

Research Paper

Reconfiguring urban waterscape: water kiosks in Delhi as a new governance model

Uma Dey Sarkar and Bikramaditya K. Choudhary

ABSTRACT

International organizations firmly ratifying the human right to water though neoliberal reforms have pushed for increasing commodification and marketization of water. Accelerated urbanization in cities of the Global South have intensified problems associated with access to water and innovative solutions such as water kiosks are seen as the future of water access in underserved areas. This paper studies access to potable water in four resettlement colonies of Delhi with a focus on the water kiosks which operate in these colonies. Tracing the broader reforms which have been initiated in the public utility (Delhi Jal Board), the paper investigates the model of water kiosk of these colonies and the extent to which access to water has been impacted by the introduction of the water kiosks. Based on the processes of changes and continuities in the waterscapes of formal yet marginal spaces in the city and concomitant reconfigurations in urban governance, the paper argues that water kiosks serve to reproduce the uneven power relations embedded in the process of neoliberal urbanization.

Key words | Delhi, urban governance, water kiosk, waterscape, water supply

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HIGHLIGHTS

- Spatial patterns of water provision in the city of Delhi reinforce urban inequities.
- The pitfalls of technocratic governance exacerbate existing inequities.
- Infrastructures act as a substrate in which social relations of power are deeply implicated.
- Decentralized solutions appear as success; our analysis points to the deeper concerns of ownership and tilted decision-making process.
- Urban policies need to focus on structures.

INTRODUCTION

Urban water supply systems are the key element in ensuring access to safe drinking water to people in cities. The primary circuit of water supply in the cities of the Global South does not cover millions. Thus, the issues of water supply, access to clean water, distribution systems in the cities have become central to discussions on improving access to safe water across cities of the Global South, like India (Saroj

et al. 2019). Following the Dublin Principle, water utilities in many developing countries were privatized under the garb of decentralization and yet, access to improved sources of drinking water has increased by only 2% between 1990 and 2011 (UN Water 2014) in urban areas of the developing countries. UN-based Water Supply & Sanitation Collaborative Council (WSSCC) noted that water and sanitation was

the least on-track target of the 21 MDG targets and thus, the Sustainable Development Goals have set an ambitious plan of achieving universal and equitable access to safe and 'affordable' drinking water for all by 2030. While experts seem to agree that inadequate access to water supply is often a result of poor policies and management practices, there is much less agreement over the approaches. Lack of solutions to inequitable access to urban water primarily can be encapsulated in the conceptual framework of 'governance failure' (Bakker *et al.* 2008). In other words, focus on the ownership aspects of water utilities including failure of state and market has kept attention away from the institutional dimensions of water supply to poorer households. Two specific types of water supply, termed as 'circuits', have been the reality for most cities in the Global South: the primary circuit which is connected to and served by the state through a public utility and the secondary circuit comprising areas which are not connected to the public utility and, thus, rely on private water vendors for their water necessities (Smith 2001). The inability of urban local bodies to provide clean water has provided an opportune market for bottled water and water purification devices; while broader reforms in the water sector have been instrumental in incorporating new actors in the waterscape and, in turn, reconfiguring urban waterscapes. A plethora of literature on the inadequacy of water supply in Indian cities is primarily focused on unplanned settlements with precarious tenure status such as slums, sprawls and unauthorized colonies (Dutta *et al.* 2005; Anand 2011; Choudhary 2012; Ranganathan 2014; Bjorkman 2015; Singh *et al.* 2018) risking conflating water inadequacies with informal neighbourhoods, while planned neighbourhoods for the poor (resettlement and rehabilitation colonies) have received scant attention.

The capital city of Delhi, one of the fastest growing megacities of the world, reels under perpetual water scarcity, which assumes particularly fatal proportions during summer. Apart from the articulated natural scarcity and population size, inefficient infrastructure, weak municipal institutions and low operating efficiency of the Delhi Jal Board (DJB), are the oft-cited reasons for the crisis. Reforms were introduced with an aim at augmentation of potable water along with efforts to modernize the DJB so that it becomes responsive to expected standards including 24×7

water supplies, greater cost recovery, and ultimately, to address the crisis. Decentralized solutions such as water kiosks were introduced as a 'stop-gap' arrangement to cater to the urban poor, where piped connection is yet to be extended (Sarkar 2019).

In light of the changing water governance in the city, this paper studies access to potable water in four resettlement colonies of Delhi (namely, Matiyala-Dwarka, Shahbad Dairy, Holambi Kalan and Savda Ghevra) with a focus on the water kiosks which operate in these colonies. The first part of the paper maps the nature of reforms along with recent policies, which shape the waterscape in the city. The second part of the paper draws on a primary survey of 200 households to examine processes of continuities and changes in the waterscapes of formal yet marginal spaces in the city, even as the wider waterscape is changed by new policies. Studies on water kiosks in India have focused on certain models and their implications on access to water (Kumar 2018; Sarkar 2019). There is a need for systematic study at a granular level beyond mere assessment of impact that water kiosks have on access to water. In this background, the present paper looks at wider governance issues along with social and material relations, which water kiosks produce. While reflecting on the reconfigurations in urban governance, it is argued here that equitable waterscapes require careful consideration of structural processes which produce unequal waterscapes rather than simple technological solutions which are projected as the panacea for every issue pertaining to access to water. The paper also contributes to emerging analyses of technology in geography by focusing on the broader urban processes, which give rise to and sustain specific techno-natural assemblages and the social relations which are implicated in and reproduced by them.

