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REPORT SERIES

URBAN SMALL WATER ENTERPRISES:
CITY ASSESSMENT

DRINKING WATER SUPPLY FOR URBAN POOR:
CITY OF NEW DELHI

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ABOUT THE REPORT

This assessment of drinking water provision to urban poor in the city of New Delhi has been conducted as a part of a partnership between Safe Water Network and the US Agency for International Development (USAID), entitled Urban Small Water Enterprises (USWEs) under the USAID Urban Water, Sanitation and Hygiene (WASH) Alliance program. This study aligns with the agreement entered into between the Ministry of Urban Development (MoUD) and USAID to contribute towards Swachh Bharat Mission. Other cities studied under this program are Visakhapatnam, Hyderabad, and Mumbai.

The objectives of this assessment were to i) map existing water supply to understand the gap and evaluate the potential of Small Water Enterprises (SWEs) as a complementary solution to piped water; (ii) assess the operational, financial, and technical aspects of SWEs for sustainability so that the urban poor, especially beyond the pipe, can get reliable, safe, and affordable drinking water; (iii) study the policy and enabling environment for SWEs; (iv) assess the existing tools deployed for e-governance, monitoring, and evaluation, and propose tools for SWEs. While detailed consumer research and water quality testing was conducted in select slums to understand the water supply and quality to the urban poor, the overall report builds on the field investigation and discussions with various officials of Delhi Secretariat, Delhi Jal Board (DJB), and Delhi Urban Shelter Improvement Board (DUSIB).

This report begins by introducing the USWE project, including the research methodology. Next, the report provides context on New Delhi—its economy and demography—followed by details of water supply, including that to slums. The next section transitions to our research conducted in slums without USWEs and then to slums with USWEs to capture differences and provide a sense of potential of USWEs that have been set up to complement the piped water in slums. It also includes an assessment of the policy and enabling environment for USWEs in the city, and an evaluation of the need for digital tools.

The assessment was undertaken by Safe Water Network through the Fixed Obligation Grant Award No. AID-386-F-15-00002, for the program titled: "Urban Small Water Enterprises" Dec. 2014–Dec. 2016.

Front Cover :
A typical slum,
New Delhi

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EXECUTIVE SUMMARY

New Delhi, now officially known as the National Capital Territory (NCT) of Delhi, is the capital of India and home to about 17 million people.

It is the largest Indian city in terms of area, and has the highest population density in the country. As of 2012, New Delhi housed about 6,343 slums with approximately 1 million households. [1] While the census indicates that 83% used treated tap water as a primary potable water source, only half of the slum households have any water source within their house premises, which reflects the insufficient availability and overreliance on unreliable shared sources.

The Delhi Jal Board (DJB), a public water utility, is responsible for production and distribution of drinking water in the NCT of Delhi.

DJB reports coverage of about 82% of households in Delhi through piped water supply, and ensured average availability of 50 gallons per capita per day of filtered water. Water is supplied to over 17 million people in Delhi through a water supply network comprising 11,350 km pipelines and 105 underground reservoirs for rationalized distribution of supply. Delhi uses an average of 835 MGD raw water daily from a supply of about 906 MGD (as of 2014). It is projected that in 2021, Delhi will have a minimum water demand of at least1,174 MGD.

Although 2011 Census numbers reflect similar levels of water supply to all housing categories including slums, this doesn't tell the whole story.

Availability of water in the premises of households living in planned colonies is reported at 78% compared to just 51% in slums. This suggests that water supply sources are being shared among households in the slums. Observations during the field study confirmed this, showing community level taps shared between 10 and 30 households. Water was observed to be available for 1 to 2 hours of water supply. It takes 35% of households more than one hour daily to fetch water, sometimes extending upto 3 hours. The majority of respondents spend 30-60 minutes daily.

With the gap in water supply to slum households, tanker water supply is a critical lifeline for Delhi's urban poor.

Almost half of these households (HHs) rely on tanker water as their potable water source (and another quarter on municipal water taps). A significant share of over 800 tankers are owned and hired by DJB to serve the urban poor. However, tanker water is quite costly for the water utility and there is also the risk of contamination, making it potentially unsuitable for potable purposes. Using a bore well or tube well is also quite common in slums,but for non-potable purposes; groundwater in Delhi is affected with above-permissible limits of geogenic contaminants like fluoride and nitrates.

Paying for water is not unusual for slum households.

Overall, most households (71%) reported paying for waterand 63% of HHs reported paying an initial one-time payment for getting access to water. These payments covered bore-well construct costs, purchase of submersible pumps, or paying for legal and illegal last-mile connectivity to the piped network.

[1] As per NSSO 69th round data

Recognizing the gaps in water provision, particularly for the urban poor, the recently elected Delhi government [2] has plans to improve Delhi's water supply.

Some of the key proposed initiatives include: (i) Free water for all metered connections which consume up to 20 kilo liters of water per month; (ii) an extension of piped water supply to unauthorized colonies over the next three years; (iii) reducing development charges for water connections to enable residents of unauthorized colonies to afford connections; (iv) using information technology for effective, continuous, and strict monitoring of water tankers and to enable people to track the water tankers, find out estimated time of arrival in their colony, and quantity of water.

DJB awarded a contract to set up pilot water ATMs for serving the urban poor which has received a mixed response.

DJB invited tenders for treatment kiosks and anytime water machines (ATMs) under the design-finance-build-operate-transfer (DFBOT) model in 2012, and selected resettlement colonies for this pilot. These are legal, planned colonies which are entitled to all municipal services. After a delay of about 18 months in accessing land, the chosen operator managed to commission the first kiosk and associated water ATMs in Savda Ghevra, a resettlement colony in northwest Delhi. This was followed by three more such clusters in different parts of the city. While 10% of the population adopted this mechanism as the primary source for potable water, these ATMs were mentioned as their secondary source for potable water by 27% of people – the highest for any secondary source. These kiosks are managing to cover operating costs and generate some additional revenue, though they are very susceptible to the vagaries of municipal water supply—both piped and tanker supply.

The ATMs, as implemented,have not been well received by residents; in areas without ATMS, there is low willingness to pay.

People in resettlement colonies with these water ATMs generally expressed disapproval of the nature of the water delivery mechanism. They reported issues like irregular filling of ATMs, unfavorable distance from home, low portability, and trouble in recharging their RFID cards. While 42% reported spending less than 10 minutes in water collection, another 45% reported spending 10-20 minutes and the rest spent more than 20 minutes.

Most HHs in this study (82%) in areas without USWEs did not pay any monthly fee for their water sources.HHs seemed fairly satisfied with the frequency and adequacy of tanker water supply for potable purposes, and thus only 37% were willing to pay for clean potable water while another 35% were not sure if they would spend money for the same.

Usage of water ATMs was found to be low, with higher usage linked to higher per capita income. The majority (80%) of respondentsin areas with USWEs were aware of the ATMs in their colonies; however, only 28% reported fetching water from them. Out of these users, 51% reported purchasing water every day while another 30% reported two to three purchases every week. There was an overallhigher level of adoption of water ATMs as the primary source as monthly per capita income of the HHs increased.

[2] Elected February 2015.

Designed to be complementary and affordable potable water sources to municipal piped supply, USWEs could be compromised by ambitious piped water plans.

Water ATMs were set up to be complementary sources of affordable and clean water, but they are almost perceived as competitors by the target population in these resettlement colonies, who have a fairly good perception of DJB-supplied water and almost-free municipal piped water supply. This raises doubts as to the financial sustainability of water ATMs given the location of sites for commissioning such mechanisms and the current government's plans to provide piped water to all with no charges for up to a monthly HH usage of 20,000 liters per month.

USWEs can be an important part of the solution to address insufficient potable water supply in Delhi slums.

In slums where there is still a gap in water provision, USWEs can play a role, particularly for potable water. To be successful and reach their potential, playing a complementary role to piped water and providing treated, reliable, and affordable water to underserved slum populations, USWEs must be supported by government and other stakeholders through a favorable policy and enabling environment.

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LIST OF ABBREVIATIONS

APL	Above Poverty Line
BPL	Below Poverty Line
CGWB	Central Ground Water Board
DUSIB	Delhi Urban Shelter Improvement Board
ESWEUP	Equipping Small Water Enterprises for Urban Poor
GDP	Gross Domestic Product
GLSR	Ground-level Service Reservoir
GPCD	Gallons per Capita per Day
HAM	Hectare Meter
HH	Household
ICT	Information and Community Technology
KM	Kilometers
LPCD	Liters per Capita Daily
MLD	Million Liters per Day
MLA	Member of Legislative Assembly
MoUD	Ministry of Urban Development
NABL	National Accreditation Board for Testing and Calibration Laboratories
NRW	Non-Revenue Water
NWP	National Water Policy
O&M	Operation and Maintenance
OPD	Outpatient Department
PPP	Public-private Partnership
RFID	Radio Frequency Identification

UNITS OF MEASUREMENT

cm	centimeter
kl	kiloliter
LPCD	Liters Per Capita per Day
MGD	Million Gallons per Day
mtrs	Meters
ml	Milliliters
MLD	Million Liters per Day
sq ft	square foot
sq km	square kilometer
TMC	Thousand Million Cubic

KEY DEFINITIONS

Urban Small Water Enterprises (USWEs)

Urban Small Water Enterprises (USWEs) generally refer to a range of entities selling water to bottom-of-the-pyramid populations in urban areas, ranging from stationary water points such as kiosks or standpipes to mobile units, such as tanker trucks and door-to-door vendors. This assessment, however, was limited to water treatment kiosks that sell affordable water to the urban poor.

Notified/Non-notified Slums

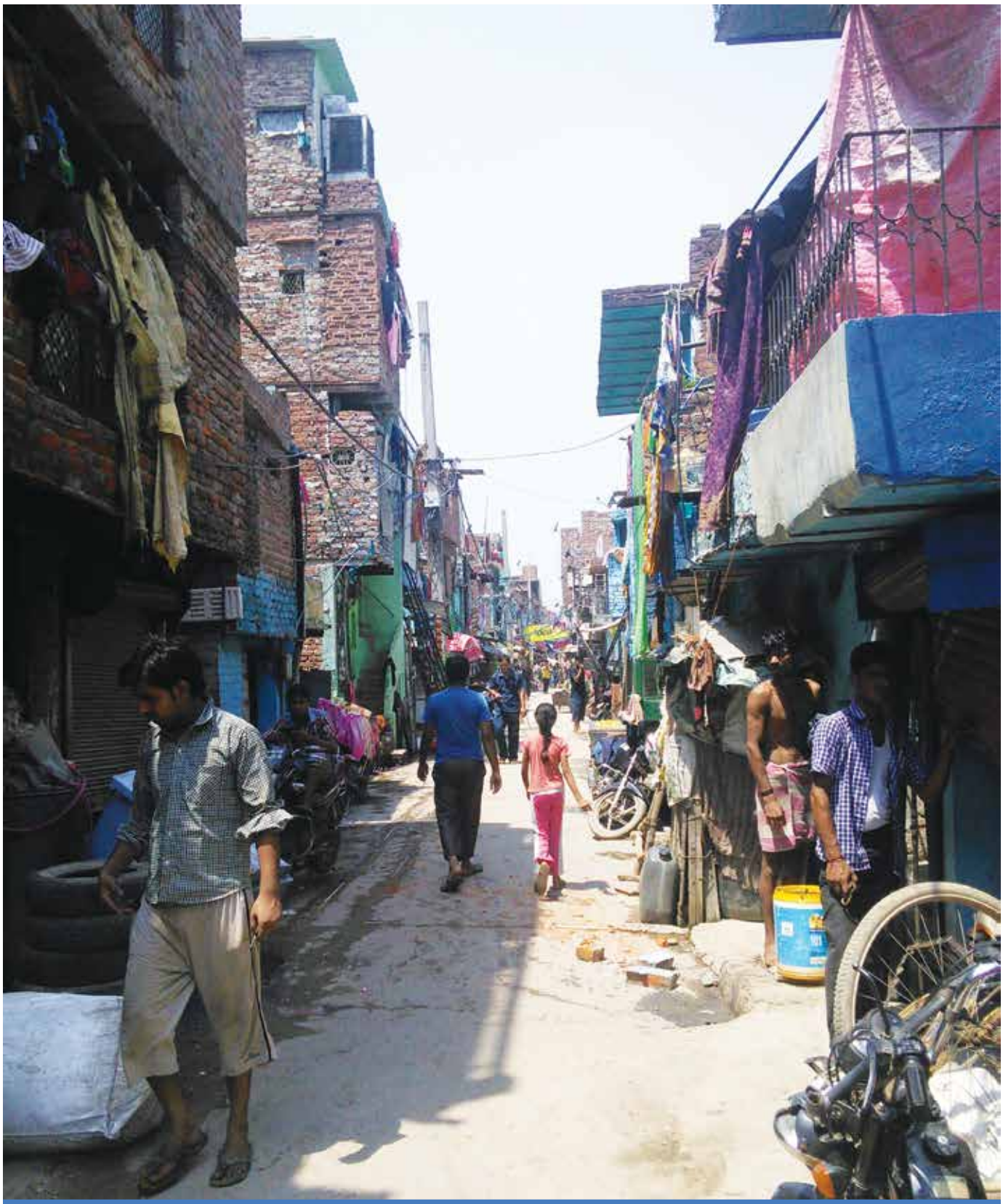
Any compact settlement with a collection of poorly built tenements of at least 20 households, mostly of a temporary nature, crowded together, usually with inadequate sanitary and drinking water facilities in unhygienic conditions. A notified slum is an area notified as a slum by concerned municipalities, corporations, local bodies, or development authorities. The balance is non-notified slums. [Source: Public Information Bureau, Govt. of India]

Resettlement Colonies

Settlements which have been created to relocate some populations which were earlier residing in slums.

Non-Revenue Water (NRW)

NRW is water that has been produced and is "lost" before it reaches the customer, owing to reasons such as leakages, theft, or metering inaccuracies, or which did not yield revenue owing to technical and nontechnical reasons. It also refers to water supplied free through stand posts or under an exemption policy.



A typical slum in Delhi city. A key challenge to the accessibility and quality of water is due to exponential and unplanned growth of cities, fueled by migration.

1. INTRODUCTION

1.1 Background

In the last two decades, the population in urban India has increased at an ever-expanding rate. The number of slums has increased due to unchecked land prices, migration, and unaffordable housing. In India, out of 4,041 statutory towns, slums were reported in 2,543 towns (approx. 63%) per the 2011 census. The total percentage of the population residing in slums is 17.4%.

Living in cramped spaces, with no or very little access to basic amenities like electricity, sanitation, or water, people living in slums are repeatedly exposed to disease and other hazards. The illegal migrant's "illegal encroacher to land" status means slum dwellers are unable to access any institutionalized mechanism for daily water supply or other basic necessities.[3]

In water-stressed cities such as Delhi, Mumbai, Vizag, and Hyderabad, city governments contract out to tankers to serve areas without piped connections or clean groundwater. Given the significant infrastructure investment needed to extend piped connections to the urban unserved, the operating deficits of most Indian utilities, the inability of most slum dwellers to contribute to capital—though not necessarily operating—costs (Bajpai and Bhandari, 2001), and the unattractiveness of peri-urban areas to the formal private sector (Cairncross, 2003), more city governments should consider recognizing, contracting with, and regulating local water entrepreneurs as formal mainstream mechanisms rather than "interim" delivery mechanisms. Water vendors will continue operating regardless of official recognition, so it is beneficial to develop quality controls, price monitoring, and accountability. In such a situation, various measures to fill gaps in provision and demand of basic amenities in slums are critical.

1.2 Objectives of this Study

The objectives of this study are to:

1. Map the existing water supply provision and assess the gap for treated water provision in selected slums;
2. Understand the potential of urban SWEs for providing treated water in the selected slums of Delhi;
3. Assess the operations, financial, technical, and management aspects of SWEs, including challenges;
4. Assess existing digital tools in the sector and seek inputs on the tools being developed by Safe Water Network;
5. Suggest recommendations for a more conducive policy and enabling environment for SWEs in urban areas.

[3] "Sanitation in Mumbai's informal settlements: state, 'slum' and infrastructure." Environment and planning A., 40 (1). pp. 88-107.

1.3 Hypotheses

The following hypotheses were tested:

- Urban poor have limited access to piped water and other sources of municipal water and therefore rely on other unreliable sources of water.
- Limited, if any, USWEs are serving the urban poor in New Delhi.
- The civic body, DJB, holds the key responsibility for ensuring potable water supply effectively and efficiently in Delhi.

1.4 Methodology

The study utilized both primary and secondary sources of data, quantitative and qualitative, drawn from the latest Census (2011) and NSSO latest rounds.

Secondary Research

The team conducted secondary research on water delivery process to Delhi city, especially to the urban poor, before undertaking the primary field survey in the selected slums

Primary Research

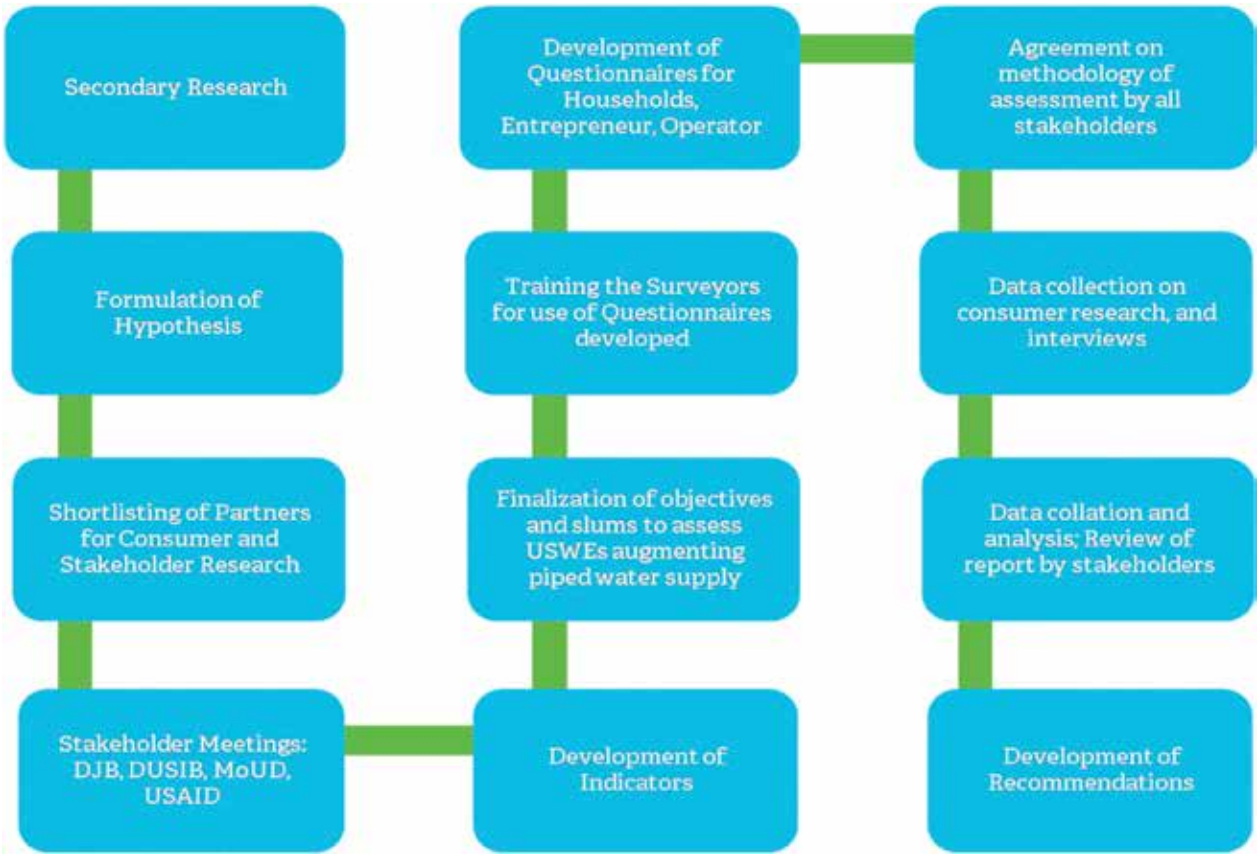
The primary data is drawn from a variety of surveys which were conducted by the research team. Interviews were conducted with the Delhi Jal Board (DJB), Delhi Urban Shelter Improvement Board (DUSIB), and representatives of USWE implementer organizations.

Surveys of the study covered four water treatment kiosks, water ATMs, and other distribution channels charging for treated water in different slums.

The primary surveys were conducted through structured questionnaires, focus group discussions with various stakeholders, and municipal and urban local bodies. Tools were developed through the following steps:

- Detailed survey design and data collection tools were developed after analyzing the secondary data from the census, NSSO, and NFHS.
- Primary surveys were based on short interview schedules directed at HHs using water treatment kiosks, kiosk operators, and other types of water vendors and suppliers.
- Several slums of various characteristics, based on information obtained from the Census, field observations, and discussion with local bodies and non-governmental organizations were visited and two were shortlisted for conducting surveys to explore the potential of USWE adoption in the slums.
- Field surveys of USWEs studied the operational and financial models and the larger socioeconomic and political environment in which they operate.
- Institutional mapping and surveys of local bodies, utility providers, NGOs, parastatal organizations, and CBO helped describe the water issues and the potential of USWEs.

