Chapter 8
Bringing Back the Wisdom: Tradition in Urban Water Management

Chandra Bhushan Kumar and Sonali Ghosh

Abstract The discovery of water as a chemical compound and its direct linkage with a disease brought a paradigm shift in water management in the cities of the nineteenth century. Contemporary imperial ambitions and control not only facilitated the spread of this newfound knowledge in the occupied Asian cities but also led to the replacement of the age-old water management system that evolved over centuries. Bereft of local geography and social wisdom, this new system introduced layers of risks, which continue to define modern Asian cities. The plurality of water, integral to urban cohabitation, as understood in pre-modern times (before the control of nineteenth century State), gradually got erased by the new Master of Cities. Its devastating consequences have led to rethinking the way the water management system needs to be redesigned taking 'traditional wisdom' into its fold. In this context, this paper discusses the future of water management in Asian cities.

Keywords Global South · Waterscape · Asia · Traditional Knowledge · Delhi

8.1 Introduction

Water is one of the five eternal elements in every civilization; and as personified in ancient Indian Philosophy (*Kshitij, jal, paawak, gagan, samira, panch tatva nirmit adham shareera,* i.e. earth, water, fire, sky, and air – these five elements make mortal body). Civilizations have evolved keeping water as a focal factor of survival and prosperity. It allowed societies to develop a symbiotic relationship with this

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M. Basu, R. DasGupta (eds.), *Indigenous and Local Water Knowledge, Values and Practices*, https://doi.org/10.1007/978-981-19-9406-7_8

ubiquitous, but finite natural element. Advancement in the idea of modernity created a rupture in this relationship, as a concept of co-existence started getting replaced by the notion of control. This change and its consequences became more evident in urban locations, which either appeared or became more populated in the last two centuries.

In the middle of the nineteenth century, there has been an earnestness to provide regulated water in the area inhabited by the power centres of the State. In the Asian setting, such locations were inhabited by colonial powers, who preferred similar arrangements to their homelands. Existing cities remained outside of this provisioning citing reasons of finances (Mann). Gradual expansion failed to match the speed of urbanization. It also ignored the existing hydraulic institutions in those habitations, which survived for centuries. After the retreat of colonial powers, several countries opted for a democratic form of government. These countries witnessed an explosion in urbanization during the twentieth century, which made the world more than 50% urbanized since 2007 (UN-HABITAT, 2008). This was anything but planned urbanization. Dotted by slums, the booming urban centres struggled to ensure the provisioning of basic amenities including water to its inhabitants.

Delhi, a megacity teeming with a population of more than 22 million is multi-layered. Located on the bank of river Yamuna and cornered with Aravalli foothills, it has been plundered and rebuilt over seven times over the last millennium. The city witnessed the development and promotion of a variety of hydraulic infrastructures including lakes, *baolis* (water harvesting structures), wells, canals, and gardens. Two centuries after the creation of Shahjahanabad, the new capital in Delhi, Thornton (1858) notes:

> *. . .in the space between the range of hills and the palace, numerous under-ground channels were cut, leading to the various residents of the nobles, and the different divisions of the city (*Delhi*); yielding to the whole city and its suburbs a supply of good water, from open well-shafts connected with these subterraneous watercourses* (Thornton; pp.260).

Under the control of colonial power, the city's waterscape changed fundamentally. The first tap water supply started in 1892. In 1915, the city got its current territorial shape. In its water governance, state instruments abandoned the age-old water practices and opted for centralized access and provisioning. Even after 75 years of Independence; Delhi, like many other cities, is struggling to cope with the water demands of its inhabitants and the city.

This chapter does not promote nor reject the modern hydraulic system. However, it attempts to highlight the perils of the complete abandonment of traditional water wisdom and argues to co-opt these by tweaking the current model of urban water governance to achieve greater sustainability, equity, and justice. The paper is structured in five parts: *first*, it presents a survey of literature; *second*, it traces the water history of Delhi; *third*, it situates the ongoing crisis in urban water governance; *fourth*, it advocates for the adoption of holistic water governance approaches by incorporating indigenous water wisdom; and *finally*, it concludes with recommendations.

8.2 Literature Survey

The word 'tradition' comes from the Latin *traditio*, the noun from the verb *traderere* or *tradere* (to transmit, to hand over, to give for safekeeping) (Giddens, 1999). Giddens further comments that 'tradition' is wrongly considered as old, as it signifies continuity. These are complex mechanisms that survived for long periods precisely because they could change insidiously (ibid). In the context of water, Agarwal and Narain (1997) produced a very appealing and popular book titled 'Dying Wisdom: Rise, Fall and Potential of India's Traditional Water Harvesting System'. Equipped with historical texts, archaeological evidence, and cultural and social meaning of water for the diverse society, it advocated the revival of a traditional system of water harvesting. However, it conveniently ignored the political undercurrents shaping these practices or the injustice inherent in these practices.

