CHAPTER 13: ADAPTATION TO CLIMATE CHANGE

Coordinating Lead Authors: Arabinda Mishra (1), Arivudai Nambi Appadurai (2), Dhrupad Choudhury (1)

Lead Authors: Bimal Regmi (1), Ulka Kelkar (3), Mozaharul Alam (4), Pashupati Chaudhary (5), Seinn Seinn Mu (6), Ahsan Uddin Ahmed (7), Hina Lotia (8), Chao Fu (9), Thinley Namgyel (10), Upasna Sharma (11)

Contributing Authors: Luni Piya (12), Sreeja Nair (13), Navarun Varma (14), Chandra Sekhar Bahinipati (15), Jyoti Nair (16), Kamal Aryal (1), Basharat Ahmed Saeed (8), Umama Binte Azhar (8)

Affiliations:

1. International Centre for Integrated Mountain Development (ICIMOD), Nepal
2. World Resources Institute (WRI-India), India
3. Independent researcher, India
4. United Nations Environment Programme (UNEP), Regional Office for the Asia and Pacific, Bangkok, Thailand
5. Local Initiatives for Biodiversity, Research and Development (LI-BIRD), Nepal
6. Perennial Crops Research and Development Center, Department of Agriculture, Ministry of Agriculture, Livestock and Irrigation, Myanmar
7. Centre for Global Change (CGC) , Bangladesh
8. Leadership for Environment & Development (LEAD) Pakistan
9. UNEP-International Ecosystem Management Partnership (UNEP-IEMP), and Institute of Geographic Sciences and Natural Resources Research (IGSNRR), Chinese Academy of Sciences (CAS), China
10. National Environment Commission (NEC), Bhutan
11. Department of Humanities and Social Sciences, Indian Institute of Technology, Delhi, India
12. Graduate School for International Development and Cooperation (IDEC), Hiroshima University, Japan
13. Independent researcher, Singapore
14. The Energy and Resources Institute (TERI), India
15. Gujarat Institute of Development Research (GIDR), India
16. Ashoka Trust for Research in Ecology and Environment (ATREE), India

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76 ## CHAPTER OVERVIEW

KEY FINDINGS

1. Adaptation to climate change is increasingly urgent for the HKH — yet for policy makers it is a complex challenge (well established). Four principal constraints are:

- *A lack of adequate data* (*both in quantity and quality terms, and especially at localized scale*) about climate change impacts
- *Weak institutional capacity* at various governance levels
- *Social and economic barriers* to intervention uptake
- *Poor infrastructure* for development and adaptation purposes

2. **Adaptation responses by governments in the HKH are mostly incremental; they are driven by international commitments; they are yet to be well integrated with development plans and programmes; and their implementation lags behind official targets and goals (established but incomplete).** Governance, especially at the subnational level, suffers from low information, knowledge, and resources. To be sure, national climate policies and short-run interventions may aim to build strategic knowledge, public awareness, and institutional capacity. Yet the policies do not envision transformative adaptation, and very little regional collaboration takes place.

3. **Funding is the main challenge to climate change adaptation in HKH countries (established but incomplete).** According to estimates, the region will need far more funding for adaptation than HKH countries have so far accessed from international sources. With appropriate incentive mechanisms, private financing might support adaptation.

4. **Autonomous adaptation, widespread in the HKH, deserves more study though it may prove inadequate (established but incomplete).** Generally, local knowledge systems are recognized as repositories of traditions and management practices that could usefully inform adaptation responses. Yet the systematic documentation of local, autonomous responses to climate change in the HKH is limited, and few attempts have been made to validate these responses scientifically.

5. **Opportunities exist for a scaled up, inclusive, and more comprehensive climate change adaptation response in the HKH (established but incomplete).** Such a response should include:

- Greater regional cooperation among HKH countries in information and knowledge sharing, particularly in areas such as disaster risk reduction, and food and water security.
- Stronger integration of adaptation with national development plans and programmes.
- Convergence of adaptation, disaster risk reduction, the Sustainable Development Goals (SDGs), and resilience-building priorities.
- Investments for generating science-based climate information and knowledge services.
- Incentives to promote policy experimentation through adaptation pilots.
- Institutional capacity building on adaptive governance.
- Creation of knowledge networks.
- Mobilization of funds for greater social protection and risk insurance.

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POLICY MESSAGES

1. **Climate change adaptation policies and practices must intensify in the HKH — and must become transformative.** Institutional capacity on adaptation urgently needs to increase until it fits to purpose at each level of governance. Lessons learned from successful policy instruments, such as the Local Adaptation Plans for Action (LAPAs), should widely inform efforts elsewhere. Governments should mainstream these instruments in their planning and budgeting processes.

2. **Local-level autonomous responses to climate variability and extreme events must be studied systematically and documented.** Such responses need to generate critical, practice-based feedback for adaptation planning at higher governance levels.

3. **Alleviating poverty must be the first step in building HKH communities' adaptive capacity.** Policy and practice should address the links among climate change adaptation, disaster risk reduction, and the Sustainable Development Goals (SDGs), and should look beyond SDG target 11b to other goals and targets (see SDG box below). Various stakeholders — government, private business, and civil society — must work together to intensify and scale up adaptation efforts.

Climate change is likely to have serious effects in the mountains of the HKH (well established). By 2050, mountain temperatures across the region are projected to increase by about 1–2° C, more at higher elevations. Although precipitation projections are less certain and spatial variability is high, studies indicate that increased climate variability is already affecting water availability, ecosystem services, and agricultural production (see Chapter 3). Further impacts will likely appear in the frequency and magnitude of extreme weather events, such as high and intense rainfall, leading to flash floods, landslides, and debris flow. A rise in extreme weather events and disasters due to climate change, disproportionately affecting mountain communities, could further impede their development.

Mountain communities — especially remote ones — are more vulnerable to these climate change impacts than non-mountain areas (established but incomplete). The high mountains are poorly served by life-saving and livelihood-supporting infrastructure. Access to climate information and support services is more limited in the mountains, as is the presence of government extension agencies. Weak institutional links hinder farmers from adopting technology that can contribute to adaptive capacity. For poor and marginalized groups, deep and pervasive structural inequalities make climate change adaptation even more difficult.

A special challenge is our uncertainty about climate change impacts in the HKH, a result of the complex interactions among various drivers. Although adaptation to climate change is an urgent priority for the region, we also know less than we need to about how climate change will affect mountain people and ecosystems, and about the range of mountain-specific adaptation needs and interventions (established but incomplete).

So, how will people living in the mountains adapt, and what is being done to help them? This chapter seeks to identify common patterns of adaptation response across the eight countries with territory in the HKH: Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. The chapter distinguishes between adaptation responses that are planned by governments or by non-state actors,

and those that are local and autonomous. Further, it asks whether the planned responses are taking notice of local/autonomous practices, and it considers the extent of policy support for these practices.

The chapter finds that the 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). Notably, the National Adaptation Programme (NAP) process — established in 2010 — emphasizes that to reduce vulnerability and build resilience, countries should integrate climate change adaptation into development planning. Most HKH countries have initiated efforts towards such integration, and established high-level coordinating bodies under political leadership. The government-led responses are at both national and subnational levels through multiple plans, programmes, and projects. In all the countries there is clear identification of priority sectors for adaptation interventions; however, attention to mountain specificities is not common (well established).

What is clear is that planned responses to climate change by HKH governments and non-state actors are hindered by large constraints on institutional capacity (well established) leading to major gaps between policy goals and actual implementation of adaptation programmes. This chapter seeks to identify the most urgent of these constraints — the ones that require immediate action. It also describes many adaptation initiatives undertaken by non-state actors. How can the most successful of these be replicated, scaled up, and learned from, to inform and create synergies with other coordinated actions? The chapter identifies solutions that could work to better connect adaptation science, policy, and practice.

Given climate change impacts that will likely be large — but that may be non-linear, and that are subject to high uncertainty — HKH countries must now go beyond incremental strategies (established but incomplete) and need to initiate transformative adaptation. Gaps in a country's adaptive capacity cannot be addressed until political leadership pushes for an intensified adaptation response within the larger development regime.

CLIMATE CHANGE AND THE SUSTAINABLE DEVELOPMENT GOALS (SDGs)

In the Sustainable Development Goals (SDGs) and their accompanying targets, SDG 11 — *Make cities and human settlements inclusive, safe, resilient and sustainable* — includes climate change adaptation explicitly as part of target 11.B:

By 2020, substantially increase the number of cities and human settlements adopting and implementing integrated policies and plans towards inclusion, resource efficiency, mitigation and adaptation to climate change, [and] resilience to disasters, and develop and implement, in line with the Sendai Framework for Disaster Risk Reduction 2015–2030, holistic disaster risk management at all levels

This target under SDG 11 is critically relevant for the HKH, especially in hill and mountain areas with rural-urban migration. Yet several other SDGs are no less important for addressing climate change and anticipating its effects.

In our view, the first priority must be that of SDG 1: *End poverty in all its forms everywhere*. For climate change adaptation to be transformative, pro-poor, and socially inclusive in the HKH, a policy

approach is needed that includes poverty alleviation measures well-integrated with disaster risk reduction (DRR) and resilience-building interventions.

In addition, SDG 13 — *Take urgent action to combat climate change and its impacts* — includes target 13.2: *Integrate climate change measures into national policies, strategies and planning.* The National Adaptation Plan (NAP) process will likely be instrumental for this purpose in the HKH.

Further, under SDG 16 — *Promote peaceful and inclusive societies for sustainable development, provide access to justice for all, and build effective, accountable, and inclusive institutions at all levels* — is target 16.7: *Ensure responsive, inclusive, participatory and representative decision-making at all levels*. Inclusive institutions are essential in the HKH for adaptation measures to be consistent with social justice.

Finally, SDG 17 — *Strengthen the means of implementation and revitalize the global partnership for sustainable development* — includes target 17.6, stressing the need for enhanced regional and international cooperation. Adaptation to climate change in the HKH will depend on meeting this target, for practical reasons related to financing, technology transfer, and capacity building.

Beyond these SDGs and targets, we propose an SDG-consistent priority for adaptation to climate change in the HKH:

- *Ensure sustainable adaptation to climate change and disaster risk reduction through evidence-based decision making*

We also propose ten indicators of climate change adaptation for the HKH, consistent with SDG priorities and targets:

1. Number of deaths, missing persons, and persons affected by climate hazards per 100,000 people (disaggregated by sex)
2. Economic loss (as a percentage of national GDP) that is averted by climate-proofing critical infrastructure and basic services
3. Percentage of population with access to improved climate information and services
4. Percentage of population with improved access to successful adaptation technologies
5. Proportion of local governments that formulate and implement local adaptation plans aimed at disaster risk reduction and resilience building for vulnerable population groups
6. Number of cities or urban settlements with access to safe, climate-resilient infrastructure and service delivery systems
7. % of rural population drawing major part of their household income from climate resilient livelihood systems
8. Amount of climate financing flowing locally for climate change adaptation (for example, the percentage of the national budget allocated to mountain districts)
9. Access to international funding (for example, from the Green Climate Fund)
10. Number of knowledge institutions actively engaged in adaptation knowledge generation, communication, pilots, and scale-up relevant to the mountain context.

