ICIMOD °CICERO GRID ARENDAL

Adaptation in the Himalayas: Knowledge, Action and Results

Highlights from the Himalayan Climate Change Adaptation Programme (HICAP), 2012–2017

Foreword

Global climate change is one of the most important issues of our time, and the effects that have long been predicted are now being felt by communities worldwide, often profoundly altering the conditions for human livelihoods.

People in the Hindu Kush Himalayan region are among the world's most vulnerable to climate and other changes. There is an urgent need to achieve a better understanding of the cumulative impacts of change in this region, and to find ways to improve livelihoods and increase security in the face of these changes. The global and complex nature of these changes and their impacts, with issues linking across national borders and regions, requires an international and interdisciplinary collaboration.

The Himalayan Climate Change Adaptation Programme (HICAP), supported jointly by the governments of Norway and Sweden, has been implemented by three leading organizations in the fields of environment, climate research and communications based in Norway and Nepal, collaborating with 28 regional partner institutions in nine countries.

This interdisciplinary collaboration has succeeded in filling significant gaps in our knowledge of recent and future climate change and its impacts on water resources, ecosystems, and people in the region, particularily women, while identifying and testing viable adaptation solutions that have already benefited thousands of people. The project has also contributed to a better contextualization of climate change at the local and national level, highlighting how both climate change, impacts and adaptation are part of a broader complex of local challenges, needs and opportunities.

In many ways, HICAP has laid the ground work for making the Hindu Kush Himalayan region more resilient to the multiple challenges that face it. We are pleased to present this report, which highlights some of the key achievements of HICAP.

We hope that the findings and successes described in this report will continue to inspire research, governments and individuals to take part in the ongoing process of creating a more sustainable future for all.

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Peter Harris, GRID-Arendal

Introduction

This short report presents a selection of the key findings, achievements and lessons learned from the Himalayan Climate Change Adaptation Programme (HICAP) over the period 2012–2017. A more comprehensive overview of all of HICAP's work is provided in the annual programme reports. This summary report focuses on selected HICAP approaches to science, action research, pilot activities, and communications and outreach. In doing so, we aim to highlight:

- The broader implications of HICAP's scientific research, how it has contributed to and filled critical gaps in knowledge on climate change and impacts in the Hindu Kush Himalaya (HKH) region, and how this knowledge can be applied locally to achieve some of the Sustainable Development Goals (SDGs)

- How HICAP's scientific recommendations, approaches and tools have been incorporated into decision-making at various levels (policies, actions, decisions)

- How HICAP's engagement with various stakeholders, such as regional partners or the media, has resulted in multiplication/amplification and new levels of action and awareness where it is most needed

We conclude this report by highlighting some of the important lessons learned over the duration of the programme, particularly in terms of policy outreach and partnerships.

This report is targeted at different groups:

- Funding partners – to illustrate the benefits of the HICAP programme and the value of its methodology, partnerships and results; and how these are essential for achieving both climate adaptation and relevant SDG targets

- Decision makers within the HKH region – to illustrate that interdisciplinary knowledge production with inputs from science, communities and policy is essential for ensuring successful local adaptation and consistency across policies

- Researchers – to illustrate that knowledge production must be connected across disciplines, relevant to soceity, and include targeted communications to improve implementation and uptake

Adaptation

Adaptation is the process of change to better suit a situation or environment. It is a continuous process, not an end-point. It means dealing with both sudden events and with slow ongoing changes in a region over time, which may include climate or weather, but also other aspects such as social and economic stresses, market fluctuations or access, ecosystem changes, policies and regulations, infrastructure, etc.

The development of HICAP

HICAP was developed as a result of two earlier interventions: 'Too Much, Too Little Water' and the 'Himalayan Climate Change Impact and Adaptation Assessment' (HICIA) – which were largely a response to the noticeable lack of information from the Himalayas in the IPCC 4th Assessment Report. The interventions were supported by the Swedish International Development Cooperation Agency and the Norwegian Ministry of Foreign Affairs, respectively. The HICIA feasibility study identified four priority topic areas for improving knowledge and understanding: (i) scenarios for climate change, water demand and availability; (ii) the effects of climate change on biodiversity and ecosystem services; (iii) the impacts of climate change on agro-ecology, food production systems and food security; and (iv) critical factors for achieving sustainable adaptation to climate change. The study concluded that the best way to examine these issues was through a large-scale study in the HKH region, with the International Centre for Integrated Mountain Development (ICIMOD) acting as the hub and coordinator for activities in the region, in collaboration with relevant international expertise including the Centre for International Climate and Environment Research-Oslo (CICERO) and GRID-Arendal. This led to the development of the Himalayan Climate Change Adaptation Programme, which aims to:

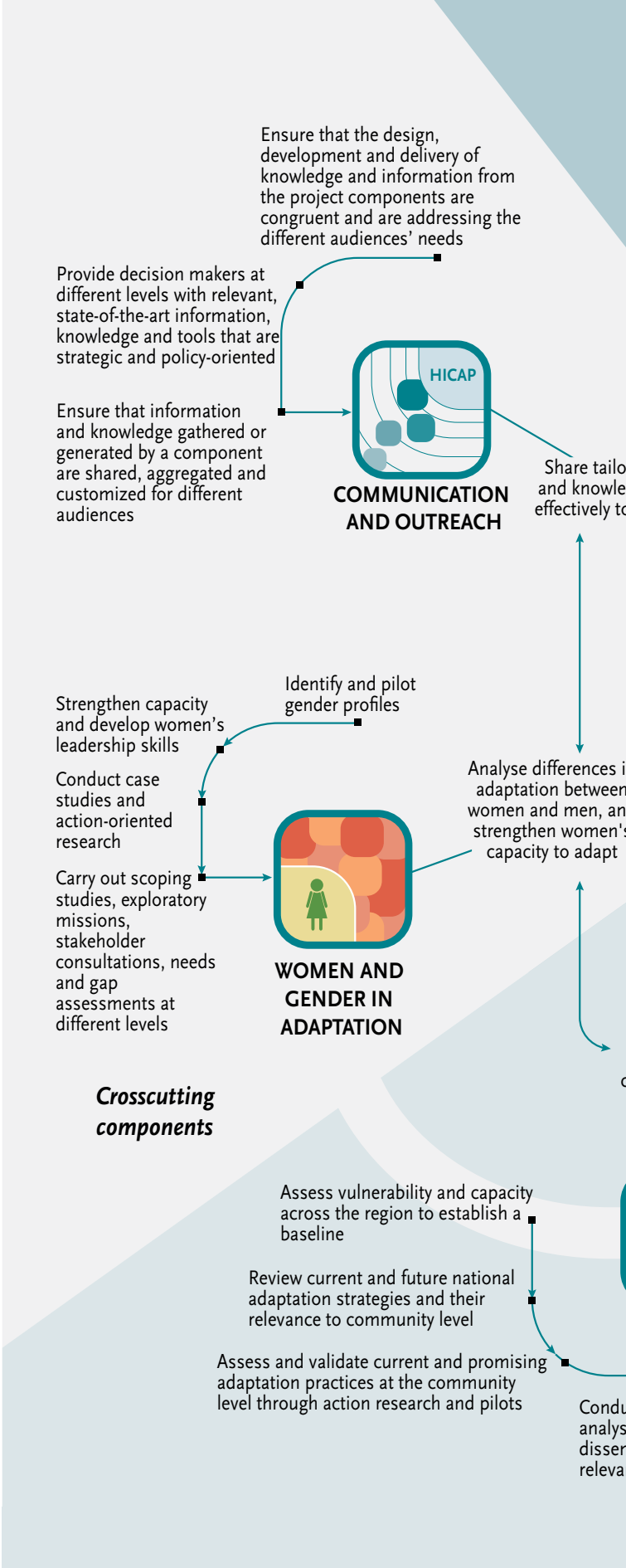
- *Reduce uncertainty* through downscaling and customizing global climate change scenarios, and developing water availability and demand scenarios for parts of major river basins