Figure 1. Process flow of the project



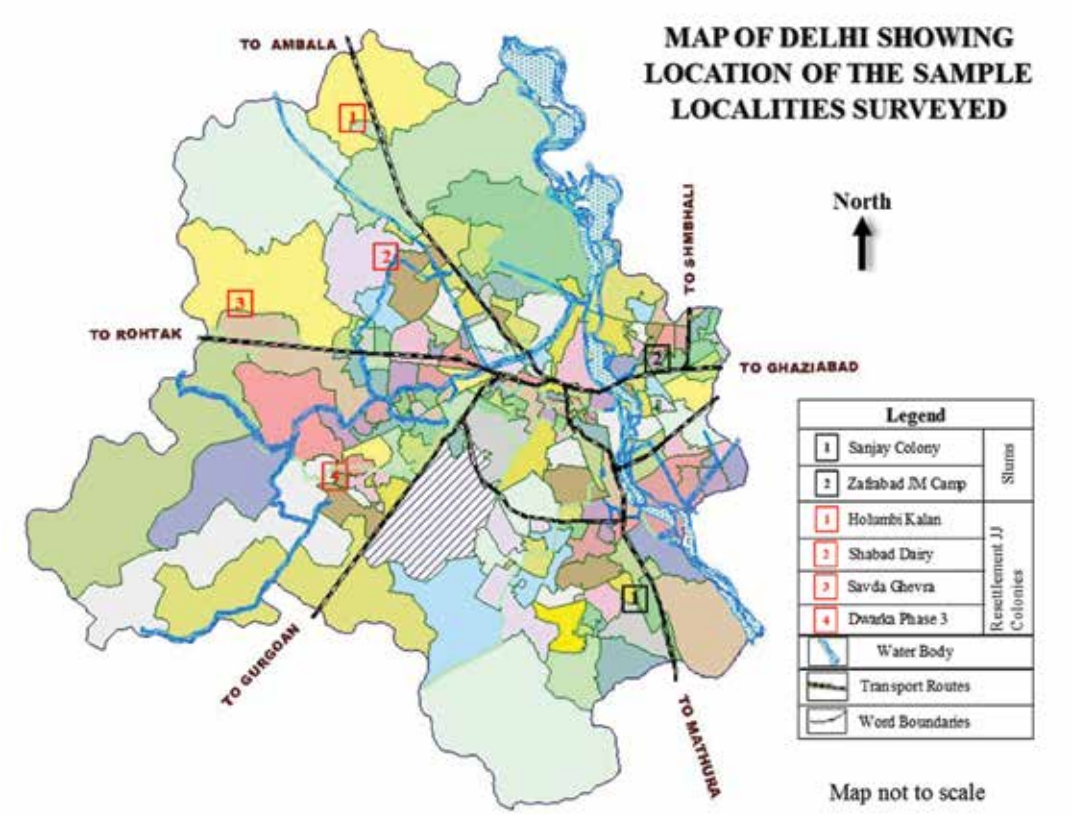
1.5 Selection of Slums

The field surveys were conducted in four resettlement colonies and two informal settlements in Delhi. The choice of resettlement colonies were made on the basis of availability of water treatment kiosks/ water ATMs, while two other informal settlements were selected which did not have water ATM services. The objective was to determine how households in these two sets of slums/informal settlements/resettlement colonies met their water needs and to draw the implications for accessing water in communities with and without water ATMs.

The resettlement colonies with water ATMs were the following:

1. Dwarka Sector 3: Matiala Village, in South West Delhi (referred to as Dwarka in the report)
2. Savda Ghevra, in West Delhi
3. Holambi Kalan, in North West Delhi
4. Shabad Dairy, in North West Delhi

Figure 2. Map of Delhi showing location of localities surveyed



The above localities were equipped with water ATM facilities provided by Sarvajal. In addition, there were two more localities with water ATMs, namely Mahavir Colony market and Mahavir Colony Mandir area. The water ATM in the former locality was run by Sulabh International at their Delhi Head Office in Mahavir Colony, while the latter was run by the DJB with technical supervision provided by Sarvajal, a Primal Foundation venture.

Selection of non-water ATM localities was a difficult task, but was based on a lack of piped water connections and dependence on water tankers for their needs as well as a minimum of 200 households living in the locality. According to the DUSIB list, there are over 1,500 such slums/resettlement colonies and a few hundred more which were not mentioned in the government/municipality list. It was therefore decided to carry out a pilot of a few localities from different parts of Delhi.

Since west and northwest Delhi are represented by the resettlement colonies just mentioned, the survey team targeted south and east Delhi for the remaining communities. Care was taken to identify slum localities with some unique characteristics in terms of socioeconomic composition of household. Sanjay Colony in Okhla phase 2 fit the framework, as it is located in the Okhla Industrial Area and has many informal manufacturing activities, mainly in the garments sector. Most of the households have members working in industries with offices located in Okhla. Sanjay Colony is located on private land with very narrow streets. The peripheral areas have tap water posts provided by DJB while the interior has no water connection and has to depend on water tankers provided round the clock by DJB.

Janata-Mazdoor Colony, Jafarabad, is over 40 years old and households claimed that they have legal papers/land deeds provided by the Delhi government. However, there was no clarity on the issue and the matter has been pending in court for over three decades. Janata Mazdoor Colony is located in the eastern part of Delhi in the Shahdara area. It has piped connections but water seldom flows except at lower altitudes, where a few buckets of water can be filled. Most of the households depend on drawing groundwater through shared submersible pumps for various uses in the household. The quality of water is poor but good enough for cleaning and washing purposes. For drinking water, the households depend on DJB tankers. This colony is Muslim preponderant, which made it socially unique—especially with respect to provision of social amenities, which was comparatively less endowed in relation to other localities in the neighborhood.
The sample household surveys were carried out in these localities and the water ATMs from 5 June to 20 June, 2015.

1.5.1.1 Questionnaire Development

Two sets of questionnaires were developed. The first set was developed for the Water ATM/Kiosk with a focus on operational, distributional, and financial aspects. The second set was developed in order to capture access to drinking water and water for other household usage, sources, cost, and implications for the households. The HH questionnaire for the non-Water ATM areas was slightly modified in order to capture the various sources on which the HHs depended, especially when the water tankers failed to arrive. The two sets of questionnaires are appended in this report.

Testing of the questionnaires was carried out during 5-7 June in Dwarka Matiala resettlement colony both for the water kiosk and households. Another water kiosk was visited in Shabad Dairy, but the operator at the Sarvajal plant refused to participate. Separate questions were also mailed to the Sarvajal Office in Delhi but to no avail. However, Sarvajal plant operators in all other localities shared information. The HH questionnaire was canvassed across 20 households and the results were analyzed by the team. Subsequently, further refinements were carried out on several parameters.

1.5.1.2 Training the Surveyors

A group of six surveyors were trained by the principal investigators on various aspects of field survey techniques. Most of the surveyors were doctoral research students with fairly good experience in conducting field surveys. However, the team paid more attention to the procedure for selecting sample HHs, which had to be few in number. They were trained in house listing and drawing of sample HHs.

1.6 Limitations of the Study

Having just described the scope and methodology, there are limitations to the assessment:

- The geographic location of the areas chosen may not be representative of the slums of the city.
- Response bias of the consumers is inherent in this type of study and may affect the resulting insights gathered from the field research.

A typical slum in Delhi city. There are about 1 million households living in slums, as per the 2015 National Sample Survey.

2. CONTEXT: NEW DELHI

2.1 Introduction

New Delhi, officially known as the National Capital Territory of Delhi, is the capital territory of India. The National Capital Territory of Delhi covers an area of 1,484 km2, of which 783 km^2 is designated rural and 700 km2 urban, therefore making it the largest city in terms of area in the country.

2.2 Geography

The NCT of Delhi is located in northern India and shares a border with the states of Uttar Pradesh and Haryana. Delhi has an area of 1,484 km2. Its maximum length is 51.90 km and greatest width is 48.48 km. Delhi is situated on the right bank of the river Yamuna, at the periphery of the Gangetic plains. To the west and southwest is the great Indian Thar desert of Rajasthan state and to the east lies the river Yamuna, across which has spread the greater Delhi of today. The ridges of the Aravali range extend right into Delhi proper, towards the western side of the city, and this has given an undulating character to some parts of Delhi. The meandering course of the river Yamuna meets the ridge of Wazirabad to the north while, to the south, the ridge branches off from Mehrauli. The main city is situated on the west bank of the river.

2.3 Demographics

2.3.1 City Population

Delhi is home to over 17 million people per the 2011 census (Table 1). A 2014 UN report declared Delhi to be the second most populous city after Tokyo. The overall population density of Delhi has increased from 9,340 persons per km2 in 2001 to 11,320 persons per km2 in 2011 (Table 1), which is the highest in India. Delhi's population has grown at a very rapid pace, recording over 30% decadal growth for the past few decades (Table 2).

TABLE 1 **NCT Delhi population split**

Region	Area (km)	Population (millions)		Density (per km)	
		2001	2011	2001	2011
NCT Delhi (urban)	1,115	12.9	16.4	13,957	14,698
NCT Delhi (rural)	369	0.9	0.4	1,692	1,135
Total	**1,484**	**13.8**	**16.8**	**9,340**	**11,320**

(Source: Census, 2011)

TABLE 2 **NCT Delhi population decadal growth and projections**

Year	Source	Decadal growth, %	Population (millions)
1991	Census	51.4	
2001	Census	47.0	
2011	Census	31.0	16.8
2021 Projections	DDA Master Plan projections	26.4	23.0
	National Capital Region Planning Board	39.8	23.5
	Population Foundation of India II	20.8	20.3

2.3.2 Literacy Rate

As per the 2011 Census, the literacy rate of the city is around 86.21% of which male literacy stands at 90.94 percent while the female literacy is at 80.76%.

2.3.3 Ethnicity, Language and Religion

The most spoken language in Delhi is Hindi with around 80.94% speakers followed by Punjabi, Urdu and Bengali. Hindi is therefore the official language of Delhi . [4]

Predominant religious faith of the city is Hinduism with 81.68% of the population followed by Islam(12.86%), Sikhism(3.4%), Jainism(0.99%), Christianity(0.87%).

2.3.4 Income and Employment

As per the data of the Economic Survey of India during the year 2014-2015, the Gross State Domestic Product of Delhi has recorded a growth of 15.35% over the previous year. Delhi's per capita income during 2014-15 also shows an annual increase of 13.49% reporting a per capita income which is almost three times higher than the per capita income at the National Level.

Based on the Employment and Unemployment Situation in Delhi by the Directorate of Economics and Statistics of the Delhi Government, about 56.24 lakh people are employed in urban area while 22.19 lakh households are engaged in regular wages. This accounts for an unemployment rate at 40 per thousand persons in labor force with about 90 per cent of the unemployed people belonging to the category of youngsters.

2.4 Slum characteristics

As per data released in February 2015 from the 69th round of the National Sample Survey, there were about 6,343 slums in Delhi with approximately 1 million households in 2012. The average size of a slum was 161 households. About 90% of slums were built on public land, owned mostly by local bodies (46%), railways (28%), and state government (16%), etc. In about 30% of the slums, most of the residents are using a septic tank/flush type of latrine facility while 22% of slums did not have any latrine facility at all. Underground sewerage existed in only about 16.30% of slums. About 98% of the slums have an underground/covered pucca/open pucca or open katcha drainage system. Only 1.6% of the slums have no drainage system.

[4] According to the 50th report of the commissioner for linguistic minorities in India, 2014 (http://nclm.nic.in/shared/linkimages/NCLM50thReport.pdf)

Local bodies were collecting garbage from 31.45% of slums; the frequency of collection ranges from a daily basis (37%), at least once in two days (32%), once in three to seven days (29%), and once in eight to fifteen days (0.68%). About 9.3% of the slums were usually affected by flooding (inside the slum as well as on the approach road) during monsoons. About 4% of the slums in Delhi have either formal or informal associations formed by the slum dwellers themselves for improving living conditions.

2.5 Context: Areas Studied

We undertook field work in six locations, including four resettlement colonies and two slums, and studied five USWEs, including four set up as part of a Sarvajal-DJB partnership and one set up by Sulabh International. In this section, we lay out the basic demographic details of the six locations that we studied to enable better understanding of survey results.

2.5.1 Resettlement Colonies with USWEs

- 64% of the population captured through field work belonged to the "working age" of 15-59 years.
- 63% of the respondents were women, most of whom were homemakers.

Figure 3. Gender split of respondents

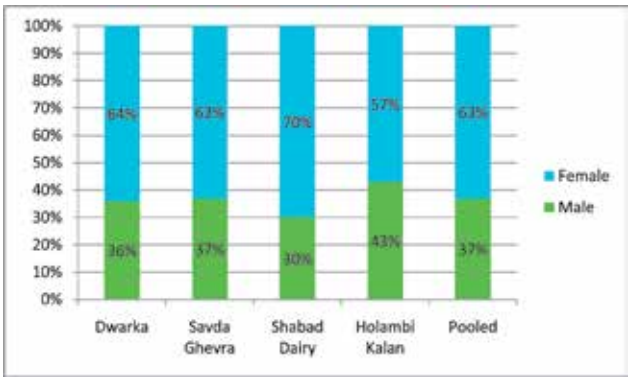


Figure 4. Age distribution of family members of respondents

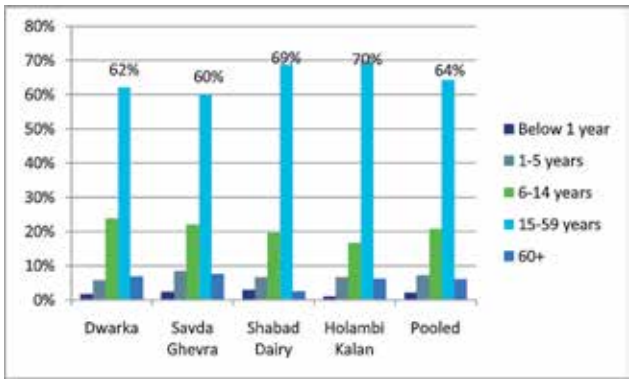


Figure 5. Work status of respondents

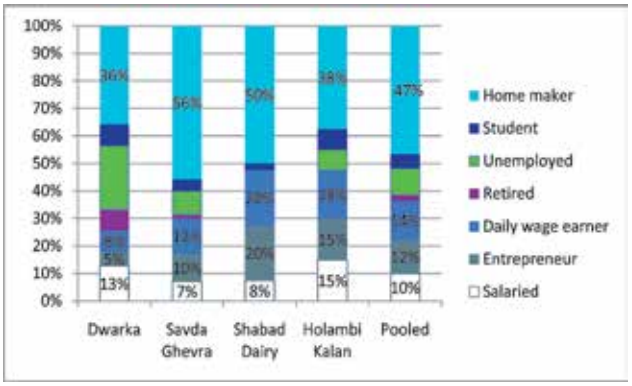
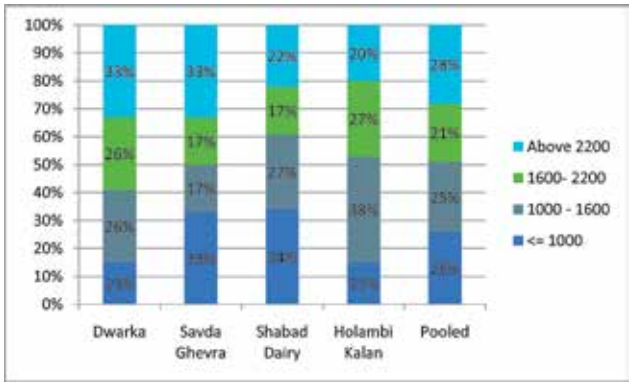


Figure 6. HHs split by monthly per capita income (INR)



2.5.2 Slums without USWEs

- 70% of the population captured through field work belonged to the "working age" of 15-59 years.
- 68% of the respondents were women and most of them were homemakers, while another 21% and 19% were entrepreneurs and daily wage earners, respectively.

Figure 7. Gender split of respondents

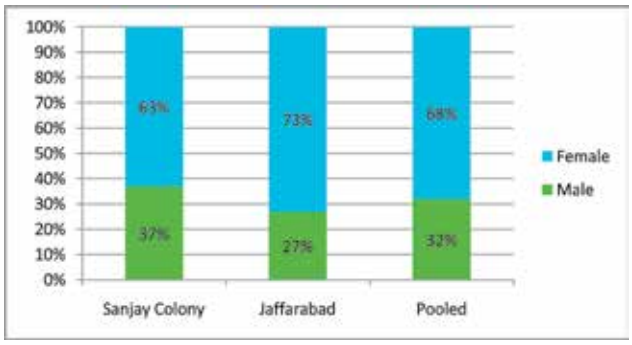


Figure 8. Age distribution of family members of respondents

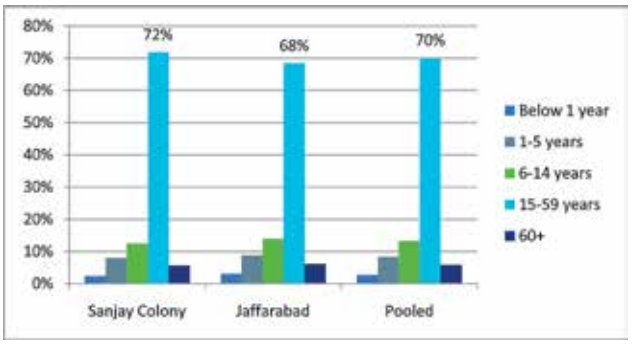


Figure 9. Work status of respondents

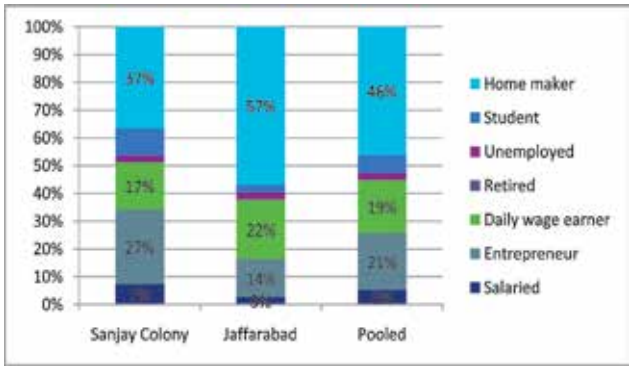


Figure 10. HHs split by monthly per capita income (INR)

Tanker Water Supply acts as a lifeline of water supply to the urban poor in Delhi. Community level taps are being shared between 10 and 30 households for 1 to 2 hours of water supply in these slums.

3. WATER SUPPLY

3.1 Overview

Delhi Jal Board (DJB) is responsible for the production and distribution of drinking water and also for collection, treatment, and disposal of domestic sewage in the National Capital Territory of Delhi. DJB claims to have covered about 82% of households of Delhi through piped water supply and ensured average availability of 50 gallons per capita per day of filtered water.

The Delhi Jal Board constituted under Delhi Jal Board Act 1998, is responsible for production and distribution of drinking water as also for collection, treatment, and disposal of domestic sewage. DJB is responsible for [5]

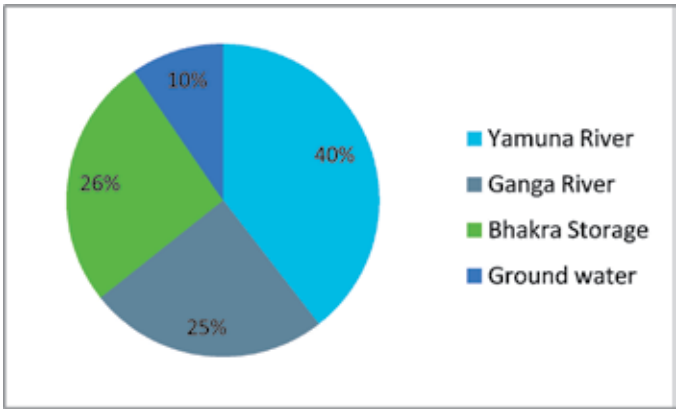
- Supply of potable drinking water
- Supply of potable water through tankers whenever needed
- Supply of packaged water "JAL" in Jars through Jal Suvidha Kendras
- Treatment and disposal of sewage
- Supply of Biogas/ Sludge Manure/ treated waste water
- Testing of water samples

Water Provision

3.1.1 Water Sources

Water is supplied to about 18 million people in Delhi through a water supply network comprising 11,350 km of pipeline and 105 underground reservoirs for rationalized distribution of supply. Delhi uses an average of 835 MGD raw water daily from various sources: Ganga River (330 MGD), Yamuna River (207 MGD), Bhakra Storage (218 MGD), and groundwater (80 MGD). The water treatment and supply capacity, which was 650 MGD in 2002, has been increased to 906 MGD in 2014.

