Water in Ancient Indian Perspective and Ponds of Varanasi as Water Harvesting Structures

K.N. Prudhvi Raju and Diva Bhatt

Introduction

Rivers and river-valleys had been centres of development of civilisation. The importance of water as a precious resource had been realised by all civilisations to sustain life on earth. In ancient texts of India, it has been said, "*where there is water, there is food; where there is food, there is life*". What was once a ubiquitous resource has become scarce and even in places where water is everywhere, it had become scarcer because of quality deterioration. The causes for the present state of affairs are: population increase, industrialisation, urbanisation, poor governance and management and peoples' apathy and ignorance.

The importance and value of water had been realised very well in ancient India. The ancient seers expressed on the importance and value of water thus: *achamanam*—sipping of water thrice, *aapo marjanam*—sprinkling of water over the body, a symbolic expression of immersing oneself to be one with the universe, *punar achamanam*—sipping of water once again, *pratah prasanam*—sipping of water in the morning, *punar marjanam*—repetition of '*marjanam*', *arghya pradanam*—offering of water to the Sun God, *deva tarpanam*–offering of water to gods etc., are different steps in daily prayer—*sandhyavandanam*—morning, afternoon and evening prayer—which is intimately linked with water. At every step in this day to day prayer, water is used as the most precious gift that one can give to gods. This is the type of relationship that ancient Indians developed with

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water and this relationship and veneration for water are responsible for keeping water sources full and pure. It is because of the importance of water as life giving and life-saving and life sustaining element, it is venerated by Indians as the most precious liquid and hence have evolved a code of conduct near water sources especially near the river Ganga. So the problems the present population is facing with water are connected with ignorance of people about their own *sastras*—texts, about the roots of their own gods and goddesses, value of water and callous attitude towards long established traditions and culture.

The present study is an attempt to map the ponds of Varanasi and the sites of garbage collection and disposal sites and to give suggestions as to what is to be done to harvest the water and how to meet the future water needs of the people of Varanasi city in a scenario of climatic and environmental change.

Results and Discussion

The Case of Varanasi City

Varanasi City, geographically located between 82° 57′ to 83° 01′ E Longitude and 25° 15′ to 25° 22′ N Latitude, has an aerial extent of about 1550 sq km (Fig. 1). It was known as a city of ponds (*kunds*) and streams (*nalas*). The ponds, streams and a number of wells served the needs of the people of Varanasi till protected water supply system came into existence in 1892 to cater to about two lakhs of population. The water supply system was expanded to cater to 4.60 lakhs of population, latest in the year 1954. Now, the population of the city is about 14.34 lakhs. With people readily going for tap water, the ponds and streams went into disuse and abuse. The waters of the Ganga too turned bad, unfit for direct consumption. With supply systems deficient and failing, most of the people (about 80 %) depend on ground water to meet their needs. So, naturally the ground water is a stressed resource and in every summer water table goes down. With water supply not very much dependable, situation can turn towards the worst with the expected climate and environmental changes.

During the years between 1954 till date, the water supply sources are augmented by punching 80 minor and 141 major (as per Varanasi Nagar Nigam records) tube-wells (Fig. 2). Currently the water is supplied at a rate 165 LD^{-1} per capita whereas the WHO norm is 270 LD^{-1} per capita (Mohan et al., 2011). This figure of 165 LD^{-1} per capita is on paper; actually, in reality the water is supplied at a much lower rate. These tube-wells run on power and with power supply playing truant for most of the time, water supply through these tube-wells is not dependable. With insufficient public water supply, people are forced to go for their own shallow to deep tube wells. There are innumerable private hand-pumps and shallow to deep tube-wells. Most of these groundwater sources go dry in summer because of lowering of water table. So, with tremendous quantities of withdrawal of ground water (about

Fig. 1 Location of Varanasi in India

180 MLD by public tube wells) and with concrete covered urban surface being impervious and with ponds shrunk in size and dwindled in numbers the recharge rate is very poor and hence most of the bores go dry in summer because of falling water table. With climate and environmental changes looming large, the problem of water supply gets accentuated.