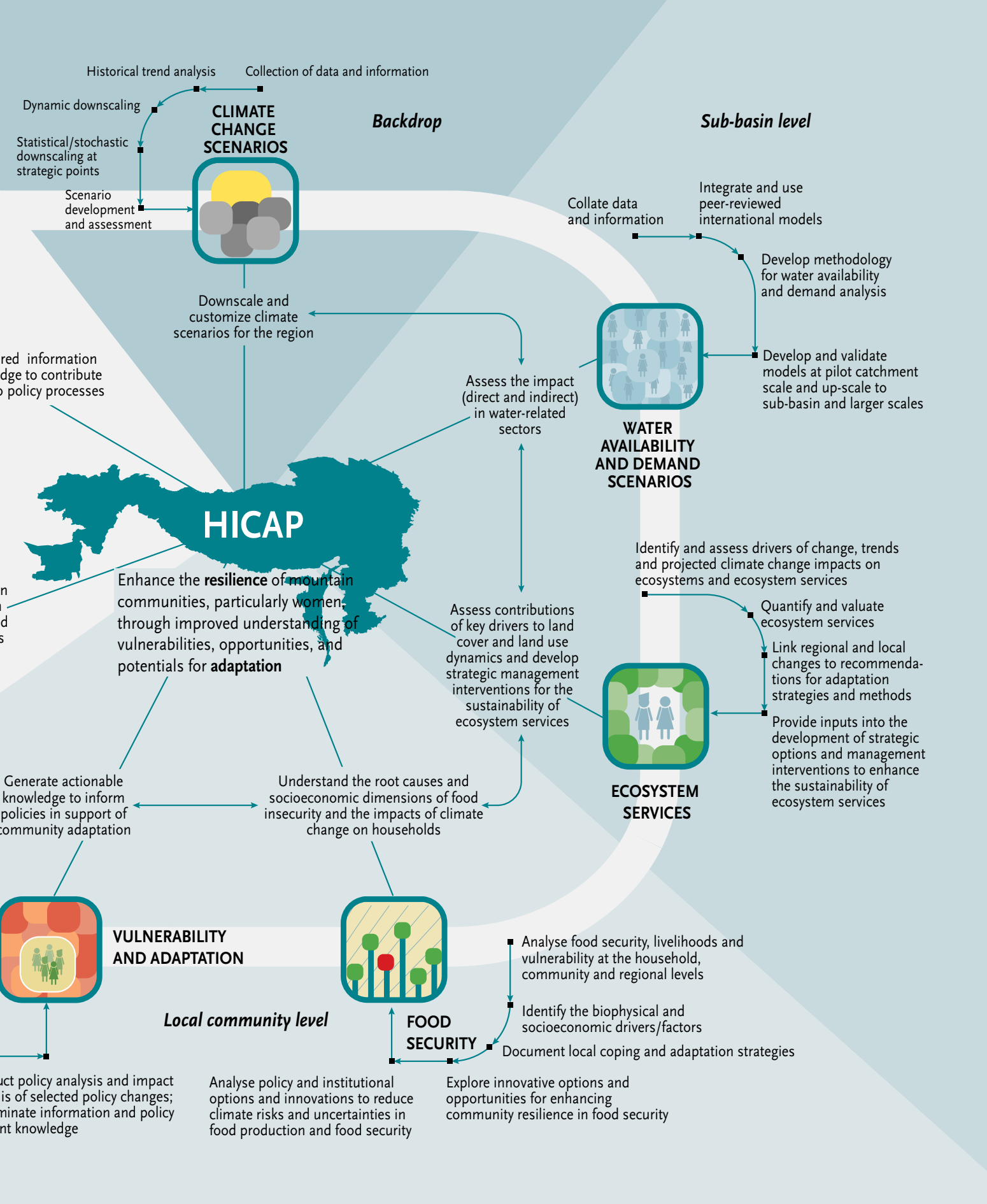
- *Develop knowledge and enhance capacities* to assess, monitor and communicate the impacts of and responses to climate change (compounded with other drivers of change) on natural and socioeconomic environments at the local, national and regional level

- *Make concrete and actionable proposals* for strategies and policies considering vulnerabilities, opportunities and potentials for adaptation, with particular reference to strengthening the role of women and local communities

To meet the objectives that were set out at HICAP's inception, the programme was organized into seven connected thematic components, with work carried out in five river basins in the HKH region – namely, the Upper Indus in Pakistan, the Koshi Sub-basin in Nepal, the Eastern Brahmaputra in India, the Upper Brahmaputra in the Tibetan Autonomous Region and the Upper Salween-Mekong in China.

HICAP has been implemented through a 'promoters' and partnership structure. The promoters group was made up of ICIMOD, CICERO and GRID-Arendal, each of whom contributed in varying degrees to science, action research, pilot projects, and communication and outreach. In addition, a total of 28 partners have been involved throughout the course of the programme.




Historical trend analysis
Collection of data and information
Dynamic downscaling
Statistical/stochastic downscaling at strategic points
Scenario development and assessment
CLIMATE CHANGE SCENARIOS
Backdrop
Sub-basin level
Collate data and information
Integrate and use peer-reviewed international models
Develop methodology for water availability and demand analysis
Develop and validate models at pilot catchment scale and up-scale to sub-basin and larger scales
Downscale and customize climate scenarios for the region
Assess the impact (direct and indirect) in water-related sectors
WATER AVAILABILITY AND DEMAND SCENARIOS
HICAP
Enhance the resilience of mountain communities, particularly women, through improved understanding of vulnerabilities, opportunities, and potentials for adaptation
Identify and assess drivers of change, trends and projected climate change impacts on ecosystems and ecosystem services
Quantify and valuate ecosystem services
Link regional and local changes to recommendations for adaptation strategies and methods
Provide inputs into the development of strategic options and management interventions to enhance the sustainability of ecosystem services
Assess contributions of key drivers to land cover and land use dynamics and develop strategic management interventions for the sustainability of ecosystem services
ECOSYSTEM SERVICES
Generate actionable knowledge to inform policies in support of community adaptation
Understand the root causes and socioeconomic dimensions of food insecurity and the impacts of climate change on households
VULNERABILITY AND ADAPTATION
Local community level
FOOD SECURITY
Analyse food security, livelihoods and vulnerability at the household, community and regional levels
Identify the biophysical and socioeconomic drivers/factors
Document local coping and adaptation strategies
Analyse policy and institutional options and innovations to reduce climate risks and uncertainties in food production and food security
Explore innovative options and opportunities for enhancing community resilience in food security

Results and impacts from HICAP science

HICAP research has contributed significantly, over a relatively short time period, to filling critical knowledge gaps on regional climate change, vulnerabilities and impacts in the Hindu Kush Himalayas. Combining rigorous scientific approaches with local experience and insight, and framed by policy and institutional analysis, HICAP research has led to a more holistic understanding of the role that climate and other factors play in livelihoods, highlighting the complexity of change and adaptation.

HICAP research has covered many issues, which were carried out in parallel and often informing each other. Natural science approaches included climate and hydrology scenarios, and the impacts of changes in climate and water availability on ecosystems, food production and flood risk. Social science approaches examined the different socioeconomic vulnerabilities across gender and social scales, and examined the complexity of interacting drivers of change such as markets, infrastructure and migration. Studies also considered the resilience and adaptive capacities of different groups across scales, and how adaptation is facilitated or hindered at these levels.

This report highlights a few examples of these studies, and the impacts or connections they have made thus far.

Downscaling climate and hydrology projections

Downscaling for the HKH region is a complex task. The large climatic and environmental variations due to significant changes in altitude over small distances create challenges in applying broad-scale data at the local level. Access to accurate scenarios for these changes are essential for adaptation planning.

HICAP has significantly reduced the uncertainty on climate change in the region through its efforts to develop regional and local downscaled climate and water scenarios. This work has been published in renowned journals such as Nature Climate Change and the International Journal of Climatology, as well as other scientific publications. The projections, along with identified challenges, implications and recommended actions,

Salience, Credibility and Legitimacy[1] in HICAP research

All HICAP research has been based on the three concepts of salience, credibility and legitimacy. Local and international expert and stakeholder involvement at various stages has ensured that a variety of relevant concerns have been addressed. Such non-scientific insights and framings have not compromised the research, but instead enriched the scientific process, informing both the climate and hydrological modelling, and setting the scene for the socioeconomic impact studies related to agriculture, forestry and gender issues.

1. Salience refers to the extent to which the particular concerns of users are addressed; legitimacy refers to the trustworthiness of the process in the eyes of various audiences (taking into account the diverse views and concerns); credibility refers to the trust audiences put in the scientific and technical quality of the study.

Key messages from HICAP's research

HICAP has led to many important conclusions, including key messages from individual research components; aggregate messages for specific countries; and messages for communication of research and practice to different target groups, and for project cooperation and implementation.

Some of the main science conclusions include:

- The region is warming, especially in winter and at higher altitudes, leading to more extreme and unpredictable weather, increased glacial melt, increased community vulnerability, and challenges for ecosystems and agriculture. The total annual water availability is not changing.

- The concept of 'flexibility' has emerged as a key notion and includes local empowerment, agro-diversity, social security and gender-friendly diversification of livelihoods. Smart planning can help adaptation and create new opportunities.

- Although initially focused on climate change, research has also clearly established that it is a combination of multiple drivers – which differ across the region and socioeconomic scales – that influences vulnerability and adaptation needs.

- There is a need for more holistic and upstream–downstream solutions, embracing different approaches in different situations and regions. These may include Payment for Ecosystem Services approaches or cost-effective Ecosystem Based Adaptation incorporating local knowledge and practices. However, different agroecological zones may have different solutions, which must be analysed individually.

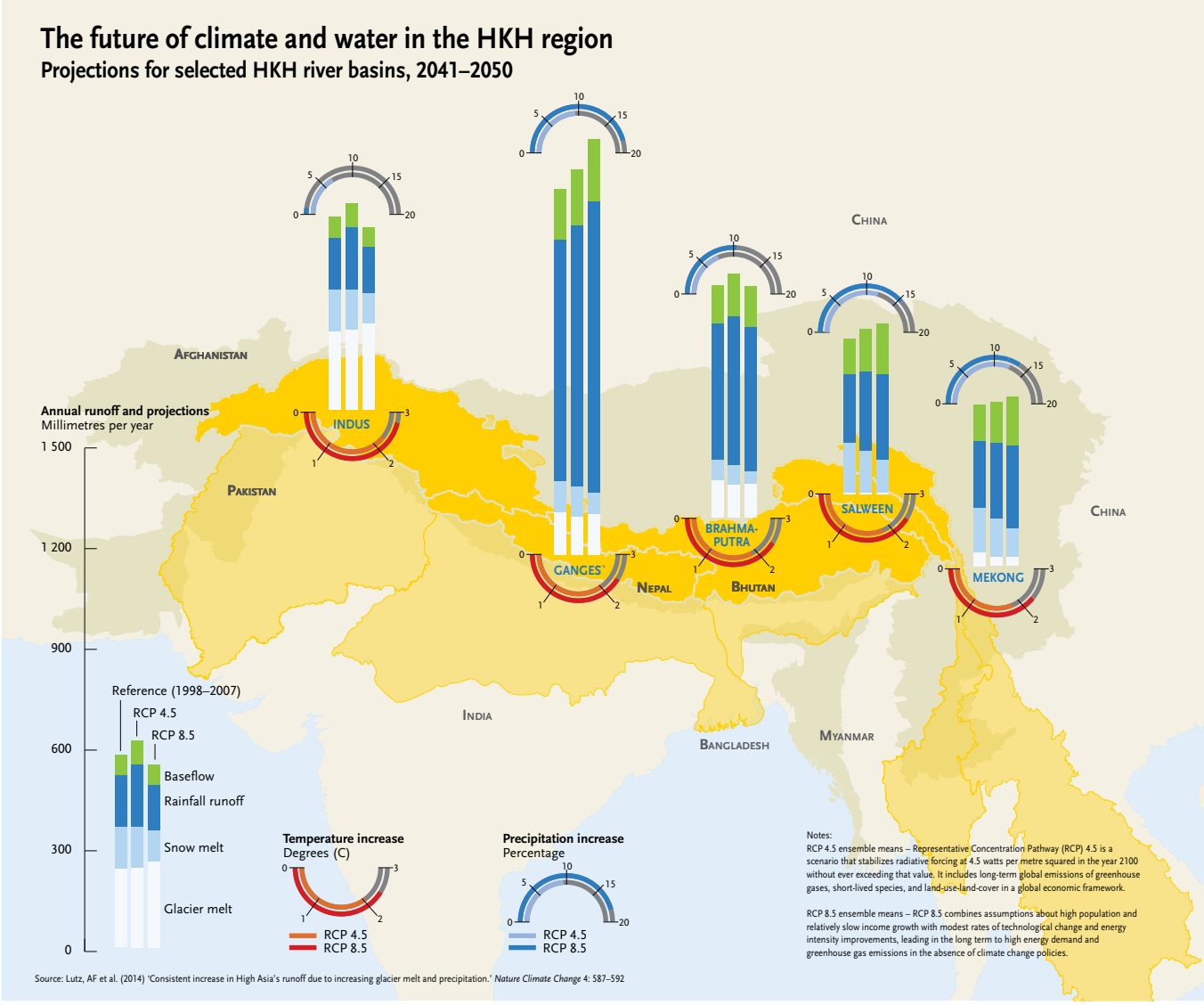
- Improved communication with policymakers, and community capacity-building (particularly for women) are two ways of minimizing risks and vulnerabilities.

