Chapter 4

Water Governance of Delhi

1.1 Background

This chapter will analyse the functioning of the public utility driven supply and distribution of water in the city of Delhi from a political economy perspective, including its growth and evolution especially in the post-colonial phase. In the preceding chapter I have explained that Delhi Jal Board has in its basic planning and allotment itself differentiated between classes of citizens depending on income and their assumed needs, and this affects availability. I have argued against the official and dominant public discourse that Delhi's water crisis is due to geographical and spatial inequity. Instead, in bringing forth inter and intra-locality sharp inequalities as they exist amongst socio-economically different groups I have shown that these inequalities are coded into the structure of DJB itself; i.e. inequalities of availability are not accidental but institutionalised.

Apart from the issue of geographical inequity, the statist and dominant discourse also explains Delhi's water crisis as an outcome of a large gap which exists between the amount of water required by the huge population of Delhi and the actual amount available. In this chapter I will discuss along with this issue of population dynamics, concepts like carrying capacity, pollution and depletion of sources of water, institutional and infrastructural processes related to the supply and demand concerns which are invoked in the populist discourse to explicate the crisis of water in Delhi. Lastly, this chapter will dwell on the role of civil society, administration, judiciary
and media as they are reflected in the debates and processes around water management in Delhi.⁶⁸

1.2 Institutions, Politics & Power over Water

Before discussing the formal institutions of water as these exist in Delhi, it will be pertinent to discuss in brief the process of institution-building. Any source of freshwater, be it in the form of a river, groundwater, lake, pond, stream, etc. – when it becomes a source of utility for human beings – does not remain a mere natural resource. An added context of human-environment interaction through anthropogenic interventions converts such sources of water into objects of utilities. Further, the meaning and quality of being a utility also varies from being either of use-value or of exchange-value. Schaniberg (1993) details this categorization of use-value and exchange-value with regards to natural resources. To state in brief; use-value is invoked when a resource like water is meant for basic sustenance, social, physiological and to some extent even economic in a narrow sense. On the other hand, exchange-value brings in the element of formal and institutionalized commodification of the resource and use of it for many purposes including sustenance derived from formalized procurement. In more simplistic terms and in case of a resource like water, use-value can be associated with resources as they exist in a common-property arena like in rural societies, whereas exchange-value properties are at display when resources are used after procuring through a formal institutionalized mechanism mostly after certain payment like in a private or state managed system found in most

⁶⁸ Though I have used the term political-economic analysis of DJB in the beginning here it needs to be stressed here that in the broader framework this research situates itself under the political-ecology framework. In very brief the conceptual distinction between the two is; a political economy approach focuses on structural explanations of the unequal power relations as they exist in a society and a political ecology stream combines political economy approach with also the explanations derived from cultural politics and cultural ecology disciplines.
urban areas. With respect to the above-said, Baviskar (2003a: 5053) suggests that this is how the disciplinary lens of cultural politics views "presumptions contained in the term 'natural resources'; natural is not to be viewed beyond human and culture; and the term resource invoking its utility, as use and exchange values, is also culturally produced. Understood in this way it becomes easier to understand how water when found in its myriad forms and accompanying uses in even an idyllic village is to be seen interwoven with the differential social, economic, political and cultural diversities and asymmetries as they exist, institutionally but also mostly informally.

In cities too, with their dense population, the sources of water can only symbolically be viewed as 'commons' or in other words commons is just a symbolic term. The primary sources of water for a mega-city like Delhi — the river Yamuna and groundwater — are managed by a huge political, administrative and technical edifice to provide water to 'all' the people of this city; but the widespread existence of formal and informal institutions and mechanisms along with their widely different practices and end-results which in turn are impacted upon deeply by the existing power relations, bring forth a hugely uneven supply and distribution system of water. By discussing water, in the paradigmatic framework of a Marxist urban political ecology, following Swyngedouw and Heynen (2003; p-898), the purpose is to "provide an integrated and relational approach that helps untangle the interconnected economic, political, social and ecological processes that together go to form highly uneven and deeply unjust urban landscapes" as seen in the case of Delhi amongst many other things like housing, transport, health, electrification, education etc. and especially in terms of water. An elaboration of water supply and distribution in Delhi can serve as a means of providing a more general exploration into power struggles and the existing social relations of production amongst the population of Delhi. The DJB's
management of Delhi’s overall water, and patterns of its provision to different population groups, sharply divides the population into distinct classes.

2) Contemporary Delhi’s Institutionalised Hydrology

For the purpose of having a coherent discussion I will first delineate the objective situation or the facts and figures related to Delhi’s water scenario. Next after this descriptive exercise will follow the analysis of these and other issues towards making a logical and structural argument in the context of the hypothesis of this research; scarcity and power relations as they play their role in explaining the ‘crises’ of water in Delhi.

The Census of India 2001 puts Delhi’s population at 13.78 million. The DJB is responsible for production of drinking water and for all other uses in Delhi and its distribution in the areas under the control of the Municipal Corporation of Delhi (MCD). It supplies water in bulk to New Delhi Municipal Corporation (NDMC) and Delhi Cantonment Board (DCB) for further distribution in their respective areas. The installed capacity of water treatment plants is 631 mgd and by optimization through Tube wells, Ranney wells,69 etc, approximately 650 mgd potable water is being supplied by DJB (Economic Survey of Delhi 2003-04, Ahmed 2008, Kaul 2008, Daga 2004). Based on the simplistic calculation of dividing the total population by the amount of potable water made available by the public utility it comes to around 250 litres per capita per day (lpcd). The DJB also stands by these supply and distribution

69 Tube wells extract subsurface water through the use of electricity. Ranney well is constructed at shallow depths to store underground water especially unutilized rainwater runoff by using pipes which extend radially into an aquifer.
figures. Remarkably, this is the highest amount available to the population of any metropolitan city in India (Ruet, Sarvanan & Zerah 2002, Daga 2004, Kaul 2008).

2.1 Sources of water for NCT of Delhi

Delhi receives its water from 3 sources:

- Surface Water – Yamuna,
- Sub-Surface Water – Ranney wells/Tubewells
- Graduated Resource – Groundwater

Table 10

<table>
<thead>
<tr>
<th>Sl.No.</th>
<th>Source</th>
<th>Quantity (MGD)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Yamuna</td>
<td>229</td>
</tr>
<tr>
<td>2.</td>
<td>Ganga</td>
<td>100</td>
</tr>
<tr>
<td>3.</td>
<td>Bhakra Storage</td>
<td>240</td>
</tr>
<tr>
<td></td>
<td>Subtotal (Surface Water)</td>
<td>569</td>
</tr>
<tr>
<td>4.</td>
<td>Ranney Wells/Tube Wells (Ground water)</td>
<td>81</td>
</tr>
<tr>
<td></td>
<td>Total</td>
<td>650</td>
</tr>
</tbody>
</table>

MGD – Million Gallons Daily (4.5 litres amounts to 1 gallon)

Source: Economic Survey of Delhi 2003-04: p- 161

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70 Delhi Jal Board 2001. Another release of the government the Delhi Human Development Report 2006 also puts this figure at 255 lpcd.

71 From 1955 to 1993, constitutionally Delhi was governed directly by the central government as a Union Territory. In 1993 semi-statehood was granted to Delhi with a legislative assembly of its own. Thus the constitutional nomenclature National Capital Territory of Delhi came into being. The NCT of Delhi covers an area of 1,486 sq. km and is divided into 9 census districts and 27 sub-divisions. Of this, the urban area, including the new settlements in rural habitations, accounts for about 525 sq. km. Delhi encompasses three governing bodies: the Municipal Corporation of Delhi (MCD), the New Delhi Municipal Council (NDMC) and Delhi Cantonment Board (DCB). Of the total NCT area, MCD occupies 94.2 %, whereas NDMC and DCB occupy 2.9% and 2.9% respectively.

72 Information for this section is compiled from various official and other sources like Economic Survey of Delhi 2003-04, DJB website, TERI (2001), Daga (2004), Kaul (2008), Ahmed (2008), etc.
Surface Water:

The river Yamuna serves as the life line in terms of providing water to Delhi. Most of the water for the city comes from this surface water source. Delhi is one of the many states in the course of river Yamuna’s stretch, other states being Uttaranchal (having Yamunotri glacier, the origin of river Yamuna), Uttar Pradesh, and Haryana. Along with its major tributaries like the rivers Chambal, Betwa, Sind and Ken, the overall Yamuna network comes to existence. This network forms part of the north Indian states of Uttaranchal, Uttar Pradesh, Haryana, Madhya Pradesh & Rajasthan (see Map 5). As regards to sharing of water of this huge Yamuna network these states officially signed a Memorandum of Understanding along with Himachal Pradesh as another beneficiary on 12th of May 1994. From a total of 11.983 billion cubic metres (bcm) of water availability calculated, Delhi was provided a share of 0.724 bcm or 4.6% of the total resource. Delhi is currently availing 0.55 bcm out of its allocated share. The balance is expected on completion of the Renuka dam by the Himachal government and the Kishau and Lakhwar Vyasi dams by the Uttar Pradesh government (Economic Survey of Delhi 2003-04: p-162).

There are two other surface water sources – River Ganga and Bhakra Storage system. Of the 650 mgd that the DJB supplies to Delhi, more than 210 mgd is sourced directly from the Yamuna. Another 100 mgd is taken from Ganga and 200 mgd from Bhakra (Economic Survey of Delhi 2003-04: p-161). The Yamuna catchment area of the National Capital Territory of Delhi is one percent of the river’s total catchment area. Water from the Yamuna river is abstracted both directly from the river at Delhi and indirectly via the Western Yamuna Canal, which also delivers water to Delhi. Raw water from the other two sources is conveyed via the Upper Ganga and Bhakra (Narwana Branch) canals respectively.

73 River Ganga runs through the north India parallel to the north of Yamuna. Bhakra storage is located at the border of Punjab and Himachal Pradesh and is fed by tributaries forming a part of Indus river basin.
Map 5 – Comprehensive Mapping of the Sources of Water for Delhi

Sub-Surface Water:
This includes the Ranney wells & tubewells, which derive water from rainfall (on an average approximately 611.8 mm rainfall occurs in 27 rainy days) and unutilised rainwater runoff which is about 193 bcm (see TERI 2001). According to Economic Survey of Delhi 2003-04, as on March 2004, DJB has 2334 Tubewells and 21 Ranney Wells (Economic Survey of Delhi 2003-04: p – 161).

Graduated Resource:
Dynamic groundwater resources in Delhi have been estimated at 292 mcm, however current withdrawal is much higher than this (see TERI 2001, Maria 2008). The (hydro) geological situation is characterised by the occurrence of alluvial and hard rock formations and controls the groundwater availability in the territory. The quality of water beneath the hard rock formation in Delhi is generally potable (mainly central, western and north-western parts of Delhi), whereas in the alluvial formation groundwater, the water quality deteriorates with depth (mostly the eastern and north-eastern areas of Delhi). Hard rock formation is found in the portion of the Aravali ridge extension. The groundwater levels in the north of Delhi and along the Yamuna River are within 1-2 metres of the surface. In the south, especially where there is significant groundwater abstraction, water levels are tens of metres below ground level (Economic Survey of Delhi 2003-04).

In Delhi, groundwater contributes to substantial quantity of supply. It represents around 11% of Delhi’s water resources (Basu and Rao 2008) officially, even though pumping of the aquifer by domestic consumers and industries remain a widespread

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74 Section on hydrology and geology in Chapter 2 explains in detail about the physiography of these areas and their corresponding geographical locations in Delhi.
strategy to cope with unreliable supply in Delhi. Some actually estimate that groundwater could represent as much as 50% of the water used in the capital region (see Rohilla 2004, Maria 2004, CGWB 1996, INTACH 1998).75

2.2 Water Treatment, Transmission, Supply & Distribution

According to official statistics, DJB’s actual production is 735 MGD but owing to the transmission losses, the amount of water processed is 650 MGD (Economic Survey of Delhi 2003-04). Different sources, including other official sources inform that the loss of water during transmission is quite high ranging from 20% to 50% (JNNURM 2005, Daga 2004, Srivastav (2006).76 The city demands 850 MGD of water approximately.77 The shortage is mostly met by extraction of groundwater both by the DJB as well as individual and informal private sources.

