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


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Chandbali, Bhadrak, Odisha

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WaterAid

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With the objective of assessing the critical water supply situation, governance, and service delivery in the 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. Chandbali town in Bhadrak district of Odisha, was one of the small towns selected for the study.

OBJECTIVES

1. To assess the drinking water supply situation and service delivery in two small and four 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 around critical service gaps 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 Chandbali, a survey was conducted of 180 households spread across three wards of the town. This was followed by interviews with six key informants (KI) using structured questionnaires, and focus group discussions (FGDs) 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, three wards were shortlisted—one from the centre of the town, another from the periphery, and the third from one of the wards between the centre and the periphery. 60 sample households were surveyed from each of the three wards. The sampling criteria for choosing households in Chandbali ensured coverage of: i) households with access to piped water supply (PWS), and ii) households using other types of water sources. Families from marginalised communities or people living in slum or informal settlements were also identified and covered. Key Informant interviews (KIIs) mainly covered broader perspectives of the town; service delivery provisions, water conservation, and measures to monitor 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 (27 from source, and 13 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, public water points, and piped water supply.

- Samples from water sources at varying ground level depths ranging from a hand pump at 50ft to a submersible pump at 120ft and deep boring at a depth of 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 Odisha

With an urbanisation level of 17 per cent, Odisha is currently the fourth least urbanised state in the country after Himachal Pradesh, Bihar, and Assam. Although an increase of 2.39 percentage points was recorded in the urban population from 2001 to 2011, the level of urbanisation (16.69 per cent) in the state in 2011 is quite low compared to the all-India figure of 31.16 per cent[1]. At present, there are 114 urban local bodies (ULBs) in Odisha, of which five are municipal corporations, 48 are municipalities, and 61 are notified area councils[2].

Even with a few large urban centres, the urbanisation pattern of Odisha is not clustered, i.e., the urban areas are distributed across the state. However, settlements are more concentrated in the eastern belt of the state, in proximity to the coastline.

Even though Odisha is 24th in terms of overall urbanisation in the country according to census 2011, a few cities in Odisha are growing much faster than the other urban pockets. These are Bhubaneswar, Cuttack, Puri, Rourkela, Berhampur, Jharsuguda, and the Jajpur Road-Keonjhar belt[3]. Each of these clusters has varied degrees of vulnerability because of the composition of its population. In those areas where the population of scheduled castes and tribes is higher, the inequity increases because of rapid urbanisation which leaves the backward classes even more vulnerable. One of the major challenges in these areas is inclusive development.

To provide safe drinking water to every household in the state, the Housing and Urban Development Department (HUDD) of Odisha and UNICEF initiated a project in October 2019; the 'Drink from Tap' mission which is a community-based water management system at the ward level. Under the mission's pilot project, 1.2 lakh people of 22,000 families are to be provided safe drinking water by 2020. Eventually the project will be undertaken across the state.

The state has also laid down various legal and policy provisions with regard to urban water supply and sanitation but these have weak implementation on ground particularly in small and medium towns. Measures like rainwater harvesting have been made mandatory for all plots (residential, public, or commercial) which are more than 300sqm in size in accordance with the Odisha Planning and Building Standard Rules, 2020. Some cities like Bhubaneswar, Cuttack[4], and Puri–Konark Development Authority[5] have their individual Planning and Building Standards Regulations, 2017, aligned to the state rules.