Figure 11. Sources of raw water for Delhi



[5] http://www.delhi.gov.in/wps/wcm/connect/doit_djb/DJB/Home/About+Us Retrieved from delhi.gov.in on 28th September 2016

There 12 Water Treatment Plants in Delhi and two new Water Treatment Plants have been constructed at Dwarka (50 MGD) and Okhla (20 MGD). The raw water availability to these plants would be made after the construction of a parallel channel from Munak to Haiderpur. Further, another treatment plant with the capacity of 20MGD will be commissioned after the availability of raw water.

3.1.2 Water Reservoirs

As per the Yamuna Water Sharing Agreement signed in May, 1994 the proposed construction of Renuka Dam, Kishau Dam, Lakhwar Vyasi Dam is aimed for the city to get its due share of water in Yamuna Water. Renuka Dam will provide around 275 MGD of water to the city. About 372 MGD of water will be obtained from Kishau reservoir and 135 MGD from Lakhwar Vyasi reservoir.

3.1.3 Piped Water Supply Network

As per the Census 2011 data, there are about 33.41 lakh households in Delhi of which 27.16 lakh households are provided water through a piped water supply system which means that 81.30 per cent of households in Delhi are covered by a piped water supply. However, out of the 81.30 per cent of households, 75.20 per cent are covered through a source which is treated while 6.10 per cent households have supply to piped water from an untreated source.

3.1.4 Demand Projections

Water demand projections by various agencies and consultative group for 2021: Various agencies in addition to the DJB have prepared projections of water demand for Delhi targeting the year 2021, including Japan International Cooperation Agency (JICA), Tata Consulting Engineers Limited (TCE), and National Capital Region Planning Board (NCRPB). The projected population size of Delhi varies from 23 million (DJB and TCE projection) to 26 million (JICA projection). JICA has given the net per capita projection of water demand in 2021 of 52 gallon per capita per day (GPCD). A leakage of 8 GPCD is projected, which is 18% of the net per capita water demand. Projection of gross per capita water demand varies between 50 GPCD (NCRPB) and 60 GPCD (JICA). Overall, in 2021, it is projected that Delhi will have a water demand of 1,174 million gallons per day (MGD) according to the NCRPB. This figure is even higher according to JICA (1,560 MGD).

TABLE 3 **Water demand projections, 2021**

Parameters	JICA Study Team	DJB	TCE	NCRPB
Population (Million)	26	23	23	23.48
Net Per Capita (GPCD)	52	-	-	-
Leakage (GPCD)	8 (18%)	Incl. in gross	Incl. in gross	-
Gross per Capita (GPCD)	60	60	51	50
Demand (MGD)	1,560	1,380	1,170	1,174

Source: Water Policy for Delhi

TABLE 4 **Projected domestic water demand based on projected population**

	Supply Norm (LPCD)	2021 (Population 23 Million), in MGD	2031 (Population 25 Million), in MGD	2051(Population 27 Million), in MGD
DDA (CPHEEO)	172	868 MGD	942 MGD	*1,018 MGD
National Water Commission	160	807 MGD	877 MGD	947 MGD
NCRPB	225	1,150 MGD	1,250 MGD	1,332 MGD
These projections are on a fixed norm. In future, norm can decline as efficiencies are factored in. This is the target figure for future water security in NCT Delhi.				

(source: water policy for Delhi)

Proposed source of water supply in Delhi: Several other dams are proposed in the Himalayas, from which NCT Delhi will retrieve a share of water; all of them are facing a certain degree of uncertainty. These are the Renuka Damon Giri River, a tributary of River Yamuna in Himachal Pradesh; Kishau Dam on River Tons, a tributary of River Yamuna in the Dehradun districts of Uttarakhand; Lakhwar Vyasi Dam on River Yamuna in the Dehradun districts in the state of Uttarakhand; and the Sarda-Yamuna Link, which involves the Pancheshwar and Pooranagiri dams on the River Sarda at the Indo-Nepal border. However, even if some of them do materialize, Delhi is unlikely to face a water shortage from a raw water perspective. It would be up to DJB to augment their water treatment capacity to serve the populations of Delhi.

3.1.5 Groundwater Scenario of NCT Delhi

It is important to consider groundwater as well, since many people depend on this for meeting their daily water requirements. While government extracts groundwater through tube wells for piped water supply in areas which are not adequately served by a WTP, households extract groundwater through personal bore wells. Additionally, a lot of groundwater is extracted for agriculture purposes in the outer realms of this region. According to the Central Ground Water Development Board (CGWB, 2011), the average level of exploitation of groundwater in Delhi is 137%.

Table 5 brings forth the share of groundwater consumption by various sectors. Table 6 highlights the stage of groundwater development by district.

TABLE 5 **Groundwater consumption in Delhi, by sector**

Sector	Share of NCT Delhi's GroundwaterUsage
Irrigation	40%
Domestic Sector	50%
Industrial Sector	10%

(source: water policy for Delhi)

TABLE 6 **Stage of groundwater development by districts, Delhi (CGWB, 2011)**

Districts	Net Groundwater Availability (ham)	Annual Groundwater Draft (ham)	Stage of groundwater development (%)
Darya Ganj	234	139	59%
Karol Bagh	40	55	138%
Pahar Ganj	72	98	136%
Gandhi Nagar	357	284	80%
Preet Vihar	604	1,466	243%
Vivek Vihar	227	374	165%
Chanakay Puri	353	340	96%
Connaught Place	189	149	79%
Parliament Street	175	160	91%
Civil Lines	1,223	764	62%
Kotwali	128	151	118%
Sadar Bazar	49	53	108%
Seelam Pur	873	743	85%
Seema Puri	120	269	224%
Shahdra	143	287	201%
Model Town	476	848	178%
Narela	4,859	3,722	77%
Saraswati Vihar	2,689	4,446	165%
Defence Colony	1,035	1,346	130%
Hauz Khas	1,523	3,565	234%
Kalkaji	1,565	3,128	200%
Delhi Cantonment	803	1,844	230%
Najafgarh	6,661	8,388	126%
Vasant Vihar	1,663	2,545	153%
Patel Nagar	1,014	1,945	192%
Panjabi Bagh	1,307	1,214	93%
Rajouri Garden	331	892	269%
Total	**28,713**	**39,215**	**137%**

3.1.6 Service Level Benchmarking Index

Table 7 captures DJB's performance along the Ministry of Urban Development-promoted water supply Service Level Benchmarks (SLBs) from 2009.

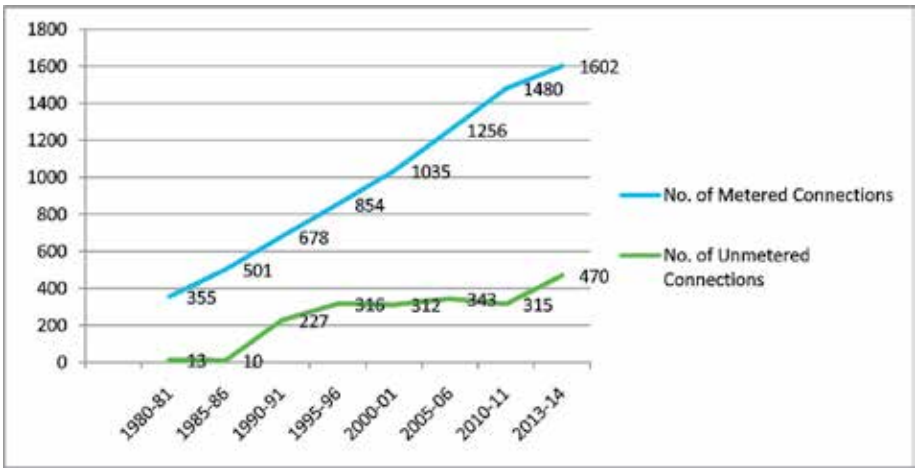
TABLE 7 **Performance of DJB along SLBs**

Indicator	Unit	Value	Benchmark
Coverage of water supply connections	%	72	100
Per capita availability of water at consumer end	LPCD	144	135
Extent of metering of water connections	%	55	100
Extent of Non-Revenue Water (NRW)	%	52	20
Continuity of water supply	Hrs/Day	3	24
Efficiency in redressal of customer complaints	%	73	80
Adequacy of treatment and disinfection and quality of water supplied	%	99.5	100
Cost recovery in water supply services	%	42	100
Efficiency in collection of water supply–related charges	%	86	90

In speaking with DJB officials, a few modifications to the table should be considered:

- DJB claims to now have covered 81% of the population through piped connections, as opposed to this 2009 assessment.
- There is no scientific figure available with DJB on how much of their water is non-revenue. They estimate it to be around 40% as opposed to 52% in the above assessment.
- There are over 2 million connections in NCT of Delhi, with about 20% of them being unmetered. Most metered connections also get charged a flat tariff.

Figure 12. Number of metered and unmetered tap connections (in '000s)



Per the 2011 Census, 33 lakh households were in Delhi, out of which 27 lakh households were provided piped water. About 5 lakh households received water supply through tube wells/deep bore hand pumps/public hydrants and the remaining 1.6 lakh households depended on other sources like rivers, canals, ponds, tanks, springs, etc. The information regarding sources and availability of drinking water in Delhi by total population compared to the slum population, as per 2011 Census, is presented in Table 8 below.

TABLE 8 **Sources of drinking water for households (total & slum-only) in Delhi, Census 2011**

Source of drinking water		Total Households (%)	Slum Households (%)
1.	Piped water supply	81.3	84.3
	I. From treated source	75.2	73.3
	II. From untreated source	6.1	11.0
2.	Covered well	0.1	0.1
3.	Hand pump	5.3	5.4
4.	Tube well	8.4	6.1
5.	Tank, pond, lake	1.2	1.4
6.	Other sources	3.7	2.7
Availability			
1.	Within the premises	78.4	50.9
2.	Near the premises	15.4	39.6
3.	Away	6.2	9.5

Although Census numbers reflect similar levels of water supply to all housing categories including slums, the location of the water supply is within the premises of 78% of households living in a planned colony compared to just 51% in a slum. This suggests that the sources in slum households are shared. Observations during the field study showed community level taps being shared between 10 and 30 households for 1 to 2 hours of water supply.

Tanker water supply is a critical lifeline of water supply to the urban poor in Delhi. A significant share of over 800 tankers is owned and hired by DJB to serve the urban poor. However, tanker water supply is quite costly for any water utility and there is always the risk of contamination, from lack of cleaning, etc., making it potentially unsuitable for potable purposes. Thus DJB had piloted a water treatment kiosk project to assess the feasibility of this solution to serve the urban poor.

3.2 Future water supply plans of Delhi government

The recently elected Delhi government, which came to power in February 2015, has shared its plans to improve Delhi's water supply. Some of the key proposed initiatives are shared below:

1 Free water for all metered connections which consume up to 20 kiloliters of water per month. Increased block tariff to be applied after that.

2 Pending water bills (until November 2015) to be waived off fully or partially depending on housing category. Only condition is that households have to set up functional water meters.

3 Since more than 800 unauthorized colonies depend on water tankers to meet their daily water requirements, piped water supply will be extended to all these unauthorized colonies in a time-bound manner in the next three years. Work will be completed in 250 colonies in 2015-2016. Entire Delhi NCR, barring 30-40 colonies, has been promised piped water supply by the end of 2017.

- To further augment water availability, government intends to use the treated effluent water of Sewage Treatment Plants (STPs), which are producing 410 MGD water out of which only 150 MGD is being utilized. A new plan has been prepared to lay the necessary trunk network to supply this water to various areas for horticultural, industrial, and other non-domestic uses.
- Since the residents of many unauthorized colonies have not been coming forward to take connections due to high development charges, there is underutilization of existing infrastructure and denial of services to the people of these colonies. Therefore, the development charges for taking water connections has been reduced from INR 440 (USD 6.57)/m^2 to INR 100 (USD 1.49)/m^2. [6]
- Charges for regularization of unauthorized connections have also been reduced from INR 18,000 (USD 268.64) to INR 3,300 (USD 44.77).
- Effective action to be taken against the tanker mafia by use of information technology for effective, continuous, and strict monitoring of water tankers. More than 400 tankers have been fitted with GPS and water sensors, and their movement is being monitored continuously through a web-based system. A new portal has been launched for "Public Monitoring of Water Tankers," enabling people to track the water tankers, find out estimated time of arrival of tanker in their colony, and quantity of water coming in that tanker.

[6] The conversion rate of INR 1 = USD 0.01 is used throughout the report.

Consumers collecting water from a Sulabh International Water ATM. Recognizing the need for safe water, the Delhi Jal Board had invited tenders for setting up of kiosks with ATMs in resettlement colonies which would help in the augmentation of the current water supply in these colonies.

4. URBAN SMALL WATER ENTERPRISES

4.1 Need

First, we present findings from the household-level surveys conducted in two slums which are currently not served by any water treatment kiosk.

4.1.1 Source of Potable and Non-Potable Water

As shown in Figure 12, the primary potable water sources in Sanjay Colony are municipality water tankers (78% of households)and community tap in Jaffrabad(46% households).In most of the households, there is only one source of drinking water. Household taps are the primary source of water for 15% of households in Sanjay Colony and 38% of HHs in Jaffrabad, but the municipal piped supply is largely seen as unreliable due to its varying availability and frequency, and inadequate pressure.

Figure 13. Slums without kiosks - potable water sources: primary

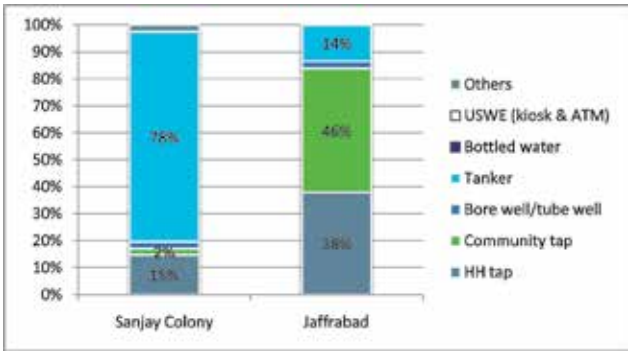
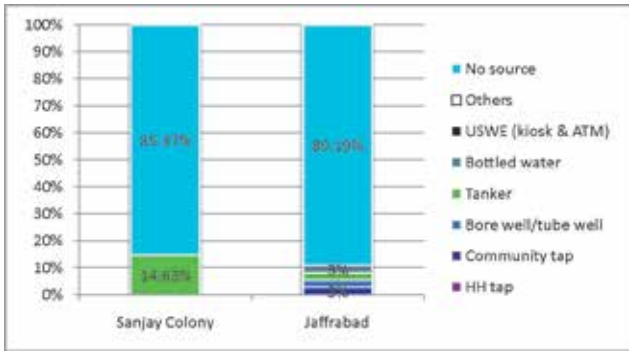


Figure 14. Slums without kiosks - potable water sources: Secondary



Only 17% of HHs in Sanjay Colony and 11% of HHs in Jaffrabad had an additional secondary source of drinking water with a main source of drinking water (Figure 13). Irrespective of the economic conditions of households, not a single household reported using secondary sources of water for other purposes. Economically advantaged households have invested more in buying containers to store water, thereby allowing them to save more when a tanker visits them.

Figure 15. Slums without kiosks - source of non-potable water

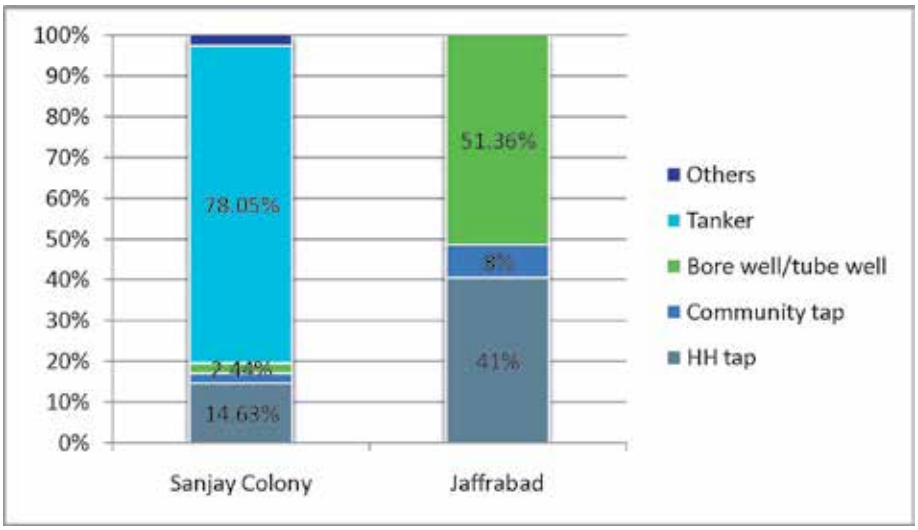


Table 9 shows the results regarding sources of non-potable water. Some 78% of respondents in Sanjay Colony use tanker water for their non-potable supply, as the availability and regularity of municipality tankers is better than in Jaffrabad. Around 51% of respondents in Jaffrabad use bore wells/tube wells but, due to the hard nature of the water, residents don't drink it. Digging a bore well is not possible in Sanjay Colony due to its rocky terrain.

4.1.2 Location of Water Sources and Collection Time

The location of water sources for most HHs is outside the premises. For potable water, respondents' families collect water from outside the premises of their house in 93% of HHs in Sanjay Colony and 78% of HHs in Jaffrabad, for an average of 86% (Figure 15).

Time to fetch water has enormous effect on the day-to-day life in households. As shown in Figure 16, it takes 35% of households more than one hour daily to fetch water, sometimes extending upto three hours. The majority of respondents spend 30-60 minutes daily. Only 13% of HHs reported no time to fetch water due to the location of their source within premises.

Figure 16. Location of primary potable water source

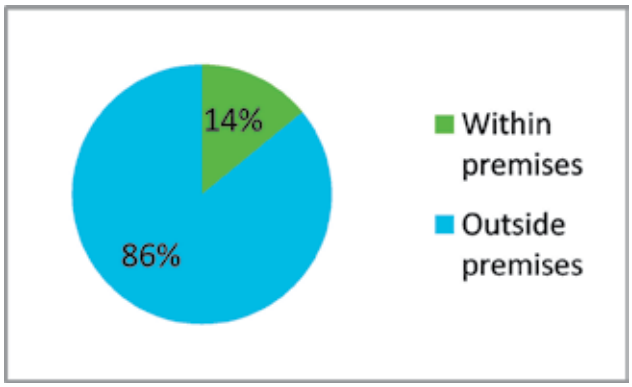
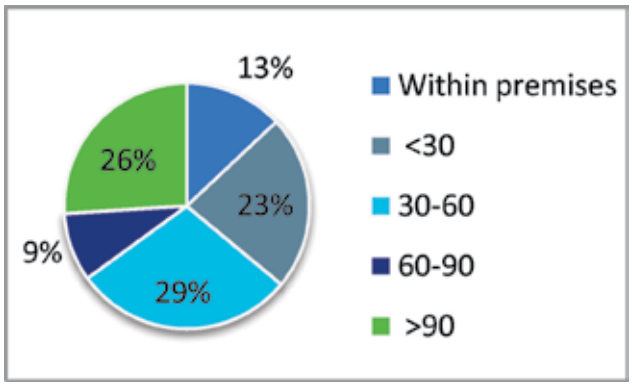


Figure 17. Water collection time



4.1.3 Piped Supply Versus Tanker Water Supply

Across Sanjay Colony and Jaffrabad, tankers, community taps, and household taps are the primary sources of potable water. Bore wells and tube wells are popular sources for non-potable water in Jaffrabad but, as a private initiative, they are regulated personally by every household.

Municipality water tankers and piped water supply are government initiatives. Below is an analysis of availability and reliability of tankers and piped water supply.

Tanker water supply was reported to be relatively more reliable both in terms of its timing during the day and frequency within a day. Some 51% of respondents reported that tanker timings are fixed, and 43% responded that they delivered water with a frequency of three times a day or more.

However, piped water is supplied for a longer period of time, with 34% of respondents reporting over 30 minutes per day, versus 2% for tankers. Both sources provide daily access for the most part: 100% of those using piped water have access daily and 97% of those using tankers report daily access.