Table 11 Treatment Capacity Indicating Source of Raw Water

<table>
<thead>
<tr>
<th>Source of Raw Water</th>
<th>Name of Water Treatment Plant</th>
<th>Installed Capacity MGD</th>
<th>Production by Optimisation MGD</th>
</tr>
</thead>
<tbody>
<tr>
<td>River Yamuna</td>
<td>Chandrawal I &amp; II</td>
<td>90</td>
<td>105</td>
</tr>
<tr>
<td>River Yamuna</td>
<td>Wazirabad I II &amp; III</td>
<td>120</td>
<td>124</td>
</tr>
<tr>
<td>Bhakra Storage/Yamuna</td>
<td>Haiderpur I &amp; II</td>
<td>200</td>
<td>210</td>
</tr>
<tr>
<td>Bhakra Storage</td>
<td>Nangloi</td>
<td>40</td>
<td>21</td>
</tr>
<tr>
<td>River Yamuna</td>
<td>Bawana</td>
<td>20</td>
<td>Nil</td>
</tr>
<tr>
<td>Upper Ganga Canal</td>
<td>Bhagirathi</td>
<td>100</td>
<td>110</td>
</tr>
<tr>
<td>Upper Ganga Canal</td>
<td>Sonia Vihar</td>
<td>140</td>
<td>65</td>
</tr>
<tr>
<td>Groundwater</td>
<td>Ranney Wells &amp; Tube Wells</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>790</strong></td>
<td><strong>735</strong></td>
<td></td>
</tr>
</tbody>
</table>

Source: Jawaharlal Nehru National Urban Renewal Mission (JNNURM), Ministry of Urban Development, Government of India, 2005

75 A discussion on various aspects of groundwater withdrawal forms a part of next section based on the analysis of the objective and factual detailing of Delhi’s water situation
76 Interview with Mr. Gyanendra Srivastav, IAS, Member Administration, DJB
77 Ibid
Map 6

Water Treatment Plants in Delhi & Sources of Water

Source – JNNURM 2005
Looking overall, the water supply system is through piped water network in urban area through in-house supply in *planned* areas; public stand posts, hand pumps in *non-planned* areas; in some parts through private motorised wells / tubewells, and in some of the other areas without planned water supply, through tankers. The tanker service is also available - vide monetary payment - on demand through DJB's telephonic services. Details are presented in table 12 below on Transmission & Distribution Network.

**Table 12 Transmission and Distribution Network in Delhi**

<table>
<thead>
<tr>
<th>Item</th>
<th>During 2001</th>
<th>As on 01.04.2005</th>
</tr>
</thead>
<tbody>
<tr>
<td>Length of Water mains(kms)</td>
<td>8363</td>
<td>More than 9,000</td>
</tr>
<tr>
<td>No. of Water connections</td>
<td>13,33,833</td>
<td>About 15.52 lakhs</td>
</tr>
<tr>
<td>No. of Water Stand Posts</td>
<td>11,533</td>
<td></td>
</tr>
<tr>
<td>(Public Water hydrants)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>No. of Water Tankers</td>
<td>493</td>
<td>1100 as per revised budget estimate 2005-06</td>
</tr>
<tr>
<td>No. of Private Tube wells</td>
<td>2,00,000</td>
<td>(Estimated)</td>
</tr>
<tr>
<td>Capacity of Exitng Underground Reservoirs</td>
<td>175 MG</td>
<td>Proposed to build 35 % of average demand as storage capacity.</td>
</tr>
<tr>
<td>[corresponding to 6-7 hours of production]</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: JNNURM 2005

Apart from above mentioned supply methods there also exist other measures like DJB's packaged/bottled drinking water which is made available in certain specially demarcated areas of South Delhi. Some specific localities of this area have been identified as *lying at the tail end* of the distribution network of DJB and thus face *water scarcity*. The rationale according to DJB for setting up of such special provision
only in the South Delhi area—"in order to meet the increasing demand for drinking water, it was decided by DJB to produce Packaged Drinking Water and make it available for sale in such areas at reasonable price" (DJB website). 78

The question of inequitable supply of water to different parts of Delhi has been officially acknowledged as well as mentioned by many other studies (JNNURM 2005, Delhi 1999 - A factsheet by National Capital Region Planning Board (NCRPB), Ahmed 2008, Maria 2008, Daga 2004, MacIntosh 2003). The mapping below taken from JNNURM 2005 document reflects the inequality as observed in geographical terms (see chapter 3 for detailed discussion of my research's argument against the geographical inequity contention).

Map 4 (repeated) Inequality of Water Supply

In-Equality of Water Supply

KEY
- NCT Boundary
- River
- HCD Zones
- Note: Figures in lpdc

Source: Delhi 1999 – A Fact

78 DJB website - http://www.delhijalboard.nic.in/djbdocs/r_t_information/pdf/DELHI%20JAL%20BOARD_01.01.08_.pdf

The website further notes—"A Bottling Plant was set up at Greater Kailash, Meter Workshop, Office Complex, Opp-Sadiq Nagar in South Delhi in Aug, 2002 and production 20 Litr. Packaged Drinking Water “JAL” bottles was started these bottles are being sold to the consumers through Jal Suvidha Kendra. Delhi Jal Board has also started production of 250 ml Packaged Drinking Water glasses recently and the same are available for sale since January 2007.” Apart from providing information about the source of water, its packaging techniques, its quality levels, the site further informs about the pricing of these; Rs. 25 for a 20 lts. jar and Rs. 31 for a carton of 24 glasses with 250 ml of drinking water in each.
The norms for the provisioning of most basic amenities including water supply, sanitation, solid waste management and electricity are different for formal and informal housing locations in Delhi. The official or policy level understanding behind this is that different segments of the population demand different amounts. Based on this assumption with regards to water supply, standards/norms have been established for provision of water to different types of settlements. While the standard for the provision of water to planned colonies is 225 lpcd, the same for resettlement colonies and urban villages is 155 lpcd and for Jhuggi Jhopri clusters is kept at 50 lpcd. According to officials, different quantities of water are provided to different settlements since their standard uses differ, and certain norms have been established in this regard (Interview with CEO, DJB and other top officials of DJB in 2006 May-June-July). At a policy level also there exist differences of opinion on putting such standard demarcations. For example, according to one of the state agencies, Bureau of Indian Standards (BIS), the average water requirement of a Delhi citizen is 160 litres per capita daily (lpcd). The Planning Commission has estimated the average requirement for different income groups - 130 lpcd for lower-income groups, 150 lpcd for middle-income groups, and 200 lpcd for higher-income groups (see Singh, A.K. 2005, Singh and Shukla 2006). Put simply, it means that the state provides water to different socio-economic groups based on certain ‘assumptions’ about differing water uses of people from different classes. To provide a very low amount of water to the vast majority of poor slum dwellers and a very high amount to the better off sections is a distinct feature of the state’s policy and it shows how power relations manifest themselves at the level of decision making. The applied scheme of things ensures that the upper classes get ample supplies to utilise water according to their ‘needs’. And,

79 Mr. Arun Mathur (June 2006)
such requirements are direct outcomes of the particular lifestyles based on the high socio-economic level of the better-off. For the poor and the marginalised, the methods, modes and quantities of supplies are kept extremely low (even below the basic minimum amount) and communitarian in nature, opposite to how and what the rich and better off are provided with; piped indoor supplies and in plentiful quantities.80

Some other sources like the Price Water House Coopers (PWC) report available on the DJB website also give us a broad picture of DJB’s supply and distribution81 –

“Outside the areas of NDMC and the DCB (to whom DJB makes bulk supplies only), the entire planned development area Municipal Corporation of Delhi is covered by the distribution system. Outside the MCD area, however, lie rural villages, some urban villages, unauthorised colonies and squatter settlements. The area outside the MCD boundary is only partially covered by the distribution system. The exact areas served by the distribution system are not known due to a lack of record drawings. Of the 135 urban villages, all have been supplied with piped water. Of the 567 unauthorised colonies 560 were supplied by March 2002, including 6,029 standposts. The number of JJ colonies is not known, but 820 have already been provided with piped water. There are 11,533 standposts within the entire system (including 830 covering all markets).”

80 A minimum of 100 liters of water per person per day is the internationally accepted norm, which includes apart from drinking purposes, water for cooking, bathing, washing and cleaning purposes (See Gleick 1996).
See chapter 5 for more details on how, when and why PWC conducted the study for DJB
To call it a summary of the discussion of the present section till now, there are certain facts from this objective description which need to be focussed; the shortfall between supply and demand is officially put around 200 to 250 mgd, the availability of water is acknowledged to be around 250 lpcd. Despite a high level of per capita availability and an officially acknowledged overuse and over-extraction of groundwater to overcome the demand-supply gap, the water crises in Delhi is explained by the problem of spatially or geographically uneven water distribution. Apart from these the other significant reasons cited are high amount of transmission losses ranging between 20% to 50% according to various sources, the exceptionally high amount of

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82 World Bank Cell remained in existence on the official taxonomy sheet as put on DJB website but with the holding up of the plans to implement World Bank proposals in 2006 the World Bank Cell has been removed as an item from the DJB official website.
'non-revenue water' and un-metered supply which is said to be an institutional lacunae of DJB, the massive pollution and diminution of the main sources of water; river Yamuna and an alarming rate of depletion of groundwater resource. These are also the ones which are cited in the dominant discourse to form a kind of bedrock to explain Delhi’s water crises (Economic Surveys of Delhi, Zerah 2000, Maria 2004, Delhi HDR 2006, Singh 2006 2007, Bhandari and Khare 2006, Interviews with DJB officials). Considering due to the public utility system in Delhi, water should be considered as a public good, the explanations in the dominant discourse seem like text-book cases based upon a wrongful understanding of society as homogeneous — absolute figures regarding supply-side and demand-side amounts based on total population figures, vague amount of transmission losses, unknown amount of groundwater extracted, communal provision of water supply treated under the category of non-revenue water. These seem completely divorced from the socio-political and cultural realities in which public goods are embedded. Taking cue from Mehta (2003) we understand that state-provided urban water supplies and distribution are not examples of pure public good as they do not exhibit characteristics of being non-rival and non-excludable in nature (see chapter 1). Instead the focus to determine their 'publicness' has to do with their level of access and deliverance by and to different groups in an urban society and as well to the power of different actors in determining its distribution. In the case of Delhi, we find that under a state-managed supply and distribution system, access to a vital resource like water is determined according to the socio-economic level with the rich and powerful

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83 In the analysis from chapter 3 over the differential access to water in Delhi I have shown how a publicly managed supply and distribution system makes water not only rival in nature, with upper classes availing better supplies at the cost of the poor, but also excludable wherein large sections of the discriminated and marginalised population groups are either discriminately provided or systemically excluded from public utility managed water allocation. In some instances I have shown that even certain rich remain excluded (e.g. Sainik Farms) but with their powerful socio-economic and political status they are easily able to avail adequate supplies contrary to the hardships of the poor.
cornering away most of the supply at subsidised prices. Their greater access also proves detrimental to the poor who get less than the required amount of water. Such a differential access is institutionalised through DJB’s policies and functioning. In this way, is also the control over water established by the better-off and powerful which in turn gives them more power. It proves to be true in Delhi’s case that power and water are mutually constitutive.

To continue the discussion, I will now carry out an analysis of the dominant discourse explanations around the issues of population dynamics, concept of carrying capacity, pollution and depletion of major sources of water and the gap between demand and supply.

3) Assessing the Role of Population Dynamics in Explaining Delhi’s Water Crisis

In the light of DJB’s discriminatory supply and distribution policy, a rigorous socio-spatial analysis of Delhi will bring out a clearer understanding of water supply and distribution and the issues and problems related to it. The areas visited during this research confirmed the vast differences amongst disparate groups of population in terms of access to and availability of water, both in intra and inter locality terms (see chapter 3). First, let us decrypt the population dynamics of Delhi and its relationship with the DJB’s patterns of water provision.

