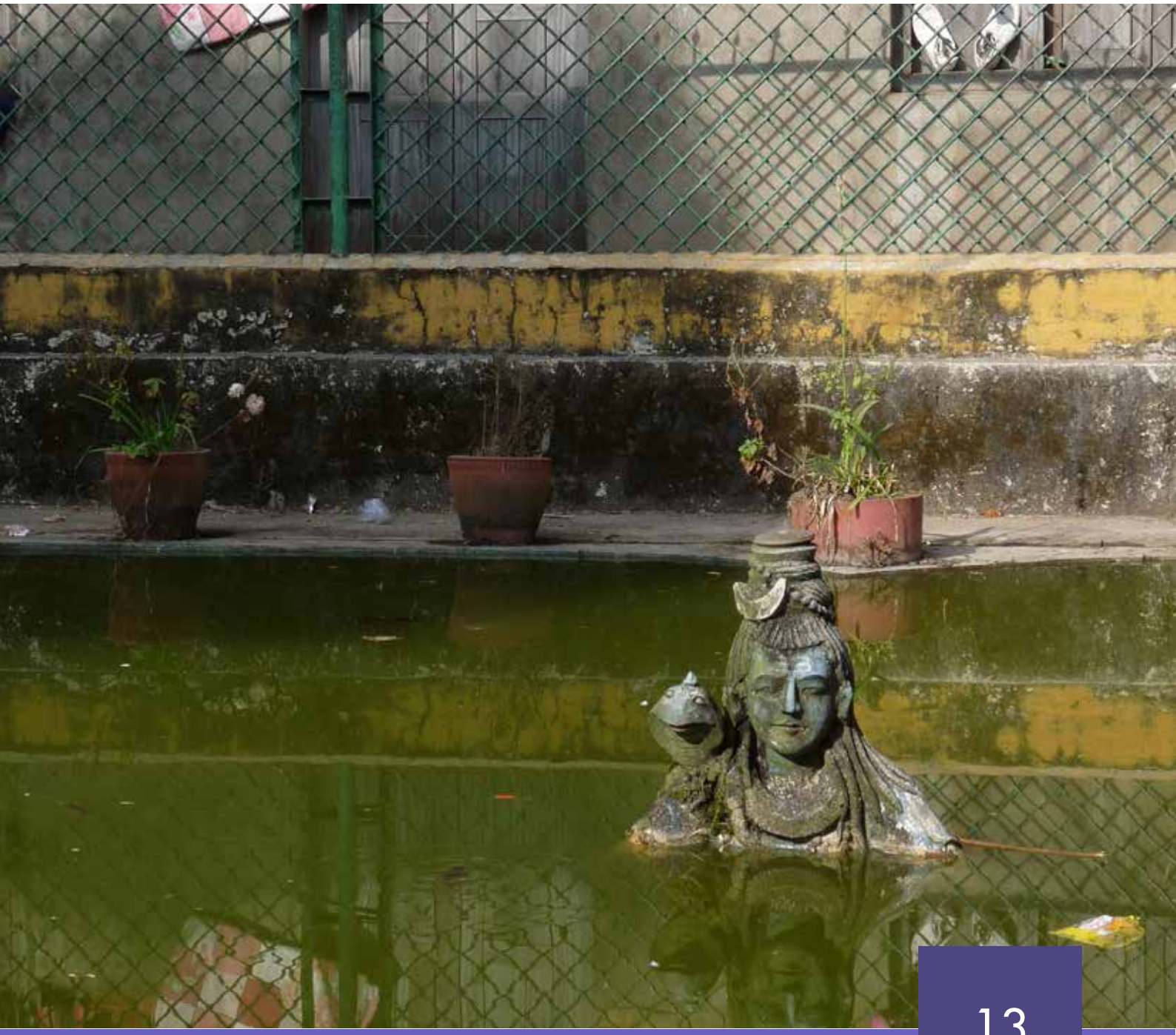
CARIAA
Collaborative Adaptation Research Initiative in Africa and Asia

HI-AWARE



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Communities in the Indus, Ganges and Brahmaputra Basins Already Experiencing Critical Climate Stress Moments

About HI-AWARE

HI-AWARE aims to enhance the adaptive capacities and climate resilience of the poor and vulnerable women, men, and children living in the mountains and flood plains of the Indus, Ganges, and Brahmaputra river basins. It seeks to do this through the development of robust evidence to inform people-centred and gender-inclusive climate change adaptation policies and practices for improving livelihoods.

