Assessment of the status, service delivery infrastructure and governance of drinking water supply in small and medium towns

WaterAid/ Dhiraj Singh

Bakshi Ka Talab, Lucknow, Uttar Pradesh

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With the objective of assessing the critical water supply situation, governance, and service delivery in small and medium towns of India, and of providing recommendations to municipal bodies, water utilities, and governments, WaterAid India conducted a study in 2019 in six towns spread across India. Bakshi Ka Talab (BKT), in Lucknow district of Uttar Pradesh, was one of the medium towns selected for the study.

OBJECTIVES

1. To assess the drinking water supply situation and service delivery in four small and two medium towns. This included assessment of the quantity and quality of the water supplied.
2. To understand sanitation systems at individual and household (HH) levels as well as community levels from a drinking water safety point of view.
3. To understand the current mandates as well as policy, regulatory, and legal framework, specific functions, finances, and functionaries allocated to the local bodies in order to fulfil these mandates.
4. To consolidate learning and suggest solutions, especially in the context of the poor and other marginalised populations in the small and medium towns of India.

METHODOLOGY

In order to capture the households' and community's perspective on the water supply and sanitation situation in Bakshi Ka Talab (BKT), a survey was conducted with 240 households spread across four wards of the town. This was followed by interviews with six key informants using a structured questionnaire, and focus group discussions (FGD) with community members. Laboratory-based water quality testing of 40 drinking water samples from select water sources was also conducted.

For the household-level survey, four wards were shortlisted—one from the central area of the town, second from the periphery, and the third and fourth from wards in between the centre and the periphery. 60 households were surveyed from each of these four wards. The sampling criteria for the households ensured coverage of: i) households dependent on different types of water sources, and ii) households covering marginalised families or people living in informal settlements. Key Informant Interviews (KIIs) mainly covered a broader perspective of the town; service delivery provisions, water conservation, and measures for monitoring water quality. FGDs were also conducted to supplement and triangulate findings from the survey and interviews.

These findings were supplemented by testing samples from shortlisted water sources in an NABL-accredited test lab. 40 such samples (28 from source and 12 user-level samples) were tested as part of the study.

The criteria for short listing water source samples for testing included:

- Samples from each type of drinking water source including individual households and public water points.
- Samples from water sources at varying ground level depths ranging from a hand pump at 50ft to submersible pumps at 120ft and a tube well at 250ft.
- Samples from different locations that present a mix of potentially safe and unsafe sanitary sites.

The entire study process was conducted between September and November 2019.

BACKGROUND

Policies and regulations for urban water supply and management in Uttar Pradesh

Uttar Pradesh is the most populous state in India with a total population of 19.96 crore according to Census 2011. 78 per cent of this population lives in rural areas and 22 per cent in urban. Though an increase of 1.50 percentage points has been recorded in the urban population from 2001 to 2011, the level of urbanisation (22.28 per cent) is quite low as compared to the all-India figure of 31.16 per cent[1]. By 2021, the urban population of the state is estimated to be 5.83 crore, which would mean an increase of 1.38 crore as against the increase of 1.09 crore recorded from 2001–2011. Although Uttar Pradesh has the largest urban system in the country with 652 urban local bodies (ULBs), it ranks as the sixth least urbanised state of India.

The state is characterised by marked regional imbalances in the level of urbanisation. As per Census 2011, the western region with 32.45 per cent urban population is the most urbanised and the eastern region with 13.40 per cent is the least urbanised. The urban population of the central and Bundelkhand regions stand at 20.06 and 22.74 per cent respectively[2]. The trend of urban population growth in Uttar Pradesh shows that large towns, especially class-I towns (< one lakh population)[3] are growing relatively faster. This is discernible from the fact that class-I towns contained 33.71 per cent of urban population in 1951 which increased to 60 per cent in 2011. The number of class-I towns also increased from 14 in 1991 to 54 in 2001 and 64 in 2011, whereas the number of metropolitan cities (ten lakh–one crore population)[4] increased from six in 2001 to seven in 2011. The population concentration in large cities is indicative of spatial polarisation of employment opportunities. Small towns, especially class-V and class-VI towns (> ten thousand population) exhibit a negative rate of growth, which is indicative of a growing trend of a population shift towards larger cities i.e., cities with a population of more than five lakh.

[1] http://uptownplanning.gov.in/page/en/urbanization-in-uttar-pradesh
[2] http://uptownplanning.gov.in/page/en/urbanization-in-uttar pradesh#:~:text=Besides%2C%20number%20of%20class%2DI,spatial%20polarization%20of%20employment%20opportunities
[3] https://planningtank.com/planning-techniques/classification-of-towns
[4] http://mohua.gov.in/upload/uploadfiles/files/URDPFI%20Guidelines%20Vol%20I.pdf