Figure 18. Time of the day: water tanker supply

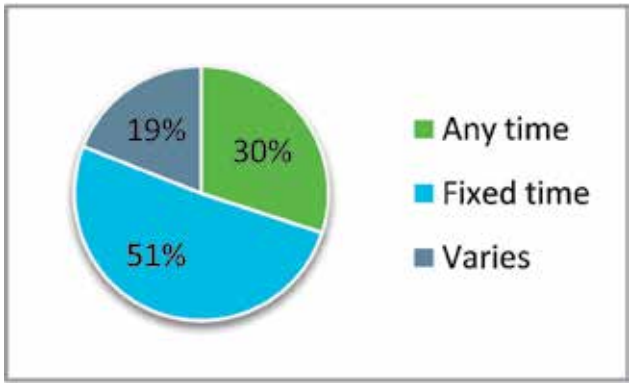


Figure 19. Time of the day: piped water supply

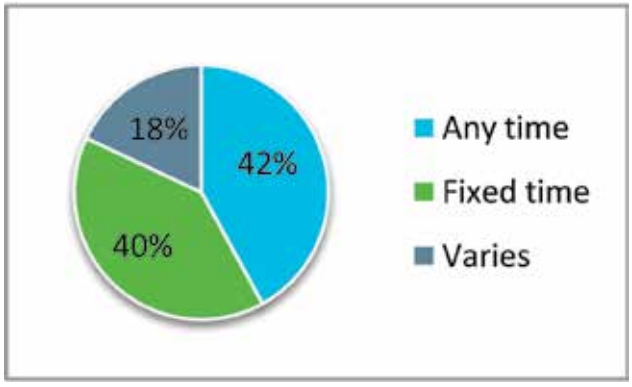


Figure 20. Frequency: water tanker supply

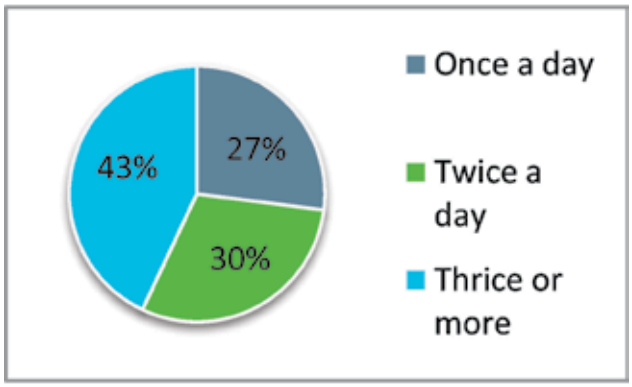


Figure 21. Frequency: piped water supply

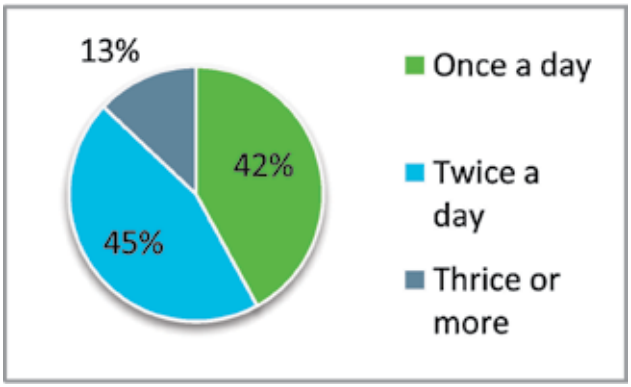


Figure 22. Duration of supply: water tanker supply

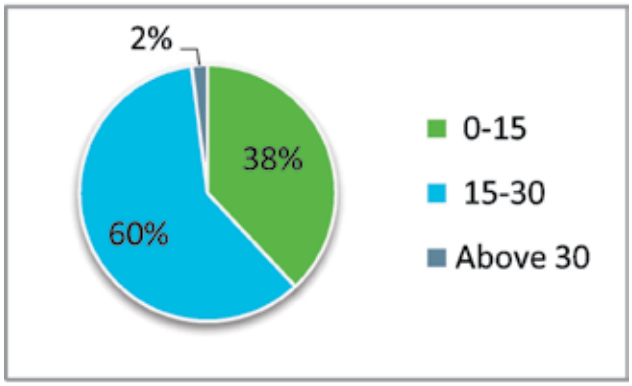


Figure 23. Duration of supply: piped water

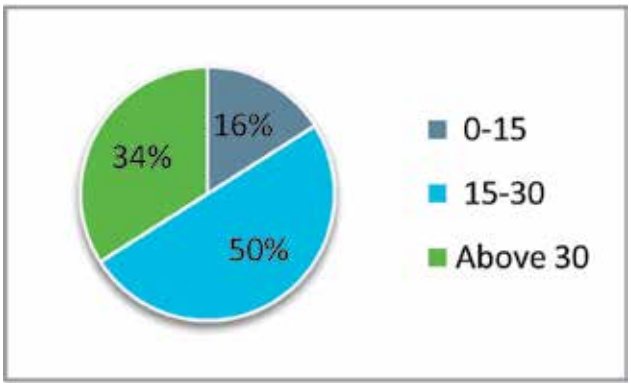


Figure 24. Frequency per week: water tanker supply

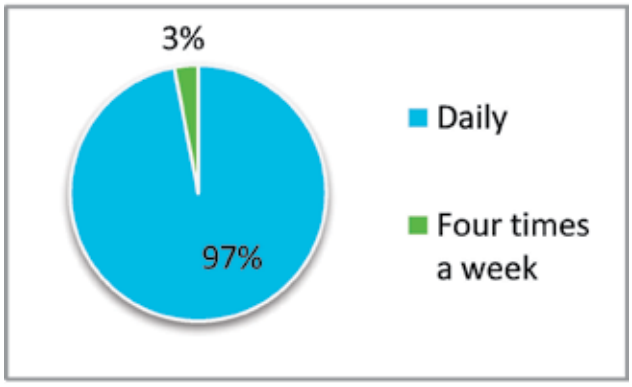
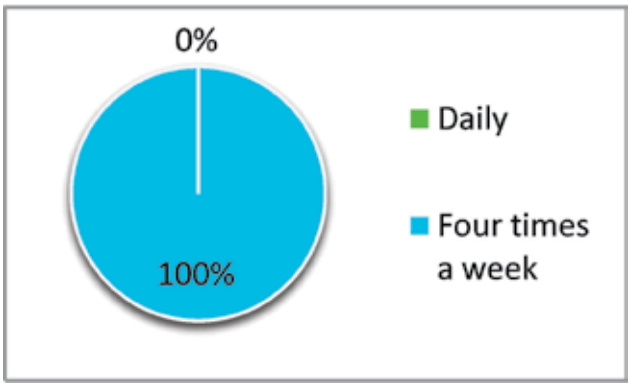


Figure 25. Frequency per week: piped water supply



4.1.4 Payment for Water

Overall, 71% of HHs reported ever paying for water, ranging from 59% in Sanjay Colony to 84% in Jaffrabad (Figure 25). These payments were largely made for the initial setup, with 63% of HHs reporting making a one-time payment for getting access to water (Figure 26). These payments covered bore-well construct costs, purchase of submersible pumps, or last-mile connectivity to the piped network, which led to expenses of over INR 6,000 (USD 89.55) in about one-fifth of the HHs (Figure 27). Sometimes these expenses have been borne on a shared level as well. Only 18% of HHs pay for water on a monthly basis, including electricity expenses (Figure 28).

Figure 26. Responses to "Ever paid for water?"

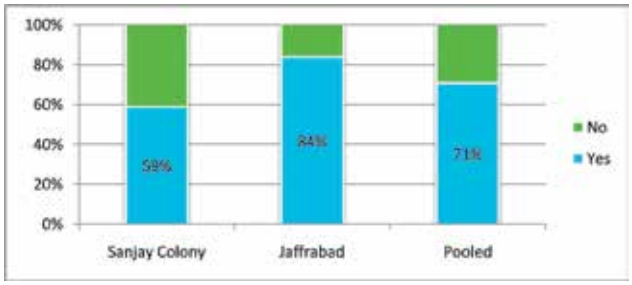


Figure 27. Responses to "Ever made any initial payment for getting access to water?"

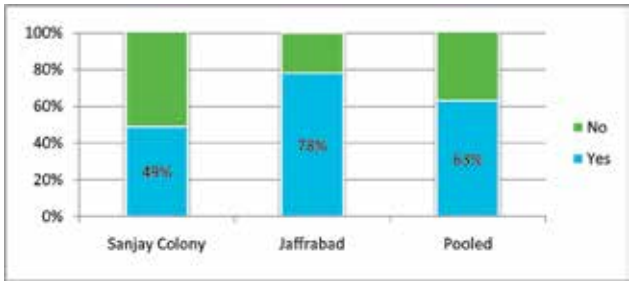


Figure 28. Initial payment for water

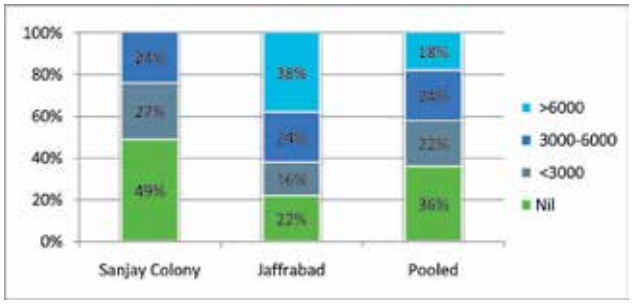
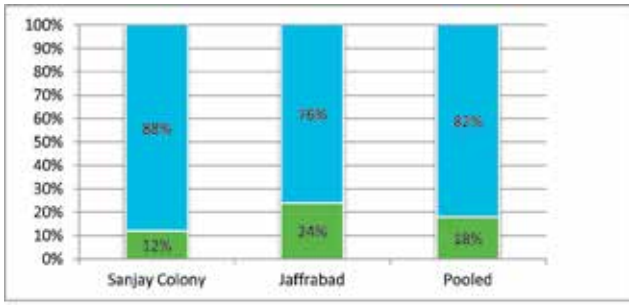


Figure 29. Monthly payment for water



4.1.5 Satisfaction and Willingness to Pay

Satisfaction with adequacy levels of water for both potable and non-potable needs can play a significant role in the willingness to pay for a better and safer delivery model. Surprisingly, almost 70% of HHs reported adequacy of water for both potable and non-potable purposes (Figures 29 and 30), 28% of HHs reported inadequate availability of water for potable purposes, and 33% reported inadequate availability for non-potable purposes (Figure 31).

Figure 30. Potable water adequacy

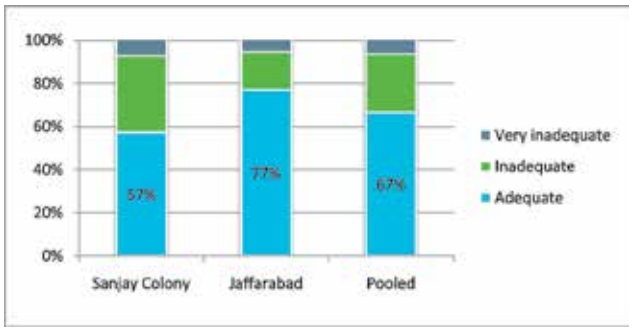
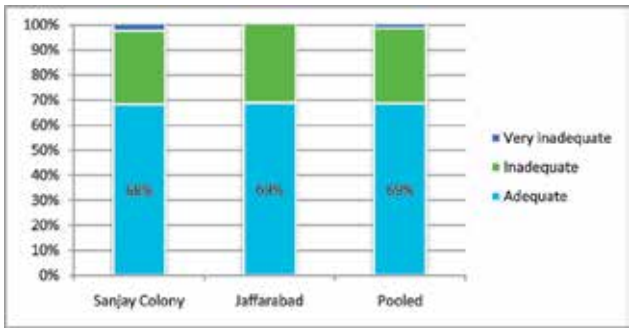
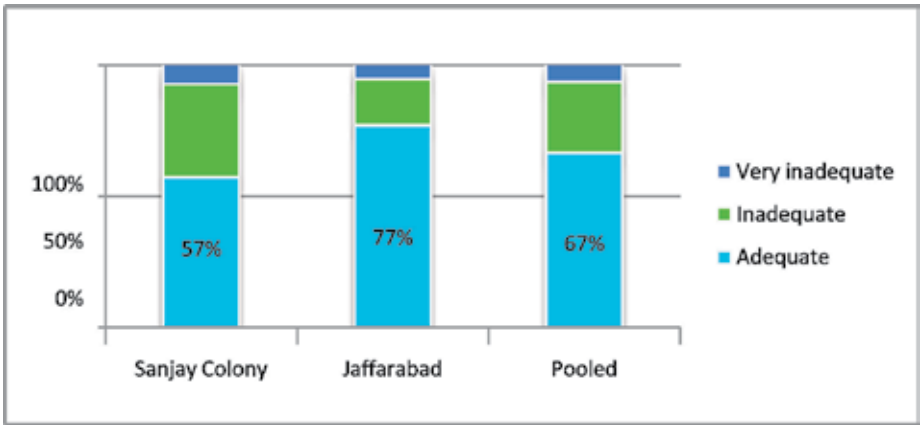


Figure 31. Non-potable water adequacy



A little over onethird of respondents were willing to pay for treated water through kiosks and ATMs. However, over a third of HHs reported being unsure whether they'd adopt a kiosk/ATM if it were established.

Figure 32. Willingness to pay for treated water



4.2 Urban Small Water Enterprises (USWEs)

This section comprises findings from the household-level surveys conducted in resettlement colonies which are currently served by water treatment kiosks.

4.2.1 Source of potable and non-potable water

As shown in in Figure 32, overall only 22% of the total HHs in resettlement colonies have a HH level tap providing potable water, though that number ranges from 0% in Savda Ghevra to 87% in Dwarka, where piped water services were reported to have improved in the last few months.

Fifty percent of all HHs reported municipal tanker water supply as their primary source for potable water, ranging from 5% in Dwarka to 84% in Savda Gehvra.

Only 10% of HHs reported a kiosk/ATM as their primary source of potable water. However, as a secondary source, i.e., in the absence of the primary source, kiosks were reported to be the most preferred across all five areas (Figure 33).

In case of Holambi Kalan, people mostly depend on 20 liter bottled water delivered by a local private player at a high price of 50 paisa per liter (or INR 10 – USD 0.15 - per 20 liter can). Only one third of the households depend on a municipality tanker for their drinking water and 60% of HHs consider bottled water as their secondary source of potable water.

People expressed their desire to consider the kiosk/ATM as their primary source, as it is cheaper than the water being provided by the local private player. However, local private players benefit from challenges at the kiosk/ATMs, including dissatisfaction with queues, irregularity by the service provider in filling ATMs through tankers, and lack of an option for cold water.

Figure 33. Primary sources of potable water

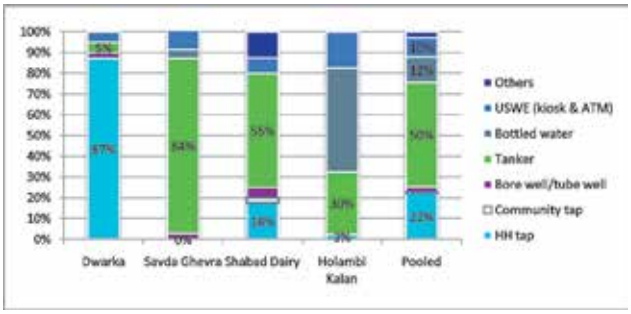
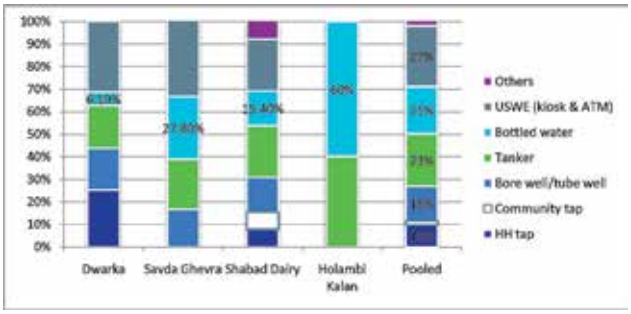
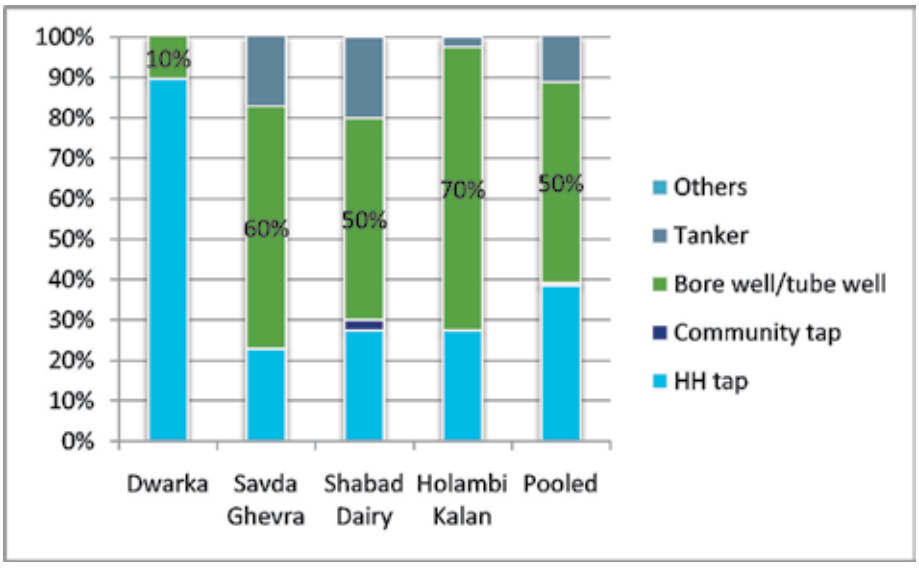


Figure 34. Secondary sources of potable water



Water for non-potable uses is primarily being drawn from bore wells except in Dwarka, where piped water into dwellings is the main source of water for other uses (Figure 34).

Figure 35. Non-potable water sources



4.2.2 Sources of water by economic condition of households

Per capita income is related to source of drinking water. Use of kiosk/ATM as a primary source of potable water increases by per capita income except in the INR 1,601-2,200 (USD 23.89 – 32.83) range, where there is a drop; however, in that range, 42% of people use kiosk/ATMs as a secondary source, indicating perhaps that it is affected by availability.

Use of bottled water as a primary source increases with income through per capita income of INR 2,200 (USD 32.83), and peaks as the preferred secondary source for those making more than INR 2,200 (USD 32.83).

Use of municipality tanker as the primary source for potable needs is about the same for all groups with a monthly per capita income over INR 1,000 (USD 14.92), but is more important for those making less. Use of tankers as a secondary source of potable water ranges from a low of 8% for those making INR 1,601-2,200 (USD 23.89 – 32.83) to 33% for those making INR 1,001-1,600 (USD 14.94-23.88). Again, this could potentially be attributed to availability of tanker supply in certain areas, assuming economic conditions are more homogeneous within communities than across communities.

Figure 36. Primary sources of potable water by monthly per capita income

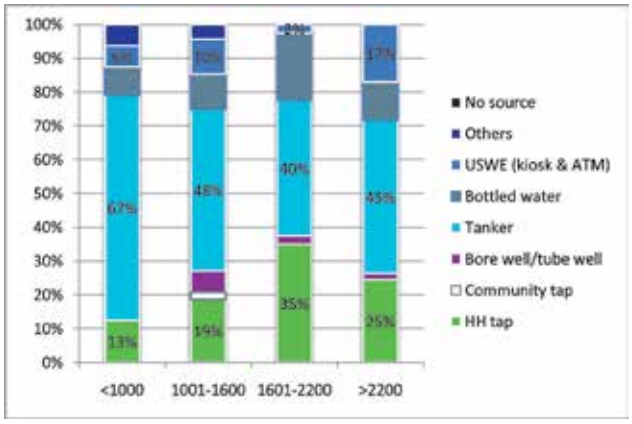
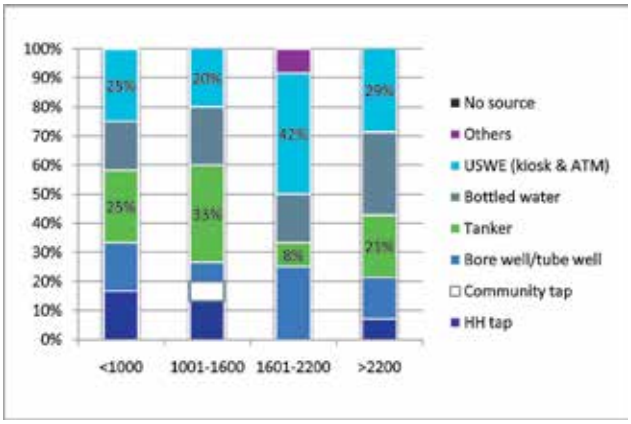


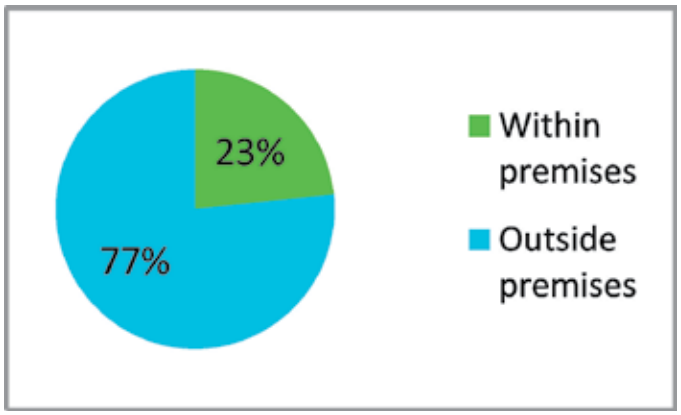
Figure 37. Secondary sources of potable water by monthly per capita income



4.2.3 Location of water sources and collection time

Overall, 77% of HHs consider their primary source of potable water to be outside their premises. HHs in Dwarka predominantly have taps available within the premises. HHs in the other resettlement colonies generally have the source, i.e., either municipal tanker, bottled water, or ATM, outside the premises. With recent changes in Dwarka's overall water governance, the status of piped water provision has improved in several surrounding areas. HHs in Shabad Dairy do not receive regular supply despite access to piped network, so they have to travel to fetch water.