3.1 Delhi – a heterogeneously populated megacity

No mature discussion on water can exclude the reciprocal nature between the upsurge in population and its impact on the water domain, be it from the perspective of availability, distribution, planning, ecology and more so socially and economically. The crucial element in such a discussion has to be the acceptance of the fact that any
given population, especially in a large urban setup is not a homogenous entity. It is composed of wide ranging social, economic, cultural and political diversity. In the case of Delhi too like many other cities, more so of the developing world, we find this to be a befitting way to initiate any discussion on population. We also know from official policy perspective that DJB provides water differentially to different groups of population – different in terms of socio-economic levels determined through patterns of housing and status of localities. In this light one needs to find how population of Delhi is composed and situated in this megacity.

As the second chapter of this thesis, on hydrology and institutional history of water management, discussed in detail that the demographic expansion of Delhi, from the perspective of settlements and their relation to water and other amenities saw a major change with the coming of British and their development of New Delhi against the existing Shahjahanabad or later called Old Delhi in comparison to New Delhi. Through Hardiman (2002), Ashraf (2004) and Mann (2007) we know what fault-line like changes were brought in by the British in terms of the way water would be provided to people of Delhi especially in a socio-economically segregated way. The inhabitants of the ‘planned’ New Delhi acquired most in terms of all resources and made the Old Delhi get relegated to the position of an ‘unplanned’ city.

The population of Delhi has seen a phenomenal rise during the 20th century (see the Table 14 below) with especially the New Delhi coming up and the mass transfer of people into Delhi at the time of partition of India in 1947 and the immediate period following it.
Table 14

Population Increase in Delhi

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<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>0.41</td>
<td>0.91</td>
<td>17.4</td>
<td>62.20</td>
<td>94.20</td>
<td>133.78</td>
</tr>
</tbody>
</table>

In millions

1 million = 10 lakhs

Source: Census of India 2001

Population Increase in 20th Century

Delhi had a population of only 4.1 lakhs in 1911, which increased to 9.2 lakhs in 1941 with a decadal growth rate averaging approximately 30%. The migrants raised the
population from 9.2 lakhs in 1941 to 17.4 lakhs in 1951. The total population of Delhi went up from 62.20 lakhs in 1981 to about 94.20 lakhs in 1991, amounting to an increase of 32 lakhs over a period of 10 years, i.e. at an average rate of about 3.2 lakhs per year. Currently it is estimated that the population of Delhi is growing at 4–5 lakhs per year. The population of Delhi which was 13.78 million in 2001 is likely to reach 19.51 million in 2011 and cross the 20 million mark by the end of 2012 A.D. The increase in Delhi’s population from 4.1 million in 1911 to 13.78 million in 2001 is considered to be the highest in the capital cities of the world. In 1901, the density was 274 persons per square km, this increased to 1176 persons per sq. km in 1951 and 9294 persons per sq. km. in 2001 (Census 2001).

3.2 Socio-economic spatiality of Delhi’s population
Before discussing more about the impact of population increase on water it is imperative to mention a few significant aspects about the socio-spatial spread of Delhi’s population. Viewed in a historical perspective, the 20th century expansion of Delhi in the aftermath of an increased institutional density during British and especially post-colonial times has seen massive expansion of the city. The landmarks have been the ‘Town Planning Committee’ established in 1912 by British to pursue their plans of building an imperial city of Delhi. This committee demolished systematically the old city of Delhi. According to Roy (2004) this laid down the fundamental premise for all ‘planned’ displacement and eviction. In 1947, with independence also came a massive influx of post-partition refugees into Delhi from across the national borders. With the population of Delhi almost doubling overnight, this set the tone for a huge planning exercise to expand the city. The newer colonies were mostly built at the periphery of the existing city, geographically beyond the present day Inner Ring Road. In the name of better administration, in 1956 Delhi was
turned into a Union Territory to be governed directly by the Union Government. The Delhi Development Authority (DDA) was constituted in 1957 by an Act of Parliament ‘to check the haphazard and unplanned growth of Delhi ... with its sprawling residential colonies, without proper layouts and without the conveniences of life, and to promote and secure the development of Delhi according to plan.’ (See Roy 2004). With DDA’s proposal of a Master Plan of Delhi for coming 20 years started another era of ‘planning’. Roy (2004) and Baviskar (2003b) point out, that this process affected Delhi in the worst possible manner. The massive restructuring of Delhi on industrial, commercial and residential enclaves was initiated at a large scale but the actual builders of this behemoth – the poor labourers – were not allowed any space in such planning process and its imaginations. This gave rise to the mushrooming of slums in this city with no infrastructural and institutional premises or facilities. With a continuous growth of Delhi on this pattern this ‘siamese twin’ as Baviskar calls it kept growing. For Roy, the city planners never understood the connection between the expansion of the city and its makers’ lives. Delhi got administratively divided under three local governing bodies – MCD, NDMC and DCB. Specifically, these latter two areas fall in the category of most well-planned areas particularly NDMC area which is the Lutyen’s Delhi or the New Delhi located geographically in the centre of the vastly spread city.84 It comprises most of the official buildings of the Central Government along with structures like Presidential Palace, the Parliament House, Prime Minister’s House, bungalows and residences of members of Parliament, judiciary, bureaucracy and military, some of the most posh markets and commercial areas, and some of the biggest luxury hotels along with State owned media and bank establishments etc. The population residing in the area comprises of the first citizen of India, moving onto the

84 Named after Edward Lutyen, the principal architect of New Delhi.
top brass of political, bureaucratic and economic elite of the country. The other region, the DCB area comprises of the part of the city earmarked for the military establishments. The area falling under MCD is the largest and has different type of population groups with a majority of high income groups residing in the South Delhi areas.

Bhan (2007) traces this haphazard growth of Delhi and indicts DDA for on one hand having failed miserably in building low cost housing units but which on the other hand has through its policies allowed a far from legitimate share to upper middle classes to avail housing opportunities in the city. The Tejender Khanna Committee was set up in 2007 by the Ministry of Urban Development to examine unauthorised construction and misuse of land found that nearly 75 percent of the city lives in unauthorised colonies, out of which nearly 40 percent lives in a combination of resettlement colonies and unauthorised slums. The report directly links this to DDA’s “failure to build adequate housing units and land area for low-income communities” (see Bhan 2007).

Although there is uniformity in the spread of poor people in all parts of Delhi but they are few in comparative numbers when one looks at South Delhi’s population distribution than other parts of Delhi. In concrete terms we see today that Delhi presents a mix of planned and unplanned areas interspersing each other. A bird’s eye view of Delhi will show that planned areas seem to be located in pockets of a largely unplanned Delhi. An official population distribution table for Delhi based on housing pattern tabulated by DUEIIP 2021 below will help to substantiate this notion. 85

Table 15

TYPE OF SETTLEMENTS

<table>
<thead>
<tr>
<th>S.NO</th>
<th>Type of Settlement</th>
<th>Estimated population in lakh in 2000</th>
<th>% of total population</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>JJ Clusters</td>
<td>20.72</td>
<td>14.8</td>
</tr>
<tr>
<td>2.</td>
<td>Slum Designated Areas</td>
<td>26.64</td>
<td>19.1</td>
</tr>
<tr>
<td>3.</td>
<td>Unauthorised Colonies</td>
<td>7.40</td>
<td>5.3</td>
</tr>
<tr>
<td>4.</td>
<td>JJ Resettlement Colonies</td>
<td>17.76</td>
<td>12.7</td>
</tr>
<tr>
<td>5.</td>
<td>Rural Villages</td>
<td>7.40</td>
<td>5.3</td>
</tr>
<tr>
<td>6.</td>
<td>Regularised-Unauthorised Colonies</td>
<td>17.76</td>
<td>12.7</td>
</tr>
<tr>
<td>7.</td>
<td>Urban Villages</td>
<td>8.88</td>
<td>6.4</td>
</tr>
<tr>
<td>8.</td>
<td>Planned Colonies</td>
<td>33.08</td>
<td>23.7</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>139.64</td>
<td>100.00</td>
</tr>
</tbody>
</table>

Source: DUEIIP-2021

3.3 Geographic or Socio-economic based Inequity?

From the early post-independence decades, somewhat in continuation of British policies, the deep prejudice of the State against the low income group or poor citizens, as reflected in the ordering of the spatial distribution of different sections of the population of Delhi, was also to be found of a corresponding nature in terms of water supply systems as worked by the State agencies. The public utility for the purpose Delhi Water Supply & Sewage Disposal Undertaking (DWS&SDU) under MCD was the initiator of the policy of segregated water supply to different types of settlements. The DJB (formed in 1998) continues with it.

For further discussion now on water provisioning let us proceed with keeping in mind that DJB supplies piped in-house supply to areas and especially formal household localities located in planned areas and on the other hand the same public utility’s mode of supplying water in ‘unplanned’ areas is through communal mechanisms like public stand posts, hand pumps and tankers. This difference acquires immense significance when we look at the fact that more than half of Delhi’s population lives
in low-income group colonies, majority of which, called slums, are termed ‘illegal’, formed on ‘unplanned’ areas and have an ‘informal’ status.

- Delhi HDR 2006 mentions that according to the Census 2001 data 38% of Delhi’s population stays in one-room housing unit and another 22% stays in jhuggi jhopdi or slums (Delhi HDR 2006; p-44-45). This totals to 60% of the population which is to be categorised correctly under low income heading. The 38% living in one room housing units also includes the officially regularised JJ Colonies.

- Another category is the lower middle class group which amounts to 27% who stay in a two-room housing unit (Delhi HDR; p-44-45).

- Apart from this, there are scores of people who may not distinctly get counted under census tabulation for various reasons like ‘informality’ mostly or so to say, those with no legal credentials. These predominantly comprise of homeless and shelter less people. Delhi HDR 2006 suggests their numbers to be around 70,000 (Delhi HDR 2006; p-45).

In this discussion we can also consider another estimate provided by Singh and Shukla (2005) that around 74% of Delhi’s population lives under low-income group housing settlements which comprise mostly of slums with sub-standard housing situation and squalor like conditions. In the light of these data the consequence of DJB’s policy of providing in-house piped supply to certain households existing in planned areas and excluding all others from it and providing them with communal sources, becomes particularly striking.
The table 15 on type of settlements also informs us that pattern of locality based housing type clearly divides Delhi’s households into two folds – the first 6 types fall distinctly into ‘informal’ category corresponding largely to lower-income household units and the last two or the seventh and eighth falling under the ‘formal’ type located in the ‘planned’ zones. In almost all first seven categories the DJB’s distribution of water falls under the mode of community standposts, handpumps or provision through tanker services, except urban village category where one finds mixed provisioning due to the legal status assigned to such villages (falling in the acquired area for development purposes as under planned area development scheme). In the last category almost all households are connected to indoor piped supply. The details of how such a supply pattern impacts the households and people is explained in detail in the preceding chapter of this thesis on differential access to water.

Here it needs to be stressed that looking at the table also informs us that about ¾th of the population of Delhi systematically remains outside the so called in-house piped supply due to DJB’s formal policy and process of such a segregated system of water provision. This kind of institutionalised mechanism of discriminatory supply based on the socio-economic division of Delhi’s society is an outcome of the way power manifests itself in the policy processes. The objective assessments forming a part of dominant discourse over Delhi’s water crises mostly rely on the argument of inequitable distribution of water. What these miss out is that while taking into account geographical inequities they tend to miss delving into this socio-economically shaped inequity. It is this latter inequity or the structural asymmetry written into the policy process which is of crucial significance to deconstruct or disentangle the crises of water in Delhi. Inequity is located in the socio-economically determined access patterns of disparate groups of the population of Delhi which is effectuated by the
way public utility differentially provides water to these. The point to be firmly understood here is that when DJB is providing water through in-house piped supply mechanism to each household in planned areas (with less number of people residing in absolute terms as well as in terms of density) as compared to communal supply in unplanned areas with lower income group residents (with more number of people residing and densely populated too); it reflects sharply on the per capita availability. In a precise statement, Delhi’s institutionalised supply and distribution system discriminates amongst socio-economically different population groups staying in the same locality. In such pattern we need to see inter and intra-city inequality manifest at the socio-economic and political level, which the dominant discourse obscures while suggesting the geographical or spatial inequity. Spatial should not be seen irrespective or disconnected of social.