GOVERNANCE IN THE CITIES OF THE GLOBAL SOUTH

Cities represent geographical and social concentrations of surplus and have historically been sites of capital accumulation. Under a neoliberal regime, cities have come to signify central nodes where neoliberal strategies are tested due to their strategic significance in terms of not just being

nodal sites of collective and private consumption, but also as loci of growth and innovation, zones of devolved governance and local institutional experimentation (Theodore *et al.* 2011). The goal of mobilizing and maintaining urban spaces, which are primarily meant for capital accumulation, has ensured that urban land-use regulations dominate urban planning. This differentiation of urban spaces has led to uneven spatial development and increasing social inequity, a hallmark of contemporary urbanization. Marginalized urban spaces, which arise due to inherent contradictions of neoliberal capitalism, are also marked by lack of basic infrastructure, insufficient livelihood opportunities and contested citizenship rights. From lacking precise forms to being outside the realm of what is 'prescribed' in planning documents, marginalized urban spaces have also been hotbeds for discussion on urban informality (Roy 2009; Wade 2009; McFarlane & Waibel 2012). Informality for a long time has been perceived as a 'phase' of development with the informal being 'integrated' with the formal structures as development progresses. This notion of informality is often challenged, as reality in the Global South suggests that maintaining informality allows global capital to grow faster and have complete contempt of any planning regulation which might exist in formal settlements. More than a decade ago, Roy (2005) contended that 'informal is not a separate sector but rather a series of transactions that connect different economies and spaces together'. As urban spaces have increasingly become commodified under neoliberal capitalism, urban planning as an instrument of spatial ordering and designing has focused more on 'management of resources, particularly land, through dynamic processes of informality' (Roy 2009). Planning in Delhi has been decisive in terms of reorganizing space and the marginal spaces of housing for the poor that remained within the city (squatter settlements in the city core without legal tenure). The unauthorized colonies and squatter settlements emerge due to inadequate demarcation of land for planned colonies (Bhan 2013). Planning mechanisms, in the subsequent master plans, have been instrumental in displacing the poor from squatter settlements located on the 'prime land' or nearby and relocate them to the geographical margins in pursuit of being a 'world-class' city. Internal competition between territories, here states in the union of India, to attract more capital and present themselves as a better

model of economic development or the provider of the most robust business climate became increasingly important under neoliberalism (Harvey 2005).

National governments and sub-national institutions including urban local bodies turned to multilateral aid agencies for funding financial deficits and help them reach the ideal of a 'networked' city weaving the marginal spaces with the wider social fabric through basic infrastructure. In pursuit of this, several reforms of utility services have been introduced which have been guided by macro-economic and sector-specific policies defined at the national level. Policies have tended to focus on privatization of public goods (such as water, electricity or public transport), including essential services like sanitation and garbage collection. The move essentially encouraged private sector partnerships, corporatization of utility bodies, deregulation and facilitation of marketization, and decentralization (Bakker 2007). While the stated focus in decentralization was on devolving powers and responsibilities to lower levels of government, there has been a subtle transfer of authority to non-state actors in the guise of self-governance (such as corporate social responsibility and participatory approaches). The pushback to harsh structural adjustment programmes has given way to softer roll-out strategies which act in and through the social economy (Graefe 2006) and are visible in increasing reliance on models of social entrepreneurship which aim to reconcile the economic vision of profit generation with the social vision of meeting unmet needs in basic services.

Stakeholder-based governance has gained currency under neoliberal restructuring to foster social integration and accountability, while tackling the vexed issue of financial sustainability. International economic reforms and consequent withdrawal of states from service provisioning have also contributed to an expanding social economy comprising non-governmental/non-profit organizations (NGOs/NPOs), voluntary groups, cooperatives and social enterprises. These entities filled the void in certain cases and also acted as mediators between the state and citizens. Examples such as Sulabh International in the urban sanitation sector or Akshay Patra Foundation in providing mid-day meals in government schools is an indication of the role of these entities in service provisioning in India. Social enterprises, as a subset of the social economy, represent a middle ground between the revenue maximization

goal of private enterprises and fulfilment of social or environmental goals of nonprofit organizations. Social enterprises help in the generation of economic value by creating local livelihood opportunities, fostering enterprise and competitiveness, facilitating innovations. They also contribute in the creation of social value by addressing the gaps and supplementing the efforts of the welfare state with solutions and fostering community cohesion in resource-scarce areas (Di Domenico *et al.* 2010; Kim & Lim 2017). As the lines blur between private enterprises and NPOs/NGOs, the relationship between 'state-market-civil society' has articulated itself in the form of new institutional set-ups, which are horizontally organized and are associated with the rise of a neoliberal governmental rationality and technologies of government (Swyngedouw 2005; Kooy & Bakker 2008). Changing organizational structures, financing and accountability associated with these arrangements has contributed to greater marketization of public goods while obscuring hierarchical power relations under the veil of consensual and participatory policy-making (Evans *et al.* 2005; Swyngedouw 2018).

WATER INFRASTRUCTURE AND THE NEOLIBERAL CITY

Infrastructure reflects two key characteristics: a collective term denoting a plurality of integrated parts and a relationship of depth and hierarchy (Carse 2017). Historical and social studies in technological systems pioneered the understanding of infrastructure as sociotechnical systems (Monstadt 2009). Studies in the field of geography, urban studies and anthropology have further brought nuance to the study of infrastructure as material mediators between nature and the city (Kaika & Swyngedouw 2000). Networked infrastructure, like water-supply systems, is often considered to be a material substrate for the provision of goods and services. The infrastructure is 'not just a 'thing', a 'system' ... (it) is a complex social and technological process that enables – or disables – particular kinds of action in the city' (Graham & McFarlane 2014). Infrastructure in this sense is a key reflector of political system, financial organization and governance structure, which under neoliberalism is heavily in favour of large scale business,

and a deeper analysis shows a complete contempt for the poor and those who are unable to pay for these infrastructures.

Governance of water infrastructure under neoliberalism particularly indicates the changing relationship among the state, the public and the private sectors, civil society and individual citizens. In the metro cities like Delhi and Bangaluru, it is introduction of systematized private entities, while in cities like Varanasi, Patna it is left to individual households to deal with, as they constitute water-rich ecologies (Choudhary 2012). Illegal water mining and illegal water trade have been characteristics of some of these cities, which are struggling to ensure water supply to growing demographic and economic realities (Das & Skelton 2020). The changing paradigms of urban water management with a focus on the evolving nature of urban water services with varying emphasis on private actors and public actors has been of interest. Bakker (2010) refers to the last and most dominant phase of water governance as 'market environmentalism' associated with transition to flexible forms of economic development and governance and growing environmental concerns and inadequacy of public networks in satisfying the rising demand leading to demand management as a strategy to deal with inadequate water supplies. Smith (2004) recognized a two-stage process: the first wave characterized by a 'roll-back the state' form of neoliberalism and the second stage marked by 'roll-out the state' form of neoliberalism, which is usually characterized by the institutional reorganization of a public service into the form of a corporation. As urban water governance regimes change, the nodes and actors in urban governance also change with consequent rescaling and reterritorialization of governance. In the Indian context, Choudhary & Das (2020) note that urban renewal and rejuvenation missions are major sites which ensure transfer of power to private actors disguised under the veil of participatory governance. This holds particularly true for JnNURM (2007–2012) and ongoing AMRUT and Smart Cities Mission, which have water supply as a thrust area with a technocratic focus on an ICT-enabled 'smart water management'.

