

Traditional Knowledge and Practices for Water Harvesting and Conservation in the Northwestern Himalaya, India

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ABSTRACT

In the present study, we assess the importance of traditional knowledge for water harvesting and conservation. Traditional technologies and practices of water harvesting have met the needs of local people since ages. The Traditional technologies and practices of water harvesting at remote areas of northwestern Himalaya is very helpful to provide drinking and irrigation water even in today's. Water is the basis of life that's why it is said that if there is water, there is tomorrow. The Himalaya, also refer as a 'Third Pole', is a huge storage tower of fresh water resources; however, at present the communities residing over there faces problems of water scarcity due to many anthropogenic activities and climate change. The water sources are under huge pressure in terms of their quality and quantity. People of ancient times considered nature as mother and used the resources available from nature in a restrained manner. Traditional *Khuls*, *Baories*, *Jayroo*, *Nauns* and *Maggaru* were used for water harvesting. As per the age-old water conservation perspective the natural springs were linked with some deity so that people would not pollute that source and protect them. Water springs of Yangrang village of Lahul Spiti district are called the water spring of Nag Devta, the Kaudimurti water spring of Udaipur have been associated with the famous Lama with the belief that this water has been revealed by Lama. Similarly, in Kullu, the famous *Raje Ra Jairu* water spring has been protected by boundary wall from all sides and developed a small Shivling of lord Shiva near it.

Key words: Water harvesting, Traditional knowledge, Water conservation, Northwestern Himalaya

Introduction

Traditional and local knowledge means to understand, skills and philosophies developed by the societies with long histories of interaction with their natural surroundings. Over an extensive succession of observations conveyed over the generation, indigenous people have a historical continuousness of practices on resource-use practices and often own a wide-ranging knowledge base on the intricate eco-

logical structures in their own vicinities. Traditional knowledge is local, empirical, and practical, develops independently, transmitted orally or by imitation, mostly remains undocumented and usually shared (Bar-On 2014).

Traditional knowledge is established to be of substantial significance to scientists inspired to advance the local livelihoods (Pei *et al.*, 2009). It addresses issues such as climate change impacts have the potential to be advantageous to both the indigenous com-

munities and the researchers. As argued by Williams and Hardison (2014), it could be beneficial for the researchers as they would be able to acquire an improved understanding of indigenous ideals that are essential for the planning of landscape management and restoration activities, traditional technologies, and thus, how traditional knowledge could complement the base of scientific knowledge. Indigenous communities, on the other hand, could be benefited by obtaining an enhanced understanding of the impacts of climate change and technologies toward handling such impacts that may be present outside their own traditions.

In the Himalayan region most of the drinking water is available by springs and the agriculture system of the Himalayan regions is based on the rainfall, both are under tremendous anthropogenic pressure and struggling for its survival. This leads us to document the traditional knowledge and practices of water conservation to supplement the present conservation and management efforts for sustenance of water resources in longer run under the shadow of climate change. Springs have historically been the primary source of groundwater for many mountain communities across the Himalaya. In recent decades, there is increasing evidence of drying up of springs or reductions in spring discharge region as a result of climate change, rapid urbanization, deforestation, land use change, and changes in precipitation, among a host of other factors. According to a NITI Aayog report, about 50 million inhabitants depend on springs in the Indian Himalayan Region, where nearly 50% of springs have already dried up or have reduced discharge. This is worrying for mountain communities who are facing acute water stress, and whose lives and livelihoods depend on spring water.

Materials and Method

Study Area

The present study documents the traditional knowledge in the north western Himalayan states such as some districts of Himachal Pradesh, Uttarakhand and Jammu & Kashmir union territory. The north-western Himalaya generally represents the Himalayan tract from the Kumaon region to Kashmir in Jammu and Kashmir. It exhibits a diverse climate, topography, vegetation, ecology and land use pattern (Wadia, 1964).

Methodology

Primary and secondary data have been used for the present study. Primary data has been collected by visiting the field, while secondary data has been obtained by studying the literature related to the research problem. Historical information related to particular spring was collected by the field and observed how they use their traditional knowledge and practices for water harvesting and conservation.

