

A scoping report to prepare the HKH Springs Outlook

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1. Background

The Hindu Kush Himalaya (HKH) region is known as the “water tower of Asia” for containing the headwaters of ten major Asian river systems. The region encompasses the highest mountain ranges in the world and contains the largest volume of ice on Earth outside the polar regions (Wester et al., 2023). The region provides freshwater to 240 million people living in the HKH region and 1.65 billion downstream (Sharma et al., 2019).

Springs are an important source of water for both humans and non-humans in the HKH. They play a crucial role in maintaining the flow of rivers and sustaining the livelihoods of communities. In the dry season, when glacier melt and snowmelt are limited, springs sustain river flows and act as a reliable source of water for drinking, irrigation, and hydropower generation. Springs are the primary water source for millions of people and supply over 90% of the water needed for domestic and productive use in the mid-hills of the region (Scott et al., 2019). At higher elevations, springs have direct connections with glaciers and permafrost (Merrey et al., 2018). They also provide water for biodiversity and ecosystems, supporting flora and fauna (Rathod et al., 2021., Nepal et al., 2023).

However, the springs in the HKH region are facing various challenges. Climate change is altering precipitation patterns and the cryosphere, affecting the availability and timing of spring flows. Deforestation, unsustainable land use practices, and urbanisation are further exacerbating the problems by reducing water infiltration and recharge of aquifers. The decline in glaciers and permafrost thawing are directly affecting water flows (Merrey et al., 2018). For example, in the Indian Himalayas, since the 1990s, nearly half of the three million springs have

either dried up or are in various stages of disappearing (NITI Aayog, 2018). Similarly, in western Nepal, a decreased discharge trend was reported in 70% of springs in a study of five watersheds (Adhikari et al., 2021), while 35% of water sources in Bhutan are in the process of drying up (WMD, 2021).

The decline in spring flows has negative impacts on water availability for agriculture and livelihoods. Communities that rely on springs for drinking water and irrigation are particularly vulnerable. Reduced water availability can lead to conflict and competition among communities and hinder socio-economic development. If the current situation of spring depletion continues, achieving the Sustainable Development Goals (SDGs) for water security will be a real challenge. Restoring and sustainable management of springs is crucial for ensuring water security, ecosystem health and function, the well-being of communities, and sustainable development. Sustainable springshed management at scale also requires information but there are limited studies on springs in the region. Information on the status, trends and the links with ecology, economy, society, and politics are very limited.

The recently launched *Water, ice, society, and ecosystems in the Hindu Kush Himalaya* (HI-WISE) report, clearly shows that the impacts of climate change on glaciers, snow and water resources including springs are deeply concerning, and the future scenarios are worrying (ICIMOD, 2023). The report also shows gaps in science, policy, and practice on springs and calls for urgent actions.

The HKH Springs Outlook is an attempt to close the gaps in spring science and provide recommendations for policy and practice. The Outlook aims to provide a comprehensive understanding of the current state of springs capturing their ecological, cultural, and socio-economic significance in the region, the main drivers of drying and degradation, the potential future risks, and opportunities. Based on this, the report will provide an outlook for the future of springs, including recommendations for policy and management actions. The HKH Springs Outlook will serve as a valuable resource for policymakers, researchers, managers, and stakeholders in the region to make informed decisions and take appropriate actions for sustainable springshed management.

2. Scope

The Outlook will cover the HKH region - a region spanning some 3,500 km in length from Afghanistan in the west to Myanmar in the east, and covering parts or all of Pakistan, India, China, Nepal, Bhutan, and Bangladesh (Figure 1). The HKH region includes areas lying below elevations of 300 masl up to 8848 masl (ICIMOD, 2023). It covers mountains, hills, and plains and is characterised by immense topographic and climatic heterogeneity. While the primary focus of this Outlook are the mid-hills, it also pays attention to the entire HKH, including highland and lowland areas where relevant. The Outlook will particularly focus on

The Outlook will identify the key knowledge gaps and areas for evidence generation in science, capacity, and policies. Based on the gaps, it will provide options and recommendations for addressing these gaps and challenges. Evidence generation will focus on different sectors aligned with springs with a particular focus on gender and social inclusion.

