

# Summary of the Hindu Kush Himalaya Assessment Report

ICIMOD

HIMAP

## SUMMARY OF THE HINDU KUSH HIMALAYA ASSESSMENT REPORT

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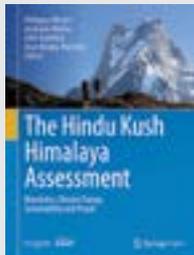
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## LINK TO THE FULL HKH ASSESSMENT REPORT



P. Wester, A. Mishra, A. Mukherji, A. B. Shrestha (eds) (2019) *The Hindu Kush Himalaya Assessment—Mountains, Climate Change, Sustainability and People*, Springer Nature Switzerland AG, Cham.

Download the full assessment at

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Assessment Report  
Chapter 1](#)

## ABOUT HIMAP

The Hindu Kush Himalayan Monitoring and Assessment Programme (HIMAP) is a long-term, integrated science-policy initiative coordinated by ICIMOD that aims to support enabling policies and sustainable solutions and promote regional cooperation to address some of the region's most immediate challenges by:

- Comprehensively assessing the current state of knowledge of the HKH region, including thematic assessments, sub-regional assessments, and topical outlooks
- Increasing the understanding of various drivers of change and their impacts
- Developing evidence-based policy solutions and recommendations
- Engaging decision makers across sectors and institutions through a series of HKH Science-Policy Forums

HIMAP is a platform for long-term collaboration and coordination among a broad and diverse group of more than 350 leading researchers, practitioners, and, policy specialists working in the HKH. Under HIMAP, experts from the region have come together to develop the first comprehensive assessment of the HKH as the first in a series of monitoring and assessment reports. It deals with major issues such as climate change, biodiversity, energy, cryosphere (frozen water), water, food security, air pollution, disaster and resilience, poverty, adaptation, and gender and migration.



## CHAPTER 1

# INTRODUCTION TO THE HINDU KUSH HIMALAYA ASSESSMENT

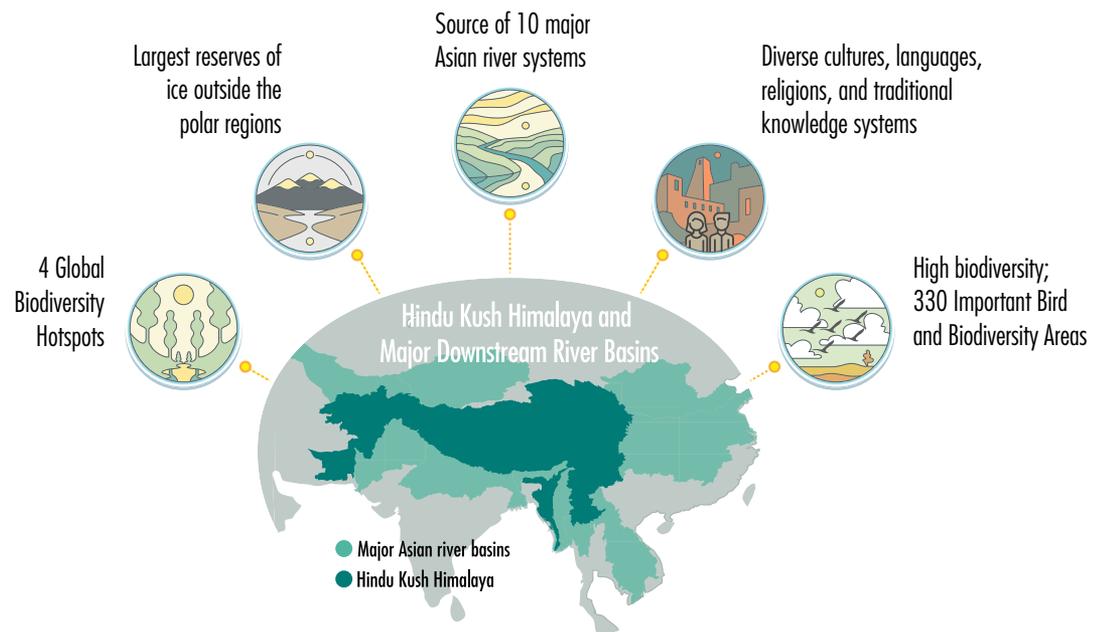
## THE HINDU KUSH HIMALAYAN CONTEXT

Ongoing changes in the HKH will have major consequences not only for people living in the region, but globally. Urgent regional and international action is needed to protect this global asset.



The Hindu Kush Himalaya (HKH) is one of the greatest mountain systems in the world, covering 4.2 million km<sup>2</sup> across eight countries: Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. The region is home to the world's highest peaks, unique cultures, diverse flora and fauna, and a vast reserve of natural resources. It is the source of 10 major river basins, and provides ecosystem services (including water, food, and energy) that directly sustain the livelihoods of 240 million people in the mountain and hills of the HKH.

Nearly 1.65 billion people living in downstream areas of these river basins also benefit directly and indirectly from its resources and more than three billion people benefit from the food produced in its river basins. The HKH and the Tien Shan mountains together form the largest area of permanent ice cover outside of the north and south poles and are also referred to as the 'Third Pole'.



**240 million**  
people depend directly on the HKH for their lives and livelihoods

**1.9 billion**  
people depend on the HKH for water, food, and energy

**> 35%**  
of the world population benefits indirectly from HKH resources and ecosystem services

## KEY ISSUES IN THE HKH

The HKH region is geologically fragile, with young and rising mountains that are vulnerable to erosion and landslides, even without human interference. The region is undergoing rapid change, driven by forces such as climate change, disasters, economic growth, globalization, infrastructure development, land use change, migration, and urbanization. Changes on the roof of the world have had and will continue to have major consequences not only for people living in the region but globally. Actions at national, regional, and international scales are urgently needed to sustain this global asset, focusing on more investments and robust regional cooperation for sustaining mountain environments and livelihoods in the HKH and concerted action to keep global warming to less than 1.5 °C by 2100.

From a policy standpoint, achieving food, water, energy, and livelihood security in the region will require exploring various scenarios so that the scientific community, policy makers, the private sector, and community stakeholders can come together and make optimal governance decisions to sustain this global asset. It will also require country-specific recommendations to guide national-level policy making.

## RATIONALE FOR THE ASSESSMENT

The assessment aims to critically evaluate the current state of knowledge about the HKH with an aim to develop policy-oriented solutions, and inform relevant decision makers across sectors.

This comprehensive assessment of the HKH region also intends to inform global assessments reports of the Intergovernmental Panel on Climate Change (IPCC) and the Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES). It will also contribute to global targets, including like the 2030 Sustainable Development Goals, the UNFCCC Paris Agreement, and the Sendai Framework for Disaster Risk Reduction 2015.

The assessment addresses the environmental, economic, and social pillars of sustainable mountain development and will serve as a basis for evidence based decision making to safeguard the environment and advance people's wellbeing. This report will not be a one-time publication. It is planned as the first of a series of monitoring and assessment reports about the HKH.

This assessment aims to:

- Establish the global significance of the HKH
- Reduce scientific uncertainty on various mountain issues
- Lay out practical and up-to-date solutions and offer new insights for the development of this region
- Value and conserve existing ecosystems, cultures, societies, knowledge, and distinctive HKH solutions that are important to the rest of the world
- Address contemporary policy questions
- Influence policy processes with robust evidence for sustainable mountain development

## ASSESSMENT PROCESS

More than 350 researchers, practitioners, experts, and policy makers were involved in drafting the HKH Assessment Report. The process involved:



## NINE MOUNTAIN PRIORITIES

Considering the issues, questions, and vision as part of this assessment, the chapters and key messages are drafted in line with the UN Sustainable Development Goals (SDGs). The “Priorities for Mountains and People of the HKH” reflect the ideals of the SDGs.

The nine mountain priorities are:

1. **End poverty in all its forms everywhere in the mountains** and ensure that women, men, and children of the HKH region lead healthy lives in an inclusive and equitable environment.
2. **Promote sustainable production systems to assure food security, nutrition security, and income for mountain people**, with particular attention to the changing roles of women in agriculture.
3. **Achieve gender and social equity** through inclusive and transformative change in the mountains.
4. **Ensure year-round secure water supply in the mountains** with universal and affordable access to safe drinking water, sanitation, and water for productive purposes.
5. **Ensure universal access to clean energy in the mountains** from sources that are affordable, reliable, and sustainable.
6. **Halt biodiversity loss and land degradation and sustainably manage forests and other ecosystems in the mountains** to enhance ecosystem resilience for sustained flow of services.
7. **Ensure integration between adaptation to climate change, disaster risk reduction, and sustainable development for the mountains** through evidence-based decision making.
8. **Build resilient, equitable, and inclusive mountain communities** empowered by economic opportunity and investment in mountain infrastructure and connectivity.
9. **Promote a mountain-specific agenda for achieving the SDGs** through increased regional cooperation among and between mountain regions and nations.



The HKH is among the most diverse regions of the world, environmentally, socioculturally, and economically. Mountain systems are strongly affected by multiple local and global drivers of change in more densely populated lowlands. A comprehensive analysis of these drivers reveals that individual and cumulative impacts are reflected at multiple spatial and temporal scales and are complex in their interactions and impacts.

This chapter describes environmental, sociocultural, and economic dimensions of change and seeks to identify the main drivers of change affecting mountain sustainability in the HKH. It outlines and describes trends, as well as existing and potential impacts of a varied and sometimes complex set of drivers of change to mountain sustainability.

## KEY FINDINGS

- Looming challenges characterize the HKH as environmental, sociocultural, and economic changes are impacting livelihoods, environmental conditions, and sustainability.
- The drivers of change impacting sustainability are interactive, inextricably linked, and increasingly influenced by regional and global developments.
- However, for mountain communities, some changes may also present novel opportunities for sustainable development.

## POLICY MESSAGES

- Policy approaches must become more holistic and multidimensional to meet the challenges arising from environmental, sociocultural, and economic change in the HKH.
- Governments should take strong and timely action to strengthen the sociocultural and environmental dimensions of sustainability, while also fostering responsible economic growth in the mountain regions.
- Governments in the region should combine and accelerate efforts to advance sustainable mountain development, especially with a view to benefiting from the global conservation and development agenda, such as the UN Sustainable Development Goals for 2030.



## CHAPTER 2

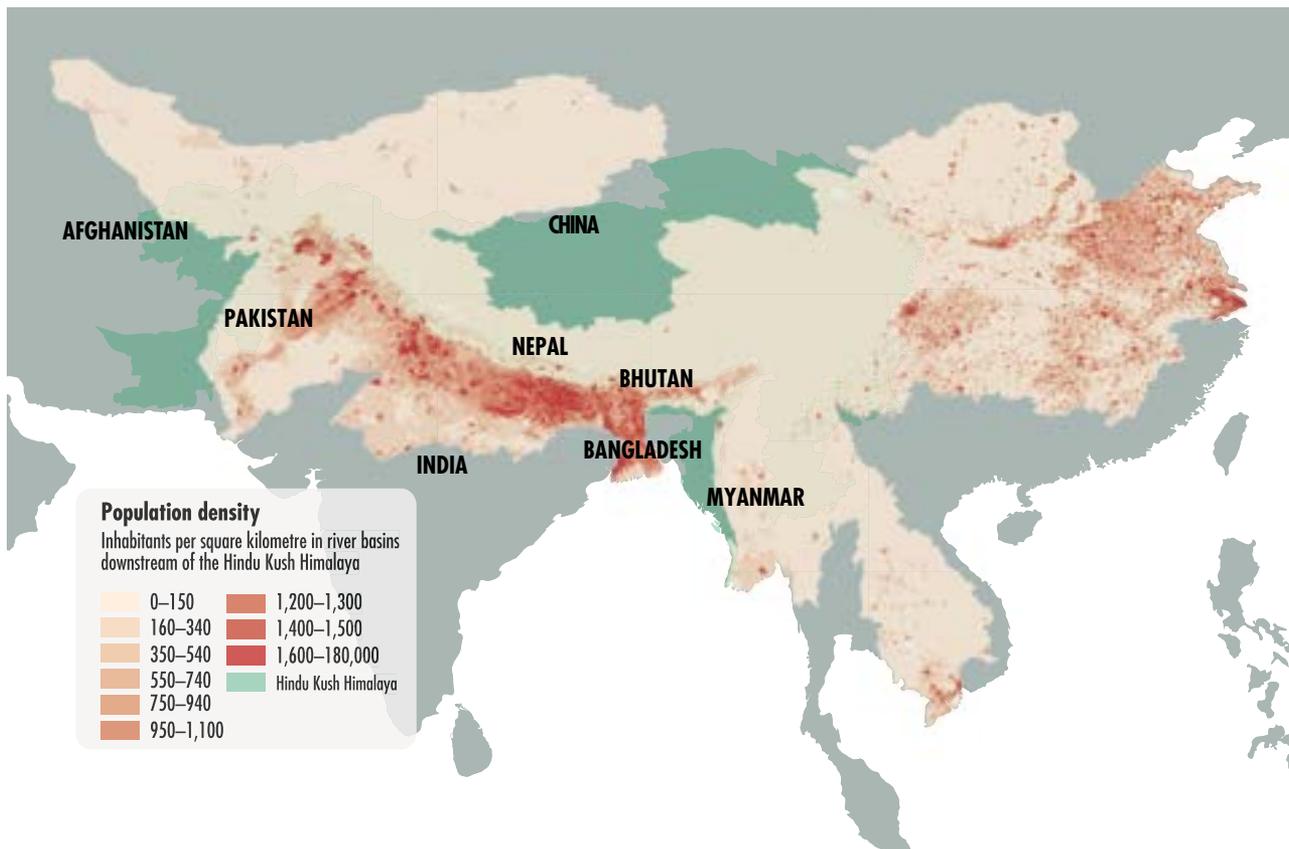
# DRIVERS OF CHANGE TO MOUNTAIN SUSTAINABILITY IN THE HINDU KUSH HIMALAYA

## OBSERVATION AND TRENDS

High-level transnational cooperation and local participation are needed to cope with conflicts arising due to rapid demographic change, increasing land use, over-exploitation of natural resources and weak governance systems.

## DEMOGRAPHIC SHIFT OF POPULATION TOWARDS THE CITIES WILL CREATE FUTURE CHALLENGES THROUGH ENVIRONMENTAL IMPACTS

In most areas of the HKH, rapid demographic and economic growth have increased the demand for natural resources leading to overexploitation, significant land use and land cover change, habitat fragmentation, and unsustainable growth. Rapid economic growth has changed levels and patterns of consumption as well as infrastructure investment. Large-scale investments have a multitude of intended or unintended effects, some of which are negative, including social and environmental consequences. Demographic shifts, with people increasingly concentrated in town and cities, are expected to create future challenges through environmental impacts caused especially by a growing demand for food and energy. At the same time, this may also lead to improved quality of and access to social services such as education, health care, and waste management.



**PEOPLE ARE INCREASINGLY CONCENTRATED IN URBAN AREAS THAT DEPEND ON NATURAL RESOURCES FROM THE HINDU KUSH HIMALAYA**

## **TECHNOLOGICAL INNOVATIONS HAVE LED TO A DECLINE IN TRADITIONAL WAYS OF LIFE, AND TO A MORE INTENSE USE OF NATURAL RESOURCES**

Technological innovations have markedly affected people's ways of life in the HKH, especially local and indigenous sociocultural practices, enabled through the development of a range of opportunities in remote mountain areas. With a gradual integration into regional and global markets, many rural societies in the region are now shifting from subsistence farming to more market-based agricultural production, including cash crops. Such changes have contributed to the conversion of croplands to non-agricultural use, a decline in traditional ways of life, and more intense use of natural resources – along with rising incomes and enhanced livelihoods, albeit not uniformly among all people or groups. Advances in agricultural technology and biotechnology may improve crop yields and food security, while increased access to global information and communication technology (ICT) services including smartphones, open access software, and cloud computing can make mountain regions more accessible.

## **DEMOGRAPHIC CHANGES, GOVERNANCE SYSTEMS, AND CLIMATE CHANGE MAY HAVE THE MOST HARMFUL IMPACTS ON SUSTAINABLE DEVELOPMENT IN THE HKH**

Several major drivers, in particular demographic changes, governance systems and institutions, and climate change, are likely to have the most harmful or challenging impacts on sustainable development in the HKH. As countries work to adapt their practices and mitigate these impacts, they must collaborate closely with each other. Weak governance and uncertain or insecure land tenure, in particular, along with political unrest, local conflicts, and migration, are also exacerbating environmental degradation through various activities such as poaching, unsustainable timber harvesting, and other forms of over-exploitation of natural resources.

## **CHANGES IN ONE DRIVER RESULT IN INTERACTIVE OR FEEDBACK EFFECTS ON OTHER DRIVERS**

The origin and impact of key drivers of change in the HKH manifest at three main levels or scales: direct local impacts of drivers on land and natural resources and their management, within a framework of coupled social-ecological systems; regional effects of local drivers, mediated largely through provision of ecosystem services in the context of highland-lowland linkages; and regional and global influences on the HKH through telecoupled systems, whereby decisions or actions made outside the region have significant impacts within the HKH. In the widely interconnected spheres of influence of each driver, multiple pathways of impact are common, including both direct and indirect associations with mountain sustainability. Human-related drivers affect mountain sustainability at different spatial and temporal scales; both the assessment and management of these drivers is complex. Changes in one driver generally result in interactive or feedback effects on other drivers. That is, for any given change, the effects are always multiple and often interactive; there is no simple causal link between a driver of change and any single aspect of mountain social-ecological systems.

## **THERE IS AN URGENT NEED FOR IMPROVED COORDINATION AMONGST DEVELOPMENT STAKEHOLDERS**

All the above challenges create an urgent need for improved coordination amongst development stakeholders, including governments, for formulating evidence-based policies and legislation, effective institutional arrangements, transparent decision making, and greater transboundary cooperation in regional aspects of conservation and development across the HKH.





## CHAPTER 3

# UNRAVELLING CLIMATE CHANGE IN THE HINDU KUSH HIMALAYA

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The HKH is sensitive to climate change and variability. Adapting to long- and short-term climate-related problems requires a thorough understanding of changes in climate in the past and possible changes in the future. This chapter presents a broad overview of weather and climate elements pertaining to the HKH. It specifically examines the linkages between large-scale drivers and climate variability in the HKH, past and present regional climate variations, and likely future regional climate projections using high-resolution regional climate models suitable for the complex topography of the HKH.

This chapter aims to support HKH countries in building resilience and adaptive capacity in the face of climate-related hazards and in integrating climate change adaptation measures into national policies, strategies, and plans.

## KEY FINDINGS

- Even if global warming is limited to 1.5°C, warming will likely be at least 0.3°C higher in the HKH, and at least 0.7°C higher in the northwest Himalaya and Karakoram.
- There has been a rising trend of extreme warm events in the HKH over the past five to six decades, a falling trend of extreme cold events, and a rising trend in extreme values and frequencies of temperature-based indices (both minimum and maximum).
- The HKH is experiencing increasing variability in western disturbances and a higher probability of snowfall in the Karakoram and western Himalaya, changes that will likely contribute to increases in glacier mass in those areas.
- Consensus among climate models for the HKH region is weak – a result of the region’s complex topography and the coarse resolution of global climate models.

## POLICY MESSAGES

- Improved long-term hydrometeorological monitoring is necessary for more robust climate change analysis and adaptation planning in the HKH.
- More reliable projections of elevation-dependent warming are crucial for accurate understanding of cryospheric dynamics.
- Policies and planning should focus on improved disaster warning systems and management and mitigation measures to address hydrometeorological extremes.