The following table from Delhi HDR 2006 (p-48) read along with the sampled households for this research will clear this point more. The figures in the Delhi HDR cite distribution of water for in-house supplied households and the slums or the informal housing localities with communal supplies.

Table 16 Quantity based Water Distribution in Delhi households

<table>
<thead>
<tr>
<th>Per capita water supplies (three per capita daily [l/p/d])</th>
<th>Number of households</th>
<th>1991</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (thousands)</td>
<td>% to total</td>
<td>Number (thousands)</td>
</tr>
<tr>
<td>&gt;250</td>
<td>490</td>
<td>55.4</td>
<td>408</td>
</tr>
<tr>
<td>150-200</td>
<td>265</td>
<td>30.4</td>
<td>225</td>
</tr>
<tr>
<td>100-150</td>
<td>250</td>
<td>29.2</td>
<td>210</td>
</tr>
<tr>
<td>50-100</td>
<td>92</td>
<td>10.8</td>
<td>125</td>
</tr>
<tr>
<td>&lt;50</td>
<td>104</td>
<td>12.5</td>
<td>155</td>
</tr>
<tr>
<td>Total</td>
<td>1227</td>
<td>100.0</td>
<td>1000</td>
</tr>
</tbody>
</table>

Number of slum households

<table>
<thead>
<tr>
<th>Per capita water supplies (three per capita daily [l/p/d])</th>
<th>Number of households</th>
<th>1991</th>
<th>2003</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Number (thousands)</td>
<td>% to total</td>
<td>Number (thousands)</td>
</tr>
<tr>
<td>50-100</td>
<td>65</td>
<td>13.9</td>
<td>88</td>
</tr>
<tr>
<td>25-50</td>
<td>425</td>
<td>71.6</td>
<td>595</td>
</tr>
<tr>
<td>&lt;25</td>
<td>105</td>
<td>17.5</td>
<td>160</td>
</tr>
<tr>
<td>Total</td>
<td>875</td>
<td>100.0</td>
<td>933</td>
</tr>
</tbody>
</table>

Source: Planning Department, Government of Delhi.
For the year 2001 data, the upper mentioned category of households (excluding slums) receiving more than 150 lpcd accounts for 61% and between 100 to 150 lpcd accounts for another 21.3%. This means that 82.3% households with piped in-house supply get 100 lpcd or above of water. The rest of 17.7% households fall under the category receiving less than 100 lpcd.

For the informal housing locality households or the low-income category, which accounts for around 3/5th of Delhi’s population according to the same Delhi HDR 2006, the figures are; 87.6% (71.7 + 15.9) households receiving 50 lpcd or less and another 12.3% receive between 50 to 100 lpcd of water. In the sampled households surveyed for this research the figures for the informal households revealed that 70% received between 25 to 50 lpcd, another 10% were able to procure even less than 25 lpcd and remaining 20% received between 50 to 75 lpcd of water (see chapter 3). Firstly, the information from the above shown table 16 and secondly, the preceding discussion over the socio-spatial spread of the city whereby we understood that planned localities of Delhi with in-house piped supply are located sparsely in a largely unplanned Delhi and around 2/3rd of the population lives in slums, helps us to understand the intra-locality variation of access to water in Delhi.

3.4 Class-based control over water in Delhi

From the discussion till now we get to substantially understand the fact that DJB’s demand based understanding on water ‘needs’ of different types of population groups living in different kind of settlements and its concomitant or resultant policy forms the backbone of differential access to water sources for different kinds of households in quantitative terms as well as in terms of the mode of supply. Such policy along with the tabulation based on this
policy regarding management of available water sources by DJB also plays the decisive role in deciding how much water will go to which classes of the population via processes like water pricing, demand articulation, quantification of distributed water etc. I will call this process as the institutionalisation of Delhi’s hydrology and its consequential inequity which will help us to explain better the issues like supply-demand relationship in an urban setup like Delhi, carrying capacity or ecological footprints for Delhi which includes concern over the health of Delhi’s primary water sources: river Yamuna and groundwater.

First and foremost, we need to take a look at the table below which informs us about DJB’s own official water balance sheet. The significance of the table does not merely lie in its calculations and the information it provides but it is important from the perspective of explaining Delhi’s distribution practices, pricing methods, projection of future demands and strategies for meeting such demands. Precisely, a thorough break-up of this water balance sheet of the public utility will help us to disentangle the way water flows through the socio-economic, political and cultural power conduits in Delhi.
Table 17 DJB’s Official Water Balance Sheet

<table>
<thead>
<tr>
<th>System Input Volume</th>
<th>Authorised Consumption 58%</th>
<th>Billed Authorised Consumption</th>
<th>Billed Metered Consumption (including water exported in bulk)</th>
<th>13% Revenue Water 50%</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Billed</td>
<td>Unmetered Consumption</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unauthorized</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Apparent</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Losses 2%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Water Losses 42%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Real Losses 40%</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leakage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>on Transmission Mains</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leakage and Overflows</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>at Utility’s Storage Tanks</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Leakage</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>on Distribution Mains and</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Service Connections upto</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Point of Customer Metering</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Unauthorised</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Consumption</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Metering Inaccuracies</td>
<td>0%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Non-Revenue Water (NRW) 50%</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Delhi Water Supply & Sewerage Project Preparation Study Report

The table is from the Economic Survey of Delhi 2003-04; p-158. The first column informs us about the system input volume, which is the total amount of water available for distribution to the DJB, i.e. 650 MGD (as stated in the same information source). The second column divides the total amount of water into two categories; authorised consumption, i.e. 58% and water losses which is 42%. Speaking broadly, the first figure represents the water supplied by DJB to citizens of Delhi and to other services like industrial, commercial and fire fighting purposes etc. along with hotels and embassies. In the preceding sections we have established how this distribution is based upon a class division of society. To repeat in a nutshell, DJB provides as a breakup of this 58% (authorized consumption) - 13% to the planned areas falling under MCD zone (where DJB also distributes on household basis) and bulk water supply to NDMC and DCB zones. This is what DJB terms as metered and billed water consumption. A distinct upper class population group of Delhi with the appearance of
every legality (concealing many illegalities like unauthorised extensions), formality and privilege avails this quantity, quality of water with private, personal in-house piped supply. Added to this 13% is another 37% which officially is labelled as billed and unmetered consumption. The unmetered characteristic is on account of the population groups that are provided this water and billed under a fixed price tag on a monthly basis without any meters providing consumption details. It is important to note that majority of the households which are supplied piped in-house supply by DJB are charged/billed on a fixed basis of assumed consumption based on the type of dwelling unit categorization. In other words, majority of piped in-house supplied households pay without being metered as DJB is yet to provide meters to most households (Chaturvedi (n.d), Bhandari and Khare 2006, Dutta 2005, Srivastav 2005). Against the dominant discourse’s often cited position regarding financial lacunae in DJB’s functioning for which the reasons suggested include incorrect economic valuation of water and thus arguing in favor of full cost recovery from even poor users, this is a very significant point which informs how the socio-technical construction or power relations shape water supply and distribution related financial accountability in Delhi in the favour of the privileged class. Unmetered fixed billing is the method which seems to be deliberately employed to maintain the types of mis-targeted subsidies on water being extended to the rich in the name of the poor (see chapter 5 for more discussion). Also, this category of consumers comprise of those few categories of households from the informal category the housing localities of which have been accommodated with a relative formal status as compared to other informal localities and its households. These are euphemistically called unauthorised (but) regularised colonies which include those Jhuggi Jhopri Colonies (JJ Colonies)

86 Interview with Gyanendra Srivastav 2005
and clusters along with resettlement colonies which still exhibit every characteristic associated with slums but on official rolls they have some legal and formal position. In chapter 3, I have discussed how most of the semi-formalized JJ colonies have though been officially sanctioned for piped indoor supplies but yet majority of households in these remain uncovered by such supply mechanism and thus depend on communal modes of supply. Those with personalised supply are billed at a fixed monthly charge albeit without any metered assessment of consumption.

Finally of this 58% (authorized consumption) comes the figure of remaining 8% which is termed as unbilled and unmetered consumption. This is what DJB provides to the biggest majority of this city – the citizens residing in unauthorised, informal, illegal colonies. Such people who form the largest majority of this city; from the table on settlement pattern we can deduce the fact that these form around half the population of this city. DJB’s policy of provisioning segregated amounts and supply of water to different settlements of Delhi categorises this largest group under authorised consumers but gives it the least amount of allocation.

This second figure regarding amount of water losses is extremely crucial, materially as well as discursively, looked at from the perspective of Delhi’s hydrology and the various discourses surrounding it. In the simplest terms, the word ‘losses’ means the said amount of water is ‘officially’ put as treated or fit for consumption but actually goes away or peters out as waste, of no particular utility towards any citizen or any other uses. In other words, it is the form of water which after incurring full fledged treatment costs still flows back to nature in different forms. With such a good quality of water after having been finely invested upon in terms of treatment, a figure of 42% makes up for a huge amount in a city, which in the dominant discourse faces major
water crises. In the fieldwork, this research tried to investigate into this contradiction. First a look at DJB's explanation, which bifurcates the figure of 42% losses into two parts – 2% as apparent losses and 40% as real losses. The former is termed as illegal or unauthorised consumption which perceptively should mean theft or consumption out of DJB's authorised network but through unverifiable means. This seems plausible from the technical point of view looking at the 9,000 kms long piped network of the utility in a vast and densely populated city like Delhi. Amongst another sub-bracket under 2% apparent losses exists the category of metering inaccuracies which for DJB accounts for 0%. Now in the household survey there were a few households which reported having non-functional or mal-functioning meters but were still billed on an 'average' figure, i.e. going by an account of calculating average of last few bills, whether or not the meter was functioning even during those meter reading instances or not. The problematic thing appears in the fact that for DJB they account for 0% or nil, not even negligible, a term which would serve to at least account for such consumption though in terms of losses. On the other hand it is the latter portion of the overall losses, i.e. 40% out of a total of 42% which is marked by DJB as real losses; real possibly because the public utility is able to cite certain reasons for these losses. The figure of 40% is trifurcated; 16% is accounted as under losses via leakage on transmission mains. It means the leakages which exist on the long and winding over ground and underground pipelines which are meant to transfer water across the length and breadth of this city. Significantly, 16% amounts to a huge figure because such leakages are not visible in the city in any form. No recorded evidence is provided by the DJB or any other source. Again going by a layman's perspective, such huge amount of water (around 104 mgd or 16% of 650 mgd) is never either found flowing or spilled on Delhi's landscape or percolating underground.
and getting added to the city’s groundwater which then on the contrary is reported to be dwindling fast. Before commenting upon this ambiguity lets consider the other two sub-bracketed forms of real losses. An even more massive loss of 24% is reported as lost from the leakage on distribution mains, at service points up to the customers’ metering point. A host of informal and formal discussions at differing levels of authority in the DJB, provided a very unclear picture about this figure. The CEO, Mr. Arun Mathur in an interview explained it formally as on one hand just another part of the leakages from a vast network of supplies. The next in DJB’s official hierarchy, Mr. Gyanendra Srivastav accounted for this loss as a form of stealing on the part of informal vendors who have formal and informal patronage and pilfer water from many of DJB’s rising mains and supply this for commercial purposes. In some cases this is used by local political party functionaries in their electoral constituencies for political gains. A discussion with 9 other DJB functionaries at varying positions in the hierarchy revealed that there does exist a wide spread network of informal water vendors who in connivance with either DJB tankers or official staff at booster pumps and rising mains take water routinely through corrupt practices like bribery and then further sell it off to various kinds of users in different localities. A notorious category of 0% again forms a part of the losses amongst the ‘real losses’ sub-category. This time it is said to be firstly, a pattern of leakage and overflows at the DJB’s many storage tanks and secondly on the part of water users to allow leaking taps etc. at the household levels. Visits to five of such DJB storage tanks; Ashok Vihar, Mongol Puri, Najafgarh, Paschim Vihar, Rajinder Nagar, revealed that during the process of filling and refilling of tankers for distribution to various localities, particularly at the time of moving and unmoving and bringing tankers under the big water taps or gushing water