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13.1 ADAPTATION TO CLIMATE CHANGE

Temperature across the mountains of the Hindu Kush Himalaya is projected to increase by about 1–2^{0}C by 2050, and even more at higher elevations (Shrestha et al. 2015). Winters are expected to be warmer than summers in most places. Precipitation projections are less certain and the spatial variability is high. A number of research studies (as cited in earlier chapters of this assessment) show that increased climate variability is already affecting water availability, ecosystem services, and agricultural production in the region. The serious changes likely to occur in the HKH due to climate change are related to frequency and magnitude of extreme weather events such as high intense rainfall leading to flash floods, landslides, and debris flow (Shrestha et al. 2015). These events would most likely affect various productive sectors in the HKH countries, particularly the natural resource systems that provide the livelihoods for poor and marginal communities, and impede the development process (Moors and Stoffel 2013; Su et al. 2013; Ahmed and Suphachalasai 2014). There is also the recognition that climate-related population dislocation will be significant in Bangladesh, China, India, and Pakistan (ADB 2012).

The current level of understanding of adaptation needs and interventions specific to mountain situations continues to be highly limited because of inadequate knowledge of climate change impacts on mountain people and ecosystems. At the same time, adaptation is becoming increasingly urgent for the HKH. Five of the eight HKH countries — Afghanistan, Bhutan, Myanmar, Nepal, and Pakistan — are predominantly mountain countries and, at the same time, four of these (excluding Pakistan) are classified as Least Developed Countries (LDCs). Even in case of the remaining two South Asian countries — Bangladesh and India — the mountain states/regions compare poorly with most of their non-mountain counterparts in terms of GDP and HDI indicators. In China, most of the people living in poverty reside in mountain regions which occupy nearly two-thirds of the land.[1] Thus for mountain people in HKH countries, climate change impacts carry a significant risk of undermining the achievement of fundamental human rights like rights to food, health, adequate housing, and access to safe drinking water and sanitation (Cameron et al. 2013).

While climate change is acting as a natural driver of change, there are several other driving forces such as urbanisation and globalisation causing rapid socioeconomic transformation in the HKH. This process of change is often accompanied by conditions of high uncertainty due to complex interactions among the driving forces. For adaptation planning and actions under circumstances of large-scale changes (some of which may be nonlinear) and high uncertainty, the HKH countries are required to go beyond incremental strategies and initiate transformative development and adaptation. There is definitely a capacity need for policy makers in the HKH to plan and deliver both, but addressing this need will be possible only when the political leadership pushes for an intensification of the adaptation responses within the larger transformative development regime.

13.1.1 Adaptation to climate change in the HKH is a complex challenge compounded by social differentiation and poor development

The mountain communities in HKH countries, particularly those located in remote areas, are most vulnerable to climate change impacts (especially disasters caused by extreme weather events). The adaptation needs of several subsets of highly vulnerable groups in the HKH, such as indigenous

[1] http://www.fao.org/docrep/ARTICLE/WFC/XII/0510-A3.HTM

peoples, women, migrants and migrant-sending households, urban slum dwellers, and minorities, deserve special understanding and targeted action. Deep and pervasive structural inequalities in HKH societies make adaptation even more difficult for the poor and marginalized people. Entitlements to elements of adaptive capacity (for example, ownership of productive assets and access to services of local government agencies) are typically socially differentiated which affects the uptake of coping strategies. For instance, in studies conducted in the Central and Western mountains of Nepal, caste hierarchy and patriarchy-led gender restrictions have been found to act as barriers for the socially marginalized groups within a locality to access certain institutions and adopt the adaptation options that are easily accessible for the so-called higher castes (Jones and Boyd 2011; Onta and Resurreccion 2011). For policy makers of the HKH, such social embeddedness makes adaptation a complex challenge.

The other key characteristic of the HKH mountain communities in the climate change context is severely limited access to climate information and support services. Because of the mountainous geography, government extension agencies have sparse presence. The weak institutional linkage results in poor access among farmers to new and innovative adaptation measures.

Similar to the thin presence of agricultural extension services in mountain regions, the level of penetration of life- and livelihood-supporting infrastructure is considerably low in high mountainous terrains compared to other areas within HKH countries. This is perhaps even more evident in cases of adaptive infrastructure. Lack of investments in this regard has long remained a challenge in the HKH. The investment bottleneck must be addressed by the leadership of these countries in order to dent the prevailing development injustice so that people in the HKH can use such infrastructure and accrue adaptation benefits.

13.1.2 National governments in the HKH are responding to the adaptation challenge, strongly influenced by the evolving global regime

The emergence of adaptation as a response option within the United Nations Framework Convention on Climate Change (UNFCCC) is marked by several milestones. The first significant action towards adaptation started in 2001 with the establishment of the Least Developed Countries Expert Group to provide technical support to the LDCs for preparing their National Adaptation Programmes of Action (NAPAs), and with the establishment of the Least Developed Countries Fund and the Special Climate Change Fund (SCCF) to support LDCs and developing countries, respectively, with adaptation action. This was followed by a knowledge and networking platform to support adaptation under the Nairobi Work Plan in 2005. The Adaptation Fund was launched in 2007 under the Kyoto Protocol to fund adaptation action in developing countries under a novel "direct-financing" modality. The Cancun Adaptation Framework in 2010 further increased the focus on adaptation under the UNFCCC process with the establishment of the Adaptation Committee and the launch of the process to formulate and implement national adaptation plans (NAPs) for LDCs and other developing countries. Most recently the Paris Agreement in 2015 cemented adaptation under Article 7 which defines an adaptation goal, the approach towards adaptation at the national level, and also provides for "adaptation communications" by parties to submit their priorities and needs for adaptation.

The NAP process established in 2010 emphasises that reducing vulnerability and building climate resilience requires the integration of adaptation planning with overall development planning. This is further carried into the Paris Agreement with the adaptation goal of "enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to

sustainable development". All the HKH countries have included adaptation actions in their Intended Nationally Determined Contributions (INDCs), and the majority have explicitly identified the NAP process as the approach for adaptation (Table 13.1).

Some of the recent INDCs submitted by the HKH countries emphasize building synergy between climate action and achieving the SDGs. For instance, Myanmar's climate change strategy and action plan identifies adaptation indicators that are linked with the SDG targets in sectors such as health, climate change, biodiversity, and food security. Similarly, Nepal's INDC states that "it is, …, imperative for Nepal to tackle the impact of poverty and climate change simultaneously to achieve Sustainable Development Goals". The INDCs of India and Pakistan also make a strong reference to the SDG commitment. In its INDC, China has committed to embark on a sustainable development path that leads to multiple wins in terms of economic development, social progress, and combating climate change.

Adaptation priorities, based on a review of UNFCCC documents submitted by HKH countries (NAPA, National Communications, INDCs), commonly identify agriculture, water, health, forests and biodiversity, and disaster management as key sectors for intervention. Further, mountain-specific adaptation issues are observed to have received varying degrees of emphasis in country priorities. Thus, in the case of Bhutan, a wholly mountainous country, all its NAPA priorities relate to mountain-specific climate risks and vulnerabilities. Strengthening early warning systems for floods and GLOF risk reduction are identified to require significantly higher density of stations due to the micro variation in the topography and climates in a mountain environment. Nepal's NAPA and Local Adaptation Plan of Action (LAPA) specifically recognize the key risks and vulnerabilities of fragile mountain ecosystems such as the rain shadow districts in the mid and far western region as the most vulnerable and prioritized geographic areas for adaptation interventions. The government has implemented a majority of the climate change adaptation projects in those remote and fragile mountains targeting the population who are suffering from food deficiency and poverty. Another example of a mountain-specific policy response is India's National Mission for Sustaining the Himalayan Ecosystem, which is one of the eight missions under the country's National Action Plan on Climate Change. It is the only mission with a geographical focus and its primary objective is to conserve biodiversity, forest cover, and other ecological values in the Himalaya by scientifically assessing the region's vulnerability to climate change.

BOX 13.1: APPROACH TO THIS ASSESSMENT

This assessment seeks to identify patterns in adaptation response common to the eight HKH countries — Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan. We look at both autonomous and planned adaptation response to climate change impacts. In the planned category we seek to distinguish between the government response and the initiatives by non-government actors. For the autonomous kind of response, we try to understand the degree to which policy formulation on planned adaptation is taking feedback from these practices and to what extent autonomous adaptation is receiving policy support. In the case of planned adaptation, institutional capacity constraints are many and we seek to identify the ones that would need to be addressed urgently. The practice domain is populated with many initiatives by non-state actors and the question here is how best to replicate, scale up, and create synergies from mutual learning and coordinated action. Ultimately this assessment hopes to identify solutions that would work for greater connectedness in the science-policy-practice continuum on adaptation.

241 **Table-13.1: Summary of adaptation components given in country INDCs**

Country	Adaptation vision/goal	Status with respect to NAPA & NAP (or other (sub)-national policy frameworks)	Adaptation priorities (in terms of sectors or actions)	Cost of adaptation	Target years	Date of INDC submission to UNFCCC
Afghanistan	"to protect the country and its population by enhancing adaptive capacity and resilience, effectively respond to the vulnerabilities of critical sectors, and efficiently mainstream climate change considerations into national development policies, strategies, and plans" (p-4)	NAPA and National Capacity Needs Self-assessment for Global Environmental Management (NCSA) completed in 2009. NAP process underway.	• Development of the CCSAP and VA monitoring and assessment system • Mainstreaming of adaptation technologies • regional and international cooperation for adaptation technology transfer • Meteorological and hydrological monitoring networks and services • Water resources infrastructure and irrigation systems • Community-based natural resources management • Selected species and habitat conservation • alternative and renewable energy • Regeneration of degraded forests and rangeland areas	10.785 billion USD (out of a total financial need of 17.405 billion USD)	2020 to 2030	13 October 2015
Bangladesh	"to protect the population, enhance their adaptive capacity and livelihood options, and to protect the overall development of the country in its stride for economic progress and wellbeing of the people" (p-10)	NAPA submitted in 2005 (revised in 2009); NAP roadmap prepared	• Improved early warning systems • Disaster preparedness and protection measures • Climate resilient housing, infrastructure and communication • Urban drainage • River training and dredging • Stress tolerant variety improvement and cultivation (including livestock and fisheries) • Research and knowledge management • Health • Biodiversity and ecosystem conservation • Institutional capacity building	42 billion USD (out of a total financial need of 69 billion USD)	2015 to 2030	25 September 2015

Bhutan	"... to remain carbon neutral ..." (p-1); "Adaptation to adverse impacts of climate change is a priority" and is to be pursued through NAP towards "reducing vulnerability by both integrating climate change adaptation into national development planning and also implementing priority adaptation actions on the ground". (p-5)	NAPA prepared in 2006 and updated in 2012; NAP process to begin on receipt of support	• Water security through Integrated Water Resource Management (IWRM) • Climate resilient agriculture and livestock farming • Sustainable forest management and conservation of biodiversity • Resilience to climate change induced hazards • Minimize climate-related health risks • Climate proof transport infrastructure • Climate information services for VA assessment and planning • Renewable and climate resilient energy generation	costs not indicated	2018-2023 (actions integrated in 12th 5-year Plan)	30 September 2015
China	"...to proactively adapt to climate change by enhancing mechanisms and capacities to effectively defend against climate change risks in key areas such as agriculture, forestry and water resources, as well as in cities, coastal and ecologically vulnerable areas and to progressively strengthen early warning and emergency response systems and disaster prevention and reduction mechanisms." (p-5)	National Strategy for Climate Adaptation under implementation	**Measures to enhance overall climate resilience:** • safe operation of infrastructure of water conservancy, transport and energy against climate change; • optimal water resources management • water conservation facilities for farmlands, to vigorously develop water-saving agricultural irrigation and to cultivate heat and drought-resistant crops • resilience of coastal areas against climatic disasters • to track, monitor and assess the impact of climate change on biodiversity • strengthen forestry infrastructure • effectively safeguard urban infrastructure • contingency planning and capacity building for public health services • to improve early warning and communication system • strengthening disaster risk reduction and emergency response systems	costs not indicated	by 2030	30 June 2015