The HI-AWARE consortium is led by the International Centre for Integrated Mountain Development (ICIMOD). The other consortium members are the Bangladesh Centre for Advanced Studies (BCAS), The Energy and Resources Institute (TERI), the Climate Change, Alternative Energy, and Water Resources Institute of the Pakistan Agricultural Research Council (CAEWRI-PARC) and Wageningen Environmental Research (Alterra). For more details see www.hi-aware.org.

This series is based on the work of the Himalayan Adaptation, Water and Resilience (HI-AWARE) consortium under the Collaborative Adaptation Research Initiative in Africa and Asia (CARIAA) with financial support from the UK Government's Department for International Development and the International Development Research Centre, Ottawa, Canada. CARIAA aims to build the resilience of vulnerable populations and their livelihoods in three climate change hot spots in Africa and Asia. The programme supports collaborative research to inform adaptation policy and practice.

Production team

Nagraj Adve & Samuel Thomas (Editors)
Debabrat Sukla (Communication officer, HI-AWARE)
Mohd Abdul Fahad (Graphic designer)

Photo Credits

Saskia Werners

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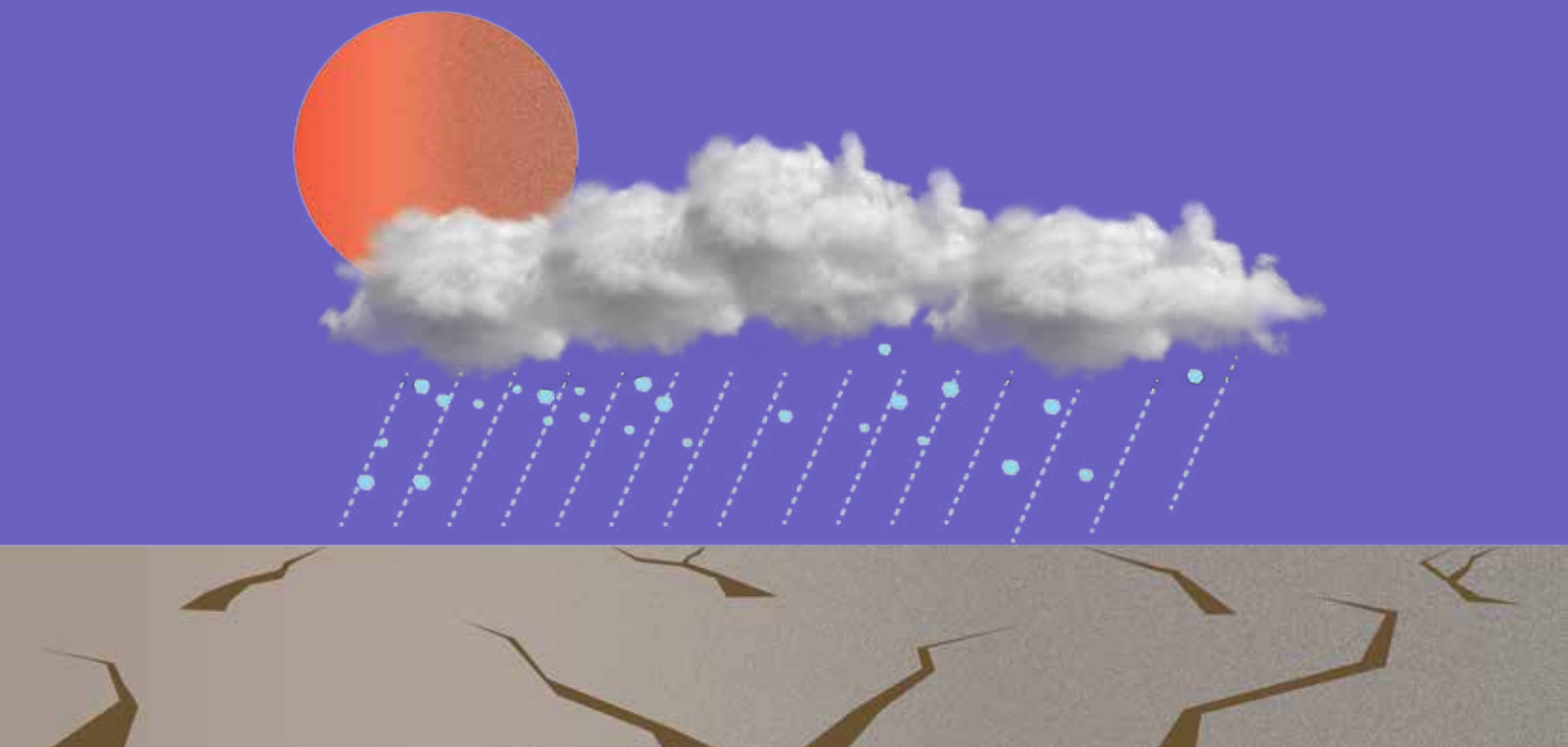
Key Message