Figure 38. Location of primary potable water sources



As shown in Table 9, aside from Dwarka, all other resettlement colonies have less than 70% regular availability of water throughout the year, with Shabad Dairy respondents reporting less than 50% availability. Perceptions play a strong role in dictating the preference for alternate source of drinking water. The perceived quality of primary sources across colonies is considered soft by almost everyone, with an average of 96%.

Respondents in Dwarka have a strong, positive perception about the look, smell, and taste of their main potable water source (HH tap, municipal supply). Holambi Kalan respondents also rated their water highly, with 75% responding that it is clean and 90% reporting no smell in the primary (bottled water).

Tanker water, the primary source of potable water in Savda Ghevra and Shabad Dairy, was not rated highly by residents. Only 43% of respondents considered it clean, an average of 75% of respondents perceived a bad smell, and only 32%-43% considered it to have a good taste.

TABLE 9 **Comparison of resettlement colonies across characteristics of main potable water source**

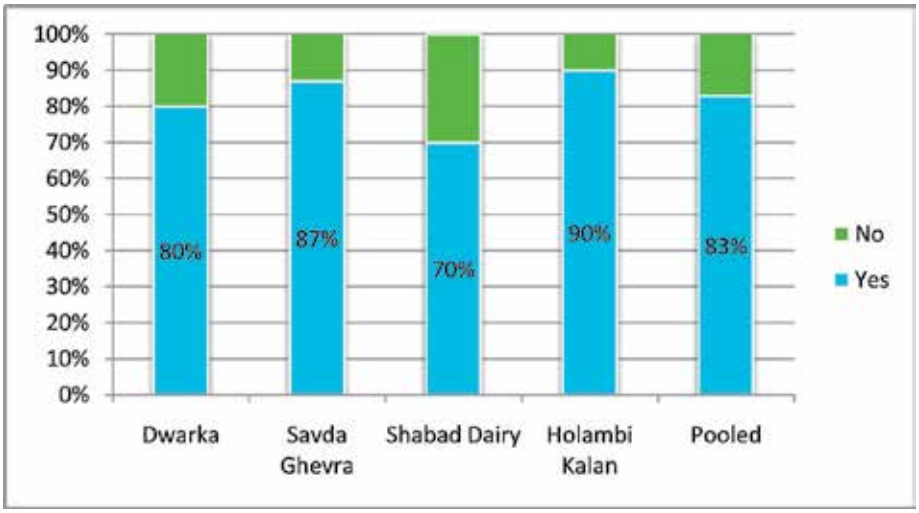
Metric/ question	Options	Dwarka	Savda Ghevra	Shabad Dairy	Holambi Kalan	Pooled
Primary source of potable water		HH tap	Tanker	Tanker	Bottled water	
Share of respondents		87%	84%	55%	50%	
Availability of drinking water (throughout the year)	Regular	92%	61%	48%	69%	69%
	Somewhat regular	8%	33%	27%	24%	24%
	Irregular	0%	6%	25%	7%	7%
Water quality perception (hardness)	Soft	100%	94%	93%	98%	96%
	Hard	0%	6%	7%	2%	4%
Water quality perception (visual)	Clean	97%	43%	43%	75%	61%
	Muddy	3%	10%	50%	8%	6%
	Sometimes muddy	0%	37%	7%	12%	27%
	Sometimes colored	0%	10%	0%	5%	6%
Water quality perception (smell)	Yes	5%	30%	20%	10%	19%
	No	95%	70%	80%	90%	81%
Water quality perception (taste)	Good	77%	43%	32%	77%	55%
	Somewhat good	23%	57%	68%	23%	45%

4.2.4 ATM use

Since the mode of water delivery through these water treatment kiosks was entirely through anytime water machines (ATMs), this study captured and compares several aspects of using ATMs to fetch drinking water.

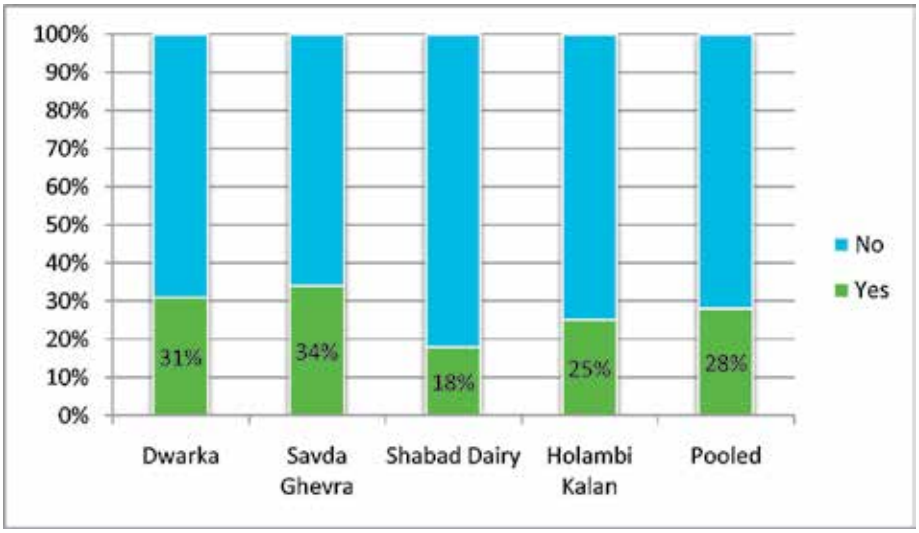
Awareness of ATMs is high, ranging between 70% and 90% across the four areas (Figure 38).

Figure 39. Aware about kiosks/water ATM: Yes/No?



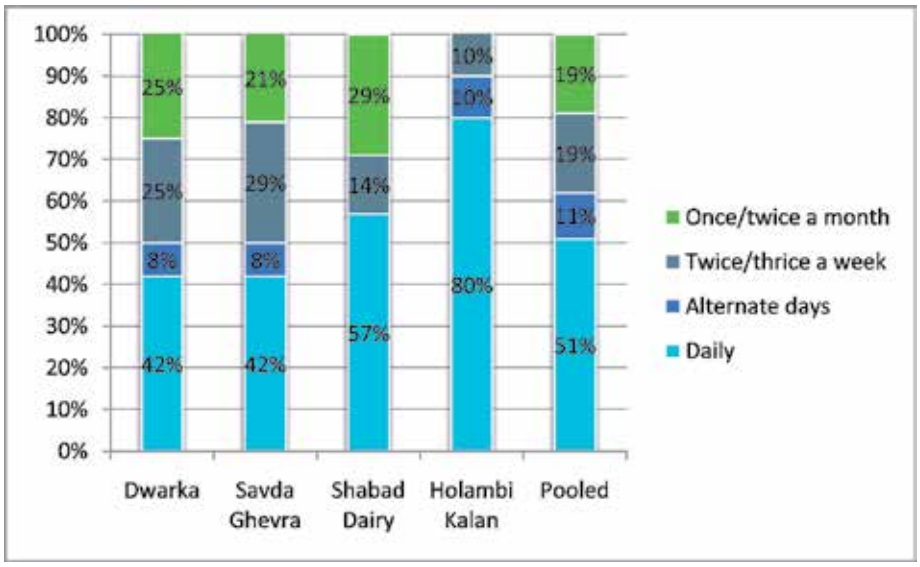
An average 28% of respondents have fetched water from these ATMs (Figure 39); however, it is largely considered a secondary source.

Figure 40. Fetch water from kiosk/ATM: Yes/No?



On average, half of the people who reported fetching water from the ATM do so daily, while another 30% reported doing so 2-4 times a week.

Figure 41. Frequency of purchase from kiosk/water ATM



On average, 87% took 20 minutes or less to fetch water from the ATM, with 42% reported spending less than 10 minutes doing so (Figure 40). The majority of respondents in Dwarka live within 10 minutes of an ATM while the majority of respondents in Shabad Dairy live within 10 to 20 minutes. Those who reported taking over 20 minutes likely had to wait in queues at the ATM, or had to travel some distance to get to the ATM.

Figure 42. Time to fetch water from ATM (in minutes)

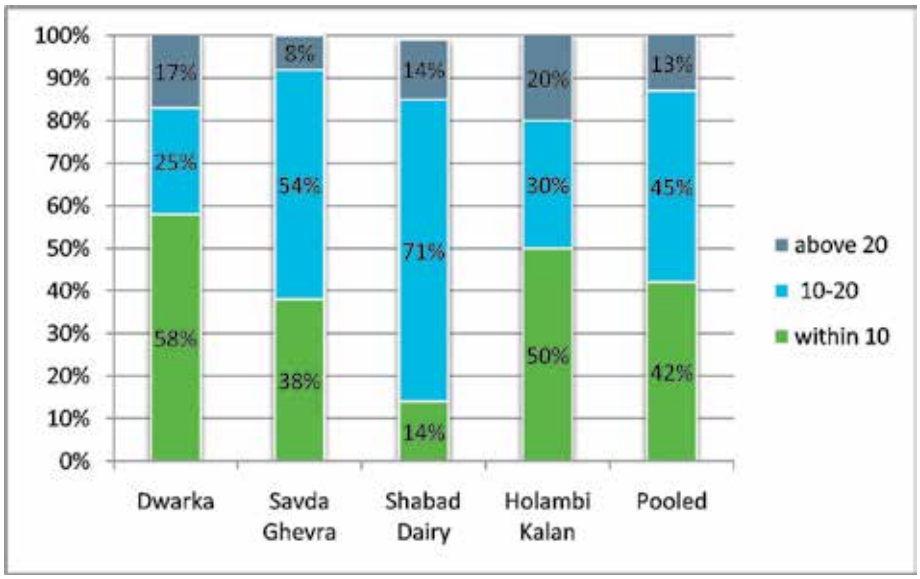
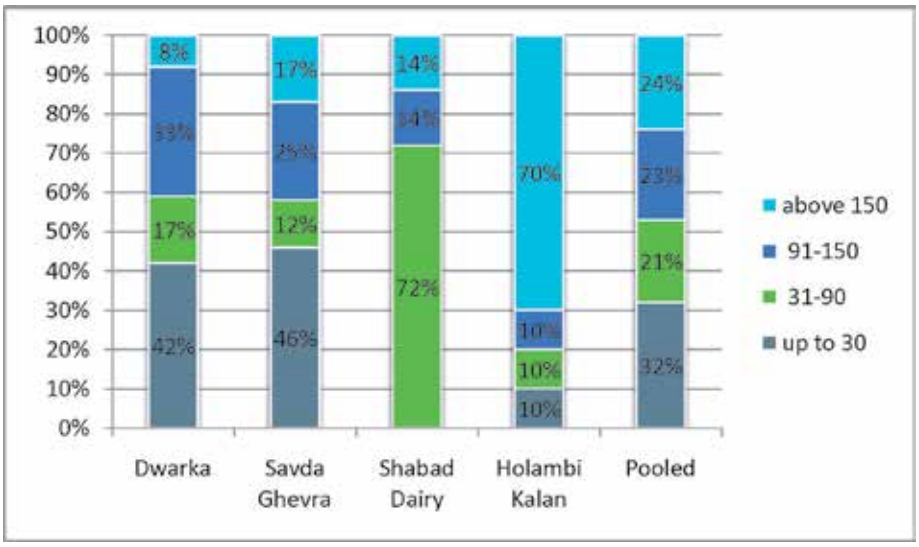


Figure 42 shows that spending on ATMs was observed to be highest in Holambi Kalan, with 70% of HHs spending above INR 150 (USD 2.24)/month, which roughly translates into a minimum of 20 purchases of 20 liters of water per month. Over 40% of respondents in Dwarka and Savda Ghevra reported spending less than INR 30 (USD 0.45)/ month, and 24% seem to be fetching 20 liters of water from the ATM 12-20 times every month.

Figure 43. Expense on ATM for drinking water (INR per month)



4.2.5 Operating Costs and Revenue

This study looked at the operating costs and revenue of four kiosks and their associated ATMs which have been set up by Sarvajal, in addition to a kiosk set up by Sulabh International within their toilet complex. One of the four kiosks was not willing to share information. All data has been summarized in Tables 10-12.

By way of background on Sarvajal, DJB invited tenders for setting up kiosks with ATMs in resettlement colonies, and the contract was awarded to Sarvajal. This was a Piramal CSR initiative which was later converted into a separate private, for-profit water enterprise for serving people at the bottom of the pyramid. Sarvajal operates on a company-owned, company-operated model, which was also an eligibility criteria for this project.

These ATMs have all been set up in the past 1-2 years. The kiosks with ATMs were set up in resettlement colonies only. By Delhi's housing categories, these are colonies which have been constructed in the last 2-3 decades to relocate some slums. These colonies are a part of the legitimate city framework and are entitled to basic services like water and sanitation.

The pricing at the ATM at the treatment kiosk is INR 20 paise (USD 0.003) per liter (INR 15 paise - USD 0.0022- in Dwarka), and at remote locations the pricing is INR 37 paise (USD 0.005) per liter (INR 20 paise – USD 0.003- in Dwarka).

General details on the four ATMs/kiosks can be found in Table 10. Though the plants have been operating for the last one to two years, the number of households drawing water from the plants/kiosks has remained low in all three resettlement colonies. The coverage of households has at best been about 10%-15%.

TABLE 10 **General details of the USWEs studied**

	Holambi Kalan (Sarvajal)	Dwarka Ph 3 Matiala (Sarvajal)	Savda Ghevra (Sarvajal)	Mahavir Enclave (Sulabh)
Number of HHs in the locality	12,000	1,200	7,000	n/a [7]
Number of RFID cards issued	2,000	300	1,300	No RFID
Quantity of treated water per day	7,000	4,200	5,700	2,500
Number of water-dispensing ATMS including ATM at treatment kiosk	4	6	9	1
Number of employees at the plant	3	3	3	1

[7] Not in a colony but on a road.

These systems can be financially viable if there is sufficient demand, according to the operators. The operating costs and revenue can be found in Tables 10 and 11, respectively. According to this information, each kiosk/ATM is covering operating expenses and making a profit. However, it is important to note that this survey was conducted during peak summer months, when typically any water source will be at maximum demand.

Monthly operating costs were typically found to be above INR 30,000 (USD 447.74). For each kiosk, electricity took up a large portion of the operating costs—in most cases it was the majority of the bill, but in Dwarka Ph 3, it was slightly less than the driver's salary. The operator's salary ranges from 18% in Savda Ghevra to 40% of the costs in Mahavir Enclave. Interestingly, in Mahavir Enclave, the raw water is bought from private tankers at INR 800 (USD 11.94) -1,000 (USD 14.92) for 5,000 liters, which takes a significant toll on their operating costs.

TABLE 11 **Monthly operating costs of the USWEs studied**

	Holambi Kalan (Sarvajal)	Dwarka Ph 3 Matiala (Sarvajal)	Savda Ghevra (Sarvajal)	Mahavir Enclave (Sulabh)
Salary operator	9,000 (19%)	8,400 (25%)	8,400 (18%)	6,000 (17%)
Salary driver [8]	8,000 (17%)	9,500 (28%)	9,500 (21%)	n/a
Salary delivery man	6,000 (13%)	3,000 (9%)	6,000 (13%)	n/a
Electricity bill	20,000 (42%)	8,700 (26%)	15,000 (33%)	7,000 (20%)
Raw water	0 (0%)	0 (0%)	0 (0%)	20,000 (57%)
Other costs [9]	5,000 (10%)	4,000 (12%)	7,000 (15%)	2,000 (6%)
Total	**48,000**	**33,600**	**45,900**	**35,000**

Average revenue across all kiosks is about INR 54,000 (USD 805.93). The volumes sold at remote ATMs, where available, are consistently higher (at least double) in all cases. Volumes sold through home delivery are significantly lower than sold at kiosks and ATMs, ranging from only 20 to 50 liters where available.

[8] Drivers take water from kiosks to ATMs for refilling.
[9] Cost of membrane replacement, plant, and vehicle maintenance

TABLE 12 **Monthly revenue of the USWEs studied**

	Holambi Kalan (Sarvajal)	Dwarka Ph 3 Matiala (Sarvajal)	Savda Ghevra (Sarvajal)	Mahavir Enclave (Sulabh)
Volumes sold at kiosk ATM @ 20p (liters)	2,000	800	1,000	2,500
Volumes sold at remote ATMs @ 37p (liters)	4,000	2,400	3,500	0
Volumes sold @ 75p,home delivered (liters)	30	20	50	0
Revenue atkiosk ATM (INR/month)	12,000	4,800	6,000	1,250 [10]
Revenue at remote ATMs (INR/month)	44,400	26,640	38,850	0
Revenue through home delivery (INR/month)	13,500	9,000	22,500	0
Total	**69,900**	**40,440**	**67,350**	**37,500**

Dwarka Sector 3 resettlement colony has recently seen a change in water governance authority (from DDA to DJB), and a water treatment plant has come online in Dwarka. This has significantly improved the piped water supply in the area, with 3-4 hours of piped water supply becoming routine. This hasimpacted demand from ATMs, as the quality and taste of water being supplied through the piped network seems adequate to people.

In the other three resettlement colonies we studied where water ATMs are currently operating, dependence on this source is limited although some households, especially those located near the dispensing kiosks, reported regular use of the ATM water. Though a significant majority of households in these localities comprise poor, daily wage earners, they did not complain about the cost they have to incur in accessing drinking water from the ATMs.

4.2.6 Challenges

The offtake of water from the ATMs, as reported by the households, is constrained by various factors, including:

- location and number of the dispensing kiosks
- problems of low pressure
- difficulty in getting RFID cards recharged
- difficulty women and children have regularly carryinglarge quantities of water

The collection of revenue at the kiosk ATM was reported to be higher than that at the remote ATMs. While differential pricing could be one of the reasons, it could also be due to unavailability of water at certain hours and low pressure leading to longer filling times.

[10] Pricing was 50p per liter.

RFID recharge is available through phones but women face difficulties carrying out the task on their own, as many do not have cell phones.For those that do, technological illiteracy may inhibit use.

Kiosks and ATMs need investors and entrepreneurs with patient capital, who are willing to deal with political risks. The cost of the decentralized water purification plant is undoubtedly high, especially when other investment options are considered. The risk of investing INR 4-10 lakhs (~USD 6,000-15,000), even if the government makes the loan available at zero interest with a repayment facility over three to five years, requires about INR 16,000 to 28,000/ month (~USD 250-400). This is a significant amount considering the current state of revenue generated from the sample plants.

In order to interest private entrepreneurs, the minimum revenue generated per month should be at least three times the monthly repayment, which is not possible even if the plants work at 100% capacity utilization. For example, if Holambi Kalan is taken as a realistic exercise on the ground, then it generated revenue over cost of INR 21,000 (USD 313.42) per month which, given repayment amount required, would leave very little for the entrepreneur.

Since the political discourse in India has been in favor of free or extremely subsidized water, this model will find resistance from people unless there is a clearly defined need which is felt by the potential consumers. Even though people report willingness to pay, they need to understand and value clean drinking water for this model to be a success and for revenues to cover expenses.