Table 1

Water and sanitation-related policies in the state

Uttar Pradesh State Water Policy, 1999 **Source:** http://www.swaraup.gov.in/WebSite/Downloads/up_wp.pdf The broad objective includes preservation of the scarce water resources, qualitative improvement in water resource management, maintaining surface and groundwater quality, project formulation on basin or sub-basin concepts with due consideration to ecological balance, and equity and social justice in water resource allocation.
Uttar Pradesh Groundwater Regulation and Management Act, 2019 **Source:** http://upgwd.gov.in/MediaGallery/GWDact2019En.pdf The Act provides for protecting, conserving, controlling, and regulating groundwater to ensure its sustainable management in the state, both quantitatively and qualitatively, especially in stressed rural and urban areas.
State Ground Water Conservation Mission **Source:** http://upgwd.gov.in/StaticPages/SGWConservation.aspx The Mission aims to construct appropriate rainwater harvesting and groundwater recharge structures in 271 critical and semi-critical blocks and 22 urban areas of the state to increase the availability of groundwater resources to an effective extent.
Uttar Pradesh State Septage Management Policy, 2019 **Source:** https://cdn.cseindia.org/attachments/0.35632400_1572954351_Septage-Management-Policy---English.pdf The objective of this policy is to enhance the ability of local implementers to build and operate septage treatment systems for urban centres and promote the behaviour change and supporting environment needed for systems to be effective and sustainable.
Draft Policy on Waste Water Reuse and Recycle in Urban Local Bodies, Uttar Pradesh **Source:** http://kmc.up.nic.in/Documentary%20Evidence_ANNEXURE/ANNEXURE%2010.4%20Waste%20Water%20%20Recycle%20and%20Reuse%20Policy(final).pdf This policy intends to direct the water sector towards more efficient use of water resources. It details the intention to reuse treated wastewater in irrigation so that fresh water can be utilised for municipal uses.
Building By-laws, 2008 (Amended 2016) **Source:** http://awas.up.nic.in/Pdf/BuildingBye-LawsAmended2016.pdf Projects with an area of more than ten acres (4,447m^2) are to be developed as 'green buildings' inclusive of a rainwater harvesting structure.
G.O. Dated 19-06-09, Housing and Urban Planning Department, GOUP **Source:** http://uptownplanning.gov.in/Go/From_2009_to_2010/Rain_Water_Harvesting-2009_6.pdf For urban areas, rainwater harvesting with combined recharge system has been made mandatory for all new housing schemes and group housing schemes as well as for individual plots of 300sqm and above.
Uttar Pradesh Urban Planning and Development Act, 1973 **Source:** http://awas.up.nic.in/acts1973.html The development authority[5] to execute works for supply of water, disposal of sewage, and levy development fees. It may also, with prior approval of the state government, make by-laws consistent for water supply, drainage, and sewerage plans, among others.

[5] An authority constituted for an area that requires to be developed according to plan

Table 2

Legal framework and regulatory bodies as per law

Key legal frameworks	Administrative body	Total numbers[6]
Uttar Pradesh Municipal Corporation Act, 1959	Municipal Corporations (*Nagar* Nigam)	17
Uttar Pradesh Municipalities Act, 1916	Municipal Council (*Nagar* Palika Parishad)	198
Uttar Pradesh Municipalities Act, 1916	Town Area (*Nagar* Panchayat)	437

[6] http://upbdmfr.gov.in/english/sampatti.html

FINDINGS OF THE STUDY

Introduction to Bakshi Ka Talab (BKT)

BKT is a nagar panchayat in the district of Lucknow, Uttar Pradesh. It was declared as a nagar panchayat on 31st December, 2009. The town is divided into 19 wards for which elections are held every five years. According to Census 2011, the nagar panchayat has a total population of 49,166 of which 25,657 are males while 23,509 are females. The population of the town in 2019 was close to 60,000. This reflects a 20 per cent increase over the last census, thereby indicating a rapid pace of urbanisation. These figures are exclusive of the floating population, which if added, would make the current population even higher.

Situated to the north of Lucknow city, the town was once famous for its pond which was the largest pond in Lucknow. It was constructed by Raja Tripur Chandra Bakshi in 1840. Presently, a vast expanse surrounding the same pond stands as a town area and is named after it.

In 2011, Bakshi Ka Talab nagar panchayat had administrative authority over 8,728 households to whom it provided basic amenities like water and a sewerage system. The nagar panchayat is also authorised to build roads within its limits and impose taxes on properties under its jurisdiction. In 2019, the number of households had increased to 9,722. The office of the nagar panchayat has two permanent staff members—an executive officer and a clerk—and around 200 contractual staff comprising office-based staff (computer operators and accountants) and field-based staff (drivers and safai karamchari).

Water supply and sanitation arrangements

As the town lacks a piped water supply system, the residents of BKT are currently drawing drinking water from two sources - individual arrangements like borewells with a submersible pump, and government sources like hand pumps. The town, therefore, is completely reliant on groundwater sources wherein hand pumps are causing selective drawing and submersible pumps cause excessive pumping of groundwater. As per the nagar panchayat office records, currently the town has approximately 1,800 India Mark II hand pumps and community-level piped water supply provision in two wards serving 20–25 households.

Around five water tankers operate free of cost in the summers to meet the additional demand for water in marginalised families. For functions and ceremonies, a 5,000 litre nagar panchayat tanker is available at INR 500 while a private tanker of 3,000 litres capacity costs INR 500–700.