## HKH CLIMATE PROJECTED TO CHANGE MORE DRAMATICALLY IN THE NEAR FUTURE

The HKH region's weather and climate is influenced by climate drivers of tropical and extra-tropical origins such as the El Niño-Southern Oscillation (ENSO), the North Atlantic Oscillation (NAO), the Indian Ocean Dipole (IOD), the Madden-Julian Oscillation (MJO), and the Arctic Oscillation. The HKH is sensitive to climate change and variability. Much of the warming observed during the last few decades of the 20<sup>th</sup> century is attributed to the increase in anthropogenic greenhouse gas concentrations and, to some extent, to other regional climate forcing elements like anthropogenic aerosols and land-use changes.

Although the climate of the HKH has changed significantly in the past, it is projected to change more dramatically in the near future. Regional warming continued even during the global warming hiatus – the period between 1998 and 2013 when global warming appeared to have slowed.

## EXTREME TEMPERATURE INDICES HAVE CHANGED SIGNIFICANTLY

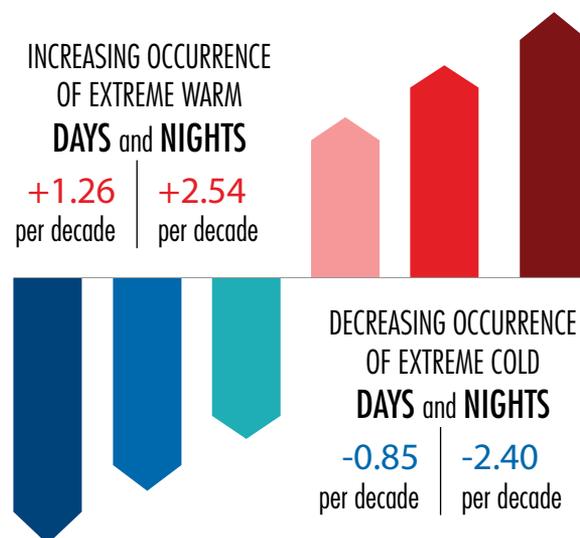
Generally, from the last century through the beginning of the current one, the HKH has experienced warming from 1901 to 1940, cooling from 1940 to 1970, and warming from 1970 to the present. The warming rate over the last 50 years in the HKH has been 0.2°C per decade. Extreme indices in the region have also changed over this period: occurrences of extreme cold days and nights have declined (days by 0.85 days per decade, nights by 2.40 days per decade), while occurrences of extreme warm days and nights have increased (days by 1.26 days per decade, nights by 2.54 days per decade). Warm nights have increased throughout the region, and extreme absolute temperature indices have changed significantly. Frost days show a significant declining trend in most parts of northern India and the Tibetan Plateau. The length of the growing season has increased by 4.25 days per decade – a positive change for agriculture.



## OBSERVATION AND TRENDS

The climate of the HKH has changed significantly and is projected to change more dramatically in the future. Urgent actions are needed to mitigate the effects and consequences of climate change.

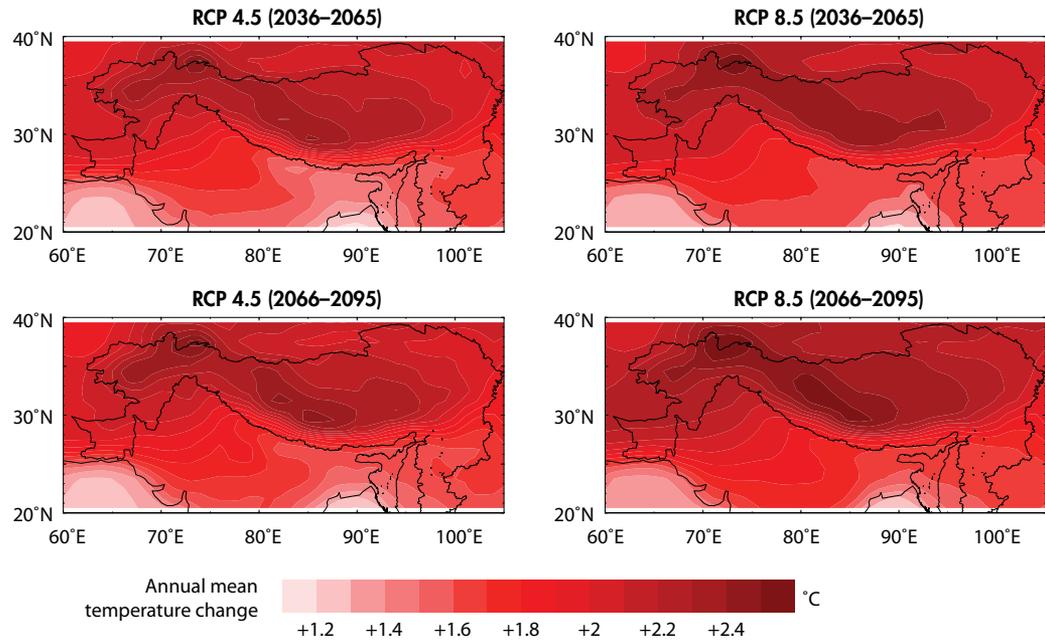
### DAYS AND NIGHTS ARE GETTING WARMER



## EXTREMES IN PRECIPITATION INCREASING

The number of intense precipitation days and intensity of extreme precipitation have increased overall in the last five decades. If these trends persist the frequency and magnitude of water-induced hazards in the region will increase in the future.

Even if global warming is limited to 1.5°C by the end of the century, the Hindu Kush Himalaya will warm by around 1.80°C.



### THE HKH WILL WARM MORE THAN THE GLOBAL MEAN AND MORE RAPIDLY AT HIGHER ELEVATIONS

*This figure shows projected spatial distribution of annual mean temperature change (°C) over the HKH for two representative concentration pathways (RCP 4.5 and RCP 8.5) over two time periods (2036–2065 and 2066–2096)*

## PROGRESSIVELY GREATER WARMING WITH ELEVATION OBSERVED IN THE HKH, PROJECTED TO CONTINUE

There is ample evidence for elevation-dependent warming (EDW) in the HKH, especially in the Tibetan Plateau and its surrounding regions. This calls for further investigation – in part because EDW can illuminate cryosphere dynamics, and in part also because EDW makes current efforts to contain global warming all the more important for the HKH. Signatories to the United Nations Framework Convention on Climate Change (UNFCCC) agreed at the Conference of the Parties (COP21) in Paris in December 2015 to take steps towards limiting the global mean annual surface air temperature increase to well below 2°C above pre-industrial levels, and to pursue efforts towards a target of 1.5°C. By the end of the century, if average global warming is limited to 1.5°C above pre-industrial levels, the HKH will warm by  $1.80 \pm 0.40$ °C. It is projected that EDW will continue.

## TIBETAN PLATEAU, CENTRAL HIMALAYAN RANGE, AND KARAKORAM WILL WARM MORE THAN THE HKH AVERAGE

The Coordinated Regional Downscaling Experiment (CORDEX) models project significant warming over the HKH region in the future. In the near term (2036–2065), the region is projected to warm by 1.7–2.4°C for representative concentration pathway 4.5 (RCP 4.5) and 2.3–3.2°C for RCP 8.5. In the long term (2066–2095), regional warming is projected to be 2.2–3.3°C for RCP 4.5 and 4.2–6.5°C for RCP 8.5.

Increased warming during the winters is also projected. The Tibetan Plateau, the central Himalayan Range, and the Karakoram will see a rise in temperature higher than the HKH average.

## INCREASING WESTERN DISTURBANCES AND THE KARAKORAM ANOMALY

Winter precipitation in the Himalaya is predominantly from synoptic weather systems known as western disturbances, which propagate eastward from the Mediterranean region. Annual winter snowfall amounts range from a few hundred to several hundred centimetres at different elevations, with the maximum snowfall occurring over the Karakoram. The western disturbances also significantly impact temperature patterns of the Himalaya besides precipitation. The changes in the westerly disturbance are also believed to increase the mass of some glaciers in the Karakoram and western Himalaya, popularly known as the “Karakoram Anomaly”.



Significant increase in the number of wet days and extreme rain events recorded over the western Himalaya and the Karakoram.



In the eastern Himalaya, the total amount of precipitation did not change much and the number of rainy days decreased, which meant a higher amount of rainfall in a shorter period of time.

## SIGNIFICANT CHANGES IN PRECIPITATION EXTREMES IN PAST DECADES





## CHAPTER 4

# EXPLORING FUTURES OF THE HINDU KUSH HIMALAYA: SCENARIOS AND PATHWAYS

SUSTAINABLE  
DEVELOPMENT  
GOALS



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Long-term future scenarios need to be developed to illuminate future uncertainties for the HKH and enable short-term development actions to be consistent with longer-term societal and environmental transformation pathways. Long-term scenarios are also needed to ensure independence from present policies and to create more flexibility for nonlinear changes and space for identifying creative opportunities.

Considering the lack of such long-term regional-level scenarios for the region, this chapter attempts to create qualitative HKH regional-level developmental scenarios (2080) and prepare alternative pathways toward prosperity beyond the current developmental plans of 2030, more specifically to set clear goals for 2050 based on a 2080 prosperous future scenario for the HKH region.

## KEY FINDINGS

- This is a critical moment for the HKH. Environmentally, socially, and economically, there is no single likely future for the HKH. Between now and 2080, the HKH may run downhill, it may continue with business as usual, or it may advance toward prosperity.
- Evidence-based actions to reduce disaster risk, mitigate and adapt to climate change, and adopt good governance – as well as collaboration among state and non-state actors – are central to ensuring prosperity in the HKH by 2080.

## POLICY MESSAGES

- To avert the worst case scenario for the HKH by 2080, institutional mechanisms must confront the main challenges and resolve conflicts at various levels, and among various social groups.
- The HKH will face significant risk if decision makers, governments, institutions, and communities continue with business as usual.
- To achieve prosperity by 2080, it is important to consider two potential pathways for the HKH – large-scale sustainable development investment with regional cooperation, and bottom-up investment with local and national cooperation.
- The two pathways toward prosperity are not mutually exclusive – they can and need to be integrated.

## SCENARIOS HELP ENVISION THE FUTURE: A SHARED VISION APPROACH

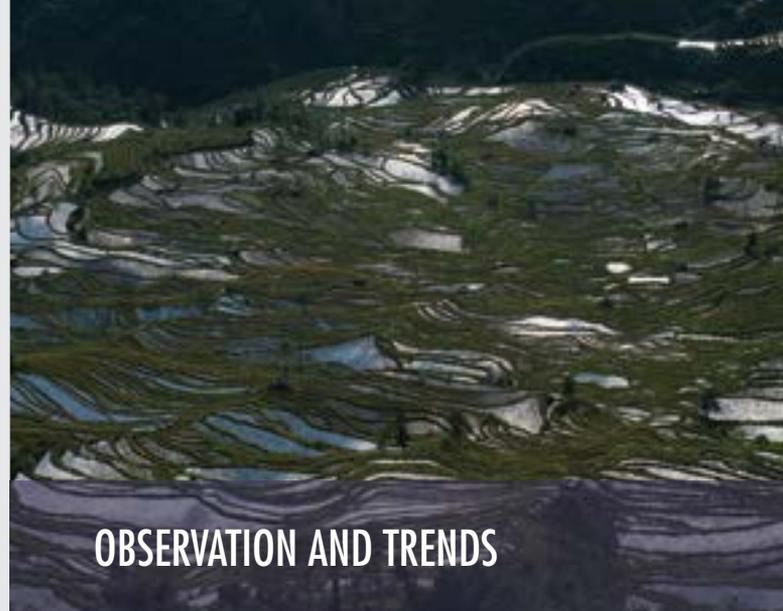
A scenario is not a forecast or prediction; rather it is a plausible story about the future with a logical plot and narrative governing the manner in which events unfold. Scenario development generally summarizes discourses such as those on poverty, nutrition, food security, and demographic change into a “shared vision” taking into consideration various stakeholders.

Long-term scenarios help us understand gaps between current and desired policy settings, set the agenda for future policies, reduce uncertainty, and build consensus to strengthen cooperation.

Four workshops with scientists and two workshops with decision makers were conducted – involving 139 national, regional, and global participants from 74 institutions – to develop a shared vision consisting of the following:

- Challenges and opportunities driving development trajectories
- Plausible scenarios for the region by 2080, identified through consensus
- Storylines/narratives for each identified scenario
- Alternative pathways and actions for a prosperous HKH

This was achieved through a three-step process. As a first step, 2080 was used as a representative year for developing long-term scenarios



## OBSERVATION AND TRENDS

Visioning and strategic planning need to start now to illuminate future uncertainties and inform strategic plans to realize the long-term goal of prosperity in the Hindu Kush Himalaya.

for the 30-year period from 2070 to 2100. Through a participatory process, the participants identified challenges and opportunities that may drive change in the region. Keeping these drivers in view, three plausible scenarios were identified and storylines were developed for each scenario. The proposed forward-looking alternative pathways guide policy for the decades from 2030 to 2050 that will lead the HKH to prosperity in 2080. Working backwards from the three 2080 scenarios – and with reference to currently available national commitments to the Sustainable Development Goals (SDGs) and targets for 2020 and 2030 – two broad potential pathways to prosperity and actions that countries in this region need to take to put the HKH on these pathways were identified.

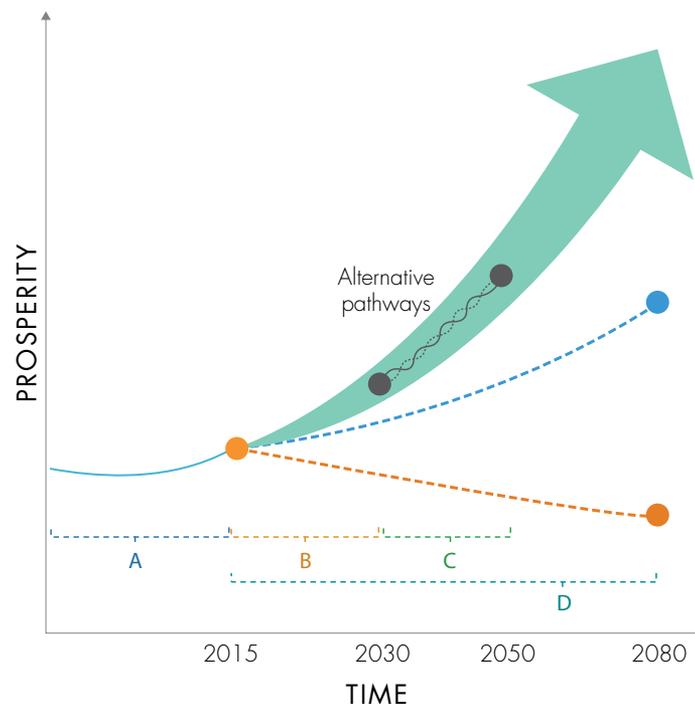
## LONG-TERM SCENARIOS ARE NEEDED TO ENABLE SHORT-TERM DEVELOPMENT ACTIONS

The current conventional planning approaches followed in the HKH region involve relatively short planning periods (five years) with less continuity between planning cycles. Long-term future scenarios are used to enable short-term developmental actions consistent with longer-term societal and environmental transformation pathways targeted towards a desired future. The HKH region currently lacks quantitative model simulations for future scenarios. As a first step, this chapter identifies challenges and opportunities driving the development trajectories of the region and the scenarios that could emerge by 2080.

### WHAT IS THE WORST CASE SCENARIO?

The worst case scenario encompasses strong climate change; a socially, economically, and politically unstable region; and strong ecosystem degradation. In this downhill storyline, regional conflicts over resource sharing persist, and even multiply, as scarcity increases. People and institutions do not benefit from emerging opportunities for efficient resource use. Communities remain isolated from the larger market systems. Mountain livelihoods do not include inclusive growth through new innovations, skills, and practices. Ecosystems are degraded and biodiversity loss continues, mitigation efforts fail, and fossil fuels remain the dominant energy source. Climate change impacts reflect the Intergovernmental Panel on Climate Change (IPCC)'s worst case scenario – global temperature rising by substantially more than 2.0°C.

## DEVELOPMENT PATHWAYS AND POSSIBLE SCENARIOS FOR THE HKH BETWEEN NOW AND 2080



A: Historical trends discussed in HIMAP chapters  
 B: Current commitments towards 2030  
 C: Pathways towards 2050  
 D: Scenarios for 2080

### Scenario 1: PROSPEROUS HKH

- Weak climate change
- A socially, economically, and politically stable region
- Low ecosystem degradation

Climate change mitigation efforts largely succeed

### Scenario 2: BUSINESS AS USUAL

- Strong climate change
- Medium social, economic, and political instability
- Medium ecosystem degradation

Climate change mitigation efforts do not meet the 1.5°C target

### Scenario 3: WORST CASE

- Strong climate change
- Socially, economically, and politically unstable region
- Strong ecosystem degradation

Climate change impacts global temperature, which rises by substantially more than 2.0°C

### WHAT HAPPENS IF BUSINESS AS USUAL CONTINUES WITHOUT ANY SIGNIFICANT CHANGES?

The business as usual scenario envisions strong climate change, medium social, economic, and political instability, and medium ecosystem degradation. In the business as usual storyline, today's economic growth patterns persist. Business and industries strive to keep meeting economic targets, while most meet only the minimum required standards for the environment and sustainability. There is some cooperation among HKH countries, although the cooperation is neither envisioned nor realized in all the ways in which it could succeed, nor in all the sectors where it could do so. The value of ecosystems is recognized by some, but not as broadly or in as many quarters as possible. Although some climate change mitigation efforts are put in place, they do not proceed rapidly or effectively enough to meet the 1.5°C target set at the UNFCCC Conference of Parties 21 (COP21), held in Paris in December 2015.

## WHAT PATHWAYS LEAD TO THE PROSPEROUS SCENARIO FOR THE HKH?

A pathway is described here as a set of actions and combinations of actions that a decision maker (individual, country, business, or policy maker) can take. There are many possible and overlapping pathways toward the prosperous scenario, but we have outlined two in depth. These two pathways differ in the scale of actions, size of investments needed, level of policy engagement required, choices about technology, and inclusion of development actors. Both pathways will help lead the HKH to a prosperous scenario in 2080.

**Pathway to Prosperity 1:** Large-scale sustainable development investments with regional cooperation. The HKH looks to large or centralized projects in developing its natural resources. Water is harnessed for food and energy in ways that address gender inequality and persistent poverty. Human resources are mobilized on a large scale. National and international funding is provided through collaboration among state, corporate, and non-state actors. Countries increasingly share resources, improve communication, and acquire infrastructure for greater mobility. Institutions gain the strength to govern this cooperation within and outside the HKH. The South Asian Free Trade Area (SAFTA), Indus Water Treaty, and India Bhutan Hydropower Treaty – under which Bhutan exported 1,500 MW of hydropower to India in 2015 – are a few examples in this direction.

**Pathway to Prosperity 2:** Bottom-up investments with cooperation across multiple levels. Water and energy, while critical, are developed through smaller-scale and decentralized programmes that promote national self-reliance. Activity is coordinated among many non-state development and social actors, both nationally and sub-nationally. Multi-level governance structures are built to maintain local diversities, to fund projects, and to monitor progress toward scenario goals across actors. Farmer-managed irrigation systems in Nepal and local spring water management projects in Sikkim and Uttarakhand, India are a few good examples.

These two pathways are not mutually exclusive. Decision makers may combine actions from each pathway at various stages, as they weigh the benefits and risks and consider associated trade-offs. What is most certain is that the HKH must quickly seize unique and emerging opportunities while meeting challenges. If actions through 2030 do not pick up speed, but remain at current levels, the region will not build the cooperation and multi-level governance structures needed to develop its natural resources in ways conducive to prosperity.



