UC Irvine
White Papers

Title

Journeys for Water: Survival Strategies for Urban India

Permalink

https://escholarship.org/uc/item/21f8h4b4

Authors

Bhushan, Gaurav

Gupta, Nitin

Fuqua, Jennifer Lee

Publication Date

2013-09-18

Copyright Information

Peer reviewed

JOURNEYS
FOR WATER

JOURNEYS FOR WATER

●

Survival Strategies in Urban India

●

BY GAURAV BHUSHAN, NITIN GUPTA & JENNIFER LEE FUQUA

The always on supply of water is considered a luxury, and most use buckets to collect water and measured cups to dispense it.

CONTENTS

Mass urbanization across the globe is bringing fresh waves of migrants into urban slums—220 million people moving from the Indian countryside to cities in the next twenty years alone and many of these are resettling in poorer communities. With this migration comes swollen demand on utilities including, of course the need for clean drinking water. A failure to meet these needs creates significant upheaval from social interaction to healthcare, to business, spanning every aspect of city life.

When people think of the places that represent our global future their minds turn to modern metropolises like Seoul, Tokyo, or San Francisco. But over the last decade I've seen globally cutting edge thinking and services shifting to include places like Manila, Nairobi, and Mumbai. This innovation is often driven by widespread, affordable connectivity and is increasingly supplemented by new ways to sense and interpret the world around us.

Recently a venture funded by the Piramal Foundation introduced a for-profit pilot to sell clean drinking water in slums through a novel "water ATM," supplying water at a fraction of the current market costs. It has great potential to be a force for good not least through providing a consistent service at a far more affordable price; located in proximity to the people it serves; remote monitoring of water quality and usage, and considered use of mobile technology.

At the same time there is significant social, economic and political capital invested in current water practices from: the nuanced give-and-take of neighbors looking out for each other in a tight-knit community; the promise of water-for-votes; through to bribes paid to have water delivered. For a slum-dweller putting faith in a technology, regardless of the benefits over existing practices can be daunting not least because it requires trust that the underlying system will permanently change. It also requires trust in technology: that it is prudent to store something of monetary value in a pre-paid smart card, and that value will be released when required.

With funding from the IMTFI Journeys for Water explores the strategies adopted by slum dwellers to ensure that their households have the water they need not just to survive, but thrive. In doing so, it provides a small, but important contribution in addition to Piramal Foundation's vision of bringing "water for all."

—   *Jan Chipchase, Executive Creative Director of Global Insights at frog*

TOP: In India, water fit for drinking is often labeled पीने कापानी or 'Peene ka pani.'   BOTTOM: There are around 20 major river basins across India, but most of them carry water that is polluted or unfit for drinking.

Water collection in Savda Ghevra.

In November 2012, a small team of researchers and designers from frog, working with funding from the Institute for Money, Technology and Financial Inclusion, traveled from Ahmedabad to Delhi to understand how consumers acquire, store and use drinking water. The research concentrated on the roll-out of a new water delivery service from Sarvajal, a company that supplies paid-for drinking water in rural areas and looking to expand into urban slums through a novel "water ATM."

A multi-disciplinary frog team from our Bangalore and Shanghai studios explored the drinking water ecosystem in India and how consumers perceive its value in both real and abstract terms, with a view to impacting the design and rollout of Sarvajal's water ATM.

Water shapes individuals and societies alike. In India, for example the powerful Sabarmati and Yamuna Rivers have nurtured civilizations and kingdoms in Ahmedabad and Delhi. To this day, the importance of water remains unquestioned, but the degree to which the systems currently in place can meet the growing demand is far less certain. In India, as in many nations, this has become particularly relevant in urban settings. Over the past few decades, India has seen a massive economic migration from villages to cities—and more people are on their way. Some 380 million Indians lived in cities as of 2011. According to the The World Bank, that number will rise to a staggering 600 million people by 2031.

Driven by economic opportunity, many first settle in slums, squeezing themselves, and sometimes their families, into small rooms on cramped streets, far from the lives they'd previously known. They work long, hard days, trying to earn enough to sustain themselves and perhaps send some money home. But in most cases, the infrastructure is inadequate to support them, and it's become clear that unless changes are made, India's major cities will be overwhelmed by the waves of new arrivals. Drinking water provides a very stark example: The Planning Commission of the Government of India has said the demand for water will rise by approximately 50 percent by 2031 unless significant changes are made in the way water is collected and used.

Slum dwellers are already struggling on a daily basis to secure clean water and the situation looks to become worse. There are few systems in place, public or private, that provide this most basic necessity on a consistent, dependable basis. People are instead left to search out water sources—in some cases literally chase them—and extract from them what they can. Someone who goes to work at 8am, for instance, might have to wake up at 4am to get the water he or she needs.

It begs the question: Is there a way to provide water in a more reliable manner to people living in these cities, particularly in the slums? And who or what might provide this solution—the government, the people, private enterprise, or some combination of all three?

The existing options have yet to prove themselves either practical or reliable, much less both at the same time. The government provides water through

tankers (similar to petroleum carriers), but service is limited and highly erratic. Some people bypass the established system by drilling their own borewells, but groundwater is usually of poor quality. Private, fee-based models have had mixed results, too, though one—Sarvajal— is now looking to transfer its rural success to an urban marketplace

Any potential solution, as we shall see, will have to take into account existing social, economic and political dynamics that all spring from the same simple notion: water is extremely valuable.

SARVAJAL

Taking its name from a Sanskrit word meaning "water for all," Sarvajal was founded in 2008 by the Piramal Water Private Limited company. It promoted itself as a reliable, technologically-advanced alternative to drinking water options in several parts of rural India. Since then, it has provided more than 200,000,000 liters of clean drinking water and built a customer base of more than 75,000 people. Though Sarvajal receives no government subsidies and shoulders all of its operational costs, it has nonetheless managed to keep its fees low, selling a liter of water for as low as 25 paise—less than half of a single US cent, or one-sixteenth the cost another private water supply company offers.

Its process varies somewhat depending on a village's size and needs, but Sarvajal generally helps set up a small water filtration plant that can be maintained by local residents and establishes a series of cloud-connected "water ATMs" from which people can make "withdrawals" using a prepaid smart card. Employing sophisticated technology that makes it possible to remotely monitor their distribution network, Sarvajal supplies clean water that is accessible at the customer's convenience. You could say it brings into three dimensions the concept of the Internet of Things, meeting a critical need in the process.

Sarvajal is looking to expand their operations into Delhi, in collaboration with the Delhi Jal Board, which oversees the provision of water in the city. The company hopes to show that its filtration plants and cloud-connected water ATMs can provide clean and affordable drinking water as dependably in the urban slums as it has in rural areas.

SARVAJAL FILTRATION SYSTEM

1 WATER TANK: Where unfiltered water is collected, usually at a height, so that there is sufficient pressure when water passes through filtering equipment.

2 FILTERING EQUIPMENT: Varies across installations. Includes a **Media Filter** to remove color, small and unwanted microscopic taste particles, a **Cartridge Filter** to remove microscopic impurities, a **Dosing Tank** to add chemicals to keep the filters clean, a **Reverse Osmosis Membrane** to remove microscopic mineral impurities, and a **UV Tube** to remove bacteria and pathogens.

