

## Traditional knowledge of water management in Kumaon Himalaya

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Received 3 October 2006 revised 22 October 2007

Water resources regime in Kumaon Himalaya is a product of its specific environmental conditions. Major river systems, lakes along with a plethora of streams and springs are the main sources of water in this region. In pre-colonial Kumaon, communities took pride in their water systems and the local communities had the right of ownership over the use of local natural resources. They managed their water bodies on their own and this gave birth to a unique water harvesting civilization. Water was revered and regarded as sacred as is evidenced by the exquisite ornamentations and architecture of the structures around water bodies. An amazing aspect of these structures and systems is their longevity. But the colonial intrusion disturbed the community mode of management and gave precedence to private and state property rights over common property rights. The situation did not change even after Independence. The paper throws light on the water harvesting methods and the linkages of water with forests. It also focuses on the watershed approach for managing water resources in the present scenario.

**Keywords:** Traditional knowledge, Water management, Kumaon Himalaya

**IPC Int. Cl.<sup>8</sup>:** E02B13/00

Water is a precious gift of nature and indispensable for the survival of all forms of life. Its use is as old as human civilization itself. The use of water is an integral part of human life, as old as civilization itself. The great Harappan civilization developed in this continent during 2500-1500 BC because of water only. Vedic literature (800-600 BC), especially *Rig-Veda* is replete with hymns about irrigated land, flowing rivers, ponds and wells etc<sup>1</sup>. Three quarters of the world is covered with water, but most of it is saline. The saline water present in the earth is 97%. Out of the rest 2% is ice and only 1% is potable. It is therefore essential to save water for the future generation.

The Himalayas, an integral part of the Indian heritage and its forests provide vegetative cover for the major river systems in India, serve as water reservoir, and are a warehouse of biodiversity, and a climate maker for the whole of Asia<sup>2</sup>. Uttarakhand is the catchments area of the Indo-Gangetic plain and the cradle of the Indo-Gangetic civilization. Uttarakhand is divided into two commissionaires', Kumaon and Garhwal. Kumaon lies between 28°44'

and 30°49' N latitudes and 78°45' and 81°5' E longitudes<sup>3</sup>. The earlier known ruling dynasty of Kumaon was *Kuninds* succeeded by the *Paurav*, *Katyuris*, *Chands* and the *Gurkhas*<sup>4-10</sup>.

### Water management

The use of water resources in a multifarious context gives rise to different management systems, which are peculiar to conditions through which they emerge. The main sources of water in Kumaon are rainwater, glaciers, rivers, lakes, streams (of all sizes) and springs (Fig. 1). Kumaon region lies in the monsoon belt and these communities in this region learned to collect rainwater, store it and use it for a variety of purposes throughout the year. Thus, a unique water harvesting civilization took shape in this region. In the pre-colonial period although the state was not responsible for providing water to its citizen; it had no intervention in the various uses of water by its people. There was community management of water for irrigation and drinking as per the need of the people. Traditional water management took birth from this system. The local communities had the right of ownership over the use of local natural resources and the state recognized this right.

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Water was revered and regarded as sacred. Since, the water bodies were considered to be sacred, they were well maintained. It was so sanctified that river or *Pani Dhara* marriage, which was publically performed in a sacred place in a river or spring, was given due recognition by the society<sup>11</sup>. Both the river or *Pani Dhara* and the *Kumbh Vivah* were given legal recognition. In the former, the nuptial ceremony was solemnized in the presence of a water body. According to *Kumbh Vivah*, when the bridegroom was inevitable absent the bride was formally married to a pitcher of water representing him. Traditionally in Kumaon, the main systems of water harvesting are *guls*, *naulas*, *dharas*, *lakes*, *kund*, *khal*, *simar* or *gazar* and water mills. Many of these technologies are still in use and provide a significant proportion of the water requirements of the people. The traditional systems are being detailed below:

### **Gul**

In Kumaon, cultivation is done largely on terraced fields and since ancient times, the problem of irrigating the fields was resolved by diverting water from nearby streams or rivers through channels called *guls*. They are the best example of water resource management in the hills and are usually dug along the contours of the slope. Apart from irrigation, *guls* were used for drinking water and for running *gharats* or water mills (Figs 2 & 3). In some areas, water from the stream is first dammed and then the irrigation channel is made. The small dam constructed for the purpose is known as *baan* in local parlance and *kulayana* in Kumaoni dialect, which means to irrigate the field with *gul* or *kul*. Along the length of the *guls* are outlets, which lead to small secondary channels, known as *hawarr*. Irrigation channels are of various sizes, the one, which is smaller than *kul* is known as *baul*. A boulder is placed at the outlet controls flow of water. There is also an outlet at the lower end of the field, which allows the excess water to flow on to the lower terraces from where it ultimately drains back to the stream. Sometimes, the flow water in the *gul* is obstructed by a boulder or hard rock. In that case, the peeled bark of a banana tree is used as a water carrier or it is channelized through a wooden pipe.