The town has a total of four public toilets, 20 community toilets, and an under-construction 'pink toilet' meant exclusively for women. Each of the 19 wards has at least one community toilet, while public toilets are located in commercial areas. There are also two dumping yards for disposal of household-level waste.

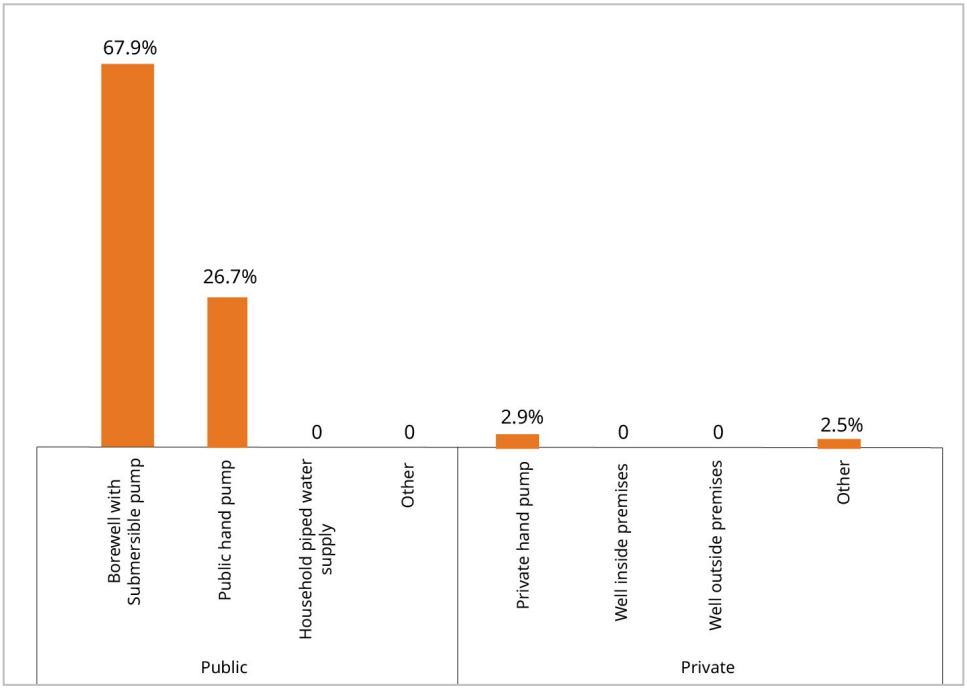
The two water and sanitation-based functional institutions in the town are Bakshi Ka Talab Nagar Panchayat Samiti and Swachhata Protsahan Samiti. The primary responsibility of the committees is to promote information and education around clean drinking water and safe sanitation. They organise community-level meetings for awareness on sanitation and undertake IEC activities through wall paintings and audio announcements. Both these committees have a helpline and a grievance cell for redressal of issues related to water and sanitation. Grievances can be submitted online through digital platforms or in hard copy.

However, the residents complained that despite these provisions, problems relating to water and sanitation remained largely unaddressed.

Water service delivery

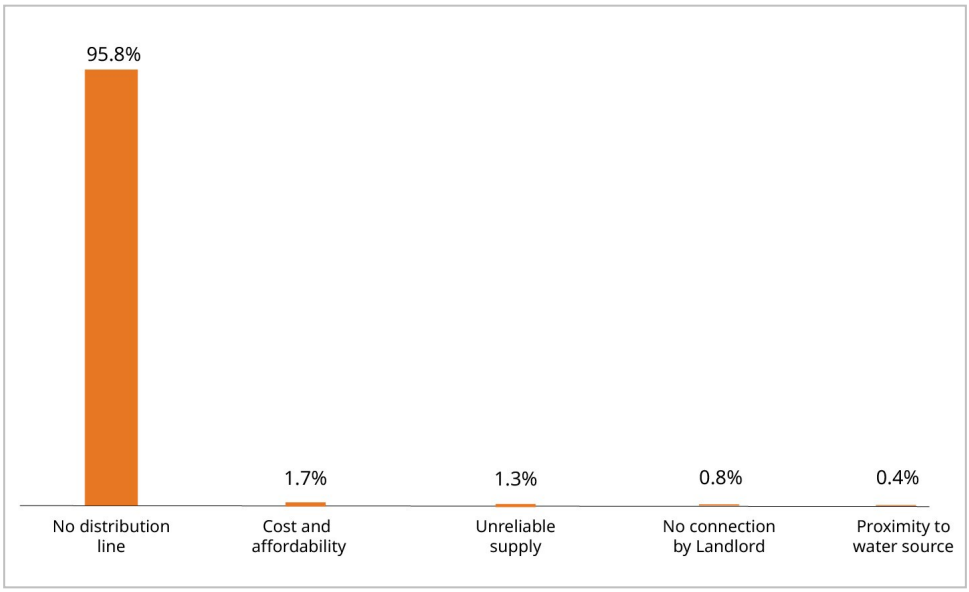
It was observed that BKT has a weak public water delivery system with only 26.7 per cent of the households having access to water through public water sources i.e. hand pumps (Graph 1). Majority of the remaining surveyed households had made individual arrangements in the form of private borewells with submersible pumps, which cost a minimum of INR 45,000. Since there is no piped water supply (PWS) in the town, the absence of a distribution line in the ward was cited by 95.8 per cent households as the reason for lack of access to piped drinking water (Graph 2).