3 PUMP: Transfers purified water to storage.

4 STORAGE: The purified water is then stored at a height, making dispensing easy.

5 ATM: One way Sarvajal dispenses water.

6 STORES: Measured quantities of water are filled in containers and delivered door-to-door by some franchises. Consumption is mostly tracked manually.

SARVAJAL ATM COMPONENTS

ELECTRONIC/SENSOR BACKEND: A basic input/output chipset equipped with LED display, RFID reader, and a basic telecommunication setup with a SIM card for each ATM.

USABLE FRONTEND/ATM CARD: Various graphic iterations have been created to explain the steps involved, as well as button mechanisms (such as push and hold, one time press, toggle). The ATM card has an RFID.

ANTENNA AND BATTERY: An antenna is placed away from the ATM, at a height to connect to the network. Batteries ensure usage during power outages.

ENTERPRISE CLOUD: All the sales information as well as ATM status are communicated to an enterprise management system.

SOOCHAK: Customers see their balance. Franchisee can check ATM status, sales info, give instructions, and request service.

ABOVE: Sarvajal Water ATM at a gas station franchisee in Laxmangarh.

AIMS

This report examines the dynamics that exist around drinking water in India, and more specifically in one Delhi slum, in order to understand the value of clean drinking water for people. We also use Sarvajal's experiences to raise questions about possible alternatives to current distribution practices, along with any advantages or obstacles that might arise if someone tried to implement a new system. It was fascinating research that gave us a much better understanding of the practices, rituals and politics tied to drinking water. We hope this understanding will support efforts, projects and people trying to find more effective ways of providing water in the slums of India, and even beyond.

THE ROAD TRIP

Our "journey of understanding" began at the Sarvajal office in Ahmedabad, in western India's Gujarat State, where the Sarvajal team told us what they'd learned from their work in rural areas and their research in urban slums.

To see what they described first-hand, the team spent the next three days covering some 1,200 kilometers by rail and by road, heading northeast through Rajasthan and Haryana States and then on to Delhi. When we were in transit, we planned our upcoming itineraries, deciding where and when we wanted to make our intercepts. But we also made sure to explore just about any chance encounter, unexpected opportunity or new lead we felt would show us something about drinking water.

The journey took us through the cities and towns of Abu, Pushkar and Laxmangarh. We connected with both water providers and consumers to get a better picture of supply and consumption patterns. We also visited a trail of Sarvajal franchises in the surrounding rural areas, along with pilot programs the company had established in cities.

We found that people were happy to discuss these things, perhaps because they are so central to their lives. With unfailing hospitality, people shared stories with us about their families, their homes and their businesses— and about how all of them were affected by the access they had, or didn't have, to clean water.

A doctor we met near Abu voiced an opinion that we heard repeatedly in the days that followed: water was available, even abundant in places, but it was rarely clean and the supply was not dependable. Even people with access to bore-wells and hand pumps had to make do with water tainted by excess fluoride or contaminated by open drains nearby, which rendered it unfit (or at least inadvisable) for consumption.

We met a number of entrepreneurially-minded individuals who had opened businesses based on the need for clean water. Two of them had invested in Sarvajal's technology and were also running petrol pumps. In their eyes, water and fossil fuels were of equal value.

JOURNEY OF UNDERSTANDING

· · · · · · · · · · · · · · ·   Travel by train
───────────────   Travel by road
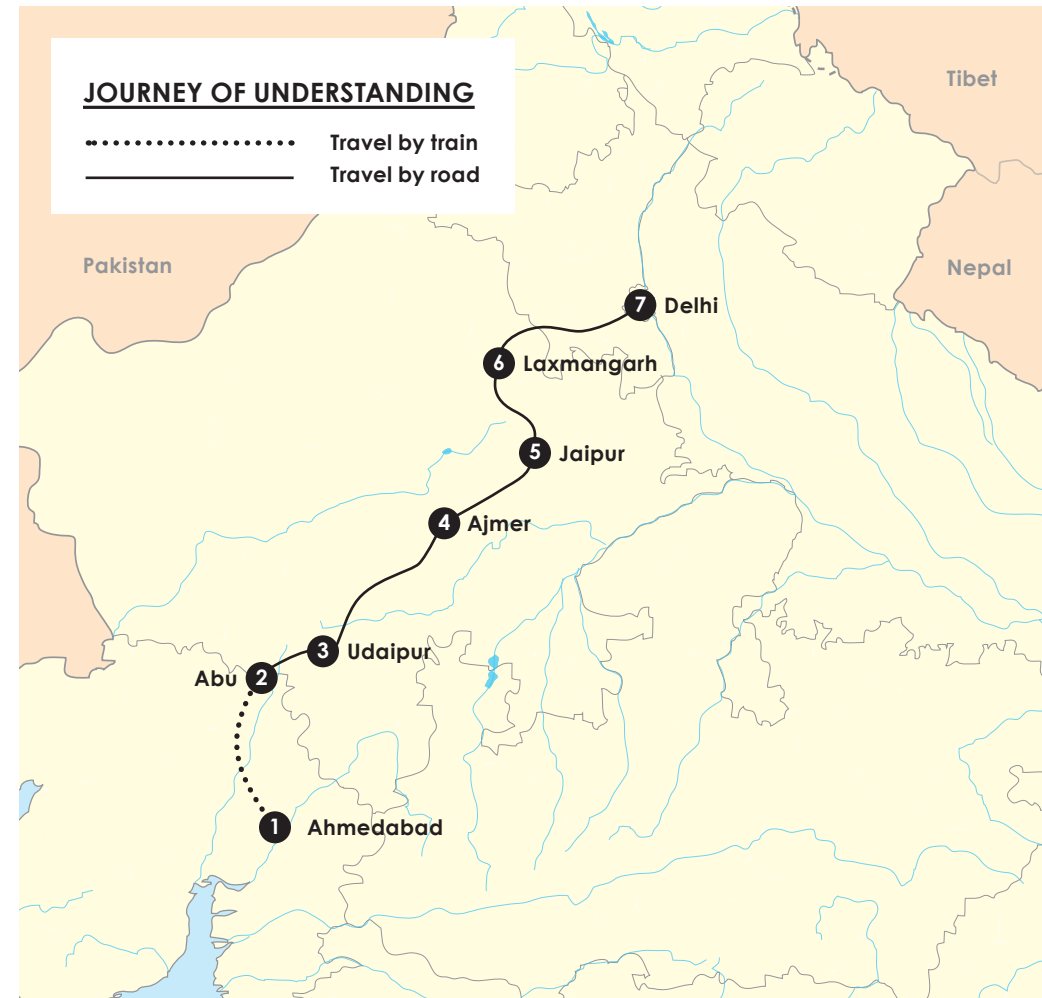
LEFT: The team plans intercepts and interviews while on a train to Abu.

RIGHT: The team having breakfast with Milind Nagda from Sarvajal after a 4 am visit to the urban slums of Delhi.

Among the wealthier people we met, several believed that clean drinking water had helped them recover from various ailments, that it had actual curative powers. On the other hand, people of lesser means seemed either unaware of or unconcerned with the risks associated with impure water. Some clearly considered clean water a lesser priority than other "needs"—including, in a few cases, alcohol.