Commodification of nature and accelerated inequality have become the order of the day in the wake of declining public investments in urban infrastructures. Multiple analyses of fragmented urban spaces, especially in the studies with more explicit focus on urban metabolic systems, have

reported such commodification and accentuated inequalities (Bakker 2007; Kumar 2014). Gandy (2008) analysed Mumbai's waterscape to argue that the western concept of a bacteriological city is at odds with the contemporary reality of heterogeneous and deeply polarized cities in postcolonial countries, and attempts to modernize infrastructures and reconfigure city spaces by middle-class activists often translates into inequities reminiscent of colonial times. Infrastructural assemblages that enable access to water often point towards the complex relationship between technology, notions of development, and articulations of citizenship in cities. It is evident from the experience of Mumbai that the technical and political systems along with the geophysical pressure of the water supply results in differentiated and uncertain outcomes for slum-dwellers (Anand 2011). Mumbai's slum redevelopment project under the neoliberal regime led to the creation of new land markets and had a tangential impact on the city's dilapidated water infrastructure (Bjorkman 2015). Everyday negotiations, mediated through micro-technologies and local knowledge combined with networks of power, point to rescaling of power and differentiated citizenship based on socio-spatial locations. A study of Udaipur city showed sectoral conflicts embedded in semi-arid ecology and different kinds of water and their flows which comprise the dynamic waterscape (Singh *et al.* 2018). Different sectors of the city are inhabited by different communities and their relative influence on the power structure and capability to negotiate and define the embedded dynamism in the semi-arid waterscape. Increasingly, the assemblages of human and non-human agents which make up water governance networks have been scrutinized using actor-network theory as a lens (Roy 2015), although integration and institutionalization of private actors in the waterscape through resultant governance changes have not been systematically examined.

Water kiosks, as decentralized solutions, have drawn much less attention than urban small water enterprises (USWEs) or water vending practices in general. Much of the literature on USWEs has been produced in the context of the urban poor lacking access to public water utilities. In such studies, water kiosks have often been categorized as either water resellers or standpipe operators/kiosk operators based on the legality of the economic activity (Njiru 2004; Kjellen & McGranahan 2006). There are a number

of general characteristics which seem to underline the activities of USWEs, such as: their presence in most parts of the developing world where utilities fail to provide services satisfactorily or are absent; their flexibility to tailor services to specific physical and social characteristics of the community; operation in a fairly competitive market; catering to and responsive to the demands of the poor; relatively expensive as compared to the water provided by utilities; difficulty in implementing/monitoring quality controls; and their ability to recover costs and maintain financial sustainability (Kjellen & McGranahan 2006). The growing presence of water kiosks, especially in cities, has attracted attention but systematic studies are few. The model of water kiosk and relevance to the urban poor in Delhi has been studied primarily with the focus on the factors contributing to the success of water kiosks and their installation and uptake challenges near railway stations (Kumar 2018; Sarkar 2019). In the wider context of economic and social relations, Schmidt (2020) has used the concept of 'pop-up infrastructure' to highlight the nature of the water kiosk as a discontinuous assemblage which is implicated with other water as well as non-water infrastructures. A granular analysis of the model of the water kiosk in operation in the resettlement colonies, its role in the wider waterscape, which characterize these spaces, and implications for urban governance are yet to be analysed, and this paper tries to answer these aspects.

DELHI'S WATER SUPPLY SYSTEM: A MACRO VIEW

Delhi is a riparian state along the Yamuna but its water footprint has expanded to the states of Punjab, Haryana, Uttarakhand and Uttar Pradesh. Three surface water sources – Tajewala Dam on the river Yamuna, Upper Ganga Canal and the Bhakra storage reservoir fail to fulfil the growing demand of water in the city. Groundwater is the main internal water source of Delhi and the DJB extracts groundwater to the tune of 80 MGD through 4,185 tube wells and 20 Ranney wells to supplement the surface water supply (GNCTD 2018). The city's increasing water demand has meant not just greater procurement of raw water from the above-mentioned sources, but also an increasing number of water treatment plants (WTPs) to

produce treated water to cater for the city's water demand. Presently, the city has nine WTPs with an installed capacity of 906 MGD, although water production is often considered lower due to reasons such as lower availability of raw water or inefficiency of WTPs (NCT 2019). The estimated water requirement of the city varies between 1,020 and 1,140 MGD depending on varying standards prescribed by Central Public Health and Environmental Engineering Organization or the Delhi Development Authority. The gap between estimated water demand and actual treated water available for distribution continues to grow as the per capita water consumption has steadily increased. In 1961, the per capita water consumption in the city was estimated at 166 lpcd which had increased to 248 lpcd in 1996 and, currently, the official figure of water consumption is estimated at 250 lpcd. Perusal of the sector-wise plan outlay for the Delhi Government's budgets shows that water and sanitation has always been high on the government's agenda, with allocation consistently higher than the national average (2.7%). However, the percentage of total revenue allocated to water supply and sanitation tends to fluctuate – from 12% in 2014 to 10% in 2016–17, 4% in 2017–18 and rising to 9% in 2019–2020.

Notwithstanding the consistent efforts of the DJB to increase production of potable water and ensure its supply to the growing population of the city, spatial inequities and unreliability of piped water supply have been marked features of the city's water supply. Unavailability of data on daily per capita consumption of water has hampered systematic studies on spatial inequities at the city scale but studies show that average per capita consumption of water in certain central areas of the city (such as New Delhi, the Cantonment area, Civil Lines and Rohini, and Karol Bagh) are considerably higher as compared to areas on the outskirts of the city such as Najafgarh/Dwarka, Narela, Mehrauli and Shahdara (Centre for Science and Environment 2012). Much of the insufficiency of water supply is often attributed to a combination of inadequate operations and maintenance systems, financial difficulties and low willingness to pay for paid water services (Zerah 2000; Dutta *et al.* 2005). In low-income areas of the city, residents depend on extra-legal tapping of water mains, water tankers (both private and municipal water tankers), buying potable water from local vendors, as well as borrowing water from

employers in exchange for extra work hours to gain access to water, with severe material and social consequences for residents of poorer areas (Truelove 2011; Sarkar 2019).