India	"To better adapt to climate change by enhancing investments in development programmes in sectors vulnerable to climate change, particularly agriculture, water resources, Himalayan region, coastal regions, health and disaster management." (p-29)	National Action Plan on Climate Change (NAPCC) and State Action Plans on Climate Change (SAPCCs) under implementation	The INDC estimate of 206billion USD is for implementing adaptation actions in agriculture, forestry, fisheries infrastructure, water resources and ecosystems. Apart from this there will be additional investments needed for strengthening resilience and disaster management. (p-31)	206 billion USD (at 2014-15 prices; mitigation cost estimated around USD 834 billion till 2030 at 2011 prices)	2015 to 2030	1 October 2015
Myanmar	"...a vision for achieving climate resilient, low-carbon, resource efficient and inclusive development as a contribution to sustainable development."(p-1)	NAPA under implementation since 2012; NAP to be developed	**NAPA priority sectors:** 1. First priority level sector: resilience in the agriculture sector, developing early warning systems and forest preservation measures 2. Second priority level sector: public health protection and water resource management 3. Third priority level sector: coastal zone protection 4. Fourth priority level sector: energy and industry sectors, and biodiversity preservation	costs not indicated	not indicated	28 September 2015
Nepal	"Nepal's Climate Change Policy (2011) envisions a country spared from the adverse impacts of climate change, by considering climate justice, through the pursuit of environmental conservation, human development, and sustainable development .... The Policy has objectives of ...enhancing the climate adaptation and resilience capacity of local communities for optimum utilization of natural	NAPA prepared in 2010; LAPAs being implemented in 90 Village Development Committees and 7 Municipalities, and nearly 2200 Community Adaptation Plans of Action (CAPAs) for community forests developed; NAP preparation ongoing since 2015	• NAP formulation and implementation; implementation of NAPA and LAPAs • Strengthening implementation of Environment-Friendly Local Governance (EFLG) Framework in Village Development Committees and municipalities to complement climate change adaptation • Study of impacts of climate change in mountains, hills and lowland ecosystems and landscapes • Research on loss and damage associated with climate change impacts • Sustainable management of forests • Agricultural sector enhancement by adopting climate-friendly technologies and reducing climate change impacts	costs not indicated	varies for sector to sector	11 February 2016

	resources and their efficient management ...." (p-3)		• Climate-induced disasters in earthquake affected areas • Institutional level capacity building			
Pakistan	"To build a climate resilient society and economy by ensuring that climate change is mainstreamed in the economically and socially vulnerable sectors of the economy." (p-15)	Process of developing a NAP underway	**Medium to long term actions (up to 2030):** • Improving irrigation systems • Enhancing water resource management • Strengthening risk management system for the agriculture sector • Implementing a comprehensive Climate Smart Agriculture program • Building climate-resilient infrastructure (focus on water) • Improving the emergency response mechanism for managing extreme climate events and strengthening the development of disaster reduction and relief management systems **Near-term actions (2020-2025):** • Developing NAP • Strengthening sub-national adaptation planning capacity • Implementation of actions under 'National Disaster Management Plan'	US$ 7 - 14 billion per annum	Medium to long-term actions (up to 2030); Near-term actions (2020-2025)	6 November 2016

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13.2 LOCAL AUTONOMOUS RESPONSES TO CLIMATE VARIABILITY AND EXTREME EVENTS IN HKH

Autonomous adaptation by mountain communities has evolved over the ages and includes possibly thousands of reactive (ad hoc, retrofitting, or retrospective) and proactive (anticipating, precautionary, incremental, or prospective) strategies, but very little is systematically researched and documented that is specific to the HKH.

13.2.1 Many autonomous adaptation practices continue to be highly relevant in the local context and need policy support

In response to climate risks, farmers in the HKH employ a number of reactive and proactive adaptation practices, such as those used by farmers in Nepal (Table 13.2).

Table 13.2: Examples of reactive and proactive adaptation practices in the agricultural sector in Nepal

Climate risk	Proactive/Prospective adaptation	Reactive/Retrospective adaptation
Temperature rise	• Mulching of crops to retain moisture • Terrace wall farming to avert risk of crop failure and to check evapotranspiration • Management of farmer-managed irrigation systems, community-managed drinking water systems, and traditional water mills • Legume integration with maize	• Changing cropping patterns in response to crop failure to climate risks • Introduction of new crops that didn't grow well in past due to excessive cold (e.g., apple and maize are being introduced to new locations in Mustang)
Erratic rainfall with frequent drought	• Dry seedbeds for sowing rice • Introduction of drought-tolerant crops such as millet, soybean, black gram • Mixing of drought-tolerant local varieties with improved varieties of maize for risk distribution • Varying the sowing dates in different plots for spatial risk distribution in case of seasonal droughts	• Direct seeding when drought damages crops • Collection of wild edible foods
Excessive rainfall and flooding	• Raised seedbeds for nursery preparation • Fencing land, orchard, houses • Growing flood-tolerant crops • Hedgerow plantation of deep-rooted grasses along the contours of sloppy agricultural lands to prevent loss of top soil and erosion	• Altering planting time and methods (e.g., double-transplanting of rice) when flood damages crops • Migration to safer places
Hailstone	• Growing hailstone-tolerant crops such as turmeric, ginger, garlic, onion, yam, cardamom, etc.	• Replacing walnuts with almonds to reduce damage caused by hailstones
Biophysical damage	• Shifting cultivation to cultivate less disrupted and deteriorated lands on a rotational basis	• Bamboo fencing to protect land, orchards, and houses • Change of occupation, migration

Autonomous adaptation practices are rooted in a community's culture, tacit knowledge base, leadership, innovations, collective action, and experiential learning that are mediated by individuals and local institutions (Smit and Pilifosova 2001; Agrawal 2008). Examples of autonomous adaptation

happening in different sectors are discussed below to illustrate why and how some practices continue to be relevant and need policy support.

Agriculture

There is sufficient evidence from the HKH countries to conclude that farmers are already adopting a wide variety of autonomous adaptation strategies to a changing climate. To take a few examples:

- In Pakistan, because of increased uncertainty in rainfall patterns, farmers have begun to change their cropping calendar and in some cases have even altered crop varieties. Some field-level studies have documented this practice in some districts in Southern Punjab and Sindh and have written policy recommendations.[2,3]
- In China, farmers faced with drought are inclined to choose a crop that is more adaptive, multifunctional, and high yielding, with better economic returns under such conditions. In addition, farmers are willing to increase investment in irrigation infrastructure and adopt water-saving technologies in response to climate change and the prospect of increasing water scarcity (Wang et al 2010).
- In hill and mountain districts of Nepal, mixing of different varieties of beans and maize seeds is a very common risk aversion strategy, because at least some of the genotypes survive extreme events and environmental stresses. Farmers also alter the sowing dates by a few days in different plots to distribute the risk of short-duration seasonal droughts during peak growing phases (Piya et al. 2012, 2013). People have developed different agro-forestry practices to address frequent drought, landslides, and surface soil erosion and have constructed cost-effective bamboo fencing to protect them from recurrent floods (ICIMOD 2007).
- In the hills of Uttarakhand, India, farmers respond to changes in rainfall by shifting to less water-intensive crops and diversifying their sources of livelihood (Kelkar et al. 2008). Farmers in Sikkim have introduced crops (like maize, cabbage, pumpkin, and carrot) that were previously unable to grow at high altitudes (Ingty and Bawa 2012).
- In Myanmar, a food security survey in Northern Shan finds farmers' adaptation practices include cultivating wetland paddy, small gardens, orchard and shifting cultivation in the upland area at regular intervals. According to the study, farmers who practiced wet paddy growing, irrigated farming, crop diversification, and growing pulses in their cropping system are more food secure (WFP 2010).

Livestock/Pastoral

- Pastoral communities in Nepal have been using various reactive and proactive adaptation techniques, such as changing grazing areas and transhumant routes[4] and reducing the length of stay at en route points when biophysical conditions deteriorate; stall-feeding animals,

[2] http://www.lead.org.pk/lead/Publications/Thematic%20Agriculture%20LAPA.pdf
[3] http://www.lead.org.pk/lead/Publications/Thematic%20Water%20LAPA.pdf
[4] A transhumance system is a strong institution developed to govern animal movements (redirection), prairie management, and rationalization of resources use in response to or anticipated biophysical and ecological changes.

growing fodder and forage, reducing herd size, and feeding crop stubbles, by-products, and hay to livestock during dry periods to cope with shortage of feed; preserving native breeds that bear ecological stresses; digging ponds to store water for feeding animals; and moving animal sheds and houses or entire villages to new locations when people face or anticipate some ecological risks (Banjade and Paudel 2008; Moktan et al. 2008; Chetri et al. 2011; Aryal et al. 2014).

- Pastoralists in Sikkim, India, have responded to changes in snowfall and rainfall by replacing sheep by yak and by collectively banning the slaughter and sale of sheep for a few years (Ingty and Bawa 2012).

- Climate change and overgrazing are believed by policy makers to have been the drivers of grassland degradation in China over the past 30 years. Li and Huntsinger (2011) observe how increasing land privatization and the institutionalization of rigid land tenure in the Inner Mongolia region have weakened traditional practices of pasture and herd management, and in the process reduced the resilience of pastoralists to cope with environmental crises like drought. On the other hand the lack of secure land tenure has been found to constrain adaptation in other contexts.

Water resources

- Water is emerging as the most important and pressing climate change impact in Bhutan with drying sources being reported in many parts of the country (NEC 2011). Norbu and Kusters (2012) report that small-scale farmers in Punakha Valley are coping with insufficient water for irrigation from traditional sources by pumping rivers.

- In the hills of Nepal, villagers have constructed community-managed water tanks sourced from free-flowing natural springs for water storage and use during recurring dry seasons, which are reported to have intensified in recent years (Piya et al. 2012, 2013). However, with springs drying up, such a practice is at risk of losing relevance and possible alternatives may not be immediately clear to communities.

Forests

- A community forestry programme in Nepal has mobilized communities to manage forest resources in a sustainable way.[5] Communities have adopted numerous practices to sustainably manage and benefit from the forest ecosystems, especially in times of stress such as crop failures and droughts.

Disasters

- Over the last few years, recurrent long-droughts in Nepal are making a vast tract of land unattended, ultimately leading to substantive yield reduction in several districts across the country. People have responded by migrating to nearby urban centres. Labour migration is a

[5] More than 25,000 community-based forest management groups across the country are directly engaged in managing about 30% of the country's total forest area. These community-based organizations are not only contributing to sequestering carbon dioxide by sustainable management of forest resources but also playing effective roles in designing and implementing Community Adaptation Plans of Action based on forests and non-forests benefits (Nepal's INDC, p-4).

prominent way of diversifying livelihood and securing a source of income that is not affected by difficult local conditions and shocks.

- In Sikkim, India, indigenous communities are coping with erratic rainfall and unseasonal floods and landslides by using local ecological knowledge and traditional techniques like riverbank retaining walls, terracing, and stabilizing slopes with native plants and rocks (Ingty and Bawa 2012).

13.2.2 Autonomous adaptation may prove to be inadequate in cases of new risks and 'surprises' arising from climate change

Although individual and institutional efforts in adapting to climate change are underway, new challenges continuously emerge as 'surprises' and many of them are difficult to tackle. Crop failures and life threats caused by new pests and diseases, long drought, flash flood, glacial lake outburst floods (GLOFs), forest fire, thunderstorms, hail, and other disasters are becoming more unpredictable, irregular, and fierce. Very little is known about ecological, social, economic, and political conditions required to adapt to such surprises and changes (Varma and Mishra 2017). According to the communities in the eastern Himalaya in India, traditional coping strategies enabled them to withstand environmental stresses, but it is not sufficient to fully insure them from the various threats of climate change likely to occur in the near future (Barua et al. 2014).