## KNOWLEDGE GAPS AND WAY FORWARD

Regional cooperation on resource sharing will not improve regional prosperity unless global commitments to climate mitigation are also upheld. Experts and stakeholders consulted during the development of this chapter expressed pessimism in this context. The Paris Agreement, if adequately implemented, can help in achieving the prosperous scenario.

A top-down regional impact assessment model should be developed to quantify the qualitative scenarios and pathways outlined in this chapter. This will help reduce risks and improve decision making in the future. In particular, two assessments can be carried out: an emissions assessment of large-scale interventions; and an economic assessment identifying the most cost-efficient and beneficial pathway, and associated adaptation and mitigation costs.



## CHAPTER 5

# SUSTAINING BIODIVERSITY AND ECOSYSTEM SERVICES IN THE HINDU KUSH HIMALAYA

SUSTAINABLE  
DEVELOPMENT  
GOALS



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Chapter 5](#)

The ecosystems of the HKH exhibit high levels of diversity and heterogeneity, partly in response to high climatic variability and topography. This chapter focuses on the key thematic areas of biodiversity and ecosystem services and illustrates the trends observed across the HKH.

This chapter contextualizes the state of the region's biodiversity and ecosystems, highlights the status and trends in biodiversity and ecosystem services, documents the current state of socio-ecological systems, highlights conservation and management practices, and identifies gaps and suggests strategic directions for mountain ecosystem sustainability.

### KEY FINDINGS

- The mountain ecosystems of the HKH have high species richness and endemism and provide varied ecosystem services to one fourth of humanity.
- Global and regional drivers of change are impacting ecosystems and leading to biodiversity loss in the HKH.
- The HKH has numerous examples of good practices in conservation and restoration of degraded habitats that go hand-in-hand with community development. These practices need to be scaled up and scaled out.

## POLICY MESSAGES

- The mountain ecosystems of the HKH need an integrated and transboundary conservation approach at the landscape scale for sustainable development.
- Regional efforts will enhance the resilience of HKH ecosystems to climate related extreme events while conserving biodiversity and promoting human wellbeing.
- Investments in mountain ecosystems should be made where they are most needed to conserve biodiversity, alleviate poverty, and provide sustainable livelihood opportunities.



**+35**

**new species discovered**

each year in the eastern Himalaya between 1998 and 2008



**1/4**

**of endemic species**

in the Indian Himalaya could be wiped out by 2100



**70–80%**

**of habitat lost**

in biodiversity hotspots in the HKH (relative to 1500 AD)

## RICH BIODIVERSITY IN THE HINDU KUSH HIMALAYA IS UNDER THREAT

The Hindu Kush Himalaya provides ecosystem services to two billion people, more than any other mountain system in the world.

## OBSERVATION AND TRENDS

Ecosystem services in the HKH are poised for major changes due to current threats like climate change; local, regional, and global market forces; and the socio-political environment in individual countries.

## THE HKH IS THE YOUNGEST GLOBAL MOUNTAIN BIOME AND ONE OF THE MOST ECOLOGICALLY DIVERSE ECOSYSTEMS IN THE WORLD

HKH ecosystems provide crucial ecosystem services to over two billion people, more than any other mountain system. The unique high mountains, driven by plate tectonics, have created a diverse landscape, climate variability, ecological gradients, and physical habitats that set the stage for ecosystem differentiation and species evolution. The biodiversity in the region is under explored and much needs to be done to document their occurrence and status. Between 1998 and 2008, an average of 35 new species were discovered each year in the eastern Himalaya alone.

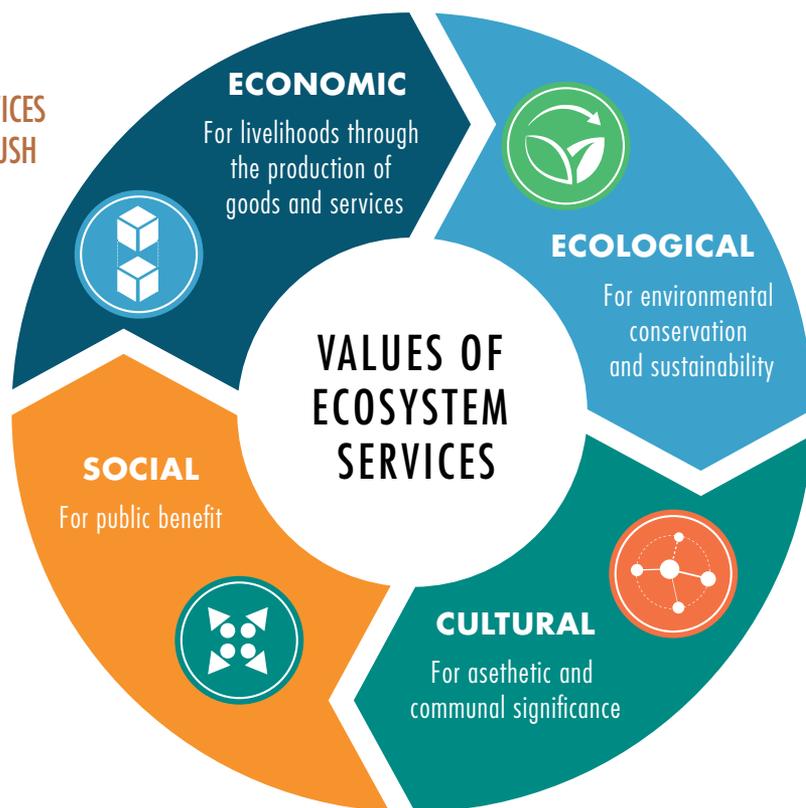
## GLOBAL AND REGIONAL DRIVERS OF BIODIVERSITY LOSS ARE PREVALENT AND INCREASING IN THE HKH

It is estimated that 70–80% of the human population in the region lives in rural areas, while 60–85% subsists directly through ecosystem services.

The ecological diversity of the HKH is being subjected to developmental pressures that contribute to ecosystem degradation. Global and regional drivers of biodiversity loss – such as land use change and habitat loss, pollution, climate change, and invasive alien species – are prevalent and increasing in the HKH. Although more than 39% of all land in the HKH lies within the protected area network, ecosystems are under stress or subject to risks from various drivers of change, including climate change, at all levels. There are indications that we may experience substantial loss of biodiversity in the HKH by the end of this century.



### THE VALUES OF ECOSYSTEM SERVICES IN THE HINDU KUSH HIMALAYA HAVE RECEIVED LITTLE ATTENTION

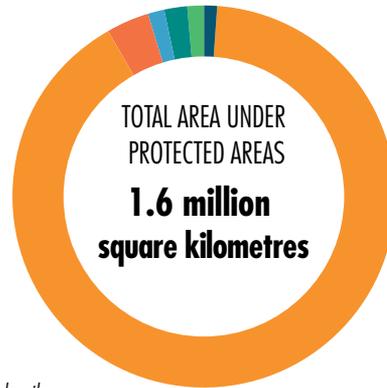
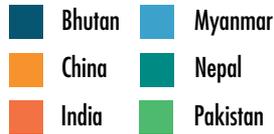


### BETTER MANAGEMENT OF HKH ECOSYSTEM SERVICES ENTAILS A BETTER UNDERSTANDING OF COUPLED SOCIO-ECOLOGICAL SYSTEMS

Broadly, ecosystem services have four kinds of values. In the HKH, social and cultural values are less recognized compared to ecological and economic values. All four kinds of values, however, have received little attention – either qualitative or quantitative – compared to widely researched topics in the region such as carbon, water, and hydropower. Many of these studies focus on a small area and lack the holistic view needed to inform and guide policy decisions.

Better management of HKH ecosystem services entails learning more about the state and trends of coupled socio-ecological systems. The diverse landscapes of the region provide multiple services with complex, dynamic interrelations. Common drivers, affecting multiple ecosystem processes and interactions among ecosystem services, can create both synergies and trade-offs between ecosystem health and the flow of services. Trade-off analysis is thus critical for integrating ecosystem services into landscape planning, management, and decision making – especially in looking at alternative paths to sustainable land use and resilience in the face of climate change.

**39%** OF THE  
HKH IS UNDER  
**PROTECTED AREAS**



*Note: Afghanistan and Bangladesh each represent less than 1% of the total area within the HKH under protected areas*

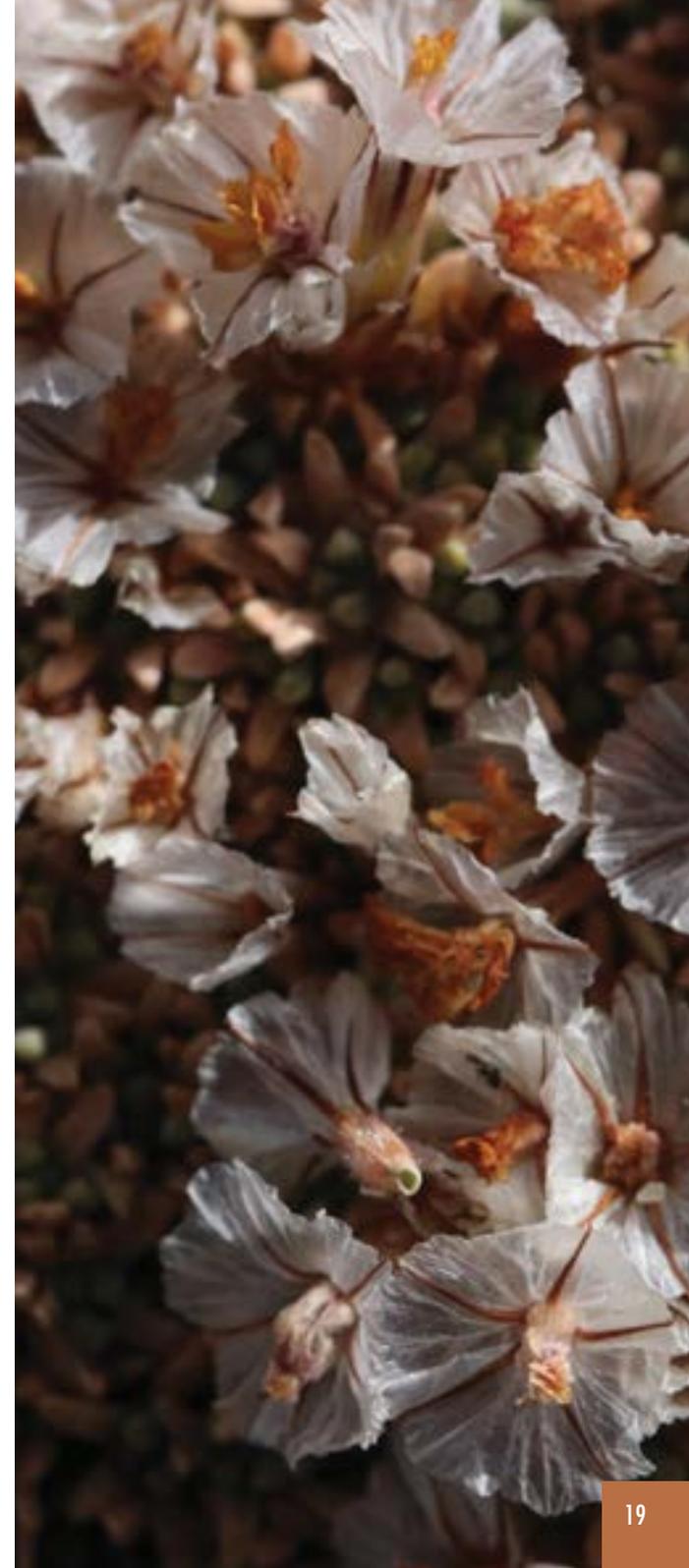
## **PARTICIPATORY AND COMMUNITY-BASED APPROACHES IN BIODIVERSITY CONSERVATION SHOW LARGE ECOLOGICAL, ECONOMIC, AND SOCIAL POSITIVE IMPACTS**

Recent decades have seen considerable development and shifts in concepts of biodiversity conservation – from perspectives that focused on species while excluding people, to new approaches centred on people and communities. Traditional ecological knowledge, cultural beliefs, and social values have contributed substantially towards meeting conservation goals.

Participatory and community-based approaches have had significant and positive ecological, economic, and social impacts. Substantial areas of degraded forest are regenerating, as decentralized practices reverse deforestation trends. Local communities have gained institutional space to decide for themselves on issues related to forests, income, inclusion, and social justice. Because of this, rural residents have been able to avail of more local economic opportunities. Progressive policies have driven this paradigm shift.

## **DESPITE SUCCESSES, CONSERVING THE GLOBAL ASSETS OF THE HKH REMAINS A CHALLENGE**

Despite successes in community-based conservation and development, conserving the global assets of the HKH remains a challenge. Biodiversity in the HKH needs to be sustained to ensure the continued flow of services. The solution lies in managing the HKH as a mosaic of integrated socio-ecological systems across political and sectoral boundaries, linking upstream and downstream conservation action with local climate adaptation strategies.





HKH ASSESSMENT REPORT  
CHAPTER 6

# MEETING FUTURE ENERGY NEEDS IN THE HINDU KUSH HIMALAYA

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The HKH is interconnected biophysically and socioeconomically across sectors, affecting energy supply and demand, their underlying drivers, and solutions to energy poverty. Mountain specificities such as inaccessibility, fragility, and marginality further lead to different manifestations of energy demand patterns and trends. The challenge for the HKH is to simultaneously address the issues of energy poverty, energy security, and climate change while attaining multiple UN Sustainable Development Goals.

The growing sectoral interdependencies in energy, climate, water, and food make it crucial for policy makers to understand the cross-sectoral policy linkages, and their effects at multiple scales. This chapter critically examines the energy outlook of the HKH in its diverse aspects, including demand-and-supply patterns; national policies, programmes, and institutions; emerging challenges and opportunities; and possible transformational pathways for sustainable energy.

## KEY FINDINGS

- The HKH remains energy poor despite its huge hydropower potential of around 500 GW.
- Measures to enhance energy supply have had less than satisfactory results because of low prioritization and a failure to address challenges of remoteness and fragility.
- Inadequate data and analyses are a major barrier to designing context-specific interventions.

## POLICY MESSAGES

- Quantitative targets and quality specifications of alternative energy options, based on an explicit recognition of the full costs and benefits, should be the basis for designing policies and prioritizing actions and investments.
- Governments of the HKH countries need to prioritize use of locally available energy resources.
- A high-level, empowered, regional mechanism should be established to strengthen regional energy trade and cooperation.

### DESPITE ITS VAST POTENTIAL OF HYDROPOWER AND OTHER RENEWABLES, THE HKH REGION REMAINS ENERGY POOR AND VULNERABLE

Despite its vast potential of hydropower and other renewables, the HKH region remains energy poor and vulnerable. Climate change is posing a major threat and a new challenge to energy security and livelihood resilience in the climate sensitive HKH region on account of factors such as receding treelines, the contribution of biomass burning to short-lived carbon pollutants, altered rainfall patterns, and unpredictable water stocks and flows, with devastating impacts on public health, environment, and livelihood security.

Despite notable progress made over the past decade to expand access to modern energy services in HKH countries, more than 80% of the rural population in HKH countries relies on traditional biomass fuels for cooking and about 400 million people still lack basic access to electricity. Although a large percentage of these energy deprived populations live in rural mountain areas – falling far behind the national access rates – mountain-specific energy access data that reflects the realities of mountain energy poverty barely exists.

In most HKH countries, existing national policy frameworks primarily focus on electrification (power sector) for household lighting, with limited attention paid to energy for clean cooking and heating, while productive energy use promotion has remained a neglected area in historical development practice. As a result, there has been limited progress in access to energy for clean cooking compared to the progress in electricity access in all HKH countries.

Some HKH countries have scaled up off-grid initiatives that are globally recognized as successful. However, the special challenges faced by mountain communities – in terms of scale economics, inaccessibility, fragility, marginality, access to infrastructure and

## OBSERVATION AND TRENDS

Providing sustainable energy access in mountain regions is a challenge due to limited access to technology, infrastructure, and finance. Investment in the renewable sector is required to harness the full energy potential of the HKH.

resources, poverty levels, and capability gaps – thwart large-scale replication of several best practice innovative business models and off-grid renewable energy solutions that are making inroads into some HKH countries.

There is a strong demand for decentralized sustainable energy solutions in the HKH due to its distinct topographic features, dispersed settlement patterns, grossly underdeveloped markets, low capabilities, and poor economies of scale. Yet, a broad range of barriers, including policy and regulatory obstacles, outdated technology, and a lack of capacity and of finance have prevented the region from taking full advantage of existing and potential renewable energy sources for decentralized sustainable energy solutions in off-grid mountain areas. This highlights an urgent need to establish supportive policy, legal, and institutional frameworks and innovations in mountain-specific technology and financing, and enhanced multi-stakeholder capacity building at all levels, for upscaling of successful energy programmes in off-grid mountain areas.

Improving energy efficiency is a cost-competitive low-hanging fruit that can address increasing demand for energy services. The massive amounts of biomass traditionally required to provide fuel for cooking and space heating results in deforestation and widespread biomass loss in the HKH mountains. Biomass use can be made more sustainable or substituted completely by moving away from the highly inefficient combustion of biomass fuels primarily used in this sector

## THE HKH CAN ATTAIN ENERGY SECURITY BY TAPPING INTO THE FULL POTENTIAL OF HYDROPOWER AND OTHER RENEWABLES

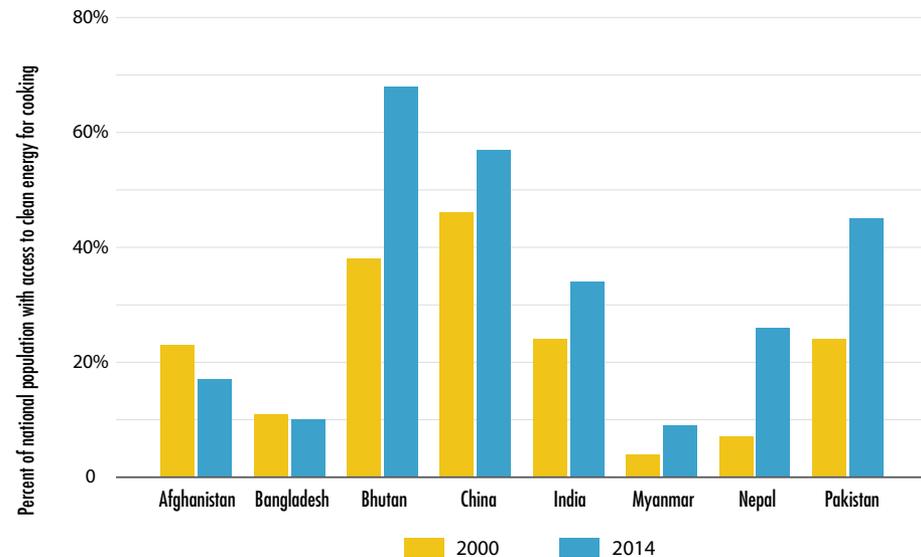
How the region handles its water, energy, and forest resources has a significant impact on the health of the Himalayan mountain ecosystems, the health and wellbeing of its populations, the vulnerability of its people and those living downstream to glacier melting and associated impacts, as well as opportunities to mitigate climate change impacts at a wider scale.

By tapping into the full potential of hydropower and other renewables, the HKH can overcome its energy poverty and attain energy security, while mitigating and adapting to climate change. Success, however, will critically depend on removing policy, institutional, financial, and capacity barriers that now perpetuate energy poverty and vulnerability in mountain communities.