- Regional key messages include the need for a greater focus on water stress and adaptation in Nepal; greater emphasis on gender in livelihood diversification and risk management in India; and greater integration of adaptation, gender, migration and other social factors in adaptation strategies in China. Global lessons point to the connections between mountain areas in the regional (upstream–downstream) and global context, with a need for cross-learning between mountain regions.

have also been published in the Himalayan Climate and Water Atlas – a user-friendly format that is more accessible for non-scientific audiences.

The messages from the downscaling work are clear, and perhaps not surprising, but now better documented and with greater certainty than before: climate will continue to change across the region in coming years, with great spatial variability; glaciers will continue to lose mass, affecting communities living in the mountain regions the most; and changes in temperature and precipitation will lead to increases in flooding and drought, with knock-on impacts for agriculture, water resources and health. Overall, temperatures across the HKH region will increase by about 1–2 degrees, and up to 4–5 degrees in some high-altitude areas, by 2050. In addition, less frequent but more intense rainfall, and a more erratic monsoon will lead to increased uncertainty in river flow and water availability.

The downscaling work has led to impact at several levels. The new and more detailed results have increased understanding in the scientific community. The scenarios have informed other HICAP studies and will continue to inform future studies in need of downscaled scenarios. The re-packaging of the downscaling work in a more accessible format in the Himalayan Climate and Water Atlas, continues to inform stakeholders and decision makers across the region, empowering local and regional stakeholders working on water-related issues to take effective measures and develop appropriate policies.



Changes in relative contributions to river flow from glacier melt, snow melt, rainfall and baseflow will affect the conservation and management of water resources in the region. http://www.grida.no/resources/6680

Farming in the Himalayas

HICAP has adopted a very effective multidisciplinary approach to adaptation research, generating holistic knowledge with greater utility for policymakers and practitioners on the ground. One issue which is intrinsically connected to climatic and rainfall variability, as well as the reduction of ecosystem services, is food security. Mountain people in the HKH region are one of the poorest populations in the world and HICAP research has shown that climate change is likely to exacerbate food insecurity in the region – more so than in other areas due to the high dependence on local agricultural productivity and depleted natural resources, vulnerable supply lines and the logistical difficulties in accessing external markets, and poor infrastructure. This highlights the need to find ways of ensuring mountain food security. Women play an important role in food production in the HKH region and have different vulnerabilities to men; they face more social, economic and political barriers, which limit their adaptive capacity. As a consequence, much of HICAP research targeted agriculture and farming practices in the region, with a focus primarily on the adaptive capacity of farmers (particularly women) to climate change and other factors.

Much of this work is now published in books, reports and papers, including the Oxford University Press book, Climate Change and the Future of Himalayan Farming. The book analyses farmer's

Reviews of the Climate Change and the Future of Himalayan Farming book

Recent independent reviews of the book indicate that the work is "extremely timely" and "will be a significant addition to the existing literature and be a useful text in the future". Moreover, the work will be "an invaluable resource for students and scholars of climate change, and for students of Himalaya" as well as "planners, geographers and biologists, and NGOs". The work is targeted at decision makers developing solutions for sustainable food security and agriculture. The gender work has direct relevance to women's adaptive capacity and to food production.

Aase, T.H. (ed): Climate Change and the Future of Himalayan Farming. Oxford University Press. ISBN: 9780199475476.

adaptive capacity to climate and other forms of change in case studies carried out in Nepal (2), India (2), China (1) and Pakistan (1). These studies are linked to the climate downscaling work in HICAP and take a comparative view of how different political and geophysical contexts facilitate or hinder adaptation processes. The studies show a decline in agriculture in the region: 26 per cent of agricultural land had been left fallow across the six villages, and only 30 per cent of households reported having an heir who was ready to take over the farm once the current generation of farmers could no longer work. Some of the key aspects of adaptive capacity highlighted by the studies include the ability of farmers to seize new opportunities, to access labour and climate information, and to ensure soil fertility, ecosystem services and access to stable markets. The case studies vary in their levels of vulnerability, flexibility and access, and the research makes a range of recommendations including increased policy intervention, enhancing the purchasing power of mountain communities, engaging younger generations in farming, supporting the diversity of small-scale farming, and developing effective distribution mechanisms and extension services.

Other studies focused specifically on gender and marginalized groups. They show that changes to the climate have increased agricultural workloads because of reductions in water availability. This has increased competition for water resources, forcing households to collect water at night – which poses particular dangers for women and heightens the marginalization of already disadvantaged groups. Soil hardening and the growing prevalence of invasive species also creates additional physical labour, while reduced diversity of crops and food intake causes adverse health effects. Recommendations include targeted programmes to enhance women's adaptive capacity; access to credit, information and technology; decreasing workloads by improving water capture and storage methods; and involving women in decision-making processes.

Action Research

HICAP's action research[2] initiatives have allowed for the simultaneous learning from and supporting of vulnerable communities. These approaches have provided valuable lessons and insights which can be used to support the development of more intensive pilots and larger-scale programmes to build adaptive capacity and resilience to climate change and disaster risks.

Financial literacy and disaster preparedness in flood-prone communities

Outmigration in search of employment opportunities is a common feature in the HKH region and is predominantly a male phenomenon. For many households, this is a livelihood diversification and income earning strategy. A third (33 per cent) of all households in the region have at least one or more migrants, and of these households about half (52 per cent) receive financial remittances, which on average constitute about 44 per cent of total household yearly income. Yet outmigration can also come at a cost: women left behind have to take on new tasks related to disaster preparedness, food security and farm management, for which they are often ill-prepared. Outmigration requires women to acquire new skills, capacities and knowledge to deal with these new challenges.

HICAP highlighted the potential of leveraging remittances for adaptation purposes – such as investing in disaster preparedness – by providing financial literacy[3] and disaster preparedness training to remittance-receiving women, and supporting them in accessing banking services. These measures showed that if investments are made in building women's capacities and if banking services are made more accessible to women, remittances can be a valuable financial resource for helping households to mitigate climate induced risks and build resilience. In total, 240 women from households receiving remittances have received training on financial literacy and flood preparedness in Lakhimpur district in Assam; the model has also been used in Udayapur district in Nepal by another ICIMOD initiative, Himalica. Both districts are prone to floods, which frequently impact local communities. The training has helped women to open a savings account and taught them skills such as budgeting and saving, as well as demonstrated ways they can use their remittance funds to ensure they are better prepared for floods – such as creating 'go-bags'[4] and saving money for emergencies. The action research is estimated to have reached over 1,000 indirect beneficiaries through the improved management of household finances and the ability to prepare for floods. In addition to the activities for