[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

Odisha Water Policy, 2007 **Source:** http://www.dowrodisha.gov.in/SWP2007/SWP%202007.pdf This policy advocates several laudable measures for better management of water resources and for providing adequate and safe drinking water to human beings as well as cattle. It also emphasises inter-area equity. The environmental impact of irrigation projects also need to be carefully evaluated before the projects are cleared.
Odisha State Urban Water Supply Policy, 2013 **Source:** http://www.ouidf.in/pdf/state_urban_water_supply_policy-2013.pdf The policy document aims at providing a framework for meeting national service level benchmarks, achieving consumer orientation, and addressing issues and challenges of the sector. All individuals must get at least 70 litres per capita per day (lpcd) of water which should be subsequently increased to 135lpcd. The continuity in supply has to be progressively increased to 24x7. The policy also aims to ensure 100 per cent household-level coverage by direct piped water connection.
Odisha Groundwater (Regulation, Development and Management) Bill, 2011 **Source:** https://www.indiawaterportal.org/sites/indiawaterportal.org/files/Odisha_groundwater_regulation_development_and_management_Draft_bill_GoO_2011.pdf The bill proposes to form a Ground Water Regulation Authority (GWRA) that will regulate extraction of groundwater in the notified areas (where water is scarce). It exempts extraction of groundwater for domestic and agricultural use in the notified areas from taking permission from the authority.
Odisha Urban Water Quality Monitoring Protocol, 2016 **Source:** http://www.urbanodisha.gov.in/ActsRules.aspx The key objective of this protocol is to provide an integrated manual of sampling protocols for water quality monitoring in Odisha in order to increase consistency across the state and to ensure that the data generated is comparable and scientifically correct and in a form that can then be used to result in interventions to improve water quality.
Odisha Urban Sanitation Policy, 2017 **Source:** https://cprindia.org/sites/default/files/OUSP%20report%20final.pdf The policy has the objective of transforming urban Odisha into community-driven, sanitised, safe, healthy, and liveable towns by aligning with Swachh Bharat Mission–Urban (SBM-U) and other relevant policies of the government, thereby ensuring 100 per cent ODF. It also aims at strengthening the sanitation chain, faecal sludge and sewage management, solid waste management infrastructure and service delivery in urban areas of the state.

Odisha Urban Sanitation Strategy, 2017 **Source:** https://cprindia.org/sites/default/files/OUSS%20report%20final.pdf The sanitation strategy provides a detailed roadmap for the Urban Sanitation Policy.
Odisha Water Supply and Sewerage Act, 1991 Source: http://www.urbanodisha.gov.in/ActsRules.aspx The Act provides for the establishment of a water supply and sewerage board to render all necessary services with regard to water supply, sewerage, and sanitation to the state government and local bodies and on request, to private institutions or individuals.
State Water Plan The state of Odisha has 11 river basins. A State Water Plan has been developed for a period up to the year 2051 when the population of the state is expected to stabilize. The State Water Plan will not only allocate water resources to different sectors of priority, it will also have a perspective plan for development of these resources in important areas like drinking water, irrigation, hydropower etc. The plan will be further refined and converted into action plans.
Odisha Planning and Building Standard Rules, 2020 **Source:** https://cms.bhubaneswarone.in/uploadDocuments/Notice/Notice20200213_172122.pdf Provision for rainwater harvesting (RWH) is mandatory for all plots more than 100sqm in area, including open spaces. In Bhubaneswar and Cuttack Building Regulations, the minimum plot size for RWH is 300sqm.

Table 2

Legal framework and regulatory bodies as per law

Key legal frameworks	Administrative bodies
Odisha Municipal Act, 1950	Municipal Corporations
Odisha Municipal Act, 1950	Municipal Councils
Odisha Municipal Act, 1950	Notified Area Councils

FINDINGS OF THE STUDY

Introduction to Chandbali town

Chandbali is the oldest town in Bhadrak district of Odisha. It is located on the banks of the Baitarani river and is a natural river port. Chandbali is famous for its exquisite fish and dry fish industry which is also supplied to other parts of the state. The town also has some small ice factories. As Chandbali was declared a Notified Area Council (NAC) in the year 2012, Census 2011 data for the town is not available. At the time of this study, i.e. in 2019, the town had 15 wards, 5,041 households, and a total population of 26,944.