Kusters and Wangdi (2013) argue that as opposed to extreme events such as floods and GLOF, gradual changes such as changes in water supply can be overlooked. They report that individual efforts by farmers in the Punakha region of Bhutan to adapt to changes in water supply are insufficient and require external support. They also argue that such gradual changes not only lead to loss of income but also impact social cohesion from increasing conflicts where water-sharing rights are being stressed.

Autonomous adaptation within and across communities varies greatly. Systematic documentation of such responses is limited, and attempts at their scientific validation are rare. Moreover, autonomous adaptation is largely a response to current climate variability rather than future climate change impacts. Even for current climate variability, there is often a time lag in autonomous response which may be explained by structural rigidities.

Some autonomous adaptation practices to solve the problems of current climate variability can foster the imbalance in the ecosystem. Robledo et al. (2012) mention that small-scale farmers in Tanzania rely heavily on forest resources for subsistence and income-generating activities. Consequently, their short-term coping practices of fuelwood cutting and selling, charcoal and craft making, and forest products hunting are not sustainable and can hasten deforestation. Such an observation is applicable to the HKH as well.

13.2.3 Local-level knowledge systems on adaptation deserve greater attention from both science and policy

Blending of tacit and scientific knowledge can play an instrumental role in generating location-specific and efficient adaptation innovations (Chhetri et al. 2012). However, the current research on adaptation in the HKH largely ignores the local-level knowledge systems that are recognized as repositories of traditional knowledge and management practices (Kreutzmann 2011; Manandhar et al. 2012).

In the HKH there are many instances of traditional institutions playing instrumental roles in managing common resources and sharing benefits accruing from it (Ostrom 1990; Bawa et al. 2008; Chaudhary 2011). For instance, the Dzumsa system is an indigenous system practiced by Lachungpas of northern Sikkim, *Na Zong Nyo* by Lepchas of Sikkim, *Kipat* by Rai and Limbus, and *Sok shing* in Bhutan (Chettri et al. 2007) to manage local community, land, and natural resources including forests, water, and biodiversity. *Kharka pratha* (managing pastures), *mahavir* (bee cliffs), and customary laws in governing fishing are examples of indigenous practices in parts of the Kanchenjunga Landscape (Khattri 2008). The winter grass cutting ceremony practiced in the Kanchenjunga region to manage fodder supply is also a local institution evolved to manage forest resources (Brown 1994; Muller-Boker and Kollmair 2000). Pastoralists perform *ubhauli* (upward movement of herds) and *udhauli* (downward movement of herds) celebrations at certain times of the year before herds are moved from one location to another. *Guthi* is practiced to collect and save grain in communal storage to be used when crops fail to epidemics and endemics.

Xu and Grumbine (2014) present examples from the Asian highlands of 'hybrid' forms of adaptation that combine traditional knowledge and bottom-up practices with top-down government-supported strategies, as an alternative to depending on traditional practices alone. In China's Yunnan Province, farmers have been adapting to climate-driven water stress through a combination of local knowledge (changing planting patterns), market dynamics (switching to commercial crop varieties) and government support (state-funded water storage). From Bhutan, Nepal and Pakistan there are examples of rural communities combining expert opinion on climate change impacts with local knowledge, and engaging with NGOs for disaster risk reduction and management. Xu and Grumbine (2014), however, also argue that the choice of such hybrid forms does not seem to follow based on detailed foresight and adaptive planning, and that they are usually taken up randomly when conditions of climatic stress prevail.

13.3 STATE-LED PLANNED ADAPTATION IN THE HKH

The HKH countries currently have various adaptation responses at the national and subnational levels through policies, programmes, and projects (Table 13.3). The majority of the national adaptation projects and programs relate to watershed management, climate resilient agriculture, improved access to information for decision making, and disaster risk reduction.

Table 13.3: Status of government response to adaptation needs in HKH countries

Country	Key adaptation response at policy level and implementation highlights
Afghanistan	**Policy response:** National Climate Change Strategy and Action Plan (being finalized); National Adaptation Programme of Action for Climate Change (NAPA 2009) and National Capacity Needs Self-Assessment for Global Environmental Management in 2009. Integration of climate change in policies and plans (e.g. National Environmental Action Plan) **Implementation highlights:** Support provided by international community and multilateral agencies; Global Environmental Facility (GEF) has provided support through enabling activities, mid-size projects, and full-size climate change adaptation projects funded by the Least Developed Countries Fund
Bangladesh	**Policy response:** Bangladesh Climate Change Strategy and Action Plan in 2009, Bangladesh Climate Change Trust Fund (BCCTF) and Bangladesh Climate Change Resilience Fund; National Adaptation Programme of Action (NAPA) in 2005 (revised in 2009); Adopted a policy

	decision by an inter-ministerial body to mainstream climate change in project design of any project under Annual Development Plan (ADP), to be guided and coordinated by the Ministry of Planning. **Implementation highlights:** Adaptation projects targeting different sectors and vulnerable geographic areas (e.g., Coastal Afforestation, Pilot Programme on Climate Resilience). Over the last three decades, the Government of Bangladesh (GOB) has invested over 10 billion US dollars (at constant 2007 prices) to make the country more climate resilient and less vulnerable to natural disasters. In recent times, the GOB has been investing about 23 percent of its ADP in projects related to climate variability and change. As of June 2015 BCCTF has funded over 236 projects of which 41 have already been implemented.
Bhutan	**Policy response:** National Adaptation Programme of Action NAPA (2006) and updated project profiles (2012), assessments of capacity needs for climate change, and technology needs assessment for adaptation (2013), initiation of national climate change policy in 2016. Framework to Mainstreaming Environment, Climate Change and Poverty concerns into Five Year Plan (2013-18), the Integrated Water Resources Management Plan 2016, the National Action Program to Combat Land Degradation 2014, and the National Biodiversity Strategy and Action Plan 2014. **Implementation highlights:** Urgent adaptation priority projects such as GLOF risk reduction; reducing risk of landslides and flash floods in key economic and industrial zones; strengthening national capacity for early warning for GLOF, flash floods, and weather forecasting; pilot projects in agriculture, forestry, and capacity building of local and community disaster management groups
China	**Policy response:** National Program on Climate Change, 2014–15 Action Plan for Energy Conservation, Emission Reduction and Low-Carbon Development, National Plan on Climate Change (2014–20), National Strategy for Climate Adaptation, Science and Technology Actions on Climate Change **Implementation highlights**: Climate adaptation plans and activities in key sectors such as agriculture, water resources, terrestrial ecosystems, coastal zone and regions, and human health
India	**Policy response:** National Action Plan on Climate Change (NAPCC) 2008 under which there are ten National Missions; seven missions focus on adaptation in sectors like agriculture, water, Himalayan ecosystems, forestry, health, coastal areas, and knowledge management. State Action Plans on Climate Change prepared to mainstream climate change concerns at sub-national level, National Adaptation Fund established since 2015 , Indian Network for Climate Change Assessment (INCCA) set up in 2010 **Implementation highlights:** India's expenditure on programmes with critical adaptation components has increased from 1.45% of GDP in 2000-01 to 2.82% during 2009-10. Expenditure on human capabilities and livelihoods viz. poverty alleviation, health improvement and disease control and risk management, constitutes more than 80% of the total expenditure on adaptation in India.
Myanmar	**Policy response:** Draft Myanmar Climate Change Strategy and Action Plan 2016, Myanmar Action Plan on Disaster Risk Reduction (MAPDRR, 2012), National Adaptation Programme of Action (NAPA) submitted to UNFCCC in 2012 **Implementation highlights:** Myanmar Climate Change Alliance established in 2013, Ongoing major projects funded by the Adaptation Fund and Global Environment Facility (e.g. the 'Building Resilience and Adaptation to Climate Extremes and Disasters', (BRACED) Myanmar Programme launched in March, 2015, project on "Addressing Climate Change Risks on Water Resources and Food Security in the Dry Zone of Myanmar", and project on rehabilitation and restoration of degraded land and reserved Forest through community participation)

Nepal	**Policy response:** Launch of NAP formulation process in 2015, Climate Change Budget Code 2012, Climate Change Policy 2011, National Framework on Local Adaptation Plans for Action (LAPA) 2011, National Adaptation Programme of Action (NAPA) 2010 **Implementation highlights:** Nepal Climate Change Support Programme, Community-based Flood Risk and GLOF Risk Reduction programme, Ecosystem-based Adaptation Programme, Hariyo Ban Project (climate adaptation component), and Multi-stakeholder Forestry Programme (adaptation co-benefits) under various stages of implementation. The Pilot Program for Climate Resilience (PPCR) is ongoing compromising of four components i) Building Climate Resilience of Watersheds in Mountain Eco Regions, ii) Building Resilience to Climate Related Hazards, iii) Mainstreaming Climate Change Risk Management in Development, and iv) Building Climate Resilient Communities through Private Sector Participation. Climate Change Knowledge Management Centre established.
Pakistan	**Policy response:** Pakistan Climate Change Act (2017), The 2013 Framework for Implementation of the Climate Change Policy for 2014–30, National Climate Change Policy and National Disaster Risk Reduction Policy (2012), Eighteenth Amendment to the Constitution on devolution of responsibilities for climate action to sub-national level **Implementation highlights:** The state has been implementing projects on disaster risk management and climate resilience practices in agriculture. Also efforts by GOP to win two Green Climate Fund projects focusing on mountain communities and GLOFs. Specific budgetary allocations at national and sub-national levels for execution of the 2013 Framework illustrate efforts towards mainstreaming of climate actions. Efforts by the Lahore High Court to oversee the implementation by government departments on priority areas identified under various sectors in the framework for the implementation of climate change. The Climate Change Act mandates the establishment of three important institutions, the Pakistan Climate Change Council, the Pakistan Climate Change Authority, and the Pakistan Climate Change Fund.

13.3.1 Commonalities among policy responses of national governments

In terms of the policy goal or vision there is a common emphasis across HKH countries on building resilience at the community level and in core economic sectors. Resilience in the agriculture sector is the first priority of Myanmar's NAPA (2012). The 2011 Climate Change Policy of the Government of Nepal aims to build resilience of local communities by enhancing their capacities for efficient management of the natural resource base and use of climate-friendly technologies (MoE 2011). The 2012 National Climate Change Policy of the Government of Pakistan gives particular attention to the needs of economically and socially vulnerable sectors of the economy for the success of climate-resilient development in the country (MoCC 2012).

China's 2013 National Strategy for Climate Change Adaptation aims to significantly enhance the country's capacity to respond to extreme climatic events and thereby build resilience in key sectors ranging from human health to infrastructure (ADB 2015). The whole country is divided into three types of adaptation regions — urbanized, agricultural, and ecological — to undertake specific adaptation tasks. For example, in the Qinghai-Tibet Plateau, one of the five major ecological regions, the tasks include assessment of the plateau's grassland carrying capacity, grassland enclosure and recovery, glacier monitoring, wetland management, development of highland valley agriculture, and so on.

The immediate to short-run adaptation interventions identified in the national climate policies seem to revolve around strategic knowledge generation accompanied by public awareness and institutional capacity building. For instance, Bhutan's adaptation interventions through the NAPA 1 and NAPA 2

projects focus on reducing the physical risk of climate-induced disasters such as GLOF, landslides, flash floods, and forest fires, and strengthening capacity at national and local levels in early warning systems and disaster risk management. Livelihoods and agriculture at the district and community level have also been the focus of recent interventions. The national strategy and adaptation priorities for Bangladesh focus on reducing the risk of climate-induced hazards and extreme events through improved early warning systems for tropical cyclone, flood, flash floods, and drought. The priorities also include sector-specific climate resilient interventions and capacity building at individual and institutional levels to plan and implement adaptation programmes and projects in the country.