Geomorphology of Varanasi vis-a-vis Ponds and Streams

Varanasi is situated on the left bank of the river Ganga over a prominent natural levee built up along the concave bank of a meander loop. The natural levee though is a result of deposition by flood waters, it remains high and dry above the flood

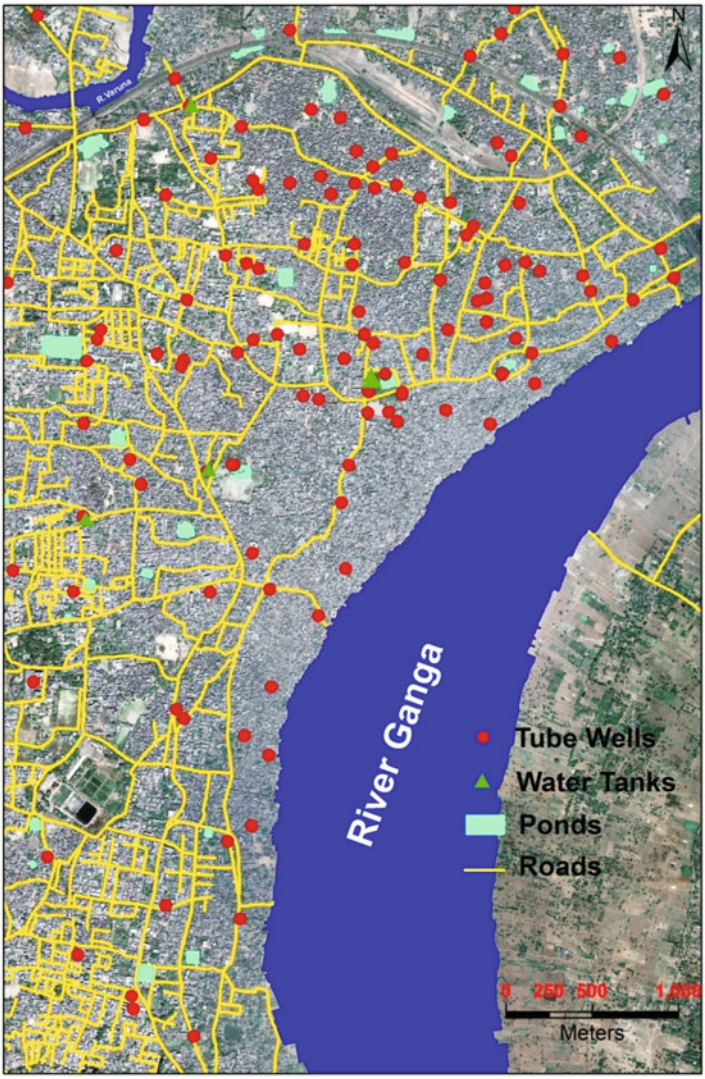

Fig. 2 Ponds, tube wells and garbage collection points in a part of Varanasi city as in 2011 with remote sensing (Google Earth) data in the background

basin and offers a favourable site (higher ground) for the establishment of human habitations. Moreover, a natural levee built-up by coarse deposits is a place of good groundwater source. So with two important conditions for the development of human habitations fulfilled, Varanasi has developed on this natural levee. When there is a prominent natural levee sloping gently away from the river, there is always a flood basin beyond with many streams and flow lines of water moving down from the natural levee into the flood basin. In a similar way, there can be

many small streams flowing down the levee into the river. Quite often, the streams flowing into the river from the steeper slope of the natural levee can capture streams flowing into the flood basin resulting in long streams cutting across the natural levee. It is for these natural causes there are many natural ponds, streams and flow-lines (*nalas*) in Varanasi. This is exactly the reason why Varanasi is called the "Blessed Land" for it offered a higher ground over the normal flood waters and many natural ponds of water. This natural levee offering good aquifer deposits, a number of wells were dug up as water sources at a later stage. Many of the ponds and wells in Varanasi are connected with the religious places. They are connected with the religious places with a clear intention of keeping them clean and pure. Most of the ponds and *kunds* in Varanasi used to have natural inlets and outlets to receive waters from the surrounding catchment. These ponds together with wells served wonderfully well the needs of the people and pilgrims of and to Varanasi.