A piped water scheme with provision for five tubewells has been proposed for BKT. However, its slow progress has led to delays in implementation. The current status of the scheme (in 2019) was that the land survey for laying of pipelines is complete and it will take another year for the construction phase to begin.



Graph 1

Public versus private water sources (n=240)



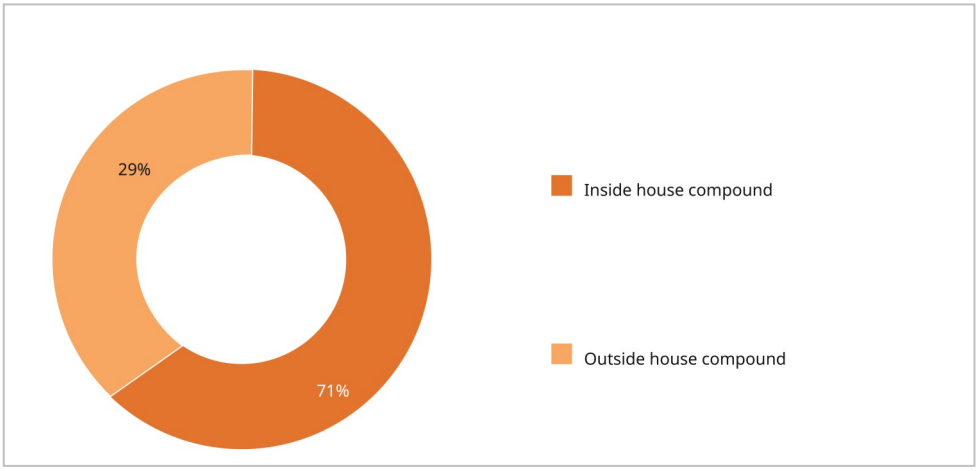
Graph 2

Reasons for lack of access to PWS (n=240)

Access to water

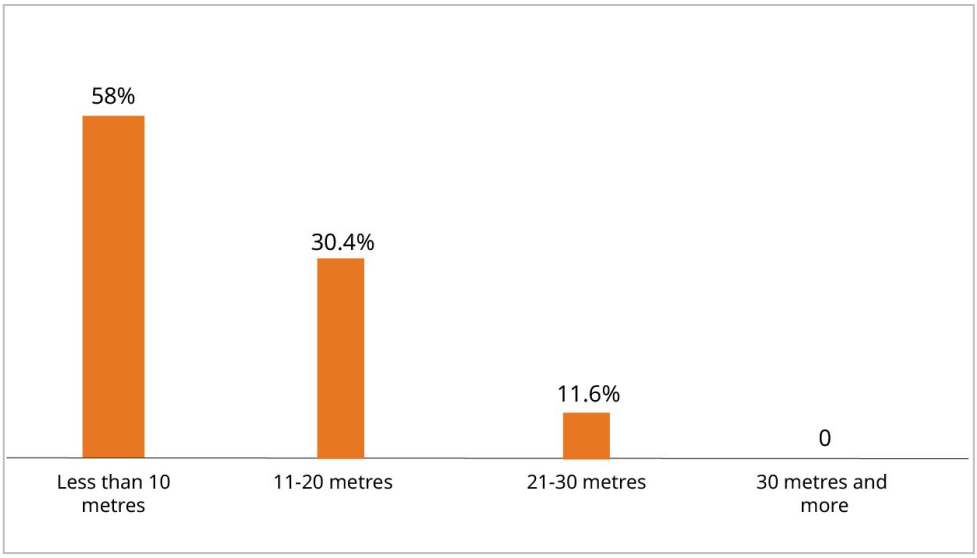
The survey data reveals that 28.8 per cent households do not have access to water within their premises (Graph 3) and have to walk for water every day. Of these households, more than half (62.3 per cent) make between 6–15 round trips per day to access water and meet their domestic needs. It is also interesting to note that for the majority of these households (58 per cent), the distance travelled to fetch water is less than ten metres (Graph 4), which indicates the presence of a public water source at close proximity to their homes. Therefore, the proximity of public water sources to homes has eased the task of fetching water from an external water source. The survey also reported that fetching water was largely done by women in more than three-fourth (76.8 per cent) of the households.

Since 70 per cent of water service delivery is privately owned, the majority (64.2 per cent) of households reported not facing any disruption in water supply. Of the households that face disruption, the leading reason stated was frequent power cuts (70.9 per cent) followed by technical issues with the pump or borewell (29.1 per cent). Only 19.2 per cent households depended on secondary sources for water consumption due to reasons like non-availability of water from the primary drinking water source and reduction in the quantity of water.