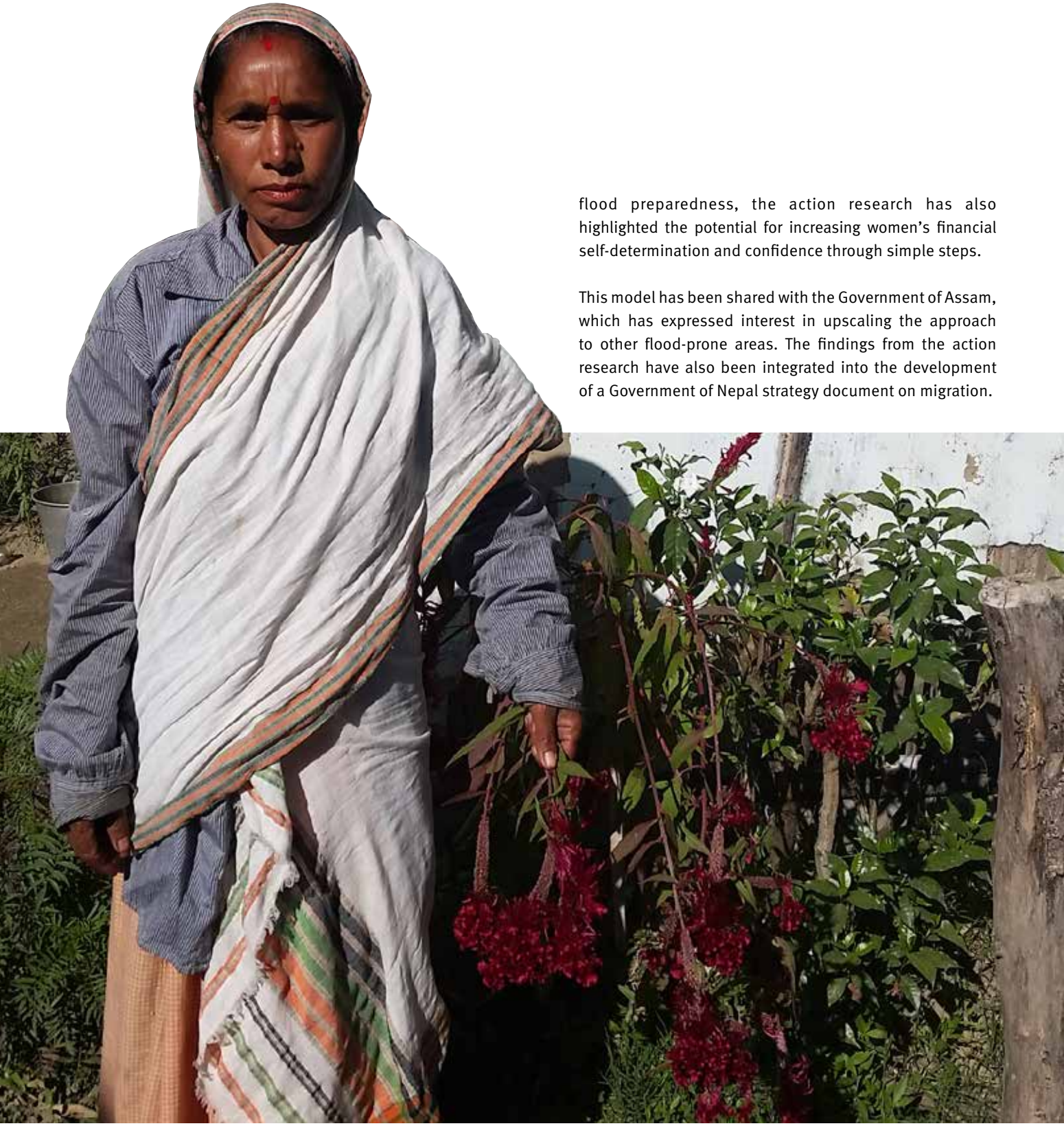
Financial literacy for villagers in Assam

Guno Borah (40) from Boropothar Village in Lakhimpur, Assam, said that the most beneficial thing about the flood preparedness go-bags, which they had made as part of the action research, was having their ID documents with them when they had to move quickly to higher ground. She related her group's experience of the flood season in 2016: other people taking shelter from the flood on a local bridge noticed the group's go-bags and were impressed that they were so well-prepared. Some of the group members were also able to share food from their go-bags with others. "'You know a lot about what to do,' they told us."

She also found the financial literacy training useful: "When my son first went to Maharastra to work, I didn't have my own bank account, so my son had to send me money through someone else's account – but that person never gave the money to me. Now that I have my own bank account, my son can send the money directly to me, and no-one else knows how much I am receiving."

Guno also used part of her savings to get medical treatment from a private facility. She said that if she had not been saving money as part of the action research, she would have had to take a loan from a self-help group at 5 per cent monthly interest to get the treatment. Because she had saved money, she was able to pay the medical costs directly.

2. Action research refers to studies carried out in the course of an activity or occupation to improve the methods and approach involved. It is an effective way of rigorously testing development and adaptation approaches.
3. Financial literacy is the education and understanding of how money is made, spent and saved, as well as the skills and ability to use financial resources to make decisions. It is usually applied in the context of managing personal or household finance.
4. "Go-bags" is the term used to describe bags that act as disaster preparedness kits, which contain essential items for survival in the event of an emergency.



flood preparedness, the action research has also highlighted the potential for increasing women's financial self-determination and confidence through simple steps.

This model has been shared with the Government of Assam, which has expressed interest in upscaling the approach to other flood-prone areas. The findings from the action research have also been integrated into the development of a Government of Nepal strategy document on migration.

Adaptive capacity-building in Nepal

HICAP has helped communities to assess their own strengths and weakness, and to self-organize to develop appropriate resilience-building actions. In 2015, teams made up of two women and one man were trained in two villages in Nepal to guide their own communities in assessing their existing skills and resources for adaptation, identifying the gaps, and developing an action plan to improve their capacities. Support for the training was provided by ICIMOD, CICERO and the partner organization Development Knowledge Management and Innovation Services (DeKMIS). 200 people are directly benefiting from the action research, with an estimated 800 women benefiting indirectly through training given to women's groups as part of the work.

At the end of the action research, community-level action plans were developed by the two villages, in consultation with the Village Development Committee and the Municipality Development Committee. The aim was to enhance their current adaptation practices, and develop the skills and knowledge required to deal with future changes. Subcommittees have been founded in the two villages to implement the action plan and community members raised between NPR 150,000 and NPR 200,000 (US$ 1,500–2,000) from line departments to support their work.

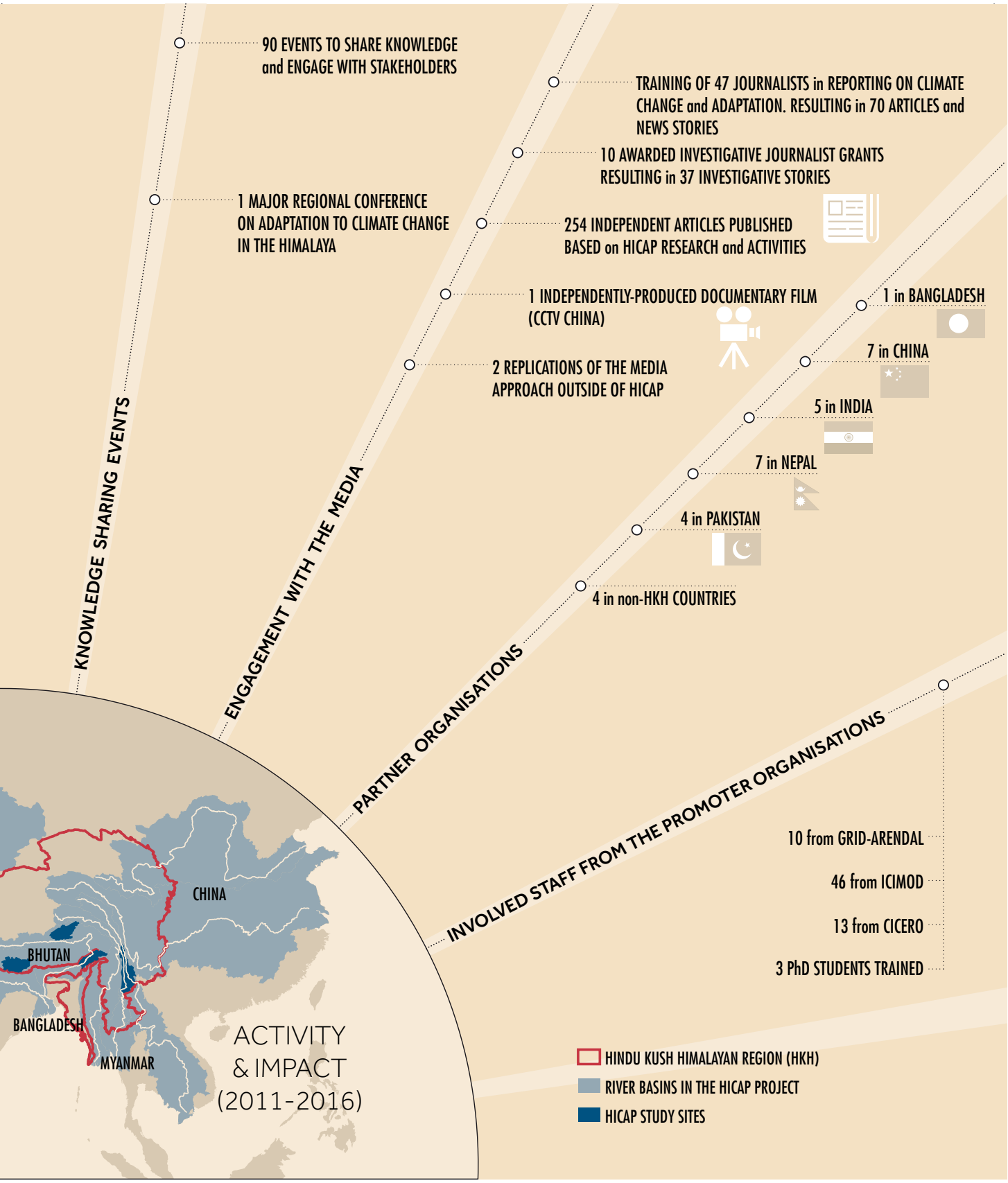
The premise of the action research is that if a community has the capacity to assess its own existing skills and resources for adaptation, identify the gaps and develop an action plan to improve capacity, it will be better prepared to adapt to any changes in the future – in contrast to interventions that focus purely on providing technical inputs.

Community responses to the 2015 Nepal earthquake

The devastating earthquake that struck Nepal in April 2015 put the action research to the test, in different conditions than anticipated. According to Dibya Gurung (DEKMIS), even though "the communities [targeted through the action research], like many in Nepal, faced severe losses, they appeared to be better able to respond to the earthquake than many others. Being aware of which local institutions and officials to approach for support enabled them to effectively seek support for relief, and the leadership training enabled community heads to equitably distribute resources within the villages."

Later, the village micro-plans for adaptive capacity were revised in view of the new situation. The communities used their skills to develop comprehensive plans for recovering their losses from the earthquake, while building their capacity to adapt to future changes and challenges.