### **Naula**

*Naula* are designed to collect water from subterranean springs (Figs 4-7). The flow of these springs is very sensitive and can be disturbed by

seismic activity and human disturbance. In Dwarahat, during survey it was found that several *naulas* like *Khulkuda* or *Kholibhit* have dried up owing to the tremors of earthquake. *Naulas* mostly found on the hill slopes in the lesser Himalayan region of Kumaon are covered reservoirs and exhibit masterpiece architectural features. Some of the *naulas* like the *Ek-hatia Naula* and *Baleshwar Naula* in district Champawat are famous for their architectural splendours (Fig. 8). The *naulas* have a common design. They consist of a tank that is closed on three sides and covered. The fourth side, which is open, has steps that lead down to the tank. There is a pillared verandah around them with engravings. Animals are not permitted to enter and the system is so designed that the users do not contaminate the source. All the water is considered sacred, even to this day the basic rules of sanitation and hygiene are mostly observed. *Naulas* were considered community property and the villagers revered their *naulas*. In the past, *naula* water was treated with *amla* (*Emblica officinalis* Gaertn) and *neem* (*Azadirachta indica* A Juss) leaves. As the construction of *naulas* was considered prestigious, these structures can be found in ancient towns, in and outside villages and on important roads. Some *naulas* are emblazoned with intricate architectural designs. At times they are massive in size with a raised platform for both bathing and washing.

Water was revered and in the recent past trees like oak (*Quercus leucotrichophora* A Camus), *kharik* (*Celtis australis* Linn.), *siling* (*Osmanteis fragrans* Lour.), *peepal* (*Ficus religiosa* Linn.), *bargad* (*Ficus bengalensis* Linn.), *timil* (*Ficus patmala* Forsk), *dudhaila* (*Ficus nemoralis* Wall ex Mig.), *padam* (*Prunus cerasoides* D. Don), *amla* (*Emblica officinalis* Gaertn), *shahtut* (*Morus alba* Linn.) and *utis* (*Alnus nepalensis* D. Don) were planted around and in close proximity to the *naulas* (Figs 9-12).

### **Dhara**

It is a common source of drinking water and can be compared with a drinking water fountain (Figs 13,14). *Dharas* located both in mountain crests and in valleys are also popular in townships. In Nainital itself, *Parda Dhara* and *Siphai Dhara* are used as public baths and people collect drinking water from *Chuna Dhara*, *Tunestein Hall Dhara*, *Hanuman Garhi road Dhara*, *Motapani Dhara* and *Gufamahadeo Dhara*, etc. In *dharas* also, the practice of planting trees was in vogue for symbolizing the sanctity of water. The

water from a spring or a subterranean source is channeled through carved outlets. They are often in the shape of a pipe, through figures of animals like lions and cows also in vogue.

There are 3 types of *dharas* depending upon their heights and nature of flow. If an individual can easily drink water from the *dhara* in a standing position, then it is called *Sirpatia Dhara* (Fig. 15); if one has to bend over for drinking water, then it is called *Murpatia Dhara* (*Murpatya* means bending up to knee level). Both these types of *dharas* are decorated with animal figures. The third type of *dhara* is not perennial in nature. During the rainy season, some wooden spouts or broad leaves are stuck in the path of a flowing stream or a spring that gets recharged during that period. As they are temporary in nature, they are called *Patveedia Dhara* (*Patveedia* means ephemeral).

### **Simar**

*Simar* are also known as *gajar*. *Gajar* is a marshy tract of land in an agricultural field and is created by the ground water. It is aptly suited for paddy cultivation. Cultivation of high quality crops like basmati rice, medicinal plants and herbs are a common feature in *Gajars*. The medicinal plants normally grown in it are two varieties of *brahmi* (*Centella asiatica* (L) Urban) and (*Bacopa monnieri* (Linn.) penn)<sup>12-16</sup>.

### **Chuptaula**

These are basically water holes for animals and are found mostly in high altitudes for use of graziers. They are not permanent in nature and water is collected in them from springs or from points where water oozes out from the ground. Faunal and bird life also use this accumulated water and at times they serve as an important source of water for human consumption at high altitudes.

### **Khal**

Large depressions in mountainous areas used for rainwater harvesting are called *khals* (Fig. 16). Mostly they are on top of ridges in the saddle between two crests. At times small ponds are also dug for collecting rainwater. During the lean period, water accumulated in *khals* is used for irrigation purposes. When discharge of water in *guls* is reduced owing to the searing heat of summers, then water is accumulated first in a *khal* and subsequently used for irrigation.

### **Dhaan**

Water collected from small and big streams gives the shape of a lake. The accumulated water is used for bathing of domestic animals and irrigation. The traditional system of water management was similar in the hilly terrain of Garhwal and Himanchal Pradesh.