DELHI JAL BOARD AND THE REFORMS

Delhi Water Supply & Sewerage Disposal Undertaking (DWSSDU) was made responsible for the water supply in the city. The DWSSDU was established in 1958 as one of the six statutory committees functioning under the aegis of the Municipal Corporation of Delhi (MCD). In 1996, the first major shift presented itself in the form of the DWSSDU being handed over to the Government of the National Capital Territory of Delhi (GNCTD), emphasizing a shift from municipal control to state control over the water supply system in the city. Soon after in 1998, the Delhi Jal Board (DJB) was established, replacing the former DWSSDU, when the Delhi Water Board Act 1998 (Delhi Act No. 4 of 1998) received Presidential assent. The DJB was set up as an autonomous body responsible for procuring and producing all the water needed to fulfil the city's water requirements. However, for distribution, it is only responsible for areas under the control of the MCD while in the New Delhi Municipal Council (NDMC) and Delhi Cantonment Board (DCB) areas, it is responsible for bulk supply to the authorities while onward distribution is the responsibility of concerned authorities in the area as it was under DWSSDU. The [Delhi Jal Board Act \(1998\)](#) also gives the DJB a greater degree of autonomy to invite private investments in any of the tasks with which the board has been entrusted.

The DJB is governed by a board, composed of elected representatives, representatives from administrative bodies (such as MCD and NDMC), as well as four nominated members for water supply, drainage, finance and administration. Apart from that, the DJB also has a representative from the Ministry of Urban Development (who is nominated by the Central Government) and a representative from the Central Ground Water Authority (CGWA). Operational head of the DJB is a CEO who is nominated by the Government of NCT of Delhi, making the Delhi government a key player and responsible for the water needs of the city ([Delhi Jal Board 2019](#)). In theory, representation from all three levels of government – local, state and central – means close

coordination and a fair representation of interest. However, in reality, the experience of functioning of multilateral agencies is anything but encouraging. Existing difficulties in accountability at various levels, such as the amount of non-revenue water in each zone, spatial inequalities in supply to water and so on is common. The DJB divides Delhi into 70 revenue zones corresponding to the assembly constituencies. The fixing of assembly constituencies as jurisdictional areas, instead of command areas of different plants, adds to the existing difficulty in determining the amount of water supplied in each division.

Arrival of the 21st century witnessed liberalization of the water sector in Delhi and efforts by the DJB in the direction of privatization. The Board commissioned the 'Delhi Water Supply and Sewerage Project Preparation Study' in 2002 to be conducted by PricewaterhouseCoopers (PWC) under the tutelage of the World Bank. The entire exercise was fraught with controversies (Bhaduri & Kejriwal 2005) from the choice of PWC as the consultant for the study to the resultant reform project – Delhi Water and Sewerage Supply Reform Project (DWSSRP 2004), which proposed privatization in the form of a management model. This entailed delegation of distribution of water, billing, collection, maintenance and grievance redressal to private companies. Strong citizen campaigns and pressure groups' actions resulted in the reforms being stalled in 2005 only to be put into motion in 2011 with another named 'public-private partnership', which in most cases, especially in India, has been 'private profit from public resources'. Three pilot public-private partnerships (PPPs) (Koonan & Sampat 2012) focused on both water distribution as well as operation of water treatment plants. As Choudhary & Das (2020) noted in their work on urban renewal and rejuvenation programmes, the funding for the initial phase of privatization of the DJB was funnelled through the Jawaharlal Nehru National Urban Renewal Mission (JNNURM). Currently, the water treatment, transmission and distribution at Nangloi Water Treatment Plant (WTP) has been entrusted to the Nangloi Water Services Private Limited (a joint venture (JV) between Veolia Water India, a subsidiary of French transnational company Veolia, and Swach Environment, a Srei Infrastructure Finance Limited initiative) while the Sonia Vihar WTP has been established on a design-build-operate model with the

contract being handed over to SUEZ India Private Limited, a subsidiary of French multinational SUEZ Environment, and the Wazirabad WTP being established on a design-build-operate model by M/s Degremont Limited, another subsidiary of French multinational SUEZ. The transmission and distribution of water in the Malviya Nagar and Vasant Vihar area is being executed under a design, build, operate and transfer basis for ten years by MVV Water Utility Pvt. Ltd, a special purpose vehicle created by SPML Infra Limited (lead partner), HaGihon (National Water Company of Jerusalem) and Tahal Engineering, Israel while improvement of efficiency of the water distribution network under the Malviya Nagar UGR command area has been entrusted to Malviya Nagar Water Services which also has SPML Infra Limited, at least as one of the partners. Similarly, under the Delhi Water Supply Improvement Investment Program (DWSIIP) under the aegis of the Asian Development Bank (ADB), plans for more such subcontracting of work for existing UGRs associated with Wazirabad WTP Command area are in the pipeline.

'Equitable distribution', was one of the stated goals of the ambitious plan to overhaul the water and sanitation situation in the city. The Project Report prepared by PWC only pays lip service to the urban poor band, stating 'specific pro-poor interventions to address the needs of the poor' as one of the objectives of the reform programme (PWC, pp. 1–3) and a brief mention about bulk contracting with communities not being covered by the distribution (PWC, pp. 1–5). The report remained silent on the specific measures that are to be taken to address the issue raised. The genesis of the water kiosks can also be found in the DWSSRP (2004), which in its framework for action, drawing from the PWC Report, mentions 'assessment of the needs for the poor using CBIS' and 'pilot projects for community mobilization' (DJB 2005, p. 17). In the section on community mobilization, one notes the suggestion of 'cost effective arrangements for linking the poor to the mainstream, e.g. through use of community contracts, water kiosks, decentralized STPs ...' (DJB 2005, p. 17). GNCTD remained evasive about full or partial private participation in the water sector. In a right to information (RTI), it replied that the progression of the water utility's reform derives from and follows the agenda set out in the Reform Project of 2005 and speaks for itself (Koonan & Sampat 2012).