SIX YEARS OF HICAP
APPROACHES TO ENHANCE LIVELIHOODS & RESILIENCE
9 NEW APPROACHES DEVELOPED and REFINED
UPSCALING by 15 INSTITUTIONS in 6 COUNTRIES
2 GLOBAL AWARDS RECOGNISING PIONEERING WORK
POLICY UPTAKE
6 NATIONAL/STATE-LEVEL DEVELOPMENT POLICIES and PLANS MAKING USE OF HICAP WORK
3 REFERENCES IN GLOBAL STRATEGY DOCUMENTS
ON-THE-GROUND PILOT ACTIVITIES
1 805 PEOPLE BENEFITED DIRECTLY
28 000 PEOPLE BENEFITED INDIRECTLY
TRAININGS TO MITIGATE RISKS & CHALLENGES
for 19 COMMUNITIES
for 18 INSTITUTIONS
PUBLISHED KNOWLEDGE
42 361 DOWNLOADS and 475 CITATIONS
87 PUBLICATIONS of which 41 PEER-REVIEWED
AFGHANISTAN
NEPAL
PAKISTAN
INDIA


KNOWLEDGE SHARING EVENTS
90 EVENTS TO SHARE KNOWLEDGE and ENGAGE WITH STAKEHOLDERS
1 MAJOR REGIONAL CONFERENCE ON ADAPTATION TO CLIMATE CHANGE IN THE HIMALAYA
ENGAGEMENT WITH THE MEDIA
TRAINING OF 47 JOURNALISTS in REPORTING ON CLIMATE CHANGE and ADAPTATION. RESULTING in 70 ARTICLES and NEWS STORIES
10 AWARDED INVESTIGATIVE JOURNALIST GRANTS RESULTING in 37 INVESTIGATIVE STORIES
254 INDEPENDENT ARTICLES PUBLISHED BASED on HICAP RESEARCH and ACTIVITIES
1 INDEPENDENTLY-PRODUCED DOCUMENTARY FILM (CCTV CHINA)
2 REPLICATIONS OF THE MEDIA APPROACH OUTSIDE OF HICAP
PARTNER ORGANISATIONS
1 in BANGLADESH
7 in CHINA
5 in INDIA
7 in NEPAL
4 in PAKISTAN
4 in non-HKH COUNTRIES
INVOLVED STAFF FROM THE PROMOTER ORGANISATIONS
10 from GRID-ARENDAL
46 from ICIMOD
13 from CICERO
3 PhD STUDENTS TRAINED
CHINA
BHUTAN
BANGLADESH
MYANMAR
ACTIVITY & IMPACT (2011-2016)
HINDU KUSH HIMALAYAN REGION (HKH)
RIVER BASINS IN THE HICAP PROJECT
HICAP STUDY SITES

HICAP pilots

Pilot projects are an important tool for testing approaches, technologies and assumptions on a manageable scale. If successful and supported by sufficient research and knowledge, they serve to educate and convince local and national governments and civil society, to upscale these approaches, or to create or reform policies to facilitate their uptake. At the same time, these pilots can have a measurable impact on the well-being of local populations and villages. Pilot projects form the cornerstone of HICAP´s policy engagement and they are now being replicated in other parts of the region.

Resilient Mountain Villages (RMV)

The Resilient Mountain Villages (RMW) pilot was initially based on the concept of Climate Smart Villages, developed by the Food and Agriculture Organization (FAO) and the Consortium of International Agricultural Research Centres (CGIAR). However, the concept was adapted to reflect the particular needs and challenges present in the mountain context. The approach integrates dimensions of sustainable development and climate change adaptation into a comprehensive approach that improves the resilience of mountain villages to current and future stressors, including a changing climate. The model was piloted in Nepal in eight villages in the Kavre district, where a total of 1,089 small-scale farmers (82 per cent of them women) received training on resilient farming practices: mulching; crop-residue management; biopesticide and biofertilizer production; efficient and simple water collection and irrigation methods; and the adoption of environmentally sustainable energy technologies, such as solar power and biogas. These interventions contribute to climate resilience by addressing the increasing lack of water in the area, reducing the use of chemical pesticides and fertilizers, and promoting sustainable energy use. In addition, farmers receive training on gender inclusion; acquire information on how to mitigate loss and damage, and secure vulnerable assets through insurance; and gain access to timely and critical information on weather from meteorological stations at local schools. The project has benefited an estimated 5,000 plus people by building household adaptive capacity and strengthening farming practices.

High outmigration of men from Kavre district means that women have to take over the responsibility for farming. They face the challenges of decreasing water availability and frequent dry spells, with very little external support. The RMV approach combines local knowledge and practices with scientific risk and vulnerability assessments. With a key focus on gender integration, the pilot in Kavre demonstrates the importance of providing communities with affordable, replicable and modular tools to strengthen their resilience and adaptive capacities. It also shows that collective action by farmers' groups – which in this pilot are largely women's groups – can build women's confidence and empower them to more effectively take part in local decision-making. The pilot in Kavre serves as an important test case for climate resilient agricultural approaches adapted to the specificities of the Himalayan mountains, and has been used to introduce the concept to a wider group of stakeholders. The pilot focused primarily on climate resilience, but the next stage of development will focus more on socioeconomic and future resilience.

In Nepal, the approach will now be upscaled by the Nepal Department of Environment, in a total of 14 districts comprising

of 114 villages. A committee has been formed to develop the programme, with the Director General of the Department of Agriculture acting as the Chair. Following a visit by a Pakistani Minister of State to ICIMOD´s Godavari Knowledge Park and some of the pilot areas to learn about bio-briquetting, several elements of the approach are being adopted in the Kohistan District in Pakistan. The initiative is supported by the Benazir Income Support Programme, Pakistan's largest national social safety net programme, which has a total of 5.4 million beneficiaries.

Switching from harmful chemical fertilizers to organic pesticides (jholmal)

Kavrepalanchok District in Nepal was notorious for its high use of chemical pesticides. Farmers in the village of Kalchhebesi used to spray large volumes of chemical pesticides on their crops, despite being aware of the associated health concerns. Through the RMV pilot, they have been trained in making Jholmal, a biological pesticide and fertilizer which can be easily be made at home using readily available resources. Jholmal is based on local traditional practices and has been refined by the RMV team using scientific knowledge.

Today, lead farmer, Bimala Bajgain, who was one of the first in her village to begin using Jholmal, explains that they have greatly reduced the use of chemical pesticides: "Earlier, we doused our crops with chemical pesticides to ward off pests. We warned our children not to eat vegetables straight off the plant; we were constantly worried they wouldn't listen. Now that we use Jholmal on our vegetables, we don't have to worry."

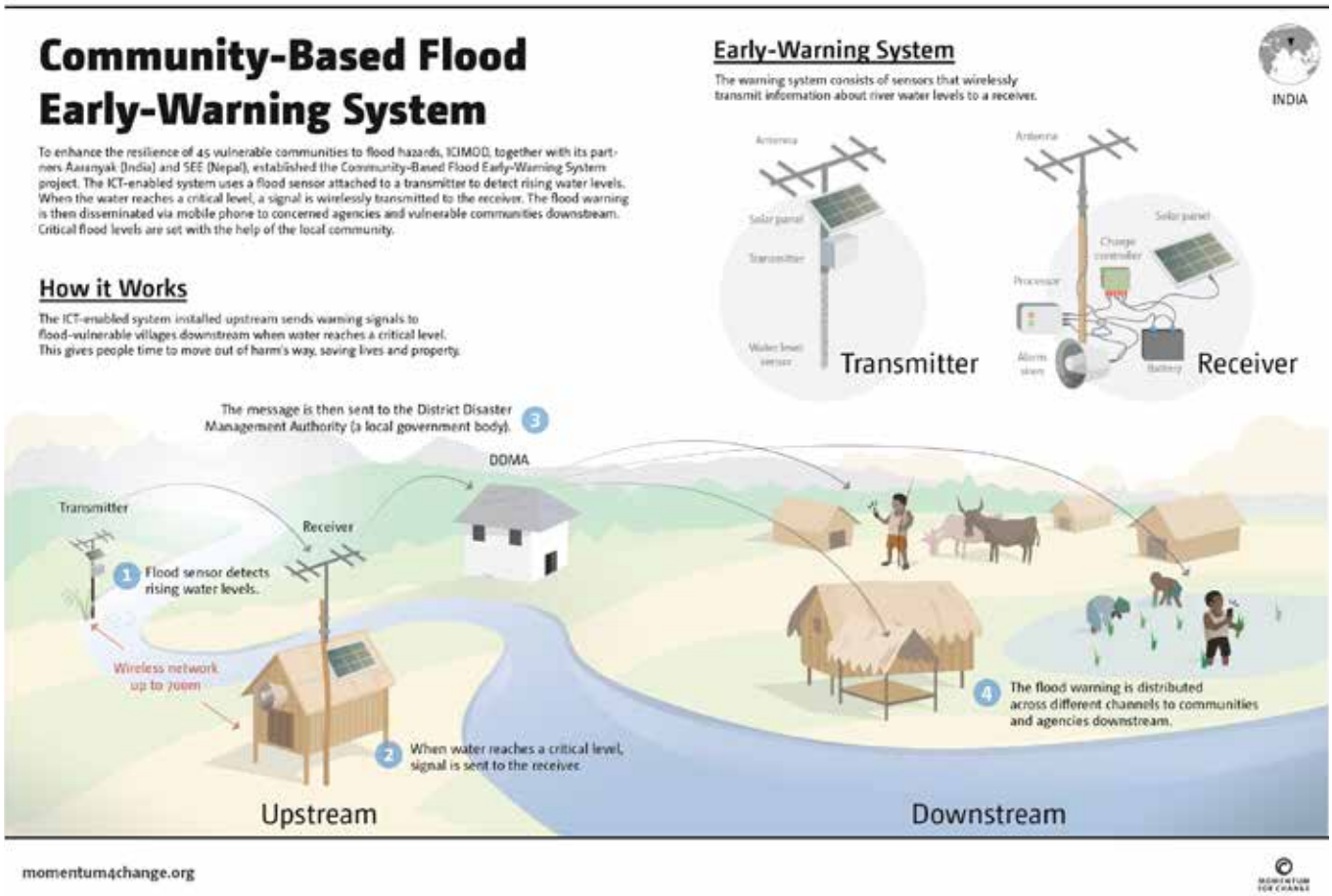
Jholmal has also reduced the farmers' expenses. Another member of Bimala's farmers' group, Sarita Regmi, used to spend about NPR 25,000 a year on chemical fertilizers and pesticides. "Jholmal saves us about 50 per cent of our farm expenditure. This has helped us to save money and we can now afford to buy external inputs.