Results and Discussion

Water Harvesting and Conservation Practices

The local inhabitants of the Indian Himalayan Region (IHR) are surrounded by several natural water sources which help them to fulfill the water requirement for household, agriculture, forestry, livestock etc. (Negi *et al.*, 2017). However, the dependency of the continuously increasing population has increased the pressure on these finite water sources thus leading to their degradation and depletion (Seth *et al.*, 2016). In recent times, it has been noticed that traditional water sources are deteriorating, poorly maintained and disused with the advent of modern facilities such as bore-wells, hand pumps and electric pumps etc. (Singh *et al.*, 2010). This has led to the transformation of many perennial water sources to become seasonal and some of them even have dried up. Since the use of these numerous traditional water sources such as *Khuls*, *Baories*, *Nauns*, *Khatris*, *kua* (well), *khads*, *nahllas*, etc., by the local communities has played a significant role in supporting daily life activities and other activities like conservation of soil by increasing groundwater table, increasing biodiversity and overall sustenance of various ecosystem services (Sharma and Kanwar, 2009).

Himachal Pradesh, Uttarakhand and Jammu & Kashmir have many types of natural water resources which are used by the locals to fulfill their daily water needs. There are different types of water conservation techniques in the different valleys of the state. The size, technique, technology is different as per the purpose of its use like domestic, agricultural and others.

Traditional water harvesting structures and conservation

Lahaul and Spiti district is known as cold desert region of Himachal Pradesh. There is low rainfall and

abundant snowfall (Bajpai, 1987). Spring water and Glaciers are the main source of water for drinking, irrigation and other domestic uses, which temporarily store freshwater at the higher altitudes and latitudes (Mark *et al.*, 2015). During field survey interaction with local communities of Rangway village reveals that the villagers developed traditional water harvesting practice known as 'Kuhl', wherein water from glacier-fed stream named 'Tozing' has been diverted and using gravity-fed system the water from Kuhl is being used for irrigation purpose (Photo Plate 1). This was also authenticated by Padigala (2013) who mentioned the use of open channels called *Kuhls* and called this traditional system as 'Farmers Managed Irrigation System' (FIMS). These *Kuhls* are traditional irrigation channels that capture and transfer snowmelt water from glaciers to the agriculture fields. Similar irrigation systems called *kuhls* are found in Jammu region also.



Plate 1. Traditional Kuhls for irrigation purpose (a&b) and agriculture practice at Lahaul valley (c)

In ancient times, sources of water were associated with some deities so that the people would keep them clean and not dirt around them. A temple of deity was built around the water spring. For example in Yangrang village of Lahaul water spring is



Plate 2. Yangrang spring water (a) and associated with Vasuki Naag Devta (b) in Lahaul valley

associated with Naag Devta (Photo Plate 2).

Watermills locally known as *Gharat*, have been in use in the Himalayan region Himachal and Uttarakhand from centuries in. *Gharat* specially used in Kullu and Mandi districts of Himachal Pradesh. These districts are blessed with different types of natural water sources. Local people of Kullu and Mandi valley are mostly dependent on these indigenous water sources for domestic, irrigation and other purposes. The names of traditional water sources/structures might vary but the objective of using them is the same i.e., use of water in a sustainable manner leading to their conservation (Anonymous, 2013). Rainfall and snowfall remain the principal mode of recharge of surface and groundwater. Due to mountainous slopes, most of the precipitation leads to surface runoff resulting in an inflow of streams, springs and *Kuhls*. They are further tapped through pipelines and distributed by the gravity method or channels to long distances downhill for domestic use. These structures are prepared from locally available resources and the traditional knowledge handed over from generation to generation (Payret *et al.*, 2013). The water bodies used by local communities in Mandi district are recharged through various tributaries like Uhl, Luni, Binu, Jiuni, Suketi, Bakar, Son, Imla, Vimla etc. Various traditional water conservation practices and irrigation methods such as *Kuhl* irrigation, canal irrigation, farm and pond irrigation, runoff harvesting ponds, religious conservation of water are also adopted by communities in rural areas. Also, the local communities of the region have started to harvest rainwater in the traditional structures used by the people for domestic and irrigation purposes. There is a famous spiritual spring water source in Kullu valley which is named *Raje Ra Jayroo* where *Baori* and *Maggaru* both are in use which is an impor-



Plate 3. Famous spring source at Kullu Valley named *Raje Ra Jayroo* where *Baori*(a) and *Maggaru*(b) and associated with Shivaling (c)

tant example of traditional water conservation practice. The source is associated with Lord Shiva (Photo Plate 3).