Water supply and sanitation arrangements

The administration of the town was categorised as urban in 2012 and subsequently undertaken as the Chandbali Notified Area Council (NAC)[6]. The public water supply infrastructure includes a combination of bore wells and pipelines. Piped water supply (PWS) in the town began in the year 2005, starting with one or two wards, through a groundwater-based piped water supply system. In 2012, this coverage increased to eight wards and by 2019, 12 out of the total of 15 wards had access to piped water supply. However, coverage within the wards is not 100 per cent. As per the official records, there are 240 hand pumps in the town, out of which 20 per cent (48 hand pumps) have become non-operational due to salinity and drying up during summer.

According to official records, 1,500 of the 5,041 households in the town had a piped water supply household connection by 2019. This increased to 3,000 by the beginning of 2020. The town also has ten commercial connections. Along with a connection charge, an additional cost of approximately INR 2,000 has to be borne by the household as labour and material costs for necessary fittings. For providing water connections, the ULB follows a slab-based cost structure:

- For APL households: A new piped water supply connection costs INR 3,060 while the monthly tariff charged is INR 96.
- For BPL households: BPL families are exempted from paying connection charges. The monthly tariff charged is INR 50.
- For commercial water connections: A new PWS connection costs between INR 5,000 –5,500. The monthly water tariff varies between INR 329–529.

Interactions with officials from the Public Health Engineering Department (PHED) also brought to light the non-standardised tariff collection system, though the number of free riders is small at three per cent (50 households). Local sources confirmed that there were several unauthorised connections in the town.

In addition to individual PWS connections, there are 55 stand posts or tap posts in the town. Piped water is supplied twice a day for four hours in the morning and four hours in the evening. According to officials, the yearly projection of demand for water is 170 litres per capita per day (lpcd) and the current supply is 147lpcd. The additional demand for water is met by the 192 functional hand pumps. A surface water-based multi village piped water supply scheme, with the river Kharashrota as its source is being funded by NABARD. This scheme will help the town meet its increasing water demand but its implementation may take time.

Chandbali sometimes depends on water tankers contracted from the PHEDs of the neighbouring districts, especially during long power cuts, breakdown of the water pump, or

[6] Unlike the municipality, a notified area council is an entirely nominated body. State government nominates all members including the chairman

in post-cyclone periods. The residents rely less on private tankers, mostly using them for events or congregations. A 5,000 litre capacity private tanker that comes from the neighbouring district costs a minimum of INR 3,000.

No systematic mechanism for grievance redressal is available in Chandbali. The consumer has to register complaints manually at the NAC office, which is cumbersome as compared to an online or telephonic complaint. Although officials claimed that a registered complaint usually takes three days to be resolved, the actual time taken is much higher.

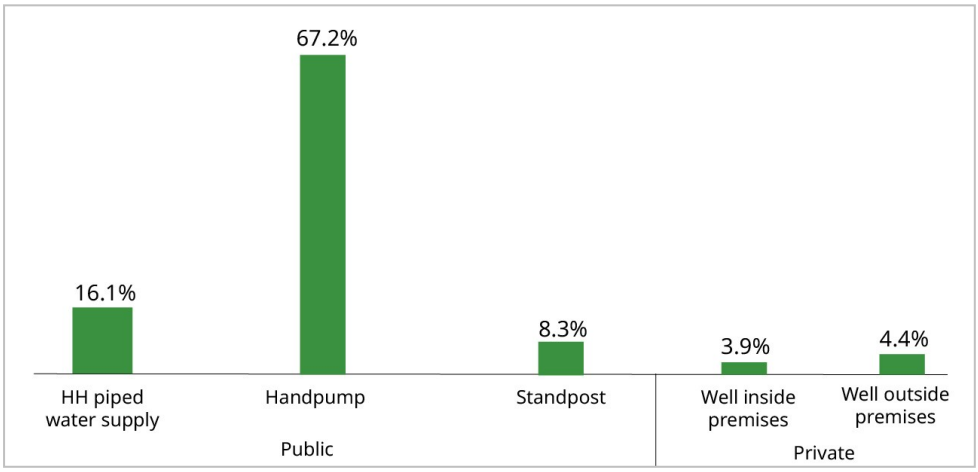
Water service delivery

According to officials, nearly 30 per cent households in the town have access to piped water supply. However, the study survey revealed that only 16.1 per cent of households have access to PWS through a household connection. 67.2 per cent access water through public hand pumps and 8.3 per cent through stand posts or tap posts (Graph 1). Interestingly, none of the households are dependent on bore wells with submersible pumps for access to water.