Governments in the HKH have started to integrate and mainstream climate change in their development planning and budgeting systems (Ahmed et al. 2017). The establishment of a trust fund in Bangladesh and climate change budget code in Nepal are some examples of those mainstreaming efforts. Afghanistan, Pakistan, Bhutan, and China have also devised policy measures to integrate climate change within ongoing sectoral policies and strategies. Bangladesh's adaptation priorities are well integrated into development plans, and development priorities are discussed in the context of climate change adaptation (Saito 2012). Bhutan has been integrating environment and climate change into development planning, with climate change identified as one of the national key result areas of the 11th five-year development plan (2013–18) and in planning at sectoral and decentralized levels through the Poverty Environment Initiative. As indicated in the country's INDC, adaptation will be a focus in the next development plan and the integration of adaptation planning into the development process will be pursued through the NAP process.

There are indications of policy convergence happening in HKH countries although implementation continues to be sectoral. The majority of the national commitments in the INDCs of Bhutan, India, Pakistan, Nepal, Bangladesh, and Myanmar have included sectoral policy targets, and many of the sectoral policies in these countries, such as agriculture, forestry, water resources, and energy, are strongly interlinked with climate change policies and programmes. Thus, for instance, the National Integrated Water Resources Management Plan 2016 for Bhutan integrates climate change measures into the actions and strategies.

The majority of the adaptation interventions in Nepal, Bhutan, and Myanmar-are being guided by their respective NAPAs, which are by design meant to focus on current and immediate threats and to address these rapidly without waiting for lengthy assessment of long-term potential impacts. An anticipatory response to adaptation is reflected in the emphasis on installation of early warning systems and structural interventions for disaster risk reduction through some of the NAPA priorities/projects. Thus, for instance, in Bhutan and Nepal, the government is improving infrastructural adaptation by lowering glacier lake levels and deepening river channels, and installing early warning systems (Adger et al. 2007; Hijoko et al. 2014; Mimura et al. 2014). Early warning systems have been developed for extreme weather events such as flooding and wildfires (Shrestha et al. 2015; Molden et al. 2016) at many places in the HKH. In Bhutan, the early warning systems are being tested in infectious disease prevention and vector control programs, as for malaria (Wangdi et al. 2010), and the network of hydrometeorological stations are being strengthened to increase national capacity to provide early warning for various climate-induced disasters. Sustainable land management interventions and watershed management interventions are also being emphasized for the anticipatory approach to providing adaptation benefits (MoAF 2014). In China, the government has attempted to reduce climate vulnerability and impact by adopting adaptation options of early planting, fixing variety growing duration, and late planting (Tao

and Zhang 2010). India's Integrated Agro Meteorological Advisory Service programme has provided climate information services to farmers (Tall et al. 2014). Generally there is a need to strengthen institutional capacity in the HKH countries for more and better anticipatory planning on adaptation.

The national-level climate policy documents reviewed in the HKH all aim to build the adaptive capacity of people by means of providing livelihood security in the face of climate change risks (Sud et al. 2015). However, there is an indication of the policy-practice disconnect when one looks at the livelihood-focused adaptation initiatives in the practice domain and contrasts this with the policy emphasis. Out of a total of 21 adaptation projects reviewed by Sud et al. (2015), only three local-scale initiatives in two countries — India and Bangladesh — have an explicit focus on livelihood. But, as Ford et al. (2014) caution, many adaptation actions are undocumented and in many other instances likely to be built into existing mainstreamed programmes to address development priorities. Some adaptation practices may provide unexpected livelihood benefits, as with the introduction of traditional flood mitigation measures in China, which could positively impact local livelihoods, leading to reductions in both the physical and economic vulnerabilities of communities (Yu et al. 2009).

From field-level evidence, it is found that government-run adaptation efforts in the South Asia region are mostly extensions of business-as-usual activities, which might be inadequate in the long run to meet the adaptation needs under the post-INDC global emission regime (Ahmed et al. 2017). Exceptions, like GLOF risk mitigation projects, are rare. An enhanced and intensified adaptation response is needed in these countries, and particularly in the mountain regions, in order to reduce gaps between growing adaptation needs and actual adaptation delivery.

13.3.2 HKH countries have established high-level political bodies to coordinate climate change responses

The overall governance for climate change in Pakistan is under the Prime Minister's Committee on Climate Change, an overarching body formed in 2004. Pakistan is also one of the first countries to set up a Ministry of Climate Change in 2012. The recently legislated Pakistan Climate Change Act (on 17 March 2017) envisages an over-arching Pakistan Climate Change Council headed by the Prime Minister of Pakistan, with representation of the sub-national governments at the Chief Ministerial level. The new law also envisages establishment of a high-powered Pakistan Climate Change Authority and Pakistan Climate Change Fund.

India's Prime Minister's Council on Climate Change and Nepal's Climate Change Council, also headed by the Prime Minister, were established in 2007 and 2009, respectively. In Bhutan the high-level National Environment Commission, which is the highest decision-making body in the government on matters related to environment and chaired by the Prime Minister, functions as the National Climate Change Committee.

The Chinese government set up the National Leading Group to Address Climate Change (NLG), headed by the Chinese premier, in 2007 to draw up important strategies, policies, and measures related to climate change. The National Development and Reform Commission (NDRC) under the State Council was vested to undertake the general work in respect of climate change, and a department was established in 2008 in the NDRC responsible for organizing and coordinating action on climate change all over the country.

Given the federal structure of government in most of the HKH countries, there is a trend towards decentralization of government action on climate change in the region. Soon after the approval of Pakistan's 2012 climate policy, a constitutional amendment (18th Amendment) delegated most of the action areas to the provincial governments. This constitutional amendment necessitated that the provinces begin to develop their own projects, allocate their own resources, and strengthen their own institutions. Responding to the challenge, Khyber Pakhtunkhwa, Punjab, and Sindh have started developing their own climate change policies and action plans.

In China, the governance system and working mechanism to address climate change features the unified leadership of the NLG, administration by the NDRC, division of work with separate responsibilities among relevant departments under the State Council, and wide participation of various localities and industries. Relevant departments have established functional organs to address climate change in their own fields, such as the National Centre for Climate Strategy and International Cooperation of China of NRDC, National Climate Centre of China Meteorological Administration, and Research Centre for Climate Change of the Ministry of Water Resources. All provinces, autonomous regions, and municipalities directly under the State Council have established their own leading groups and working organs to address climate change, and some sub-provincial or prefectural cities have also set up offices to address climate change.

In India, subnational policy making has resulted in State Action Plans on Climate Change that identify adaptation interventions relevant to the local context. A number of adaptation projects in Indian Himalayan states are being funded by India's National Adaptation Fund.

Effective adaptation interventions require harnessing synergies among various government schemes along with stakeholder involvement in monitoring and evaluation of policy implementation (Sud et al. 2015). However, public consultation and stakeholder engagement in adaptation planning and implementation is highly uneven and more often than not ad hoc within HKH countries. For instance, it has been pointed out that in Nepal the NAPA consultations may have missed out on opportunities to foster inclusive climate change responses, particularly to accommodate the concerns of many different community groups affected by climate change in diverse geographic regions and socioeconomic locations in the country (Ojha et al. 2015). In comparison, the multi-stakeholder-led implementation of LAPAs in Nepal is assessed to have led to successful adaptation outcomes at the local level (Regmi et al. 2014).

There are examples to show that in the absence of collaboration among local stakeholders and national actors, many of the adaptation measures failed to deliver and instead led to maladaptive practices (Regmi et al. 2015). Lack of participation can also create mistrust and lack of ownership leading to new forms of exclusion or reinforcing existing exclusions. It has been found that adaptation planning, which relies heavily on select institutions and actors, and power and social structure at the local level, is likely to create new powerful groups comprised of elites within the community, and to introduce a new form of dependence of poor and vulnerable households on the elites for receiving benefits from the projects or programmes (Regmi et al. 2016).

At present, Nepal is implementing LAPAs in 90 village development committees and seven municipalities (the lowest administrative units in the country). Similarly, about 375 local adaptation plans and nearly 2,200 Community Adaptation Plans of Action for community forests have been developed (Nepal's INDC, p-6). The experience of making LAPAs in Nepal can be considered a

543 replicable model of a bottom-up approach to adaptation planning for mountain communities. With
544 the participation and support of government, development partners, and civil society organizations, a
545 LAPA framework has been developed. Adaptation investments are being costed by the Government of
546 Nepal and integrated into annual and medium-term budget frameworks and resource mobilization
547 strategies. Pakistan, on the other hand, has implemented LAPAs at the state and local levels through
548 the support of non-governmental organizations. An analysis of LAPAs in Nepal and Pakistan concludes
549 that Nepal's focus on official formalization of the process has come at the cost of delayed
550 implementation, while Pakistan's devolved implementation-centric approach lacks official buy-in to
551 nationally scale up the LAPAs (Chaudhury et al. 2014).

552 ### 13.3.3 Paucity of tailored responses for gender and social inclusion

553 Some of the HKH countries have national-level climate policies that explicitly identify the most
554 vulnerable groups (indigenous peoples, migrants, women, for instance), but very few that seek to
555 address their specific adaptation needs through tailored responses (see Box 13.2).

BOX 13.2: COUNTRY POLICIES AND TREATMENT OF MARGINALIZED PEOPLE

- Pakistan's National Climate Change Policy 2012 explicitly provides for ensuring the rights of indigenous people in the management of rangeland and pastures. It also has detailed provisions for mainstreaming gender perspectives into climate change adaptation, ensuring women's participation in decision-making on climate initiatives, and utilizing indigenous knowledge of women in climate adaptation (MoCC 2012).
- Nepal's Climate Change Policy 2011 provides for the participation of indigenous communities and women in the implementation of climate change-related programs, and identifies the importance of traditional knowledge in climate adaptation (MoE 2011). Gender is explicitly included as a cross-cutting theme in Nepal's NAPA and gender-differentiated information was collected through participatory approaches during its formulation (Mainlay and Tan 2012). In the ongoing NAP process, gender and social inclusion is a cross-cutting theme.
- Although India's National Action Plan on Climate Change (NAPCC) does not explicitly mention indigenous peoples, the National Mission for Sustaining the Himalayan Ecosystem under NAPCC addresses the importance of traditional knowledge and community-based natural resource management in the Indian Himalaya (NAPCC 2008). India's NAPCC recognizes the differential impacts of climate change with respect to gender, but incorporates only a few gender-specific measures in any of its national missions (Parikh et al. 2012).
- Bangladesh's Climate Change Strategy and Action Plan identifies women as a special category of vulnerable group and has special programs for incorporating gender consideration in climate change management. Within the HKH countries, it is the only climate change policy document which addresses the issue of climate-led forced displacement. The document has provisions to build the capacity for education and training of environmentally displaced people to ease and facilitate their migration and integration in new societies (MoEF 2009).

- Myanmar's Climate Change Strategy and Action Plan (2016) specifies implementation plans for poor and landless households in vulnerable areas of dry zone, delta, mountain, and coastal areas in terms of initiating eco-friendly crops, bioenergy schemes, and livelihood diversification activities (MoNERC 2016).