87 Rising Mains are those nodal points in DJB’s supply network where the water is forced with use of pressure building devices in order to make it travel long distances in the 21 different water zones of Delhi
valves, quite a lot of water got wasted because the nozzles were not turned off. When enquired if these could not be turned off when queuing of tankers is in progress, the Executive Engineers of DJB at these locations and some other staff members replied that these valves are worked on a process which can be turned off and on with a huge time gap interspersing and this would not allow the smooth functioning of water filling services along with long time gaps. An Executive Engineer, Mr. Mumtaz Hassan at Mongol Puri explained that the valves function manually but there is a plan of introducing hydraulic mechanisation on the part of DJB to allow for immediate turning on and off of these as the need may be. Considering that such a technology is a must to save such precious resource like treated water, it seems serious inefficiency on the part of DJB to not have installed the correct technology to minimise such wastage. In the second instance, the household survey revealed that at maximum number of households, the respondents reported least of water loss due to leaking taps etc, i.e. negligible wastage of water. Yet, at an observable level such wastage can be seen to some extent genuine whereby overflowing and leaking water tanks and taps at household levels is commonly cited in Delhi. The thing of notable worth though is that an overflowing or leaking tap or personal storage tank can exist along with other wasteful practices amongst those sections of the Delhi’s population which are mostly able to satisfy their needs first and then could afford to ignore or allow the water overflowing or leaking and thus getting wasted. For those whose even basic needs remain unfulfilled, the largest of Delhi’s poor population, and also the ones relying on a short and limited supply through public standposts as well as without huge storage facilities, such a luxury comes across as inexplicable. Going by the above mentioned, it comes out as a gross inaccuracy and a misrepresentation of facts by DJB to report loss of water via leakages as 0%.
Another issue of significant importance which can be deduced from the table of the DJB's statistics of its water management is the issue of revenue and non-revenue water; 50% under each category. Most notable, because DJB labels all water supplied to the largest population group as unmetered and unbilled (precisely 8%) as well as all wrongly/ambiguously ascertained losses as non-revenue water. We need to discuss not just the material but also the discursive aspect of this criterion. On the material side, such labelling of non-revenue assets substantiates those claims of DJB whereby it exhibits its financial incapacity to improve services in terms of efficiency and economy, simply speaking non-fulfillment of operational costs, and on the discursive side such a balance sheet reinforces the ideologically neo-liberal arguments of bringing in concepts like full-cost recovery, public-private partnerships at service levels like rent or bill-collection, cutting down subsidies, even advocacy of full fledged privatisation in place of public management to utilise the resource in a better manner, etc. and at the level of massive demand a recourse to more and more supply augmentation mechanisms. Such material and discursive practices and prophesies have a significant say on not just how water and related services are being managed but also how these ought to be managed.

Up till now we have discussed the gap between the statist and dominant discourse explanations and the field work findings as well as actual usage related quantitative and qualitative aspects of water usage of Delhi's population. Further, we will now try to probe the unexplained details of Delhi's overall use of its water resources. This exercise will potentially try to bring forward the notions encompassing Delhi's severe
water ‘crises’ and ‘scarcity’ as it is felt in starkly different ways by Delhi’s socio-economically, politically and culturally different population groups.

3.5 The Ground Level Practices

In this section we will focus upon findings and details from the numerous field visits carried out during this research in trying to find out how the institutionalised management of water on the part of DJB functions at the ground level and how these functionalities explain and reflect upon the water related understandings of the public utility.

Amongst many booster pumping stations of DJB spread across the city, this researcher carried out some informal discussions with different type of staff managing these establishments. It was an exercise to know what practices are being followed and what ground they hold in consonance with the official explanations of DJB especially regarding the problems associated with DJB’s water management.

As cited earlier, DJB reasons out that much of the water crises in Delhi is an outcome of a daunting inequitable distribution of its water at a geographical level, i.e. different areas of Delhi receive water in an unbalanced way with some like NDMC and DCB getting much higher quantities in terms of lpcd along with many of the MCD areas too; but unlike them there are also many areas which get water in insufficient quantities. The explanation DJB gives for this inequitable distribution is based upon one amongst the many frequently cited – the areas falling at the tail-end of its distribution system receive much less (see the map of inequitable distribution repeated below from an earlier portion in this chapter).
During the visit to booster pumps of DJB situated at Haiderpur, Shalimar Bagh, Pitam Pura, all situated in north Delhi, the argument presented by DJB engineers manning these stations by and large presented itself as in agreement with DJB's official position. Significantly they also explained that the hydraulic system of individual booster pump stations is also structured in such a technical way that proximity to pumping stations makes it possible to avail water supplies in better quantities and at better pressure. So the point here is that although in the wider picture of Delhi, the North-West district (in DJB's categorisation the area of Narela DJB zone) in DJB's system of distribution may, within the overall supply and distribution system of DJB, fall at the tail end and thus receive much less quantities of total water supply (officially 31 lpcd), but within the area proximity to booster stations ensures better supply. Such a technical construction of supply and distribution mechanism not only enforces a situation of sub-geographical inequity in a picture of larger geographical inequity, but when we read it with respect to the findings as explained in previous
section that socio-economically determined spatial situatedness determines access to water, it presents a scenario of a crisis of water which is structurally rooted in the official scheme of things as designed and implemented for the purposes of providing water. It is also worth noting that the case for structural inequality gets substantiated by the fact that going by the census accounts, in the North-West district of Delhi which receives the lowest per capita amount of water resides the highest number of Scheduled Caste population of Delhi, the most socially, economically, politically and culturally marginalised community in a caste-divided Indian society (see Census of India 2001). In fact, this area of Delhi is composed of a majority of such groups of population because of a historical process wherein ever since 1977 when the official process of relocating people from the slum clusters in various parts of Delhi started, this region was earmarked for relocation purposes. 88

Another reason cited by ground staff of DJB and explained as a major issue in understanding DJB’s poor water supply to many areas was the losses through ‘pilferage’ at the various rising mains across the city. Visits to some of the rising mains at Azadpur, Okhla and Tagore Park explained some of the peculiarities and meanings associated with the often cited explanation of pilferage at rising mains. In all of the three visited rising mains there was found to be an informally working network of private tanker services or businesses, mostly working under the patronage of local political leaders belonging to different political parties. Interactions with some of the drivers of these tankers revealed that twice everyday they drive the tankers to these DJB rising mains and filled up with treated water which is later supplied to different areas - usually the close lying localities or in some cases even further. When asked about whether such a service was provided to people at a cost, all

88 We shall discuss in latter sections more about Delhi’s slum demolitions and relocation drives.
but one driver on the condition of anonymity revealed that payments are regularly sought for such a service ranging anywhere between Rs. 700 to 1000. In the case of apartment residents the payment was done in one go by the Resident Welfare Association members and in cases of slums the slum dwellers were required to pay anything between Re. 1 to Re. 5 (depending upon the water ‘crisis’ situation varying seasonally) for each bucket of water withdrawn. In the case of slum dwellers, this is what should be understood as paying a premium on poverty. In a poverty stricken life which has no in-house piped supply and with the public stand post delivery mechanism also unable to provide the required amount of water needed, procuring water with such payments is a reflection upon the discriminatory system of water provision in the public utility driven water management system of Delhi. On the other hand from the perspective of apartment residents, comprising the middle classes it is another way of accessing more water over and above the DJB’s piped supplies and non-potable groundwater extraction through booster pumps; a way of middle-classes’ monopolising and capturing the resources and services the state provides in Indian cities (see Chaplin 1999 and Chatterjee 2004). In another case a driver at Okhla rising mains suggested that the local politician who is responsible for ‘fixing’ such an arrangement at the rising mains mainly provides this service to people of his constituency for political mileage and thus no monetary gain is sought. When pursued further he revealed his political patron’s plans of contesting the 2008 assembly elections of Delhi for which the provision of this service will come out to be very useful in getting better support and more votes from the voters staying in the parched area. To summarise we can say that such ‘pilferage’ based regular collection of water is quite a regular feature in Delhi for both, purposes of business by informal tanker operators and also local politicians for garnering the political benefits out of it. The
above findings raise important issues looked at from the point of view of DJB’s official water balance sheet as stated in the earlier given table and wherein the public utility marks an exorbitant 42% of water as being lost and assigns to it reasons like transmission and distribution losses. It seems an outcome of the exercise of allowing massive water transfers through informal means and in thus allowing for or making it differentially accessible to different class groups.

All the above must be seen at the level of larger issue of politics of water and treated in a political ecological perspective. In a public utility provided water system of Delhi, such informal but high magnitude businesses over water supply and distribution thrive due to state connivance. Legally the entire water, according to what Iyer (2007) calls eminent domain belongs to the state and it has a responsibility of providing water to all. But the manifestation of power wherein the socio-economically better off sections are able to procure satisfactory amount of water by either taking recourse to different coping mechanisms or by paying more for it allows the capture and control of this resource.

Through the discussion till now we have been able to understand through objective data and the fieldwork findings that from an institutional perspective there is a highly unequal access to water for a very large section of the population of Delhi. A vital resource like water is captured and controlled by the social, economic and political elite of Delhi. We also have tried to see that as water management is a social activity, the process of putting in place a technical structure of treatment plants, pipelines, reservoirs, taps etc. is all a socio-technical construction. From the British to post-independent times, the policy of water provisioning is not in any way isolated from other activities of the state and in turn is marked by the way the relationship between
the nature of state and the society has existed through time. The maintenance of a socially discriminatory system with regards to its continuance can be seen as the way middle and upper classes have ‘captured’ the state in India in a way that its political agenda has been consistently diverted from the universal provision of basic services like housing, health, employment, water etc. These classes have long been the principal beneficiaries of state provided water supply system and they exert little pressure on the state to extend services to the poor. In the face of inefficiencies in the public water system, the economically better off sections have taken recourse to other modes of accessing, storing and utilising more water. This has affected seriously any cohesive political response to government failure as it is countered by a multitude of individual responses (see Gandy 2008, Chaplin 1999, D’Souza 1999). History of water supply and distribution in Delhi is in consonance with the history of the socio-economic spatially segregated way in which Delhi has evolved with ‘planning’ playing its major role and such process of planning being a tool of the powerful (see Roy 2004). The supply and distribution of water has seen such planning’s manifestation in the way Delhi’s public utility based processes evolved whereby the planned areas largely with formal housing structures and occupied by better off sections has been developed along the lines of provision of piped supply water from the public utility but the ‘unplanned’, ‘informal’ and ‘illegal’ expansion of Delhi, seen in its slums and low income residential localities has not been included in the piped supply network because of the policy imperative of not providing such areas and the households therein with a permanent and personal supply mechanism. This practice has been put in place with the understanding of the administration that given the ‘informal’, illegal and ‘unauthorised’ nature of such areas and dwellings, providing a formal supply and distribution would amount to illegality. It is this policy design
which when seen in the background of present situation of Delhi, wherein more than half of Delhi's population lives in unplanned areas, explains the water 'crises' or problems faced in the water domain.

4) Issue of Carrying Capacity, Pollution, Depletion, Demand-Supply Gap

The concept of carrying capacity significantly informs the dominant and public discourse over water issues of Delhi. In its simplest definition, the concept of carrying capacity with respect to water means the limits imposed by the availability of water for human growth in terms of population size as well as its spatial spread (Soni 2003). In our discussion we will try to find out how it holds a reciprocal relationship with three major issues with regard to Delhi's water problems; the pollution of river Yamuna, the depletion of groundwater and the issue of gap between demand and supply. Precisely stated, the carrying capacity discourse argues that the two major sources of water for Delhi, river Yamuna and groundwater are facing enormous pressure from the burgeoning population of the city and are thus reducing rapidly the carrying capacity of the city. The relationship of the third issue regarding gap between demand and supply means that as the population keeps growing it increases the demand for water and with that comes in the need for further augmentation of supply which in turn imposes limits on the water resources, presently used and the ones expected to contribute in future.

With respect to the purview of this research the consequences of pollution and depletion of the two major sources of water for Delhi are seen as explaining significantly the crises of water in Delhi. In a similar perspective with respect to the hypothesis of this research, the role which the population plays in such pollution and depletion when looked at from its heterogeneous character also needs to be looked at.
Apart from it what explains the character of institutions like DJB and other agencies which have a significant impact upon the way such precious resources like Yamuna and groundwater are worked around?