The 'traditional' system thrived on the prefixed social structures that remained far from equal. The caste inequalities impacted the management and the use of this system. In the post-Independence phase, these inequalities have reduced but not disappeared yet. The question of scale remains absent in this propagation. The romanticization of the community water management as an alternative to the formal state arrangements has been questioned on various grounds including scale, politics, management, and sustainability (Bakker, 2010). Sillitoe (1998) cautions that while indigenous knowledge may facilitate people's skilful management of their resources, it may be inadequate in situations of rapid change (Mosse, 2003). Baviskar (2003) suggests that identities, interests, and resources should not be seen as predetermined givens, but as emergent products of the practices of cultural production. In the same vein, other scholars highlight the mutability of identities and traditions, thus calling concepts such as local knowledge, custom, and indigeneity into question (Tsing et al., 2005).

While unbridled faith in scientific rationality needs a rethink, so does romanticization of the past as well as traditional knowledge. Traditional knowledge and practices are not static but continuously evolving in the face of the changes in the wider political economy (Gupta 2011). As Sundar (2000) argues, 'indigenous or local knowledge is not frozen, inert, timeless entity, but dependent on the material conditions of those whose knowledge it is and the uses to which it is put'.

Knowledge and wisdom earned by human societies find space in modern urban water management at a subtle level in nudge form to influence the behaviour. There seems scope to enrich the current urban water governance with the values and wisdom of the indigenous water system, which has survived for centuries. Before elaborating on these, it would be helpful to understand the journey of hydraulics in Delhi.

8.3 Water History of Delhi

In Hindu mythology, Yamuna was *Sarjuga*, the daughter of the Sun god and the sister of Yama, the Lord of death. Along with the Ganges and Saraswati (a mythical river with no physical trace in modern times), Yamuna is a sacred river and taking a bath in it is part of the ritual. It originates from *Yamunotri,* a glacier in the Himalayas, and reaches the city after travelling a distance of 396 km (Fig. 8.1). The river has dictated the physical and political characteristics of the city since its beginning.

Broadly, the river divides the rural landscape on its left side from the urban life on the right (Fig. 8.2). However, it has been temperamental for the city and its hinterland. The remains of at least six paleochannels (old channels or courses) have been identified in Delhi. While a major paleochannel has been located in west/north-west Delhi coinciding in the main with the Mungeshpur Drain, several paleochannels have been located in and adjacent to the river flood plain.[1] This gradual shift in trajectory has left several traces in the form of lakes, ponds, and water bodies within the megacity (Dhawle & Bhatnagar, 2010). Regarding its present trajectory and seasonal fluctuation in flow, the *Delhi District Gazetteer,* 1912 informs: '*The river enters, the district at a height of some 710 feet, and leaves it at about 630 feet above the level of the sea, with a course within the Delhi limits of rather over 90 miles, and an average fall of between 10 and 11 inches to the mile. 'the general direction is nearly due south. In the floods of the rainy season, the river has considerable breadth, swelling in places to several miles, with a maximum depth of some 25 feet. In the cold weather, its normal depth is said to be four feet only; the stream is only sufficient to supply the three canals which draw from it (the Eastern and the Western Jamna. and the Agra 'Canal) and is then fordable in many places'* (p.4).

The presence of river and ridge within the territorial boundary of the megacity was not sufficient to fulfil the vision of water-sustained civic life. Rather these physical features became the basis for human interventions.

Before the arrival of new rulers from Central Asia, local rulers, belonging to the Hindu community used the simplest prototype of rainfall-runoff control (the earthen, sometimes rock-clad, check dams across local streams) and/or construction of large ponds, like Surajkund for the needs of habitation (Cherian, 2004). After 1192, Delhi came under the control of Islamic rulers, the followers of Islam, which like other religions claimed, '*we have made from water every living thing'* (Qur'an 21:30). This belief and the political compulsion of meeting the well-being of the habitants influenced the evolution of a distinct urban landscape dotted by three forms of the structure surrounding water: *first,* large water tanks and reservoirs, *second,* step-wells, and *third,* gardens. These structures were not new for the new locations. However, these were grand in scale, complex in a plan, and symbols of political power and human (to show care for the public) statements (Singh, 2010).

[1] Blueprint for water augmentation in Delhi, NHD, INTACH, p.V, March 1999.