Specific traditional water structures and their use by the local people of the region

Kuhls in Himachal Pradesh are the traditional irrigation systems which have been built by the native people to draw water from main streams called *khads* and *Nallas*. These *Kuhls* are narrow, man-made surface channels that gravitationally divert water from naturally flowing streams. These traditional channels are provided with *kuchha* outlets, further used to irrigate nearby terraced fields. Best example of *Kuhl* system is in *Karsog* valley of Mandi district. *Karsog* valley is famous for the twin *Imla* and *Bimla* streams, which are considered holy and supports the irrigation facility of the region through these channels. Similarly, in the Lahual and Spiti and Kullu district, people also channelize water sources to their agricultural fields through these channels also called *Kuhls* in these regions. A similar concept of using *Kuhls* for irrigation has been mentioned by Sethi and Kanwar (1989), who found that *Kuhls* are the potential source of irrigation in the rural parts of Himachal Pradesh and enhances the crop productivity. However, in the changing scenario, this *Kuhl* system is getting nonfunctional in many places or faces the extinction. In all the three districts, these *Kuhl* system are also used to operate the water mills or *gharats*.

Watermills (Gharat): Traditional watermills locally known as *Gharat*, have been in use in the Himalayan region from centuries. These watermills are mostly built by village carpenters and blacksmiths from locally available materials. Kullu, Lahual and Spiti and Mandi district have a large number of *gharats* (water mills). These are considered eco-friendly devices that harness waterpower for grinding wheat, barley, maize and rice into flour. Wooden channels are made along the gradient (gravity) to carry the water from source to the mill besides maintaining the speed of water to rotate the wheel of mill for grinding purpose. In recent years, the use of watermills (*Gharats*) has declined and only a small portion of the rural population of the Himalayan region are using it especially who are living in remote and inaccessible areas. There are many reasons which has contributed to the disuse of this traditional technology viz. less amount paid for the work, availability



Plate 4. Traditional Watermills (Gharat)

of less costly modern technology for grinding, with minimal time requirement taken for the process etc. But there is a need to recognize the benefits of local water mills used by the local communities especially where places are still without modern grinding machines or are available at distant places, making them dependent on local watermills (Agarwal, 2006). Therefore, suitable modification or adaptation in the technology could help in sustenance of the age-old *Gharat* and thereby livelihood opportunity could be created at village level in Himalaya. This way, conservation, adaptation and livelihood enhancement through traditional knowledge could be achieved in IHR.

Baori: *Baori* is a deep stone-walled pit dug in an area where water percolates naturally through ground aquifers. It is circular or square in shape with walls gently sloping towards the centre of pit in the form of staircase for one to collect water especially during summer when the water is less reflecting its seasonal nature. It is an age-old traditional drinking water source especially in the lower regions of Himachal Pradesh. Generally *baoris* are covered with a roof but sometimes are without it. Also, a small channel is provided outside a *baori* for washing clothes and drinking water for animals. A small temple of Lord Shiva is observed/present near these *baories*, where local communities of the village perform their religious ceremonies. Similar results have been authenticated by Sharma and Kanwar (2009) and Singh *et al.* (2010).

Nauns: *Naun* is a tank-style surface water storing structure with huge capacity constructed by native people with stones. The structure consists of three walls, a rooftop and a small gate in the front so that water can be protected from contamination by stray animals and others. There is one small outlet outside the *Naun* where water is collected and is used for washing, bathing and for livestock etc.

