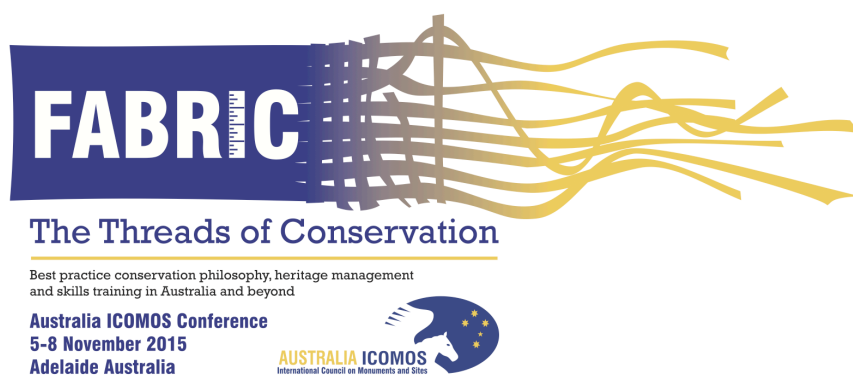


Preserving the *Hiti*, Ancient Water Spout System of Nepal

Jharna Joshi

Proceedings of:



Preserving the *Hiti*, Ancient Water Spout System of Nepal

1 Historical Background

The early recorded settlements in the Kathmandu valley (Nepal is the original name of the valley, which was later extended for the country after it was conquered by the Shah king from Gorkha in 1768 AD) are attributed to the Kirat dynasty (800 BC – 300 AD) and dates back to the 3rd century BC (Becker-ritterspach 1994). The Kiratis were followed by the Licchavi dynasty (400 – 750 AD), when the settlements started to be organized as urban and rural centres, which were further expanded and improved in the Malla dynasty (1200 – 1768 AD). These two dynasties are the foundation of the Kathmandu valley civilization that is included in the UNESCO World Heritage List because it:

bears an exceptional testimony to a cultural tradition and civilization which is living; is an outstanding example of a type of building, architectural or technological ensemble or landscape which illustrates (a) significant stage(s) in human history; and is directly or tangibly associated with events or living traditions, with ideas, or with beliefs, with artistic and literary works of outstanding universal significance; (UNESCO WHS criteria (iii), (iv) and (vi)).

This civilization prospered as the main gateway on the Indo-Tibet trade route, which was possible through the knowledge, skills and management capabilities of the societies that settled on tars (high grounds) to leave the fertile flood plains for cultivation as well as protect themselves from floods and disasters. Kathmandu valley was created when the vast lake that was formed surrounded by the high hills was drained by the Chobar gorge through the Bagmati River. Thus, the bedrock of the valley is made of dense impenetrable black mud (clayey sediment, Kalimati clay) and is very fertile (Joshi and Shrestha 2008). These earlier dynasties utilized the geographic structure and the available natural resources with exceptional skills to expand and enhance the civilization. One exemplary example of their

high skills is demonstrated by the traditional water supply system or the *hiti* system that was developed with the excellent knowledge of the physical structure of the terrain (Lalitpur slopes from the south towards northeast) and the available natural resources (water) and the ingenuity of managing the resources to enhance the civilization.