In 2014, the newly elected state government of the Aam Aadmi Party (AAP) announced the implementation of their free lifeline water policy to achieve their promised election manifesto's vision of 'water as a right'. The free lifeline water policy ensures water of up to 20,000 litres to every household per month through the DJB's metered connection, which remained limited to the middle-class population, incidentally, the louder voice in urban governance. In its quest to provide universal access to clean drinking water to the city, AAP also decided to extend piped water and sewerage network to all settlements irrespective of their legal status. However, water supply in the city is reliant on specific legal tenures on which a settlement is built and extension of piped network is contingent on receiving no-objection certificates (NoC) from landowning agencies. This technicality proved to be a hindrance in extension of piped water supply to many colonies in Delhi.

Waterscapes in the resettlement colonies are heterogeneous with respect to the actors involved in water provisioning as well as sources from where water is accessed. For non-potable water services, most areas largely depend on either public provisioning (in the form of piped water or municipal tankers) or self-provisioning. However, in the case of potable water requirements, the range of actors involved are greater as some form of water market is present in all the resettlement colonies. The waterscapes in individual resettlement colonies are largely shaped by their degree of integration with public water utility services (municipal piped water or municipal tankers). A significantly higher proportion of the lower quintile section of households was found to be dependent on municipal tankers for potable water. Participation in the existing water markets is mediated via economic status as well as extra-economic ties, as only 14.5% of households in the lowest quintile buy water (bottled water and water kiosk) while the proportion rises to 21.4% for the next three quintiles and 33.3% for the highest quintile.

THE WATER KIOSKS AS GOVERNANCE MODEL IN DELHI

The waterscapes in the resettlement colonies, of course, need to be seen in the light of the two major interventions in the city's water governance – the lifeline water policy

introduced by the AAP government in 2014 and the water kiosks installed in 2014, but which have been under process since 2012 initiated by the then Congress government. While the former universalizes the solution to water issues at the scale of the city, the latter seeks to provide a technical solution to water access issues at the local scale. In between this rescaling of governance, failure to appreciate the nature of water problems in potable and non-potable water for domestic water requirements has left many of the residents in the resettlement colonies in the same state of inadequate access as before these interventions were made in the city's waterscape.

The water kiosk is a market-based solution to the problem of insufficient access to drinking water. It operates mostly on the idea of social entrepreneurship in India and is argued as a boon of technological innovation. Such kiosks (popularly called 'water ATMs') are low-cost, self-contained automated water vending machines that store clean water and ensure access to water at a nominal cost with the added advantage of choice – both of the amount of water that a consumer wants and the timing at which they need it. The challenge of providing affordable clean water in underserved or unserved areas has resulted in water kiosks proliferating in urban as well as rural areas of the country. Water kiosks have been installed in varied spatial contexts in India and have moved beyond simply providing potable water to households in underserved areas. In public places such as railway and metro stations, places of worship, shopping complexes and markets, water kiosks have proliferated with urban policies (such as Smart Cities Mission) encouraging technology-based solutions in area-based development schemes.

Sarvajal, a social enterprise associated with global conglomerate Piramal runs the water kiosks in resettlement colonies on a for-profit basis. Post on-site purification, these ATMs sell either at the purification unit or through vending machines located across the settlement. Efficient and sufficient revenue generation is a key-varying factor between social enterprises and charitable organization and is necessary to keep the model financially viable. At the same time, the prices have to be fixed at competitive rates (i.e., comparatively lower than other informal water vendors who are already there in the market). This is usually achieved by partnering with other CSR implementation

partners, or in Delhi's case, with the DJB. The model that is followed in Delhi is the 'design, build, operate model' wherein Sarvajal is responsible for setting up the water kiosks on the land which Delhi Urban Shelter Improvement Board (DUSIB) has allotted in each of the resettlement colonies. The capital cost of the purification unit and dispensing units are borne by Sarvajal, which is also responsible for the operation and maintenance of the units, while they draw on the groundwater free of cost. The willing residents have to register at the Sarvajal office in the settlement and are provided with a 'radio frequency identification' (RFID) card, which is to be swiped every time water is drawn. Such cards also provide credit information. The RFID card can be topped up with a balance from the office of the operator and water is charged at Re. 1 for 3 litres at the purification unit while it is charged at 0.50 paise per litre at the dispensing units, factoring in the cost of transportation from the purification to the dispensing units. Since the terms of reference (ToR) for this particular arrangement between DJB and Sarvajal are not available in the public domain, details of how water is priced at the kiosks were clarified by kiosk operators as mutually decided between DJB and Sarvajal at fixed rates.

ACCESS TO WATER IN RESETTLEMENT COLONIES OF DELHI

That the conditions of access to water in Delhi are inequitable have been noted repeatedly (Zerah 2000; Dutta *et al.* 2005; Roy 2013) and policy discourses focusing on inefficiency of water infrastructures due to financial constraints, inadequate operation and maintenance of existing infrastructures has made decentralized solutions such as water-kiosks a preferred choice to ameliorate the problem of inadequate distribution of water in low-income areas. Resettlement colonies, as the name suggests, are areas or villages on the fringes of the city where erstwhile slum dwellers have been relocated. Resettlement colonies are part of the planned landscape of the city although the Master Plan for Delhi (2021) lists it under its 'unplanned' settlement category. While resettlement colonies were visualized as planned spaces with access to basic services, in reality, most resettlement colonies only receive a rudimentary form of basic services.

The nature of waterscape varies across the selected resettlement colonies depending on the degree of their integration with the primary circuit of water supply (DJB's piped water supply) in the city. Piped water supply was extended to Dwarka resettlement colony in 2014 when the victorious AAP took office for its first term. In Shahbad Dairy, only a proportion of the colony is connected to the DJB's piped water supply while Savda Ghevra and Holambi Kalan was found not to be connected to piped water supply. In these colonies, households in certain lanes have resorted to an informal piped water system by pooling money to install a borewell and then extended pipes to relatively poorer households; while those who can afford an individual bore-well have that for their water supply.

