

# Himalayan Climate Change Adaptation Programme (HICAP)

Emerging Evidence of Change for Policy and Action

°CICERO  
Center for International  
Climate and Environmental  
Research - Oslo

GRID  
ARENDAL  
A Centre Collaborating with UNEP

ICIMOD

FOR MOUNTAINS AND PEOPLE



HICAP is a pioneering collaboration between three organizations – International Centre for Integrated Mountain Development (ICIMOD), GRID-Arendal and Center for International Climate and Environmental Research – Oslo (CICERO).

The programme aims to help enhance the resilience of mountain people, particularly women, by improving understanding of vulnerability to change and identifying opportunities and potential for adaptation.

To achieve this, the programme seeks to increase understanding of change and uncertainties, enhance capacities, and make concrete proposals for policy and action.

# HICAP in a Nutshell

Generating knowledge about the impacts of climate change on natural resources, ecosystem services, and the communities that depend on them in order to contribute to policy and practice for enhanced adaptation.

“People who are socially, economically, culturally, politically, institutionally, or otherwise marginalized are especially vulnerable to climate change.”

– IPCC Fifth Assessment Report (2014)

## Approaches for Impact

Producing **high-quality science** and disseminating findings through publication in international peer reviewed journals and knowledge products tailored to different audiences.

### Proactive policy engagement

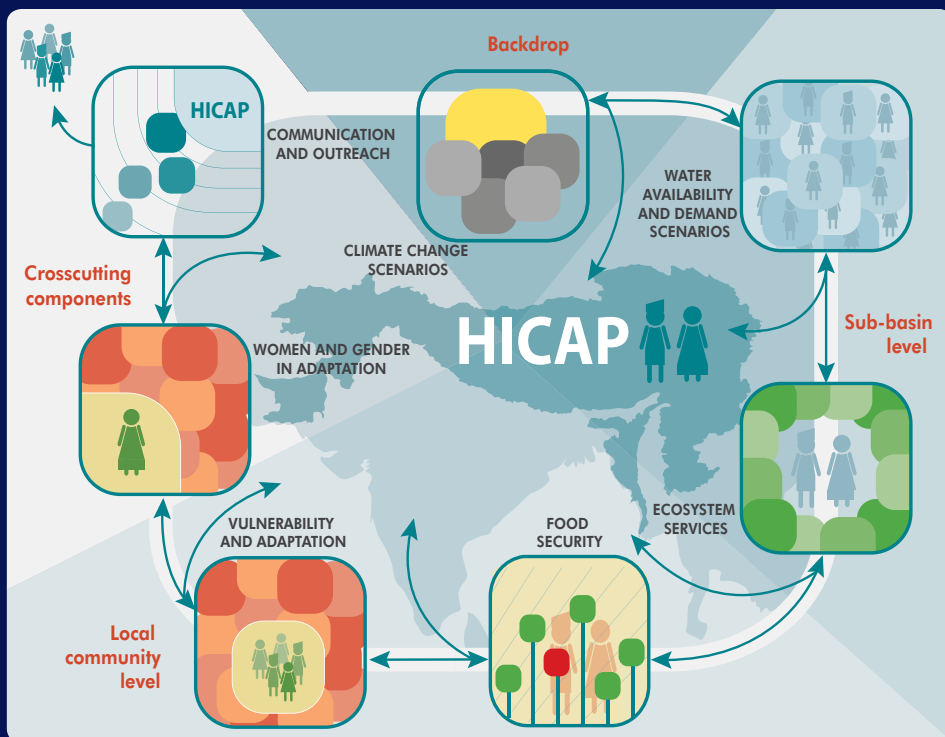
by sharing HICAP findings and approaches at national, regional and global events, organising stakeholder dialogues and creating strong partnerships with governments at every level.

### Hands-on media engagement

through journalist training and grant programmes. Complex science is communicated in simple language, supported by engaging visual representations and by sharing HICAP findings through print, radio, video, and web.

**Cross-thematic integration**, to provide a more comprehensive picture of the impacts of climate change and support the development of holistic adaptation approaches.

## HICAP Framework



# Initial Results

## Change in river flows

### Increased uncertainty of water flow and availability

Hydrological modeling was carried out in the upstream areas of five river basins – Indus, Ganges, Brahmaputra, Salween and Mekong – using Representative Concentration Pathway (RCP) scenarios RCP 4.5 and RCP 8.5. The results show that glaciers in the five river basins are likely to reduce by 20% to 55% by 2050.