Graph 3

Households with location of water source (n=240)



Graph 4

Distance travelled to fetch water (n=69)

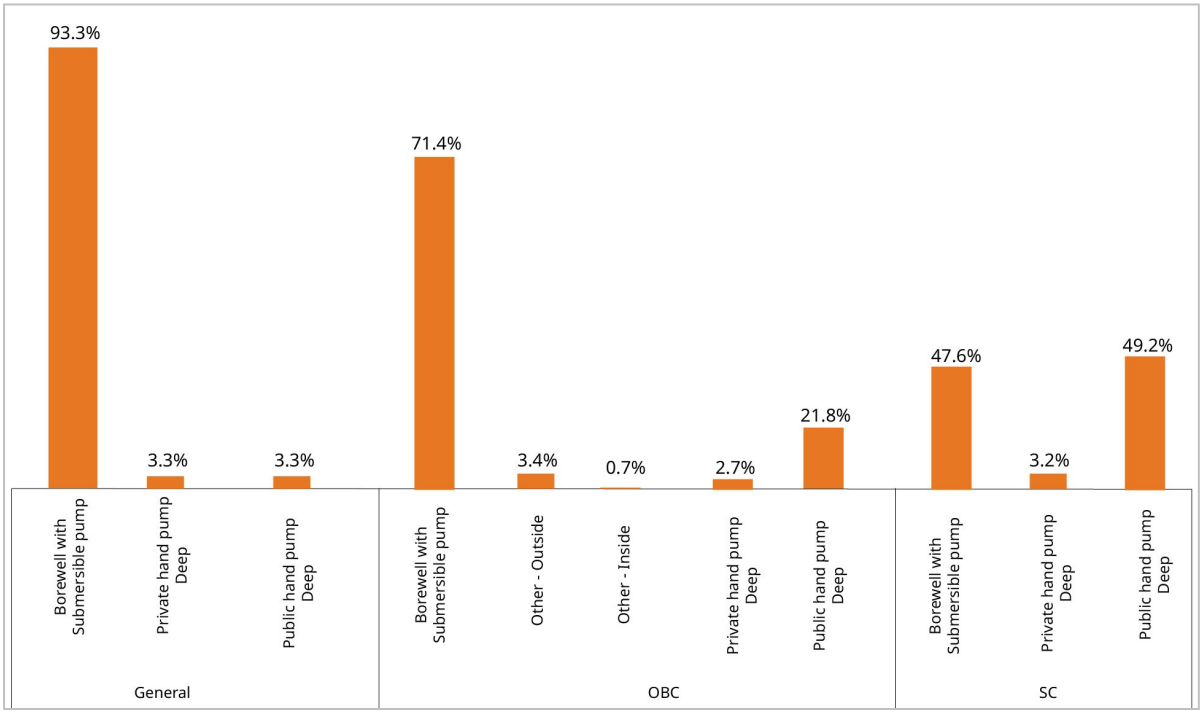
Caste-wise access to water source

The study found that different caste groups access water from various water sources. In the absence of PWS, use of borewells with a submersible pump was predominantly reported among the general category households (93.3 per cent) while the use of public hand pumps was found to be highest among the scheduled castes (SC) at 49.2 percent.

Overall, the caste group that was least dependent on external water sources was the general category with only 3.3 per cent households fetching water from outside. This was followed by households from the other backward classes (OBC) at 25.2 per cent. The caste group that was reported to be primarily dependent on external water sources was the SC with half the households (49.2 per cent) fetching water from outside (Graph 5).

Graph 5

Caste-wise access to water source (n=240)



Water storage and use

Though the households most commonly stored water in buckets (87.9 per cent), it was also found that the use of overhead tanks for storing drinking water was highest in BKT (32 per cent) as compared to the other five study towns. Interestingly, all households that reported having an overhead tank also had borewells with a submersible pump as their primary source of drinking water.

- Water for drinking and cooking was mainly stored in containers with lids (87.1 percent), though a small per cent of households (7.1) also stored drinking water in water filters.
- 66.3 per cent of the households were reported as keeping drinking and cooking water at the ground level. This increases chances of contamination by kids, pets, insects, and dust.
- The water handling habits of the households were particularly poor with 81.9 per cent consuming water by dipping a non-ladle vessel into the container. Such unhygienic habits could result in water contamination and affect the health of the family in the long run.