4.1 Understanding Yamuna’s Pollution

According to the TERI’s (2003) assessment of the total stretch of river Yamuna the portion falling in Delhi is about 2% but generates more than 50% of the pollutants found in the river’s entire course. This crucial stretch is merely 22 km long portion of its 1200 km journey. Wastewater with little or no oxygen flows through this stretch. Yamuna before it enters Delhi at Wazirabad is relatively clean with appreciable level of dissolved oxygen and low biochemical oxygen demand levels and also none of the cities downstream of Delhi generate more than 1000 mld of wastewater. In contrast, Delhi alone generates 3000 mld of wastewater. The long and widespread network of 17 major drainage channels and trunk sewers running through the city carry this wastewater to be finally disposed off into the river before getting treated at the network of Sewage Treatment Plants (STPs) spread across the city. Some very significant observations about this system of wastewater disposal need our attention. Firstly, most of the ‘informal’, ‘illegal’ and ‘unauthorised’ colonies are not connected to any formalised nature of sewage collection and disposal. This explains the difference between the clean environments, on the one hand, of the well off citizens’ localities and the unclean, filth-ridden poor citizens’ localities of Delhi where they live with all the waste generated. Considering this fact it becomes quite clear that most of the wastewater and sewage generated from the city which reaches the river through the network of STPs is an outcome of the planned areas. The earlier section on population dynamics and the relationship of it with socio-economic spatial situatedness revealed that it is the better off sections of the Delhi population which
resides in the planned colonies. It needs to be thus stressed that the near-total pollution of the life-line like water resource for the city, namely the river Yamuna gets effectuated off the waste generated by the upper class population of Delhi. Many studies have pointed out that pollution level of the river Yamuna has reached its most critical level (CSE 1999, Shiva 2002, CPCB 2004). The sewage comprises of most as the liquid and semi liquid waste generated out of use of clean water and other kinds of residual making uses. Also, it is not difficult to understand at all that the ones which get to use more water are also the ones who pollute more. The poor don't pollute to the degree claimed simply because they cannot, explained due to their levels of access to water and consumption patterns. Agrawal’s (2002) theory about the politics of defecation points out to one of such ideas. Agarwal informs us about the political economy of this sewage treatment, transport and discharge process which is so biased in the favour of the rich as compared to poor. To quote CSE on the political economy of defecation “Thus, sewers only lead to a subsidy for the rich to excrete in convenience. The poor always remain the 'unserved' in this waste disposal paradigm. In addition, the government has to invest in sewage treatment plants whose costs are again rarely recovered from the rich users of flush toilets” (Narain 2002). As also earlier discussed, Chaplin (1999) has pointed out that the reason that such environmental conditions exist in Indian cities, is because the better off have been able to monopolize what basic urban services, such as water and sanitation, the state has provided. The consequence has been a lack of interest in sanitary reform and the exclusion of large sections of Indian society from access to these basic urban services. Instead, public health and environmental policies have frequently become exercises in crisis intervention instead of being tools for effective long-term planning and implementation.
The above discussion proves that when a relationship is to be established between the effect of population on environmental resources like water it is most important to have a comprehensive understanding about the heterogeneous nature of any given population and the way this fact impacts upon the usage of the natural resource. The differences in the socio-economic, political and cultural realms account for distinct usage patterns of the population groups and consequentially impact upon the environmental and ecological status of the resource. The explanations based upon monolithic and absolutist understandings of population impacts are to be considered as part of Malthusian schema which profess and argue in diverse ways that environmental degradation is the net result of population growth whereas in reality it is the diverse consumption pattern of different population groups - an outcome of the class differentiation existing in the society - which explains more rigorously the differentiated impact upon the environmental resources.

The issue around pollution of river Yamuna in Delhi has not just surfaced regarding issue of population impact, it has featured in the discourse regarding the image of the city also. Various accounts tell us about how in the name of driving away polluters and for conserving the flood plains of the river a huge slum agglomeration called Yamuna Pushta, a settlement of poor which got established on the banks of the river in mid 1970s, was demolished at the behest of a Supreme Court order which ordered for the cleaning up of the river banks (see Baviskar 2006a, 2007a, Sen 2006, Sen and Bhan 2008, Dupont 2008, Interview with Anupam Mishra 2005). Taking a cue from the argument presented above we can make out that Yamuna’s grave pollution is not merely an outcome of certain visible polluters, namely the poor residing on the banks but it is a case of systemic pollution whereby the wastewater and sewage generated from the middle and upper class localities of the city which are connected to the city’s
sewage disposal system explains the critical situation of the river. But the judiciary at the behest of certain bourgeoisie environmentalist (Baviskar 2003b) civil society organisations, which filed 'public' interest petitions with the courts for cleaning up of the river Yamuna, pursued the case against the slum dwellers staying on the banks. The judiciary responded in a class-biased manner and ordered the Delhi Government to demolish the slums and 'relocate' its dwellers. The administration too on its part while responding to the court's intervention stated that such slums are in the violation of the Master Plan of Delhi which does not permit any residential or other constructions on the river banks considered to be necessary for maintaining the ecological balance. The slum dwellers residing here for almost two to three decades were ousted in the most inhumane manner immediately by the government authorities. When several human rights organisations appealed to the court by stating that these slum dwellers are mostly here as a result of the state's misdirected housing policy in the city and they are a part of the very strong informal economy of this city due to their different vocations, the court turned down the appeal saying 'to allow for these encroachers with a continued stay on such a land will be like rewarding a thief'. In the name of relocation followed a policy of extreme discrimination and apathy. Only few were relocated to the fringes of the city at a site in Bawana with only 18 to 12.5 sq feet of land per household and no other basic amenities. They were cut off from their livelihood opportunities which existed in the closer parts of the Yamuna Pushta where they were staying. With many other hardships they continue to face constant struggles as their tenure of stay at Bawana also is officially marked as temporary resettlement colony for a period of few years. Most other residents of the Pushta were pushed aside with no relocation too with the official explanation that these were unable to prove their credentials.

In the same instance, one needs to have a look at the two recent huge and daunting
constructions on the same river banks by a government agency, the Delhi Metro Rail Corporation (DMRC) and another by arguably the richest Hindu religious congregation of the country, the Swami Narayan sect. The DMRC has built its headquarters and the Swami Narayan sect has built a commercial temple named Akshardham temple at the river banks. The temple is mostly promoted as a major tourist destination by various Delhi governmental agencies. Its visitors are supposed to pay a huge fee if they would like to visit the whole temple. When such blatant violations are brought in front of the same judiciary which found slum dwellers as thieves and encroachers of river bank, it suggested that as such massive construction has already taken place of two significant structures and have contributed to a certain kind of development of the area they cannot be treated as encroachments. The government on its part argued the case for these constructions as part of the development and beautification plans of the city. Taking further cue from this now in the wake of upcoming Commonwealth Games of 2010 to be held in Delhi the government has ‘suitably’ modified the Master Plan of Delhi 2021 itself to accommodate not just these two structures but also allowing for future constructions on this flood plain zone of the river in the form of shopping malls, corporate offices, infotainment parks, esplanade, side walks, cafeterias, etc. Baviskar (2007a 2007b), Bhan (2007), Dupont (2008), Mishra (2005) have argued the way the imaginations around the city in the name of making it ‘world class’ in which there is no place for the poor has altered the whole face of the already perishing river Yamuna in Delhi. It needs to be viewed critically and understood how the class-biased institutions of society like judiciary, state agencies, civil-society, media have all joined hands in the case of pollution of river Yamuna by creating a false public discourse around the slum dwellers who are merely the visible polluters due to their unhygienic surroundings, an
outcome of poverty, as the main polluters of the river and ousted them from their accommodation of decades. Later the same institutions in the name of pro-rich, exclusionary, bourgeoisie development, have allowed for the alteration of the land-use pattern of the river side which is so crucial for the river’s sustenance.

### 4.2 Groundwater Depletion

Different studies and sources point out that groundwater is contributing from 1/3rd to almost half of Delhi’s water supplies. The DJB officially withdraws around 100 mgd, i.e. around 11% of its total supplies. According to other official studies like that of CGWB and INTACH the withdrawal is around 157 mgd and 290 mgd respectively. Maria (2004) suggests it to be around 450 mgd through 3,60,000 illegal tubewells and borewells extracting water in Delhi. The Delhi Government on its part accepts the presence of about 2,00,000\(^9\) illegal tubewells and the Union Government’s figure is around 3,60,000\(^9\). As a consequence, indiscriminate abstraction has led to a rapid fall in water tables across the city (CGWB, 2003), which threatens the sustainability of the system. In the close vicinity of the river Yamuna the groundwater level has gone down by almost 2 to 8 meters and in farther areas located especially in south and south-west districts of Delhi (seen also as lying at the tail-end of DJB supply lines) the tables have gone down to more than 30 metres (see map 7 below). Objective assessments like these do hold a lot of ground considering this sub-surface water resource is one of the most primary and significant sources of water for Delhi.

\(^8\) Economic Survey of Delhi 2003-04  
\(^9\) Central Groundwater Board 2003
Map 7 Groundwater Situation in Delhi


Coming to the reasons specified for such a large scale withdrawal of groundwater, legally in some cases and largely through illegal means, various researches point this out to be an outcome of the poor supply of water under the public-utility managed system. Maria (2004), Zerah (2000) and Daga (2004) point out that the nature of DJB’s water supply is of a very intermittent and irregular nature which largely forces
the people to withdraw, according to their convenience, the extra amount of water from the sub-surface sources.

The field observations for this research revealed that owing to various reasons – lack of enforcement of laws regulating groundwater, intermittent and unreliable service by the public utility, better economic capacity and capability – many of the lower and upper middle class households and most of the rich households have developed illegal private groundwater abstraction as their major mode of supply of water. Apart from directly withdrawing groundwater through the use of motors, boosters etc. these households also collectively withdraw water by using borewells operated at the community level. Other mode of reliance on groundwater involves being part of an informal tanker service which withdraws water illegally from both kind of sources, DJB’s water systems and tubewell based extraction mostly along the Yamuna river bed as well as at the peripheries of the city. As the data from the household level survey conducted for this research shows: 30% of lower middle income households, 70% of upper middle and a very high 80% of rich households depend on groundwater supplies in either personalised manner or through collective efforts at the level of households.

As the map above on temporal and spatial features of the evolution and impact upon groundwater level reveals the situation is most critical in the South Delhi areas. The reasons explored show various reasons for such a fall in groundwater table in these areas. At the official and dominant public discourse levels, because these areas lie far away from the river Yamuna’s catchment areas as well as also at the fag end of the distribution system of the DJB, the people of these areas are ‘forced’ to withdraw a lot of groundwater through different mechanisms. At the level of field observation things
become clearer. Firstly, the South Delhi area is the most affluent areas of Delhi in terms of income levels. Most of the localities in this area are found to be of planned nature housing largely the middle income and rich income households, having mostly piped supply from the DJB, in infrastructural terms. The reason behind such high level groundwater abstraction on the part of these localities needs to be understood from the perspective of the higher 'needs' of the higher income group households residing in these areas which is an outcome of a much better lifestyle and thus need for more water (see chapter 3 on differential access for more elaboration). Their better economic status, in the wake of lack of enforcement of laws preventing illegal groundwater extraction, allows them to withdraw huge amounts of water in this region. During visits to areas like Sainik Farms, Dwarka and Vasant Kunj, lying in this region many facets of this illegal system of groundwater mining came out. Sainik Farms is an exceptional area categorised under the unauthorised and informal housing areas of Delhi occupied by the rich who have erected huge palatial houses in the form of ‘farmhouses’ in this locality. Due to its informal status the DJB does not provide any piped supply to this area. However, all of these households have installed bulky tubewells in each house. These structures force out immense amounts of groundwater everyday to be utilised in these houses for various purposes including daily personal uses to watering huge lawns and gardens. Dwarka is the latest amongst the middle class localities being developed by the DDA. The water supply provisioning in this area has been a very contentious issue between DDA as the developer of the area and DJB as the service provider. With most critical water supply situation as explained by DJB on its part the burgeoning middle class apartment type localities in this area are taking to groundwater abstraction as their primary mode of supply in a collectivised manner using booster pumps. Another area, Vasant Kunj has mostly upper middle
class apartment style localities. Visit to three of these apartments revealed that each had their own piped-supply system at household level as well as a collective groundwater mining procedure, used on daily basis, through the process of common booster pumps. The investment and maintenance costs are borne collectively by households. Also, a lot of times, mostly during peak summers the reliance extended over to private tankers supplying water on high prices, which withdraw water on Delhi’s southern border.