## SUSTAINABLE ENERGY IS A SHARED RESPONSIBILITY

The region requires a radical energy transformation that ensures universal electricity access, through grid-connected and off-grid power for lighting and productive uses, and the complete replacement of traditional, inefficient sources for cooking and heating energy with clean, sustainable energy options that are efficient, reliable, affordable, and demand-driven.

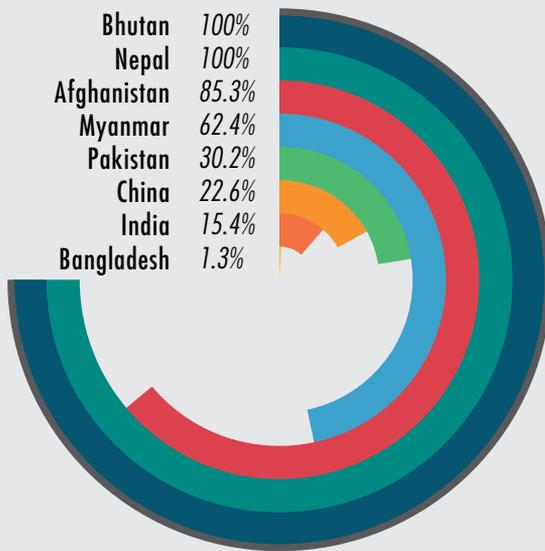
Sustainable energy transition is a shared responsibility. To accelerate progress and make it meaningful, all key stakeholders must partner with one another and work synergistically for a sustainable energy transition. The world needs to engage with the HKH to define an ambitious new energy vision: one that involves building an inclusive green society and economy, with mountain communities enjoying modern, affordable, reliable, and sustainable energy to improve their lives and the environment.



**ALTHOUGH IMPROVEMENTS HAVE BEEN MADE AT THE NATIONAL LEVEL, 80% OF RURAL POPULATIONS LIVING IN HKH COUNTRIES STILL LACK ACCESS TO CLEAN ENERGY FOR COOKING**

*This figure shows the differences in access to clean fuels and technologies for cooking in 2000 and 2014 (percentage of national population)*

## SHARE OF RENEWABLES IN TOTAL ELECTRICITY GENERATION IN HKH COUNTRIES



## ACTION POINTS

The four-point priority action agenda presents a way for sustainable energy transition to ensure energy security for all in a climate-resilient manner, through hydropower and other renewables. It also highlights the urgent need to customize UN SDG 7 targets and indicators to the specific needs and priorities of the HKH region.

- Making mountain-specific energy policies and programmes an integral part of national energy development strategy.
- Establishing monitorable quantitative and qualitative targets for each energy end use and tracking the progress of different attributes of clean energy access.
- Scaling up current investments and ensuring access to finance through capacity building at different levels.
- Accelerating the pace of regional trade and cooperation in sustainable energy through a high-level, empowered regional mechanism.





## CHAPTER 7

# STATUS AND CHANGE OF THE CRYOSPHERE IN THE EXTENDED HINDU KUSH HIMALAYA REGION

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Chapter 7](#)



The cryosphere encompasses frozen water in its many forms – glaciers, ice caps, ice sheets, snow, permafrost, and river and lake ice – and is a key freshwater resource. Industry, agriculture, and hydroelectric power generation rely on timely and sufficient delivery of water in major river systems. Changes in the cryospheric system may thus pose challenges for these sectors and for disaster risk reduction in the extended HKH.

This chapter summarizes the current status of cryospheric components in the extended HKH, examines patterns and impacts of change, and synthesizes cryospheric change projections in response to representative concentration pathway (RCP) scenarios.

## KEY FINDINGS

- The cryosphere is an important part of the water supply of the extended HKH. Observed and projected changes in the cryosphere will affect the timing and magnitude of streamflows across the region, with proportionally greater impacts upstream.
- Snow-covered areas and snow volumes will decrease in most regions over the coming decades due to increased temperatures and snowline elevations will rise.
- Glaciers have thinned, retreated, and lost mass across the HKH since the 1970s, except for parts of the Karakoram, eastern Pamir, and western Kunlun. These trends are projected to continue, with possibly large consequences for the timing and magnitude of glacier melt runoff and glacier lake expansion.
- Permafrost will continue to thaw and the depth of the active layer (seasonally thawed upper soil layer) will increase.

## POLICY MESSAGES

- To reduce and slow cryospheric change, international agreements must mitigate climate change through emission reductions.
- To better monitor and model cryospheric change and to assess spatial patterns and trends, researchers urgently need expanded observation networks and data-sharing agreements across the extended HKH region.
- Improved understanding of cryospheric change and its drivers will help reduce the risk of high-mountain hazards.

### GLACIERS IN MOST REGIONS ARE SHRINKING AND LOSING MASS

Glacier meltwater provides a regular and reliable source of streamflow in glacierized river basins. According to a compilation of glacier mass and area change studies, glaciers in most regions are shrinking and losing mass. Average rates of mass loss are slower than observed in other mountain regions, but have accelerated from -0.26 mwe/yr (1970–2000) to -0.37 mwe/yr.

### GLACIER MASS LOSS HAS INCREASED SINCE 2000, AND WILL ACCELERATE IN THE FUTURE

It is projected that glacier mass loss will accelerate through the 21<sup>st</sup> century, and higher-emission scenarios will result in even faster mass loss. The rise of regional equilibrium line altitudes will result in the complete disappearance of debris-free lower elevation glaciers, and will increase volume losses from glaciers with high-elevation accumulation areas.

### AS GLACIERS CONTINUE TO RETREAT, THERE IS INCREASED RISK OF DANGEROUS GLACIAL LAKE OUTBURST FLOODS

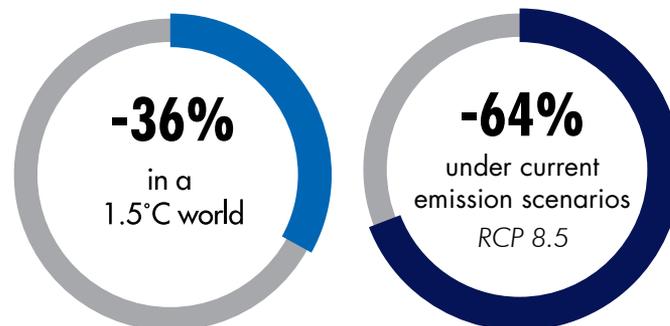
Glacial lakes occur frequently in the extended HKH, and numerous new lakes will form in response to cryospheric change. Since the 1990s, glacial lakes show a clear increase both in number and in area. Several glacial lakes in the extended HKH are potentially hazardous — and as glaciers continue to retreat, the risk of dangerous glacial lake outburst floods (GLOFs) may increase further.



## OBSERVATION AND TRENDS

The HKH cryosphere is a key water resource for the region. Changes may pose challenges for industry, agriculture, hydropower, and disaster risk reduction beyond the extent of the HKH.

### HKH GLACIER VOLUMES WILL DECLINE SUBSTANTIALLY BY 2100



## HYDROLOGICAL TRENDS RELATED TO CRYOSPHERIC CHANGE ARE DIFFICULT TO IDENTIFY

Hydrological trends related to cryospheric change are difficult to identify for three reasons: confounding influences on discharge, scarcity of long-term data sets, and high interannual variability in discharge that masks any temporal trends. Nevertheless, large volumes of snow and ice in the extended HKH are important for regional water supplies – more so as one looks further upstream. An increase in air temperature will reduce snowpack accumulations and result in earlier and lower snowmelt runoff volumes. Medium- and long-term changes in glaciers and permafrost will reduce summer melt contributions.

## FUTURE PROJECTIONS POINT TOWARDS REDUCED SNOW COVER AND LOWER BASIN-WIDE SNOW WATER EQUIVALENT

Snow is an important seasonal water storage component in the extended HKH and, in many areas, a critical source of streamflow for irrigation. Yet snowfall totals at high elevations are not well documented. Long-term measurements of snow water equivalent and solid precipitation are needed to validate gridded data sets or remote sensing-derived precipitation data sets. As snow cover in the extended HKH is highly variable and satellite-derived records are short, observed trends in snow cover are generally weak and inconsistent between studies and regions. Future projections point towards reduced snow cover and lower basin-wide snow water equivalent.

## CAPACITY FOR ADAPTATION AND RISK REDUCTION DILUTED DUE TO LACK OF ATTENTION ON IMPACT OF PERMAFROST CHANGE

Permafrost exists beneath large parts of the extended HKH – yet its occurrence and importance is not widely known in the region. As permafrost cannot easily be seen, it is easy to ignore. Yet permafrost can shape many climate impacts in cold regions. Existing measurement sites indicate permafrost warming, with an increase in the depth of the active layer. Thawing permafrost can reduce ground

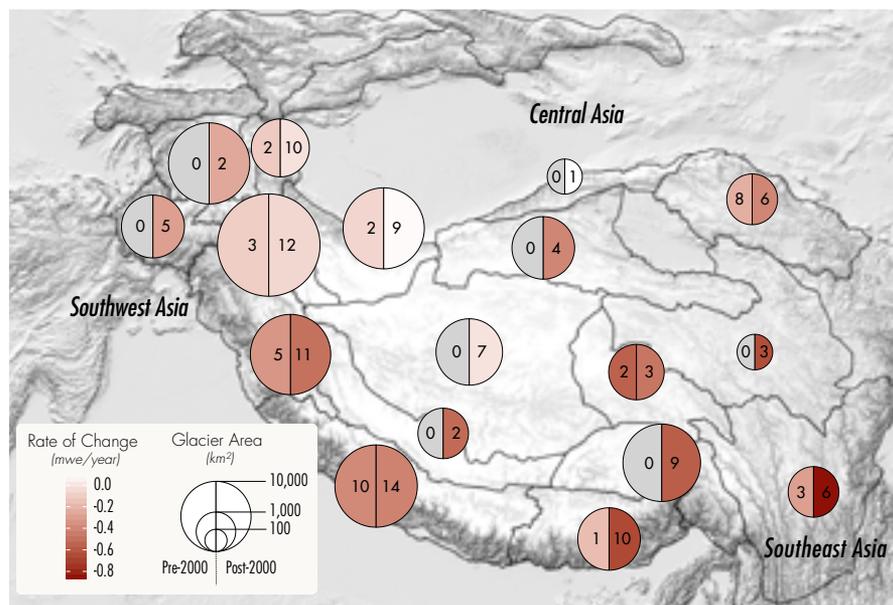
stability and cause a range of problems, from undermining engineered structures, to increased occurrence of rockfall, and increased outburst potential of glacier lakes. In addition, thawing permafrost affects the hydrological cycle: water stored in ground ice may be released or near-surface soil water availability may decline as the active layer thickens.

Strong future warming will lead to partial permafrost thaw throughout the entire HKH region. Continued neglect of permafrost in large parts of the extended HKH could limit future capacity for adaptation and risk reduction programmes.



## ICE COVERAGE DECLINING IN LARGER LAKES

Information about lake and river ice has been identified as a suitable proxy for mean air temperatures and their variability. Remote sensing-based studies show ice coverage declining in larger lakes since 1980, but no clear trend emerges for the period 2000–2012. While no future projections exist, it is likely that with a continuous increase in air temperature, ice coverage will decrease further.



**Glacier change varies across the HKH, with greater loss in the eastern Himalaya**

*This figure summarizes 164 estimates of glacier mass change by glacier region. The average rate of change from all studies is shown by the shading in half circles (pre-2000 left, post-2000 right). The numbers in each circle indicate the number of studies available for each period.*

## RESEARCH GAPS

The following critical research gaps were identified for which urgent action is needed:

- Better snow water equivalent observations and estimates are needed for high mountain areas; long-term snow course monitoring sites and strategies should be developed.
- Glacier volume change estimates prior to 2000 are currently unavailable for several regions – a gap that researchers can now fill using declassified satellite imagery.
- Detailed studies of high-elevation snow accumulation and snowmelt processes and scenarios concerning future snowpack properties are needed.
- Well-documented, reliable, and long-term hydrological observations are needed across different climate zones and elevations to assess uncertainty and variability in discharge observations, and to improve and develop models of hydrological change.
- Although many studies quantify glacier area and volume change, few try to diagnose the reasons for these changes. Better models of future glacier change will require a closer focus on regional glacier sensitivity and the causes of regional glacier change.

## ACTION POINTS

- More resources are needed for cryospheric change impact studies – both regional- and sector-specific. High-level international agreements should promote systematic data collection, data sharing, training of local and regional scientists and technicians, and the development of cryosphere-related hazard warning systems.
- Stronger global commitments are needed to reduce greenhouse gas emissions, as all projections indicate that lower emission futures result in reduced cryospheric change.
- Reductions in carbon emissions today will reduce future climate change impacts.



## CHAPTER 8

# WATER IN THE HINDU KUSH HIMALAYA

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Chapter 8](#)



Water security has emerged as a subset of human security – one that has been raising serious concern throughout the early part of the 21<sup>st</sup> century. The HKH, commonly described as the “water tower of Asia,” plays an important role in ensuring water, food, energy, and environmental security for much of the continent.

This chapter takes stock of current scientific knowledge on the availability of water resources in the HKH; the varied components of its water supply; the impact of climate change on future water availability; the components of water demand; and policy, institutional, and governance challenges for water security in the region.

## KEY FINDINGS

- The mountains of the HKH provide two billion people a vital regional lifeline via water for food, water for energy, and water for ecosystem services.
- Glacier and snow melt are important components of streamflow in the region. Groundwater, from springs in the mid-hills of the HKH, is also an important contributor to river baseflow.
- Water governance in the HKH is characterized by hybrid formal-informal regimes with a prevalence of informal institutions at the local level and formal state institutions at national and regional levels.

## POLICY MESSAGES

- To counter the formidable and immediate threats to water security posed by human drivers and climate change, equitable, productive, and sustainable water use should be promoted through decentralized decision making, effective management of urban pollution, improved infrastructure planning, and enhanced regional cooperation.
- Ensuring regional and local water security requires proactive HKH-wide cooperation, specifically in open data sharing among scientists and ministry or agency personnel; conflict management via regional platforms; and investment of public- and private-sector funds for generating and exchanging knowledge, enhancing public awareness, and stimulating action.
- Tradeoffs between upstream and downstream water uses; between rural and urban areas; and among irrigation, energy, industrial, and other sectors must be carefully managed in order to enhance water security.

## TWO BILLION PEOPLE ACROSS ASIA ARE DEPENDENT ON THE HKH FOR WATER AND A RANGE OF ECOSYSTEM SERVICES

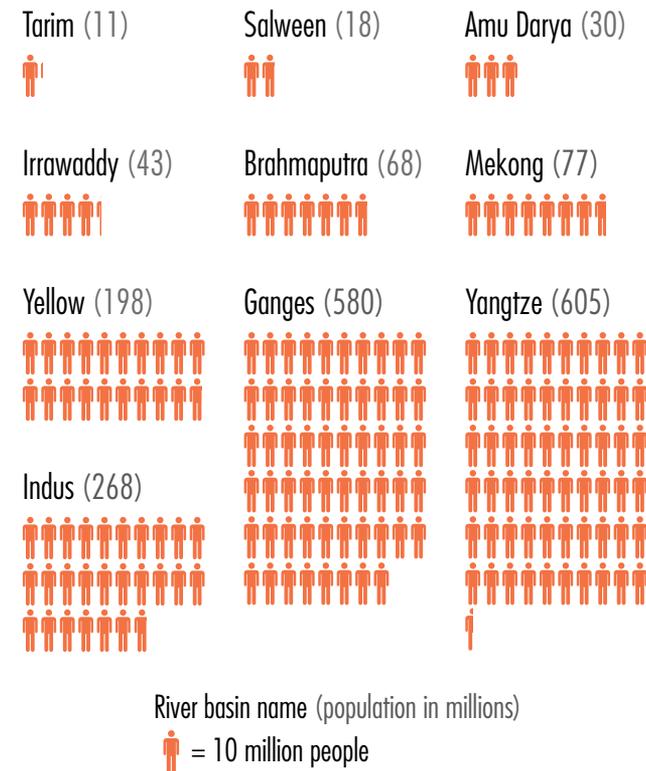
The HKH is the source of 10 major rivers that provide water – while also supporting food and energy production and a range of other ecosystem services – for two billion people across Asia. Precipitation, glacial melt, snow melt, runoff, river discharge, springs, and groundwater are the principal sources of water in the HKH.

The monsoon provides the main source of water for the eastern Himalaya, whereas the western Himalaya receives at least half of its precipitation from western disturbances in the winter. While glacier and snow melt are important components of overall streamflow in the region, rainfall runoff contributes the largest share of streamflow in the eastern rivers. Groundwater, from springs in the mid-hills of the HKH, is an important contributor to river baseflow. The contribution of springs to overall water budgets in the region is poorly understood. We urgently need better scientific knowledge of groundwater in the HKH – especially because millions of mountain people depend directly on springs. What is somewhat understood is that groundwater is overexploited in the western plains, while it remains largely untapped in the eastern plains.

## OBSERVATION AND TRENDS

Water availability, use, and governance in the HKH are in a constant state of flux. Ecosystem flows in Himalayan rivers and streams are subject to flow regimes that are heavily impacted by human water uses.

### RIVERS FROM THE HINDU KUSH HIMALAYA PROVIDE WATER FOR NEARLY TWO BILLION PEOPLE ACROSS ASIA



## INCREASE IN STREAMFLOW EXPECTED DUE TO CLIMATE CHANGE TILL 2050 AND DECREASE IN PRE-MONSOON FLOW THEREAFTER

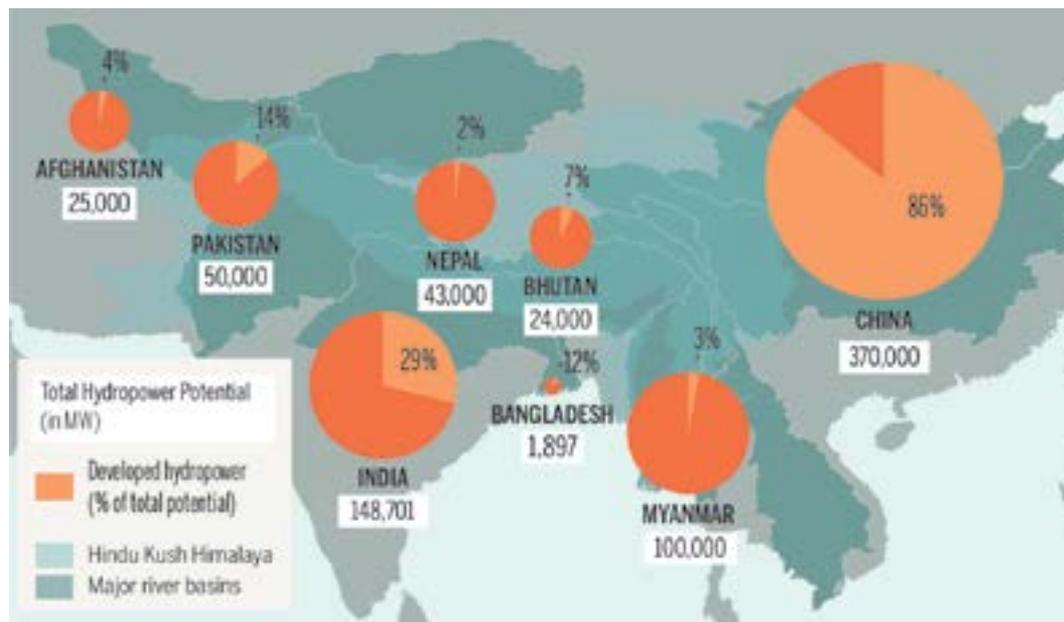
As a result of climate change, a consistent increase in streamflow is expected at large scales for the upstream reaches of the Indus, Ganges, and Brahmaputra rivers until at least 2050. In the Indus, this increase will result from increased glacial melt for a limited period, while in the Ganges and the Brahmaputra, it is expected to result mainly from increased precipitation. Pre-monsoon flows are expected to decline, with implications for irrigation, hydropower, and ecosystem services.