With the starting of water supply system in 1892, gradually, these ponds and wells went into disuse and misuse and were spoiled and filled in due course of time. The number of ponds has dwindled, their surroundings are occupied and some of the ponds are completely filled. According to Ajai and Mohan (2011) there are 118 ponds and tanks now in the city, out of which 39 ponds and tanks are not in the revenue records of local government and 54 ponds are in the final stage of disappearing because of garbage filling and encroachment. It is unfortunate that Varanasi Development Authority (VDA) and Varanasi Municipal Corporation (VMC/Nagar Nigam) have filled some of the ponds to either bring up residential buildings or to use them as garbage dump-yards (Aagrah, 2011). Figure 3 shows the ponds, *kunds* and wells of Varanasi as recorded and mapped by James Prinsep in 1822 (Kejariwal, 2009) and Fig. 2 shows the ponds of Varanasi mapped on high resolution remote sensing data of 2011. A comparison would reveal that the number of ponds has come down from 94 ponds in 1882 to just 49 ponds in 2011 (here comparison between Varanasi of 1882 and Varanasi of 2011 is made for the same extent of area as in 1822 map though Varanasi is spread far and wide towards north, south and west of 1882 extent) and particularly the catchment areas around ponds have been built-up into a dense urban landscape (Fig. 4). Of course, ninety nine per cent of old wells are filled and covered up and the land are occupied for some purpose or the other. In place of 191 open dug wells present in 1882, there are now 125 shallow to deep public tube wells (for the part of Varanasi shown in Figs. 2 and 3) to supply water. Depth of general water level in this area of the Ganga Basin varies between 5 and 29 m bgl (Raju, 2012). But unfortunately the ground water up to these levels has become unfit for consumption and it is now generally extracted from depths ranging from 60 m to 120 m and beyond. Most of the old city of Varanasi is situated over a natural levee composed in depth of coarse sandy soils (Prudhvi Raju and Pandey, 2013) where percolation is somewhat quicker and the leeward side of the natural levee slopes gradually into the flood basin beyond, over which a greater extent of modern Varanasi city has developed, is made up of alternating sand and clay layers creating a multi-layered aquifer system (Shukla and Raju, 2008).