The above findings explain why South Delhi is the area where the groundwater table is falling at the most alarming rate. The notion that being at a long distance from Yamuna the water table is bound to be slightly low in this area seems to be incorrect because then such logic does not explain why the water table is not declining as abysmally in the western parts of Delhi which are at an even farther distance from Yamuna. The other parts of Delhi, north, east and central parts lie closer to Yamuna and fieldwork findings reveal an equally high amount of groundwater abstraction in these areas too on the part of the upper and middle classes. However, the groundwater table there does not show meteoric fall because of the proximity to a rich source of water, the river Yamuna which replenishes the table at a better rate. Field visits to areas like Rohini in the north and Anand Vihar in the east revealed enormous reliance of upper middle class population of these areas on groundwater abstraction but the fall of groundwater is still above critical levels.

Coming at the question of institutional responsibility and functioning in terms of management of groundwater in Delhi, the study done by Daga (2004) reveals its determining characteristics. Daga (2004) writes, legally the borewells have to be registered with Central Ground Water Authority (CGWA). In order to put a check on
indiscriminate extraction of groundwater, CGWA was made in charge of the groundwater in Delhi. "CGWA has been constituted under sub section (3) of the Section 3 of the Environment (Protection) Act, 1986 vide notification No. S.O. 38 (E) dated 14.01.97 for the purpose of regulation and control of groundwater development and management."91 The obligatory or mandatory aspect of registering borewells was not enforced in practice because CGWA stated that it does not have the manpower to enforce the law. *The judiciary's class-bias in the process of intervention on the massive groundwater abstraction in Delhi comes out when one finds that* (emphasis mine) Supreme Court did give CGWA the authority to enforce registration of borewells and tubewells but at the same time, the court was *cognizant* (emphasis mine) of the fact that CGWA does not have the infrastructure to do so. In 2000, CGWA declared amongst some south Delhi areas, Vasant Kunj as 'Notified Area' in order to put a check on arbitrary extraction of groundwater. And later the whole of south and south west districts of NCT of Delhi have been declared as Notified Areas and a prohibition and restriction have been imposed in these districts on the construction & installation of any new structure for extraction of groundwater resources, to avoid further depletion and deterioration in water quality in the said districts. In the light of the above decision one can still find incongruence in CGWA's behaviour if we read CGWA's Public Notice No. 25/2001 which states: "...ban on abstraction of groundwater for sale and supply by private agencies/persons from the above said 'notified areas' except Yamuna floodplain area, NCT Delhi..." This clearly shows CGWA's callous attitude towards the areas where groundwater is available at shallow levels. In other words, Yamuna floodplain area has not been notified to the advantage of the private individuals and informal business based water

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91 Public Notice No. 6 of 2000 issued by CGWA, Ministry of Water Resources
providers. Private suppliers of water, states Daga, generally bore tubewells in this region and sell the water abstracted from there to different parts of the city.

During the visits to DJB offices, at the level of discussions with the public-utility’s top officials one of them went on to say that in the planned parts of MCD areas the rich, upper and lower middle income citizens of Delhi (residing in planned areas) have been withdrawing too much water apart from the water supplied by the DJB. This is being done by making illegal use of booster pumps, motors etc. When asked why no action is taken if such an over-withdrawal of water is beyond the legal norm, the bureaucrat attached with DJB replied that it is due to the ‘requirement pressure’ upon the residents that such a withdrawal is inevitable. Also he expressed the reluctance of the DJB in forcing these residents to comply with the rule of not installing motors/booster pumps on the main lines of DJB or in the ground, thus taking the blame on the public utility’s unreliable and inadequate supply. With respect to the above given explanation by the DJB official and also based on the data collected during the field work, two things came out very clearly. First, that the rich, upper and middle income residents, specifically residing in planned areas of the city and having an in-house piped water supply, have more demand for water due to the lifestyle they follow. In comparison to poorer citizens living in slums and other lower income localities, the well off tend to need more water because of the uses such as flush toilets, wasteful cleaning and washing uses, other water use appliances and many other different profligate lifestyle preferences different and opposite from the poorer sections. Second, they are more capable of satisfying, partially or fully, their demands due to the twin comparative advantages they possess over the lower income citizens - better or enhanced storage capacity, and the means to tap required amount of water, again often more than required, through use of expensive and extra means.
such as motors/boosters. Both advantages are possible due to their better off socio-economic and political status. Chatterjee (2004) views such contexts as the way in which the urban elite exercise their social and political dominance over the resources of the city.

4.3 Decrypting Demand-Supply Gap

Up till now we have understood that although technically the level of the amount of water available for this city does not itself present any reason for experiencing any water shortage or perpetual scarcity, due to the prevalent state policy of distributing water to the citizens of Delhi in a segregated manner based on the status of the housing and their tenurial status, Delhi’s population is divided into broadly two categories: the first includes the households which avail better availability through piped in-house supplies as well as use of other methods and means like groundwater abstraction and other informal private means. These are also the households which are socio-economically and politically powerful staying in formal and planned housing localities and areas. The second group includes a much higher population roughly three times the first and comprises households which are staying in lower income group housing localities with mostly informal or illegal and unauthorised status, with communal modes of supply rather than in-house personalised supplies and due to their poor socio-economic and political status are unable to extract much needed water through other informal means which demand very high investment costs as well as political (informal) approval. This method of providing differential modes of supplies is supplemented by the policy of allocating different amounts of water to the households falling in the two categories. The former is provided more and the latter less in terms of per capita water supply, based on the DJB’s logic that different socio-economic groups demand different amounts of water.
Going by its supply pattern, the following table 18 explains DJB’s final allocation tabulation

**Table 18**

<table>
<thead>
<tr>
<th>Type of supply</th>
<th>Supply mode</th>
<th>Volume supplied in MLD (Million Liters/Day)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Domestic connections</td>
<td>133182 connections</td>
<td>1124</td>
</tr>
<tr>
<td>Commercial and Institutional connections</td>
<td>52623 connections</td>
<td>34</td>
</tr>
<tr>
<td>Industrial connections</td>
<td>10876 connections</td>
<td>13</td>
</tr>
<tr>
<td>Bulk supply to DCM and NDMC</td>
<td>Bulk supply</td>
<td>158</td>
</tr>
<tr>
<td>Public standposts</td>
<td>11533 standposts</td>
<td>221</td>
</tr>
<tr>
<td>Water tankers</td>
<td>493 vehicles</td>
<td>10</td>
</tr>
</tbody>
</table>


NDMC and DCB are provided only bulk water by DJB distributed by these agencies in their respective areas.

Coming to the issue of demand, the DJB in somewhat of a commonsensical manner follows the understanding that the level of socio-economic status moulds the demand of population groups in terms of water they need. During the fieldwork for this research, of the many visits to different types of DJB offices at different levels/places and also at the level of different hierarchies of officials there was not even a single instance whereby it could be ascertained that DJB, ever carries out any assessment at the level of demand too at the same per capita norm, even though it has different supply norms for different areas. In fact there also happens to be no available official record which helps to understand if like differences in the supply modes, methods and...
quantities, there exists any standard, norm or benchmark for ascertaining differential demand.

The point of utmost significance to be understood here is that while calculating how much total water is available to be distributed to different kinds of households there exist a policy of segregated supply but to calculate the scientific or logical basis of this policy perspective there exists no calculation of demand of the different kinds of populations. The serious consequences of this major flaw comes out thus when one finds that DJB is unable to provide any detailed explanation about how in the face of the highest amount of total availability of water on per capita basis (250 lpcd through 750 mgd available water) in the country it is still short of around 300 mgd per day. Put simply, one cannot make out from DJB statistics which group demands how much quantity of water and how much then DJB falls short of providing this. Such a practice of not calculating or to say deliberately concealing the demand, allows for certain other activities on the part of DJB. By citing a gap between demand and supply it becomes possible to work on supply augmentation projects in the name of meeting the gap and also bringing in practices of demand management through various policy and practical attributes.

This allows for choosing certain kind of practices or solutions to problems and excluding others. It has largely and erroneously, even perhaps with malafide intent furthered the Malthusian understanding that population growth causes water shortage. In the case of Delhi most people lack access to sufficient, clean and affordable water which is mainly a question of relative scarcity as a result of uneven distribution premised upon socio-economic and political differences existing amongst the population groups. The socio-technical construction of the public utility managed...
system causes relative scarcity which is socially produced and is not an outcome of a low amount of total availability of water. Such a manufactured and constructed form of scarcity, therefore, serves primarily ideological and political purposes when evaluated on the basis of solutions practiced or propagated and does not reflect effectively upon existing socio-economic and political inequalities in accessibility.

Talking about the meaning of demand, it is fairly understandable that increasing urbanisation and increase in overall density of population does bring pressure on the existing water resources of Delhi. But, as in the words of Turton and Warner (2002), ‘a focus on “demand” forces us to take into account how the notion of scarcity is also economically and culturally constituted’. Iyer (2007) discusses the concept of basic water requirements, as Gleick (1996) has described. Calculating on the basis of needs like drinking, sanitation, bathing, cooking and kitchen, the basic water requirements per person comes to 50 lpcd. Iyer suggests adding a provision for cleaning the house, washing clothes etc. but a common norm of 100 lpcd would seem prima facie to be adequate. He adds though that this figure may need further examination, but it seems unnecessary to enhance norms. In the case of Delhi, against an actual availability of around 250 lpcd, the public utility and planning agencies follow the norms suggested by Central Public Health and Environmental Engineering Organization which recommends 60 gallon per capita per day (272 lpcd), or DDA's own norms of 80 gpcd (363 lpcd), and given an estimated population of 15 million people, they come up with an estimated demand of 4080 or 5445 million liters per day (MLD) or 900 or 1200 million gallons per day. However, beyond a basic water requirement of say arguably 100 lpcd for basic human needs, ‘demand’ and even ‘need’ are not absolute values; they depend on socio-economic levels and are thereby determined by consumption patterns and habits or use-behaviour, as well as culturally bound,
differing across population groups of differential socio-economic and consumptive behaviour and cultural levels.

Contrary to the above mentioned understanding of the concept of demand, the DJB allows for future reforms the calculating of total amount of water required based on a per capita demand figure on the basis of an absolute population growth for Delhi and homogenous supply, thus obscuring the inequitable and uneven distribution of water. In the two tables 19 & 20 below one finds its manifestation whereby, as shown in table 19, on an average calculation of 50% increase in each group of population on a time period of 2004 to 2021 the DJB reaches the figure of a projected demand increase. According to the second table the calculation are based on projected demands for each broad type of water use category, and are based purely on the overall understanding of the existing per capita norm. For example, amongst the domestic users, if requirement is stated to be 2076 mld in 2004 (which is based on present calculation of 250 Ipcd), the projection for 2021 is made to be 3080, almost a 50% increase.