Community-based flood early warning systems

Flash floods are one of the most common forms of natural disasters in the HKH region. Their sudden and unpredictable nature allows little time to react, with devastating impacts on infrastructure and human lives. They commonly occur in isolated mountain catchments, where the central government's reach is limited or even non-existent. For this reason, it is essential that mountain communities are able to manage the risks from floods themselves. Individual households often have strategies to minimize the risks, but these individual efforts can be much more effective if they are coordinated.

The Community-Based Flood Early Warning System (CB-FEWS) is an integrated approach developed and piloted through HICAP in Assam, together with the NGO, Aranayak, and the Assam State Disaster Management Authority. CB-FEWS provides the tools, technology and capacity necessary for communities to detect and respond appropriately to flood emergencies. One of the central components of the system is a reliable instrument which can detect rising water levels – a ground-breaking but affordable technology which was jointly developed by ICIMOD and Sustainable Eco Engineering (SEE). But a monitoring and warning service alone is not sufficient for ensuring long-term success; the CB-FEWS approach also includes capacity training on risk knowledge, dissemination and response action by communities. The pilot approach in Assam, India, has received widespread praise from local communities and other concerned agencies (including local governments) for its effective outcomes.

During the flood season, the system not only helped downstream communities by informing them of impending flooding, but also helped district authorities to deploy flood rescue teams in a timely fashion. In total, 46 villages and approximately 21,000 people have benefited from the scheme in Assam. For example, during the 2013 flood season, the system installed in the Jiadhal River successfully informed community members in Dihiri of impending floods, helping them save assets, including cattle and pigs, worth approximately US$ 3,300.



Experiences from Sarpallo community, Assam

"Times have changed and the way we communicate has improved a lot for the villagers, especially the women," says 30-year old Rinku Singh, a local woman farmer from Sarpallo – a community of 1,000 households (Ratu River, Koshi Basin). She explains how until a few years ago, villagers had to monitor the floods themselves. During heavy rains, local villagers took turns going to the river to check the water level, even in the middle of the night when it is difficult to take readings. A big flood hit the village in July 2016, but the early warning system enabled all the villagers to relocate to higher ground with their children, elderly, important documents and livestock. For many women like Singh, the system has been a source of reassurance, helping them to get the right information at the right time.

Upscaling of CB-FEWS

Following the success of the pilot, the Assam State Disaster Management Authority has expanded the CB-FEWS initiative to more flood-prone areas. CB-FEWS is also being upscaled in the region through capacity support provided by ICIMOD. In Nepal, CB-FEWS was first upscaled in the district of Bhurung Tatopani-Myagdi, in collaboration with Local Initiatives for Biodiversity, Research and Development (LI-BIRD), Sustainable Eco Engineering (SEE) and Environmental Camps for Conservation (ECCA) in 2014. It was later implemented along the flood-prone Ratu River (Koshi Basin), through the Department of Hydrology and Meteorology/ Community-based Flood and Glacial Lake Outburst Risk Reduction Project, with support from the ICIMOD Koshi River Basin programme. In Afghanistan, CB-FEWS is being piloted by FOCUS-Afghanistan, in collaboration with the Afghan National Disaster Management Authority in Bhaglan Province. In 2016, the scheme won the UN Framework Convention on Climate Change (UNFCCC) "Momentum for Change – Lighthouse Award".

Coping with water extremes in Assam

In Dihiri village in Lhakimpur, Assam, the winter is so dry that the river disappears completely, forcing villagers to dig down into the sand for water. In the monsoon season, the same river floods and pushes the community further away from its banks each year. HICAP climate projections show that such conditions are likely to increase in severity, with climate change leading to more intense floods and droughts in vulnerable areas. Communities in the HKH region need to be given the tools to deal with such extremes while maintaining their livelihoods.

Tributary of the Brahmaputra River near Dihiri village in Lhakimpur, Assam, December 2016.

The same river in flood, July 2016. According to local CB-FEWS staff, the river flooded 38 times during the monsoon that year.

Communications and outreach

HICAP has used a combination of approaches to communicate new scientific knowledge and the results from its pilots and action research to decision makers, the media and the general public. These approaches have strengthened the quality and coverage of climate change and adaptation in the media, both regionally and internationally. Highly informative, visual and engaging publications, such as the Himalayan Climate and Water Atlas, have become benchmark products for the region, helping to communicate what can sometimes be a confusing subject for non-specialists. The HICAP co-ownership approach and ongoing work on developing outreach material, especially policy briefs, is designed to ensure that findings and recommendations from the programme are owned by those best placed to make or influence policy.

HICAP engagement with the media

Proactive engagement with the media in HICAP has included training journalists to understand and effectively communicate information on climate change and adaptation. The core of this approach has been to place talented journalists at the front line of climate change, in areas where they might not normally reach. Complemented by short lectures from subject specialists, and interactions with well-respected senior journalists and their own peers, they gain direct exposure to issues affecting Himalayan communities, while also developing a more complete understanding of the science of climate change and possible adaptation solutions. In total, 47 competitively-selected journalists from the four HICAP countries have been trained as part of this effort. Ten journalists have been further supported, via a grant programme, to report investigative stories on climate-related environmental issues in hard-to-reach areas, with a particular focus on adaptation measures.

The impact of this approach has been significant: a total of 70 articles and news stories have been published on HICAP-specific climate issues, and 37 investigative stories have been published by recipients of the grant programme. A young journalist from Nepal, Shahani Singh, was one of 20 journalists supported by UNDP to attend and report on the Paris climate change negotiations, as a result of her article on HICAP. Over 250 independent news articles on HICAP research and activities have been published in regional and international media over the course of the programme. Several initiatives within ICIMOD have now embedded the media engagement approach within their own activities, and other institutions are also replicating the approach through their own programmes e.g. the Indian Himalayan Climate Adaptation Programme (IHCAP).

Visual, informative assessments

HICAP places a strong emphasis on producing knowledge and communicating it in a format that is accessible to its target audiences, be it through short videos, reports, policy briefs or larger reports. One noteworthy example of this approach is the Himalayan Climate and Water Atlas, a publication which takes the latest science on climate and water in the HKH region and presents it in a clear, user-friendly format, without compromising scientific accuracy. It aims to empower stakeholders working on water-related issues in the region to take effective measures and develop appropriate policies.

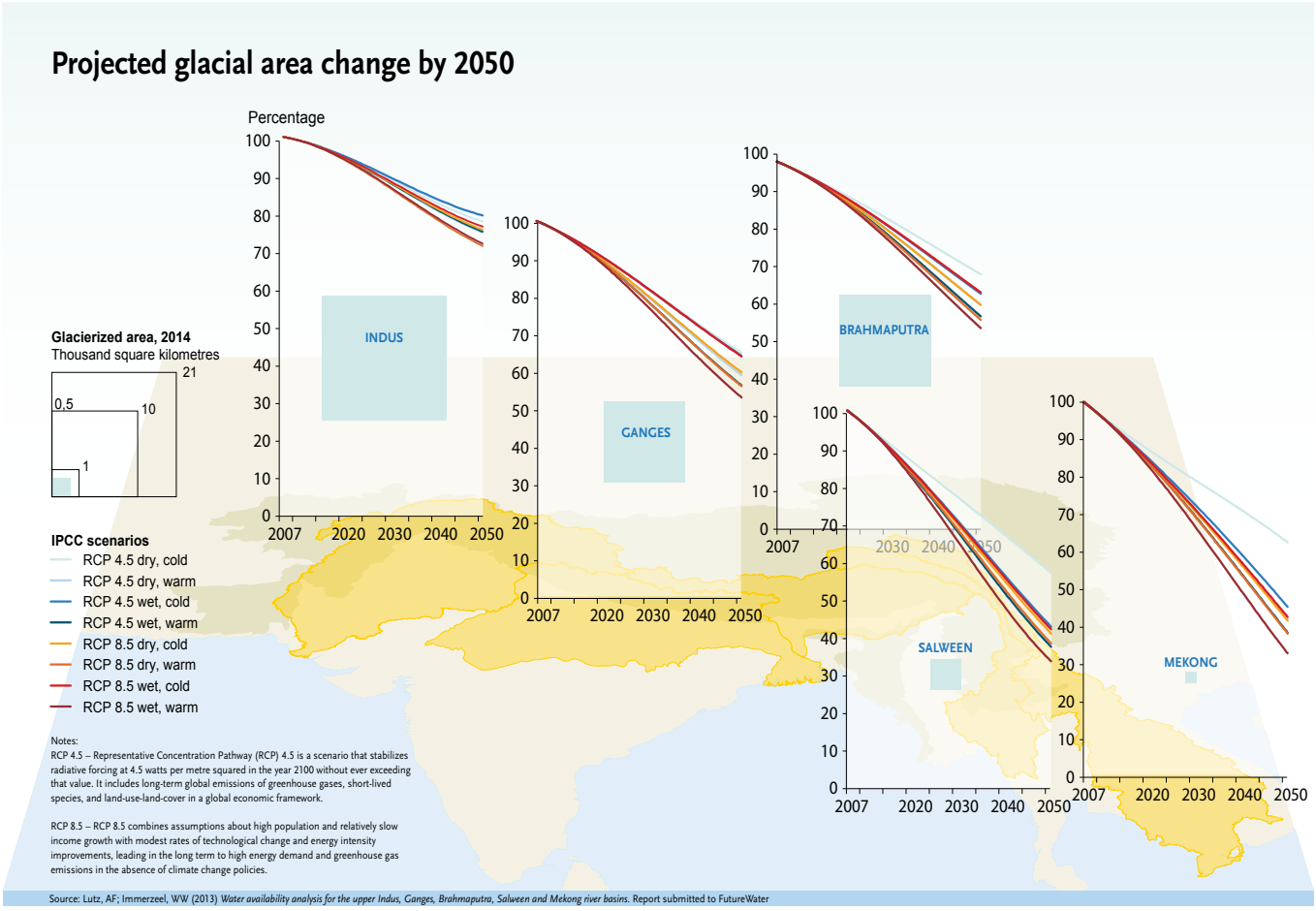
With an overload of information and a seemingly endless number of publications produced by organizations nowadays, it is easy to question the purpose of producing yet another report. Yet products like the Atlas demonstrate that, if well planned, reports still have a place in the communication toolkit. For one, the Atlas has been able to distil and communicate a holistic understanding of climate change impacts in the region, something that many individual scientific papers would not be able to do. Second, the Atlas has been able to extend the life of scientific results by re-packaging the information in more accessible formats. Thirdly, it has become a very useful primer for discussions, be they at national policy conferences or at international events. In this regard, ownership of the report by all three promoter organizations and key individuals has been crucial.