Despite the policy provisions, realizing adaptation goals for women and socially marginalized groups in the HKH is likely to be very challenging. Recent studies from Nepal and India report that adaptation decisions among women, in particular, can be constrained by cultural and institutional pressures that favour male land ownership (Ahmed and Fajber 2009; Jones and Boyd 2011). Due to women's limited ownership of land, they are still largely excluded from trainings, extension services, irrigation management, and development schemes intended for farmers (Gioli et al. 2014). Within development and poverty reduction programmes it has long been acknowledged that strengthening and improving women's access to and control over assets, access to formal and non-formal education, land rights, mobility, and opportunities to generate income is pivotal to securing progress in development. Addressing and improving on these issues is also essential for enhancing adaptation and building adaptive capacities.

13.3.4 Implementation of adaptation programmes is challenged due to institutional inertia and inadequate institutional capacity

Countries in the HKH have weak institutional capacity at both national and subnational levels to deal in an effective and timely manner with climate change impacts. Major gaps exist between policy targets and actual implementation of development and adaptation programmes.

Most of the institutional capacity needs are related to access to information, knowledge, and resources. National governments have recognized the seriousness of climate change and have submitted NAPAs, but significant scientific knowledge and data gaps remain (Davis and Li 2013). In China, the findings suggest that there is a need for a knowledge support system to generate, communicate, and manage climate change knowledge and information in support of policy- and decision-making processes at all levels (Li et al. 2012). In the case of India, there are financial, technological, and knowledge gaps in adaptation, as well as capacity building and institutional needs (Garg et al. 2015).

The most pervasive of barriers relate to poor coordination within and between organizations responsible for planning and implementing adaptation actions, and a lack of, or irrelevant knowledge/information on, climate change as well as ineffectual communication between stakeholders involved in adaptation actions (Spires et al. 2014). Local governments especially lack institutional capacity or have difficulty gaining coordination among departments as conflicts emerge to obtain scarce resources. In Bangladesh, the limited access of local governments to resources has been cited as a barrier to local adaptation (Christensen et al. 2012). Local councils and planners are often confronted by the complexity of adaptation without adequate access to guiding information or data on local vulnerabilities and potential impacts. Local institutions are affected by lack of coordination with state and national policies and priorities and cross-cutting institutional coordination that is weakening environmental governance processes in the region (Tiwari and Joshi 2015).

A recent assessment by Appadurai et al. (2015) shows that adaptation to climate change in the rainfed agriculture sector in India is mostly driven by one-off, small-scale pilot projects with limited scale and scalability. Although these projects provide valuable knowledge and learning and help thousands of farmers and their families, their scale is limited — intervention is required for millions, not thousands. This same assessment lists resources, partnerships, knowledge management, and understanding of local context as fundamental enabling factors for scalability. Scalability via traditional government or civil society implementation is limited due to institutional inertia and capacity constraints.

In many cases a blanket approach to adaptation interventions has resulted in failure and even maladaptation. A study carried out in Nepal shows that adaptation interventions introduced without considering local context and culture have failed. For example, although the solar-wind hybrid technology was successful to generate adaptation and mitigation co-benefits in other parts of Nepal, it failed in Nawalparasi District due to economic burden on the poor households for the maintenance of the infrastructure and equipment (ICIMOD 2016).

13.4 ADAPTATION INITIATIVES BY NON-STATE ACTORS SHAPING PRACTICE IN THE HKH

Non-governmental actors working on climate change adaptation comprise a wide range of stakeholders including I/NGOs, civil society organizations, community-based organizations, private business, and media. The initiatives by non-governmental actors are of paramount importance, because they are expected to complement, build synergy, and leverage resources with government programs. Presently there is great diversity among such initiatives in the HKH.

13.4.1 There is multiplicity of actors and approaches, but little synergy

It is common to many parts of the HKH that although a number of NGOs may be working on similar adaptation-related issues, more often than not there is very little functional collaboration, coordination, and communication among the actors. This results in isolation, redundancy, and duplication of interventions, and inefficient resource utilization. It is observed that NGOs follow frameworks/approaches to adaptation that are often similar with respect to goals, tools used, envisioned actors and stakeholders, and design elements. For instance, climate-smart agriculture is being promoted by more than a dozen I/NGOs in Nepal to adapt to climate-led challenges in agriculture, but each tends to adopt or modify their homegrown practices, and little effort is made to cross-fertilize the ideas (Bhatta et al. 2016).

The frequently used frameworks/approaches in the HKH include sustainable livelihoods framework,[6] community-based adaptation [7] (CBA) and ecosystem-based adaptation [8] (EBA). Climate-smart

[6] This framework considers financial, social, physical, human, and natural capital (Brooks and Adger 2005).

[7] CARE uses climate-resilient livelihoods, disaster risk reduction, capacity building, and addressing underlying causes of vulnerability as the core themes of its community-based adaptation framework (http://careclimatechange.org/wp-content/uploads/2015/04/CBA_Framework.pdf).

[8] The NGOs and government have collaborated to promote an ecosystem-based adaptation approach in the HKH. For example, EBA focused on agro-forest-based adaptation practices to build resilience of ecosystem and communities in Nepal (Park and Alam 2015). Payment for ecosystem services is widely piloted in the HKH as an EBA approach.

623 agriculture,[9] climate-smart villages, and climate compatible development adaptation are also concepts
624 that have come to be used in recent years.

625 Bangladesh is possibly the global leader in pioneering people-centric, small-scale adaptation
626 initiatives, which are generally planned and executed by non-state actors. The pioneering role of an
627 early initiative called Reducing Vulnerability to Climate Change, implemented by CARE Bangladesh
628 with numerous partner organizations including local government and non-governmental partners
629 between 2002 and 2005, laid the foundation towards designing and delivering concepts such as CBA
630 and EBA (Ahmed 2010). Although the pilot-scale project was implemented in the southwestern region
631 of Bangladesh, the concepts have been further examined, extended, and tested repeatedly by both non-
632 state and government actors across Bangladesh, and gradually across more than 70 countries.[10]

633 By examining the early successes of CBA methodology and efforts, the Government of Bangladesh
634 allocated about 10 percent of its climate financing to engage non-state actors towards further
635 refinement of CBA activities. Such activities encompass micro-level agricultural adjustments to ensure
636 continuation of crop production in climate-affected areas by means of adopting hazard-tolerant crops,
637 adjusting crop calendars based on early signs of climate trends, replicating advanced agronomic
638 practices, and enhancing farmers' skills to switch to livelihood practices that are not directly affected
639 by climate variability or change. Moreover, CBA activities embrace small-scale water management
640 practices, disaster risk reduction practices, and creation of protection measures either to reduce
641 vulnerability by reducing exposure to known climate-induced hazard(s) and/or reduce sensitivity to
642 such known hazards (Ahmed 2010). Although such measures are gaining rapid popularity among the
643 users (because of their relative simplicity to replicate at low cost) as well as among the non-state
644 actors, it is argued that such measures might not be adequate to ensure resilience of affected
645 communities to such a considerable extent that the remaining vulnerability appears only negligible
646 (Ahmed et al. 2017).

647 In China, numerous innovative and indigenous ecosystem-based approaches have been taken for
648 adaptation to climate change over the country. In this regard, the Chinese Ecosystem Research
649 Network (CERN) established by the Chinese Academy of Sciences (CAS) in 1988 provides substantial
650 best practices that are collected and documented during its long-term investigation and management
651 of typical ecosystems in China. Demonstration efforts (Table 13.5) have been made to improve low-
652 yield croplands in the North China Plain, soil and water conservation in the Loess Plateau, re-
653 vegetation of hilly regions in southern China, rehabilitation of eutrophicated lakes, protection and
654 recovery of natural vegetation in ecologically fragile areas such as desertified areas, karst systems,
655 agro-pasture ecotones, and permafrost.

656

[9] The term 'climate-smart agriculture' (CSA) was coined by the FAO at the Hague Conference on Agriculture, Food Security, and Climate Change in 2010. It is defined as agriculture that "sustainably increases productivity, enhances resilience, reduces/removes greenhouse gas emissions, and enhances achievement of national food security and development goals" (FAO 2010). Various international and national NGOs have been implementing the CSA concept in the HKH (ICIMOD 2015, LI-BIRD 2015).

[10] The London-based International Institute for Development Studies and Dhaka-based Bangladesh Centre for Advanced Studies have been organizing annual CBA conferences and helping global extension of good lessons learnt since 2007.

657 **Table 13.5: Major technologies and demonstration models of CERN on ecosystem-based adaptation**

Demonstration model	Key issues of the ecoregion
Qianyanzhou Model (forest ecosystem)	Comprehensive control and agricultural sustainable development in hilly areas, South China
Technology for saline-alkali soil treatment (cropland ecosystem)	Comprehensive treatment of middle- and low-yield fields in the Huanghuaihai Plain, North China
Zhifanggou Model (cropland ecosystem)	Water and soil loss and ecosystem restoration in Loess Plateau
"1/10 Functional Replacement" Model for Degraded Grassland Restoration (grassland ecosystem)	Adaptive management and sustainable development of the Xilingol grassland, North China
Shapotou Model for Desertification Combating (desert ecosystem)	Construction of sand-fixing vegetation protection system in arid sand area, Northwest China
"Three Ring" Ecology-Production Paradigm of Ordos Plateau (desert ecosystem)	Sustainable management of desertified land in Ordos Plateau, North China
Technology for Water Remediation (lake ecosystem)	Treatment of eutrophication and algal bloom of freshwater lakes, Yangtze River Delta
Model of fenced grassland and artificial grassland (grassland ecosystem)	Wise use of natural grassland and seasonal optimization of livestock structures in Qinghai-Tibetan Plateau

658 Source: Chinese Ecosystem Research Network Annual Report 2012 (in Chinese)

659 ### 13.4.2 Scaling up and sustainability challenges are common to projects implemented by NGOs

660 Projects implemented by NGOs are too spread out, small-scale, short-term, and often embarked upon
661 as piloting, testing, and experimentation, with little chance to be scaled up after termination of project
662 funding. The support is not adequate to reach out to a large number of households and make a real
663 lasting impact at wide scale. The technologies and practices sought to be promoted are poorly scaled
664 up partly because the projects are rarely integrated into government programs.

665 There are some success stories though. For instance, the Government of Nepal is scaling up a home
666 garden approach in 20 districts to promote on-farm diversity to contribute to food and nutrition and
667 improve resilience (diversity for adversity) of smallholder farmers with technical support of an NGO.
668 Similarly, river-bed farming practice pioneered in Nepal by a local NGO has recently been
669 mainstreamed into the national policy (Gurung et al. 2014). Riverbed farming is an adaptation practice
670 that utilizes the dry sandy beds left after the flooded rivers recede in the *terai* plains. Nepal's Ministry
671 of Local Development has recently developed riverbed farming guidelines in collaboration with the
672 Riverbed Farming Alliance.[11]

[11] http://www.riverbedfarmingalliance.org.np/news-and-events.html

673 Nepal has developed a novel multilevel institutional partnership in recent years that includes
674 collaboration with farmers and non-governmental organizations. By combining a conventional
675 technological innovation process with the tacit knowledge of farmers, this new alliance has been
676 instrumental in the innovation of location-specific technologies thereby facilitating the adoption of
677 technologies in a more efficient manner. This alliance has improved knowledge networking among
678 institutions, scientists, and farmers and enabled them to seek technologies that are responsive to likely
679 changes in climate, which is evident from NGO work on climate-smart agriculture and participatory
680 plant breeding work (Gyawali et al. 2006, Bhatta et al. 2016).

681 NGOs are good at securing community participation, but they sometimes develop programs and
682 suggest policies without adequate public consultation and validation. In many cases proposals seem
683 to be developed in accordance with donor requirements that lack on-the-ground reality. There is also
684 research showing that NGO-promoted participation can be limited to those who are elite, educated,
685 male, and higher caste, often leading to marginalization of the poor, women, and vulnerable
686 households (Regmi et al. 2016).