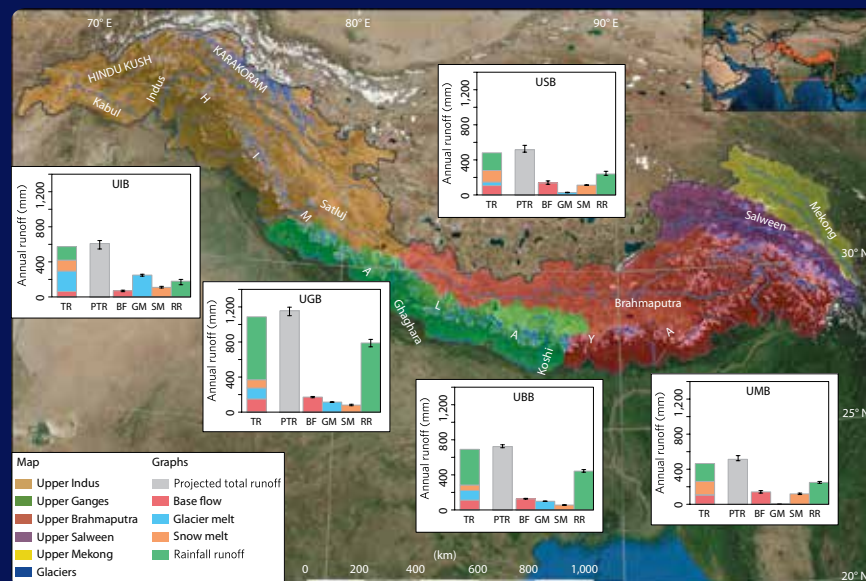
Due to melting of glaciers and increased precipitation, the overall river flows are likely to increase or remain unchanged from 2041 to 2050 compared to 1998 to 2007 for all five river basins.

By 2050, total runoff is likely to change:

- -5% to +12% in the upper Indus basin
- +1% to +27% in the upper Ganges
- 0% to +13% in the upper Brahmaputra
- 3% to +19% in the upper Salween and
- +2 to +20% in the upper Mekong

The results strongly indicate that governments have to be prepared to deal with unexpected floods and dry periods, despite greater water flows on an aggregate basis.

## The upstream basins of Indus, Ganges, Brahmaputra, Salween and Mekong



Bar plots show the average annual runoff generation (TR) for the reference period (1998–2007, REF; first column). The second column shows the mean projected annual total runoff (PTR) for the future (2041–2050 RCP4.5) when the model is forced with an ensemble of 4 GCMs. In the subsequent columns, PTR is split into four contributors (BF: baseflow, GM: glacier melt, SM: snow melt, RR: rainfall runoff). Error bars indicate the spread in model outputs for the model forced by the ensemble of 4 GCMs (Lutz et al. 2014').

“The climate has already changed a lot. Last year we suffered from floods, now we are suffering from drought. There is no rain, but we must cultivate our land. Otherwise we will have nothing to eat.”

– 60-year old farmer, Lower Laopani, Tinsukia, India

<sup>1</sup> Lutz, AF; Immerzeel, WW; Shrestha, AB; Bierkens, MFP (2014) 'Consistent increase in High Asia's runoff due to increasing glacier melt and precipitation'. *Nature Climate Change*, advance online publication. doi: 10.1038/nclimate2237



## Ecosystem services and forest patterns

### Strong community desire for improved resource management.

Research shows that changes in forests in the Koshi River basin are caused by a number of climatic and non-climatic factors, and that overgrazing is one of the key factors affecting forest cover. The projected increase in erratic rainfall and river flows is expected to escalate degradation and trigger landslides.

Valuation of ecosystem services in the same river basin showed that households expressed a 'willingness to pay' (WTP) up to 13 work days (equivalent to USD 31) for improved watershed

management and services which could provide increased water for domestic and irrigation use, an extra basket of leaf litter, and a head load of fuelwood.

The results provide various options for better management of forests and watersheds, with potential for payment for ecosystem services (PES). HICAP intends to initiate a pilot for PES implementation and identify possible institutional mechanisms.