Our early findings underscored the gravity of the situation and set the tone for our research in Delhi. There were crucial differences, however, between urban and rural settings in terms of population density and the volume of resources available. This quickly became clear when we arrived in our anchor research location, Delhi's Savda Ghevra slum.

RESEARCH FOCAL POINT: SAVDA GHEVRA

We visited a number of slums in Delhi, but our primary focal point was Savda Ghevra, a "resettled" slum in the western reaches of the city. As recently as 2006, the area was still barren scrubland. At the time, however, in preparation for the Commonwealth Games that Delhi was hosting, city authorities demolished several slums, particularly those around the Yamuna River and Delhi's airport. Residents were allotted new parcels of land far from the city center, in Savda Ghevra and places like it, and permitted to build new homes.

This created a situation wherein several impoverished communities organized around distinct cultural, geographic, religious or other links would now be living side-by-side. When they arrived at their new "homes," however, they found that hardly any arrangements had been made for water, sanitation, transportation or electricity. Even housing was in short supply, and many people spent their first nights sleeping in tents. Furthermore, numerous working men and women had to give up jobs because their commutes had become prohibitively long.

It took sustained pressure from residents to get the authorities to provide even a minimal level of services. But rather than unite the various "cliques" of Savda Ghevra based on common needs, the shortcomings instead served to make them more insular, convinced that they had to look out for themselves because no one else would.

Today, unemployment remains a problem, particularly for men. Many work as day laborers when they can. Some wile away their days gambling on the main market road. Women most often work as household help in residential colonies, leaving their own homes early in the morning and returning at night.

There have been improvements in Savda Ghevra since those early days, but residents still expend a great deal of energy worrying about basic services. The sanitation system is dysfunctional; uncollected garbage and open drains attract mosquitoes and flies, posing a health risk to residents. The water situation is even more troubling.

TOP ROW: Waste water in the street. A woman with fluorosis, a condition linked to poor drinking water. BOTTOM ROW: A man who said drinking Sarvajal's water alleviated pain in his leg. Water tank near Abu Road.

ABOVE: A hand-crafted map of Savda Ghevra on the wall of a local non-governmental organization's office.

CITY SLUMS VERSUS RESETTLEMENTS

There are two commonly used definitions for slums in India:

City Slums

City slums are organic and evolve slowly over many years, usually in the shadow of major industrial or residential areas. Most current residents work nearby and have established relationships with others in the area prior to their arrival. These slums are characterized by cramped living conditions, limited amenities, often subtle degrees of economic stratification and a generally stable population. They have a history, their own traditions and entrenched social networks. They even support small industries such as textiles or scrap metal work.

Resettlements

Resettlements are created when authorities force residents to move from more established city slums. They are often located in a remote location on the fringes of the city, far from the places people customarily work. The streets and blocks are planned out, but both the conception and construction are often haphazard and ill-considered. Unemployment and a sense of dislocation prevail; many people relocate back to the city if they have the opportunity to do so.

SAVDA GHEVRA'S JOURNEY FOR WATER

During Savda Ghevra's early days, water tankers came through the area every two or three days at best. Predictably, chaos ensued when they arrived. People argued over who should get their water first, or how much each person should get. Fights broke out. Public and private property was vandalized. At times, the police were called in to restore order.

With the support of local non-governmental organizations (NGOs) and legal advocacy groups, members of the community launched a campaign calling for regular delivery service. By filing a right-to-information (RTI) claim, they learned what the schedule of deliveries was supposed to be and thus made those providing the water, including the government, somewhat more accountable.

That said, the majority of people in Savda Ghevra still depend on water tankers for their drinking water—tankers that still do not adhere to set routines. People rarely know when or where a tanker will appear. They know only that they must be ready if and when it does, and that they need space in their homes to store large capacities of water—in case the tanker doesn't return for several more days.

A kind of order does exist amidst the chaos that erupts when a tanker makes a delivery. There's something of a hierarchy around who gets to fill their containers first, and all the shouting is a way of enforcing that order, so no one steps out of line. And yet, no matter what the residents have done over the years, the fact remains that water is delivered largely at the discretion of the suppliers, and more

TOP: Houses crammed in next to each other in a city slum at dawn.   BOTTOM: Planned housing and alleys in a resettlement.

ABOVE: Tanker trucks haul water to various neighbor-hoods, but it's hard to predict when they'll arrive.

specifically the drivers, who themselves must react to traffic patterns, road problems and other unforeseen obstacles.

The frog team saw this firsthand when we rode in a tanker ostensibly headed to Savda Ghevra's B-Block. Nearing the destination, the driver saw that the road he planned to take was impeded by construction and that he'd have to find another way in. He decided, without consulting anyone, that he was going to deliver the water to H-Block instead. This was great news for the people of H-Block (at least for those who were ready to collect water that day). But the B-Block residents who were expecting the tanker were left in limbo, unaware of what had just happened or when the tanker might come back.

RESEARCH METHODOLOGY

Intercepts

After identifying key players and locations that were relevant to our project, we spoke to regulatory bodies, local entrepreneurs, local leaders, social workers and NGOs. We targeted family members who managed the home and made decisions about acquiring and storing drinking water. We also conducted numerous spontaneous intercepts with people fetching water from wells, water tanks or other sources; people carrying or transporting water; people drinking water, boiling it or using it to wash dishes; people hanging around locations somehow related to water (storage tanks, posters promoting good hygiene, etc.). Lastly, we interviewed people we saw buying goods with things other than cash—using bank cards, or recharging airtime on their mobile phones—as Sarvajal's subscribers do.

Mapping the Terrain

There are 12 main "blocks" in Savda Ghevra; in each, one finds clusters of people who had lived in the same slums before they were resettled here, or who share some other connection. These micro-communities co-exist, but they are quite distinct from one another as well, something we had to factor into our research.

Our team was designed to allow us to reach into as many sections of the society as possible. It was made up of two men and two women. Three members spoke Hindi; one also spoke Bengali, another commonly-heard language in Savda Ghevra.

The people of Savda Ghevra were no strangers to researchers, surveyors or journalists looking for information. These various inquisitors all seemed to blend together in people's minds, too; the more important distinction was between people who were there to "get" something and people who might be able to offer some help. Our team therefore adopted a NGO-researcher model, making it clear that we were there first and foremost to gather information. We could not promise anything, we stated explicitly, but we could say that we believed that our work could serve a useful purpose at some later date. Being transparent about our goals seemed to help us with some of the initial skepticism outsiders often encounter.

Small gestures also helped establish connections, however brief they may have been: stopping to have a cup of chai at a roadside stall, for instance, or spending time
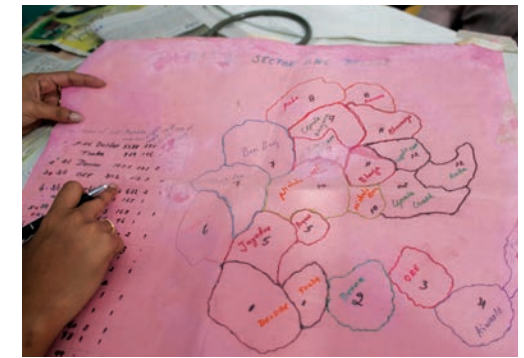
with kids playing out in the open, or just listening as people aired their concerns.