### **Water and other natural resources management**

In Kumaon irrigated agriculture was practiced since ancient times. It may be assumed that water mill technology (*Gharats*) has the same ancient past<sup>17</sup>. Forests, land either cultivated or uncultivated had never been measured for the purpose of determining revenue<sup>18</sup>. Local communities had full access and rights over forest resources<sup>19</sup>. Village paid revenue dues to the state, and not on an individual basis. This gave village communities the freedom to budget their expenditure on local needs and concerns<sup>20</sup>. Water rights were commonly held by individuals and communities with respect to drinking water, irrigation and water mills<sup>21</sup>. Traditions, customs and rituals governed the major part of rural life. The activities related to use of water and its management, for construction, maintenance, distribution and repair of water bodies; the mobilization of resources was part and parcel of the social life of communities. Rural communities mainly administered even resolution of disputes with very little reference to the state. There was a de-centralised judicial system. Caste assumed a critical role in the access to land and water resources. The governance of natural resources was decentralized. A local community had the right of ownership, power of management and right to use natural resources. A rural legal framework that regulated management and use of water or other natural resources was demarcated by customs and traditions.

Besides drinking and domestic purpose, the chief use of water was for irrigation and a special use in this region was that of running of water mills (*Gharats*). The question of water rights developed around these 3 uses of water and was exercised by the village community<sup>22-24</sup>. In the context of revenue administration there was straight intervention of the state in general life. In mid 19<sup>th</sup> century the Government measured all agricultural land, the boundaries of villages were demarcated and village records were also prepared<sup>25-27</sup>. The prior users had the first right and later users of water could only use



Fig.1 River



Fig.2 Gharat at Pithoragarh



Fig.3 Gharat at Almorah



Fig.4 Buria Naula



Fig.5 Hathi Naula, Almorah



Fig.6 Internal view of Naula



Fig.7 Naula at Harishtal



Fig.8 Ek Hatia Naula



Fig.9 Cedrus deodara



Fig.10 Oak forest



Fig.11 Prunus tree



Fig.12 Rhododendron tree



Fig.13 Akkal Dhara, Lohaghat Kumaun



Fig.14 Dhara



Fig.15 Sirpatya Dhara, Sitabani Nainital



Fig.16 Khal

water in such a way as not to harm the right of earlier user. The rationale was that in the hills, significant investment of money and labour was necessary for carving out channels in the mountainside to carry water over long distance for human consumption<sup>28,29</sup>.

The issues of water rights were closely associated with the administration of land revenue. The process of land revenue administration separated the measured land of the villagers (*Nap*) from the unmeasured waste land (*Benap*) and forest land (*Van*)<sup>30</sup>. Village rights to water were recorded in village records of rights. Local customs in the use of water were given official recognition. Potable water was not taken under revenue system. In nineteenth century, there was no direct law to affect traditional rights over water, but laws for land and forest management affected water management<sup>31-35</sup>.

### Conclusion

A wide range of rights flourished and custom gave rights of ownership to water bodies. Water was considered a common property even when private rights were prevalent. There is a need for redefinition of rights to water resources. The new legislation should adopt an integrated natural management resource approach to replace the fractured legal policy and framework that is in force at present. The participation of the people should be ensured in preparation, maintenance and operation of water bodies. New projects should preferably be taken on the demand and priorities of the people.

Deforestation and urban conglomeration have led to drying up of water sources. In Dwarahat township in Almora district there were about 360 *naulas* in the 1900s, but now about 36 *naulas* have a perennial supply of water. Rampant deforestation and unnecessary road construction in the catchments area together with faulty planning has led to this crisis. Again in the last two decades in the catchments area of the river *Gaula* in Nainital district, almost 46% of the springs have dried up and almost 60% have become seasonal. According to a recent report, 121 natural springs have dried up and in 850, the capacity has dwindled by 50%. In Kumaon, 55% of the systems constructed for drinking water are functional while 45% are non-functional. It is essential that all agencies related to water resources, should have an integrated approach both in theory & practice and the planning should be done with the help of villagers.

Most of the forests in Uttarakhand are situated in the sensitive catchments areas of the rivers. These catchments are not only rich in biodiversity, but they are intertwined with our long-range ecological security and perpetuity of our rivers and glacier systems. In Uttarakhand there are 8 catchments, 26 watersheds, 116 sub-watersheds and 1,120 micro-watersheds<sup>36</sup>. The treatment of forests for maintaining the water supply in rivers and springs should be initiated in the sub-watersheds and the smallest unit, the micro-watershed, should be prioritized. They should be adopted as the smallest unit of development. Further at the state level, a single, Watershed Development and Regulatory Authority should be established. The function of this authority would be to implement development and management plans at the river basin level and to empower and involve the watershed communities in planning and development.

It is important to understand that water is an economic commodity with multiple uses. Protection of fresh water resources is the need of the hour for water managers. It should be used judiciously and policies must be formulated to address the needs of women and to work towards their empowerment. The focus on water management system requires a holistic approach aided by modern knowledge and technology but in consonance with traditional knowledge system and the actual local needs. It is essential to redeem the people's interest in environment, and instead of de-empowering them, they should be made partners in the whole process of planning, implementation and the real beneficiaries of the endeavour. Well-developed information systems for the purpose and a strong political will are the prime requisites.

### Acknowledgement

Authors are thankful to Shri MS Vani & Shri Rohit Asthana, Development Centre for Alternative Policies, New Delhi for their valuable assistance.

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