**Table 19**

<table>
<thead>
<tr>
<th>Type of settlement</th>
<th>2004</th>
<th>2005</th>
<th>2006</th>
<th>2011</th>
<th>2021</th>
</tr>
</thead>
<tbody>
<tr>
<td>Villages</td>
<td>2.3</td>
<td>2.374</td>
<td>2.448</td>
<td>2.519</td>
<td>3.413</td>
</tr>
<tr>
<td>Slum designated areas</td>
<td>2.952</td>
<td>3.052</td>
<td>3.148</td>
<td>3.225</td>
<td>4.388</td>
</tr>
<tr>
<td>Unauthorised colonies</td>
<td>0.821</td>
<td>0.848</td>
<td>0.874</td>
<td>1.007</td>
<td>1.219</td>
</tr>
<tr>
<td>Resettlement colonies</td>
<td>1.971</td>
<td>2.035</td>
<td>2.099</td>
<td>2.146</td>
<td>2.925</td>
</tr>
<tr>
<td>Rural villages</td>
<td>0.821</td>
<td>0.848</td>
<td>0.874</td>
<td>1.007</td>
<td>1.219</td>
</tr>
<tr>
<td>Regularized unauthorised colonies</td>
<td>1.971</td>
<td>2.035</td>
<td>2.099</td>
<td>2.146</td>
<td>2.925</td>
</tr>
<tr>
<td>Urban villages</td>
<td>0.986</td>
<td>1.102</td>
<td>1.049</td>
<td>1.205</td>
<td>1.463</td>
</tr>
<tr>
<td>Planned colonies</td>
<td>3.072</td>
<td>3.279</td>
<td>3.929</td>
<td>4.203</td>
<td>5.449</td>
</tr>
<tr>
<td>TOTAL population, millions</td>
<td>12.5</td>
<td>14.6</td>
<td>16.5</td>
<td>19.0</td>
<td>22.0</td>
</tr>
</tbody>
</table>

Maria (2008:11) contends that "the logical consequence of this representation of the problem is to draw long term programs of raw water supply augmentation consisting in new dams in the Himalayas, and to plan for the corresponding water treatment capacities through building new plants" like one at Sonia Vihar through private sector participation involving MNCs, building long conduit water canals to transfer waters from neighbouring and remote regions to Delhi and inviting private foreign companies for consultation or even taking up water supply and distribution in Delhi (also see chapter 5).

Iyer (2007) discussing Delhi’s demand-supply gaps in water suggests that to tackle the inequitable and uneven distribution, we need to enforce economies on those who use too much water, and improve availability to groups and areas that receive too little. In the context of fixing norms then, such a practice will not require raising the average amount.
5) Role of Media in Explaining Delhi’s Water Problems/Crises

Apart from the academic and official discourses there is in place a very powerful public discourse over the understandings of various water related issues. The need for this section stems from the way media plays its role of shaping this contemporary—urban—public—discourse—and—the way—debates—over—water—are understood, explained and even constructed in various situations by the media.

First, it is important to understand that media which analysed here comprises of the mainstream print and the electronic media, which has mushroomed post-liberalisation.

This combination of print and electronic media has contributed immensely to shaping the way public discourse on a ‘perpetual’ water crisis in Delhi exists. While interviewing many people from different class groups in Delhi during the household survey it frequently came up during discussions that the epistemological meaning associated with the term ‘water scarcity’ has certainly undergone a change in the last 10 to 15 years. For the middle class respondents, from a notion of water shortages as a cyclical phenomenon, especially occurring during the peak summer months, the understanding of water scarcity has acquired a meaning of perpetuity over these years. In other words, scarcity of water earlier was seen as a temporary event but has now turned into a more permanent feature. On the other hand for the poor population group the situation for most has largely gone from bad to worse, thus also changing the meaning of water scarcity but only in terms of degree, intensifying or deepening the problem or crisis more. The chapter on differential access in this thesis has expounded on the structural reasons for this. In brief we can mention here that with the change and improvement in the
socio-economic status within the middle class of Delhi has also come about a
greater utilisation of water through various means according to increased ‘needs’
and practices.

We will discuss in this section, if there has been a role of media also in such a
notional change around the meaning of water scarcity. The findings reveal that
most people of Delhi do get influenced by the heightened and intensified spread of
an image of water shortage of a universal and permanent nature which the media
‘informs’ them about. This happens despite the fact, as the survey for this research
show us that not many amongst the middle and upper classes of society report
actually suffering from a permanent crisis of not getting water, even though
temporal shortages exist. There exist a huge population group, going by
observations of the fieldwork of this research, which forms the poor majority of
Delhi who are perpetually in a grip of water shortage due to reasons of lack of
access to water under the present institutional setup and not because of any crisis
of availability of water.

An analysis of the way mainstream media presents the temporal crisis of upper
classes of Delhi as the perpetual one, at the same time obscuring the actual
permanent crisis of the poor people reveals the nature of the media. Along with it,
the media has distinct opinions on the way reforms for the present problematic
situation are presented, evaluated and discussed. Let us discuss each issue around
water problems of Delhi as an exercise of disentangling the different aspects of the
water as they find place in the media. Starting with supply and distribution, we
find that the official and dominant explanation the media has is of a very
inequitable distribution of water at a geographical level under the public utility
managed system. This finds utmost coverage in the mainstream media (see Jha, *The Hindu* July 23rd 2004, Dhawan, *The Times of India*, June 22nd 2005). In a complete disregard of the socio-economic position playing a role in terms of having access to water supply, storage mechanisms, cost of water procured, quality, in certain instances the mainstream media seems completely and overzealously convinced of the geographical inequity of water distribution. For instance, putting aside even the misplaced notion of the zonal aspect of geographical inequity, it represents a scenario of even more fallacious understanding by suggesting in most simplistic terms that northern Delhi receives more water than southern Delhi (Special Correspondent, Capital Gains, *Frontline*, Vol. 23, Issue 6, March 25 to April 07, 2006). Such an understanding or reporting makes a reductionist argument as if DJB supplies water not through any city-wide spread treatment plants and piped system but by directly connecting households to river Yamuna which lies closer to north and east Delhi areas. Also, in most of the media reports, the focus area remains south Delhi. Next we also find that especially during the peak summer season when the water shortage from piped supply DJB network to some extent does affect the upper classes of Delhi, though again in a temporal and sporadic manner, and not on an extended basis, the mainstream media reporting presents it as a case of perpetual crisis, also mostly for South Delhi areas and the high income group localities situated therein. Moreover, it never comes across in the media that though water availability has declined from DJB sources still, the sections of better off citizens are able to procure water through other means like tankers, big-bottled water business or even over-extraction of groundwater (*The Times of India*, 29th April 2002). To take a sample view of the larger media’s regular reporting through this TOI news piece,
it describes elaborately how some of the most affluent south Delhi residential localities were not getting satisfactory water supply during the summers, like Chittranjan Park, Kalkaji, Sarita Vihar, Sukhdev Vihar, Lajpat Nagar, Greater Kailash, South Extension and Vasant Vihar. The obfuscation of the very fact that most households in these localities also form part of the privileged network of areas supplied with piped in-house supply of the DJB when compared to large number of areas without such provision, like the so called ‘informal’, ‘illegal’ and ‘unauthorised’ colonies shows the bias and concealing or misreporting of the problematic situation along with the differing magnitude and intensity levels of the water crisis.

On the issue of groundwater exploitation, the assessments of mainstream media come out in the most partisan manner. Largely the reporting and opinion formation exercises builds an ecological crisis narrative around the fast depleting groundwater levels in Delhi but it never reports from a class-perspective, over how such mining of groundwater is at the behest of the advantaged groups of Delhi’s population. Moreover, in a complete disregard to the ecological dimension the reporting, in a class-biased perspective, many a times even caters towards legitimisation of such malpractices, whenever there is a case on the part of state authorities on taxing or penalising such practioners. The report carried on this issue in Indian Express (15th June 2005) was titled ‘Free Groundwater May Soon Be a Thing of Past’ and in TOI as ‘You may have to pay DJB for that tubewell in backyard’ (14 Jun 2005). Starting from the very title the intent of the news is clear that groundwater, under howsoever tremendous stress, should not be charged. These kind of opinion building must be understood from the very perspective of class-bias wherein the mainstream media without ever acknowledging the fact that
groundwater is extracted by socio-economically and politically powerful upper classes of Delhi, comes in strong defence against any move to take away this position of exploitative privilege. The notion of applying ‘user-fee’ and procuring ‘licence’ to avail such benefit is stated by media as wrongful only because it is in this case with regard to the rich sections of the society. On the other hand media is most supportive of such legalities and financial liabilities when it approves of such measures in the context of poor people who are accused by media and state agencies as free-riders or ones who steal and pilfer the water from formal DJB transmission and distribution pipelines.

On an issue like pollution of river Yamuna, the media has on the one hand perpetually obscured the reality that the life line of Delhi gets polluted maximum from the sewage generated from the planned areas where the upper classes reside. On the other hand, media has also constantly been reporting that the major polluters of the river are the ‘unauthorised’ colonies and slum areas of Delhi. It is worth noting that such areas actually remain out of Delhi’s institutionalised sewage disposal mechanism. The report appearing in Mail Today (15th Dec 2008) opines on a very important issue in the contemporary times. It relates the cleaning up of the river Yamuna to the upcoming commonwealth games to be held in Delhi. It presents its major concern regarding pollution of river Yamuna in the words ‘...a polluted Yamuna flowing near the Commonwealth Games village will give a wrong message to the several thousand international participants...if it is not cleaned before the games it will be a major embarrassment for the country’. It goes ahead and puts the blame for this pollution on the 63 laundry centres (dhobi ghats) spread across the city. It is important to understand that these dhobi ghats are places where poor washer men/women clean the dirty clothes of the better-off
of this city, used for the purposes of the upper classes at different instances and places like hotels, parties, functions, etc.

On the understanding of demand-supply gap, mostly cited in the dominant discourse of this city’s water problems, the media plays its class-biased role to perfection. Never does it reports any study or assessment of demand on the basis of different sections of the society based on socio-economic differences. It instead, equally ambiguously as DJB, reports frequently about the huge gap as the basis of water shortage in the city. The political and ideological agenda of pushing for more infrastructural (building more dams and pipelines to bring water from neighbouring and far off areas) and financial reforms (increasing charges uniformly for all and not according to ability of each population group) finds appropriate back up in the mainstream media (see chapter 5 on reforms).

Ironic though, but very dubiously, majority of daily newspapers have repeatedly reported against the privatisation in some or the other form for water supply and distribution in Delhi but in a most mischievous and devious manner have supported the other side of it; the corporatisation of DJB and bringing in financial prudence. They have spoken in favour of any and every move on the part of the state agencies to provide 24x7 supply of water to Delhi households, without seeing through the plan of DJB in starting such scheme in the already served and posh localities of South Delhi. The various willingness to pay surveys amongst poor, conducted under ideologically motivated studies to bring in financial strain further upon poor in the name of efficiency and economy and better services, are cited regularly in the mainstream media. One never finds any account of such
willingness to pay *more* and in proportion to paying capacity surveys being conducted amongst the rich and upper class sections of Delhi.

Finally, when discussing the issue of river Yamuna’s massive pollution, the mainstream media carries out big advertisements on behalf of DJB which shows and thus poses in the most wrongful way the causes of Yamuna pollution as the poor residing on its bank. In one such advertisement, *Indian Express* Jan 22nd 2008) figure 1 below, the most striking thing is that a poor washer-man on the river bank is shown as a symbol of environmental degradation but on the other hand in the backdrop of a dream-like clean and pristine river one finds an old man performing religious exercise or may be Hindu ritual of praying to the god of sun (Surya Namaskar), which if seen in the backdrop of most polluting exercises performed in the name of religion - immersing idols of gods and goddesses, offering various other things, and even discarding or offering remains of the dead humans after their pyre-burning - is seldom made to appear like pollution. Moreover the whole exercise in a very ambiguous way lists certain causes of Yamuna pollution. These are distinctly associated with the upper classes’ polluting exercises via being connected with DJB’s own segregated sewage disposal mechanism, which excludes large areas of Delhi which are labelled as ‘informal’, ‘illegal’ and ‘unauthorised’. The promise cited in the advertisement of providing clean Yamuna is directly linked to infrastructural enhancements, another part and parcel of the bureaucratic.engineer approach of resolving problems through massive investments.
6) Conclusion

The chapter by doing an analysis of the functioning of DJB furthers the argument from the preceding chapter that inequalities of water availability across socio-economic groups in Delhi are not accidental but institutionalised.

The main point which this chapter tries to put forward is that the water crises is not simply the gap between demand and supply; but the way this ignores a.) differential access amongst people of different classes and b.) the several reasons for the gap such as transmission and distribution losses, which are actually deliberately misleading on the way such water is accessed and controlled by the upper classes, apart from the formal public utility supplied water the get), c.) the incorrect portrayal of the reasons for severe pollution and depletion of Delhi’s major water resources, by the official and dominant discourses.