Chhrudul Maggaru: *Chhrudu* is a type of traditional water structure used mainly for drinking purpose. Surface or groundwater is channelized directly with

the help of a pipe. Earlier, the native people used locally available trees or bamboo stems for making the pipe or outlet which is famous with the name of maggaru. But now with the advancement in technology, bamboo pipes have been replaced by iron or plastic pipes. This special water source is mainly found in the Kullu valley and nowadays it is generally used by the tourists while travelling. The use of traditional water sources is decreasing with technological advancement and modernization (Sharma and Kanwar, 2009).

Conclusion

The study reveals that, the people of the ancient times used eco-friendly and low cost structure for water harvesting and as per conservation point of view water sources were associated with God and Goddesses. People used the naturally available water sources in such a way that they could neither get polluted nor disappear. In ancient time people were conserved the natural resources and consider these natural things as the blessings of the deities. Today water scarcity is one of the biggest problem, especially drinking water. We need to relook and adopt the ancient traditional knowledge for harvesting and conservation of water sources.

Conflict of Interest- None

References

- Agarwal, S.K. 2006. Re-energizing watermills for multi-purpose use and improved rural livelihoods. *Mountain Research and Development*. 26(2): 104-108.
- Anonymous. 2013. Ground water information booklet. Kullu District, Himachal Pradesh. pp. 20.
- Bajpai, S.C. 1987. *Lahaul-Spiti: A Forbidden Land in the Himalayas*. Indus Publishing Company FS-5, Tagore Garden, New Delhi. pp. 186.
- Bar-On, A. 2014. Indigenous knowledge: Ends or means? *International Social Work*. 58(6): 780-789.
- Mark, B.G., Baraer, M., Fernandez, A., Immerzeel, W., More, R. and Weingartner, R. 2015. Glaciers as water resources. In book: *The High-Mountain Cryosphere Environmental Changes and Human Risks*. Cambridge University Press, Editors: Huggel C., Carey M., Clague M., Kaab A., pp. 184-203.
- Negi, V.S., Maikhuri, R.K., Pharswan, D., Thakur, S. and Dhyani, P.P. 2017. Climate change impact in the Western Himalayas: people's perception and adaptive strategies. *Journal of Mountain Science*. 14: 403-416.
- Padigala, B. 2013. Traditional water management by mountain communities of Lahaul and Spiti, Himachal Pradesh, Spandrel.
- Payret, A., Pyakuryal, B., Seneres, L., Gover, A., Singal, D. and Kant, S. 2013. Incorporating traditional methods of irrigation with water management in Mandi, India. pp 67.
- Pei, S., Zhang, G. and Huai, H. 2009. Application of traditional knowledge in forest management: Ethnobotanical indicators of sustainable forest use. *Forest Ecology and Management*. 257(10): 2017-2021.
- Seth, R., Mohan, M., Singh, P., Singh, R., Dobhal, R., Singh, K.P. and Gupta, S. 2016. Water quality evaluation of Himalayan Rivers of Kumaun region, Uttarakhand, India. *Applied Water Science*. 6: 137-147.
- Sethi, A.S. and Kanwar, B.S. 1989. Irrigation potential of *Kuhls* and its impact on crop productivity: a case study of Himachal Pradesh. In: V.S. Mahajan (ed.) *Agricultural and Rural Economy in India*, New Delhi, Deep and Deep Publications. 170-79.
- Sharma, N. and Kanwar, P. 2009. Indigenous water conservation systems: a rich tradition of rural Himachal Pradesh. *Indian Journal of Traditional Knowledge*. 8(4): 510-513.
- Singh, H.P., Sharma, M.R., Hassan, Q. and Ahsan, N. 2010. Sustainability of traditional drinking water sources in Himachal Pradesh. *Nature Environment and Pollution Technology*. 9(3): 587-592.
- Williams, T. and Hardison, P. 2014. Culture, law, risk and governance: contexts of traditional knowledge in climate change adaptation. *Climate Change and Indigenous Peoples in the United States: Impacts, Experiences and Actions*. J.K. Maldonado, B. Colombi and R. Pandya. Cham, Springer International Publishing: 23-36.