4.2.7 Recommendations

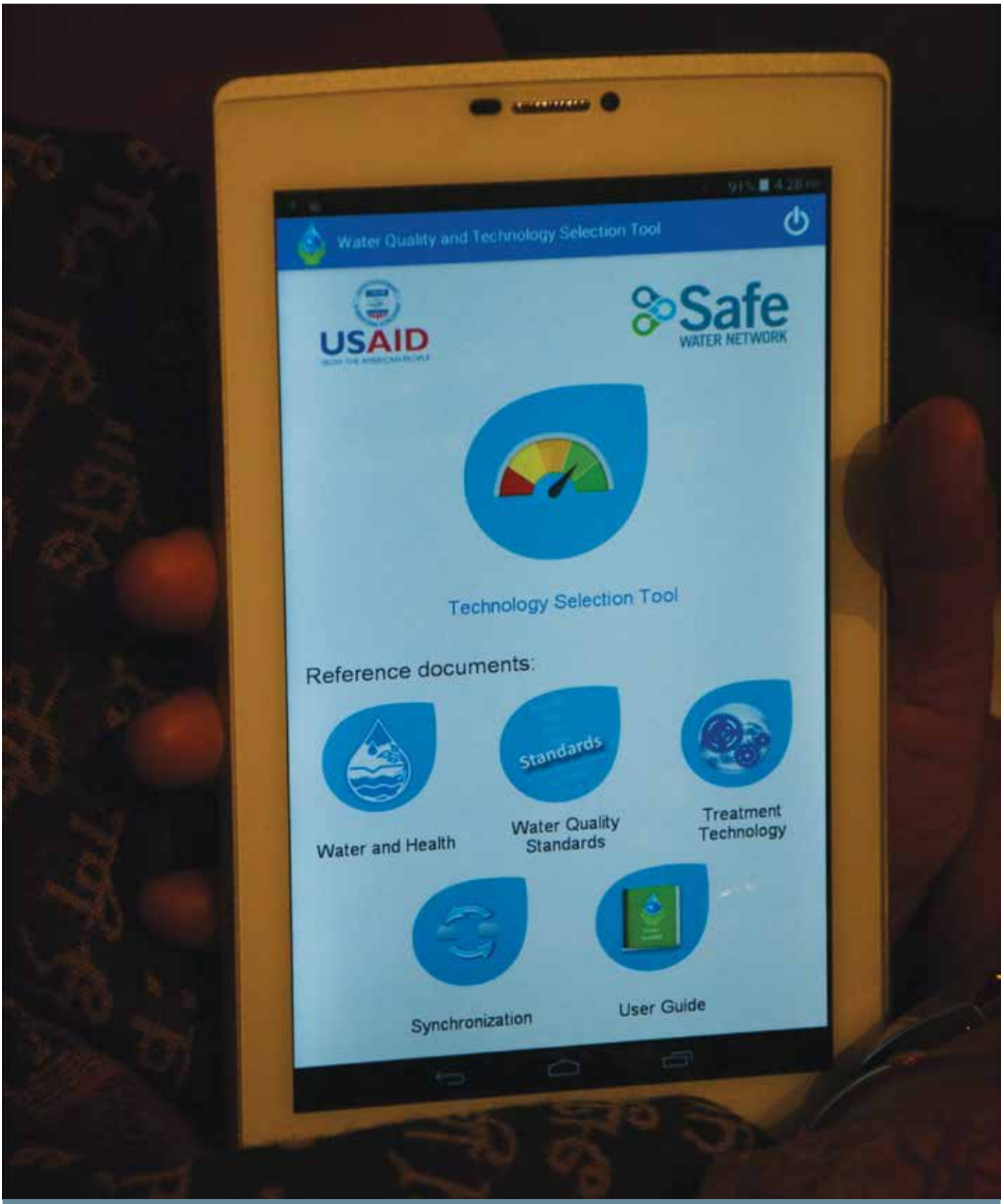
The four kiosks analyzed in this study show impressive results in their first one to two years of operation. In studying the operations of these kiosks, and speaking with stakeholders for this study, the following recommendations have been compiled.

Kiosks and ATMs should be set up in areas where there is a clear need for augmentation in water supply, and there should be a provision to shift them if the locality they serve receives access to treated municipal tap water. The contracting authority, in this case DJB, should ensure this and should also arrange for land, raw water, and electricity approvals at the time of award contract.

DJB should partner with organizations or advise organizations to take up such projects under their CSR funding.

The plants studied in this report are operating below capacity. There is a need to find ways to utilize these systems more. One way forward could be an increased focus on consumer awareness to increase demand. Increasing service area is also an option; however, this would incur additional costs on transportation and manpower.

Vending machines could be developed in order to have both RFID and coin-based functions.Thiswould enable greater access, as those without RFID cards could then access the drinking water.



A proposed water quality and technology-specific digital tool. Digital tools for USWEs will help to better monitor and understand the economics of water-delivery models

5. DIGITAL TOOLS

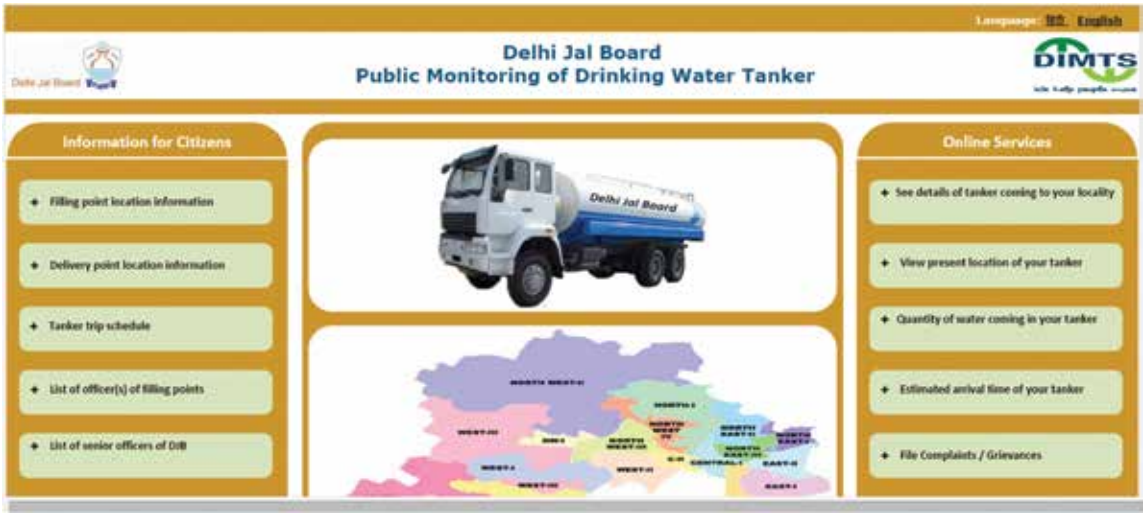
5.1 Overview

The water sector has not been as quick as others to take up information and communications technology (ICT), but as the field matures, interest has grown. The most important application of ICT tools is offering real-time reporting of quality of water and service being provided as well as cross-checking this information with customers. In the last few years, DJB has leveraged digital solutions to increase transparency and gather consumer feedback. The main initiatives are:

- **Online information sharing**
  Information regarding timing of water supply, water quality tests and schedule of water tankers is now available on DJB's website.

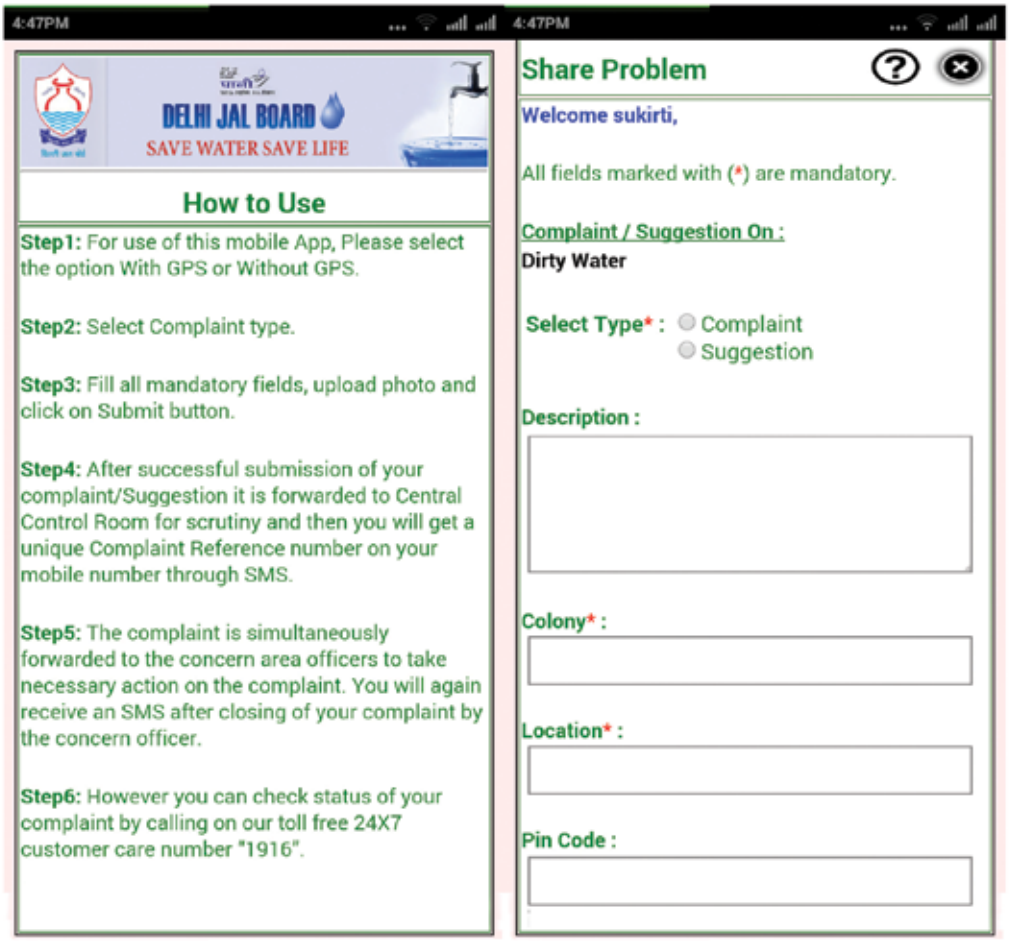
- **System for public monitoring of drinking water tankers**
  DJB offers public monitoring of its drinking water tankers in a bid to maintain transparency. It offers the tanker schedules, present location, estimated arrival times, volume of water carried, and other details on its website.

Figure 44. DJB's online water tanker monitoring system



- **Android-based mobile application**
  DJB has introduced an Android-based app with location-capturing capabilities, to allow for the registration of complaints regarding dirty water, leaking pipes, etc.

Figure 45. DJB's consumer grievance registration mobile application



5.2 Need for Digital Tools

There is a clear need for digital tools for USWEs to better monitor and understand the economics of these water-delivery models. Safe Water Network is currently developing tools for sector advancement; the kiosk plant assessment and financial viability tools are extremely critical for both policy makers and potential entrepreneurs to better understand the finer points of this model. The technology-selection tool will be useful for entrepreneurs, NGOs, and urban local bodies to evaluate and make informed decisions when buying treatment technology systems. In light of the fact that there is an overreliance on RO even for treating municipal water, this tool can also be great for spreading awareness of alternative options.

A water treatment kiosk in Delhi. DJB has been trying to improve access to water supply in unauthorized colonies and has therefore piloted a number of ATMs with an implementer agency in order to provide access to safe water in these resettlement colonies.

6. POLICY & ENABLING ENVIRONMENT FOR USWES

India does not have a national urban water policy and given that water is a state subject, every state has its own policies and implementation strategy. At the center, Ministry of Urban Development has pushed the case for piped water supply. The service level benchmarks (SLBs) set for assessing water provision by any ULB in India, as advocated by MoUD, captures performance with regard to piped water supply only. So, in effect, the urban water policy framework revolves around piped water supply. However this supply in most cities and towns is only available for a couple of hours per day, pressure is inadequate and the water is of questionable quality. High levels of non-revenue water (NRW), low tariff and even lower collection efficiency with regard to piped water supply has left Indian ULBs cash-strapped. Pursuing piped infrastructure for all not only seems like a financially unviable goal, but could ultimately be an ineffective goal if current scenario of piped water supply is honestly considered. Mackenzie and Ray (2007) highlighted that this 'pipe only' strategy has implications on resource planning not only for a dozen big cities but more so for the many thousand smaller cities, peri-urban areas and towns which might seem unattractive for financing.

6.1 Overview

Presently, Delhi also cannot be said to have a water policy. While DJB is the organization with the largest mandate in Delhi's water sector, it does not have the sole and exclusive mandate. There are several organizations and factors within and outside Delhi that have substantial influence, directly or indirectly, over Delhi's water sector. Fragmented mandates have resulted in a fractured medium-term strategy but not comprehensive or clearly organized policy.

DJB has been trying to improve access to water supply in unauthorized colonies through provision of underground reservoirs and network expansion to cover 1,739 urban poor settlements with moderate success. However, in the interim, the DJB has also been providing water supply through tankers in the areas that remain to be connected to the network. This is achieved through a fleet of departmental, hired, and GPS-enabled stainless steel tankers in different zones in Delhi (i) at predetermined and fixed points in localities with no piped water connection selected in consultation with local representatives, and (ii) based on inadequate supply of water, especially in summer or in the case of emergency. However, this has severe implications on the health and time of women and children, and increased drudgery.
To improve water supply delivery in such informal clusters and non-networked areas, DJB called for tenders and piloted a number of ATMs with an implementer agency (Sarvajal) under a design-finance-build-operate-transfer (DFBOT) model.

6.2 Challenges

Since USWEs are not highlighted in policy, there are challenges in promoting their fit in the framework for water solutions in India. Challenges include the difficulty in obtaining access to land, which has been widely reported as a bottleneck for Sarvajal in commissioning kiosks in Delhi. While DJB was willing to provide a water connection and letters of recommendation for land and electricity connection, it took over 18 months for Sarvajal to get approval for land from DUSIB.

This USWE pilot was carried out in resettlement colonies. These colonies are entitled to all municipal services just like any planned, legal colony. The prevailing status of piped water supply and tanker supply was not very poor, and thus the inherent demand was not adequate right from the beginning. With the new government, these colonies have been prioritized for better water provision, which too has taken a toll on the demand for water from these ATMs.

Free or extremely low tariffs for piped water are also taking a toll on willingness to pay for clean water from these kiosks, and availability of capital for this sector can become tricky given the likely slow or no return on investment.

Since they remain informal entities, monitoring processes seem weak, with almost no regular water quality checks by DJB.

6.3 Policy & Enabling Environment for USWEs

In response to these challenges, the government and other entities can help improve the enabling environment for USWEs. Political recognition and acceptance of SWEs as viable and potentially significant contributors to service provision, especially in informal urban settlements, would boost interest. Institutional arrangements and legal reforms that incorporate service providers into the formal solution reduce opposition and improve transparency, which can provide a win-win situation for both parties. Informal providers get security and legitimacy, and the utility can take advantage of the knowledge and skills of alternate service providers.

The government could also enable informal settlement regulation that would remove potential barriers such as planning or building regulations, land law, and tenancy rights. It could also facilitate formal deals with utilities to lower USWE operational costs; one such example is leasing of equipment for transporting water or vending facilities.

Authorities should attempt to regulate for higher water quality, without enforcing standards that are prohibitively high for most USWEs, in order to make investments in community water service attractive. Competition should be promoted, and new entrants to the market encouraged. Finally, USWE owners should be supported with information on accessing micro-credit.

7. CASE STUDIES

7.1 Jafrabad: A low-income colony/ settlement dependent on bore-wells and tankers

Jafrabad is a 40-year colony, containing over 5,000 households, with a mix of tenable and non-tenable land in East Delhi. The elderly man below showed us all relevant government-approval documents from the 1970s which entitle the colony to get piped water supply. However, only the front row of flats which face the main road have been provided with tap connections. Generally, the pressure was reported to be very low at these taps, and hence most taps had been set up at a very low ground clearance. The majority of people rely on groundwater extracted through bore-wells. The picture on the right shows kids queuing up to collecting free potable water in small vessels from a DJB-provided tanker. This was in the middle of a school season at noon, implying absenteeism.

7.2 Sulabh International ventures into the SWE sector

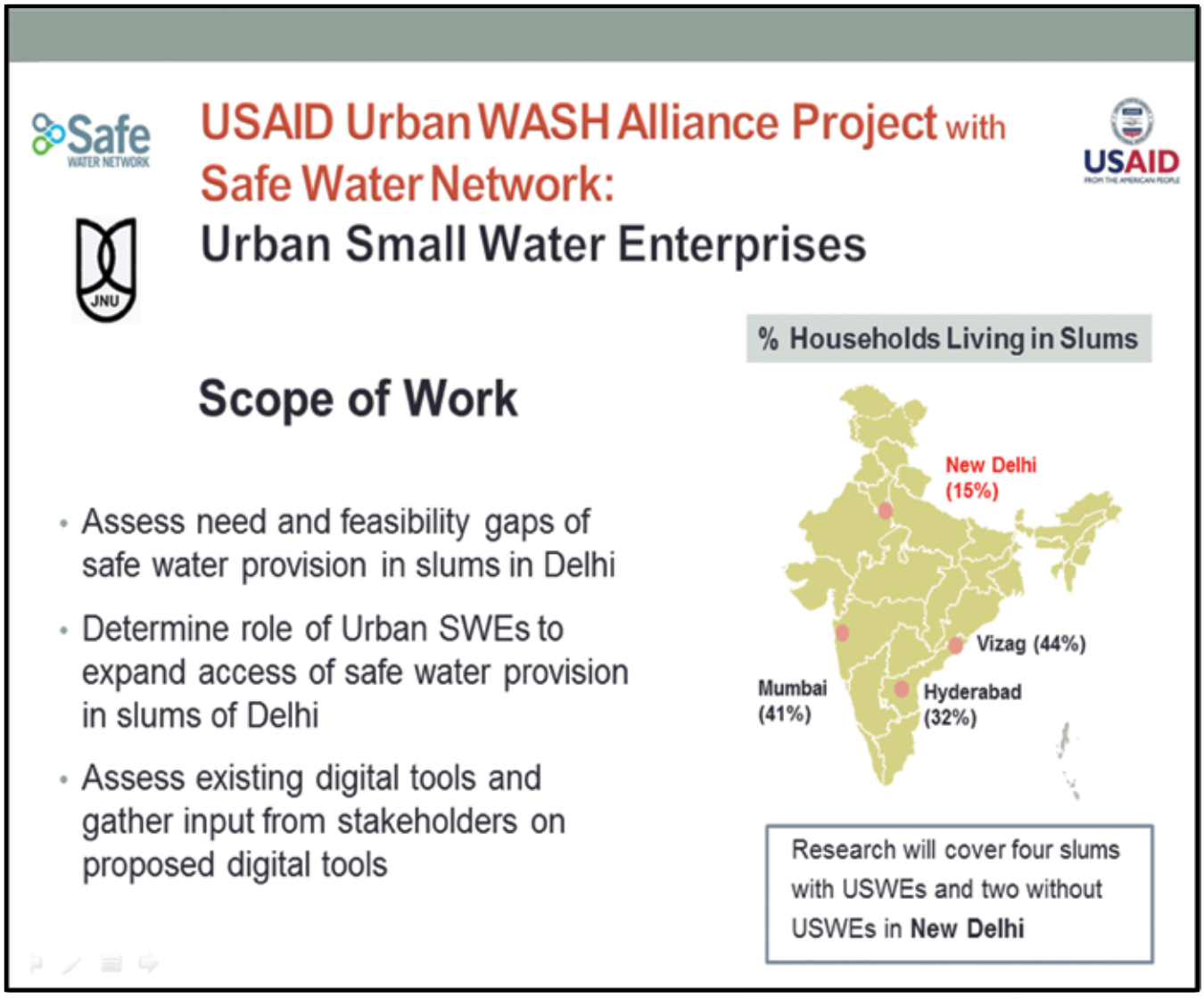
Sulabh International, an India-based social service organization known for setting up pay-per-use toilets across the country, has forayed into the drinking water sector by setting up a water ATM at its complex in Mahavir Enclave in southwest Delhi. Intended to serve passersby and the neighboring middle-income colony, they sell water at INR 50 paise per liter (INR 10 per 20 L). Initially consumers were supposed to only use RFID cards for withdrawing water but, after experiencing some backlash, they now facilitate cash transactions as well. While a part of a larger complex, this water treatment system's financial viability is most affected by tanker water charges of INR 1,000-1,500 for 10,000 liters. They plan to pilot such systems in several other Indian cities, including Varanasi and Kolkata.

8. REFERENCES

1. Water Policy for Delhi, 2015.
2. Aam Aadmi Party's 70 Point Action Plan for Delhi
3. Census of India, 2011.
4. DDA Master Plan 2021.

9. ANNEXURES

9.1 Scope of Work



9.2 Logical Framework Analysis

PROJECT GOAL			
Narrative summary	**Indicators**	**Data sources**	**Assumptions**
• Reliable and sustainable safe water provision for urban poor by institutionalizing urban small water enterprises (USWEs), which complement piped water supply, to improve their health	• Consumers' satisfaction and sense of security with regard to water sources, including USWEs • Institutional support from governments and parastatal agencies	• Interviews of leaders of ULBs and other concerned parastatal agencies as well as elected representatives • Consumer household surveys	• Consumer (urban poor) satisfaction, even from pilot projects, is given due consideration by the state government and recommendations are considered for sector development. • Proactive policy and implementation support from the Delhi government and operational support from Delhi Jal Board, municipal corporations, and elected representatives can create the right enabling environment for such decentralized systems to thrive. • Availability and scalability of such SWEs given the need for and availability of technical skills, financial investments, and social capital to sustain the sector. • Lessons derived from the research are representative and thus recommendations are replicable to areas which have not been studied.