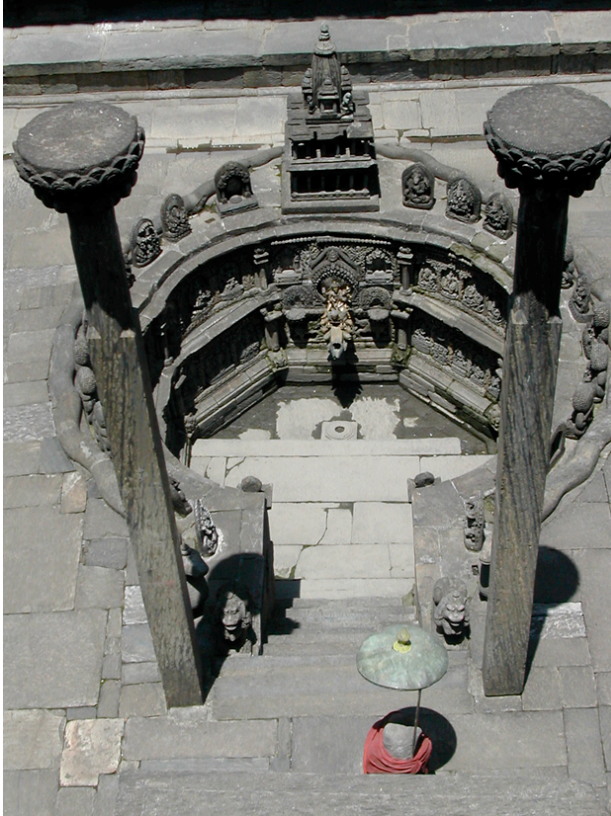


Figure 1: Tusa *hiti*, Lalitpur

2 The *Hiti* System in Lalitpur:

Among the many forms of water architecture found in Nepal, the *hiti*, no doubt, is the most elaborate and intricate in design and technology. The *hiti* is supported by the *rajkulo*, ponds and wells that are part of the traditional water architecture group, along with the *ghats* (riverside cremation sites) and *jahdu* (drinking water tanks). The *hiti* and the *rajkulo* are the traditional water supply systems in the Kathmandu Valley that started in the Licchavi period and was further developed in the Malla period (Becker-ritterspach 1994). The *rajkulo* was built to irrigate the paddy fields in the villages and facilitate drinking water in the cities

supplied by the *hitis*. Besides functioning as the main source of water for the neighbourhood, these intriguing pieces of architectural elements still play a vital role as religious and social spaces and many of these *hitis* are associated with specific festivals and rituals. Thus, this system of bringing water from the natural sources to the cities forms a unique cultural landscape that has survived almost two centuries.

Though a similar system exists in Kathmandu and other cities of Nepal most of them are lost or in an advanced state of deterioration. The system in Lalitpur survives because of the strong local communities and the urgent need for water, both in the rural and the urban zones. (UN-HABITAT 2008)

Table 1: *Hitis* in Kathmandu valley (Source: NGOFUWS, 2006)

S.N	Municipality	Working		Not Working	Not Exist	Total
		Natural	NWSC Pipeline			
1	Bhaktapur	33	35	18	1	87
2	Madhyapur	49	6	8	3	66
3	Kirtipur	10	0	0	3	13
4	Lalitpur	47	0	4	7	58
5	Kathmandu	106	3	34	33	176
Total						400

There are two main *Rajkulos* providing water to Lalitpur, the second city in the Kathmandu valley adjacent to the capital city, Kathmandu. Both these canals join at Dholahiti, on the outskirts of Lalitpur to feed the pond at Lagankhel at the southern edge of the urban core of Lalitpur. The intake or the source of these *rajkulos* is the upstream of Tikabhairab and it channels water from the rivers Lele and Naldu (Joshi 1993). The source of the *hitis* are mostly natural underground shallow aquifers or springs that are located near or around it and linked through an intricate underground supply and drainage lines that use natural sand filter systems to purify the water as it flows. The dense black mud bedrock of the valley prevented the

access to deep underground aquifers, thus, a network of several ponds was constructed at strategic locations to collect rainwater and recharge the shallow aquifers (Joshi and Shrestha 2008). The wells also served as excellent sources of water as well as collect and store rain water. Thus, the system of *rajculo* and *hiti* was able to provide water for irrigation and household purposes in the rural and the urban areas all year round.

The traditional water system in Lalitpur, Nepal starts with the *rajculo* from the upstream of Tikabhairab, continues along the agricultural fields in the rural zones and the network of *hiti*, ponds and wells in the urban core and ends through the drainage lines at the river. The intake at Tikabhairab is located about 16 kms north from Lagankhel, the northern edge of the urban core of Lalitpur, and the *rajculo* channels water from the Lele and Naldu rivers. The urban core of Lalitpur covers 15.43 sq. km (total area of Lalitpur) with 58 *hitis* (of which 4 are dry, 7 does not exist and the remaining and from poor to good condition, NGOFUWS, 2006), 39 ponds (of which the *rajculo* (drainage) connects 18, rainwater feeds 5 and local springs, aquifers and *hitis* feed 11, 5 unknown; out of 39 ponds, 14 do not exist at present), and more than 218 wells (UDLE 1993).