On occasion, the team also tagged along with people going about their daily routines—filling their water jugs early in the morning, riding the bus to or from work, tidying up their homes and so forth.

Interviews

Drawing on leads from about 15 intercepts, we conducted 8 in-depth interviews in the homes of various people in order to understand how the provision and acquisition of drinking water in Savda Ghevra impacted their personal lives, their finances, their relationships and their work. We also consulted with experts who explained to us the legal and financial status of existing water networks.

Pop-Up Studio

As we do in many settings, we created a pop-up studio in Delhi, a makeshift living and working space not far from our target population. This helped our research team immerse themselves more deeply in the environment they were examining.

BIASES

Savda Ghevra is a very dynamic, complex environment. We had to remain cognizant of numerous cultural, religious, socio-economic and political nuances at work in the various communities. These included:

Recognizing the Presence of NGOs

NGOs and researchers have been coming to Savda Ghevra since its inception. Many of these organizations have worked in the slum ever since. Some of their efforts had become highly politicized, though. We stayed neutral when asked about any of this because we did not want to interfere with existing projects and relationships.

Though diverse and complex, Savda Ghevra is a rather small place. When outsiders arrive, people talk. First impressions are therefore critical to gaining acceptance, so we made a point of explaining to everyone we met who we were and what we were doing there.

Gender and Household Dynamics

India remains a largely patriarchal society. Despite the sheer number of tasks women carry out on a daily basis, and the fact that they are the primary wage-earners in some families, they still tend to have a lower standing in many communities. Those who don't work run their households and are in most cases responsible for getting drinking water for their families. So most of our key interviews were carried out with women.

We also had to consider whether or not female respondents were being candid, or if their answers were shaped by the viewpoints of other family members, who were around. If the presence of a male, be they a member of the household or one of our researchers, seemed to hinder the interview process, we found ways to subtly remove them from the room.


22 TOP: During the day the alleys of Savda Ghevra are mostly populated by small children and the elderly.

BOTTOM: Large water containers, smaller bottles, mugs, and water hoses are common sights outside houses in Savda Ghevra. 23

A person stops at a community tap for a drink of water between providing camel rides to tourists in Udaipur. The tap is guarded by religious symbols in order to keep its surroundings clean.

How much time do you spend thinking about getting hold of drinking water, and how does this impact the way you use water? For illustrative purposes we compare two households: an Urban Stay-at-Home Indian parent and an Urban Stay-at-Home American parent.
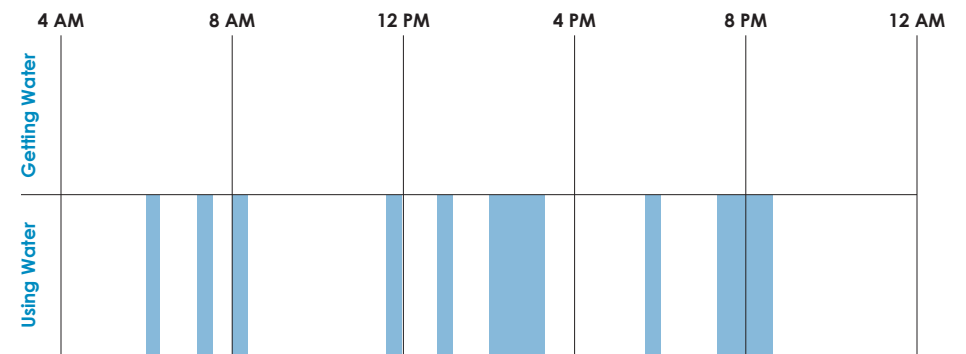
COMPARING DAILY RELATIONS WITH WATER

Urban Stay-at-Home Indian Parent
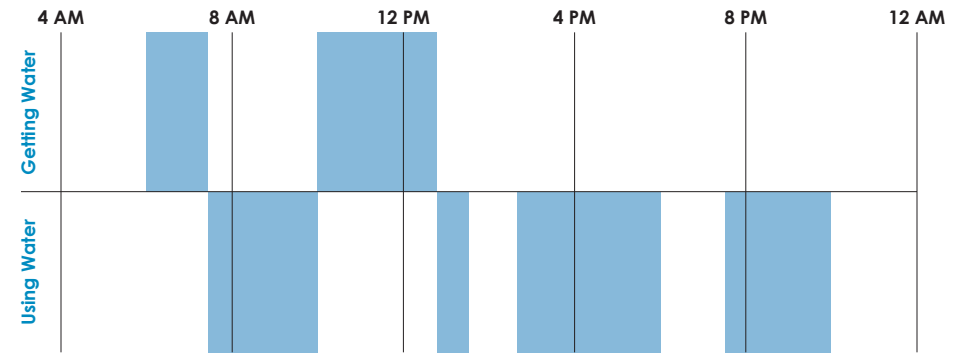
6-7:45 AM: Gathering water from borewell. **7:45-10 AM:** Morning chores and preparing meals. **10 AM-12:30 PM:** Gathering water from tanker. **12:30-1:30 PM:** Preparing lunch. **2:30-5 PM:** Afternoon chores, preparing dinner. **7:30-10 PM:** After-dinner chores.

Urban Stay-at-Home American Parent

6-6:30 AM: Showering and getting ready. **7-7:30 AM:** Preparing breakfast. **8-8:30 AM:** Morning chores. **11:30 AM -12 PM:** Preparing lunch. **1-1:30 PM:** Dishes. **2-3:30 PM:** Afternoon chores. **5:30-6 PM:** Preparing dinner. **7:30-8:30 PM:** Evening chores.

GURU
THE DECISION MAKER

Guru, 28, is a teacher and private tutor who recently married his wife, Komal. They have been living in Savda Ghevra for two years and now reside with Guru's mother-in-law in a house she helped them buy.

Guru gives private lessons to primary, secondary and higher secondary students in the locality. His wife runs a small beauty parlor in their home. Before moving to Savda Ghevra, Guru worked for an IT company, a job that paid significantly more than teaching does, since few families here can afford private tutoring. Life was better back then, he believes. More income. Less financial pressure.

They had come in search of more affordable housing, however. They possess a handful of electrical appliances—a microwave, a washing machine, a printer and a water cooler—that they purchased when they lived in their previous home. As the primary earner in the household, Guru made the decisions about which appliances to buy.

His nostalgia notwithstanding, Guru and Komal had a rather high standard of living relative to most other people in the slum. Still, Guru said he hoped they could move out of Savda Ghevra and closer to the city center before long.

Guru's Journey for Water

Despite their relatively elevated social status and the fact that they both work, Guru and Komal are just as dependent on tanker deliveries as the other residents of Savda Ghevra. The actual task of collecting the water falls on Guru, who fills up their water jugs when he can, then carries them home. Many times, he told us, tankers had arrived in the middle of his sessions. When this happens, he has no choice but to rush out. Often, the students come with him and help him fill the containers.