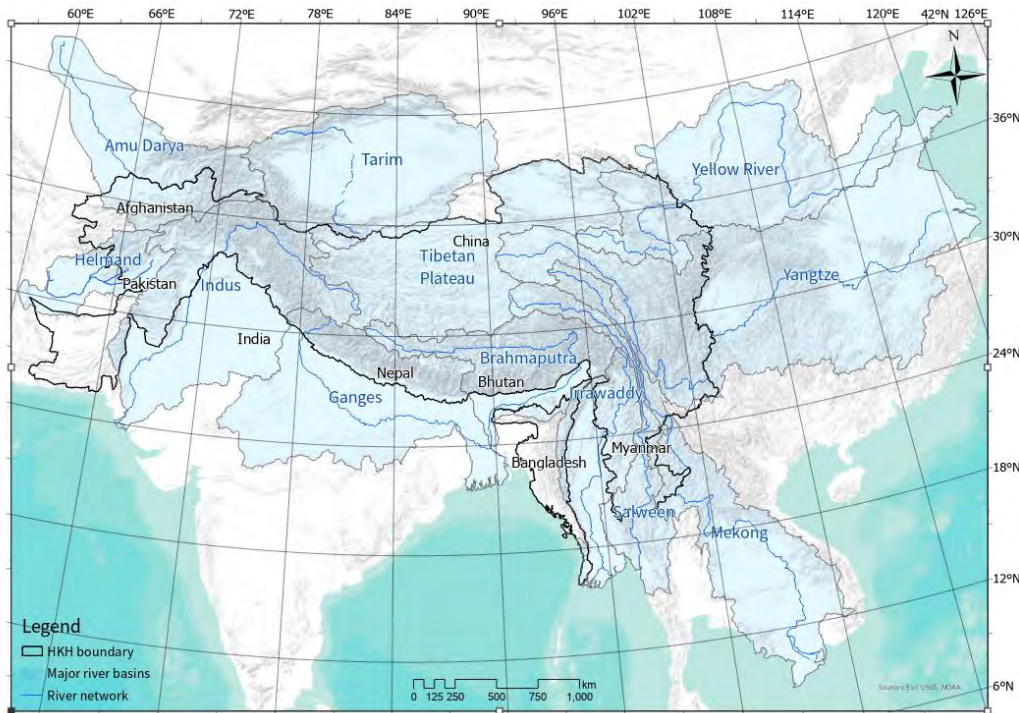


Figure 1: The HKH region (black outline). Source: ICIMOD (2023)

3. Policy context

The Outlook will strengthen the knowledge base on springs for informed and evidence-based decision-making in the context of national strategies and action plans, nationally determined contributions, and other global commitments of HKH countries. The aim is to mainstream springshed management into sectoral policy and planning. It will also contribute to the global agreements such as the Paris Agreement adopted under the United Nations Framework Convention on Climate Change (UNFCCC), Sendai Framework, Kunming-Montreal Global Biodiversity Framework (GBF), and the 2030 Agenda for Sustainable Development.

The target audience for the Outlook includes governments, academia, non-governmental organisations, civil society, and the private sector. The Outlook is expected to inform local, national, and global policies and agreements on restoration, regeneration, conservation and sustainable management of springs and valuation of its contributions to biodiversity and people.

The aim is to highlight key scientific evidence around contribution of springs to water security in the HKH, the loss of springs and consequent impacts on people and biodiversity, and the implications of this for achieving SDGs and targets. A particular emphasis will be on understanding social and governance systems of springs at the local, national and regional scales as most of the bilateral cooperation frameworks on water resources in the region do not focus on gender and social vulnerabilities. There are also gaps in policy provisions for gender and social inclusion at the national scales which may ultimately hinder in achieving SDGs. There is a need to integrate gender and social inclusion into the planning and implementation of springs revival which ensures equitable access and benefits and meaningful participation of the marginalised voices in policy and practice.

4. Methodological approach

The Outlook will be produced by a group of experts from within and outside the region. It will be based on the existing evidence: datasets (national, local, regional, and global as appropriate), peer-reviewed and grey literature, and other forms of knowledge, in English and in the languages of the regional member countries (where feasible and appropriate). The most updated climatic, biodiversity, hydrology, and cryosphere datasets available will be used.

The approach and methods for the Outlook will be discussed and decided in a participatory manner by the experts and stakeholders chosen for the Outlook. We will be closely collaborating and cooperating with Himalayan University Consortium ([HUC](#)) – a collaborative network of universities and academic institutions from the HKH and outside of it working on strengthening research and scholarship on issues from and relevant to the region – and the South Asian Network for Development and Environmental Economics ([SANDEE](#)) – regional network that uses economic tools and analyses to address South Asia’s environmental challenges.

5. Chapter outline

The Outlook will have at least seven chapters which will provide a holistic regional outlook that can inform decision-making, policy development, and management strategies for the sustainable management of springs and water resources in the region.