### Key questions

- What are the potential impacts (positive and negative) of change, and how can the capacity to monitor them be enhanced?
- What are the vulnerabilities and adaptive capacities of human and natural systems in the Hindu Kush Himalayan region?
- What evidence of potential risks and opportunities can be provided to decision makers in order to increase the adaptive capacity of mountain people, particularly women?

### Facts about HICAP

- 8,000 households surveyed for Poverty and Vulnerability Assessments within almost 350 settlements in 4 countries
- 25 regional and global partners
- 31 peer reviewed publications – 8 published, 13 submitted, and 10 drafted
- 21 knowledge products – 11 published, 10 in pipeline
- 34 print, radio, video, and web stories from collaboration with journalists and media
- 37 stakeholder engagements organized and/or participated in to share HICAP results



## Food security

### Changing farming systems require climate-smart practices

Farmers in the eastern Brahmaputra and Koshi River basins have experienced decreased productivity in both staple and cash crops and attribute this to environmental and other changes. In the Upper Indus, farmers have noted a decrease in staple crops and increase in cash crops, whereas no change has been recorded in the Salween-Mekong.

Incentivized by governments and private companies, farmers are largely shifting from subsistence to cash crops. This leaves households vulnerable to market and price fluctuations, can lead to a loss of self-sufficiency, and could potentially damage local biodiversity.

Up to 40% of males in rural communities in the Koshi basin are migrating for domestic and international work. Women are left to manage work in the field while the decision-making power often remains with the absent men.

Research shows that governments and organizations can enhance food security by encouraging diversification of crops in small-scale farming, reevaluating cash crop and livelihood programmes from a climate-smart perspective, incentivizing youth to maintain and develop farming systems, and strengthening education and knowledge-sharing networks.



## Empowering women

Women left with the responsibility – and challenges – of agriculture in a changing environment.

Data from a poverty and vulnerability assessment in Nepal seems to give rise to a new narrative about the effects of male migration and the feminization of agriculture. In Khotang, female-headed households reported facing more difficulty than male-headed households in procuring enough seed and fodder for agriculture, but they reported facing the same level of difficulty as the latter when it came to feeding household members.

For female-headed households, remittances play an important role in mitigating loss of labour due to migration. Eighty-one per cent of female-headed households receiving remittances in Khotang reported using hired labour, compared with 53% of non-recipients, and remittance recipients also hired 42% more workers.

Access to key resources helps women find a way to manage additional burdens. A focus on women-friendly agricultural approaches is needed, including improved agri-equipment, technologies, and mobile extension services. In addition, options should be explored to improve women's ownership of and access to resources, such as a revival of traditional women-owned crop practices (*pewa crops*).

## Community-based flood risk management

Initiatives for a community-based flood early warning system and flexible flood management planning have been piloted in two tributaries of the Brahmaputra River in Assam, India.

The installed community-based flood early warning systems send warning signals to 42 downstream communities along the Singora and Jiadhah rivers. Villagers estimate that the warning signals sent by one of the systems saved livestock and property worth USD 3,300 in 2013.

Flexible flood management planning-trained field facilitators have worked with communities to record rainfall and temperature data and to create flood maps.



## Poverty and Vulnerability Assessment (PVA)

### Identifying and assessing poverty and vulnerability in the HKH

Survey data from 8,083 households in four river basins has been collected under HICAP. A Multi-Dimensional Livelihood Vulnerability Index (MLVI) was applied to analyse the data. The MLVI uses multi-dimensional livelihood measurements and enables identification and assessment of vulnerable households and communities.

Analysis of data from Nepal, India, and Pakistan has begun, with a number of initial results:

Respondents in the flood plains of the Brahmaputra estimate a loss of USD 155 per household from environmental shocks in 2011. The largest damage was in Dhemaji in India, where households reported losing USD 340, predominantly because of floods and droughts.

For all four river basins, households' self-reported food sources are on average 41% self-produced, 51% store bought, and only 8% from food subsidies and other sources. This shows that rather than food subsidies, programmes should focus on strengthening agriculture and diversifying income opportunities.



More land is being left fallow in lowland areas due to a combination of factors such as reduced income from agriculture and outmigration of men for employment. Meanwhile, farmers at higher altitudes are exploring new opportunities. With increasing temperatures, crops that were previously growing only at lower altitudes are being moved upwards.

Further analysis of the data is being carried out. The PVA is expected to be a powerful instrument for informing policy and practice to address vulnerability and adaptation in the HKH.