In some instances, Guru says, neighbors help out, filling up jugs for him when he's unable to do so. His role as a teacher has ingratiated him to the community, he thinks. This has been a huge help when it comes to getting water. Customarily, he explained, newer arrivals have to wait to fill their vessels until the "veterans" are finished with theirs. Soon after he and Komal moved to the neighborhood, he recalls, before anyone helped him find a foothold in the process, it was a decidedly uphill battle. "Getting water filled is like winning a war," he remembers thinking.

Now, he usually fills three or four containers each time the tanker arrives. He doesn't think the tankers deliver high-quality water, however, so he and Komal filter what they get through a multi-layered cloth when they arrive home to remove any excess residue.

They also draw water from a submersible pump near the entrance to their house and store it in a water tank on their roof. They use this water for washing, bathing, sanitation (clearing the toilet) and running their air cooler. During our discussion, Komal also noted that she thinks the water's high content of salt and iron is making her skin darker.

ABOVE: Guru outside his 2-storeyed accommodation in Savda Ghevra.

TOP ROW: An overhead tank stores water pumped from a borewell Guru and his students. BOTTOM ROW: Guru and Komal use a fine cloth to filter water. The microwave, a rarity in Savda Ghevra.

MAMATA
THE COMMUNITY INFLUENCER

Mamata, 56, has lived in a Bengali community in Delhi's Laxmi Nagar neighborhood before she and many others were among the first people resettled in Savda Ghevra. Now, she lives in A-Block in a small, square two-story house with her husband, the youngest of her three daughters, her son-in-law and her grandson.

Her home in Laxmi Nagar had essentially been her only possession, but it had been demolished. She managed to sell the plot of land on which it had stood, however, and used the profit to build not only her own home in Savda Ghevra, but also additional homes for her two older daughters. This helped her feel like her daughters were looked after, and that they would be able to look after her as she gets older.

Though the family makes decisions together, usually over dinner, Mamata is the clear leader. She has invested in the businesses her younger and eldest daughters run—a cosmetics shop and a general store in the main market, respectively—and she continues to advise them, providing guidance and knowledge from her own experiences.

She has earned the lasting respect of the community as well. Mamata has been at the forefront of efforts to bring change to Savda Ghevra, pressuring authorities to improve the services they provide. The flow of electricity has indeed improved since those early days. There are now regular buses from Savda Ghevra

and her grandkids have a school to go. Getting water is still a problem, but she will keep fighting for that, too.

Mamata's Journey for Water
Like most of her neighbors, Mamata is dependent on tanker water for drinking, bathing and cooking. Her youngest daughter fetches the water, running after tankers, filling up two or three big jugs when her turn comes, then hauling them back from the collection point. If the tankers come when her daughter is not around, Mamata grabs the jugs and collects the water herself.

Regardless of who actually gets the water, they follow the same storage and classification routine once they get home. First, they pour water from the big containers into smaller containers. Three are for drinking, one of which stays on the ground floor. Four are for bathing; those are kept on the stairs. And three more are put under the kitchen shelf and used for cooking.

Mamata finds the process immensely frustrating, but she nonetheless thinks they get high-quality water that is filtered at its source and thus does not pose a health risk. She does not treat it in any way before giving it to her grandchildren to drink, aside from adding chlorine tablets if she thinks it tastes bad.

ABOVE: Mamata arranges for the research team to sit and interview her alongside the main street in Savda Ghevra, which is lined by shops including hers.

TOP ROW: Scenes from inside and outside Mamata's house.   BOTTOM ROW: Mamata in her home, discussing her daily routines and her community advocacy work.

SAKINA
THE KEEPER OF THE HOUSE

Sakina, 35, is a housewife who lives in a square two-story home with her second husband, her father-in-law, six sons and a daughter. The family has its bathing, water storage and kitchen area on the ground floor. The living space is one flight up.

Some of her children are old enough to work; others are still in school. Sakina spends most of her time on the ground floor, managing the household. She cooks three meals each day, something she's determined to keep doing because she thinks it is good for her family. Sakina's husband is prone to illness and cannot work, so on many days, in addition to her other tasks, she tends to him as well.

Three of her sons run butcher stalls in Savda Ghevra's market. They are the primary earners in the household. Sakina does not know how much money they make, but she knows that they provide enough for her to buy what she needs for the family.

Sakina is not very social and rarely mingles with neighbors. For the most part, she stays inside her home. Relatives occasionally come to visit, but she rarely goes to see them. She also goes to a nearby mosque each Friday with her young daughter.

Sakina's Journey for Water

Sakina basically plans her day around the arrival of the water tanker. She carries about eight containers, each capable of holding 15 to 20 liters, so at a given fill-ing, she can collect enough water to last for two days in winter or one in summer. It's quite a load to carry—it usually requires several trips back and forth—but Sakina thinks many women in the neighborhood bear similar burdens. She also uses a submersible pump to extract groundwater for washing clothes and cleaning the house.

Sakina does not think the water is to blame for her husband's frequent ill-nesses or any other maladies that affect her family. She instead points the finger at the neighborhood's poor sanitary conditions, particularly open sewage drains.

32   ABOVE: Sakina settles down in a comfortable stairway corner of her house to talk to us.

TOP ROW: Bathing area inside Sakina's house. Submersible pump installed outside her house extracts hard water.   BOTTOM ROW: Water containers on Sakina's staircase. Her family, except her, spends most of their time upstairs.   **33**

WHEN PATHS MERGE: STRATEGIES OF SURVIVAL

GURU
As the Decison Maker, Guru decides on where the family should get water, and often collects the water as well.

Techniques for carrying water
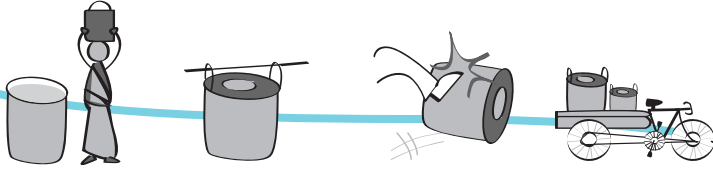
Shortest Range
Filling up a large container and using a smaller container to get the water.

Short Range
Insetting a metal rod through the handles of the container so two people can carry it.

Long Range
Kicking and letting the container roll.

Longest Range
A cycle or van for people who live furthest from the tanker point.

MAMATA
As the Community Influencer, Mamata helps to establish a system in which her neighborhood works together to gather and distribute tanker water.

Neighborhood dynamics

Close proximity to the tanker point increases property value.

Container gathering and watch point
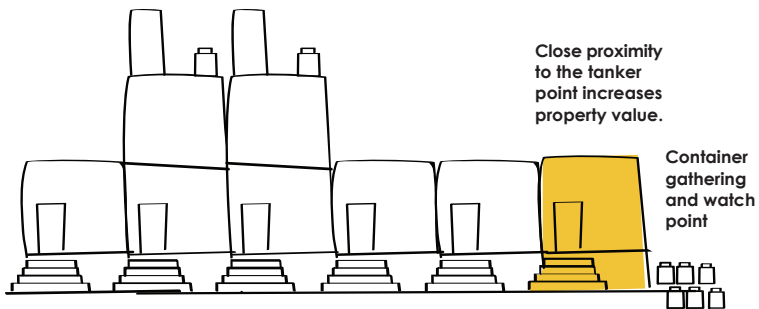
Those who reside nearest to the tanker point usually find out when the tankers arrive, hence they assume the role of a pipe holder. The pipe holders also watch out for their neighbors' water containers as they gather, fetch and bring them to their homes.