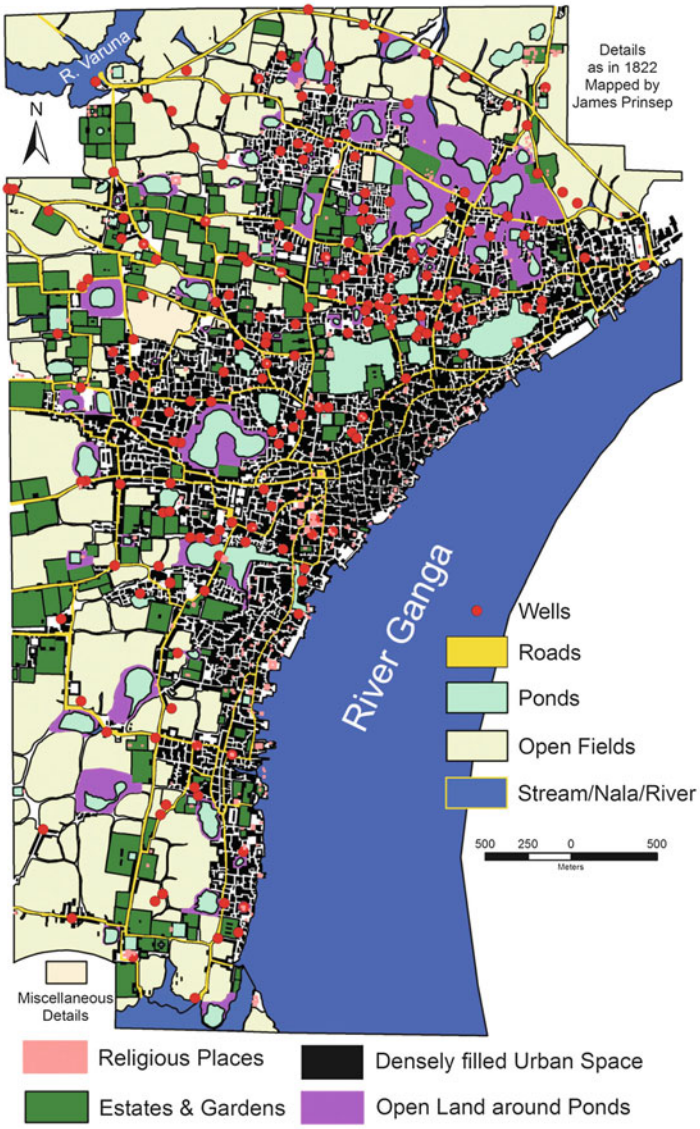

Fig. 3 A map showing (same extent of area as in Fig. 2) various details in Varanasi city as in year 1822 (mapped by James Prinsep)

Conclusion and Suggestion

The ponds of Varanasi offer an excellent opportunity to harvest rainwater for general use and to recharge ground water. But, as for using the existing ponds for water harvesting, there is a big impediment in the form of poor sewage and garbage

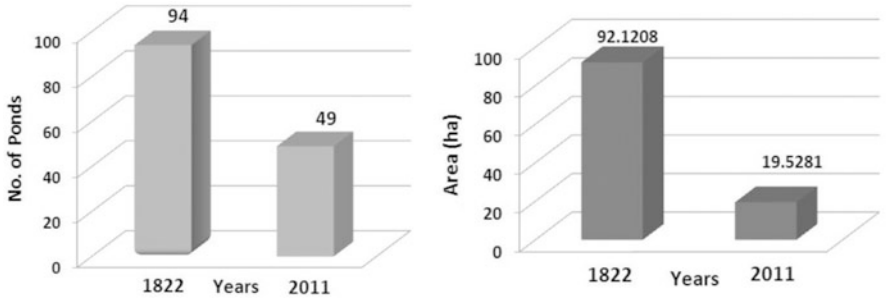

Fig. 4 Number and cumulative area of ponds in Varanasi city in years 1822 and 2011

management. So, unless the sewage and garbage is taken care of and unless the ponds are renovated after de-silting and with protection walls, water harvesting will not yield good results.

Since a large chunk of population of Varanasi is dependent on ground water, one solution to water problem is to allow for good recharge of ground water. The ponds of Varanasi offer an excellent opportunity to harvest the rainwater to recharge ground water. Many of these ponds are being rampantly occupied by encroachers and a few ponds linked to temples are not able to receive any discharge into them because of occupation of catchment. If the local government has a will, it can bring back the areas around most of the ponds by clearing the encroachments. But, there is a problem of garbage and sewage to harvest rain (storm) water into these ponds. Roof-top harvesting can be implemented later on. Figure 2 gives the original extent of ponds as in 1822. There is no proper scientific way of collection and disposal of garbage and sewage in the Varanasi city.