## HYDROPOWER CAN DISRUPT NATURAL FLOW REGIMES, IN TURN HARMING LOCAL IRRIGATION, FISHERIES, AND ECOSYSTEMS

Hydropower infrastructure can change the timing and location of river flow, thereby disrupting natural flow regimes, in turn harming local irrigation, fisheries, and ecosystems. Such conflicts arise especially in the mid-hills and the mountains – the location of most current and foreseeable hydropower sites. The HKH has a total of 500 gigawatts (GW) of hydropower potential, of which only a small fraction is actually developed.

The hydropower sector in the HKH suffers from the twin challenges of societal pressure and climate change. The sector faces major challenges due to glacial melt induced by climate change. Glaciers across the region are retreating, leading to changes in future hydrological regimes. At the same time, risks of glacial lake outburst floods and landslides are increasing, putting both existing and planned hydropower plants at risk.

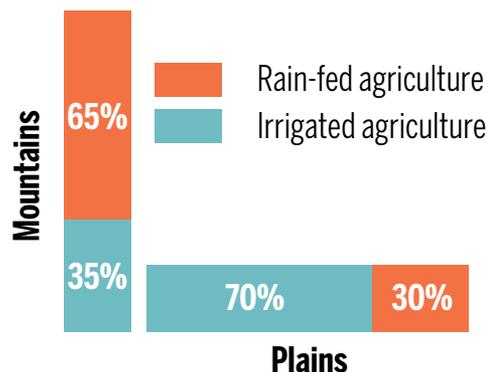
Very often, mountain people do not derive commensurate benefits from these projects. These projects are mostly developed in mountain areas, but mountain people fear that even as they bear the environmental and social costs of hydropower, the benefits in the form of electricity will flow to people in the plains. As a consequence, most hydropower projects have seen widespread protests from local mountain communities. Appropriate benefit-sharing norms are needed to ensure that mountain people also benefit from the region's vast hydropower potential.



**FOR THE DEVELOPMENT OF THE REGION'S 500 GW HYDROPOWER POTENTIAL TO BE SUSTAINABLE, IT MUST CONSIDER NATURAL FLOW REGIMES AND BENEFITS FOR MOUNTAIN COMMUNITIES**



## DIFFERENCES IN THE MOUNTAINS AND THE PLAINS DEMAND DIFFERENT STRATEGIES FOR ENSURING WATER SECURITY



## GOOD WATER GOVERNANCE IS NEEDED TO ENSURE WATER SECURITY IN THE HKH AND IT MUST BE POLITICALLY AND CULTURALLY TAILORED TO THE LOCAL, NATIONAL, AND REGIONAL CONTEXTS

Among the leading causes of poor water governance in the HKH are unequal power dynamics, centralized decision making, and inadequate opportunities for local communities to influence their water-security decisions despite the presence of local institutions – all taking place under constantly changing conditions in the ecologically fragile landscape with dispersed settlements. Transboundary institutions for water resources are inadequate or non-existent, heightening the risk of conflict while also offering opportunities for HKH-wide cooperation. Throughout the HKH, more attention needs to be paid to HKH-specific conditions as well as more general challenges including participatory and cooperative decision making, evidence-based policies, transparent programme implementation, accountability at all levels, and transboundary and regional cooperation.

## INDIA, BANGLADESH, PAKISTAN, AND CHINA TOGETHER ACCOUNT FOR MORE THAN 50% OF THE WORLD'S GROUNDWATER WITHDRAWALS

For all eight HKH countries – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan, agriculture accounts for the largest share of water use, accounting for over 90% of use in Afghanistan and 65% in more industrialized China. India, Bangladesh, Pakistan, and China together account for more than 50% of the world's groundwater withdrawals. These withdrawals mostly take place in the plains of river basins that originate in the HKH. Groundwater is used mostly for irrigation and in other sectors like urban water provisioning.

## NATURE AND DYNAMICS OF THE REGION'S AGRICULTURE SHIFTING IN RESPONSE TO CLIMATE AND DEMOGRAPHIC CHANGES

In recent years, late melting of glaciers due to high climatic snow line has made seasonal water scarcer in the Upper Hunza region of Pakistan (and in the trans-Himalayan part of Ladakh in India). In response, communities have come together to create artificial glaciers on southern slopes, both as a strategy to cope with seasonal water scarcity and long-term adaptation to climate change.

Another system of irrigation in the hills of the western HKH is spate irrigation, which uses flood water generated from an upstream hill slope that is then stored as soil moisture. The inherent uncertainty of occurrences and magnitudes of floods means that minimum yield too is not assured every year, leading to cyclic outmigration of labour.





## CHAPTER 9

# FOOD AND NUTRITION SECURITY IN THE HINDU KUSH HIMALAYA: UNIQUE CHALLENGES AND NICHE OPPORTUNITIES



[Click here to access full text of HKH Assessment Report Chapter 9](#)

There is widespread food and nutrition insecurity in the HKH. Despite some progress in reducing hunger, millions of children suffer from stunting, wasting, and malnutrition. The nature and causes of food insecurity in mountain areas differ from those in the plains as a result of differences in the physical environment, transportation and communication facilities, remoteness, and seasonality.

Addressing this challenge has become increasingly complicated because of rapid socioeconomic, demographic, and environmental changes. This chapter aims to understand the causes of food and nutrition insecurity in its four dimensions – food availability, accessibility, utilization and stability – and to suggest actionable policy measures to improve food and nutrition security in the HKH.

## KEY FINDINGS

- Food and nutrition insecurity remains a serious challenge in the HKH. Over 30% of the population suffers from food insecurity and around 50% face some form of malnutrition, with women and children suffering the most.
- The causes of food and nutrition insecurity are multifaceted and complex, and influenced by a range of factors including high poverty, natural resource degradation, climate change, low market development, uncertain food support, and inadequate policy and institutional support.
- Traditional mountain food systems are under threat from rapid socioeconomic and environmental changes.
- Despite several challenges the HKH region has advantages in certain products and services that have the potential to revitalize mountain agriculture and improve food security and nutrition.

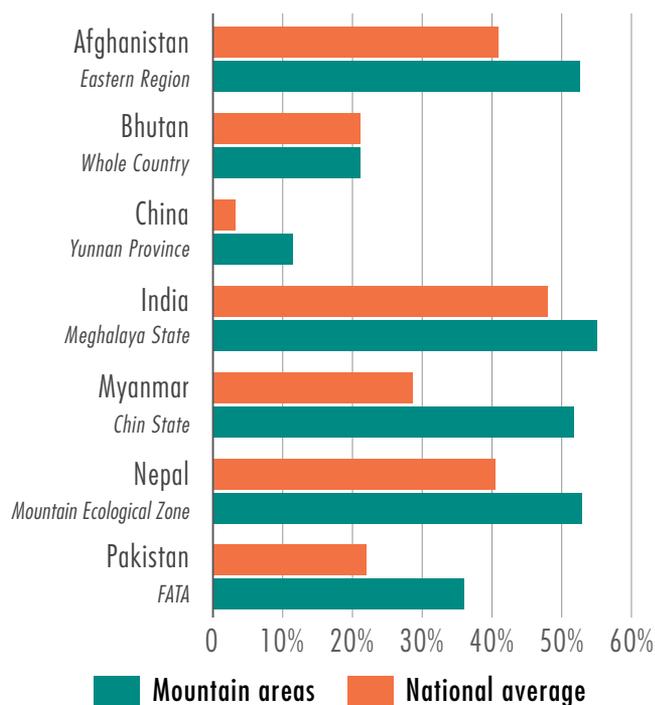
## POLICY MESSAGES

- To address food and nutrition insecurity in mountain communities, national governments need to integrate a mountain perspective into national policies related to food and nutrition security.
- Governments in the region need to adopt a holistic approach to improving food and nutrition security that includes revitalizing local food systems, strengthening social safety nets, enhancing knowledge and awareness about nutrition, and reducing physical and socioeconomic vulnerabilities.
- Increased investment in the management of natural resources – including soil, water, and energy – is critical to improving nutrition, enhancing agricultural production, and diversifying local food systems.



## OBSERVATION AND TRENDS

Mountain people are more vulnerable to food and nutritional insecurity. The loss of agrobiodiversity has become a serious concern and may undermine long-term agricultural sustainability and food security in the region.



### FOOD INSECURITY CONTRIBUTES TO HIGH LEVELS OF STUNTING IN CHILDREN IN THE MOUNTAINS OF THE HKH

*This figure shows the prevalence of stunting in children below 5 years of age in some mountain areas of HKH countries*

### ABOUT HALF THE POPULATION IN THE HKH IS SUFFERING FROM MALNUTRITION AND NEARLY ONE-THIRD FROM FOOD INSECURITY

Agriculture is one of the main livelihood options in the HKH, but traditional agricultural systems are under pressure and failing to provide adequate food and income. As a result, nearly one-third of the population is suffering from food insecurity, and between one-fifth and one-half of children (less than five years of age) are underweight and suffer from stunting and wasting. The region's population is increasing quite rapidly at close to 1.4% annually, and both the total area available per capita and the proportion of net sown area will become even smaller as the population increases. Some mountain areas exhibit high nutrition insecurity compared to the national average for the whole country – eastern Afghanistan, Meghalaya state in India, Chin and Rakhine states in Myanmar, the high mountains of Nepal, and Balochistan province in Pakistan.

*Note: The specific mountain area to which data refers is listed below the country. Data for the Chittagong Hill Tracts of Bangladesh is not available. Data for severe stunting is presented for the Federally Administered Tribal Areas (FATA) of Pakistan.*

## FOOD PRICES BEYOND THE PURCHASING POWER OF POOR PEOPLE DURING WINTER AND RAINY SEASONS

There is a seasonal variation to food security; it tends to be most compromised during the monsoon and winter months, as well as during periods following natural hazards. High mountain areas in the HKH often experience heavy snowfall during the winter months. As a coping strategy, people often reduce their food intake, in terms of both quantity and frequency, which has serious implications for nutrition. Furthermore, in the winter and rainy seasons, road networks in the mountains are often disrupted and food transportation becomes very difficult and highly expensive, particularly if food needs to be airlifted. High transportation costs also increase food prices to levels that may go beyond the purchasing power of poor people and compromise food quality and quantity, affecting nutritional outcomes.

The cultivation of traditional crops is declining, with a few commodity crops now dominating food systems at all levels.

## SHIFT FROM TRADITIONAL TO NEW CROP VARIETIES AND FROM TRADITIONAL TO MODERN FARMING PRACTICES HAS LED TO A DECLINE IN AGRICULTURAL DIVERSITY

A wide range of traditional crops that used to be part of the food basket in mountain areas are being replaced with high-yielding cash crops. The consumption of traditional coarse grains, which contain an abundance of micronutrients and fibre, is often considered to be 'backward' in the sociocultural value system and refined rice and wheat have become the main food items. Traditional crops, known as neglected and underutilized species, are high in nutritional value and adapted to mountain conditions and resilient to climate-induced stresses like drought and frost. These are now being relabelled as 'future smart foods'.

The loss or limited cultivation of neglected and underutilized species is leading to a decline in agricultural diversity in agricultural ecosystems and changing dietary patterns in the HKH, with a few commodity crops now dominating food systems at all levels. The region should tap its huge potential to develop mountain niche products and promote non-farm livelihood options like tourism, handicrafts, food processing, and medicinal plants.

## APPROACH TO ACHIEVING SUSTAINABLE FOOD AND NUTRITION SECURITY IN THE MOUNTAINS

The challenges faced by mountain communities are often not adequately understood, and the perspectives of mountain communities are not fully recognized in national agricultural policies in the HKH countries. Achieving sustainable food and nutrition security in the mountains requires a balanced approach that entails improving production and increasing household income, along with improving rural infrastructure to enable transportation and market access.

In addition, special attention needs to be paid to the following:

- Strengthening local food systems by integrating crops, livestock, agroforestry, fruits, nuts, and vegetables
- Harnessing the potential of high value mountain niche products
- Strengthening agricultural marketing systems and infrastructure
- Establishing community food banks to store food at the village level
- Managing water resources, especially springs in the mid-hills and mountains, and promoting efficient and equitable hill irrigation infrastructure
- Establishing mechanisms for cross-border food trade and internal movement of food products
- Strengthening agricultural research and innovation in mountain agriculture and food systems, including strengthening knowledge on nutrition, child care, and food preparation
- Empowering women by improving knowledge and their control of resources to enable them to take decisions on matters related to family health, education, and nutrition

## AREA-SPECIFIC STRATEGIES ARE NEEDED TO ENHANCE FOOD AND NUTRITION SECURITY

- High agro-ecological potential, good market access:

Focus on tapping the potential through land use intensification and growing cash crops in line with market demand.

- High agro-ecological potential, poor market access:

Focus on improving market access, developing local food systems, and promoting high value but low volume and non-perishable products.

- Low agro-ecological potential, good market access:

Focus on promotion of non-farm activities to enhance purchasing power.

- Low agro-ecological potential, poor market access:

Focus on subsistence use of resources, developing incentive mechanisms for conservation of resources, and support for outmigration to increase purchasing power and thus access to nutritious food.

A balanced approach between food self-sufficiency and market access is needed to achieve food and nutrition security in the HKH along with a strategy to enhance production, distribution, income, and rural infrastructure.





## CHAPTER 10

# AIR POLLUTION IN THE HINDU KUSH HIMALAYA

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Air pollution has large impacts on the HKH, affecting not just the health of people and ecosystems, but also climate, the cryosphere, monsoon patterns, water availability, agriculture, and incomes. The HKH region is fragile and rapidly changing. While the outcome of the interplay of complex drivers is difficult to predict, it will have major consequences. That holds true for air pollution as well.

The HKH receives significant amounts of air pollution from within and outside of the region, and transboundary pollution from other parts of Asia. This chapter surveys the evidence on regional air pollution and considers options for reducing it, while underlining the need for regional collaboration in mitigation efforts.

## KEY FINDINGS

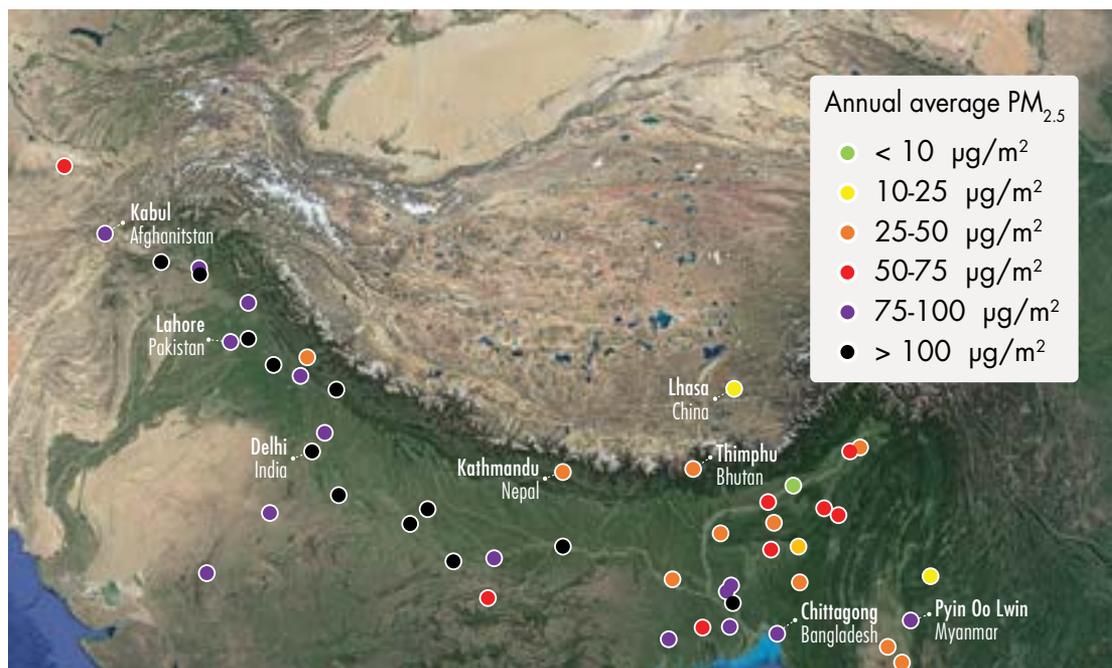
- Air pollution in the HKH is on the rise and regional air quality has worsened in the past two decades, with the adjacent Indo-Gangetic Plains now one of the most polluted regions in the world.
- Persistent winter fog and haze have increased across the Indo-Gangetic Plains, leading to reduced visibility and elevated air pollution just south of the HKH and affecting air quality in the HKH as well as in the Indo-Gangetic Plains.
- The HKH is sensitive to climate change – air pollutants originating within and near the HKH amplify the effects of greenhouse gases and accelerate melting of the cryosphere through the deposition of black carbon and dust, and changing monsoon circulation and rainfall distribution over Asia.

## POLICY MESSAGES

- To mitigate air pollution and its severe socio-economic effects, investment in clean technologies and infrastructure is essential.
- Dedicated national institutions are required to address air pollution across multiple sectors and scales and implement air pollution mitigation policies.
- Education is essential – the HKH needs more mechanisms to enhance knowledge sharing, to increase responsiveness to scientific evidence, and to promote awareness and behavioural change.

## OBSERVATION AND TRENDS

A large population in the HKH is exposed to air pollution levels much higher than WHO recommended limits. Air pollution mitigation is urgent given its severe impacts on health, climate, cryosphere, water resources, agriculture, and livelihoods.



ACROSS THE HKH AND ADJOINING PLAINS, CITIES HAVE DANGEROUSLY HIGH LEVELS OF AIR POLLUTION

**MANY CITIES IN AND NEAR THE HKH HAVE ANNUAL AVERAGE  $PM_{2.5}$  CONCENTRATIONS ALMOST 10 TIMES HIGHER THAN THE WORLD HEALTH ORGANIZATION GUIDELINE OF  $10 \mu\text{g}/\text{m}^3$**

There has been a rapid rise in air pollution affecting the HKH in the past decade. Across the region, levels of particulate matter (PM) – both primary and secondary aerosols – as well as tropospheric ozone ( $O_3$ ) – a secondary pollutant – have increased. Three urban cities in the HKH, including Peshawar (Pakistan), Mazar-e-Sharif (Afghanistan), and Kabul (Afghanistan), are on the list of the 20 most polluted cities in the world. Furthermore, in 12 cities – Agra, Allahabad, Amritsar, Jaipur, Patna, Dehradun, Delhi, Lucknow, Ludhiana in India; Peshawar, Rawalpindi in Pakistan; and Narayanganj in Bangladesh, the annual average concentrations are more than 10 times higher than the guideline value.