For potable water needs, as seen in Table 1, in the case of Dwarka which is part of a primary circuit, the majority of households surveyed depend on piped water. In other resettlement colonies, people largely depend on municipal water tankers for their potable water needs. It is to be noted that all the resettlement colonies had small entrepreneurs selling bottled water in the local market even before Sarvajal's water kiosks were established. Holambi Kalan, which has more than half of its households dependent on either bottled water or water kiosks for their potable water needs, is also the settlement with the highest average per capita income among the surveyed resettlement colonies and has local entrepreneurs who extract, purify and sell water. Depending on the reliability and quality of water supplied by the municipality, the households tend to switch sources for their potable and non-potable water needs.

Table 1 | Sources of potable water in resettlement colonies

Sources of potable water	Dwarka	Savda Ghevra	Shahbad Dairy	Holambi Kalan	Total
Piped into dwelling	87.20%	0.00%	17.50%	2.50%	22.20%
Public tap	0.00%	0.00%	2.50%	0.00%	0.50%
Tubewell/Borehole	2.60%	2.90%	5.00%	0.00%	2.60%
Municipal tanker	5.10%	84.30%	55.00%	30.00%	50.30%
Bottled water	0.00%	2.90%	0.00%	50.00%	11.60%
Water kiosks	5.10%	10.00%	7.50%	17.50%	10.10%
Other sources	0.00%	0.00%	12.50%	0.00%	2.60%

Source: Field work.

Income class-wise analysis of the data shows that for all the resettlement colonies taken together, households belonging to the highest quintile group (i.e., top 20% of the distribution) had least dependence on municipal tankers while being also the group which depended the highest on water kiosks (19.4%). Not unpredictably, the bottom 20% of those surveyed had the lowest proportion of households which bought water from water kiosks at a meagre 6.2%. With decreasing income, reliance on water kiosks as a source of water declines sharply. The trend across the resettlement colonies shows that in Dwarka, households belonging to the highest quintile depend on piped water into their dwelling and water kiosks for drinking water.

Table 2 denotes that in Savda Ghevra, it is seen that dependence on water kiosks is as high as 21.4% for the highest quintile, while for the lowest quintile, it is only 4.3%. In Holambi Kalan, which has a flourishing bottled water business, it is seen that dependence on bottled water (50%) is much higher than relying on water kiosks (17.5%) for the highest income quintile and this holds true across all income quintiles in this settlement. Highest income quintile households depend on water kiosks as their primary source of drinking water, while the lower quintiles, even if they buy, tend to depend on bottled water, which at times is marginally more costly. Preference for bottled water or water kiosks cannot be explained simply on the basis of

Table 2 | Income quintiles and sources of potable water

Sources of potable water		1st Quintile	2nd Quintile	3rd Quintile	4th Quintile	5th Quintile
Dwarka	Piped into dwelling	83.33	100.00	75.00	100.00	90.91
	Tubewell/Borehole	0.00	0.00	8.33	0.00	0.00
	Municipal tanker	16.67	0.00	8.33	0.00	0.00
	Water ATM	0.00	0.00	8.33	0.00	9.09
Savda Ghevra	Tubewell/Borehole	0.00	0.00	6.67	0.00	7.14
	Municipal tanker	91.30	87.50	93.33	70.00	71.43
	Bottled water	4.35	12.50	0.00	0.00	0.00
	Water ATM	4.35	0.00	0.00	30.00	21.43
Shahbad Dairy	Piped into dwelling	7.69	33.33	26.67	16.67	0.00
	Public tap	0.00	0.00	6.67	0.00	0.00
	Tubewell/Borehole	0.00	0.00	13.33	0.00	0.00
	Municipal tanker	69.23	33.33	33.33	83.33	66.67
	Water ATM	0.00	33.33	6.67	0.00	33.33
	Other sources	23.08	0.00	13.33	0.00	0.00
Holambi Kalan	Piped into dwelling	0.00	0.00	7.14	0.00	0.00
	Municipal tanker	16.67	63.64	21.43	0.00	12.50
	Bottled water	50.00	18.18	64.29	100.00	62.50
	Water ATM	33.33	18.18	7.14	0.00	25.00
Total	Piped into dwelling	12.50	25.00	25.00	23.81	27.78
	Public tap	0.00	0.00	1.79	0.00	0.00
	Tubewell/Borehole	0.00	0.00	7.14	0.00	2.78
	Municipal tanker	66.67	53.57	41.07	57.14	36.11
	Bottled water	8.33	10.71	16.07	4.76	13.89
	Water ATM	6.25	10.71	5.36	14.29	19.44
	Other Sources	6.25	0.00	3.57	0.00	0.00

Source: Field work.

socio-economic status of individual households. It is dependent on complex interactions between reliability of piped water or municipal tankers, perceived quality of water and extra-economic social ties.

The trend can be deciphered when one looks closely at how economy in the resettlement colonies functions and also how one perceives water. On the question about preference of bottled water over water kiosks or vice versa, it was revealed that paying upfront for water may not be possible for all households, especially the poorer households which depend on buying water on credit from local water-sellers. However, among the richer households, the preference of buying from water-kiosks vis-à-vis buying from a local seller is more of a perceived quality. The water from kiosks is considered better in quality vis-à-vis bottled water from a local seller. This can be attributed to not just official campaigns about clean water and sanitation, but also rigorous door-to-door campaigns the kiosk operators undertook when they began service across the resettlement colonies. This, of course, does not mean that poorer households are not aware of the quality of water. As a respondent (mother of two, piece-rate worker) aptly summarized her choice of bottled water over water kiosk, 'It is not about 'better' water as long as it is clean and potable unlike the tanker water. So many of us do not have enough money to spend on water every day and we can pay only when the contractor gives us money. So, the arrangement with the local guy works well'. It is also important to note that for many poorer households, water kiosks are often a secondary source of water to be relied on in terms of emergencies striking the family. For instance, a woman in Savda Ghevra mentioned that the local doctor prescribes clean water for her frail toddler who repeatedly suffers from digestive problems, an ailment unsurprisingly common among the residents of this resettlement colony. While her meagre income is not sufficient to provide water from the kiosks on a regular basis, she utilizes the services of the water kiosks when her toddler falls sick. Thus, it is seen that it is not just about the quality of water which determines the kind of water accessed, but is importantly shaped by working relations between local entrepreneurs and the community.