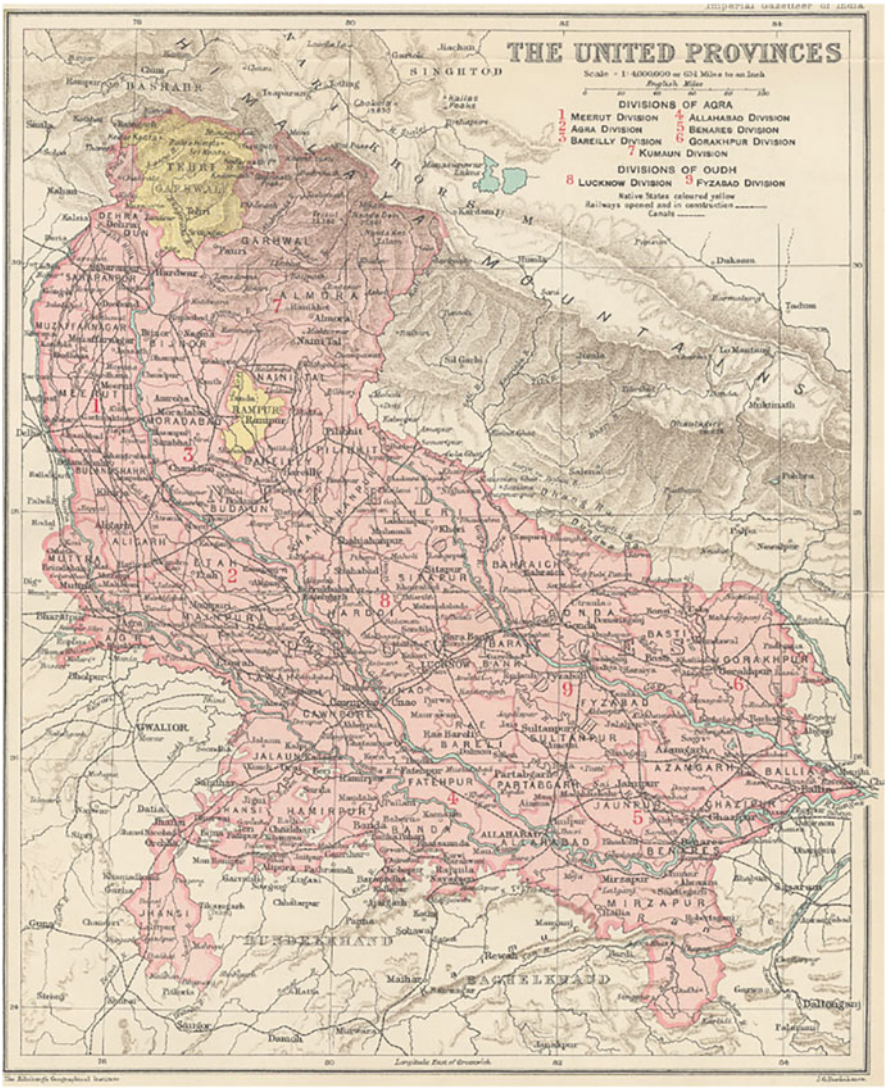

Fig. 8.1 The Yamuna and its cities (Source: Imperial Gazetteer Atlas, 1909, Available at http://dsal.uchicago.edu/reference/gaz_atlas_1909/ (accessed on 14/07/2012).)

Another popular water augmentation method was the construction of step wells. These wells, unique to India, create '*a link between underground water and surface life is as rich, colourful, and textured as India itself'*, claims American photographer Morna Livingston, the author of *Steps to Water*. Her vivid photographic work focuses on step-wells in western India. These wells follow a common structural design: '*an excavation lined with stone allows the water level inside the cavity to fluctuate freely with the surrounding water table. Continuous steps from ground*

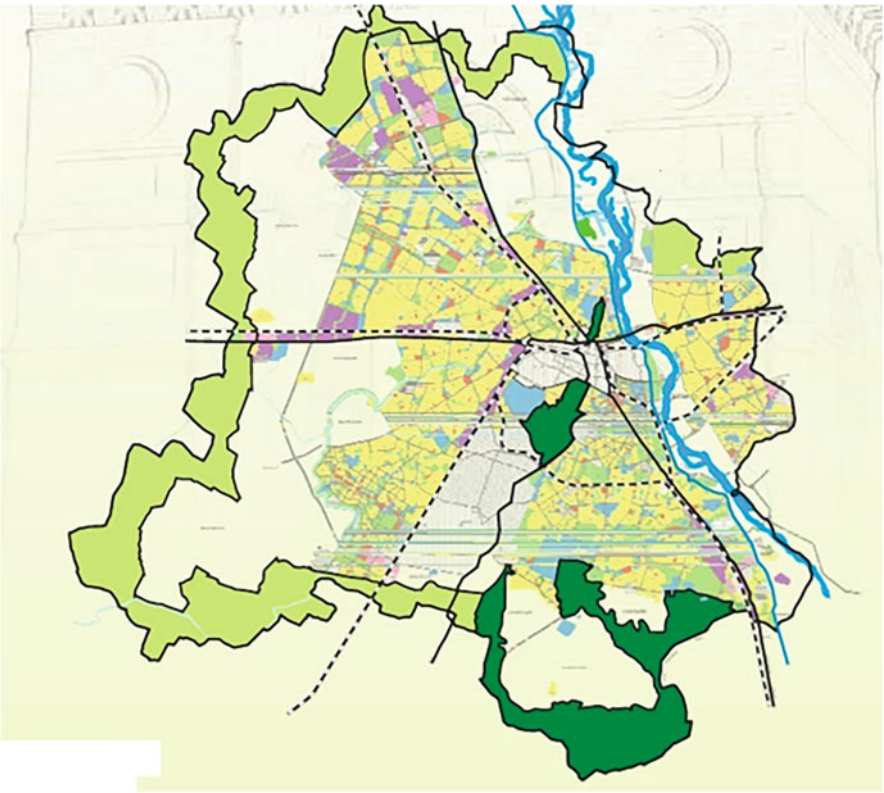

Fig. 8.2 Delhi and Yamuna (Source: GNCTD, 2010)

level to the bottom of the structure lead to water, no matter how great the variation in the water table' (Livingston, 2002: xix). Lort (1995) lists eighteen *baolis* (step-wells) from this period within the present megacity. All of these are located between the northern ridge and the southern boundary of the present megacity on the western side of Yamuna.