The primary reason stated for lack of a household-level connection is cost and affordability, followed by the absence of a distribution line in the ward (Graph 2). According to PHED officials, the town has an 18km pipeline spread across fifteen wards. However, close to 7 per cent households have denied the presence of a distribution line in the ward, which is one of the major reasons for lack of access to a piped water connection.

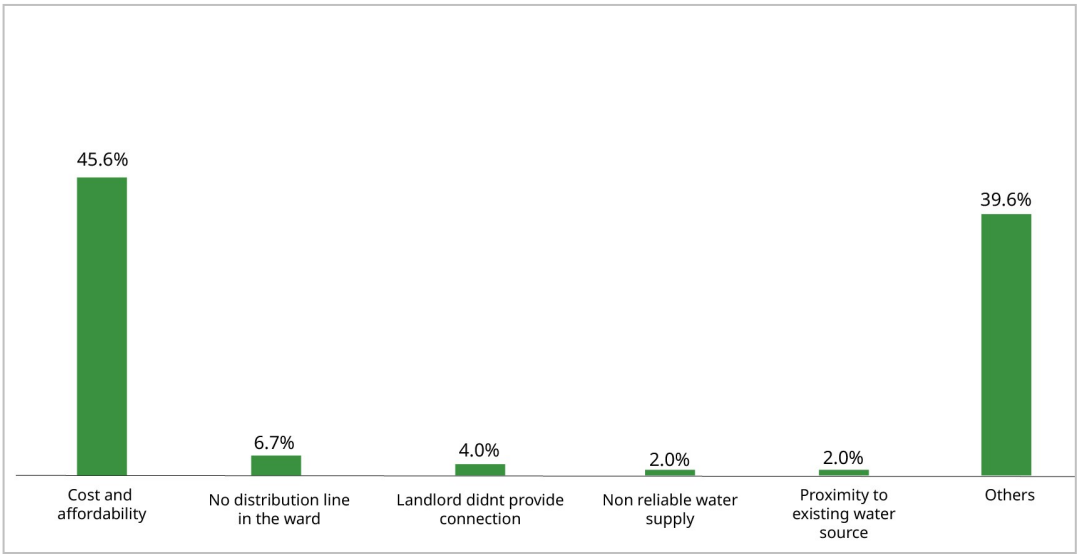
Graph 1

Public versus private water sources (n=180)



Graph 2

Reasons for lack of access to PWS (n=149)