The earliest *hiti* found in Lalitpur is the Mangal *Hiti* that was built in 570 AD, although the system of extracting water from springs and ponds began during the Kirat rule (Becker-ritterspach 1994). Primarily, the *rajculo* and the *hiti* system consist of 5 major components:

- a. The intake or the natural water source
- b. The irrigation canal or the *rajculo*
- c. The stone spouts or the *hitis*
- d. The ponds and wells
- e. The drainage system.



Figure 2: *Rajkulo*, Lalitpur

A management system was also laid in place for the sustainability and distribution of the water. Similar to other religious and public properties, several local *Guthi* (Trust) is set up for the management and maintenance of the *hiti*. The *guthi* is a self-sufficient social organization, a Trust, established for the management and maintenance of the specific structure or function and is funded by tilling the lands donated to it. There are also several festivals and traditions associated with the *rajkulo* and *hiti* that are celebrated to bring together the communities to appreciate and thank the natural resources. The most important festivals related to the water system are Sithinakhah and Machhendranath jatra. Sithi nakha falls in May, just before the monsoon and is a day dedicated to clean and repair the water system, including the wells, *hitis* and ponds. Machhendranath *jatra* is the most important festival of the city of Lalitpur, when the whole city gets together to pull the chariot of Machhendranath around the city core to bring in the monsoon and lasts for more than a month.

Thus, this water supply system creates an intricate cultural landscape that demonstrates the ingenuity of human influence on the geographic formation of the terrain and the natural resources to develop a rich culture that includes the material as well as intangible heritage.

After the unification and creation of the modern day Nepal, the Shah dynasty that followed the Malla was involved in expansion the state power and the development of these inventive systems were neglected. The modern pipe water system was introduced in the late 1800s by the autocratic Rana rulers (who ruled during the Shah dynasty), who aggressively discouraged local cultures and traditions. After the overthrow of the 104 years of autocratic Rana rulers and the opening on Nepal to the outside world in 1950, the modern system was extended, but caution was not taken to preserve the ancient structures. Hence, the ancient system went into decay, though a large part of the population of the city centre continued to use this water. The limited resources, weak management capabilities and instability of the following government of Nepal has not been able to provide sufficient drinking water to the citizens through the municipal systems and there is a rising interest in restoring and rehabilitating this ancient system that has proven to be more effective and sustainable.

3 Current problems and limitations

Most of these *hitis* are still the only source of water for many; especially the urban poor and the large part of the farmers in the rural zones still depend on rainwater to irrigate their land. The municipal water supply system has not been able to provide adequate drinking water to the urban areas and a large population still depends on these traditional water supply systems. However, the unplanned building construction, the infrastructure growth in the expanding urban core and the construction of modern underground structures, has not only damaged the *rajculo* but is affecting these ancient systems, especially with the loss of ponds that help in recharging the *hitis*. In addition, the deforestation of the intake surroundings for firewood or

other purposes and the general lack of preservation of the forests have also had negative impact on the quantity and quality of the water source.

The acute shortage of water in Lalitpur and the growing interest and knowledge in the importance and significance of heritage and water conservation has increased the involvement of the local communities in reviving the traditional water system. The Local Governance Act (1991) has increased the responsibilities and authorities granting the local governments more access to resources (funding and human capacity building) and more autonomy to undertake local development projects. This Act has also facilitated the process of establishing non-government organizations whose involvement in awareness raising and community development has increased participation in local development works.

Agriculture is one of the main industries of Nepal with 76% of the population depending on this sector and contributing to 40% of the national economy. Kathmandu valley is dotted with villages that are based on agriculture and usually situated on higher ground with surrounding agricultural fields. However, there is no policy or law that protects this cultural landscape and defines the identity of the land. The Department of Archaeology (DOA) under the Ministry of Culture, Tourism and Civil Aviation is the national body entrusted to protect and preserve the cultural heritage of Nepal. Its jurisdiction includes tangible and intangible heritage, and includes the two cultural World Heritage Sites, Kathmandu Valley and Lumbini. The other two natural World Heritage Sites in Nepal, Sagarmatha National Park and Chitwan National Park are the responsibility of Department of Environment under the Ministry of Forestry. In addition, currently, the government of Nepal is in the transitional period and in the process of drafting a new constitution, which has left local governments without elected official. However, when the new constitution is in place, it is hoped that the local governments will have more authorities to conserve and promote its natural and cultural heritage.