Two specific characteristics are noticed in the construction of these step-wells: these were mostly constructed by the men and women of repute from the society (including aristocracy and wealthy landlords) and the purpose of construction was twofold, first to invoke a sense of proximity to political power among the general population, and second, offering sweet water for the public (as pious and charitable activity). One such stepwell (at Naraina) claims, '*is this the water of the celestial river – cool, sweet and wholesome?...Thus exclaims the crowd of wayfarers when they proceed home, after drinking the sweet clear water of this well'* (quoted in Lort, 1997: 117).

These step wells survived in the landscape of the city amidst the changes in kings and emperors. This must have been possible due to local management, community

engagement, and continuous utility for the people. Here nature, culture, and society seem to work in harmony at a specific location. It was an example of *collective consumption* that made the city of Delhi.

Another form of water practised and promoted during this period was visible (and invisible) in the construction of gardens. 'Delhi is (was) surrounded on three sides by gardens in straight lines, each one stretching to the extent of twelve miles' (Al-Umari, fourteenth century quoted in Singh, 2010). While promoting the water management practices of storage and conservation, the rulers in the middle ages, followed the saying in the Quran (3:15) to construct gardens: '*Say: Shall I give you glad tidings of things far better than those? For the righteous are Gardens in nearness to their Lord with rivers flowing beneath; therein is their eternal home; with spouses purified and the good pleasure of Allah, for in Allah's sight are (all) his servants'*. Tradition, devotion to faith, administrative necessity (of the agricultural economy), pleasure and aesthetics influenced the laying of innumerable gardens as part of broader water management practices during the period. This legacy, despite the considerable alterations during the last two centuries, has helped Delhi as one of the greenest cities in the world.[2]

The centrality of water in designing habitation and its sustenance according to local conditions remained intact. This was evident from the landscape works like gardens in the city. The location of the new city provided an opportunity 'to emulate the riverfront landscape of gardens of the previous Mughal capital city of Agra, which had a series of gardens lining the river on either side' (ibid:143–144). Within and outside the imperial city gardens of varying scales and functions—*baghs, bagichas, and bagichis*—were made possible with the availability of water through the canal linked to minor channels.

During Mughal times (1526–1857), the link between various forms of water continued and the structure was designed according to local terrain and the local patterns of rainfall. Delhi Gazetteer (1912) notes that '*..irrigation from bunds is a characteristic feature in all parts of the district lying under or near the hills. The principle is that of concentrating the rainfall to moisten thoroughly a given cultivated area, allowing surplus water to run or drain off; application of this principle was successfully made on a large scale by the former rulers of the country and in no respect perhaps does the civilization of the Mughal Empire show better than in this of artificial irrigation'* (p.127).

The Ali Mardan canal, or Western Jamuna canal, was a significant addition to the existing forms of water in the city. The purpose of the canal seems threefold: *first,* to bring assured water to the city; *second,* to connect it to intra-city sources through channels [Polier noticed watercourses running through every principal street (quoted in Thornton, 1858)]; *third,* to provide sufficient irrigation facilities for the hinterland. It did not act as a substitute for the existing water infrastructure. Rather it acted as a feeder system for the existing network.

[2] http://www.financialexpress.com/news/delhi-one-of-cleanest-greenest-cities-pm/287796/ (accessed on 11/08/2012).

The summer in Delhi was a critical factor in influencing the design of the water management system. Harvesting the water for its judicious use during these difficult days in the year was a way of life. It encouraged the creation of literary works and proverbs which still survive in society. Abdur-Rahim-Khankhana, the court poet of Akbar wrote: *'Rahiman pani rakhiye, bin pani sab soon Paani gaye na ubare, moti manas choon'* (Conserve water, as without this everything including pearls, humans, and lemons has no value). Besides these, recognizing the multiple values of water in many proverbs was prevalent in Delhi and its hinterland. The Delhi Gazetteer of 1912 notes:

> *There are many sayings in the popular vocabulary exemplifying this: —If it rains in Har, it will make (the country) prosperous. —The showers of Sawan are filled with pearls.— (In) the showers of Sawan, dry and moist (soil) all become green. —If it rains in Bhadon, then both harvest will be (good): while heat for Jeth and rain for Bhadon are pithily indicated as desirable in the forcible lines:-—Talk as a rule is good, but not too much; silence is good, but not too much. Rain is good, but not too much; sunshine is good, but not too much. But the more we get the better of rain in Bhadon, or sun in Jeth, or talk in our storytellers, or silence in our wives.* (p.112)[3]

The presence of a variety of water in social and cultural life was further complemented by the presence of the river Yamuna, in some or other way, remaining integrated into the daily lives of people in the city.