SAKINA
As the Keeper of the House, Sakina treks to the tanker to fetch water, bring it home and store it.

Places for storing water

Toilet

Overhead water tank

Under the bed

Under and over the staircase

Near the cooking area

Outside the house
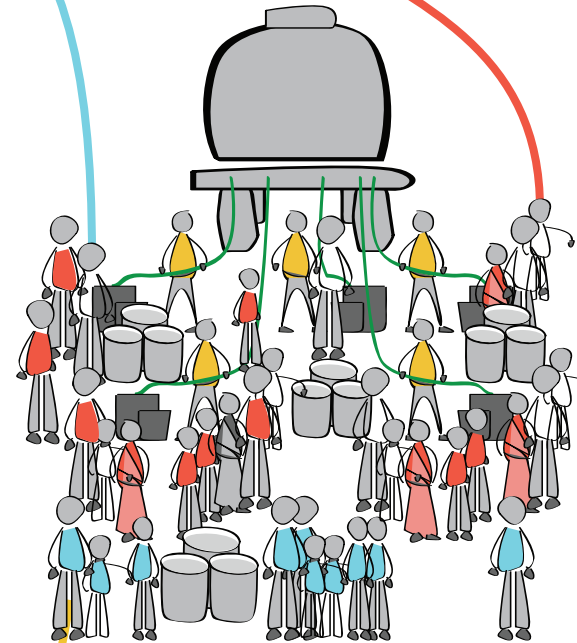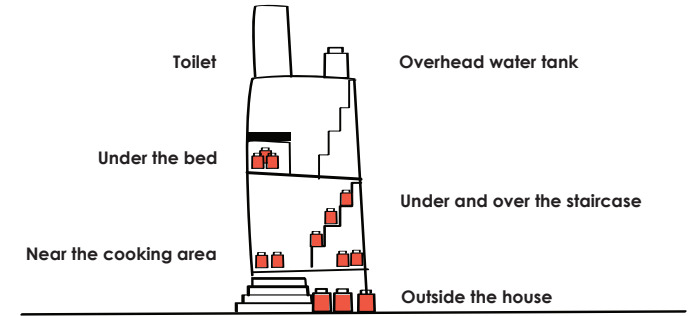
Roles at the Tanker

Pipe Holder and Owner

Crowd from lanes assigned to this tanker

Container Carrier

Driver and Assistant

Crowd from other lanes

THE TANKER
Chaos is directly proportional to the supply gap. However, there are clear patterns in the tanker chaos, and a variety of roles.

TOP: Chaos ensues as women struggle to maintain their position in the queue for water collection from the tanker.

BOTTOM: A cow tries to sniff a filled water container.

TOP: Dirt floats over water that was freshly collected from the tanker.

BOTTOM: Water is wasted as people keep away from it during an early morning in Delhi winters.

Scene as the water tanker leaves and the remaining people lift their filled water containers to bring them to their homes.

WATER AS A STORE OF VALUE

As you would expect for something that meets such a basic need our research underscored that for the people of Savda Ghevra, water has significant store of value. It's treated akin to a valuable household possession. A store of water is a form of security protecting the family's health and needs for however long it takes for the tanker to return. The obviousness of this statement is contrasted with the experiences of many readers of this report, for whom water is considered a commodity.

If the tanker does not come for a while, people resort to lobbying the Delhi Jal Board to send someone. In certain instances, they call drivers directly. Either way, they know they need to be ready for gaps in service. Many respondents had a dedicated space in their home to store water that was ready for use. For some, it was a hallway lined with jugs of water. For others, it was a concrete cistern they had built themselves. How much they stockpiled depended on how much space they could afford to devote to storage and how much water they could access at a given time. Whatever the amount, it had to be protected. Theft is not uncommon—another indicator of how valuable clean water, and the containers to store it are, and how desperate some people are to acquire it. We saw many storage vessels that were locked up with heavy chains.

Water is a store of value in Savda Ghevra in more intangible ways as well. A home address located close to the tanker delivery point is considered a status symbol and a privilege that increases the value of one's home. The fact that people are already investing time, energy, and money—for storage containers, for borewells—in it is another sign of its worth.

We saw earlier how some people think clean water has curative powers. Certain residents also ascribed to it a very specific type of cosmetic value. One told us that despite the effort involved, she's willing to haul extra water jugs home for her daughter and son because "bathing in clean water will make their skin lighter in color, so that they can marry off to better families." In her mind, all that toil was an investment in her children's futures.

ACCESS TO WATER IS POWER

It quickly became apparent that the water situation in Savda Ghevra is highly politicized. Local leaders and other opportunists tried to assert authority over our project from the start, "Everything needs to go through me," said one (we didn't

oblige). Although the Delhi Jal Board does not charge consumers for the water that tankers deliver, local leaders often "claim" ownership of certain water tankers and demand support for their political party in exchange for access.

This is another example of water's store of value: access to the water, and not just the water itself, is something that can be leveraged. "I don't really have a political stand," said one resident, a father of three who wakes every day at 4am to collect water for his family before leaving for work at 6am, "but joined this party so that I can fetch water from the nearby water tanker."

Local leaders aren't the only ones who exploit their control over the delivery chain. The tanker driver themselves collect hafta, or bribes, from consumers in exchange for water, or from local profiteers, who make themselves middlemen by effectively purchasing control of the tanker's cargo and re-selling it to consumers.

Micro-communities in slums often band together to protect their own interests, but there are hierarchies of access within communities as well. A person's place in these hierarchies can depend on how long he or she has lived in a community, the type of work he or she does or the connections he or she has. "When my family first moved to Savda Ghevra, I couldn't get any water from my block's tanker because they see me as an outcast," said Guru. "It was only until I established myself as part of the community, that I could get access to the tanker without begging."

INNOVATION BY NECESSITY

Politicians can score easy points by pledging to address water issues afflicting a slum like Savda Ghevra, especially at election time. But rarely do they follow through, so residents are deeply skeptical of anyone claiming they want to change things for the better. In some cases, this has made people passive, thinking themselves powerless. In others, though, residents have taken action themselves.

Mamata, the respondent who was among the first groups relocated to Savda Ghevra, spent years lobbying the government to bring electricity to the neighborhood. It took patience and steady pressure, but it eventually worked, and electricity is now available around the clock.

Members of the community have also devised ingenious tactics and strategies of improving their access to water. There used to be just a single pipe connected to the tankers, for instance, which meant a long and occasionally violent struggle to get to the front of the queue. Then a splitter was invented that made it possible to run five pipelines from the tanker at the same time. People were assigned to certain pipelines based on the street they lived on. They were also responsible for buying their own pipe and for behaving respectfully while awaiting their turn.

This community-driven innovation was a significant improvement. It also gave members of each community a greater role in the process. People spoke of it with pride. The number of fights decreased, we were told. In some instances, people from one section went out of their way to help people from another who missed the delivery—the type of thing that is more likely to happen when people have faith that they'll eventually get what they need.