The Atlas was launched at UNFCCC's COP-21 in Paris in 2015, and was very well-received: it was covered by 7 international and 17 regional news outlets at the time of launch. The online version has been downloaded over 10,000 times, making it the most downloaded publication on the ICIMOD website in 2016. The Atlas has become a benchmark publication on climate change and its impact on water resources within the HKH region. It has been used as a guiding reference for the region in the Nairobi Work Programme, and has helped to initiate the regional priority setting workshop through the UNFCCC´s Lima Adaptation Knowledge Initiative.

Review of the Himalayan Climate and Water Atlas

An independent review of the Atlas published in the Mountain Research and Development Journal, stated that *"This Atlas would not be out of place on the bookcase of any Himalayan researcher or on the coffee table of the interested layperson. Great credit should be given to the editors and the contributors for summarizing complex data in such an accessible format."* – Dr. Duncan Quincey, University of Leeds.

Quincey, D.J. 2017. The Himalayan Climate and Water Atlas. Mountain Research and Development 37 (1): 155-156. https://doi.org/10.1659/mrd.mm197.



Lessons learned

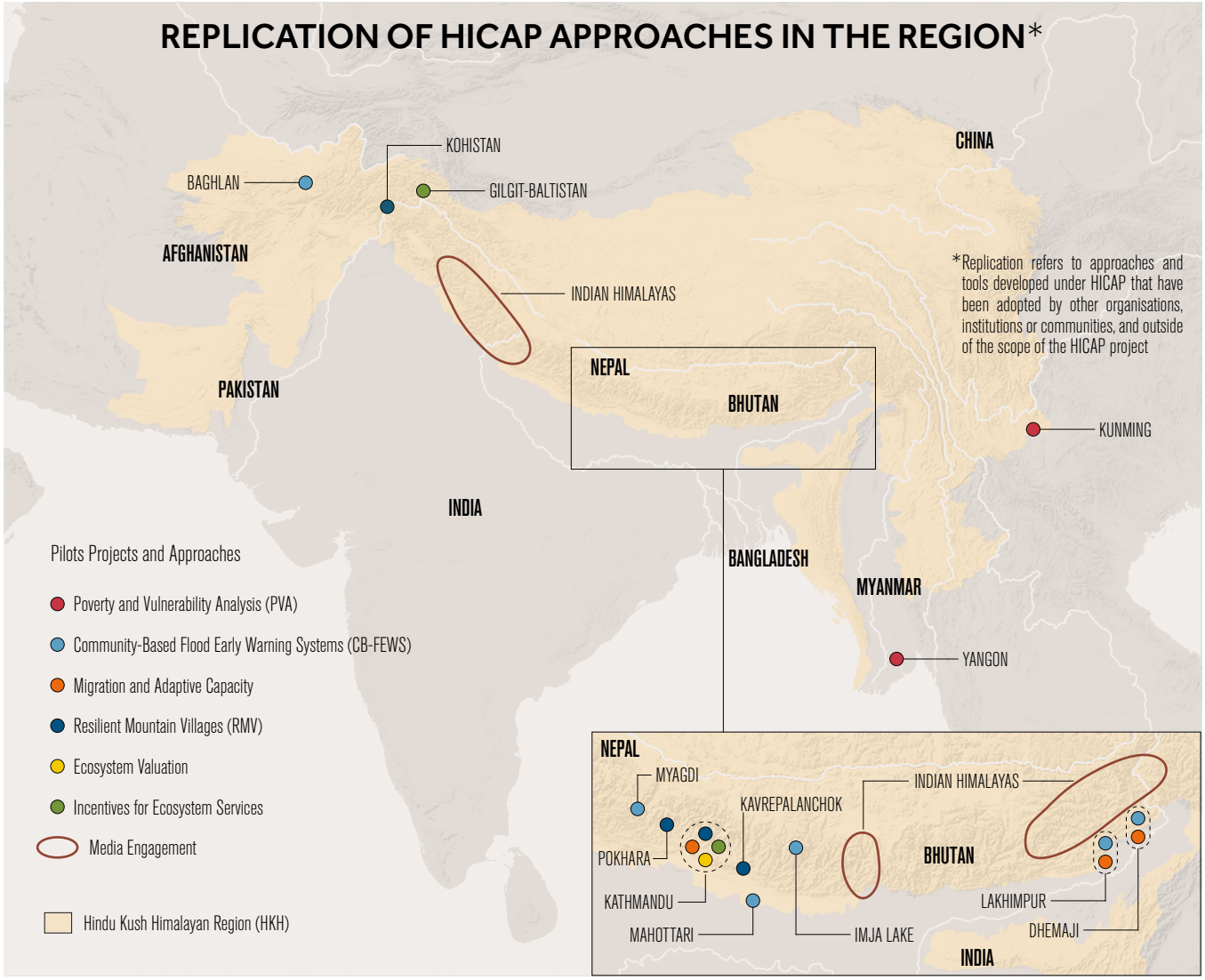
One of the main successes of HICAP has been as a source of learning. While there have been many notable results from the pilots, action research, science and outreach activities, the programme has also provided valuable lessons for the development of future programmes working for adaptation and resilience-building in the HKH region and beyond.

Policy engagement

HICAP was initiated as a programme primarily focused on generating knowledge through scientific research. Though the intention from the beginning was to ensure this knowledge is taken up and used by the stakeholders, the specific strategy for HICAP's outreach and policy engagement was not fully defined at the outset but evolved throughout the course of the programme. The interaction between policy engagement and scientific results was, in some ways, new territory for the promoters, particularly in the HKH region.

Overall, HICAP's strategy for policy engagement could have been more defined and built into activities from the start, particularly by including policy experts in the original programme team. The significant achievements in upscaling the pilots and action research (despite their relatively late initiation in 2014), could have produced even better results if this had been planned from the very beginning. In hindsight, the upscaling of activities could have been more effective with not only engagement but formal partnerships with government stakeholders from the outset, and even in the design stage of activities. This is a practice that can be employed both in research and piloting to heighten

Dr. Khatiwada, former Vice Chair of the National Planning Commission of Nepal, visits one of the Resilience Mountain Villages in 2018.



the ownership of activities by key stakeholders, enable more effective uptake, and ensure that the key priorities and concerns of stakeholders are taken into account.

The 'Policy Champions' approach, although introduced quite late in the programme, has been of great benefit. This approach centres on the identification of key individuals with professional policy and decision making experience and networks in relevant sectors in the HICAP countries. These champions have been engaged to advocate for the inclusion of HICAP research results and recommended practices in policies and programmes in their respective countries. The approach was initiated in India on a trial basis in 2015, with the selection of three Policy Champions. This has provided many opportunities for HICAP to present its results and recommendations in high-level forums, and has helped the team gain access to influential stakeholders and gain legitimacy. The Policy Champions have also been invaluable advisers for the team, helping to navigate the country's often complex decision-making landscape, a complexity that is shared across the region. If initiated at the beginning of the programme, this approach could have been used in all four of the HICAP countries, possibly to great effect. Their engagement could have helped to ensure that the questions and topics researched during the programme were relevant and of interest to key stakeholders.

In short, successful translation of scientific results into policy and practice requires a clear strategy from the outset, supported by genuine partnerships with key stakeholders and policy expertise within the programme. The lessons learned from the gradual evolution of HICAP's policy engagement strategy can be of great use to future programmes seeking to improve the uptake of scientific knowledge by key stakeholders.

Balancing science and solution-oriented action

The four 'pillars' of HICAP activities – science, action research, piloting and communication – each have their own benefits and shortcomings, which can be balanced by implementing all four action areas in an integrated way.

Scientific research and analysis, which was the programme's primary focus, has been an essential foundation for all the work undertaken under HICAP. Through science, the programme has been able to fill knowledge gaps and answer key questions on the context of change in the HKH region and the scope of adaptation options. However, policymakers and decision makers generally do not make decisions based on scientific research alone. In order to ensure that the findings are seen and taken up by key stakeholders, they need to be proven on the ground and effectively communicated. Moving from research to policy and implementation is a long process, and consequently not all the findings from HICAP research have reached the latter stages yet. However, HICAP research is part of a longer process of translating knowledge into action, and like research programmes before it, HICAP results will continue to play a role in implementation in the future.