Thus, an effective management system for the traditional water system requires coordinated efforts from various ministries, departments and local governments. The heritage sites are limited to physical monuments or natural sites and do not address the two as complimentary elements that provide a setting and context for each other. There is a need to initiate a dialogue in Nepal on the concept and significance of cultural landscapes as well as policies, laws and guidelines for their protection and preservation.

4 Case study: The Restoration of Nagbahal *Hiti*

Till date, out of the total original 38 *hitis* in Lalitpur about 30 are still partially functioning, while the rest have either dried up or been buried. The Nagbahal *hiti*, located at Nagbahal had been dry for about a decade and urgently needed renovation works. Nagbahal is one of the biggest residential courtyards in Lalitpur that was originally a Buddhist monastery. Although the original structure no longer exists, this *bahal* or monastery still retains its religious and cultural significance. The *Dipankara yatra*, a religious excursion around Kathmandu Valley that occurs once in about 18 years when all the five auspicious elements align and celebrated by both Hindus and Buddhists, originates from this site. Nagbahal is also the site where the five-yearly Patan *Samyak*, the assembly of all the Dipankara Buddha images from Patan and its surrounding areas take place.

There are three individual stone taps at the Nag Bahal *hiti*. About halfway down the steps leading to the *hiti*, there is a large standing stone image of the Buddha of a later date inside a small temple. The construction date of this *hiti* is unknown but, in the northeast corner of the area around the *hiti*, a stele about three feet in height with four figures of different Buddhas carved on it dates to the eighth century. (Locke, John K., 1985)



Figure 3: Nagbahal *Hiti*, Lalitpur

Before the restoration works, the supply of water at Nag Bahal *hiti* was very poor and the outlet was also partially blocked. The source of this *hiti* had been identified and is located Khwayebaha, southeast of the *hiti*. The inlet channel from the source to the *hiti* is more than 530 meters in length passing through dense residential area. (Joshi 2008)

The Nag Bahal Hiti Rehabilitation project recently restored this important monument funded by the U.S. Ambassador's Fund for Cultural Preservation and supported by the Nagbahal Hiti User Group. The rehabilitation works included repairing the inlet and outlet channels of the *hiti*, by digging several maintenance holes that helped to precisely map and clean the channel. These maintenance holes are marked in the documentation maps for future repair works and have been filled with gravel, sand and earth for filtration.



Figure 4: Nagbahal *hiti* channel restoration

The inlet channel is nine to twelve feet underground and constructed of bricks, about four inches wide and six to seven inches deep. Stone or brick collection bowls are placed where the line is turned and is filled with pebbles for filtration. The mapping of the inlet channel also identified the private and public plots above the supply line. This map is essential to protect the water flow of Nagbahal *hiti*, so that new constructions will not damage the channel. The three or four storied traditional buildings are rapidly being replaced by higher structures with the danger of their foundations going deeper and destroying the supply channel.

General repairs to the *hiti* complex reused the existing materials as far as possible and have made this monument a focus of the courtyard once again. The flow of water has increased noticeably since the restoration works, however, only the protection of the inlet channel and groundwater recharging will ensure the future of the *hiti*.

5 The future of *Hitis*

The Nagbahal Restoration project set an example by documenting the *hiti* system and providing valuable information for its future maintenance as well as other *hitis*. This project can be further replicated in other *hitis* to revive the ancient water supply system that has been supplying water to the urban areas of the valley for more than a thousand years. The *hitis* can

also follow the example of the Alko *hiti* and Dhobighat *hiti*, both in Lalitpur, storing the water at night to redistribute benefitting a larger population. (UN-HABITAT 2008) However, recharging the ground water is essential and will have long term effects on the water supply system of a larger area.

There is an urgent need in Kathmandu Valley to recharge the ground water. Since the municipal water supply is inadequate, the majority of city dwellers are depending on individual deep water wells that is overextending the natural ground water resources and decreasing the water table rapidly. More and more people are digging deeper to access ground water without recharging the ground water, which will only add stress to the system. The *rajkulo* and the manmade ponds were built to support the water architecture and are in dire need of revitalization. The welfare of both the *hiti* and the private deep wells depends on the overall water table of the city. This *hiti* system that has its roots in the sixth century needs detailed investigations on its origins and technology. This is a unique and highly intricate system that should be preserved for the future generation, not as a decorative monument but a functioning architecture.