Another example: The traditional way for men and women to carry buckets of water was on their head, supported by hands, transporting heavy payloads across slippery lanes and uneven pavement, often having to make more than one round-trip to get everything home. Over time, though, people tinkered with their containers, looking for a way to make the process easier and safer. They began using tightly-sealed cylindrical water drums that they could roll along the ground like an oversized wheel. They designed buckets that two people could carry, sharing the load. They added special hooks and braces so containers could be more securely fastened onto bicycles and tricycles.

These adaptations saved people time and energy and made it possible to carry (and thus store) more water home at a given moment. Experiments with filtering mechanisms have likewise helped people remove unhealthy particles from the water, although whether the impurities collected by the filter were regularly cleaned out, is unknown.

Knowing that government and leaders can't or won't solve their problems, people found their own solutions and integrated them into their routines. This innovation by necessity first showed, there is a need for alternatives and second, that a bottom-up approach can be effective in some instances. In Savda Ghevra, top-down approaches imposed from the outside have proven less successful, because, we think, they rob people of agency and they have proven unreliable.

But could an alternative set up by outsiders find traction if it gave people agency—in this case to access to affordable clean water when they needed it, rather than whenever a truck driver made the journey into their neighborhood? Could

ABOVE: The splitter in action at a water tanker in Savda Ghevra.

it meld the top-down and bottom-up approach in a way that benefits citizens and operators alike? This is what Sarvajal is claiming it can do.

CASE STUDY: MOTHER DAIRY

Can Sarvajal work in an urban setting? The company has set up pilot projects in Ahmedabad and Delhi, but it's too soon to tell what the outcomes will be. We think it is more constructive to find a similar company with a somewhat similar model, to study it to see if there are any lessons to be learned or mistakes to be avoided.

Take Mother Dairy, a well-known purveyor of milk and milk products that's been operating in India for some 35 years. Its combination of retail outlets and mobile units help the company spread its reach far and wide. There are two Mother Dairy outlets in Savda Ghevra, in fact. Each has ATM-like machines from which consumers can purchase milk at their convenience—much like the mobile ATMs Sarvajal uses for water.

The operator is an employee
Mother Dairy's operators can start selling the product once they pay a deposit of Rs. 100,000 (around $1,675 USD) and go through a training program, after which they become salaried employees. They undergo more training later and are posted in different locations by the company based on their experience.

Packaged and unpackaged milk
Mother Dairy sells pre-packaged milk and also distributes milk in varying quantities through ATMs. According to Mother Dairy, the company distributes approximately 3.2 million liters of milk every day in the markets of Delhi, Mumbai, Saurashtra and Hyderabad, and it has a market share of 66 percent in the branded sector in Delhi, where it sells 2.5 million liters of milk daily. Mother Dairy's mobile distribution unit—basically a cooler mounted on the back of a bicycle—makes door-to-door delivery possible, too. The mobile units allow operators to hire people from the community as delivery men.

The company designs the distribution centers and takes care of regular maintenance and any repairs that need to be made. But operators are responsible for the upkeep of their own facilities and equipment, which they basically paid for with their initial fees. They are trained to handle any emergencies and to do basic troubleshooting, too.

There are similarities to Sarvajal's model, especially the licensing arrangement and the ATM system. Some of these are encouraging. There are differences as well. For one, packaged milk creates a great deal of trash; selling water in packets—as opposed to having people bring their own jugs to fill—would add even more waste, further stretching a municipal garbage collection system that can barely handle the volume it deals with now.

Another, more crucial difference is that people expect to pay for milk, for the most part. They do not necessarily feel, as we will see, that they should have to pay for water.

The Mother Dairy setup: A mobile milk carrier, ATM, dispensing counter, filtering equipment and branding.

$.32 per litre .5L Bottle	$.20 per litre 1.5L Bottle	$.14 per litre .25L Pouch	$.07 per litre 15L Can	$.01 per litre Sarvajal ATM	Free* Tanker
PROS: Bottle reuse	**PROS:** Bottle reuse	**PROS:** Just-in-time	**PROS:** Robust	**PROS:** Just-in-time	**PROS:** "Free" / A known process
CONS: Waste	**CONS:** Waste	**CONS:** Can't be stored, risk of contamination and litter problem	**CONS:** Hard to carry around / Dispensing water requires additional apparatus	**CONS:** Card needs to be pre-loaded with cash / Requires trust in a new technology	***CONS:** People pay in terms of time and effort, and sometimes bribes to the tanker driver / Unreliable source

WATER IS A HUMAN RIGHT, BADLY IMPLEMENTED

When raising the prospect of a commercial venture that provides people water for a fee, the question of the "right to water" needs to be addressed. Put another way: is water a commodity or a necessity, or both?

"Nobody will pay for water," we heard numerous people in Savda Ghevra say. "It should be free!" Water, after all, is not electricity, or cable television, or even milk, for which people will (for the most part) pay. It's more often compared to sunlight, or the air we breathe, a notion that's been further enforced by NGOs and local politicians trying to pressure the government to improve water tanker access, especially to the slums.

Indeed, several commercial ventures involving water have failed or gained little traction. Privately-owned tanks selling clean water have been vandalized. An effort to sell small packets of drinking water for 1 rupee each was embraced primarily by thirsty kids on playgrounds but few others (it also led to a litter problem). The exceptions have been a handful of small-scale door-to-door delivery services, which serve a specific niche (places not served sufficiently or at all by government tankers, and customers who could not abide by the existing public system).

That said, there are limits to the concept of the "right" to water when that right is not being observed or honored. For whatever reason, the Delhi Jal Board is unable to fulfill this right by guaranteeing regular delivery of quality water. This is something the people of Savda Ghevra experience first-hand, engendering in them a sense of being overlooked or forgotten. "If there's a water shortage, we are the last on their list," one respondent declared as a matter of fact. "One time the tanker did not come for four days."

If the provision of water is viewed as a right that's being denied to certain populations, the strife that can arise around the issue is hardly surprising. Lengthy delays in deliveries have led to riots wherein angry residents physically attacked the drivers, who are, for better or worse, the public face of the city's water services, or lack thereof. These sorts of incidents, however, have made drivers less likely to deliver water in the days that followed—a punishment of sorts for the outbursts that reinforces the notion that they, or those they work for, are the ones denying the people's right to water.

On a less abstract level, the current system undermines overall productivity. The cumulative amount of time spent waiting in line, wondering when the trucks will come and planning around delays and shortages that are likely to ensue is significant, to say the least. "If water was not a problem people would be making a more productive use of their time," says Mamata, "earning more money perhaps!"

The Sarvajal model poses a very intriguing question: As frustrated as residents of Savda Ghevra are, would they be willing to "invest" in the unknown technological model Sarvajal is offering them over the maddening, undependable "human" model they deal with now? Would they be willing to make that change? Could it hurt them if, say, they switched to Sarvajal, or some similar service, and then found themselves unable to access an ATM for whatever reason, or unable

to top up their card before they needed more water? They have ostensibly given up their spot in line at the water tanker distribution point, so what options would they have?