## **SNOW AND GLACIER MELT ARE ACCELERATED BY ABSORBING AEROSOLS, AFFECTING SHIFTS IN RAINFALL DYNAMICS**

The HKH is sensitive to global climate change through its impacts on atmospheric dynamics and thermal forcing. In addition snow and glacier melt are accelerated by absorbing aerosols including black carbon and dust. Several climate models have suggested the importance of aerosol solar absorption in modulating summer monsoon circulation and rainfall distribution over Asia. Water from seasonal snow and glacier melt provides significant resources for regional livelihoods. Monsoon rainfall – particularly over southern Asia – is a crucial freshwater resource for the region (constituting over 70% of annual rainfall). Thus, as aerosol radiative effects and regional warming perturb monsoon circulation and the Himalayan cryosphere, the resulting shifts in rainfall dynamics could have critical socioeconomic as well as environmental implications.

## **HAZE AND WINTER FOG HAVE WORSENERD IN AND NEAR THE HKH**

The Indo-Gangetic Plains are a big source of pollution reaching the high mountains. Located just south of the HKH, this is an extensive stretch of highly fertile agricultural plains covering an area of 700,000 km<sup>2</sup>. It is also among the world's most densely populated regions, inhabited by over 900 million people, roughly one seventh of the world's population.

A thick aerosol haze covers the heavily populated Indo-Gangetic Plains during the dry season, reducing visibility and obscuring sunlight. The haze often penetrates deep into Himalayan valleys, reaching the high mountains and at times even crossing the Himalaya to reach the Tibetan Plateau. The Indo-Gangetic Plains have seen an increase in persistent winter fog during the past two decades that is at least partly driven by increased air pollution, in addition to changes in moisture availability.

## **POOR VISIBILITY DAYS OVER THE INDO-GANGETIC PLAINS CAN BE AS HIGH AS 90% DURING WINTER**

In winter months, temperatures over the Indo-Gangetic Plains are cold enough for frequent temperature inversion episodes – when a layer of cool air is trapped near the ground under a layer of warm air. This condition suppresses the normal tendency of pollutants to rise and disperse over a wide area, trapping them instead in a relatively shallow boundary layer and causing winter haze to be optically thick. Winter-time air pollution is also aggravated by increased biofuel burning for heating, combined with increased open biomass burning. Dense persistent haze and fog reduce the sun's ability to warm the land surface, further lowering the surface temperatures and perpetuating the inversion effect. Poor visibility days can be as high as 90% of the winter over the Indo-Gangetic Plains.



## MAJOR GAPS IN HKH AIR QUALITY NETWORKS PERSIST DESPITE RECENT IMPROVEMENTS IN DATA COLLECTION

Despite recent improvements in data collection, major gaps in HKH air quality networks persist. Many large cities and even more rural areas within and surrounding the HKH (i.e., Indo-Gangetic Plains) still lack monitoring. These data gaps reflect several challenges. First, the topographical heterogeneity and resulting fine-scale atmospheric variations in the HKH mean that improved air quality monitoring would require a denser network of stations than is needed in the plains. Second, the current use of different instruments or protocols at different sites means that data from these sites urgently needs to be compared and validated to produce harmonized data bases. Third, in addition to the ground-based observation of air pollution, a full picture would also require measurement of the vertical variation of pollutants. In addition, more advanced instruments with higher sensitivity are essential for advancing our understanding of air pollution.



## THERE IS AN URGENT NEED FOR AIR POLLUTANT MITIGATION

Air pollutant mitigation is urgently needed in the HKH, given the severe impacts of deteriorating air quality and increasing haze and winter fog across the region – on health, climate, the cryosphere, water resources, agriculture, ecosystems, and livelihoods. Such mitigation will require three elements:

**Dedicated institutions and policies, both within countries and across national borders:** Because air pollution in the HKH is regional, its mitigation is, critically, a regional responsibility. The region urgently requires institutional arrangements that will enable inter-agency coordination on air pollution, actively engaging multiple stakeholders. To begin with, two constraints need to be addressed: the lack of clarity in the division of labour among government institutions, and the lack of coordinating mechanisms to break down agency silos.

**Public awareness and behavioural change:** As an example, people who lack adequate solid waste collection services commonly burn their trash, generating emissions that can be linked to health problems. Raising awareness of these problems can help to build public support and pressure for improving services in urban areas – and for adopting alternative waste disposal methods, such as composting.

**Investment in clean technologies and green infrastructure:** Promising clean technologies exist for mitigation in the household, industrial, transport, and energy sectors. At the household level, steps include chimney installation and the use of cleaner cook stoves that use liquefied petroleum gas (LPG), biogas, or electricity. At the industry level, brick producers can reduce fuel consumption and mitigate CO<sub>2</sub> and air pollutant emissions by shifting to more efficient zigzag or vertical shaft kilns. HKH countries can also adopt tighter vehicle emissions and fuel quality standards and design cities that promote public and non-motorized transport.

Mitigating air pollution in the HKH will not be possible without effective policies, public awareness, and greater investment in clean technologies.





## CHAPTER 11

# DISASTER RISK REDUCTION AND BUILDING RESILIENCE IN THE HINDU KUSH HIMALAYA

SUSTAINABLE  
DEVELOPMENT  
GOALS



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Mountain development and disaster risk are inherently linked, as many mountain settlements are located on unstable mountain slopes that are prone to landslide and erosion, or on river terraces and alluvial fans that are susceptible to debris flows and floods. The HKH is one of the most fragile and hazard-prone mountain regions in the world.

Mountain communities are threatened by numerous risks from natural hazards and a changing risk pattern. Disaster risk reduction is particularly important in mountain areas for many reasons, including the multi-hazard environment, land use pressure, and the effects of climate change. Building disaster resilience in the mountains requires decision making that is informed by the best available studies of disaster risk reduction and climate change adaptation.

## KEY FINDINGS

- More than one billion people are at risk of exposure to increasing frequency and intensity of natural hazards.
- Cascading events resulting from a multi-hazard environment have upstream-downstream linkages, often with transboundary impacts.
- Women and men are differently affected by disasters in the HKH – in numbers of deaths, increased vulnerabilities, and access to both risk and recovery information.

## POLICY MESSAGES

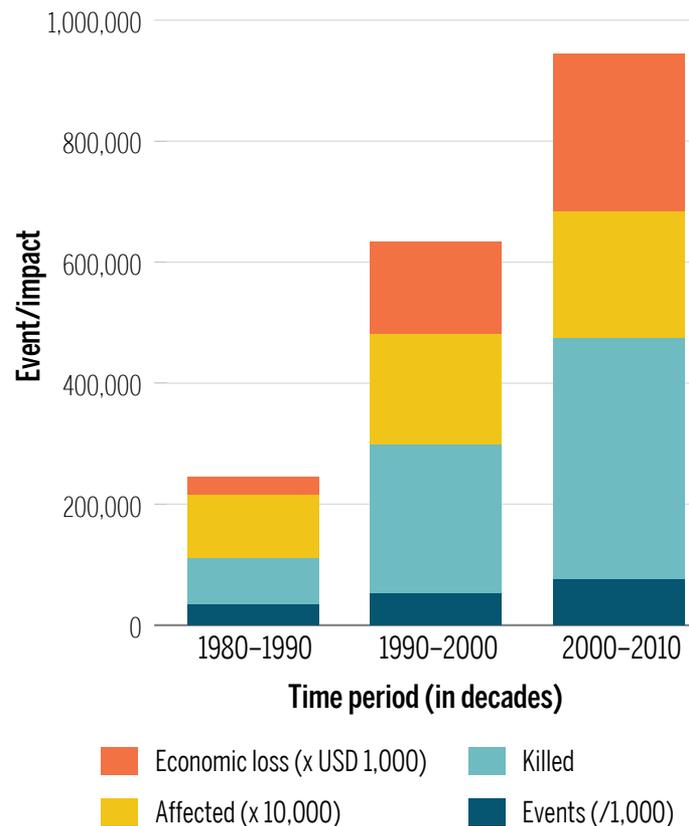
- Institutions and governments in the HKH urgently need to adopt a standardized, multi-hazard risk assessment approach.
- All stakeholders – including governments, individuals, households, and communities – need to take urgent action to enhance resilience through four pillars: information, infrastructure, institutions, and insurance.
- The countries of the HKH need to cooperate more extensively and effectively by sharing data, information, and scientific and indigenous knowledge, and by fostering transboundary disaster risk reduction practices.



## OBSERVATION AND TRENDS

Disaster risk reduction is particularly important in the multi-hazard environment of the HKH. Communities are more vulnerable due to their remoteness, poor accessibility, and lack of emergency communication.

### THE ECONOMIC AND HUMAN IMPACTS OF NATURAL HAZARDS ARE INCREASING



### NATURAL HAZARDS IN THE HKH ARE INCREASING IN MAGNITUDE AND FREQUENCY DUE TO CLIMATE CHANGE

Because of its steep terrain, high seismicity, fragile geological formation, and intense and highly variable precipitation, the HKH is especially vulnerable to floods, landslides, avalanches, and earthquakes. Natural hazards in the HKH are increasing in magnitude and frequency – a trend driven partly by climate change. Shifting monsoon patterns may result in episodes of intense precipitation, leading to further increases in floods, landslides, and soil erosion.

## THERE IS INCREASED RISK OF GLACIAL LAKE OUTBURST FLOODS DUE TO THE INSTABILITY OF MORaine MATERIAL

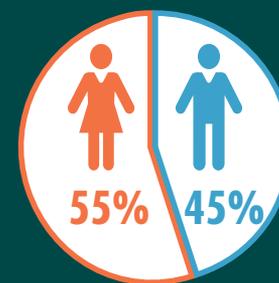
Among the impacts of climate change and variability are the growing number and size of glacial lakes: Himalayan glaciers have retreated rapidly in recent decades, causing many such lakes to form and expand. Climate change is expected to lead to further increases. The instability of the moraine material holding back these lakes poses a risk of glacial lake outburst floods (GLOFs). As of 2000, the HKH has witnessed more than 33 identifiable GLOFs and the number is increasing.

## MOST COUNTRIES IN THE HKH RANK BELOW THE GLOBAL AVERAGE ON THE HUMAN DEVELOPMENT INDEX AND ARE HIGHLY VULNERABLE TO NATURAL HAZARDS

A community's vulnerability to natural hazards includes the exposure of people and property to disasters and their impact. While some of the factors in exposure and vulnerability are physical and environmental, other factors are socioeconomic, such as poverty, human settlement and habitat, lack of preparedness, susceptibility, and adaptive capacity. Poverty leaves many people in the region with few resources when trying to rebuild their homes and livelihoods. With the exception of China, most countries in the HKH rank below the global average on the Human Development Index (HDI) and income inequality is also high throughout the region making them more vulnerable to disasters.

## WOMEN IN THE HINDU KUSH HIMALAYA ARE MORE SUSCEPTIBLE TO NATURAL DISASTERS THAN MEN

The pre-existing social structures and norms create greater stress on women and marginalized groups further exacerbating their vulnerability. More women than men die when disasters strike. Gender inequities are evident in a lack of, or inadequate, early warning information and evacuation procedures and arrangements targeting women. In some cases, women may be ill-informed about natural hazards and not allowed to make the decision to evacuate. This situation is compounded by high rates of male outmigration.



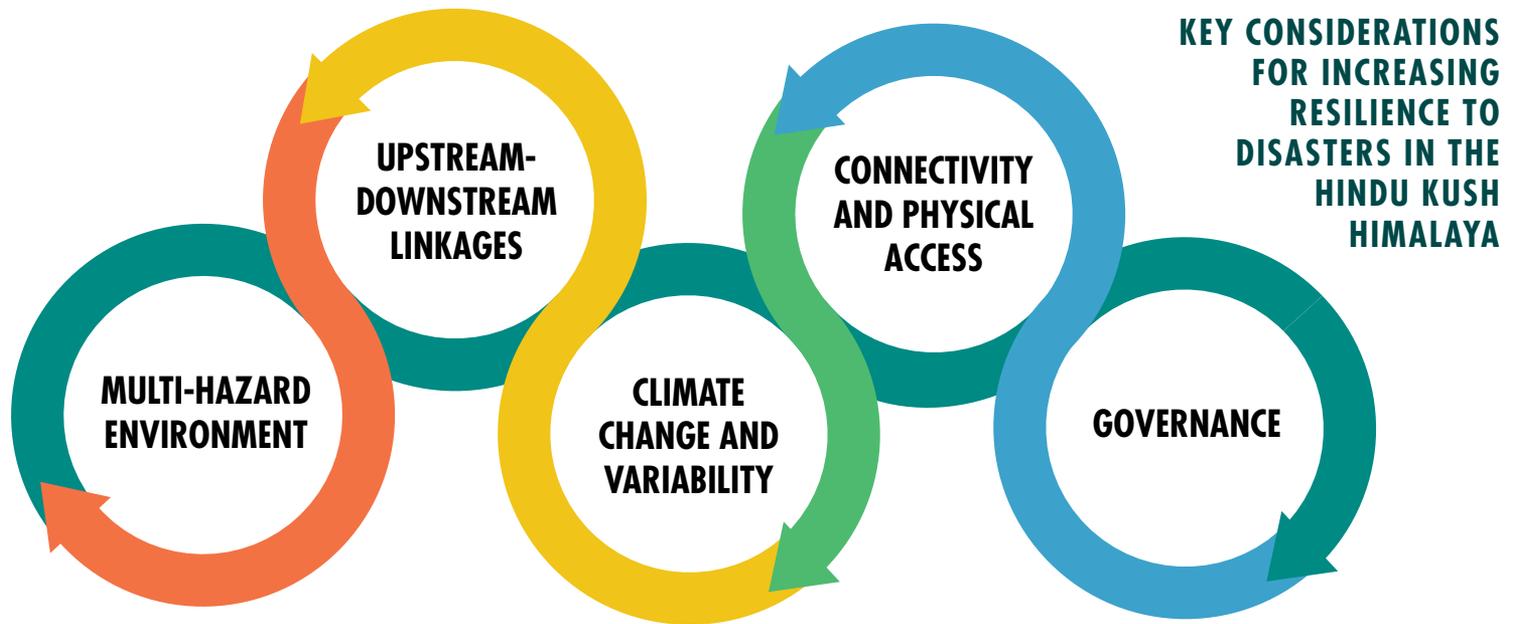
**MORE WOMEN DIED  
IN THE 2015 NEPAL  
EARTHQUAKE**

## IN THE MULTI-HAZARD HKH ENVIRONMENT, EFFORTS TO BUILD RESILIENCE NEED TO CONSIDER CASCADING THREATS AND DISASTERS

Multi-hazard environments are common to many HKH countries, where natural processes are interconnected and a primary event triggers a chain of subsequent (secondary and tertiary) hazard events. Efforts to build resilience thus need to consider not just the primary event, but also secondary hazards involving cascading threats and disasters. Cascading hazards in particular require a multi-hazard methodology that integrates complex “hazard interactions and interaction networks” and a multi-hazard early warning system.

## EXPOSURE TO HAZARDS CAN EXTEND BEYOND THE SITE OF THE PRIMARY EVENT, EVEN ACROSS INTERNATIONAL BORDERS

The upstream and downstream linkages of hazard events may extend exposure to hazards, though with a time lag, to an area much larger than the site of the primary event, often across international borders. For example, the outburst of a landslide-dammed lake in the Tibetan Autonomous Region of China could seriously damage a hydropower plant in Nepal. Similarly, events in Nepal could endanger India's densely populated northern states. Communication channels between local authorities in upstream and downstream nations are often poorly developed and central government efforts to establish communication may be too late to save human lives or infrastructure.



**MOUNTAIN COMMUNITIES ARE MORE VULNERABLE BECAUSE OF THEIR REMOTENESS, POOR ACCESSIBILITY, AND LACK OF EMERGENCY COMMUNICATION**

The challenge of connectivity and physical access can involve road and air travel and information and communication technology in sparsely-settled and often remote mountain areas. Compared to better connected areas, local governments and communities need the capacity to make decisions about hazards that commonly affect isolated and remote locations. In addition, national plans and institutional options for strengthening adaptive capacity may not fully reflect local realities and could be more thoroughly informed by local adaptation concerns.

**NEW DISASTER RISK REDUCTION FRAMEWORK AND THE NEED FOR STRONGER REGIONAL COOPERATION**

The proposed disaster risk reduction framework can help assess hazard and risks while discussing adaptation and resilience measures. It draws on two existing frameworks: the Hyogo Framework for Action (2005–2015) and the Sendai Framework for Disaster Risk Reduction (2015–2030).

It envisions a four-by-four matrix emphasizing the four elements of disaster risk reduction – information, infrastructure, institutions, and insurance – against the four elements for successful planning and execution: command-and-control mechanisms (e.g., zoning regulations, land use guidelines and building codes), monetary incentives (e.g., subsidies on insurance premiums), persuasion by providing information (e.g., risk maps), and nudging (e.g., early warning systems).

Because natural hazards know no borders, disaster risk reduction in the HKH would benefit greatly from stronger regional cooperation. A regional approach, with efforts in timely data sharing and modelling, should improve flood management and help mitigate adverse impacts in transboundary basins.



## CHAPTER 12

# UNDERSTANDING AND TACKLING POVERTY AND VULNERABILITY IN MOUNTAIN LIVELIHOODS IN THE HINDU KUSH HIMALAYA

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This chapter critically reviews the existing knowledge on livelihoods, poverty, and vulnerability in the HKH. The characteristics of mountain areas or ‘mountain specificities’ uniquely condition the lives and development of people. While inaccessibility, fragility, and marginality act as constraints on development, the abundant biological diversity, ecological niches, and adaptation mechanisms present windows of development opportunities for mountain people. Mountain specificities need a distinct frame of analysis from what is used in the lowlands. This chapter explores the changing contexts of HKH mountain economies and livelihoods, detailing their specific conditions and challenges, as well as of the determinants and challenges in measuring and addressing poverty and coping with vulnerability to climate change.

## KEY FINDINGS

- Overall, in the mountains and hills of the HKH, the poverty incidence is one-third compared to one-fourth for the national average.
- Poverty reduction approaches/programmes designed at the national level are likely to miss crucial sub-national and local manifestations of poverty.
- Determinants of vulnerability and of poverty in the HKH overlap substantially.

## POLICY MESSAGES

### Allocate resources for mountain poverty reduction programmes

- Infrastructure suited for fragile mountain ecosystem
- Targeted approaches for indigenous and marginalized communities
- Social protection for climate threats

### Address multidimensional poverty: education, health, living standards

- Regular, systematic collection and sharing of data among HKH
- Information on determinants of poverty, duration of spells, and causes of transient poverty
- Data by mountain specificities: fragility, marginality, and remoteness

### Raise the benchmark for mountain people to more than USD 1.25 per day

- Higher costs of living: heating costs, food prices, access to public services
- Cost of living surveys for mountains

## MOUNTAIN REGIONS OF THE HKH HAVE A HIGHER INCIDENCE OF ECONOMIC, MULTIDIMENSIONAL, AND INCOME POVERTY LEVELS THAN THE PLAINS

Precise measurement of mountain poverty and vulnerability is a challenge, given the large gaps in mountain-specific data for most HKH countries. The United Nations Development Programme's Multidimensional Poverty Index currently does not take account of mountain specificities. Income poverty has declined in all countries over time, most rapidly in Pakistan, India, and Bhutan. However, national scale poverty estimates may mask significant inequalities between mountain and non-mountain regions, as well as inequalities among mountain areas. For example, in Nepal, the poverty incidence in 2010/2011 was 42% in the mountains, compared with 23% in the plains and 25% nationally. If China and Bhutan are excluded, the multidimensional poverty rate is well above 40% across the region. The average intensity of deprivation is fairly consistent across HKH countries, varying from 43% in Bhutan and China to 52% in Pakistan.

In 2009, on average, 31% of the HKH population (excluding China and Myanmar) was below the poverty line, compared with 26% of the total population of these countries.