6 Conclusion:

An effective management system that employs a sustainable approach to development and conservation is opportune for the traditional water system of Lalitpur. Though a similar system exists in Kathmandu and other cities of Nepal most of them are lost or in an advanced state of deterioration. The system in Lalitpur survives because of the strong local communities and the urgent need for water, both in the rural and the urban zones. Promoting this traditional water system as a valuable cultural landscape will not only conserve an important heritage but also work towards solving the essential problem of water in the valley and contribute to improving the living conditions of the citizens and sustainable development. However,

reviving this system requires coordination of various different agencies and planning at the macro level, including mitigating the effects of global climate change. The areas surrounding the intake or the source should be acquired and preserved to ensure the continuity of water flowing in the *rajkulo*. Likewise, an intensive plan has to be in place in the rural and urban areas that promote and preserve the water architecture group and their sources. These physical elements linked with the various rituals and traditions are an integral part of the civilization of Kathmandu valley and a unique architectural heritage of universal significance.

References

- Becker-ritterspach R. O. A. 1994, *Water Conduits in the Kathmandu Valley*, Munshiram Manoharlal Publishers Pvt. Ltd. New Delhi.
- Dixit, Ajaya, M. Upadhya, et. el, 2005, *Augmenting Groundwater in Kathmandu Valley: Challenges and possibilities*, Nepal Water Conservation Foundation, Kathmandu.
- ICIMOD, 2009, *Water Shortage: A Strategy for Climate Change Adaption in the Himalayas*, ICIMOD, No. 56.
- Joshi, Hiterndra Raj and S. D. Shrestha, 2008, *Feasibility of recharging aquifer through rainwater in Patan*, Central Nepal, Bulletin of the Department of Geology, Tribhuvan University, Kathmandu, Nepal, Vol. 11.
- Joshi, Jharna, 2008, *Preserving the Nagbahal Hiti*, SPACES Nepal, Nov-Dec.
(http://www.spacesnepal.com/archives/nov_dec08/nagbahal_hiti.htm)
- Joshi, P. R. 1993, *Feasibility Study of Rajkulo: Rehabilitation of Patan's Traditional Water Supply Network, Final Report: Patan Conservation and Development Programme*, UDLE/GTZ, (unpublished report).
- Locke, John K. 1985, *Buddhist Monasteries of Nepal: A Survey of the Bahas and Bahis of the Kathmandu Valley*, Sahayogi Press Pvt. Ltd., Kathmandu.
- NGOFUWS, 2006, *Traditional stone spouts enumeration, mapping and water quality*, Unpublished report by NGO Forum for Urban Water and Sanitation, Kathmandu, Nepal
- Shrestha, Roshan Raj, *Water, Water Everywhere: Rainwater Potentials of Kathmandu, Nepal*, Monitor: The National Online Journal
- Theophile, E. and Joshi, P. R. 1992, *Historical Hiti and Pokhari: Traditional Solutions to Water Scarcity in Patan; Patan Conservation and Development Programme*, UDLE/GTZ, (unpublished report).

- Tiwari, S. R. 2001, in *City Diagnostic Report for City Development Strategy of Kathmandu Metropolitan City*, Kathmandu Metropolitan City / World Bank: Kathmandu.
- Tiwari, S. R. 2002, *The Brick and the Bull: An account of Handigaun, the ancient capital of Nepal*, Himal Books: Lalitpur.
- UDLE, 1993a. *Rehabilitation potential of the traditional water supply system, Lalitpur, Nepal*. Unpublished report of Urban Development through Local Effort, Kathmandu, Nepal.
- UDLE, 1993b. *Feasibility study of Rajkulo: rehabilitation of Patan's traditional water supply network*. Unpublished report of Urban Development through Local Effort, Kathmandu, Nepal.
- UDLE, 1992. *Historical Hitis and pokharis: traditional solution to water scarcity in Patan*. Unpublished report of Urban Development through Local Effort, Kathmandu, Nepal.
- UN-HABITAT, 2008. *Water Movements in Patan with Reference to Traditional Stone Spouts*. UN-HABITAT Water for Asian Cities Programme Nepal, Kathmandu.