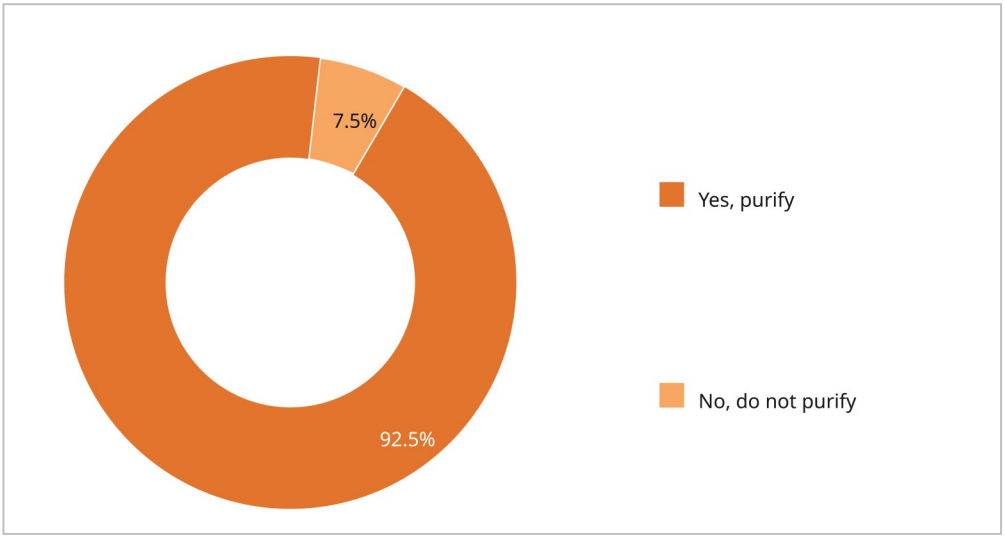
Water quality monitoring

A major gap in ensuring access to safe drinking water was the lack of monitoring mechanisms to track drinking water quality. When questioned, the nagar panchayat officials could not recollect the year when a water quality test was last conducted. According to the survey, 93.3 per cent of the households reported that water samples were never collected at their level. Of the 6.7 per cent households who reported that water samples were collected, 68.8 per cent reported that they were collected by private companies selling water purification systems, thereby indicating a large market developing for water purification units. The remaining households reported that samples were collected by government organisations and NGOs. However, the results of the test were shared with only half the households. According to a respondent, "people have an idea about the diseases that occur due to polluted water but they do not have any idea about water quality monitoring systems".

Another problem faced by the households is water logging due to the absence of adequate drainage facilities. Almost all the drainage water is diverted towards the nearby ponds. This leads to contamination of surface water bodies, which in turn impacts the sub-surface groundwater. According to the survey, 13.8 per cent reported that they were facing water quality challenges that were primarily related to taste and odour. In a few instances, they were colour related too.

The challenges in drinking water quality were mostly found to be seasonal (48.5 per cent), occasional (30.3 per cent), and in some cases recurring (21.5 per cent). As stated by a respondent during the FGDs, "our slums face problems due to the absence of drainage facilities, and during the rainy season water logging is common in our area". The residents were unaware that a grievance cell and helpline number were available for them. This reflects asymmetric information and there is a dire need to inform people about the various grievance-redressal measures present in the town to address their water and sanitation problems.

Although 13.8 per cent households reported facing water quality issues, only nine per cent were using any form of water purification measures. Additionally, the use of water purification methods in the town as a whole was low with only 7.5 per cent reporting that they purified their water (Graph 6). Out of these, the majority (61.1 per cent) used Reverse Osmosis (RO) filters, followed by gravity-based non-electric filters (16.7 per cent) and 11.1 per cent boiled their water (Graph7). A striking observation was that none of the households surveyed in BKT purchased cooking and drinking water.

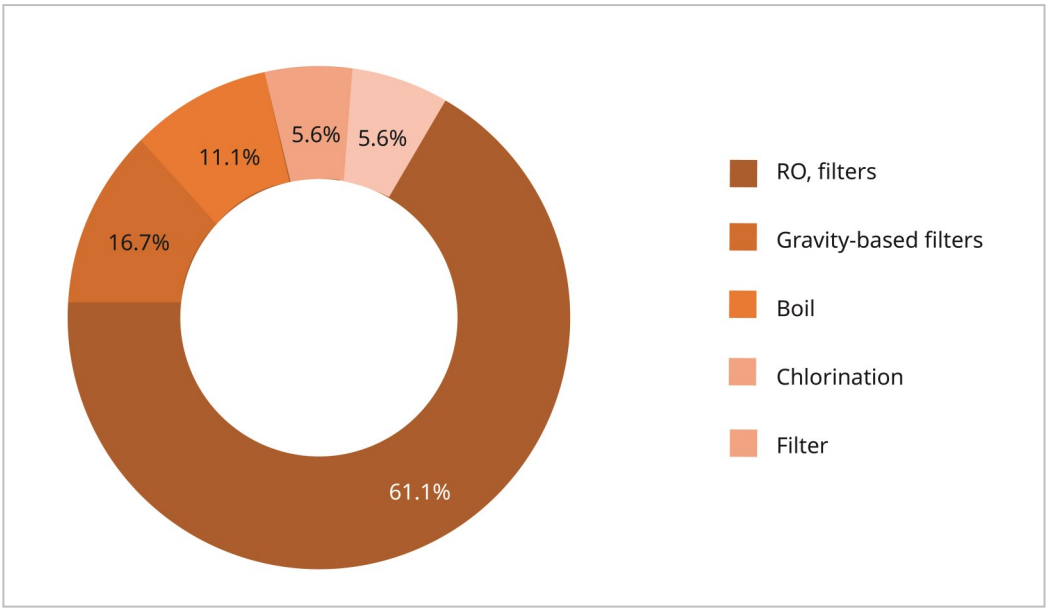


Graph 6

Households practicing purification measures (n=240)