1. **Introduction:** Introduction to springs, their significance, and the rationale and objectives of the springs outlook for the region. Case studies and good practices on different aspects of springshed management can be incorporated to provide contextual understanding and examples from across the region in each chapter/sub-chapters, wherever applicable.
2. **Status, processes, and trends:**
 - a. **Science:** The status and past trends of springs in the region, highlighting, among other things, their hydrological, ecological, and socio-economic significance. Importantly, gender and social inclusion aspects related to springs management will be explored. This chapter will cover the state of knowledge focusing on the contributions of springs to baseflows, dry season flows, isotope studies of hydrology and hydrogeology, and spring ecology.
 - b. **Policy:** This will include a review of existing policies, regulations, and management practices related to springs. This will also focus on existing financial resources and investments, and the gaps for sustainable management of springshed.
 - c. **Practice:** This will particularly focus on the implementation of policies, and initiatives focused on springs in the region.
 - d. **Governance:** Besides policies and regulations, institutions at the regional, national, and local levels will be explored to understand the formal and informal management practices of springs, access and benefit sharing, representation, and participation of the diverse groups.
3. **Drivers of change:** This chapter will discuss key drivers and trends affecting spring systems in the HKH region – climate change, land use change, seismic events, infrastructure development, population growth, and pollution, among others. It will analyse how these drivers and trends are impacting spring flows, water availability, and ecosystem health. If appropriate and feasible, it will use modelling and data analysis techniques to quantify the magnitude and extent of these impacts. A particular emphasis will be given to the cost benefit analysis of springs in the region.
4. **Gender and springs:** This chapter will focus on gender analysis to better understand the roles, needs and constraints of women and men in relation to springs and its management. Gender and social vulnerability with respect with different drivers will also be explored.

- 5. Impacts of changing spring systems on water resources, biodiversity, and society in the HKH region:** This chapter will include the vulnerability of water sources, such as rivers and aquifers, to changes in spring flows, and impact of degrading springs on water quality. The ecological consequences of reduced water availability on aquatic and terrestrial ecosystems, socio-economic implications of declining spring flows on agriculture, livelihoods, water security, and impacts on human health will be discussed. This chapter will also touch upon the cultural and religious significance of springs.
- 6. Existing mitigation and adaptation strategies:** This chapter will identify and evaluate the existing and traditional adaptation and mitigation strategies to address the drying of springs in the region. This could include measures such as community-based water management, indigenous knowledge and practices, examples of evidence-based revival of dried or drying springs, sustainable land use practices, and climate-resilient strategies. It will consider the socio-economic and cultural contexts within which these strategies have been formulated and applied.
- 7. Scenario development:** Develop future scenarios for springs in the HKH region based on projected changes in climate and water demand and in collaboration with stakeholders and experts.
 - a. Hydrology: This could involve running hydrological models to simulate future spring flows under different climate and land use scenarios.
 - b. Policy and investments: It will involve scenario-building exercises on policy and investments based on the past and current trends.
 - c. Potential future pathways of springs based on the current and past trends.
- 8. Outlook: gaps, recommendations, and actions**

Develop policy and planning recommendations for the sustainable management of springs in the HKH region. This includes identifying policy gaps and proposing policy interventions to protect and restore springs and developing action plans and guidelines for sustainable GESI responsive spring management at the local, national, and regional levels.

6. Communication and outreach

The HKH Springs Outlook will be published in an electronic format and made available on [HimalDoc](#), ICIMOD’s digital repository and promoted through media and social media handles of ICIMOD and its partners. We will inform and engage with a wide range of knowledge holders, practitioners and end users through continuous communication and outreach from the inception and through the development of the Outlook.

Before the launch of the HKH Springs Outlook, specific products, milestones, and process will be shared with the target audience and the general public every year or half-year. These may include policy gap analysis report, repository of springs publications, produced maps and stories on risks.

7. Process and timeline

Within ICIMOD, a technical and steering working group (TWG) comprising of experts with multi-disciplinary knowledge and expertise, including gender and social inclusion, from all three Strategic Groups will be formed. Coordinating Lead Authors (CLA) for each chapter will be chosen from the TWG. Each chapter will have experts from within and beyond the region as lead authors (LA). The CLAs and LAs can choose contributing authors (CA) from within and outside ICIMOD. Within ICIMOD, an internal review committee will be formed. A team of external reviewers for each chapter will be formed from experts within and beyond the HKH region. Their roles and responsibilities are outlined in Table 1.

Table 1: Roles and responsibilities

Role	Responsibilities
Technical and steering working group (TWG)	Overall responsibility for overseeing preparation of the report, arranging meetings, and coordinating with experts and reviewers for completion of the report.
Coordinating Lead Author (CLA)	The CLA will be responsible for coordinating major sections and overall chapters of the Outlook. Regional, gender and social inclusion aspects will be considered for a balanced team of CLAs.
Lead Author (LA)	The lead author will be responsible for producing designated sections or parts of chapters based on the best scientific, technical, and socio-economic information available.
Contributing Author (CA)	CLA and LA can choose 1 contributing author to help in the collection, analysis, and writing of the chapter.
Internal review committee	Within ICIMOD, a multi-disciplinary and gender balanced team will be formed to guide the technical and scientific content of the chapters and the Outlook.
External review committee	Experts including GESI experts from ICIMOD, within and outside the HKH region will be chosen to be on the external review committee to rigorously review the content of the chapters.

We will engage diverse stakeholders from inception to the launch of the HKH Springs Outlook. Figure 2 outlines the proposed steps for developing the Outlook.



Figure 2 Outline of the process for developing the HKH Springs Outlook – 2023–2026

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