## OBSERVATION AND TRENDS

Apart from remoteness, poor accessibility, and high dependence on natural resources, major determinants of poverty and vulnerability in the HKH are socioeconomic inequities, conflicts, gender inequities, and caste or ethnicity based discrimination.

Estimates of national-scale poverty may mask significant inequalities between mountain and non-mountain regions, as well as inequalities among mountain areas.

## THE HKH IS HOME TO MILLIONS OF INDIGENOUS PEOPLE WHO ARE THE REGION'S POOREST AND ARE POLITICALLY AND SOCIALLY MARGINALIZED

The HKH is home to the region's poorest, politically and socially marginalized people who are often known as ethnic minorities, minority populations, and tribal groups.

Mountain poverty is associated with social markers and inequality at the intersection of class, caste, ethnicity, gender, education, occupation, and employment status. Factors that predict poverty and its persistence in the HKH broadly fall under the following five categories:

- Remoteness and low access to markets and basic facilities
- Access to natural resources – and high dependence on them
- Demographic factors
- Social and cultural factors
- Marginalization (political and socioeconomic)

All five types of determinants may hinder the conversion of resources, such as income, into desirable outcomes for wellbeing (increasing food and nutrition security, raising educational achievement, and improving health).

## MOUNTAIN HOUSEHOLDS INCREASINGLY RELY ON LIVELIHOODS THAT COMBINE FARM WORK WITH NON-FARM ACTIVITIES

In the mountains of the HKH, land is scarce, for the most part, and formal property rights either do not exist or are ill-defined. Employment is largely informal, and access to social and economic services – including financial instruments – and social protection is limited. In this context, mountain livelihoods in the HKH are evolving. The past three decades have seen a significant shift from the agro-pastoral to a combined subsistence-labour system: mountain households no longer rely entirely on their land, though they cannot make do entirely without it. Mountain households increasingly rely on livelihoods that combine farm work with non-farm activities, such as wage labour, circular labour migration, and tourism services.

# 26%

NATIONAL AVERAGE  
IN HKH COUNTRIES

# 31%

AVERAGE IN MOUNTAIN  
AREAS OF THE HKH  
*(excluding China and Myanmar)*

## POVERTY IS HIGHER IN MOUNTAIN AREAS

## ACTION POINTS

### DESIGN INTERVENTIONS TO TARGET POVERTY AND VULNERABILITY

Interventions that tackle challenges facing marginalized groups – including ethnic minorities – can boost economic returns from cultural tourism, alleviating poverty among the poorest, while preserving the region's ecological and cultural diversity. National, regional, and global institutions should allocate resources to develop mountain-specific policies.

### GATHER DATA TO IMPROVE POLICIES IN THE FUTURE

There is an urgent need for gathering longitudinal data on poverty and vulnerability determinants, the duration of poverty spells, and the causes of transition in and out of poverty – disaggregated for mountain areas, while harmonized with national surveys and databases that enable the disaggregation of data for mountain areas. If future data gathering is to include information on key potential drivers of poverty in the HKH – such as the impacts of climate and other global drivers of change on mountain-specific livelihoods – then new investments and research on the ground will be needed.

## SUSTAINABLE DEVELOPMENT GOALS



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This chapter focuses primarily on analyzing ongoing adaptation activities and identifying common patterns of adaptation response across the eight countries in the HKH – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. It distinguishes between adaptation responses that are planned by governments or by non-state actors, and those that are local, autonomous, and unplanned. Further, it asks whether the planned responses are sufficiently knowledgeable of autonomous adaptation practices. It also considers the extent of policy support for these practices as well as the need to critically evaluate practices and results, and identifies solutions that could work to better connect adaptation science, policy, and practice.

### KEY FINDINGS

- Adaptation to climate change is urgent for the HKH, but it presents a complex challenge for policy makers. Adaptation responses by governments are mostly incremental and not well integrated with development plans and programmes.
- In spite of these challenges, there are opportunities for scaled up, inclusive, and more comprehensive climate change adaptation responses in the HKH.
- Bolstering climate change adaptation in the HKH will require substantially more funding than is currently available. With appropriate incentive mechanisms, private financing could also support adaptation.



## CHAPTER 13

# ADAPTATION TO CLIMATE CHANGE IN THE HINDU KUSH HIMALAYA: STRONGER ACTION URGENTLY NEEDED



## POLICY MESSAGES

- Climate change adaptation policies and practices must intensify in the HKH, and must become transformative.
- Governments will benefit from mainstreaming policy instruments on adaptation in their planning and budgeting processes. Institutional capacity on adaptation needs to be built and fit to purpose at each level of governance.
- Local-level autonomous responses to climate variability and extreme events must be systematically studied, documented, and validated.
- HKH countries and institutions must work together to build mechanisms and fora to address key challenges, such as data sharing, and incentivize regional cooperation and cross-learning at the regional scale.

## OBSERVATION AND TRENDS

In the high mountains, limited access to climate information, support services, and weak institutional links hinder the building of adaptive capacity. Additionally, life-saving and livelihood-supporting infrastructure is underdeveloped.

Every country in the HKH has initiated efforts to integrate climate change adaptation in multiple plans, programmes, and projects. However, mountain-specific adaptation issues have been emphasized to varying degrees.

## ADAPTATION IS BECOMING INCREASINGLY URGENT FOR THE HKH, WHILE DATA, CAPACITY, AND RESOURCE GAPS CONTINUE TO CHALLENGE POLICYMAKERS

There is growing evidence that increased climate variability is already affecting water availability, ecosystem services, and agricultural production in the HKH. The huge impact of frequent extreme weather events on life and property underscores the urgency of the situation and the necessity to ramp up adaptation action in the region. Policy makers in the HKH countries are aware of the urgency to act on adaptation but face substantive challenges: lack of adequate data (both in terms of quantity and quality, and especially at a localized scale) about climate change impacts in the mountain context, weak institutional capacity at various governance levels, social and economic barriers to intervention uptake, and poor infrastructure for development and adaptation purposes.



## **ADAPTATION NEEDS OF HIGHLY VULNERABLE GROUPS – INDIGENOUS PEOPLE, WOMEN, MIGRANTS, AND URBAN SLUM DWELLERS – DESERVE SPECIAL UNDERSTANDING AND TARGETED ACTION**

In the high mountains, life-saving and livelihood-supporting infrastructure is underdeveloped. Access to climate information and support services is limited, as is the presence of government extension agencies. Weak institutional links hinder farmers from adopting technology that can contribute to adaptive capacity. Entitlements to elements of adaptive capacity (for example, ownership of productive assets and access to services of local government agencies) are typically socially differentiated, and this affects the uptake of coping strategies. Realizing adaptation goals for women and socially marginalized groups in the HKH is likely to be very challenging unless there is urgent and more targeted action on the ground to strengthen and improve their access to and control over productive assets, and access to formal and non-formal education, mobility, and opportunities to generate income. Some HKH countries have national-level climate policies that explicitly identify the most vulnerable groups but very few that seek to address their specific adaptation needs through tailored responses.

## **ALL HKH COUNTRIES HAVE CLEARLY IDENTIFIED PRIORITY SECTORS FOR ADAPTATION INTERVENTIONS, BUT MOST LACK ATTENTION TO MOUNTAIN SPECIFICITIES**

Government-led planned adaptation responses in the HKH are strongly influenced by the evolving global regime under the United Nations Framework Convention on Climate Change (UNFCCC), including adaptation actions and approaches in Nationally Determined Contributions and National Adaptation Plans. This assessment shows that all HKH countries have initiated efforts towards integration of climate change adaptation through multiple plans, programmes, and projects. A majority of their national adaptation projects and programmes relate to watershed management, climate-resilient agriculture, improved access to information for decision making, and disaster risk reduction. However, mountain-specific adaptation issues have received varying degrees of attention and emphasis in country priorities.



## **MAJOR GAPS EXIST BETWEEN POLICY GOALS AND ACTUAL IMPLEMENTATION OF ADAPTATION ACTIONS**

At both national and subnational levels, HKH countries have weak institutional capacity to deal with climate change impacts in an effective and timely manner. Most institutional capacity needs are related to access to information, knowledge, and resources. Poor coordination within and between agencies responsible for implementing adaptation actions is pervasive across all countries in the region. Public consultation and stakeholder engagement in adaptation planning and implementation is highly uneven and, more often than not, ad hoc within HKH countries. Capabilities required for adaptive governance need to be created in institutions at all levels of governance in HKH countries.

## **A COMPREHENSIVE ASSESSMENT OF CLIMATE CHANGE ADAPTATION: FINANCE NEED AND AVAILABILITY IS LACKING FOR THE HKH**

Estimating the future costs of adaptation to climate change impacts can be highly speculative and subject to unrealistic assumptions, as these are likely to be non-quantifiable. However, it is important to put some numbers to potential adaptation costs as a way to convey a sense of urgency in addressing financial needs. Unfortunately, a comprehensive assessment of climate change adaptation finance need and availability is lacking for the HKH, for the region as a whole and for specific geographical areas and sectors in each country. Therefore we have very limited knowledge of how much finance is available and of how much the available funds have been allocated to mountain regions or spent on addressing mountain-specific issues. It is highly unlikely that international finance will ever be sufficient to address the adaptation needs of HKH countries. Therefore, mobilizing funds from domestic sources is imperative. Businesses and private finance can become partners in scaling up adaptation efficiently, provided the risks and transaction costs of such investments can be managed.

## **THE HKH NEEDS TO MOVE BEYOND REACTIVE, INCREMENTAL STRATEGIES AND SCALE UP ANTICIPATORY, TRANSFORMATIVE ADAPTATION**

Government-led adaptation efforts in the HKH continue to be mostly extensions of business-as-usual activities, which might be inadequate to meet adaptation needs in the long run. Given that climate change impacts are likely to be substantial in the near future, HKH countries will benefit from moving beyond incremental strategies and scaling up transformative adaptation, integrating these with development planning and disaster risk reduction. The political leadership must push for an intensified adaptation response within the larger development regime, accompanied by sustained efforts to promote climate literacy, which would require massive awareness campaigns, inclusion of climate change issues in the curriculum, and active engagement of the media.

## **CROSS-BORDER IMPLICATIONS OF CLIMATE CHANGE IMPACTS MAKE REGIONAL COOPERATION ON ADAPTATION A NECESSITY**

Greater regional cooperation among HKH countries in information and knowledge sharing is of critical importance, particularly in areas such as disaster risk reduction, and food and water security. Presently there are very few examples of cross-country adaptation projects or programmes from the HKH. A transformative stimulus from the global regime would be to allow global adaptation funding mechanisms to put in place funding instruments that support multi-country, transboundary, and regional adaptation action proposals.

Regional cooperation is critical, but there are limited examples of cross-country adaptation projects from the Hindu Kush Himalaya



## **KEY AREAS FOR PRIORITY ACTION**

The proposed SDG-consistent priorities for adaptation to climate change in the HKH is to ensure integration between adaptation to climate change, disaster risk reduction, and sustainable development for the mountains through evidence-based decision making and means of implementation.

The key areas for priority action are:

- Greater regional cooperation in areas such as disaster risk reduction and food security
- Stronger integration of adaptation in national development plans and programmes
- Convergence of adaptation, disaster risk reduction, Sustainable Development Goals, and resilience-building priorities
- Investment for generating science-based climate information and knowledge services, creating knowledge networks, and boosting climate literacy
- Promoting policy experimentation through adaptation pilots
- Building institutional capacity on adaptive governance
- Engaging with private business

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Chapter 14](#)

Climate change and extreme weather events in combination with socioeconomic processes have an especially severe impact on people living in remote mountain areas of the HKH. However, little is known about how changes in climate will impact the lives, livelihoods, and resources of diverse communities in the region. Given the diversity of people based on caste, class, gender, and ethnicity, the impacts of climate change will not be the same for all.

This chapter highlights intersections between gender and social factors through case studies that demonstrate the complex workings of gender relations in the context of climate change in the HKH. Specifically, these case studies highlight the unique, embodied experiences of climate change and how gender and social power relations affect climate interventions.

## KEY FINDINGS

- Policies and responses in HKH countries overlook the multiple forms of oppression and exclusion that women face.
- Existing laws and policies do not support the multiple ways in which women negotiate their roles in households, communities, and the market.
- Women do not have commensurate decision-making rights or control over resources despite shouldering both productive and reproductive workloads and responsibilities.



## CHAPTER 14

# IN THE SHADOWS OF THE HIMALAYAN MOUNTAINS: PERSISTENT GENDER AND SOCIAL EXCLUSION IN DEVELOPMENT



## POLICY MESSAGES

- Policies that support adaptation to climate change will not succeed unless they consider gender and how it interacts with other factors such as class, caste, ethnicity, and geography, which will require disaggregated data.
- Policies to improve women's participation in decision making and climate governance must go beyond numbers and quotas to create mechanisms that ensure empowerment and promote women's rights and agency.
- All levels of government must allocate resources – financial and human – for gender responsive interventions at scale and adopt clear accountability mechanisms, such as gender budgeting, to demonstrate their commitment to gender equality enshrined in the UN Sustainable Development Goals (SDGs).

## OBSERVATION AND TRENDS

Women across socioeconomic categories are disproportionately affected by inequalities in the distribution of rights, assets, resources, and power. Gender mainstreaming policies have applied the concept of gender narrowly and without differentiation.

## THE GENDERED RHETORIC OF 'FEMINIZATION OF RESPONSIBILITIES'

As more men migrate in search of livelihood options, rural women assume a disproportionate share of responsibilities – agricultural labour, reproductive work, and other work that supports community welfare, as well as responsibilities in the public sphere – giving rise to a gendered rhetoric of 'feminization of responsibilities'. Within this, women may be assigned new 'caring' roles as 'climate agents', expected to adapt to climate change and cushion its adverse effects on their households and communities, adding climate change adaptation to the already long list of women's caring roles. There is often little attention to gendered divisions of labour and how these vary across socio-political and socio-ecological contexts, and assumptions are made, especially of what women do, and can do, in policy and practice.

## AVAILABLE NATIONAL DATA ON WOMEN IN HKH COUNTRIES DOES NOT REFLECT THE RELATIONS OF INEQUALITY, HIERARCHY, INCLUSION, AND EXCLUSION

Gender differences intersect with other dimensions of social and geographical differentiation. Class, caste, ethnicity, and age intersect with different geographical and sociocultural settings such as upstream, midstream, and downstream communities in mountain contexts to produce differential access to resources. Women and men are thus marked by multiple, coexisting identities that create overlapping – and often conflicting – relations of inequality and hierarchy, inclusion and exclusion. However, the available national data on women in HKH countries does not reflect this diversity and intersectionality, because they rely on aggregates.



## THE SHIFT IN WOMEN'S AND MEN'S RESPONSIBILITIES HAS NOT BEEN MATCHED BY A CORRESPONDING SHIFT IN POLICIES AND ATTITUDES ABOUT GENDER

There are continued assumptions made around a single homogenous class of 'mountain' women even though gender inequalities are more complex with contextual political and economic situations intersecting with class, caste, religion, age, and ethnicity. Notions of gender are simplified in policy making, and reduced to the inclusion of some "poor women". This simplistic and apolitical interpretation and way of integrating gender into climate interventions and policies poses large problems, which manifests in the assumption that engaging women on projects is taking care of women's needs and will lead to women's empowerment.

The linear, techno-managerial approach to climate governance, with simplistic one-size-fits-all solutions and 'quick fixes' for gender equality and women's empowerment, fail to recognize the complexity of women's and men's realities.

## POLICYMAKING INCORRECTLY FOCUSES ON NUMBERS AND QUOTAS AS MEASURES OF CHANGE AND PROGRESS, RATHER THAN ON THE STRUCTURAL ISSUES OF INEQUALITY AND DISCRIMINATION

Policies and programmes have long focused on the functional rather than the structural aspects of gender relations. Gender mainstreaming policies have applied the concept of gender narrowly, and without further differentiation of women's needs, interests, emotions, identities, and roles. There is the paradoxical positioning of homogenous categories of "mountain women" as being both "vulnerable victims" of climate change as well as "formidable champions" of climate adaptation. This has led to extreme approaches in policies: from a welfare approach in which women are taken as passive beneficiaries to one where they are seen as "fixers" of environmental problems based on assumptions about their "volunteer" time in projects as "natural care-givers". This dichotomization of women into one of two identities creates policymaking focus on numbers and quotas as measures of change and progress, rather than on the structural issues of inequality and discrimination.

## PROGRAMMES THAT FOCUS ON ECONOMIC DEVELOPMENT OFTEN DO NOT ADDRESS THE BIGGER ISSUES LIKE UNEQUAL POWER RELATIONS, UNEQUAL WAGES, AND UNEQUAL SHARING OF WORK RESPONSIBILITIES

While there are economic programmes which do include women, that involvement is generally driven by aims of economic efficiency rather than aims of gender equality. While the pursuit of economic efficiency can offer women economic opportunities, it does not fully address their unequal power relations with men, vis-à-vis equal wages for equal work, or the sharing of domestic work responsibilities.

## PROGRESSIVE POLICIES NEED TO ADDRESS THE 'MASCULINE' WORKING CULTURE

Men continue to be key actors in environmental science, policy, and intervention across the HKH and the manner in which masculinity mediates environmental science, policy, and governance is important to know and address. Several fields in environmental governance have been qualified by feminist scholars as 'masculine'; for example, male professionals have traditionally dominated the fields of engineering and technology. The 'masculinity' of professional cultures in natural resources management is considered a scale challenge in environmental governance and is reason for concern in the HKH. It leads to a structural mismatch between actual realities in the field and expectations and administrative realities at the policy level. This means that complex problems in the field, such as gender inequities in irrigation, are conceptualized as technical or engineering problems, making current measures to bridge the gap between field and policy levels fall short of expectations.





## CHAPTER 15

# MIGRATION IN THE HINDU KUSH HIMALAYA: DRIVERS, CONSEQUENCES, AND GOVERNANCE

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Chapter 15](#)



Migration has become an integral part of current global development processes. In the HKH, migration continues to be a significant livelihood strategy. Population movement is widely perceived as a challenge in the HKH. However, there is a growing understanding that it can also open up new opportunities for development. This chapter attempts to understand the dynamics of internal and international labour migration in this region, consolidate the current state of knowledge on migration, and where possible, collate mountain-specific information on migration. It concentrates on three areas of migration research: drivers, consequences, and governance of labour migration. It explores the countries' overall migration experience and, where possible, highlights findings specific to mountain areas of the HKH.

## KEY FINDINGS

- Migration drives a broad range of economic, social, and political changes throughout the HKH, while migration itself is determined by multiple factors.
- Labour migration contributes significantly to poverty reduction in the HKH region, although this depends on who is able to move, and under what conditions.
- Issues associated with internal migration remain peripheral to the policy discourse in most HKH countries, even though there are more than three times as many internal migrants compared to international migrants.