Graph 7

Types of purification measures practiced in households (n=18)



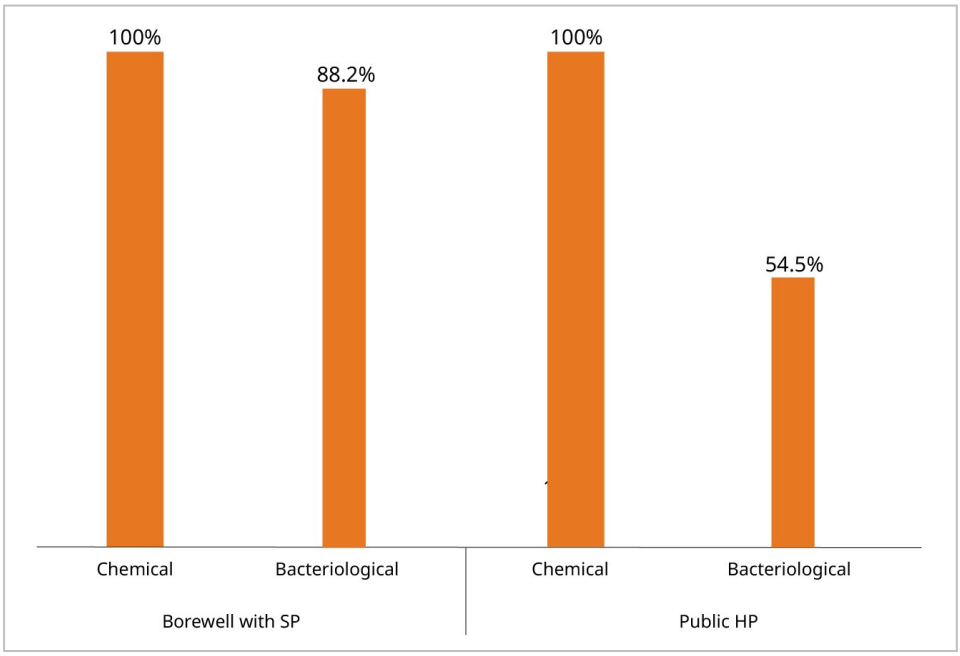
Water quality test results

Testing of water from different water sources in the town like public hand pumps and private borewells with submersible pumps revealed that all the source samples (100 per cent) were chemically contaminated. The main indicators of chemical contaminants were total hardness, total alkalinity, and magnesium, which were above acceptable limits.

88.2 per cent of the samples from borewells at the household level were bacteriologically contaminated. About 17.8 per cent of the total source samples were detected with faecal coliform and E-coli above acceptable limits while 75 per cent of the source samples had total coliform above acceptable limits. 100 per cent of the public service delivery sources (public hand pumps) were also chemically contaminated while 54.5 per cent were bacteriologically contaminated (Graph 8).

Graph 8

Water contamination by source, based on lab test results (n=28)

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Sustainability measures

The groundwater level has fallen drastically over the past ten years. According to officials, groundwater was earlier available at 20–30ft which went down to 65–80ft by 2019. Excessive withdrawal can be traced to the extreme reliance on groundwater for meeting drinking water and also irrigation needs as the wards located in the periphery of the town are engaged in agriculture. There are also brick kilns in the periphery that require water. Though the nagar panchayat reported water availability at a depth of 50–60ft from the surface, the local residents had dug bore wells as deep as 120–150ft.

According to the survey, 100 per cent of the households use groundwater for their consumption. Of these, 17.1 per cent have re-drilled or deepened their bore well in the past. Though withdrawal of water is rampant, water conservation measures have not been adopted at either the household or administrative level to sustain groundwater. None of the surveyed households have taken any steps to ensure sustainability of the groundwater level. Source sustainability measures are not even part of the nagar panchayat plans but the network of ponds in the town enables automatic recharge and rejuvenation.

Apart from residential areas, BKT has a large presence of educational institutes and also serves as an Air Force base. Therefore, water conservation measures could exist at an institutional level to reduce the annual water demand. Water saving measures such as retrofitting with water-efficient showerheads and water closets, and water conservation measures like rainwater harvesting and recharging could go a long way in managing the situation.

Sanitation

The Indian government has prioritised access to safe sanitation with schemes like Swachh Bharat Mission. The survey in BKT revealed that only 87.1 per cent households had functional toilets at home. The predominant toilet technology (88.5 per cent) was simple containment structures, i.e., simple holding tanks[7]. Only 7.7 per cent households reported having septic tanks (Graph 9). Septic tanks are environmentally safe in terms of preventing groundwater contamination provided they meet the design standards and the accumulated faecal sludge is periodically removed.