Theoretically, having direct access to water ATMs, along with a prepaid card that opens them up, gives citizens more agency in the process. Furthermore, the data and analytics collected by Sarvajal's technicians bring elements of the "smart city" to places like Savda Ghevra, showing how resources can be allocated based on need and usage, not patronage and opportunism.

But there are other questions as well: Would people in places like Savda Ghevra find the prepaid card system user friendly, and how might it or the interface with which it's used be designed so that it is? (The recent push for national biometric identity cards could prove informative here). How much coverage could it get in a given area correlated to mobile phone use, and how quickly? How scalable is the model? And privacy: who gets to see the data that is collected about customers, and how well is personal information protected? Lastly, do people need "one more card," or could it somehow be incorporated into an existing card, a shared account of some sort?

It's worth remembering that very few of the people in Savda Ghevra chose to live there in the first place, and that most of the people who come from the countryside and wind up in the slums of Delhi (or Mumbai, or Kolkata) will not have any other options. With that in mind, then, will a system like Sarvajal's feel like something that belongs to them, or something that's being imposed on them?

Water containers are a precious commodity and unsafe to leave around in urban slums, which are densely populated.

50   TOP: A Savda Ghevra resident fondly talks about her family, and their aspirations, pointing to photographs on the wall.   BOTTOM: Local leaders bank for votes promising to solve the water issue, election after election.

A businessman serves water in exchange for plastic tokens, which people buy from him on a monthly basis. Their colour represents different values for different quantities of water.   51

Female students at a government school in Savda Ghevra try to get as much water from dry taps during their 5-minute break in between studies.

CONCLUSION

Given the accelerated urbanization in India and beyond, it is clear that water issues will become increasingly important in the decades to come.

The majority of the people we met during this study expended a great deal of time and energy every day trying to secure clean water. In this context, the widespread belief that water is a right and that it should be free is moot. In the slum residents pay for their water in one way or another—with time and money, with their ability to move and make political choices based on other interests.

As such, they clearly understand the intrinsic value of the water they collect, store and use. (And even if they did not know the precise numbers, they would be at least generally aware of the costs a lack of clean drinking water can impose. For example: UNICEF estimates that water-borne diseases in India carry annual costs of $600 million in medical bills and lost productivity.) People who have not experienced similar circumstances may not understand it, but many of the people we met in Savda Ghevra know that if they had better access to clean water, they would have more time and energy to devote to their family, their work, their children's educations—and, ultimately, a better life.

Designing a solution that scales quickly

So what would a viable solution for the water issues in slums look like? Given the complex social dynamics, whether the solution comes top-down or bottom-up, there is probably no one-size-fits-all answer. Our research indicates that a sustainable water solution must be able to clearly articulate and respond to the cost and value of the service. It must give some ownership and control to the residents themselves. It must also be sensitive to local forces that might impact people's access to water and understand how they could impact any effort to implement a new system.

Creating value for the community, by the community

Sarvajal's effort to bring affordable, clean water into the urban slums of Delhi seems promising in several respects. Its micro-grid system gets local entrepreneurs involved in the business at a very fundamental level. The different franchises can be adapted to meet the needs of a given locality.

What's more—and this may be the most important point—Sarvajal's water ATMs make clean drinking water available 24-hour a day. For most slum residents, this would be life-changing. Yes, they would have to pay for it, but the fees at present are still very low. The more salient issue would seem to be that their access to clean water would no longer be dependent on tanker deliveries. It would depend on their own schedules, their own needs.

55

To be sure, there are immense challenges ahead for Sarvajal, or for any water solution or business directed toward urban slums. The political and social dynamics are extremely complex, and setting up new ATMs requires significant relationship- building throughout a given community, and consumer literacy and trust in this new technological solution. Extensive, targeted outreach is needed in order to communicate to the community the value of the service being offered, and the reasons someone should pay for something they think should be free. If the technology Sarvajal employs consistently works, then it comes down to education.

Threatening the "right"?

One can argue that clean water is and should be a basic human right. However, because of its intrinsic value in the urban slums, various entities try to leverage that value for profit or influence. One has to wonder: are businesses and organizations, including Sarvajal, undermining the "right" to water? Or is that a purely theoretical question, given the very real value all the players in the delivery process, including the consumers, ascribe to water?

During the frog team's last day in Savda Ghevra, we witnessed the Chhath Puja, where men and women fast for days, coming together during the sunset hours to wade waist deep into the holy water, to offer prayers to the sun. The "holy water" is really just a muddy puddle, which is frigid in the winter, when the ritual is observed. Men, women, and children stood shivering in the water for hours, waiting for their prayers to be heard. "The more suffering, the more likely my prayers will be heard," one father said, as he prayed for his son to recover from sickness and his daughter to find a good marriage.

On one hand, this reliance on other entities to provide one's needs suggests that people will willingly cede control over certain portions of their lives when they feel another force is somehow more powerful, more magical, than they are. On the other hand, however, the people enduring extremely uncomfortable conditions for hours on end show how far people will go when they think something or someone offers the chance of a better life.

We may not have the final answers to all the questions we raised above after our time in Savda Ghevra, but we do know that these two intertwined instincts—to both cede and seize agency for problem solving—will influence the process. Depending on governments and NGOs alone to provide a solution will not yield one. It would also deprive us of the great wealth of know-how and ingenuity that emerges bottom-up from community members themselves when they start making necessary changes to their own environment.

The clearest point of all, however, was that anything that made accessing water easier, safer and less of a disruption than it is now will have an enormous impact on these people's lives.

TOP: A lady immerses herself in cold water for the Chhath Puja, which they believe is holy and will wash away their sins.

BOTTOM: The common wish of the residents of Savda Ghevra is the well-being and progress of their children.

Chhath Puja in Savda Ghevra

RESEARCH TEAM

Somaditya Banerjee
Somaditya is a Senior Interaction Designer at frog. His interests, in the field of design, are interaction, information and visual design. At frog, Somaditya is responsible for leading teams and producing design work across different media like web and mobile. He has a degree in commerce and a diploma in visual arts.

Gaurav Bhushan
Gaurav is an Interaction Designer at frog, who loves to collaborate with teams across cultures and studios on projects that range from design research to detailed design. He is a post graduate in Information Design from the National Institute of Design, India.
Twitter: @bgaurav

Jennifer Lee Fuqua
Jennifer is an Associate Program Management Director at frog, focusing on innovation management, design research, and creative workshop facilitation. Jennifer holds a MA in Graphic Communication from New York University and a MBA from UCLA Anderson School of Management.
Twitter: @yurlee

Nitin Gupta
Nitin Gupta is a Creative Director at frog, responsible for its design practice in India. He is a trained human factors and cognitive science professional specializing in combining research and design to create experiences for new markets and technologies.
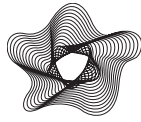*Twitter: @niting13*

Vaijayanthi Iyengar
Vaijayanthi is an Interaction Designer at frog, designing solutions for smart devices, web, platforms and gaming consoles. She has a degree in Information and Interaction design from NID Ahmedabad and Architecture from Anna University, Chennai.
Twitter: @vyju

IMTFI
INSTITUTE FOR MONEY, TECHNOLOGY
& FINANCIAL INCLUSION

frog™