## POLICY MESSAGES

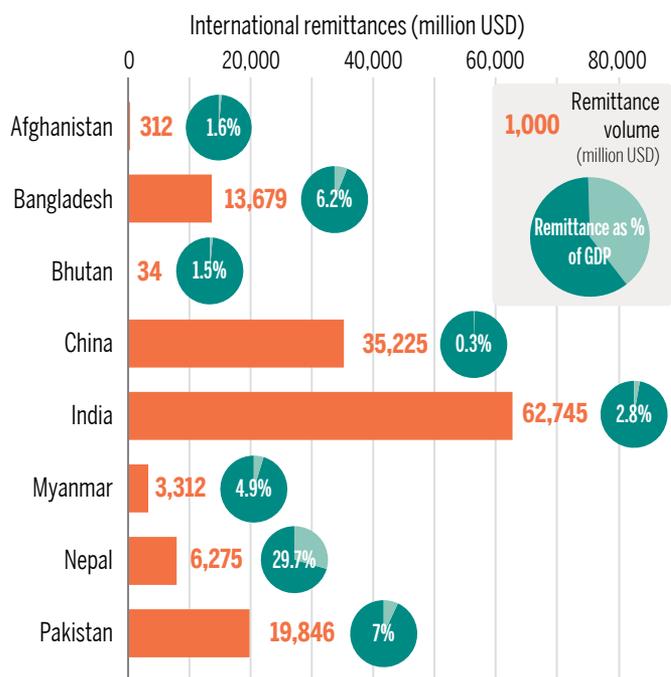
- Policy makers in HKH countries must approach migration not as a challenge, but instead seek ways to mainstream it into climate change adaptation, disaster risk reduction, and policy processes and programmes related to the United Nations Sustainable Development Goals.
- Policy makers, researchers, and grassroots NGOs urgently need quality data on seasonal migration, remittances, and reintegration of returnee migrants.
- Social protections – such as the right to access public amenities and services – should be made portable across administrative boundaries.
- Measures to reduce migration costs and decentralize migration governance are required if low-income households are to benefit fully from migration.



## OBSERVATION AND TRENDS

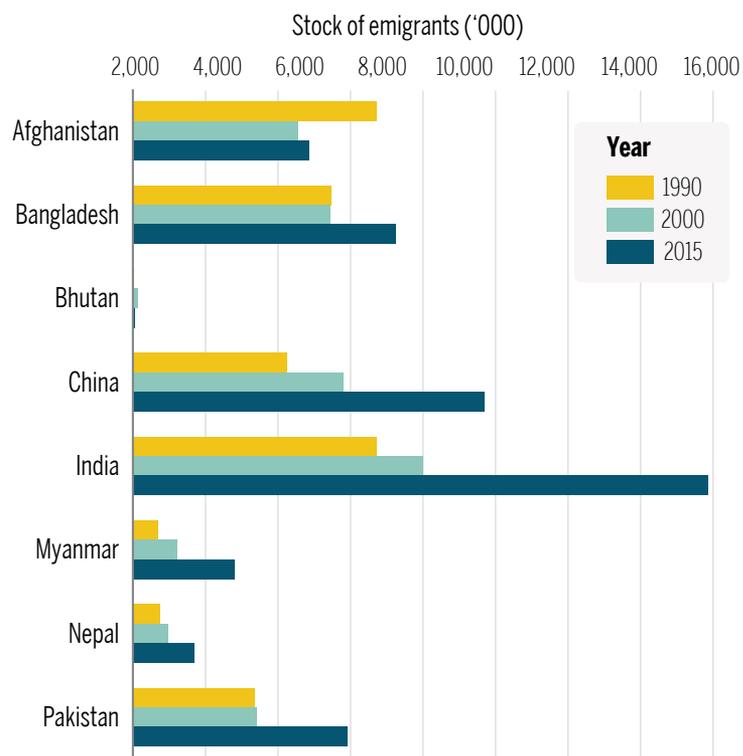
Households in the HKH adopt migration as a strategy to increase income, diversify livelihoods, and manage risks. Countries can unlock the potential of migration by reducing its risks and facilitating orderly, safe, and regular migration.

### REMITTANCES CAN PROMOTE CLIMATE CHANGE RESILIENCE IF INVESTED IN AGRICULTURE, DISASTER RISK REDUCTION, AND CLIMATE ADAPTATION



### MIGRATION REDUCES MOUNTAIN POVERTY AND CREATES NEW LIVELIHOOD OPPORTUNITIES

A majority of migrant-sending households, irrespective of whether they have internal, cross-border, or international migrant workers, benefit economically from their investment in migration. Migration increases livelihood and employment opportunities, and more importantly, their financial income. Migration can promote economic development – through decent wages for migrant labour, and through foreign exchange earnings. Migration is also seen as a strategy for climate change adaptation. Remittances sent by migrants are being used in disaster risk reduction. In order to facilitate international migration, some countries have undertaken measures to establish migration governance systems, reduce migration costs, streamline the remittance transfer process, assist the reintegration of returnee migrants, and engage the diaspora in national development.



## POLITICS IN THE TIME OF INCREASING MIGRATION

Migration has contributed to increased political demands, including voting rights for migrants from HKH countries. Since 2008, Bhutan has permitted its overseas citizens to vote; Afghanistan has allowed it since 2004. Changes in electoral laws have been approved by the Government of India to permit non-resident Indians to cast their votes in state assembly and national parliamentary elections from overseas. At a public hearing, the National Election Commission of Bangladesh stated that it would explore a mechanism allowing absentee voting rights for those citizens who are residing outside the country for work. The Government of Nepal was ordered by the Supreme Court of Nepal to draft a law that enables Nepali migrants abroad to vote. However, irregular cross-border movement of people has become a major source of political tension in some HKH countries, with migrants being portrayed as a 'threat to national security', 'infiltrators', 'terrorists', 'weapon traffickers', 'demographic invaders', and 'criminals'

## MIGRATION CAN INCREASE INEQUALITY, ESPECIALLY IF THERE ARE RESTRICTIONS

International migration governance has traditionally sought to manage recruitment and introduced restrictions on movements of certain categories of workers, like unskilled women, while some HKH countries criminalized irregular and undocumented migration. Protection mechanisms in both origin and destination countries have remained weak.

Migration can increase inequality, especially if there are restrictions on who can migrate, and to where, as this can lead to 'capture' of profitable migration routes by wealthier groups, and/or limitation of migration benefits for the poor. In the past, mainly men migrated for work, and women were left behind, or accompanied the men as spouses. Since the beginning of the new millennium, an increasing number of women from the HKH have been participating in labour migration.

## INTERNAL MIGRATION IS SEEN AS A CHALLENGE TO URBANIZATION AND PLANNING PROCESSES

Along with international migration, the HKH also experiences internal and cross-border migration. Urban centres are attractive to migrants due to access to employment opportunities, urban amenities, and services, as well as opportunities for participating in the market. On internal migration, most HKH countries have public policies that reflect a strong sedentary bias: migration is perceived as a challenge to urban development. Discussions on internal migration in the context of urban development mostly focus on measures to reduce migration from rural to urban areas. This negative attitude towards internal migrants is often supplemented by a 'sons of the soil' ideology. This attitude towards rural to urban migration is often not based on facts and hampers the potential of urbanization to be fully leveraged for development.

## INTERNAL MIGRANTS FACE VARIOUS FORMS OF EXCLUSION

Internal migrants to urban areas of HKH countries – who are relatively less educated, less skilled, and employed in the informal sector – experience various kinds of exclusion. They do not enjoy social security such as access to food through the public distribution system, education and health care. Most importantly, they lack entitlement to housing at their migration destination, because they lack proof of identity and residence. In many cases they and their families end up living in informal settlements, with limited access to public amenities. These forms of exclusion limit the benefits and create new risks for internal migrants and their families. Accordingly, vulnerable internal migrants in HKH countries – who work in marginalized areas such as domestic work and construction, and as hawkers and security guards – should be supported with new social protection measures.



## THE HKH HAS SEEN THE EXPANSION OF LAWS AND POLICIES AGAINST HUMAN TRAFFICKING IN RECENT YEARS

A significant development for the HKH in recent years has been the expansion of laws and policies against human trafficking. Countries in the region have shifted away from a narrow definition of trafficking – limited to intended commercial sexual exploitation – to a broader interpretation that includes labour trafficking, slavery, bonded labour, organ trade, and drug trafficking. Laws in Bangladesh and Nepal have even enabled the creation of special funds to support victims. Although gaps remain in the implementation of these anti-trafficking laws and policies, these changes are welcome.

## REGIONAL AND INTERNATIONAL INSTRUMENTS ARE IMPORTANT FOR THE GOVERNANCE OF MIGRATION

Major migrant-sending countries in the region – Afghanistan, Bangladesh, China, India, Nepal, and Pakistan – have recently joined regional consultative fora such as the Colombo Process and the Abu Dhabi Dialogue. The 1990 UN International Convention on the Protection of the Rights of all Migrant Workers and the Members of their Families (ICRMW) is the most comprehensive instrument relating to migrant workers. Multilateralism is important for protection of the rights of the migrant workers; unfortunately none of the countries of origin of the HKH region, except Bangladesh, have ratified the 1990 Convention, and nor has any destination country. Therefore, due to lack of ratification the rights assigned under the international instrument cannot be exercised.

## CHALLENGES IN ANALYSING MIGRATION IN THE HKH REGION

A challenge to analyzing migration across the HKH is that certain countries in the region, such as Nepal and Afghanistan, are mostly mountainous, whereas others are not, thus limiting the scope for generalization. Absence of mountain specific data in nationally representative sample surveys is another challenge. Data that are generated at the country level are not gathered following common standardized definitions and methods. This limits the scope of cross-country comparisons. Besides, the available data on migration from country level censuses is unlikely to cover circular and temporary migration. Though the data on international remittances have been improving over the past decade, data on domestic remittances remain scarce and scattered in several HKH countries.



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SUSTAINABLE  
DEVELOPMENT  
GOALS



## CHAPTER 16

# GOVERNANCE: KEY FOR ENVIRONMENTAL SUSTAINABILITY IN THE HINDU KUSH HIMALAYA

Environmental governance holds the key to the future of sustainable development in the HKH. Broadly, it denotes the ways in which formal and informal institutions act to manage the environment in light of various social, cultural, economic, and ecological values. It also involves equitable sharing of benefits, costs, and risks. Environmental resources in the region are diverse and include forests, water, biodiversity, and agriculture. The governance of these resources involves a complex ensemble of policies, institutions, policy-making practices, and implementation procedures. This chapter documents the current state of governance and describes emerging trends in environmental policy and practice. It identifies both gaps and opportunities in policy making, in regulatory arrangements and enforceability, and in adapting environmental governance to address climate change impacts.

### KEY FINDINGS

- There are few existing regional policies and processes for environmental governance in the HKH; most are national and subnational.
- Environmental governance reforms in the HKH emphasize decentralization, often creating positive local outcomes. However, these local initiatives are not adequately supported through subnational and national governance systems.
- HKH countries lack institutions to link upstream and downstream communities in river basins and mountain landscapes.

## POLICY MESSAGES

- Governments and environmental institutions in the HKH need to act now to strengthen the interface between science, policy, and practice.
- Transboundary cooperation is crucial for improving environmental governance in the HKH.
- Environmental policy implementation in HKH countries will improve only if national governments recognize the multi-sectoral and cross-scalar nature of environmental governance.
- Governments need to create regulatory frameworks and local institutional arrangements to scale up successful initiatives, empower community action, and inspire community-government partnerships.

### ENVIRONMENTAL GOVERNANCE IN THE HKH REMAINS UNEVENLY DISTRIBUTED

While disproportionate in their influence, national environmental policies and institutions are complex and still evolving in response to the many challenges of environmental governance in the HKH. A number of state agencies have emerged in HKH countries, but they face challenges in achieving coordination and linkages across different levels: local, sub-national, national, regional, and global. At present, environmental governance in the HKH remains distributed unevenly across these various levels, with limited mechanisms and processes in place to build linkages across scales. Much of the planning and decision-making power rests with national and subnational authorities, while regional and local authorities have much less. This imbalance in the vertical distribution of governing power is often incompatible with sustainable natural resource management.



## OBSERVATION AND TRENDS

Environmental governance in the HKH at present is distributed unevenly across various local, sub-national, national, regional, and global levels, with limited mechanisms and processes in place to build linkages across scales.

### LOCAL INITIATIVES OF REFORM TEND TO PROVE LIMITED WHEN BROUGHT TO SCALE

Although many of the reforms at the national and sub-national level aimed at decentralization and devolution have succeeded locally, they cannot have a more substantial impact without concurrent reforms in national and sub-national governance. These are needed to ensure an adequate institutional set up and linkages at various levels of governance. The reason is that local initiatives tend to prove limited when brought to scale. The limitations arise not only from poorly conceived policy frameworks, but from inadequate attention to inequalities of power and from fundamental deficits in accountability and representation. Unclear lines of authority and accountability often hinder effective devolution, and significant policy reforms are not translated into practice. Another weakness is a continued disregard of scientific evidence which is itself limited in the context of environmental systems in the HKH. Although rich and abundant, local knowledge also remains underutilized in policy-making processes.



### **SPACE FOR MULTI-ACTOR ENGAGEMENT IS EXPANDING, BUT REMAINS UNDERUTILIZED**

Institutional diversity in environmental governance is growing, creating opportunities for innovation. State agencies and local communities have a long history of environmental governance in the HKH and non-governmental organizations, private organizations, and knowledge communities have recently become more active. In general, the space for multi-actor engagement has expanded, but this opportunity remains underutilized. The HKH region has begun to see reforms in environmental governance, especially through decentralization and devolution, and a paradigm shift in conservation policies and practices: from exclusion to acceptance of local communities as an integral part of conservation initiatives, and from a species- and habitat-focused approach to a participatory, livelihood-based landscape approach. Other reforms have promoted a shift toward market mechanisms in resource governance, especially for the water, energy, and agriculture sectors.

There are many examples of positive shifts in environmental governance in the HKH: from exclusion to acceptance of local communities as an integral part of conservation initiatives, and from a species- and habitat-focused approach to a participatory, livelihood-based landscape approach.

### **ENVIRONMENTAL INSTITUTIONS HAVE NOT YET FULLY ADAPTED TO THE COMPLEX GEOGRAPHY OF THE HKH**

Environmental governance faces other challenges besides the dominance of national and subnational authorities. One is that environmental institutions have not yet fully adapted to the complex geography of the HKH. As a result, the region lacks appropriate and context-specific institutions to link upstream and downstream communities in river basins. Another institutional challenge is the sectoral fragmentation of environmental governance, which impedes coordination.

### **MANAGING THE RESOURCES OF THE HKH SUSTAINABLY WILL DEPEND LARGELY ON THE EMERGENCE OF REGIONAL AND INNOVATIVE INSTITUTIONAL ARRANGEMENTS**

Cooperation among HKH country governments is hampered by limited cross-border knowledge sharing, as well as by recurrent geopolitical standoffs. At the national level, governance systems are characterized by weak cross-scale political representation and insufficient attention to social equity and inclusion. Increasingly, the need for a polycentric approach to environmental resource governance in the HKH is being recognized: one that emphasizes new partnerships and cross-scale linkages with improved knowledge-sharing platforms for diverse stakeholders.



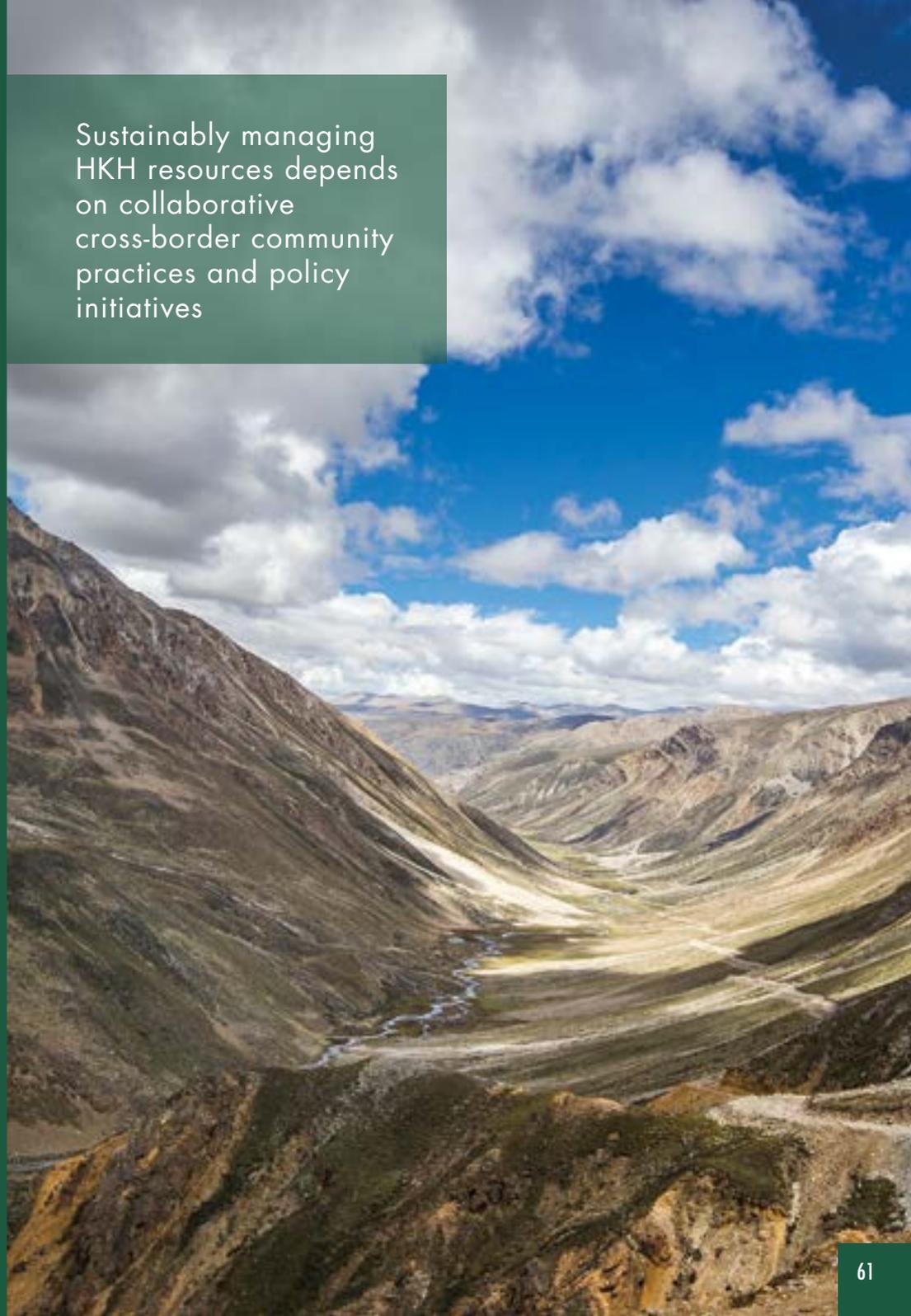
## THOUGH THE HKH IS A REGION OF INTERCONNECTED TRANSBOUNDARY LANDSCAPES, GOVERNANCE AND POLICY PROCESSES REMAIN PRIMARILY AT THE LEVEL OF INDIVIDUAL COUNTRIES

Although there is increasing acknowledgement of the HKH as a region of interconnected transboundary landscapes, governance and policy processes remain primarily at the level of individual countries. Forest, water, and rangeland are the most prominent resources of the environmental governance space in the HKH. Managing these resources sustainably will depend largely on the emergence of regional and innovative institutional arrangements – to foster intergovernmental dialogue, to further common policy initiatives, and to enable collaborative trans-border community practices.

### GOVERNANCE KEYS TO THE SUSTAINABLE FUTURE OF THE HKH:

- Institutional innovation for landscape level governance, upstream-downstream linkages, and for translating policy goals into action
- Upscaling and institutionalizing decentralized and community-based resource management practices
- Transboundary cooperation for managing connected landscapes
- Science-policy-practice interface for decision making, learning, and effective implementation of policies and programmes

Sustainably managing HKH resources depends on collaborative cross-border community practices and policy initiatives





## 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 Himalaya – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan – and based in Kathmandu, Nepal. Globalization 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.



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