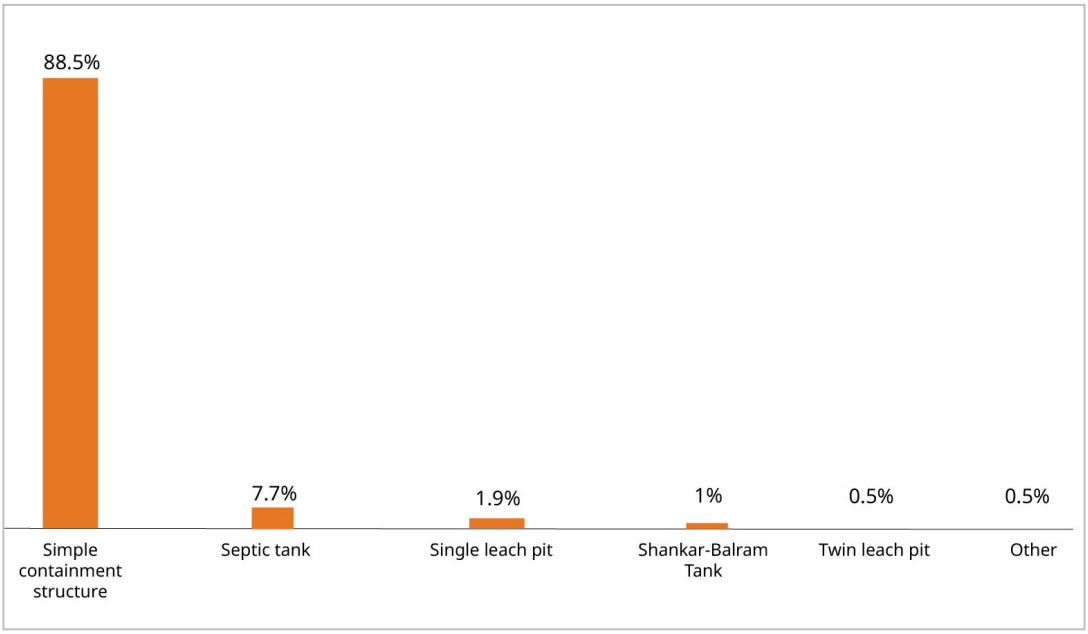
The proper management of faecal waste is of primary importance. According to the survey, 86.6 per cent of the households with individual household toilets have not desludged their pits yet. While this needs to be investigated further, one of the main reasons could be that the simple containment structures have their waste outlet into the open drains.

The proximity of toilet pits to the primary groundwater source is alarming. More than half of the households (57.8 per cent) reported that their toilet pit is at an unsafe distance from the primary groundwater source i.e., the horizontal distance between the nearest toilet pit and the groundwater source is less than 10 metres. Further, it has been pointed during FGDs that "cleaning of drains and streets is done twice every day but it is mostly done in the upper caste and the affluent wards". According to the officials, "the nagar panchayat organises wall paintings, audio announcements, and meetings to spread sanitation awareness". However, this awareness was not seen among the people.

More than half of the households (57.8 per cent) reported that their toilet pit is at an unsafe distance from the primary groundwater source i.e., the horizontal distance between the nearest toilet pit and the groundwater source is less than 10 metres.

Graph 9

Types of toilets technology (n=209)



[7] The data presented is based on the responses of the respondents; verification of toilet sub structures was not possible.

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INTERVENTIONS NEEDED

- Functional household tap connection services should be provisioned by the town authorities to the households as it will save time and increase productivity.
- While starting a new piped water supply project in BKT, there is a need to estimate the demand for water per household per day for the next 20 years as the town's population is rapidly increasing.
- Piped water supply connections should be metered, wherein connection charges and monthly tariffs are decided, keeping in mind the various socio-economic groups.
- Annual groundwater level monitoring mechanisms should be planned and implemented with the objective of ascertaining groundwater levels and planning water conservation measures accordingly.
- Water quality testing should be made an essential part of the safe drinking water supply protocol and conducted twice a year; pre and post monsoon. On commencement of the water supply scheme by the government, cleaning and chlorination of the water storage tanks should be followed at least once a year.
- The reliance on groundwater in the town is quite high, therefore groundwater recharge should be given prime importance and source sustainability measures such as rainwater harvesting and pond-recharge should be undertaken in accordance with the Government Order (GO) passed by the Housing Department, GoUP, which mandates recharge systems for individual plots of 300sqm and above.
- Greywater management and safe disposal of sewage waste is particularly poor. Therefore, legislative provisions with regard to water pollution and environment protection should be enforced in the town. Moreover, septage should be disposed in designated disposal or treatment sites. Given the increasing population of BKT, a separate faecal sludge treatment plant for the town is highly recommended.
- Hygiene is an important factor for achieving better health outcomes. There is a need to inculcate good hygiene behaviour and purify drinking and cooking water as 75 per cent of the total samples tested were detected with total coliform above acceptable limits. Public health measures for disinfecting water and preventing further infection are urgently required. Also important are measures for epidemic preparedness and dissemination of IEC materials on hygiene.

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Report prepared by Nirma Bora with review inputs from Chanchal Kumar Modi, Anurag Gupta and Chandra Ganapathy, under overall guidance of VR Raman. We acknowledge Trios Development Support (P) Ltd for conducting the household survey and key informant interviews, and Equinox Lab for conducting the water quality tests. The study was facilitated by WaterAid India's Regional Office for North India, with support of partner NGO Vigyan Foundation.

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