Nature was still an ally in the city not as an outsider, but as an insider. Cultural meanings were still part of state discourses while harnessing and utilizing various forms of water. Socially, it continued to shape daily life through various practices. These practices on one side reflected the deep-rooted social stratification based on caste, race, and religion and on the other side, they remained a vehicle to attain prestige, salvation, and *punya* (goodness) (Lort, 1995). However, nature was political as evident in the inscriptions on the stepwells in Delhi (Lort, 1995). If the rich from the community sought proximity to the political power of the time, the state itself used hydraulic structures as a weapon to exert control (Wittfogel, 1957) and/or command obedience.

The mid-nineteenth century was a revolutionary time for the municipal water system in the western world. The discussions surrounding miasmic and germ theories were influencing the redesigning of the system of city hydraulics in the western world. Its implications for the colonial cities were obvious. For Delhi, the Punjab Sanitary Commissioner, in 1869, suggested building waterworks for tapping the Jamuna and levying taxes to cover the cost. However, 'the Mofussilite wondered whether the inhabitants would agree to be taxed and whether the Hindus would accept Jamuna water if it flowed out of underground pipes' [P.A.R., 1869–70:132 quoted in Gupta, 1981: 88–89)].

In 1889, after a considerable gap of 20 years in conception and implementation (unlike Lahore which got the water supply system in 1876), Delhi witnessed the beginning of a new era in the water supply. Gupta (1981) notes: '*The water supply*

[3] All italicized words represent various seasons in northern India.

wells were located at Chandrawal, a village on the banks of the Jamuna. Its inhabitants were shifted out. The heavy cost, aggravated by the absence of any contribution from the Provincial Government, meant that the project was carried out in stages. The walled city was to be supplied first, followed by the western suburbs and then the Civil Lines – where the houses, spread out over a large area, unlike the crowded city, were adequately supplied with water from the canal. Shahjahanabad came first, because it included the Cantonment, and the project had originally been put forward as necessary for the health of the garrison' (p. 161). The seeds of infrastructural biases in the modern system were sown.

She further says, **'**...*the water supply scheme substituted purified river water for the traditional supply from the canal and the wells. The pure water made available by the waterworks helped to reduce the death rate and the incidence of typhoid, cholera, and the 'Delhi boil'. But the swelling population and the increased density, the fall-off in the supply from wells and from the canal, the need to flush the new open drains in order to avert plague and to water the roads where increasing traffic threw up more and more dust, the needs of the new sewage farm, all made it imperative to secure more water, both of the potable, and the unfiltered variety. The consumption of water in 1904, with two thousand private connections, was more than double of what it had been in 1900'* (ibid:p.166). The new water system, premised on public health needs, was a departure from earlier understanding which included need fulfilling, cleansing characteristics, and modes of salvation.

The creation of a new capital, which took almost 20 years to complete, put a severe strain on the existing system. It also brought institutional changes in the city water management. To deal with water supply amongst four urban bodies—the Delhi Municipal Committee; the Delhi Civil Lines Notified Area Committee; the Cantonment Authority, Delhi New Cantonments; and the Imperial Delhi Municipal Committee—a Joint Water Board was constituted through the enactment of the Delhi Joint Water Board Act, 1926. Its objective was 'to provide for the maintenance of the works established to supply drinking water in bulk for the urban area of the city of Delhi'. However, it did not intend to reach the 184,032 rural inhabitants residing within the official territorial limit of Delhi.[4] The functioning of this Board was polarized since its inception. Gupta (1981) notes that '*in the first joint service worked out for the two Municipalities... friction soon developed. The charges were made arbitrarily, and the Delhi Municipality refused to pay (C.C.O., Education, F.4 (35)B/1925). They were also dissatisfied with the reduced quantity of water available to them (a large portion was going to the Notified Area, New Delhi, and the new Cantonment). The Delhi municipal representatives on the Water Board Committee were militant Congress sympathizers'- Asaf Ali, Lala Pearey Lal, Lala Sri Ram – and they were able, by taking a firm stand, to get better terms for the Municipality'* (p.220). The inequity in treatment between the new imperial city (including civil lines and cantonment) and the old city was evident in distribution, funding and other

[4] In 1921, the urban population of Delhi was 304,420.

spheres. Legg (2007), using governmentality as a framework, demonstrates the contrast in these treatments in the context of decongesting the city.

It affected the well-being of the old city greatly as the inhabitants, on one side failed to receive due attention from the authorities and on another side, they were gradually forced to forget the wisdom of the past with constant neglect of traditional hydraulic structures. The waves of urbanization already created concerns about congestion (ibid). The need for decongesting the Old City arose because it posed a danger to the whole of Delhi. Hume (1936) in *the Report on Relief of Congestion in Delhi* wrote '*the city contains numerous well-defined slum areas of the meanest type and abounds in insanitary lanes and dwellings of constituting a menace to the public health of the whole urban area of Delhi'*. Focus on public health has been a significant feature of the modern municipal water system.