In terms of time spent in collecting potable water, it is seen in Table 3 that households collecting water from water kiosks spend an average of 25 minutes (approximately) in fetching

Table 3 | Time taken to fetch potable water (in minutes)

	Water kiosk	Any other source ^a
Dwarka	12.5	42.6
Savda Ghevra	21	29.5
Shahbad Dairy	12.5	32.5
Holambi Kalan	36.4	33
Total	25.6	32.4

^aExcludes households which have in-house water connections and private tubewell/borehole.

Source: Field work.

water from the water kiosks while collection from other sources (such as self-purchase of bottled water, municipal tankers, public taps, or collection from neighbours/community boreholes) takes slightly longer (approximately 32 minutes). Except in Holambi Kalan, time taken to fetch water from the kiosks is significantly lower than collecting water from other sources. This is particularly true of Dwarka and Shahbad Dairy which are older resettlement colonies and much more compact in their layout. Both Holambi Kalan and Savda Ghevra are newer resettlement colonies comprising multiple blocks of houses spread out over a larger area. Since the numbers were fixed at four units for Dwarka and Shahbad Dairy and five units at Savda Ghevra and Holambi Kalan, the location of units within the particular settlements and distance between units is an important consideration of the time taken to fetch water from water kiosks. Usually fetching water from kiosks is less time-consuming compared to other sources (especially from municipal tankers), although there is often a sense of unpredictability associated even with these kiosks. A respondent in Dwarka complained about intermittent gaps in re-filling water, which was found to be due to low off-take from those units. In Savda Ghevra, too, a respondent reported lowering the size of operation from four units to three units; this was also due to lower off-take. This made the respondent switch to bottled water as it is delivered to her doorstep and saves time.

The difference in terms of consumption is not very high whether water is collected from a kiosk or any other source (Table 4). It is still pertinent that households that depend on water kiosks tend to consume a marginally lower quantity of water except in Dwarka where, as noted in Table 2, consumption of water from water kiosks has only been noted among samples belonging to the higher quintiles. On the

Table 4 | Per capita consumption of potable water (in litres)

	Water kiosk	Other sources
Dwarka	9.3	7.9
Savda Ghevra	7.1	8.3
Shahbad Dairy	6.7	9.7
Holambi Kalan	4.3	5.5
Total	6.3	8.0

Source: Field work.

other hand, in Holambi Kalan, where the majority of the sample households depend on either bottled water or water kiosks to fulfil their potable water needs, per capita consumption is the lowest among all the surveyed resettlement colonies. In fact, for households collecting water from kiosks, it is below the minimum prescribed drinking water requirement of 5 lpcd (Gleick 1996). It is indicative of some form of water rationing by households when there is upfront monetary payment.

Owing to low capital investment and the compactness of their design which makes them suitable for a wide variety of settings, and their 'smart' technology and assured reliable quality, water kiosks are often presented as solutions to issues of access and affordability. However, water purchased from water kiosks is priced significantly higher than water provided by the public water utility (Re. 0.5 for a litre of water from a water kiosk vs Re. 0.0015 for a litre of water from DJB's piped water supply). Even with visible time saving while collecting water from water kiosks as compared to other sources, off-take is low in most colonies and consumption of potable water does not seem to be impacted in these colonies. Given the complex interactions among several factors, the scalability of the model is questionable, especially in settlements, where a water market already exists prior to installation of the kiosks or settlements that are connected to the public water utility.

WATER KIOSK MODEL: DEEPENING NEOLIBERALISM AND RECONSTITUTING CITIZENSHIP

Neoliberalism attracts citizenry with illusive outcry and catchy slogans. One such catchy slogan India witnessed

was 'minimum government and maximum governance', which was propagated during the 2014 general election by the then opposition party and the prime contender, BJP, led by the declared prime ministerial candidate of the BJP, Mr Narendra Modi. People in India, including the mainstream intelligentsia, became rather enthralled by the slogan and voted BJP into power, without realizing that minimum government also means almost absolute withdrawal of the state from welfare schemes (Choudhary & Das 2020). There has been a shift from government to governance which is found to be associated with rescaling and restructuring of states under neoliberalism (Jessop 2002; Swyngedouw 2005; Fuller & Geddes 2008). The genesis of water kiosks in Delhi point to structural transitions in the way cities are being governed when core functions of the state, such as policy-making, are being assigned to and shaped by management consultancy firms such as PWC.

Neoliberalism leads to a proliferation of polycentric institutions having key roles in rule making, rule setting and rule implementation (Swyngedouw 2005). The water supply system and key institutions in Delhi have been hybridized over time and incorporated private actors became entrusted with treatment, distribution and transmission of water. Installation of the water kiosks too represents another hybrid institution, in which private actors are at the focal point of operation, management and distribution of water. However, what sets apart the model of water kiosks is the de facto control over natural resources (groundwater) that is given with no regulatory oversight of the state. In a city with unprecedented groundwater depletion rates, strict regulations regarding extraction of groundwater, and contaminated groundwater being reported with alarming frequency, there is no account of the amount of water being extracted by the owners of these water kiosks. Similarly, there is no uniform policy of wastewater disposal at the sites of water kiosks. In Savda Ghevra, wastewater produced after water treatment is pumped into the ground ostensibly not to lead to water wastage. Nevertheless, it, in effect, pollutes the local aquifer with water that has high concentrations of total dissolved solids (TDS). It, thus, has negative externalities on residents, who depend on groundwater for drinking purposes, but is not accounted for in the model, which has been lauded for its efforts to bring water to the bottom of the pyramid.