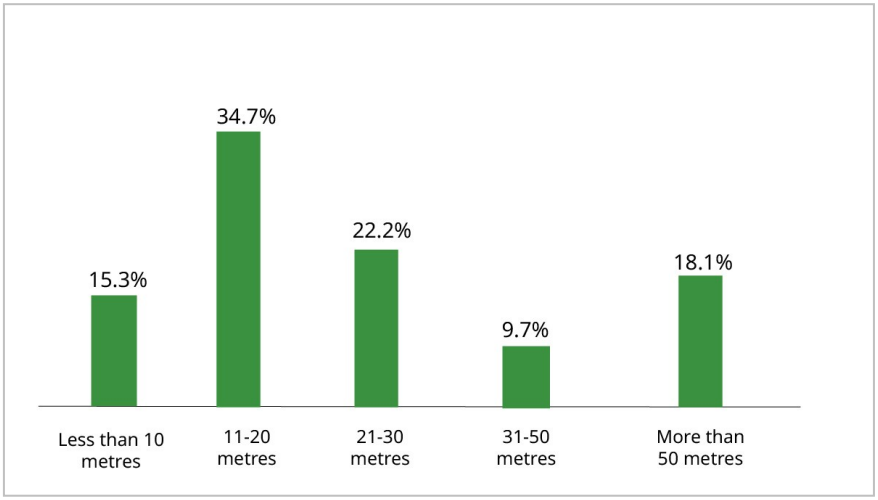


Access to water

Despite PWS having been initiated in the town about eight years ago, only one-fifth of the households (20 per cent), have access to water within their premises, primarily through PWS connections and a few dug wells. The remaining 80 per cent have to fetch water from outside. Reliance on public water sources, particularly on hand pumps, was found to be more than on private sources of water. More than three-fourth (83.3 per cent) of these households were reported as making more than five trips daily to get sufficient water. However, 72.2 per cent households fetched water from a distance of within 30 metres, indicating proximity of the houses to public water sources (Graph 3). In most of the households, women (91.7 per cent), followed by girls (6.3 per cent) performed the task of fetching water. Only one disabled household in the study area collected water from outside the premises.

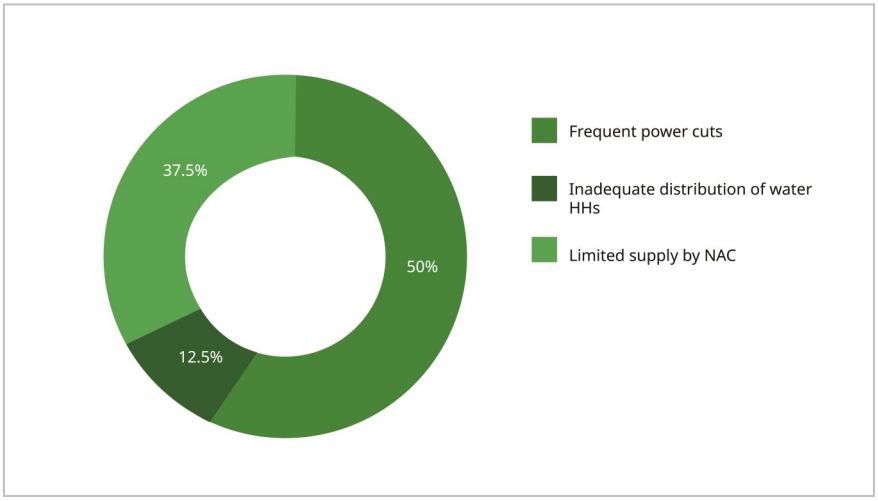
The majority (97.2 per cent) of households do not face any disruption in water availability from their primary water source. This indicates that water supply, whether public or private, is reliable in terms of quantity. In cases of disruption, the major reasons stated (Graph 4) were frequent power cuts in the ward/NAC (50 per cent), limited supply by the NAC (37.5 per cent) and inadequate distribution of water to all households (12.5 per cent).

Despite undisrupted water availability, the survey results indicate that 43.3 per cent of the total households were dependent on secondary water sources such as public hand pumps, public stand posts, private hand pumps and even protected dug wells due to reasons like frequent power cuts and reduced water supply by the NAC.



Graph 3

Households fetching water from various distances (n=144)



Graph 4

Reasons for disruption in water supply (n=8)

Caste-wise access to water sources

The study found that different caste groups accessed water from various water sources. Within the various social groups, access to water through household PWS connections was reported to be highest among the Other Backward Caste (OBC) households at 33.3 per cent, followed by general category households at 16.7 per cent (Graph 5).

Overall, the OBC had maximum access to water within the premises (33.3 percent). These were followed by general category households at 24.5 per cent. The caste groups that were primarily dependent on external water sources were both the scheduled castes (SC) and scheduled tribes (ST) with more than 90 per cent of these households fetching water from outside.