PROJECT PURPOSE			
Narrative summary	**Indicators**	**Data sources**	**Assumptions**
• Assess need and feasibility gaps of safe water provision in slums • Determine role of USWEs inexpanding access to safe waterin slums • Assess existing digital tools and gather input from stakeholders on proposed digital tools	• Following aspects of safe water provision for various water sources: - Access - Availability - Reliability - Affordability • Policy and regulatory framework for water provision to urban poor • Prevailing digital tools in this sector being used by ULBs and USWEs • Stakeholders' interest in digital tools for this sector	• Consumer household surveys • Interviews of officials of ULBs and other concerned parastatal agencies as well as USWE implementers • Census data, NFHS data, literature review • Feasibility reports, annual reports as shared by ULBs, USWE implementers	• High degree of collaboration from key stakeholders, including information sharing to allow for assessment of technical, financial, operational, and social viability of the USWEs • Proper schedule and sequence of meetings within a given timeframe with the respective stakeholders

OUTPUT			
Narrative summary	**Indicators**	**Data sources**	**Assumptions**
• Identification and mapping of various water sources available to urban poor • Water supply and demand estimates for urban poor • Assessment of operational, technical, and financial viability of USWEs recommendations for enabling a conducive environment and for establishing an appropriatepolicy and regulatory framework for USWEs Assessment of existing digital tools and feedback on proposed digital tools	• Number of slums studied • Number of USWEs assessed • Number of water sources available to urban poor, split by municipal, private, community managed and public-private partnership (PPP) • Water supply and consumption per capita from various sources • HH expenditure on water from various sources • Demand for USWEs by urban poor • HH willingness to pay for USWEs • Cost recovery for USWEs • Competition from other sources – free and paid • Urban poor's awareness levels about correlation between safe drinking water and health • Number of existing digital tools along with utility and end users • Suggestions and feedback on features/capabilities of proposed digital tools	• Consumer household surveys • DUSIB/DJB reports on water, Delhi Master Plan, and City Development Plan • USWE reports • USWE operators'/ implementers' surveys • FGDs of specific providers and user groups • Interviews of officials of ULBs and other concerned parastatal agencies • Legislation regarding water provision, acts, provisions of different ULBs and parastatal agencies, recent policy initiatives	• Proper sampling methodology and selection of the slums for HH survey based on reliable sources of secondary information • Insightful, trained, and passionate field investigators • Availability of institutional and household respondents to give time and share reliable information

INPUTS/ACTIVITIES			
Narrative summary	**Indicators**	**Data sources**	**Assumptions**
• Literature review of prevailing water policies, schemes, and programs for urban poor • Analyzing standard demographic studies – Census, NFHS[11] , NSSO[1] • Institutional mapping and key stakeholder interviews • Consumer household surveys • Focus group discussions (FGDs)	• Documentation of various policies, initiatives, projects, etc., related to water provision for urban poor for the various relevant institutions • City-wise profiles for water provision • USWE profiles • Consumer profile: household consumption, affordability, etc.	• Diverse and detailed desk reviews of USWE initiatives, including institutional, technical, and financial arrangements • Key stakeholder mapping and using stakeholder analysis techniques • Key informant surveys for important stakeholders, including households • Triangulation of key information from various sources • Household need, consumption, affordability, willingness to pay, and perception surveys	• Availability of secondary information • Pilot surveys to identify and map locations of slums and kiosks • Appropriate stakeholders' identification and consultation • Trained team for survey

[11] National Family & Health Survey (NFHS), National Sample Survey Organization (NSSO)

9.3 Questionnaires

9.3.1 Household Level Survey in Resettlement Colonies with USWEs

Urban Small Water Enterprises (USWEs)

(A Project led by Safe Water Network in partnership with the US Agency for International Development (USAID) India)

Delhi Household Survey: June, 2015

Investigating Institute: Jawaharlal Nehru University, New Delhi-110067

Questionnaire No.: .....

CONFIDENTIAL
For research purpose only

(Respondents should preferably be a woman in the 19+ age group)

A. Interviewer's details:

A01. Name of the Interviewer _____ Code

A02. Time when started _____ Ended_____

B. Identification

Sl. No.	Particulars	Code
B01	Name of the Locality.....	
B02	Ward No.....	
B03	Sector/Cluster of the Slum.....	
B04	Observations (with reference to the social background of HHs living in the said *sector/cluster; cleanliness/ nature of drainage, etc.)*.....	
B05	Household Number	
B06	Name of the Respondent.....	
B07	Sex *(Male-1, Female-2, Other-3)*	
B08	Age (in complete years).....	
B09	Marital status *(Unmarried-1, Married-2, Widowed-3, Divorced-4, Separated/ Deserted-5, Other-6)*	
B10	Relationship with head of the household *(Relation to Head: 01 Head, 02 Spouse, 03 Son/Daughter, 04 Son-in-law/Daughter-in-law, 05 Grandchild, 06 Father/mother, 07 Father-in-law/Mother-in-law, 08 Brother/Sister, 09 Brother-in-law/Sister-in-law, 10 Uncle/Aunty, 11 Niece/Nephew, 12 Grandfather/Grandmother, 13 Other relative, 14 Servant/Employee/Other)*	

B11	Caste *(Non-Scheduled-1, SC-2, ST-3, OBC-4, Do not know-5)*	
B12	Religion *(Hindu-1, Muslim-2, Christian-3, Buddhist-4, Others-5)*	
B13	Work status *(Salaried-1, Own busines-2, Daily wage-3, Retired-4, Unemployed-5, Student-6)*	

C. Household Particulars

Sl. No.	Particulars	Code
C01	Name of the Head of HH	
C02	Age (in complete years)	
C03	Sex *(Male-1, Female-2, Others-3)*	
C04	Work status *(Salaried-1, Own busines-2, Daily wage-3, Retired-4, Unemployed-5,Student-6)*	
C05	Place of work (specify location)	
C06	Distance from home (in km).....	
C07	Travel time.....	
C08	Travel mode to work *(Walk-1, Cycle-2, Motor bike/scooter-3, Car pool-4, public transport-5, others -6 (specify)*.....	
C09	Nature of the dwelling *(pucca-1, semi pucca-2, kuccha-3)*	
C10	Condition of the dwelling *(Good-1, Livable-2, Dilapidated-3)*	
C11	Electricity *(Yes-1, No-2)*	
C12	Latrine *(Open-1, own pit-2, public pit-3,own flush-4, public flush-5*	
C13	House ownership *(Owned-1, Rented-2)*	
C14	Age of the house *((<1 yr)-1, (1-5 yrs)-2, (5-10 yrs)-3, (>10 yrs)-4)*	
C15	Area of the house *(specify in sq. mts.)*.....	
C16	Type of taxes *(property tax, user fees, and service charges they pay to the local body) (Yes-1, No-2)*	
C17	No. of persons usually in the house.....	
C18	Number of married couple/s	
C19	Aged Persons (60+): *Male*.....*Female*.....	
C20	Number of children: Below 1 yr ....., 1-5 yrs....., 5-14 yrs.....	
C21	Number of illiterate persons: *(Above 7 years): Male*.....*Female*.....	
C22	Numbers of persons in HH engaged in gainful employment.....	
C23	Total monthly income of the HH from all sources *(in Rs.)*.....	
C24	Other observations.....	

D: Access to Water:

Drinking Water-

D01: What are the sources of drinking water for the HH? *(Enter Codes in the box as under- Main-1; Subsidiary 2; Other 3 (Check quantity of water collected daily by observing how many pots/buckets and multiplying with capacity, after observing a vessel)*

Sl. No	Types of sources		Code	Quantity (in lts.)
D01/1	Piped Water	Piped into the dwelling		
D01/2		Piped into plot/yard		
D01/3		Public tap		
D01/4		Tube well/bore well		
D01/5	Dug Well	Protected well		
D01/6		Unprotected Well		
D01/7	Municipality tanker truck/cart			
D01/8	MLA/MP/Ward Comm. Tanker Truck/Cart			
D01/9	Private Tanker Truck/Cart			
D01/10	Surface Water (river/spring/canal/irrigation channel etc)			
D01/11	Bottled Water			
D01/12	Community Plant			
D01/13	Other specify.....			
Main-1; Subsidiary 2; Other -3				
D02:	Where is the source of drinking water? *Within premises-1/Outside premises-2*			
D03:	Who usually fetches water for the HH? *(Specify in relation to the Head of HH)*			
D04:	How long does it usually take to fetch water? *(Mention time in hrs & mins. Incl. waiting and travel time)*			
D05:	Is the availability of drinking water regular/ reliable throughout the year? *Regular-1, somewhat regular-2, not regular-3*			
D06:	What is quality of drinking water?			
	Main Source: Soft-1, Hard-2			
	Clean-1, Muddy-2, colored-3			
	Does the water smell? *Yes-1, No-2*			

	Taste: *Good-1, somewhat good-2, salty-3, not sweet-4*			
	Secondary source: Soft-1, Hard-2			
	Clean-1, Muddy-2, colored-3			
	Does the water smell? Yes-1, No-2			
	Taste: Good-1, somewhat good-2, salty-3, not sweet-4			
D07:	Does the HH do anything to the water to make it safer? *Mark the options below; can be multiples)* *Boiling -1, Water Filter:Ceramic-2 and Electrical- 3, Water Purifier-4, Using Cloth as filter-5, Keeping water in un-6, Chlorine Tablets-7, Bleach-8, Alum-9, ...*			
Others-9_____ (Use colloquial style)				
D08:	**Water for other uses:**			
D08/1	Piped Water	Piped into the dwelling		
D08/2		Piped into plot/yard		
D08/3		Public tap		
D08/4		Tube well/bore well		
D08/5	Dug Well	Protected well		
D08/6		Unprotected Well		
D08/7	Municipality tanker truck/cart			
D08/8	MLA/MP/Ward Comm. Tanker Truck/Cart			
D08/9	Private Tanker Truck/Cart			
D08/10	Surface Water (river/spring/canal/irrigation channel etc)			
D08/11	Bottled Water			
D08/12	Community Plant			
D08/13	Other specify.....			
Code: Main-1; Subsidiary 2; Other -3				
D09:	Where is the source of water located? *Within premises-1, Outside premises-2*.....			
D10:	Who usually fetches water for the HH?_____			
D11:	How long does it usually take to fetch water? _____			
D12:	Is the availability of drinking water regular/reliable throughout the year? *Regular-1, somewhat regular-2, not regular-3*			

D13: Is the water supply received from the said source/sources adequate to meet the following needs?

D13/1: Drinking: *Adequate-1, Inadequate-2, Most Insufficient-3* ..... ☐

D13/2: Cooking: *Adequate-1, Inadequate-2, Most Insufficient-3*..... ☐

D13/3: Washing & Cleaning: *Adequate-1, Inadequate-2, Most Insufficient-3*..... ☐

D13/4: Bathing: *Adequate-1, Inadequate-2, Most Insufficient-3*..... ☐

D13/5: Other needs, if any? *Specify*_____

D14: If the water supply not adequate than what are the other alternatives? (open ended; record responses)

_____

D15: Do you pay for water? *Yes-1, No-2*..... ☐

D16: If Yes, Did you pay any amount initially for the piped/bore well/ connection or tanker?

Yes-1, No-2..... ☐

D17: If yes, how much?_____

D18: Do you pay fixed / variable charges monthly for water? *Yes-1, No-2*..... ☐

D19: If yes. How much? _____

D20: Drinking water (quantity/day in lts)_____Rate_____

Lump sum: *daily/weekly/monthly*

D21: Water for other use (Q/d/lts)_____ Rate _____

Lump sum: *daily/weekly/monthly*

D22: To whom, you pay for water?_____

D23: On the whole how much do you spend for water per month? (in Rs.)_____

D26: Seasonal variation if any? Yes /No *(good to get a sense on this at a slum/area/colony level rather than HH level)*_____

D27: If piped water/Tanker truck then how long the supply is available? (Also ask for weekly frequency)

1.Daily; Timings -Once _____*Usual duration*_____ *Fixed timing*_____

2. No of Days in a week:

Twice a week-1, thrice a week-2,Four times a week-3, Available on demand-4.. ☐

D28: Quantity of water storage at HH (in lts.): For Drinking_____ Others_____

D29: Any seasonal variation on water expenses? *Yes-1, No-2*..... ☐

D30: Reasons (Record responses, open ended)_____

E. Water ATM/KIOSK

E01: Are you aware about the water kiosk/water ATM in your locality? *Yes-1, No-2*..... ☐

E02: If yes, since when the facility came into existence? ☐

_____

E03: Do you use the facility? *Yes-1, No-2*.....

E04: Where is it located? _____

E05: How long it takes to fetch?_____

E06: How Often?

Daily-1, Alternate days-2, thrice a week-3, twice a week-4..... ☐

E07: How much you spend on drinking water? Rs_____

(Check with ref to the previous day and week and then impute)

E08: Do you think that the municipal water supply (taps at home, community taps, tankers) has improved in the recent months? *Yes-1, No- 2* ☐

E09: Has it improved particularly after the Water Kiosks / ATMs were established?

Yes-1, No-2..... ☐

E10: Is it more regular/punctual and dependable/secure now? *Yes-1, No-2*..... ☐

E11: What are the possible reasons for the improvement? (open ended)

_____

E12: If not, then has it deteriorated in quantity and is irregular? *Yes-1, No-2*..... ☐

E13: If Yes, then what could be the reason(s)? (Open ended)

_____

E14: Has the ATM reduced dependencies on alternative sources? *Yes-1, No-2*..... ☐
If yes, then what extent?

_____

E15: What are the problems of getting water from ATM?

_____

E16: Do you think it is viable and reliable option? *Yes-1, No-2*..... ☐

E17: What are your suggestions to improve ATM services?

_____

_____

E18: Are you aware that water is priced differently at different water ATMs?

Yes-1, No-2..... ☐

E19: If yes, then would you prefer to collect water from the ATM where it is cheaper?

Yes-1, No-2, Doesn't matter-3..... ☐

E20: Will you be willing to pay a higher price if water is delivered home?

Yes-1, No-2..... ☐

F. Health related issues:

Specify the main ailments in episodes suffered by the HH persons during the last one month?

F01: **Episode 1 -Nature of ailment**_____

F02: Who in the HH_____

F03: Sex Male-1, Female-2, Other-3 ☐ F04: Age_____ ☐

F05/1: Treated *Yes-1, No-2* ; ☐

F05/2: If yes, specify the source: Public-1, Private-2, Not aware-3 ☐

F06/3: Distance in km_____

F06: Cost incurred Rs_____*Source: OP-1, Borrowed-2, Free-3* ☐

F07: **Ep.2- Nature of ailment**_____

F08: Who in the HH_____

F09: *Sex Male-1, Female-2, Other-3* ☐ F010:Age_____

F11/1: Treated *Yes-1, No-2* ☐

F11/2: If yes, specify the source: Public-1, Private-2, Not aware-3 ☐

F12/3: Distance in km_____

F12: Cost incurred Rs_____\ Source: OP-1, Borrowed-2, Free-3 ☐

F13: **Ep.4- Nature of ailment**_____

F14: Who in the HH_____

F15: *Sex Male-1, Female-2, Other-3* ☐ F16:Age_____

F17/1: Treated *Yes-1, No-2* ☐

F17/2: If yes, specify the source: Public-1, Private-2, Not aware-3 ☐

F17/3: Distance in km_____

F18: Cost incurred Rs_____ Source: *OP-1, Borrowed-2, Free-3* ☐

F19: Do you think that there are fewer episodes of water borne health issues in the HH ever since you have been using Water ATMs?

Significant imp-1, somewhat imp-2, No change-3, Worse-4..... ☐

F20: Do you think that the quality of drinking water has contributed towards better health?
(Supplement with FDGs with ASHA and Other medical personnel in the locality)

G. Household Assets:		Record: Yes-1, No-2
G01	Mattress	
G02	Bed/Cot	
G03	Table	
G04	Chair	
G05	Electric fan	
G06	Radio/Transistor	
G07	Television	
G08	Sewing machine	
G09	Cell/mobile phone	
G10	Refrigerator	
G11	Air cooler	
G12	Bicycle	
G13	Moped	
G14	Scooter/motor bike	
G15	Car	
G16	Pressure cooker	
G17	Water purifier	
G18	Water pump	

9.3.2Household Level Survey in Slums Without USWEs

Equipping Small Water Enterprises for Urban Poor (ESWEUP)

(A Project led by Safe Water Network in partnership with the US Agency for International Development (USAID) India)

Delhi Household Survey: June, 2015

(Slums without Water Kiosk facility)

Investigating Institute: Jawaharlal Nehru University, New Delhi-110067

Questionnaire No...K/.....

CONFIDENTIAL
For research purpose only

(Respondents should preferably be a woman in the 19+ age group)

A. Interviewer's details:

A01. Name of the Interviewer _____ Code _____

A02. Time when started _____ Ended_____

B. Identification

Sl. No.	Particulars	Code
B01	Name of the Locality.....	
B02	Ward No.....	
B03	Sector/Cluster of the Slum.....	
B04	Observations *(with reference to the social background of HHs living in the said sector/cluster; cleanliness/ nature of drainage, etc.)*.....	
B05	Household Number	
B06	Name of the Respondent.....	
B07	Sex *(Male-1, Female-2, Other-3)*	
B08	Age (in complete years).....	
B09	Marital status *(Unmarried-1, Married-2, Widowed-3, Divorced-4, Separated/ Deserted-5, Other-6)*	
B10	Relationship with head of the household *(Relation to Head: 01 Head, 02 Spouse, 03 Son/Daughter, 04 Son-in-law/Daughter-in-law, 05 Grandchild, 06 Father/mother, 07 Father-in-law/Mother-in-law, 08 Brother/Sister, 09 Brother-in-law/Sister-in-law, 10 Uncle/Aunty, 11 Niece/Nephew, 12 Grandfather/Grandmother, 13 Other relative, 14 Servant/Employee/Other)*	

B11	Caste *(Non-Scheduled-1, SC-2, ST-3, OBC-4, Do not know-5)*	
B12	Religion *(Hindu-1, Muslim-2, Christian-3, Buddhist-4, Others-5)*	
B13	Work status *(Salaried-1, Own busines-2, Daily wage-3, Retired-4, Unemployed-5, Student-6)*	

C. Household Particulars

Sl. No.	Particulars	Code
C01	Name of the Head of HH	
C02	Age (in complete years)	
C03	Sex *(Male-1, Female-2, Others-3)*	
C04	Work status *(Salaried-1, Own busines-2, Daily wage-3, Retired-4, Unemployed-5,Student-6)*	
C05	Place of work *(specify location)*	
C06	Distance from home *(in km)*.....	
C07	Travel time.....	
C08	Travel mode to work *(Walk-1, Cycle-2, Motor bike/scooter-3, Car pool-4, public transport-5, others -6 (specify)*.....	
C09	Nature of the dwelling *(pucca-1, semi pucca-2, kuccha-3)*	
C10	Condition of the dwelling *(Good-1, Livable-2, Dilapidated-3)*	
C11	Electricity *(Yes-1, No-2)*	
C12	Latrine *(Open-1, own pit-2, public pit-3,own flush-4, public flush-5*	
C13/1:	House ownership *(Owned-1, Rented-2)*	
C13/2:	Land ownship *(Open ended)*	
C14	Age of the house *((<1 yr)-1, (1-5 yrs)-2, (5-10 yrs)-3, (>10 yrs)-4)*	
C15	Area of the house *(specify in yards)*.....	
C16	Type of taxes *(property tax, user fees, and service charges they pay to the local body) (Yes-1, No-2)*	
C17	No. of persons usually in the house.....	
C18	Number of married couple/s	
C19	Aged Persons (60+): *Male*.....*Female*.....	
C20	Number of children: *Below 1 yr* ....., *1-5 yrs*....., *5-14 yrs*.....	
C21	Number of illiterate persons: *(Above 7 years): Male*.....*Female*.....	
C22	Numbers of persons in HH engaged in gainful employment.....	
C23	Total monthly income of the HH from all sources *(in Rs.)*.....	
C24	Other observations *(Open ended)*.....	