The limitation of the colonial design of urban water management was the result of some interrelated factors: one, the inability to blend with the design suitable to local climatic conditions; two, the distaste for the existing system. It was performed selectively, a 'selective modernity' (Kaika, 2005). Moreover, the colonial interventions brought a paradigm shift in introducing modern water as a monolithic substance with uniform value. The colonial urban water supply left a polyglot legacy of institutions, modernity, and ideology to be carried forward into a new political state with Delhi as its central location.

The Interim Plan for Greater Delhi (GoI, 1956) notes that,

> *In the case of water supply, the problem of the enormous increase in demand for filtered water is becoming seriously acute and authorities feel their inability to meet the increased demand since the capacity of existing reservoirs is not much to hold adequate quantum of filtered water for the necessary supply./ In this connection the tapping of new sources to supply water to cope with the increasing demand should be envisaged and immediate measures taken so that the calamity of an impending insufficiency of supply may be avoided well beforehand. Prevention of wastage from unnecessary use and provision of adequate water supply in the newly developed colonies and many of the existing refugee colonies are some of the important problems that require immediate solutions*. (p. 73)

Interestingly, the institutional design of water provisioning for the megacity followed the usual prescription of 'water for all', but with a rider of 'feasibility' of the water utility. As seen in previous sections, the provisioning of modern water followed a stratified trajectory from the core to the periphery: first the rulers, then its associates, and if feasible, then other urban residents. Segregation was inbuilt into its design from inception. It very much dictated the geography of the modern hydraulic in the city. Another dimension of this was urban centricity. Despite, the formation of a capital territory in 1915, the state water provisioning for rural areas within the city remained a distant dream. Since Northwest, South West and South areas in Delhi are predominantly rural, the historical neglect (or lack of foresight) in the hydraulic planning still affects a large portion of the megacity. Since the ideological premise of singular and modernist water remained embedded in the postcolonial governance and its apparatus, the compartmentalized treatment of waters became a norm. In colonial times, the rural areas continued to rely on other waters, but with

independence, the desire for modern water grew, which got articulated in the vision of 'water supply for all' through the state-controlled network.

At the end of the twentieth century, the vision of a singular modern water supply in Delhi remained a distant dream. While replying to a question in the Delhi Legislative Assembly, the Chief Minister of Delhi stated that no timeline can be fixed for a 24x7 water supply in the city.[5] However, gradually, the limitation of the current vision has seen two major additions: one, the increased focus on other waters; and two, conservation at a household level.

8.4 Crisis in Water

Three elements viz., *first,* the transformation of 'waters' into 'water'; *second,* the increasing monopoly of the state in managing this water for distribution through a centralized hydraulic system by gradual dispossession of the indigenous methods of extraction and control; and *third,* incorporation of 'segregation' as an instrument to allocate this resource differently within the megacity, provide foundations to the multiple risks experienced in the urban water management system (Kumar, 2013). He further identifies:

> *A South megacity experiences two broad categories of risks- first layer risks and second layer risks. The first layer of risks mainly concerns five essential attributes of domestic water supply: sufficiency, accessibility, safety, acceptability, and affordability. The empirical results confirm the presence of these risks in the water supply system of Delhi. Existing inequity, denial of the right to water and infrastructural biases in the megacity water system aggravate the experience of these risks at the household level. This gets further compounded during the extreme summer season. The relationship between this category of risks and the source risks is quite obvious from the field results. As the megacity struggles with the first layer risks, the emergence of new drivers like globalization, climate change, new urban middle class, and regional politics create fresh conditions for second layer risks. Besides influencing the first layer risks, these second layer risks bring elements of uncertainty and unpredictability to the system. Interventions in these risks are happening at different scales with varied outcomes*. (p.45)

The supply-demand gap has another interesting dimension. Since supply comes from outside, the shift in responsibility is quite easy. The city uses it as a potent weapon to exert pressure outside and shirk responsibility within. It sidelines the larger issues of equity, justice, right, geography, and culture. The pre-fixation of the postcolonial state with its immediate predecessor obscures the centuries-long historical traditions in city making and the centrality of water in it.

[5] Starred Question no. 187 dated 29/06/2009.

8.5 Holistic Water Governance

> *Successful management entails both 'hard' investment in solid and lasting infrastructure to provide water services over the long term – thus reducing risk – and 'soft' investment in capacity, science, data collection and analysis, and information about water, so that uncertainties are continuously reduced. It will also require investment in alternative and innovative forms of water service provision, including the restoration of water services provided by healthy ecosystems, which have thus far been largely ignored as entry points for water management.* (WWAP, 2012: p. 356)

The cities in the global South face the dual challenges of poor infrastructure to overcome the existing and future risks: *first,* maintaining the decaying water assets; and *second,* building new infrastructure and services (Cashman and Ashley, 2008). These management approaches are based on the vision of a 24 × 7 uniform supply of water. This vision gets its scientific credibility through the adoption of a fixed normative volume of H_2O needed for everyone. The normal yardstick for individual needs provides a powerful tool to pursue accumulation, extract more resources, and propagate the myth of scarcity. It produces three facts: (i) domestic water uses are identical in value and quality; (ii) domestic water needs are more (quantity-wise) for the users of modern technology; and (iii) domestic water needs are uniform and unaffected by the season. These facts armed the technocrats to negate the political negotiations.