It is evident that dependence on water kiosks is a function of primary (piped water) and secondary water (tankers) circuits. The level of integration in these resettlement colonies varies with respect to the piped water network and frequency of water tankers. While Dwarka experiences the extension of piped water with the rise of Dwarka subcity, the other colonies are only partially connected to a piped water network and depend largely on a secondary circuit of water supply or self-provisioning. Water kiosks have only marginally captured the imagination of residents in the resettlement colonies primarily because they fail to solve some of the core issues related to water in the colonies, such as access to non-potable water which is still largely dependent on state provisioning in these areas and subject to its many uncertainties. Further, the state has not withdrawn from provisioning of water, it continues to supply water to the rich areas of the city and also owns the rights on the natural resource, and decisions to which parties to sell it are chosen by the state. Facilitating the private entity to provide safe drinking water, however, allows the state to be still seen as a provider because of its formal arrangement with the private entity while allowing the state to govern from a distance without any accountability – as is seen in the case where water-dispensing units were uncereemoniously removed as the off-take from those sites was found to be below acceptable levels. There are no mechanisms even for grievance redressal. The kiosks operate as autonomous institutions and economic rationality dictates the choice of sites and worthiness of areas which can have access to water kiosks, primarily based on capability and the willingness to pay for water.

The choice of localities being serviced by the public utility is often responsible for production of informality in urban waterscapes (Bakker 2003; Cheng 2014; Ranganathan 2014). Resettlement colonies, being part of the city's formal planned landscape, are entitled to full service levels. However, inefficient service delivery modes have resulted in the waterscape being co-produced by state provisioning (water tankers/piped water suppliers), self-provisioning (bore-wells), but also substantially by small-scale water providers who either sell through local grocery stores or who are engaged in water treatment and selling much like Sarvajal. Ong (2006) observes that neoliberalism in emerging countries articulates as exceptions which 'are introduced in sites of transformation

where market-driven calculations are being introduced in the management of populations and the administration of special places'. The prevailing informality in Delhi is not a selective formalization as was observed in Manila (Cheng 2014) but the state selectively accepting and enabling the same practices which are dubbed 'illegal' by the state, thus disempowering local water entrepreneurs who, apart from being regularly harassed by the authorities, now have to compete with a multi-million company which has been selling water at a relatively cheaper rate with the approval of the state.

The water kiosks fundamentally represent not just a shift from government to governance, but through these kiosks, the city also produces subjects with neoliberal rationalities. The act of paying to access clean water delineates between 'good' citizens who choose to consume 'clean' water and also self-regulate water consumption and 'bad' citizens who continue to be a burden on a fiscally strained utility while indulging in wasteful consumption. It legitimizes the prevalent discourses, which vilify the poorer residents of the city for being the primary indulgers in informality while also not contributing to the fiscal health of the public utility. Introduction of water kiosks has not just reconstituted citizenship by assuring that 'clean' water can be consumed by paying a price but has further deepened inequalities along class-lines as depicted in Table 2. In other words, water kiosks serve to give rise to exclusive niches instead of democratizing waterscapes.

Given that supranational development and finance organizations are committed to fostering 'transformative' changes to achieve the SDGs, solutions, which promote alliances between stakeholders in the public and private sectors are looked at favourably. In fact, policy innovations and institutional innovations that facilitate changes in governance arrangements are considered the key to transformative sustainable development. These changes in governance arrangements represent structural changes toward greater commercialization of water resources without any change in the corresponding spatial or social power hierarchies, which underscore neoliberal urbanization. Customers who buy water from water kiosks still consume less water than middle- and upper-class residents while paying more per unit of water. Interventions such as water kiosks, thus, represent broader transformations in the relationship between residents of marginal spaces such as resettlement colonies and the state as hydro-social

contracts are redefined in terms of one's ability to pay, and this reproduces inequalities. The state relegating one of its basic functions to benevolent entrepreneurs who operate in and through the social economy underscores the importance of carefully evaluating technological solutions to political issues as these overlooked incremental shifts towards marketization change the nature of social justice and the meaning of belongingness to the city.

CONCLUSION

Interventions in waterscape often entail changes in existing mechanism of water delivery while establishing new patterns of water access and associated forms of in/exclusion. Roth *et al.* (2018) note that many interventions in waterscapes (institutions, policies, technologies, markets) often make governance choices appear rational and natural through the combined processes of technification (rendering technical), naturalization and universalization and, in the process, obscure the political nature of water governance. In this paper, we have highlighted the pitfalls of technocratic governance which exacerbate existing inequities in an uneven waterscape. Infrastructures act as a substrate in which social relations of power are deeply implicated and often are at the centre of contestations in everyday lives of urban residents. Thus, the need arises to examine how infrastructure and their changing governance regimes impact distributive and procedural aspects of justice. The AAP government's lifeline water policy, while a step forward in ensuring affordable water, focuses on piped water supply and, thus, fails to account for or ameliorate already existing spatial inequities inherent in the water network. Interpreting distributive justice based on homogenous categories (of space and people) does not lead to changes in material conditions as is evident from the waterscapes in resettlement conditions. Introduction of new flexible water technologies unburdened by the baggage of intensive capital requirement characteristic of public utilities has not changed the waterscape, where people still rely on inferior provisioning of public utility (municipal tankers) or self-provisioning. Decentralized solutions appear as success stories in popular media and policy circles, as they enable the poor to access clean water; our analysis points to the deeper concerns of

not just ownership of the water kiosks but also tilted decision-making processes. Participatory urban governance has incorporated large conglomerates and social enterprises in horizontally networked governance structures, which has led to commodification and marketization of water. Decentralization without participation has enabled new fault-lines to emerge in communities and the inability of residents in marginalized spaces to participate in shaping their infrastructural destinies. Techno-natural assemblages, such as water kiosks, are specific to certain sites, produced in certain political contexts, and are productive of political subjectivities. As such, the occurrence of pay-per-use water kiosks in planned but marginalized resettlement colonies once again points to the secondary status that poor residents of neoliberal cities are relegated to as new infrastructures and policies continue to reproduce unequal power relations.

Spatial patterns of water provision in the city of Delhi reinforce urban inequities. Such existing inequities require the examination of distributive and procedural modes of justice. This notion of formulation of justice takes us beyond mere ownership and delves into the arena of what we can call governance, prompting a question like 'how we do things', rather than 'what we have' (Smith 2004). Inclusion of in-built underlying processes and structures that foster injustice within a distributive framework provide an additional strength to the analytical frame of distributive justice (Fraser 1997). Thus, questions of equity in the urban waterscape can only be suitably addressed when urban policies focus on structures and seek to answer larger questions of oppression and domination while dealing with the issue of distribution of resources.

DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

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