D: Access to Water:

Drinking Water-

D01: What are the sources of drinking water for the HH? *(Enter Codes in the box as under- Main-1; Subsidiary 2; Other 3 (Check quantity of water collected daily by observing how many pots/buckets and multiplying with capacity, after observing a vessel)*

Sl. No	Types of sources		Code	Quantity (in lts.)
D01/1	Piped Water	Piped into the dwelling		
D01/2		Piped into plot/yard		
D01/3		Public tap		
D01/4		Tube well/bore well		
D01/5	Dug Well	Protected well		
D01/6		Unprotected Well		
D01/7	Municipality tanker truck/cart			
D01/8	MLA/MP/Ward Comm. Tanker Truck/Cart			
D01/9	Private Tanker Truck/Cart			
D01/10	Surface Water (river/spring/canal/irrigation channel etc)			
D01/11	Bottled Water			
D01/12	Community Plant			
D01/13	Other specify.....			
Main-1; Subsidiary 2; Other -3				
D02:	Where is the source of drinking water? *Within premises-1/Outside premises-2*			
D03:	Who usually fetches water for the HH? *(Specify in relation to the Head of HH,* *Adition: Home delivered-15)*			
D04:	How long does it usually take to fetch water? *(Mention time in hrs & mins. Incl. waiting and travel time)*			
D05:	Is the availability of drinking water regular/ reliable throughout the year? *Regular-1, somewhat regular-2, not regular-3*			
D06:	What is quality of drinking water?			
	Main Source:			
	Soft-1, Hard-2			
	Clean-1, Muddy-2, colored-3			
	Does the water smell? *Yes-1, No-2*			

	Taste: *Good-1, somewhat good-2, salty-3, not sweet-4*			
	Secondary source:			
	Soft-1, Hard-2			
	Clean-1, Muddy-2, colored-3			
	Does the water smell? *Yes-1, No-2*			
	Taste: *Good-1, somewhat good-2, salty-3, not sweet-4*			
D07:	Does the HH do anything to the water to make it safer? *Mark the options below; can be multiples)* *Boiling -1, Water Filter:Ceramic-2 and Electrical- 3, Water Purifier-4, Using Cloth as filter-5, Keeping water in un-6, Chlorine Tablets-7, Bleach-8, Alum-9, ...*			
*Others-9*_____ *(Use colloquial style), No.-11*				
D08:	**Water for other uses:**			
D08/1	Piped Water	Piped into the dwelling		
D08/2		Piped into plot/yard		
D08/3		Public tap		
D08/4		Tube well/bore well		
D08/5	Dug Well	Protected well		
D08/6		Unprotected Well		
D08/7	Municipality tanker truck/cart			
D08/8	MLA/MP/Ward Comm. Tanker Truck/Cart			
D08/9	Private Tanker Truck/Cart			
D08/10	Surface Water (river/spring/canal/irrigation channel etc)			
D08/11	Bottled Water			
D08/12	Community Plant			
D08/13	Other specify.....			
Code: Main-1; Subsidiary 2; Other -3				
D09:	Where is the source of water located? *Within premises-1, Outside premises-2*.....			
D10:	Who usually fetches water for the HH?_____			
D11:	How long does it usually take to fetch water? _____			
D12:	Is the availability of drinking water regular/reliable throughout the year? *Regular-1, somewhat regular-2, not regular-3*			

D13: Is the water supply received from the said source/sources adequate to meet the following needs?

D13/1: Drinking: *Adequate-1, Inadequate-2, Most Insufficient-3* ..... ☐

D13/2: Cooking: *Adequate-1, Inadequate-2, Most Insufficient-3*..... ☐

D13/3: Washing & Cleaning: *Adequate-1, Inadequate-2, Most Insufficient-3*..... ☐

D13/4: Bathing: *Adequate-1, Inadequate-2, Most Insufficient-3*..... ☐

D13/5: Other needs, if any? *Specify*_____

D14: If the water supply not adequate than what are the other alternatives? *(open ended; record responses)*

_____

D15: Do you pay for water? *Yes-1, No-2*..... ☐

D16: If Yes, Did you pay any amount initially for the piped/bore well/ connection or tanker?

Yes-1, No-2..... ☐

D17: If yes, how much?_____

D18: Do you pay fixed / variable charges monthly for water? *Yes-1, No-2*..... ☐

D19: If yes. How much? _____

D19/2: Customary payment to any one? *(Yes-1, No-2)*..... ☐

D19/3: If yes, how much annually (in Rs.).....

D19/4: Time of operation (in hours): Water pump.....Submersible.....

D20: Purchase and cost of water:

Type of use	Frequency (code)	Average Quantity (in lts)	Rate (Rs./Lits)	To whom, you pay
Drinking water				
Water for other use(home)				
Water for commercial use				

Codes:

Frequency: Daily-1, Once in a week-2, Twice a week-3, Four times a week-4, once/twice in a month-5, During festival-6, very rare-7

D21: Seasonal variation of water cost if any? *Yes-1, No-2*

(Specify time if yes).....

Supply of water by water tanker or pipe:

D22: If piped water/tanker truck is present, then how long the supply is available?

Mode	Timing (Code)	Frequency /day(Code)	Duration (in minutes)	Frequency/ week(Code)	Conflicts (Code)	Water pressure (Code)
Pipe water						
Water Tanker						

Codes:

Timings: Any time-1, Fixed time-2, Variable-3

Frequency/day: Once in day-1, twice in a day-2, thrice of more in a day-3, No water-4.

Frequency/week: Daily-1, Twice a week-2, thrice a week-3,Four times a week-4,Once/twice in a moth-5, Available on demand (during festival/other use)-5

Conflict: Yes-1, No-2(only for public tap/tanker)

Water pressure: High-1,Medium-2, Low-3, Variable-4(only for tap water)

D23: Quantity of water storage at HH (in lts.): For Drinking..... Others.....

D24: Any seasonal variation on water supply? *Yes-1, No-2*..... ☐

D25: If yes, specify (Record responses, open ended).....

E. Miscellaneous

S.No.		Code
E1	Do you think that the municipal water supply (taps at home, community taps, tankers) has improved in the recent months? (Yes-1, No- 2)	
E2	Is it (taps at home, community taps, tankers) more regular/punctual and dependable/ secure now? (Yes-1, No-2)	
E3	What are the possible reasons for the improvement? (open ended)	
E4	If not, then has it deteriorated in quantity and is irregular? (Yes-1, No-2)	
E5	If Yes, then what could be the reason(s)? (Open ended)	
E6	Has the alternative sources reduced dependencies on alternative sources? (Yes-1, No-2)	
E7	If yes, then what extent?	
E8:	What are the problems of getting water from alternative sources?	

Alternative sources:

For drinking water:

E9: Presence of any alternative source of water (in absence of main and subsidiary water sources, *No-1, Stored water-2, Others-3 (Specify)*.....

E10: If others, extent of dependency reduced: *(Quite-1, Significant-2)*.....

E11: Problems of alternative sources (open ended).....

E12: Suggestions for improvement: .....

Water for other use:

E13: Presence of any alternative source of water *(in absence of main and subsidiary water sources, No-1, Stored water-2, Others-3 (Specify)*.....

E14: If others, extent of dependency reduced: *(Quite-1, Significant-2)*.....

E15: Problems of alternative sources (open ended).....

E16: Suggestions for improvement: .....

Perceptions regarding water ATM/Kiosk:

E17: Willingness to use water by paying very less charge if there is any water ATM in colony?

Yes-1, No-2, Not sure-3.....

E18: Will you pay if the water is home delivered at minimum cost? *Yes-1, No-2, Not sure-3* ☐

E19: Other observations: *(anything regarding water)*

F. Health related issues:

Specify the main ailments in episodes suffered by the HH persons during the last one month?

F01: **Episode 1** -Nature of ailment.....

F02: Who in the HH *(specify relation with HH head)*.....

F03: Sex: *Male-1, Female-2, Other-3* ☐ F04:Age..... F05: Treated: *Yes-1, No-2* ☐

F06: If yes, specify the source: *Public-1, Private-2, Both-3, Not aware-4*

F07: Distance in km..... F08: Source of expenditure: *OP-1, Borrowed-2, Free-3* ☐

F09: Cost incurred Rs..... F10: Others.....

F11: **Episode 2** -Nature of ailment.....

F12: Who in the HH *(specify relation with HH head)*.....

F13: Sex: *Male-1, Female-2, Other-3* ☐ F14: Age..... F15: Treated: *Yes-1, No-2* ☐

F16: If yes, specify the source: *Public-1, Private-2, Both-3, Not aware-4* ☐

F17: Distance in km..... F18: *Source of expenditure: OP-1, Borrowed-2, Free-3* ☐

F19: Cost incurred Rs..... F20: Others.....

F21: **Episode 3** -Nature of ailment.....

F22: Who in the HH *(specify relation with HH head)*.....

F23: Sex: Male-1, Female-2, Other-3 ☐ F24:Age..... F25: Treated: Yes-1, No-2 ☐

F26: If yes, specify the source: *Public-1, Private-2, Both-3, Not aware-4* ☐

F27: Distance in km..... F28: Source of expenditure: *OP-1, Borrowed-2, Free-3* ☐

F29: Cost incurred Rs..... F30: Others.....

F31: Do you think that there are fewer episodes of water borne health issues in the HH ever since you have been using bottled water?
Significant imp-1, somewhat imp-2, No change-3, Worse-4..... ☐

F20: Do you think that the quality of drinking water has contributed towards better health?
(Supplement with FDGs with ASHA and Other medical personnel in the locality)

G. Household Assets:		Record: Yes-1, No-2
G01	Mattress	
G02	Bed/Cot	
G03	Table	
G04	Chair	
G05	Electric fan	
G06	Radio/Transistor	
G07	Television	
G08	Sewing machine	
G09	Cell/mobile phone	
G10	Refrigerator	
G11	Air cooler	
G12	Bicycle	
G13	Moped	
G14	Scooter/motor bike	
G15	Car	
G16	Pressure cooker	
G17	Water purifier	
G18	Water pump	
G19	Submersible	
G20	Shared Submersible	
G21	Others (Specify).....	

9.3.3Kiosk level questionnaire for operator

Equipping Small Water Enterprises for Urban Poor (ESWEUP)

(A Project led by Safe Water Network in partnership with the US Agency for International Development (USAID) India)

Delhi Household Survey: June, 2015

(Slums without Water Kiosk facility)

Investigating Institute: Jawaharlal Nehru University, New Delhi-110067

Questionnaire No...K/.....

CONFIDENTIAL
For research purpose only

(Respondents should preferably be a woman in the 19+ age group)

1. Name of the Informal Settlement colony:_____

1.1 Address Location:_____

1.2 Demography details: Population: _____ Households: _____

2. Other Utility Services available:

Water-1, Electricity-2, Sewerage-3, Housing-4, Others-5

(Can be multiple answers)

3. Time and Date of Interview: _____

4. Current Raw Water Supply

4.1 Type of Water supplied:

Piped-1, Jal Board-2, Ground water-3, Other-4

(specify) _____

4.2 Quantity of Water Supplied daily:_____

4.3 Water Quality supplied: Raw Water TDS _____ppm

4.4 Time of Water Availability: Morning _____AM Evening_____ PM

Other_____

5. Urban Safe Water Enterprise (USWE)

5.1 Name of the Plant/Station Operator: _____

5.2 Education Qualifications: _____

5.3 Contact Number: _____

5.4 Date of Establishment: _____ Month _____ Year

5.5 GPS Coordinates: _____ Latitude _____ Longitude

5.6 Water Quality supplied (Treated): TDS_____ ppm

5.7 Treated water price at kiosk (INR) _____ per liter _____ 12 liters _____ 20 liters

5.8 Treated water price at ATM (INR): _____ per liter _____ 12 liters _____ 20 liters

5.9 Treated water price at retail outlet/shops (INR):

_____ per liter _____ 12 liters _____ 20 liters

5.10 Treated water price at home (INR): _____ per liter _____ 12 liters _____ 20 liters

5.11 Time of Water Availability: Morning _____AM Evening _____ PM

5.12 Past Visit by any Regulatory Authority Name of authority _____

Last Visit Date _____ Fees (INR) _____

Comments _____

5.13 How many people are involved in running this kiosk/ATMs on a daily basis?
What does each one of them do?

5.14 For how many hours do you run this plant every day? _____

6. Water Quality and its Treatment

6.1 What are the main contaminants in the raw water here? | | | | | | |
Fluoride-1, Microbial-2, Arsenic-3, TDS-4, Nitrates-5, Salinity-6

6.2 Type of Treatment Technology deployed: | |
Chlorination-1, UV-2, Coagulation-3, Ion Exchange-4, R. O.-5 etc.

6.3 Water Testing Protocol: | |
Daily-1, Monthly-2, Quarterly-3, On Wall Display-4

6.4 Date of last treated water quality test _____
(Please share report/results if possible)

6.5 Testing Laboratory:

Name: _____

Address: _____

Quality Parameters Tested: _____

Testing Fee Per Test (INR): _____

7. USWE Model

7.1 Type of Model: | |
Community/SHG -1, NGO-2, PPP-2, DWACRA-3, Private-4, Govt.-5

7.3 Entrepreneur-owned:

Funding Source

Land_____

Building_____

Technology_____

Legal Approvals taken if any:_____

7.4 Any approvals taken from Local Authorities (land/water/fire/environmental/etc.)

_____

7.5 Are there any other USWEs operating in this area?

_____

8. Capital Expenditure: Cost of Infrastructure

8.1 Type of Land: ☐

Rental-1, Owned-2, Registered-3

8.2 Water Source/Bore drilling: _____ depth of drilled bore well

8.3 Source of Electricity:

Single-1, Three-Phase-2 _____Cost/KWH

8.4 Station/Plant details: ☐☐☐☐☐☐

Building-1, Signages-2, Storage-3, Tanks-4, Skids-5, Plumbing-6, Wiring-7, Electrification-8
_____Costs, etc.

8.4.1. Treatment System:

Manufacturer _____

Litres per hour (LPH) capacity _____

List the purification stages _____

Hours of Operation /Day _____

Daily Volume of Treated Water _____

Remote Monitoring System: *Yes-1, No-2* ☐

RFID Smart Cards (if any) _____

Safety measures like Stabilizer / AVR _____

8.5 Contingencies / Supervision / Training / Consumer Campaign etc.

_____

8.6 Reject Water Disposal mechanism:

8.6.1. Method of Disposal: _____

8.6.2. Cost of Disposal: _____

8.6.3. Local regulatory compliance (if any): *No-1, Yes-2* ☐

_____documents?

9. Operating Expenditure (Op-Ex)

9.1 Operator salary / month_____

9.2 Rental Cost of Land, if any_____

9.3 Rental Cost of Source Water, if any_____

9.4 Monthly Electricity Bill: _____ Cost per unit _____ (INR/kWh)

9.5 Consumables used: ☐

Anti-scaling chemicals-1, Cartridges-2 etc.

9.6 Can wash/collection vessel cleaning protocol, if any:

_____

9.7 Program / Admin costs:

9.7.1 Consumer activation (or advertising/marketing), if any:

9.7.1.1 Brand name, if any _____

9.7.1.2 Activity type _____

9.7.1.3 Cost of activity_____

9.7.1.4 Activity Frequency_____

9.7.1.5 Customer base created _____

9.7.1.6 Cost / month / annum _____

9.7.2 Operator Training:

9.7.2.1 Skill training imparted:

9.7.2.1.1 Plant operation: *Yes-1, No-2* ☐

9.7.2.1.2 Book keeping: *Yes-1, No-2* ☐

9.7.2.1.3 Consumer handling : *Yes-1, No-2* ☐

9.7.2.1.4 Any other_____

9.7.3 Operator experience / education:

9.7.3.1 Number of days of training_____

9.7.3.2 Refresher courses, if any *Yes-1, No-2* ☐

If yes, specify_____

9.8 Maintenance Technician

9.8.1 Costs to the Station (including conveyance / month):

9.8.1.1 Number of breakdown (s) _____

9.8.1.2 Type of breakdown_____

9.8.2 High value spares

9.8.2.1 Cost of membranes replacement

<2 years-1, 3 years-2, 5 years-3 ☐

9.8.2.2 Pump replacement

<3 years-1, 4 years-2, 5 years-3 ☐

9.8.2.3 Any other _____

9.8.2.4

9.9 Buffer Staff / Apprentice for the operator: *Yes-1, No-2* ☐

Specify, if yes _____

9.10 Total Op-Ex / month_____

9.11 Profit / Loss per month / per annum _____

10. Distribution

10.1 For each SWE delivery mechanisms, capture the following:

Delivery mechanism	Treated water holding capacity	Litres sold (daily average)	Travelling time to replenish stock (round trip)	Time to replenish stock at the delivery mechanism	Distance from main treatment facility	No. of times stock is replenished daily	Price (INR paise/ litre)
Kiosk							
ATM 1							
ATM 2							
ATM 3							
ATM 4							
ATM 5							
Retail outlets/ shops Home delivery							

10.2 Cost of Distribution/month

10.2.1 Vehicle cost (Rs/-) _____

Company owned-1, hired-2, Self-owned-3, hired-4 ☐

10.2.2 Fuel cost_____

10.2.3 Driver salary_____

10.2.4 Maintenance cost _____

11. Pricing of Water Container and Smart Card, if any:

11.1 Cost of container (one time), if any _____

11.2 Cost of subscription (e.g. - RFID Card), if any_____

11.3 Container Cost: _____ 20 liters _____ 12 liters

Additionally, we used questionnaires for interviewing ULB representatives and USWE management. These can be obtained by contacting Safe Water Network.

9.4 List of People Interviewed

Organization	Designation	Name
Delhi Jal Board (D.J.B.)	Technical Advisor	Vijay Babbar
Sulabh International	Senior Advisor	Ajay Kumar
Smaat India Pt. Ltd.	Karunakara Reddy	Chairman & Managing Director (CMD)
Delhi Secretariat	Water Minister for NCT of Delhi	Kapil Mishra
Gender Resource Centre	Head, Savda Ghevra centre	Deoraj Singh
CURE	<group meeting>	<group meeting>
Chetnalaya	<group meeting>	<group meeting>
National Institute of Urban Affairs (N.I.U.A.)	Director	Jagan Shah

9.5 List of Slums and USWEs Studied

Housing Category	Name of Colony/Area	Additional Information
Resettlement colonies	Dwarka, Sector 3	With USWEs
	Holambi Kalan	With USWEs
	Savda Ghevra	With USWEs
	Shabad Dairy	With USWEs
Slums	Sanjay Colony, Okhla – II	Without USWEs
	Jaffarabad	Without USWEs

DRINKING WATER SUPPLY FOR URBAN POOR
CITY OF NEW DELHI

- New Delhi is the capital of India with over 17 million population
- 15% HHs in Delhi are in slums (Census 2011)
- 81% HHs in Delhi use treated tap water as their main drinking water source; 84% HHs in slums report the same. However, availability within premises is 78% total versus 51% in slums

DJB water supply: Key SLBs[1]	
Piped water coverage	82%
Non-revenue water	52%
Per capita supply (LPCD)	144
Cost recovery	42%

Water Supply for Urban Poor

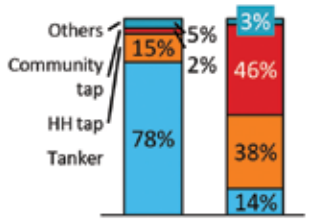
- Recently elected government (Feb'15) is focused on universal piped water coverage for all including informal settlements and unauthorized colonies
- Introduced policy for free water till 20kL consumption per HH per month; increased block tariff to be applied after that
- 800 DJB owned and hired tankers supply water, esp. to slums; recently set up online portal for public monitoring

USWE landscape

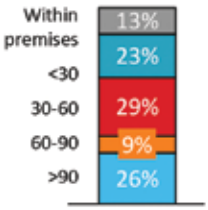
- Delhi Jal Board has facilitated USWEs in 4 resettlement colonies (20+ water ATMs set up by Jun'15)
- Company owned, company operated (COCO) model being followed
- Pricing INR 3/ 4 at kiosk ATM and INR 6/ 7.5 at remote ATMs per 20L
- Typical daily can sales 150-300; monthly operating costs : INR 34000-48000
- Likely future plans for covering ~30 more colonies by employing this mechanism

Slums without USWEs[2]

Primary source for potable water, % respondents



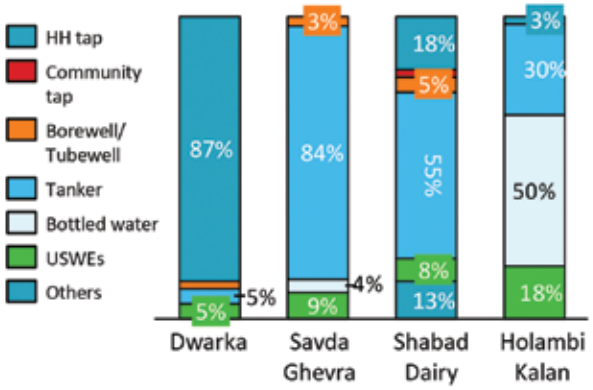
Water collection time, minutes



- Over 2/3rd respondents reported tanker water and community taps to be adequate for all purposes; 82% do not pay any monthly fees
- 37% willing to pay for safe water, 35% unsure

Slums with USWEs[2]

Primary source of drinking water , % respondents



- Overall 27% respondents reported USWEs to be their secondary source of drinking water

Strengths

- Prices adequately increased after pilot USWE (from INR 3 to 4 at kiosk ATM & INR 6 to 7.5 at remote ATM)
- Single point of contact for water utility
- Standardized operations across the locations
- USWE consumers are loyal with 51% fetching water daily, and another 30% fetch it 2-4 times a week

Challenges

- Involvement of multiple agencies in getting regulatory approvals (esp. land) has led to significant delays
- Bore wells highly prevalent for non-potable demand; continuity of tanker water supply for potable needs has thus limited USWE demand
- Irregular filling of remote ATMs, RFID card recharge and low pressure posing challenges to ATM adoption
- Despite poor prevailing supply and its associated drudgery, people are not keen on paying for water

[1] Delhi Jal Board (Delhi's public water utility) data
[2] 870 HHs across 6 slums were studied (4 with USWEs, 2 without USWEs)

RESEARCH PARTNER:
Centre for the Study of Regional Development, Jawaharlal Nehru University

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