## Mapping the Way Forward

Building on these results, HICAP will continue programme activities until 2017 and will take into account the multiple change processes currently ongoing in the Hindu Kush Himalayas. During this time, the programme is expected to produce more evidence-based knowledge to provide multi-dimensional understanding of the complex change processes in the HKH, as well as concrete advice for appropriate policy and action at all levels.



## Implementing Partners

### 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

### Nepal

- Center for Environmental and Agricultural Policy Research, Extension & Development (CEAPRED)
- Koshi Victims Society (KVS), Nepal
- Nepal Development Research Institute (NDRI)
- South Asian Network for Environmental Economics (SANDEE)
- World Wide Fund for Nature (WWF)
- Women Organizing for Change in Agriculture and NRM (WOCAN)

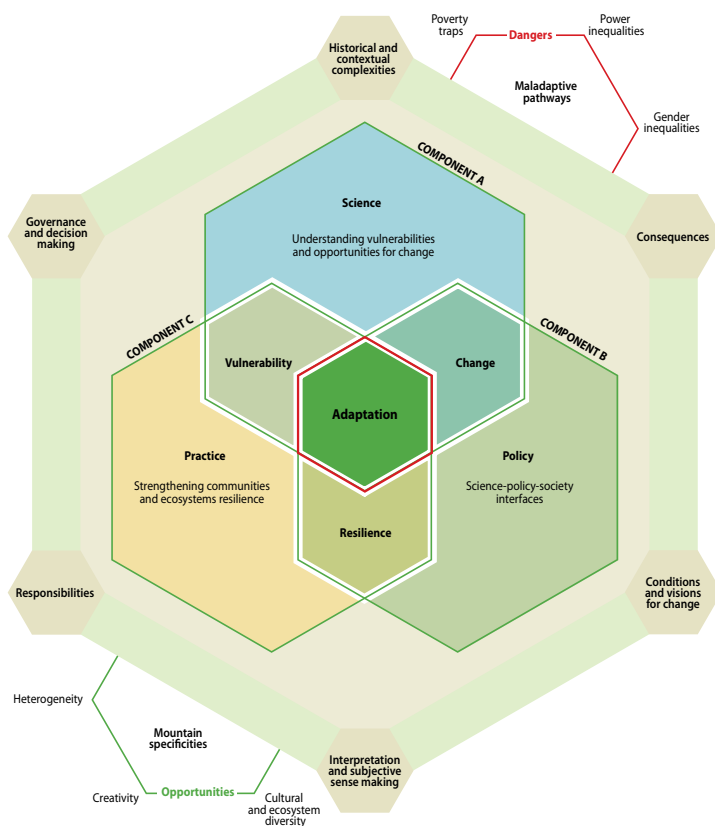
### Pakistan

- 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

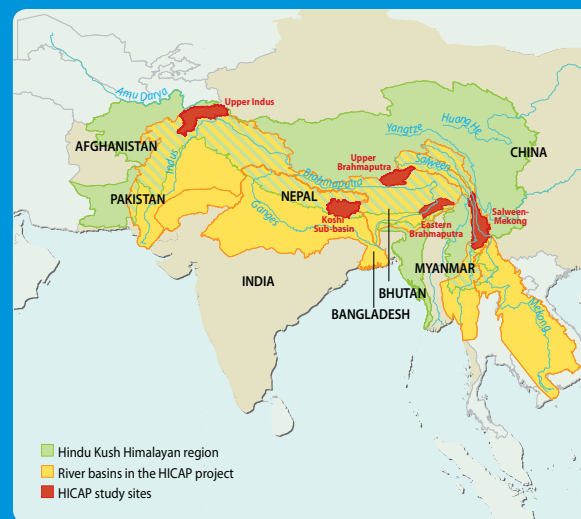
## Scientific Framework for ICIMOD's Regional Programme on Adaptation to Change



## Scientific Framework

HICAP has developed a unified scientific framework that is also being applied across ICIMOD's Regional Programme on Adaptation to Change. The framework contributes to streamlining the methodologies and findings of the programme and to delivering consistent scientific results in line with the latest discussions of the Intergovernmental Panel on Climate Change. The scientific framework provides a way to understand the results of the work under each HICAP component in a holistic way.

### HICAP project sites



Base map source: ESRI Map and Data 2001



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