

## Chapter 2

# Traditional Water Management System for Climate Change Adaptation in Mountain Ecosystems

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### ABSTRACT

*The physical characteristics and geographical isolation of mountain ecosystems in Himachal Pradesh has contributed towards a practice of cooperation and development of traditional knowledge among local communities. Over the centuries these traditional knowledge has been used to manage resource scarcities and adapt to vulnerabilities by the local population for over many generations. This paper describes one of such traditional 'Farmers Managed Irrigation System' (FMIS) practice, Kuhl, it's an open channel irrigation system to capture and transfer fresh snowmelt water from the glaciers to the agricultural fields in the valley. The characteristic of the local water management institution (structure, participation, process and governance) has been studied to understand their performance and success in managing water rights over the centuries. Lastly, the paper discusses the relevance of traditional water management against the backdrop of climate change, present status and issues related to the continuance of the Kuhl system and recommendations thereof.*

### INTRODUCTION

Lot of factors like social, political, financial, and ecological that governs the lifestyle, culture, livelihoods and ultimately the life of mountain communities across the world. These communities are already vulnerable as a result of resource paucity, poor connectivity and fragile geographic conditions, to complicate the situation further global climate change has become an additional issue that will or in fact is affecting mountain communities directly and is also aggravating the impacts of other aspects of change (Aizebeokhai, 2009; Hansen et al., 2000; Toprak et al., 2013).

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Variations in local climate patterns and resultant phenomenon's have impending severe consequences for the fragile mountain ecological systems and services and people dependent on them. Yet, very little information is available about the impacts of climate change on the resources (water resources and glaciers), livelihoods, and community's awareness and adaptive capacity to these climate variations (Ensor & Berger 2009; Eriksson et al., 2009).

Glaciers and mountain ecosystem and communities in the Indian Himalayas have been in the global climate change discussion arena for quite some time (Shrestha et al., 2012; Singh et al., 2006). The impacts of climate change are not only important in the context of ecosystem services, but also in connection with the overall water regime and associated hazards (Richardson & Reynolds, 2000).

One of the most perceptible consequences of climate change in the Himalayan region is the glacial retreat and resultant impacts on water regime of the area. Studies suggest that this constant deglaciation could have a deep impacts on the water regime of various river basins originating in the Himalayan region (Barnett et al., 2005; Singh & Bengtsson, 2004; Xu et al., 2009). Increasing glacial discharges are likely to rise for some time, but the water flow is then expected to reduce with decreasing glacier size. The effects of this phenomenon are most likely to be felt by communities occupying the arid parts of the region and who are heavily dependent on snow melt water for their livelihood.

At the same time, owing to their resource constraints these communities have also developed wide range of adaptive mechanisms ingrained in their cultural, livelihood and societal practices (Chettri et al., 2010). So far discussion on vulnerability of mountain communities and their adaptive capacity to climate change impacts traditional mechanisms and strategies have not been given due importance as a tool to adapt to climate change.

However, in a more positive development, the issue of acknowledgment and integration of traditional knowledge has been also documented in the Paris Agreement signed during recently concluded COP21 in Paris. Under the Article 7, the agreement encourages countries to develop climate change adaptation plan taking into consideration appropriate traditional knowledge, knowledge of indigenous peoples and local knowledge systems action as an integral components with a view to integrating adaptation into relevant socio-economic and environmental policies and actions. The agreement has also requested Global Climate Fund (GCF) to take adaptation (particular the principles of traditional knowledge amongst many other components) into account in its programmatic priorities (UNFCCC, 2015). On the water front, the COP21 also saw a creation of the international Paris Pact on Water and Climate Change Adaptation under the Lima to Paris Action Agenda (LPAA). This coalition includes nations, together with almost 290 water basin organizations, business and civil society parties. The international Paris Pact on Water and Climate Change Adaptation includes promises to implement adaptation plans, strengthening water monitoring and measurement systems in river basins and promoting financial sustainability and new investment in water systems management. Under the ambit of this pact, India announced a financial commitment to build climate resilience through improved groundwater management.

Given the importance of traditional knowledge in climate change adaptation and limited documentation of the same in India, this study has tried to investigate the traditional water management practices followed by local communities in Miyar valley of Himachal Pradesh, India.

Understanding traditional water resource management will considerably make climate change adaptation strategies at the community level much more efficient and effective, furthermore it's also useful for developmental agencies, NGO's and local authorities' to understand the environments changes better and device credible adaption plans so as to safeguard locals against economic, environmental and

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