Communities in the Hindu Kush Himalayan region are already experiencing critical climate stress moments, which form a growing risk to their livelihoods. These stresses are experienced differently by men and women and are driven by a changing climate and perceptions of more extreme weather events in the past years. Community perceptions of change and climate events in the past ten years reveal increasing temperatures, erratic and untimely rainfall, hailstorms, drought and decrease in snowfall. These variabilities affect agriculture, the major component of their livelihoods, at various stages of the crop cycle depending on the study sites, and communities are adapting to these changes by altering the crop cycle or shifting to climate resilient crops.



Introduction

Critical Climate Stress Moments are those periods of time when a livelihood system is the most vulnerable to climate related stresses. Understanding local communities' vulnerabilities through critical moments helps in tailoring adaptation options to certain livelihood systems at an appropriate time. In the case of agriculture, the concept includes the time dimensions of climatic stresses and their effects on various crop stages affecting the livelihood of the community. Critical moment assessment, therefore, provides particular attention to timing in relation to local/household level vulnerabilities including temperature levels, critical months and thresholds.

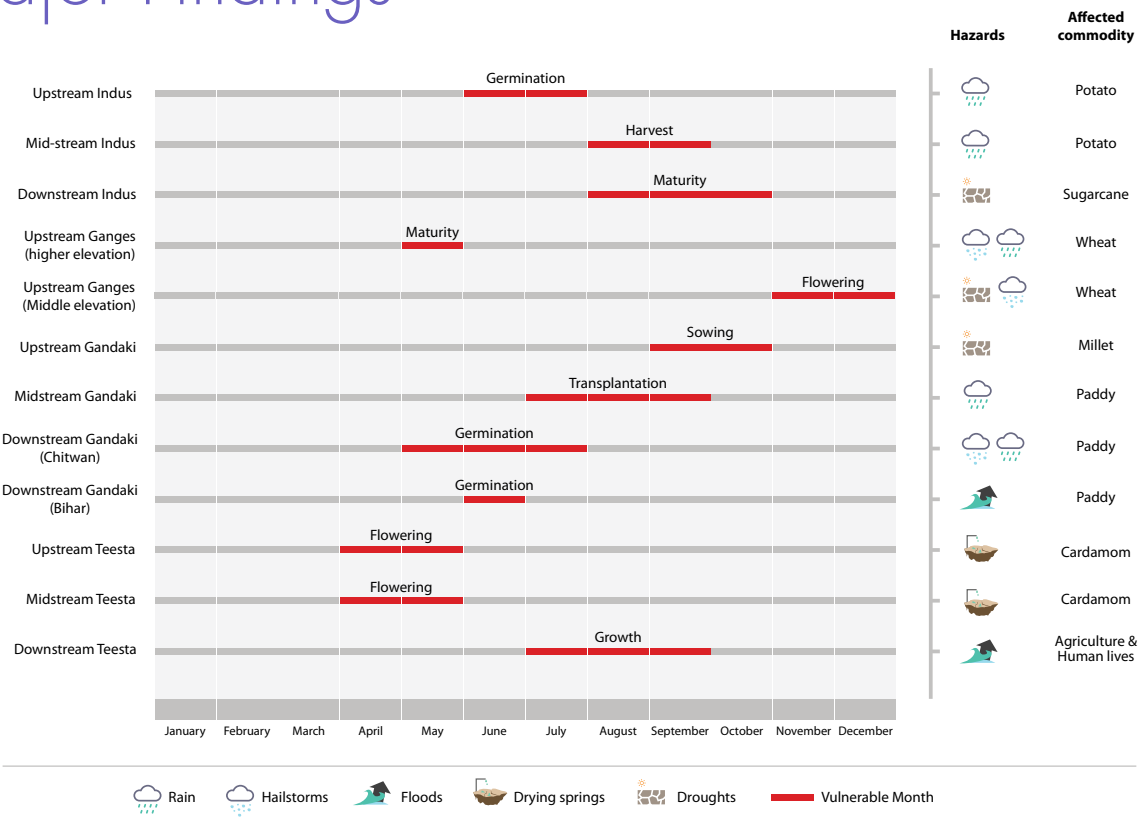
The assessment has provided direct and indirect effects of climate related stresses at household level and has paid more attention to timing of these events in relation to local vulnerabilities. For example if drought delays the sowing of a crop then it is subject to stresses in the later stages of the crop cycle. The critical moments concept, developed under HI-AWARE, brings together the world of climate models, people's perception/realities and policy decisions. In the twelve study areas of HI-AWARE we found that critical moments are context, scale and geography specific. The communities are also altering the crop cycle according to the weather as an adaptation action. The assessment of critical moments by HI-AWARE consisted of three components:

1. Assessment of the livelihood system, perceived climate stresses and gender, socio-economic and biophysical drivers of vulnerability.

2. The use of historical climate data on (trends in) precipitation, temperature, flood occurrence, hailstorms or snowfall, and insight into thresholds identified in a critical moment assessment through the tailoring of climate modelling and climate scenarios.

3. A qualitative and quantitative critical moment assessment supported by literature review. The survey for the assessment was carried out with around 2000 households in the twelve HI-AWARE study sites across the Indus, Ganges and Brahmaputra Basins.

Major Findings



The research identifies agriculture as the major source of livelihoods in the IGB Basins. Previous literature review of critical moments identified major crops that are adversely affected by climate change and disasters like floods and heat stresses in the IGB river basins. Building on this, qualitative and quantitative data were collected to assess the critical moments across the study sites. The critical moments for various crops, with the most critical stage in the crop cycle, are shown in the figure.

From the figure it is obvious that extreme/erratic rainfall and drought are the major concerns for the community and the critical period varies across the year for different crops, affecting crops which are largely the income source of the communities or subsistence agriculture. A few communities are responding and coping to the critical moment by adopting new agricultural techniques such as introduction of new varieties of crops suited to the changing climate and improved/modified cropping patterns. Communities are also delaying or advancing planting of crops to cope with the changing rainfall patterns. As for coping with disasters like floods, the practices include building flood resilient structures like constructing houses and embankments to protect their assets and crops. The male members of the communities, in some cases, are migrating to lessen the financial burden brought upon them by events like the Nepal 2015 earthquake and frequent floods. This has resulted in changing social dynamics with an increase in women led households.

Policy Action

The study basins of HI-AWARE are vulnerable to climate change especially in terms of water availability. Communities depend on agriculture, livestock, forests and biodiversity for their livelihood. These systems, depending on the location, are affected by climatic stresses such as erratic/extreme rainfall (Indus, Upper Ganga), drought (Indus and Gandaki), decrease in snowfall (Upper Ganga, Gandaki) and climate extremes (floods in Gandaki and Lower Teesta). Critical moments therefore can be in various stages depending on the effects of aforementioned climate stresses. Major stress moments are being experienced in the agriculture sector where erratic rainfall and drought have adverse impacts at different stages of the crop cycle.

Although communities have experienced changing climate in the past years, they are unaware of the science behind it. Erratic rainfall and water availability seem to affect communities the most, with temperature variability as another major effect. Some indirect effects of increase

of temperature can be seen in the form of increased pest attack and heat waves which restricts farmers from work in the field during daytime.

Smart water management technologies are recommended for policy makers to address the critical moments that are experienced by the communities. Further, climate smart agriculture should be advised in the form of zero tillage, solar powered irrigation pumps and micro-irrigation. In terms of water governance there is inadequate legal and policy focus as well as institutional issues and implementation gaps.