687 Media has been playing a supporting role especially to promote good CBA practices and to highlight
688 adaptation needs of certain vulnerable groups and locations in the HKH. Media has also played a
689 significant role in highlighting the need for participatory governance in climate financing in a few HKH
690 countries such as Bangladesh and Nepal (Ahmed et al. 2017). The inspiring features of electronic and
691 printed media in Bangladesh have encouraged many non-state actors to emulate CBA activities in
692 different ecosystems, while the media in Nepal has been involved in the LAPA processes.

693 ## 13.5 FINANCING ADAPTATION IN THE HKH

694 Finance is the biggest challenge to achieving an adequate adaptation response to climate change
695 impacts in the HKH. To date, the quantum of funds accessed for adaptation purposes from
696 international sources by HKH countries is grossly inadequate when compared to estimates of what is
697 required for the region.

698 ### 13.5.1 Estimates of climate change adaptation finance need and availability are lacking for the
699 HKH

700 A comprehensive assessment of climate change adaptation finance need and availability is lacking for
701 the HKH — for both the region as a single assessment unit and any specific geographical area or sector
702 in each country that falls within the HKH.[12] Therefore we have no knowledge of how much finance is
703 available, how much of the available funds have been allocated to mountain regions or spent towards

[12] The closest one is a 2014 ADB report, "Assessing the Costs of Climate Change and Adaptation in South Asia", (https://www.adb.org/publications/assessing-costs-climate-change-and-adaptation-south-asia). According to the report: "To avoid the damage and economic losses from climate change under the BAU scenario, the region needs to provide an average adaptation expenditure of 0.48% of GDP per annum (USD 40 billion) by 2050 and 0.86% of GDP per annum (USD 73 billion) by 2100. Obviously, regional adaptation costs under the C–C scenario are much lower than the BAU scenario as it only requires an average of 0.36% of GDP per annum (USD 31 billion) by 2050 and 0.48% of GDP per annum (USD 41 billion) by 2100. The study took into account investment in building adaptive capacity in anticipation of future climate change as well as climate proofing measures in key sectors toward climate-resilient development" (Ahmed, M. and S. Suphachalasai 2014).

addressing mountain specific issues, basis of allocation of funds, scale of mobilization of private sector finance, and so on.

Our assessment presented below has applied several assumptions while translating global and country-level assessments for the HKH.

The Fifth Assessment Report by the IPCC (Chambwera et al. 2014) reports global estimates of the costs of adaptation in developing countries ranging between USD 70 billion and USD 100 billion per year in the period between 2010 and 2050. According to UNEP's reports (UNEP 2016) the costs would be much higher — possibly reaching up to USD 300 billion per year by 2030 and USD 500 billion per year by 2050. Considering aggregated GDP of all developing countries (low income, lower middle income, and upper middle income), i.e., USD 26.53 trillion (WB 2016), and the estimated cost of adaptation for developing countries, one may argue that the cost of adaptation against each million of GDP would require about USD 80,000 to USD 110,000 per year by 2030 and would increase to about USD 130,000 to USD 190,000 by 2050. Considering the number of people living in the HKH and their per capita income by countries, and applying similar argument, one may argue that the region would require USD 3.2 billion to USD 4.6 billion per year by 2030, which would increase up to USD 5.5 billion to USD 7.8 billion per year by 2050.

Recognising financing gaps at the international level and to support the immediate needs of the country, Bangladesh and India have established mechanisms for mobilizing funds from domestic sources. Bangladesh has taken the lead in the region in this regard by establishing a climate change trust fund, and already mobilized USD 600 million of which about USD 400 million is from government internal resources and about USD 200 million from development partners. The Government of India has estimated that it would require about USD 230 billion over five years to support adaptation and climate resilient development including implementation of state-level climate change action plans, and has established the National Adaptation Fund on Climate Change. The Bhutan Trust Fund for Environmental Conservation also supports small-scale activities (up to USD 300,000 each) in Bhutan to address impacts of climate change on ecosystems and species as well as supporting communities to access climate change funds from other sources. The Government of China has established the USD 3.1 billion South-South Cooperation Fund as an independent contribution to global climate finance[13] particularly building capacity of developing countries in adapting to climate change.

In addition to domestic sources of funding established and supporting climate change adaptation in the HKH, countries in the region have accessed about USD 600 million from different international sources of climate finance (Climate Fund Update, September 2016) of which approximately USD 180 million to USD 240 million appears to be for the HKH. Countries in the HKH, except for Bangladesh, are yet to access climate change adaptation funding from Green Climate Fund which has allocated 50 percent of the fund for adaptation.

There is a lack of reliable estimates of public expenditure on adaptation by national governments in the HKH. Although in some HKH countries like Nepal, attempts have been made to mainstream climate change financing within the national development process (Fenton et al. 2014), the attempts are

[13] China has made it clear that it would not pledge any money into Green Climate Fund despite developing countries like Vietnam promising to fund it.

largely scattered and limited. While estimates vary on the expenditure[14] that the Government of Pakistan undertakes on climate change adaptation and mitigation, there is an ongoing effort to track and review the climate public expenditure.

The Government of India (GOI) has estimated a need of USD 273 million over the next five years for evolving management measures for sustaining and safeguarding the Himalayan glaciers and mountain ecosystem as well as to attempt to address key issues such as the Himalayan glaciers, biodiversity, wildlife conservation, and livelihood of traditional knowledge societies. The GOI has already approved about USD 81 million and key achievements to date include establishing six new centres relevant to climate change in existing institutions in Himalayan states, creating an observational network to monitor the health of the Himalayan ecosystem, and instituting several capacity building and training programmes.

Climate change-related investments for the most part are presented through projects dealing with improvement in infrastructure to mitigate the risks associated with disaster risk reduction. Conventional budget heads are likely distorting the response towards more infrastructure and sector-specific solutions; decision making on funds flow is also dominated by economic considerations (cost-benefit or least cost considerations).

13.5.2 Business potential in adaptation is high, but investment is limited

Most businesses are yet to take a proactive approach to adaptation in the HKH. Few have even assessed the likely effects of climate change on their operations, although it is understood that adaptation to climate change can add significantly to project cost.[15] That business can be a key stakeholder in adaptation policy and practice is demonstrated by the active participation of the Association of Bhutanese Industries and the Bhutan Chamber of Commerce and Industry in the formulation of the country's NAPA. As a result of their inputs, key industrial areas and investments in the Pasakha area in the foothills of the Bhutan Himalaya were identified and prioritised as being at risk from increasing intensity of rainfall, flash floods, and landslides (ADB 2014). The Punatsangchu Hydro Projects I and II in Bhutan are key stakeholders in the GLOF risk reduction project in the Punatsangchu Valley and have made direct contributions to the installation of early warning systems (UNDP 2012).

Often the focus falls on the role of the private financial sector in providing risk management options including insurance and financing for large projects (Khattri et al. 2010). However, there are major sectors of climate financing in India such as renewable energy, energy efficiency, transport sector improvement, clean-tech sector, and waste management sector, which are either from international financing companies or from social-environmental safeguard budgets (GIZ 2015). In Bangladesh the

[14] Based on a CPEIR 2015 report, the climate-related expenditure was estimated to be between 5.8 percent and 7.6 percent of total federal expenditures in the four studied years. The relative proportion of the climate-relevant budget spent on adaptation varied between 25 percent and 60 percent: http://www.pk.undp.org/content/dam/pakistan/docs/Environment%20&%20Climate%20Change/UNDP%20Climate%20Report%20V10.pdf

[15] The International Finance Corporation (IFC) did a risk assessment for the Khimti I Hydropower Project in Dolakha District in Nepal using scenarios of future climate change impacts including variable and uncertain streamflow in the dry season and the risks of extreme events like flash floods, landslides, and GLOFs. Incorporating the increased likelihood of floods and GLOFs into dam design leads to increased project cost (Communication from PCD, DHPS, MoEA cited in ADB 2014).

774 private sector is more engaged in agriculture and climate change adaptation (IFC 2010). Case studies
775 show that the role of the private sector can be instrumental during the period of disaster risk and
776 rehabilitation work. It was effective during the case of post-tsunami rehabilitation work in India and
777 other parts of Asia (Chatterjee and Shaw 2015).

778 An assessment [16] carried out in Pakistan on public finance support to stimulate private sector
779 investment in building disaster resilience and climate change adaptation identified public finance
780 interventions required to support two sectors: agriculture and construction. The study establishes that
781 the private sector is yet to be a major feature of disaster and climate risk management planning
782 frameworks. Nor are there specific initiatives targeting the involvement of the private sector within
783 key economic sectors, or at provincial or local levels.

784 Some other areas, such as agribusiness value chains, tourism, insurance, and climate services, in which
785 we see the potential of business-led adaptation in the HKH, are discussed below with examples.

786 • As part of the Pilot Programme for Climate Resilience in Nepal executed by the International
787 Financial Corporation, "agribusiness companies (such as processors of rice, maize, and
788 sugarcane) have committed to provide training to farmers to reduce crop losses and increase
789 productivity, with the long-term aim of sustained private sector involvement and
790 transformational change" (ADB 2014).

791 • Private companies are experimenting with a range of business models for ICT-based climate
792 and market services — either to open new markets or to safeguard their supply chains. One
793 such mobile-based initiative[17] by Reuters Market Light presently serves thousands of farmers
794 in Uttarakhand State in India. Scaling up of such services in the HKH is technically feasible as
795 much of the forecasting can be based on [private or public European] weather satellites. Of
796 course, to make such products financially sustainable in the HKH, private sector providers will
797 need to address issues of mobile connectivity, low literacy, and [customization, interactivity,
798 responsiveness, call centres, field extension agents] handholding support for farmers.

799 • For insurance companies, weather index-based crop insurance is potentially a big market
800 opportunity. Recently the Indian state of Himachal Pradesh opened weather-indexed
801 insurance for ginger, potato, tomato, and pea crops, while a private insurer has implemented
802 a pilot scheme in Uttarakhand and Assam States. A similar effort towards insuring livelihoods
803 and well-being in Bangladesh has experienced the involvement of an insurance agency
804 working with Oxfam to offer pilot scale insurance against flood[18]. In Nepal, it is reported that
805 the Insurance Board is making preliminary regulatory changes to introduce rainfall and
806 hailstorm insurance for apple farming on a pilot basis[19]. Scaling up of such pilot schemes
807 remains a challenge and requires investment in a dense network of weather stations and
808 regulatory changes. As climate risks increase under a climate change scenario, such schemes

16 https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/305412/stimulating-private-sector-engagement-climate-disaster-resilience.pdf

17 http://www.icimod.org/?q=23463

18 http://oxfamblogs.org/bangladesh/wp-content/uploads/2013/08/Product-Brochure1.pdf

19 http://sakchyam.com.np/first-weather-index-insurance-product-launched-in-nepal-for-apple-farmers-of-jumla/

809 will further need to be backed by a combination of global reinsurance and public climate
810 finance.

811 • Pakistan's National Disaster Management Authority is working on a disaster risk insurance
812 fund targeting vulnerable populations for protection against climate hazards[20]. In addition to
813 public sector insurance bodies such as National Insurance Corporation Limited and Pakistan
814 Reinsurance Corporation Limited, private sector insurance organizations have also been
815 engaged through the Insurance Association of Pakistan. One of the key fund design
816 recommendation coming out of this project is for a public-private partnership model.
817 Engagement of the private sector in such an initiative is important to fulfil the capital
818 requirements for setting up the fund and ensuring long-term financial sustainability.