Garbage is disposed into many of these ponds (Figs. 5 and 6) and the stipulation of locating garbage disposal sites beyond 2 km of distance from the existing water sources—river and ponds—is given a go by and garbage is being dumped very near to surface water sources (Fig. 3). Garbage and sewage is grossly mismanaged inside the city. Varanasi produces 600 MT of solid waste per day and out of which about 150 MT remains uncollected every day (City Development Plan for Varanasi, JNNURM, 2006). The uncollected 150 MT (in total) per day is found dumped near, around and within the ponds. It is for these reasons of sewage leakage and decomposition of garbage, nitrate concentration in ground waters is found to be between 66-199 mg/l (Raju et al., 2009). Unless the stipulations and guidelines of locating garbage disposal are strictly followed, water harvesting can't be successful. But such programmes and projects cannot be implemented with success sans the co-operation and participation of the people.

Another major impediment for rain (storm) water harvesting is city's sewage. Varanasi has a very poor sewage disposal system and sewage is directly and quite often indirectly released into the various existing surface water systems of the city.

The city of Varanasi was well equipped with many water sources (streams, ponds and wells) like any other settlements in the past. These ponds and wells made

Fig. 5 Part of pond in Varanasi being filled with garbage and sewage

Fig. 6 Close-up of the same pond showing some details of the dumped garbage

it sure that the city never felt shortage of water. But with protected water supply system coming in place, ponds and wells went into disuse and misuse. With the result groundwater levels have also gone down because of high withdrawal of ground water and for want of recharge (from the ponds). As water supply system cannot be augmented at short intervals, now a time has come to look towards supplementing the water supply and recharging groundwater by revival of ponds as water harvesting structures. It can be done successfully if the ponds are reclaimed and revived after taking care of proper garbage and sewage disposal. It is time we should own the disowned infrastructures of the past. Revival of the ponds is the only refuge to stave off the looming water crisis for not only the holy city of Varanasi but also for other such settlements in India where ponds went into disuse.

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References

Abhilash (2010). The meaning of the word Bhagawan, http://www.hindu-blog.com/2010/06/bhagavan-meaning-of-term-bhagawan.html. Accessed 2 April 2013.

City Development Plan for Varanasi, Jawaharlal Nehru National Urban Renewal Mission (JNNURM) Municipal Corporation, Varanasi Final Report (2006). Varanasi, India http://gangapedia.iitk.ac.in/sites/default/files/CDP_Varanasi.pdf. Accessed on 4 December 2012.

Aagrah (2011). Some important sacred ponds and places in Kashi. *Editorial*, **1(8):** 12.

Kejariwal, O.P. (2009). Benaras Illustrated, James Prinsep with James Prinsep and Benares. Pilgrims Publishing, Varanasi.

Mohan, K., Srivastav, A. and Rai, P. (2011). Ground Water in the City Varanasi, India: Present Status and Prospects. *Quaestiones Geographcae*, **30(3):** 47-60.

Prudhvi Raju, K.N. and Pandey, M.K. (2013). Varanasi: Origin and Growth from a Geomorphic Perspective. *In:* Jayaswal, V. (ed.), Varanasi: Myths and Scientific Studies. Aryan Books International, New Delhi.

Raju, N.J., Ram, P. and Dey, S. (2009). Groundwater Quality in the Lower Varuna River Basin, Varanasi District, Uttar Pradesh. *Journal Geological Society of India*, **73:** 178-192.

Raju, N.J. (2012). Evaluation of Hydrogeochemical Processes in the Pleistocene Aquifers of Middle Ganga Plain, Uttar Pradesh, India. *Jour. Envi. Earth Sci*., **65:** 1291-1308.

Shukla, U.K. and Raju, N.J. (2008). Migration of the Ganga river and its Implication on Hydro-geological Potential of Varanasi area, U.P., India. *Jour. Earth System Sci*., **117:** 489-449.

Singh, R. (2012). www.manmaujisansthan.info Issues 5A and 5B. Accessed 2 April 2013.

Srivastava, A. and Mohan, K. (2011). Ponds and Water Bodies in the City of Varanasi: State of the Art. *In:* Kumra, V.K. et al. (eds), Strategic Management of Environment for Sustainable Development. Shree Publishers and Distributors, New Delhi.