Conclusion

Given that the majority of livelihood systems depend mainly on agriculture, this research points out that climatic stress are affecting communities. Various surveys, point to the fact that the communities have no long-term adaptation strategies, and are forced to accept the changes as they occur. Although there are some interventions by government agencies in adaptation, no long-term strategies have been formulated yet. Communities have been learning to cope with critical moments on an autonomous basis. In interviews with government officials on introducing new climate-resilient varieties of crop, we found out that they were actually studying it. Many researchers are also working on resilient crops. The big problem lies in the gap between science and application, especially in the case of climate-resilient crop varieties. An improved livestock breed will also help in coping with the adverse impacts of climate stress, and increase resilience when diseases break out.

HI-AWARE identified four types of critical moments: those with immediate, delayed, combined and shifted impacts. This distinction is novel as it considers time lags between a hazard's occurrence and realization of its impact.

The availability or non-availability of water impacts crops as well as the health of communities. Climate-smart techniques should be implemented to mitigate this adverse effect. Water-efficient crops that require less water will help increase the supply of water and implementing efficient irrigation techniques will increase the efficiency of water use.

In the lower stretches of the river basins, disasters like floods (riverine and flash) are a constant threat to communities. Other adverse impacts faced by these areas are heat/cold waves which affect the community as well as the livelihood systems. Early warning systems should be set up in the floodplains, and these would be more sustainable if they are managed by the communities themselves. The introduction of flood-resilient crop or fish farming is an alternative livelihood strategy to cope with these adverse impacts.

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This brief is based on the following HI-AWARE publications:

Chowdhury, D.R., Bajracharya, S.B. (2018) Water Management Technologies for Climate Smart Agriculture in South Asia: A Review. HI-AWARE Working Paper 14/2018. Kathmandu: HI-AWARE

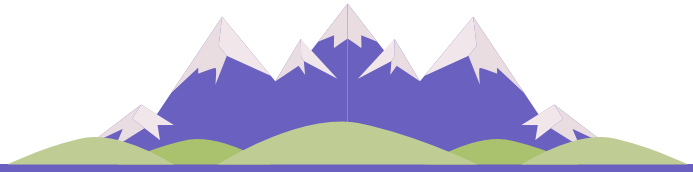
Groot, A., Werners, S., Regmi, B., Biemans, H., Gioli, G., Hassan, T., Mamnun, N., Shah, H., Ahmad, B., Siderius, C., Singh, T., Bhadwal, S., Wester, P. (2017). Critical climate-stress moments and their assessment in the Hindu Kush Himalaya: Conceptualization and assessment methods. HI-AWARE Working Paper 10. Kathmandu: HI-AWARE

Groot, A., Singh, T., Pandey, A., Gioli, G., Ahmed, B., Ishaq, S., … HI-AWARE. (2018). Literature review of critical climate-stress moments in the Hindu Kush Himalaya: A resource kit. Kathmandu, Nepal. Retrieved from http://lib.icimod.org/record/33837/files/HI-AWARE-Resource Kit.pdf

Hassan, S. M. T., Bhadwal, S., Dilshad, T., Gorti, G., Hussain, A., Mamnun, N., . . . Syed, M. A. (In Review). Critical climate stress moments: Evidence from Teesta basin in India and Bangladesh. HI-AWARE Working Paper.

Regmi, B.R., Shrestha, K. (2018) Policy gaps and institutional arrangements for water resources management in Nepal. HI-AWARE Working Paper 16/2018. Kathmandu: HI-AWARE

Shah, H., Hellegers, P., Siderius, C. (In Review). Vulnerability of agriculture to intra-annual climate variability: A synthesis to define different types of critical moments.



Contributors: Avash Pandey[1], Annemarie Groot[2], Suruchi Bhadwal[3], Saskia Werners[2], Tanvir Hassan[4], Bashir Ahmad[5], Sultan Ishaq[5], Abid Hussain[1], Christian Siderius[2] and Philippus Wester[1]

For more information, please contact Avash Pandey at avash.pandey@icimod.org

[1] International Centre for Integrated Mountain Development, Nepal
[2] Wageningen University and Research, The Netherlands
[3] The Energy and Resources Institute, India
[4] Bangladesh Center for Advanced Studies, Bangladesh
[5] Pakistan Agricultural Research Council, Pakistan

Himalayan Adaptation, Water and Resilience
(HI-AWARE) Research
c/o ICIMOD
GPO Box 3226, Kathmandu, Nepal
Tel +977 1 5275222
Email: hi-aware@icimod.org; Web: www.hi-aware.org

Consortium Members

Strategic Partners