Through action research, HICAP has succeeding in gaining a deeper understanding of certain key areas of adaptation, and has been able to systematically test practices and approaches on the ground to document their benefits and challenges. The action research conducted under HICAP has produced lessons and findings which can be integrated into more intensive pilots and larger-scale programmes in the future. However, the process of systematic action research is relatively slow-moving, and the results may not always be at a large enough scale to successfully convince decision makers. To ensure impact, the findings of action research should be further developed through piloting and documentation.

The HICAP pilots have been perhaps the programme's most successful activities in terms of uptake. By showcasing results and approaches on the ground, the pilots have enabled HICAP to tangibly 'prove' its messages and recommendations to key stakeholders in a more convincing way than is possible through publications alone. However, pilot actions must be founded on a solid base of scientific evidence. Documenting the results of piloted approaches through scientific analysis is also important to ensure their uptake and credibility at a larger scale.

Finally, communication and dissemination of knowledge is essential for taking forward the achievements of the other pillars of action, and ensures that findings and results reach the intended audiences. Without a solid communication strategy, important messages may not reach further than the programme's immediate partners. Communication should not only be an end-line activity, but instead incorporated from the beginning to build two-way communication with key stakeholders.

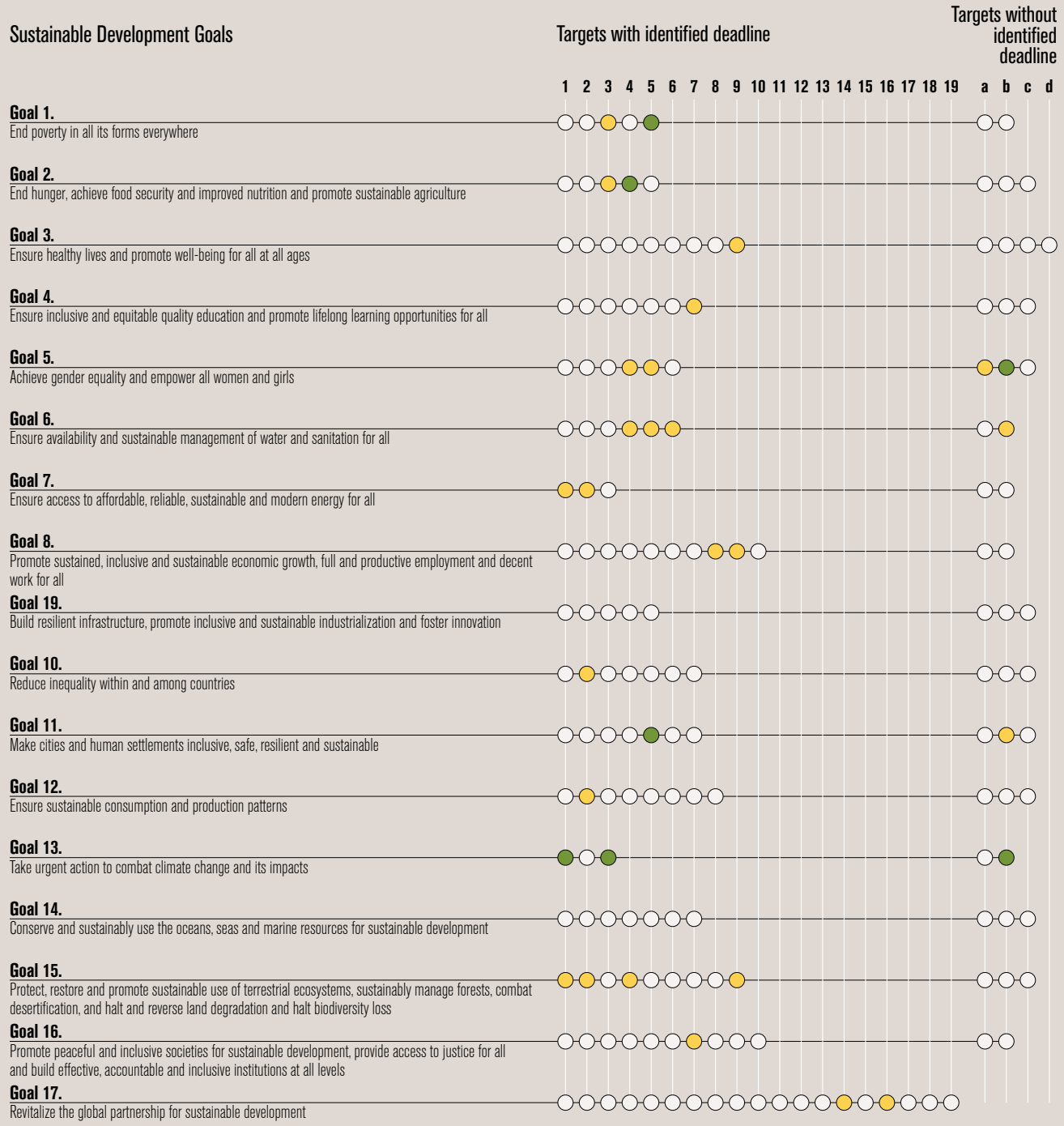
Future programmes working towards similar objectives may benefit from more cohesive planning: integrating the activities of all four pillars, as many of the weaknesses characterizing one pillar may be offset by the strengths of another. By planning activities in a way that complements the activities in other pillars, a programme will be able to develop solution-oriented approaches and recommendations, underpinned by strong science and communicated in an effective way to key stakeholders. The benefits of this integrated model have been a significant lesson from the HICAP programme.

Partnerships

HICAP's partnership structure has provided several opportunities for learning, particularly in terms of the relationship between the 'promoters': ICIMOD, GRID-Arendal and CICERO. Overall, the three promoters and the 28 implementing partners have been essential to the success of HICAP's interdisciplinary and multiple-country programmatic model. By engaging partners with different kinds of expertise and capacity in research and implementation, the programme has been able to draw on the strengths of each individual partner organization, achieving far more than any of these individual organizations could on their own. In particular, the combination of CICERO's scientific expertise, GRID-Arendal's capacity for effective communication of environmental science, and ICIMOD's regional knowledge and networks has been essential to HICAP's successes.

HICAP´s Contribution to Sustainable Development Goals and Targets

The knowledge generated from HICAP science, action research and piloting has contributed to the understanding of how 15 of the 17 Sustainable Development Goals can be achieved in the Hindu Kush Himalayas, to a greater or lesser extent.[1]



[1] This table is based on a qualitative judgement by the promoter organisations, and as such should not be interpreted as a definitive monitoring and evaluation tool.

However, the long physical distances between the institutions proved to be a challenge. It would have been beneficial to have contact point(s) for both Norway-based promoters physically based for a considerable length of time within ICIMOD (where the programme's management structure was based), to cement working relationships and enable closer collaboration.

Another lesson can be found in the collaboration with the Chinese partners. The Chinese context is quite unique in the region, in terms of modes of collaboration, the logistics of implementing research activities, and policy engagement. Unlike the other HICAP sites, work in the Salween-Mekong basin had to be implemented primarily by the Chinese partners, with ICIMOD and other partners acting as advisers. In 2014, HICAP engaged a Chinese Communication Officer, who benefited the programme significantly by overcoming language barriers, building stronger relationships with the Chinese partners, verifying the quality of research outputs from China (mainly published in Chinese), and advising on systems and protocols in the Chinese context. Future programmes may benefit from engaging similar 'country contact points' from the outset.

Overall, many of HICAP's achievements would not have been possible without the diversity and complementarity of the partners engaged in the programme, and this model would be of benefit to future programmes seeking to work in similar cross-discipline and multiple-country contexts.

HICAP Partner organisations

We would like to gratefully acknowledge the following partner organisations of HICAP (below). More details on the HICAP team can be found at icimod.org/hicap

Bangladesh
- Institute of Water Modelling (IWM)

China
- Asia International Rivers Center (AIRC)/Yunnan University
- Chengdu Institute of Biology (CIB)
- Ecological Environment Protection Research Center, Yunnan Institute of Environmental Science
- Institute of Geographic Sciences and Natural Resources Research (IGSNRR)
- Kunming Institute of Botany (KIB) – including Centre for Mountain Ecosystem Studies (CMES)
- Social Development Institute, Sichuan University
- Women and Development Research Centre (WAD), Yunnan Academy of Social Sciences (YASS)

India
- Aaranyak, India
- Indian Institute of Technology (IIT) Delhi
- Indian Institute of Sciences (IISc) Bangalore
- Institute of Integrated Resource Management (IIRM)
- Swayam Shikshan Prayog (SSP)

Nepal
- Center for Environmental and Agricultural Policy Research, Extension and Development (CEAPRED)
- Development Knowledge Management and Innovation Services Private Limited (DeKMIS Pvt Ltd)
- Koshi Victim Society (KVS), Nepal
- South Asian Network of Environmental Economists (SANDEE)
- Nepal Development Research Institute (NDRI)
- World Wide Fund for Nature (WWF)
- Women Organizing for Change in Agriculture and NRM (WOCAN)

Pakistan
- Aga Khan Rural Support Programme (AKRSP)
- International Water Management Institute (IWMI)
- Pakistan Agriculture Research Council (PARC)
- World Wide Fund for Nature (WWF)

International
- Bjerknes Centre for Climate Research (BCCR), Norway
- FutureWater, the Netherlands
- International Institute of Social Studies, The Hague, Netherlands
- University of Sussex, United Kingdom

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This short report illustrates a selection of the key findings, successes and lessons learnt of the Himalayan Climate Change Adaptation Programme (HICAP) over the period 2012–2017. It focusses on a few, selected approaches that HICAP has taken in the fields of science, action research, pilot activities, and communications and outreach. It also highlights some of the important lessons learnt over the duration of the programme, particularly in terms of policy outreach, and the strengths and also challenges of partnerships.

HICAP is an ongoing programme continuing until the end of 2018.

For more details, please visit www.icimod.org/hicap

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