Globally, three prominent concepts are promoted to redesign the urban water management strategy – integrated urban water management (IUWM), soft path, and water--sensitive cities. All three disregard the dominance of traditional engineering or hard approaches which focus on supply-side interventions. The buzzword 'sustainability' seems a common thread in these approaches as they believe in 'development that meets the needs of the present without compromising the ability of future generations to meet their own needs'.[6] Another common factor is the increased attention on demand-side interventions. IUWM is driven by international organizations like the UN and World Bank, whereas the proponents of 'soft path' and 'water sensitive cities' are testing it in the cities of Canada and Australia respectively.

Anil Agarwal and Sunita Narain of the Centre for Science and Environment (CSE), Delhi edited a highly popular report titled 'Dying Wisdom: Rise, fall and potential of India's traditional water harvesting systems' (1997) which argues for the revival of local water harvesting systems and claims that this revival would not be an archaic return to the past. In Delhi, it campaigned for the popularization of rainwater harvesting, the revival of water bodies including the river Yamuna, and the conservation of the historical and cultural landscape of the city. Looking inside the city seemed attractive for three reasons: reducing (or limiting) external dependence;

[6] United Nations General Assembly (1987) *Report of the World Commission on Environment and Development: Our Common Future*. Transmitted to the General Assembly as an Annex to document A/42/427 - Development and International Co-operation: Environment. Retrieved on:16/08/2012.

reviving internal sources; and advocating increased engagement of the 'local' in overall water management.

Hosagrahar (2011) argues that the 'prevailing discourse on demand and supply of water obscures the loss and reinterpretation of features in the hydrological landscape through modernity and colonialism and the more recent trends in globalization and hypermodernity'. She feels that a 'view of modernity has framed contemporary approaches and interventions' (p.112). The need for a paradigm shift in urban water management has been noticed by the WWAP (2012) also.

> *There is, therefore, a need to replace the old ways of sector-based decision-making with a wider framework that considers the multiple facets of the development nexus, and the multiple risks and uncertainties, costs and benefits of every decision, in light of a long-term goal. In this regard, national governments have a major contribution to make by creating stronger, more collaborative, flexible institutions, adopting appropriate financing mechanisms to ensure the long-term viability of water services and infrastructure, and ensuring that water considerations are mainstreamed into everyday policy decisions as well as international governance processes. Water managers have a responsibility to continuously inform these processes and to raise awareness of the centrality of water in the development nexus*. (p.360)

However, it cautions against the application of historical understanding in current scenarios.

> *Knowledge in dealing with risks and uncertainties often comes from past experiences, observations and records. However, these are no longer adequate indicators of the risks and uncertainties faced by future water planners, managers, users and policy-makers, due to uncertainties generated by future changes in population growth and spatial distribution, water consumption patterns, socio-economic development, and climate variability and change. It is, therefore, crucial to understand the sources of uncertainty and learn how to analyse, internalize and cope with the risks that arise due to these uncertainties.* (p. 256)

It may be true in dealing with unknown uncertainties, but in cases of known uncertainties history and culture do offer opportunities to re-examine the path chosen to secure the water's future. As Hosagrahar (2011) comments in the case of Delhi:

> Studying the cultural landscapes of water through a historical perspective gives a window into alternative views, technologies, interpretations, and practices that worked well once. An opportunity to examine whether they can be modified to work well again. Such a cultural view of water management also allows us to reflect on transformations in its premises and as such, reframes discussions of water in megacities and our responses to it. (p.127)

Dealing with the multi-layered diverse risks of megacity water management demands a multi-pronged approach. However, if the ideology (singular and modernist vision of urban water) remains intact, the tools to achieve this ideology would continue to prevail over any radical change.

There is a strong case to bring a paradigm shift. History provides evidence; culture becomes the driver; science acts as an innovator, and politics lends support to displace the existing ideology of singular water first. Waters is not a mere cultural past, but it is very much visible in present. The practices of multiple waters are observable in the raw water portfolio (diverse sources including surface water, groundwater, and ranny (sic) of the Delhi Jal Board (government supplier of

water); bottling industries (Hamlin, 2000); in household uses (Gyawali, 2010); and even in institutional handling (stormwater, groundwater, drainage, irrigation, etc.). For domestic water supply, the most compelling evidence comes from two sources: first, the arguments for a dual water supply system or use of recycled wastewater; and second, the evidence emerging from the household approach.

The consideration of multiple waters in the ideology opens up various opportunities to design strategies to manage some of the risks present like diversifying source portfolio to reduce external risks; overcoming the risk of institutional fragmentation; revitalizing the historical and cultural landscape to reconnect with local resources; delinking the essentiality from other needs of water; and bringing local (seasonality, ecology and politics) back into consideration.