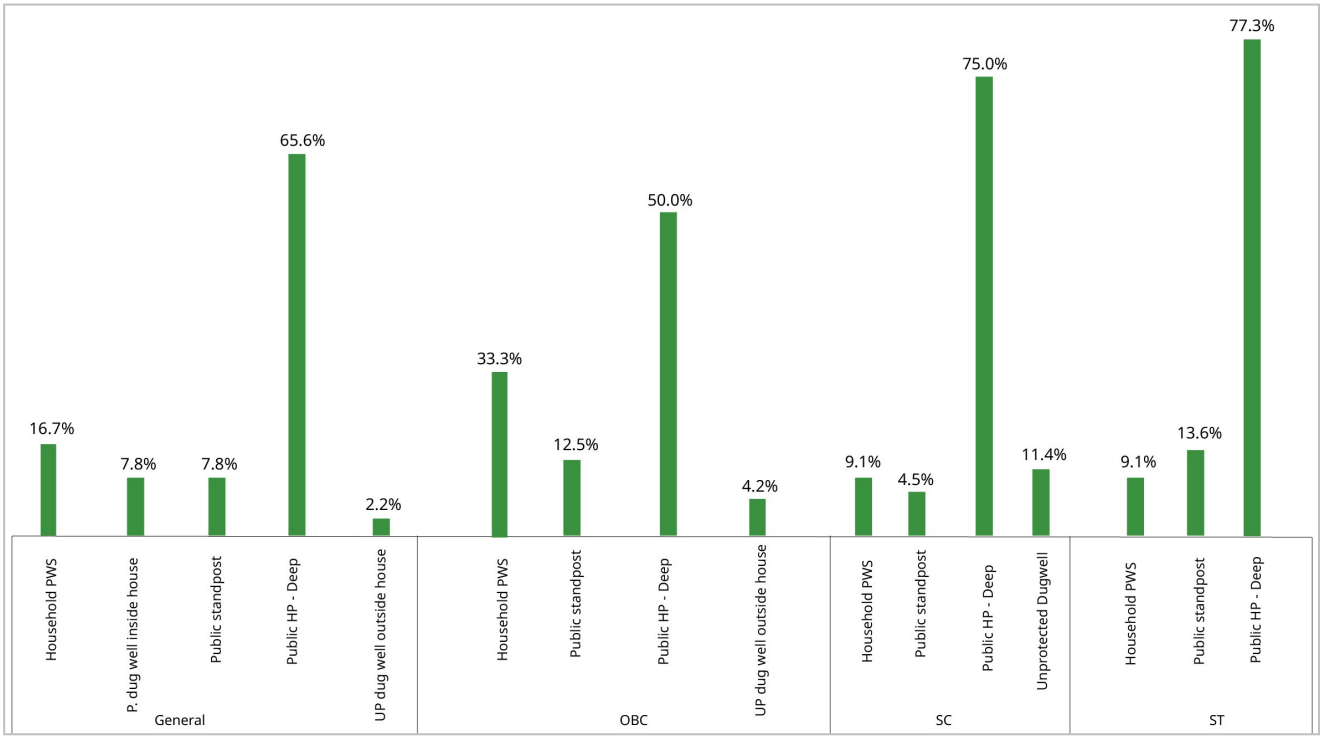
Water storage and use

Since piped water is supplied for eight hours per day and is available in the taps, water storage practices are not well established. Close to 97 per cent of the households were found to be storing water mainly in buckets, followed by tubs and cans, while the use of overhead tanks was reported to be as low as three per cent. Drinking and cooking water storage practices were found to be weakest in Chandbali as compared to the other five towns.

- Nearly 97.8 per cent of the households reported storing of cooking and drinking water in containers with lids, while a small per cent (2.2) stored drinking water in water filters.
- The highest among the six towns in this study, 97.8 per cent of households in Chandbali reported keeping drinking and cooking water at the ground level. This increases the chances of contamination by kids, pets, insects, and dust.
- The water handling habits were particularly poor with 95 per cent consuming water by dipping a non-ladle vessel into the container. This unhygienic habit could result in water contamination and affect the health of the family in the long run.