819 ### 13.5.3 Labour migration and migrant remittances provide an opportunity for building adaptive
820 capacity

821 Human migration is a significant socioeconomic phenomenon in the HKH.[21] The mountainous region
822 generally has higher out-migration than in-migration. Whether internal or international, remittances
823 are increasingly becoming an important source of income for the households in the HKH. Apart from
824 financial remittance, social remittance (acquired skill, knowledge, and confidence) is also extremely
825 important, and highly under-researched.

826 Research shows that remittance-recipient households may not be using the financial resources in the
827 best possible manner for improving adaptive capacity (Banerjee et al. 2017). The governments have a
828 critical role to create enabling conditions in origin communities through the promotion of livelihood
829 diversification, provision of skill-training opportunities (including financial literacy,
830 entrepreneurship, etc.), improvement in transport and communication infrastructure, enhancing
831 access to market and formal financial institutions, and creation of storage facilities. These
832 interventions should aim to reduce the risks involved in migration, maximize the utility of a
833 household's income, provide opportunities for the utilization of social remittances, and reduce climate
834 and non-climate risk to its livelihoods.

835 ## 13.6 THE WAY FORWARD — SOME KEY AREAS FOR PRIORITY ACTION BY COUNTRY
836 GOVERNMENTS IN THE HKH

837 Opportunities do exist for a scaled up, inclusive, and more comprehensive adaptation response in the
838 HKH. This assessment suggests that the way forward for such an adaptation response in the HKH
839 should, among other things, include: (a) greater regional cooperation among HKH countries in areas
840 such as disaster risk reduction (DRR) and food security; (b) stronger integration of adaptation in
841 national development plans and programmes; (c) convergence of adaptation, DRR, SDGs, and
842 resilience-building priorities; (d) investments for generating science-based climate information and
843 knowledge services; (e) promoting policy experimentation through adaptation pilots, building

[20] https://cdkn.org/project/disaster-risk-insurance-for-vulnerable-communities-in-pakistan/?loclang=en_gb

[21] Four countries (India, China, Pakistan, and Bangladesh) in the HKH are among the world's top 10 highest remittance-receiving countries. Nepal is globally the third-largest recipient of remittances as a share of GDP (World Bank 2016), accounting for 29.6 percent in 2015/16 (NRB 2016).

institutional capacity on adaptive governance, and creating knowledge networks; and (f) mobilizing finance for greater social protection and risk insurance.

13.6.1 Regional cooperation on adaptation is a necessity

Adaptation to the impact of climate change can be viewed as a regional public good (Sandler 1998) and therefore justifies the call for greater cooperation among HKH countries. Presently there are very few reports of cross-country adaptation projects or programmes from the HKH (Sud et al. 2015) although upstream-downstream linkages between mountains and plains provide a strong basis for regional cooperation. Among the South Asian riparian countries, enhanced regional collaboration for undertaking integrated scientific research, policy making, and implementation of cross-country adaptation measures has been cited as a necessity (Xu et al. 2009; Mirza 2011; Viviroli et al. 2011).

There is scope to structure cooperation among HKH countries around the complete food-water-energy nexus (Rasul 2014). The Climate Summit for a Living Himalayas held in Bhutan in 2011 had produced a regional Framework of Cooperation in which the agreed areas of cooperation include food security, natural freshwater systems of the Himalaya, biodiversity, and energy security. However, there has not been any follow-up action or movement since the summit, which is indicative of the challenges remaining in implementing regional cooperative action on adaptation.

13.6.2 Stronger integration of adaptation in development plans and programmes

Given the diverse socioeconomic and biophysical variability across the HKH, it is a huge challenge to scale up adaptation to achieve transformative results. It is therefore important for policy makers to embed adaptation to climate change in ongoing large-scale development-based activities. The NAP process and associated funding from Green Climate Fund is likely to be helpful in this regard.

While aiming for an integrated approach, it is still necessary (though difficult) to retain the distinction between adaptation and development in order to prevent diversion of adaptation investments to conventional development activities which could be maladaptation (Ayres and Huq 2009; Ericksen et al. 2011). This approach of distinguishing additional climate change risks or additional environmental benefits has been long practised in the financing of projects by the Global Environment Facility (GEF) where baseline activities need to be demonstrated and additional financing is provided only for the incremental cost of climate change or other environmental action.

13.6.3 Convergence of adaptation, DRR, SDGs, and resilience-building priorities

Climate change adaptation is identified as the cross-cutting priority with clear linkages to DRR, sustainable development goals, and resilience building in most national policies and plans in the HKH that highlight the importance of greater integration. The developing countries that are in the process of preparing NAPs and the countries that already have NAPAs (like Nepal) have clearly indicated the need to link climate change adaptation with DRR and SDG priorities. In addition to the policies and plan, several adaptation initiatives in the region have piloted projects to facilitate the integration of climate change with DRR and SDGs.

There is a need to develop overarching national polices and framework which can translate the idea of integration of climate change adaptation, DRR, and SDG in action. This will allow the national governments in HKH to strategically think of policy, legal, and financial instruments that can facilitate convergence of the three.

13.6.4 Investing to enhance the synergies between CBA and EBA approaches

Many EBA projects exist around the world, including several in the HKH. A recent example is the GEF-SCCF-funded project Enhancing Capacity, Knowledge and Technology Support to Build Climate Resilience of Vulnerable Developing Countries, which has been recognized as the 'first mover' in catalysing global collaborations on EBA in the context of South-South cooperation. It is a joint initiative between the UNEP and NDRC of China consisting of concrete, on-the-ground EBA interventions in Seychelles, Nepal, and Mauritania, representing coastal, mountain, and arid/semi-arid ecosystems, respectively. Another example is the German-funded mountain EBA which pilots in three mountainous countries: Nepal, Peru, and Uganda.[22]

These initiatives have demonstrated the significant potential of an EBA approach for addressing climate change in the HKH. Since trade-offs between competing demands for ecosystem services are becoming increasingly significant, strong political leadership and optimal investment are required to enhance the synergies between ecosystem-based adaptation and other approaches.

13.6.5 Generating new knowledge and strengthening the evidence base

The adaptation policies and plans of all HKH countries emphasize generating science-based climate information knowledge and services to enhance resilience of climate sensitive sectors and vulnerable households. For example, in Myanmar and Bhutan, NAPA has identified lack of locally usable knowledge and information on weather and seasonal forecasting to assist farm production operations. The NAPA of Afghanistan also identifies lack of empirical data on the extent and impact of desertification thus hindering effective climate change adaptation. Evidence-based decision making on adaptation warrants greater efforts towards strategic knowledge generation and communication through knowledge networks (for example, Indian Network for Climate Change Assessment, Himalayan University Consortium) and knowledge management platforms.

In general, across the HKH, people's access to climate change information, knowledge, and services continues to be severely limited. People have developed strong community networks to exchange information, knowledge, and skills relevant to climate change risk identification and adaptation (MoSTE 2015). For example, in Pakistan a national-level alliance for climate adaptation comprising almost 200 local-level community organizations has been in existence since 2010. This has contributed to the awareness of local organizations and communities of issues related to climate change.[23] Similar networks can be encouraged and supported in other HKH countries.

13.6.6 A policy environment for social learning

Responding to novel situations requires the capacity to learn. Social learning plays a critical role in building adaptiveness in natural resource management (Lebel et al. 2010) and enabling transitions (Tschakert and Dietrich 2010). Policy experimentation, including piloting, is important in enabling social learning to overcome system lock-in and facilitate restructuring of existing social-technical systems for changes in norms, values, goals, processes, and actors (O'Brien et al. 2012). Discussing the example of specific water resource management pilots such as improved watermill and spring

[22] UNEP, UNDP, IUCN. 2013. Building Resilience to Climate Change: Making the Case for Ecosystem-based Adaptation.

[23] http://www.lead.org.pk/lead/Pages/naca.aspx

recharging in the Garhwal Himalaya, Uttarakhand, Agarwal (2013) argues that adaptation policies in the Himalayan states should encourage the development and adoption of replicable and scalable models of conservation of natural resources and livelihood support, based on decentralized planning.

13.6.7 Building institutions and capabilities

Effective adaptation requires enhancing adaptive capacity, which includes, among other things, change in institutions and institutional processes for better governance. The roles of local institutions in structuring the risks and vulnerabilities, creating an incentive framework, and mediating external interventions in facilitating adaptation have been highlighted by studies. Bouma et al. (2009) observe that while market and institutional access are important determinants of the effectiveness of adaptation strategies, equity and governance factors finally determine the level of access of various social groups to the market and institutions. One approach would be to leverage existing social networks for effective governance outcomes in this regard.

Local governance organizations, which have reminiscence of customary institutions but are also legitimized by respective polities to formulate strategies for local natural resources, can take the role of bridging organizations in South Asia. One such example is the Dzumsa in Sikkim (India), which is an administrative unit continuing under the traditions of chiefdom. It regulates the migratory pattern for agro-pastoralists in the area, apart from governing other aspects like benefit sharing from different livelihood activities, social conduct, and cultural practices. It reserves certain pastures from grazing during seasons of normal snowfall and levies fines as an instrument for regulation. However, during seasons of erratic snowfall when local predictions do not apply successfully, the reserved pastures are made accessible for convenience of the agro-pastoralists. Such local governance institutions can fit between resource-using communities, civil society, local universities and technical institutes, government departments, and elected representatives.

Planned adaptation in the HKH would essentially require a mix of policy responses that consider a range of options from incremental to adaptive and potentially transformative strategies. Given that climate uncertainty cannot be reduced completely it is critical to deploy a decision-making framework to identify a suite of policy options instead of an optimal or best solution (Smith et al. 2010, Hallegatte et al. 2012). Conditions of 'surprise' might offer little or no scope for decision makers to respond from history or experience (Lempert et al. 2003; Walker et al. 2010). The concept of adaptive policy making (policies adapt over time as conditions change and learning takes place) has received much attention in the past decade as a useful approach to policy formulation under uncertainty (Swanson and Bhadwal 2009). Capabilities required for adaptive governance need to be created in institutions at all levels of governance in HKH countries.

13.6.8 Engaging with private business

Business can become a partner in scaling up adaptation efficiently. There is considerable scope for attracting private finance to adaptation provided the risks and transaction costs of such investments can be managed. Business looks for profits and scalability and thus tends to be restricted to regions with a large business presence, market potential, and investment climate sustainability (Chin 2014). Since adaptation is about helping the vulnerable, with a focus on poor and marginal communities, novel models of public-private partnerships are required. Apart from protecting current operations,

new revenue streams can be identified, such as ICT and insurance. At the same time local enterprises will need to be supported — not just big business.

Corporate social responsibility can play a very powerful role in building infrastructure and human capital. For example, Google has provided funding for disease outbreak monitoring in Myanmar and the Rockefeller Foundation is working to build urban resilience in a number of HKH cities (Shimla, Shillong, Guwahati, and Leh) through the Asian Climate Cities Resilience Network (WRI 2009).

13.6.9 Engaging with the emerging policy regime on loss and damage

Under the UNFCCC a new policy regime to prepare for inevitable losses and damages is covered under the Warsaw International Mechanism on Loss and Damage from Climate Change established in November 2013 and subsequently under the Paris Agreement. This is premised on the existence of a residual policy gap between climate change adaptation, disaster risk reduction, and current social protection and risk transfer mechanisms,[24] wherein climate change may generate conditions that can neither be mitigated, nor adapted to, nor insured against (Dow et al. 2013). The assumption is that current insurance instruments will be unable to cover the collective losses entailed, such as those in cultures, languages, indigenous knowledge systems, livelihood practices, social networks, and statehood.

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