The management of risks present in megacity water is an ongoing struggle for the state and the households. The state often relies on engineering solutions to reduce the risks. This engineering fixation has continued in the case of rainwater harvesting measures in the megacity of Delhi. Here, the technical design and its promotion are themselves becoming barriers to maximizing the potential of rainwater. Despite several initiatives to promote the harvesting of rainwater, Delhi has not seen much success in water management as risks continue to be present in the system, and this has left the households to devise strategies to cope with these risks. Drawing from tradition, the households rely on segregation, prioritization, and diversification to reduce the impact of these risks. For a household, water is not a singular and uniform element. It practices multiple forms of water. The distinction between the drinking/cooking water and the washing and other water uses in the household is a time-tested risk reduction strategy. The coping strategies are acting as safety valves in the overall scheme of megacity governance. These coping strategies may seem to be the result of the failure of the state's commitment to adequate universal supply, but these also offer opportunities for the state to redesign its water management system strategically.

Conservation of water is a preferred strategy to reduce risk and enhance water security. In the households, this has been traditionally practised. However, in a megacity, these practices depend upon the characteristic of habitation. The planned colonies, in comparison to the villages (rural as well as urban), are less inclined to follow certain practices like the use of clay pots as water infrastructure. The state in its approach needs to factor in this kind of spatial diversity of the megacity. This targeted approach will be more strategic, focused, and rewarding (in outcome).

8.6 Discussion

The uniform strategy of water provisioning has not seen much success in Delhi. The centralized management of water provisioning fails to look beyond the singular form of water. This has obscured the historical and cultural landscape of water in the city. There is no place for the neighbourhood and its practices in this approach. It led to the neglect of internal water and increased dependency on external water giving a

false sense of security to the city. The change in this strategy is imperative in today's environment. This would require a two-pronged approach: the dispersion of the existing management structure and the adoption of the legal right of universal provisioning of the minimum threshold in domestic water. The dispersion of the existing management structure would entail the involvement of neighbourhood communities in the decision-making process, the conservation measures, and the revival of historical and cultural landscapes of water. The state needs to redesign its role as facilitator and regulator for the water provisioning in the megacity.

To sum up, the existing interventions to reduce risks in megacity water postulates to look beyond the engineering solutions, factor in the spatial diversity of the megacity, revisit the historical and cultural landscape of water and disperse of the management structure with the conferment of legal rights to water for the domestic provisioning. This multipronged approach will create conditions to address the multi-layered risks simultaneously.

8.7 Conclusion and Recommendations

In a more urbanized world, it is obvious that State has assumed the responsibility of harvesting and provisioning water to its inhabitants. Since the middle of the nineteenth century, in the belief of controlling water, the State started designing its water governance architecture ignoring the co-existential character of human societies of the past. Its devastating consequences are apparent in excessive extraction, scarcity, wastage, behavioural neglect, inequitable access and deprivation of certain habitations in the cities. It has also led to ignorance about seasonal variations of resources and availability, which has become more palpable in times of climate change. Indigenous wisdom about this essential element allows us to lessen these damages, as demonstrated in this paper. In conclusion, important recommendations are as follows:

One, the idea of control over water is flawed. Modern technology may provide a temporary sense of controlling nature. However, experience shows that instead of control, society must continue living harmoniously with nature. This would require revisiting the narratives of power and control over water. In urban setting, it needs to shift from dominance to co-existence.

Two, water governance by integration has been advocated to maximize utilization and reduce wastage (WWAP, 2009, 2012). This integration of compartments misses the obvious: the sum is more than the total of each component. A holistic understanding of water is essential to inform the approaches to water governance in urban areas. It is more than the integration.

Third, urban water management is confronted with multiple risks. Concerns about supply and demand, on both sides, exacerbate the risks experienced by the inhabitants. Cities must learn to do portfolio management of water risks. On the supply side, it needs to widen its source base using harvesting and conservation as

key factors to enhance the availability of water. On-demand side, it needs to distinguish between essentiality and necessity, and design its policy instruments appropriately.

Fourth, seasonality in water in tropical countries is often ignored aspect. Cities in these areas have varied requirements and this needs to be factored into governance.

Fifth, conservation is not a dominant factor in current urban water governance. Provisioning by the State tempts inhabitants to become free riders. Reversing this behaviour would require the concerted efforts of every stakeholder.

Sixth, urban water institutions must ensure accessibility, availability, and affordability of quality water in reasonable quantity for every household. The right to assured water must be integral to the right to life.

Seventh, urban life requires the development and promotion of green spaces. Urban green spaces are not only the spaces for recreation but act as locations for absorption of rainwater, which helps in the recharging of groundwater. These green spaces need to be redesigned with treated water/wastewater.

Eighth, the urban water supply system works on norms of requirements. These are fixed mathematical articulations ignoring the needs evolved culturally in a particular location. Politically and technically fixed norms may sound appealing. However, it needs to be discarded because of its futility in water management in cities. Large cities ignoring their internal inequity and unmindful wastage keep projecting their demand at the cost of others. Norms must be culture and geography-specific for realistic assessment.

Ninth, indigenous water wisdom is inter-generational. Advocacy on water conservation needs to account for this. In urban centres, inter-generational understanding of water wisdom is being forgotten. The state in close collaboration with civil societies must acknowledge these aspects in their policy praxis for sustainable water management in urban areas.

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