Graph 5

Caste-wise access to water sources (n=180)



Water quality monitoring

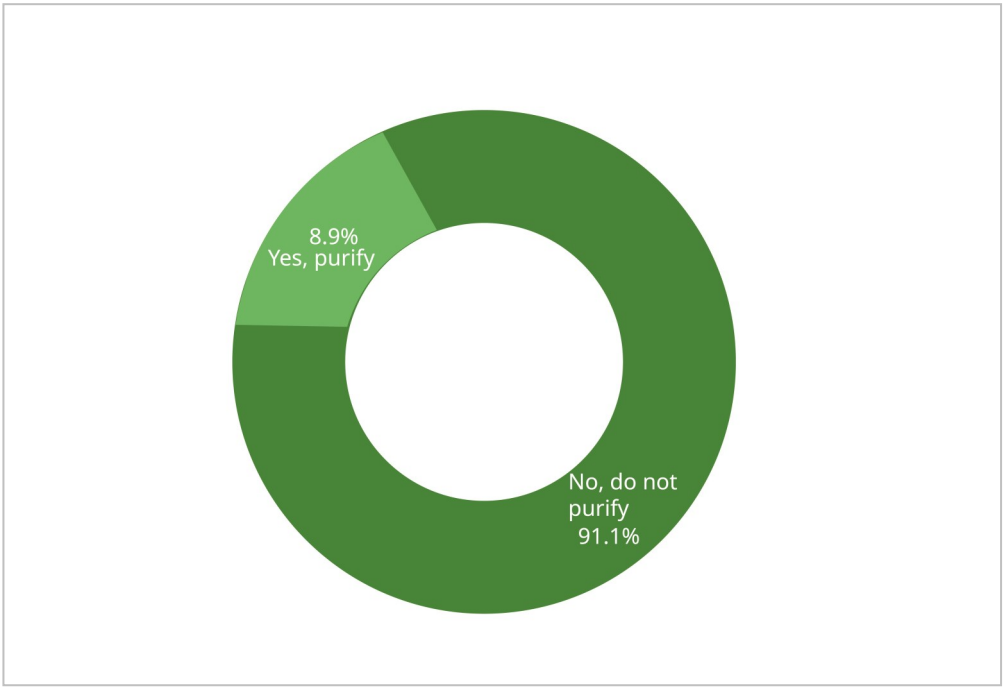
The PHED conducts tests of select public hand pumps once a year. However, piped water is chlorinated and therefore considered as disinfected. Hence, water quality tests are not conducted for PWS.

The PHED in Chandbali has no water quality test lab. A block-level understaffed, space constrained water quality test laboratory with poor sample collection and test facilities functions under the Rural Water Supply and Sanitation (RWSS) Department. (PHED) conducts tests of select public hand pumps once a year. However, piped water is not tested for quality as it goes through chlorination, hence the water is considered to be disinfected.

According to Interviews with officials revealed that 40 per cent bore wells are affected with saline water intrusion. But in spite of water quality issues being reported by the town administration, water testing is not conducted at the household level. This was reported by 98.9 per cent of the households surveyed. Only two households reported water sample collection; one by a government department and the other by a private company selling water purifiers. However, the test results were not shared with the households.

74.4 per cent of the households reported problems with the quality of the drinking water. Close to 41.8 per cent households reported that these problems are faced occasionally. The remaining said that the frequency was 'recurring' and 'seasonal'. The quality was mostly compromised in terms of taste, followed by colour and odour.

Despite water quality being impacted, purification habits were not well established, as only 8.9 per urveyed households reported purifying their drinking and cooking water (Graph 6). The most common filtration method was boiling (62.5 per cent), followed by the use of Reverse Osmosis (RO) filters (Graph 7). None of the households purchased water for drinking and cooking purposes.

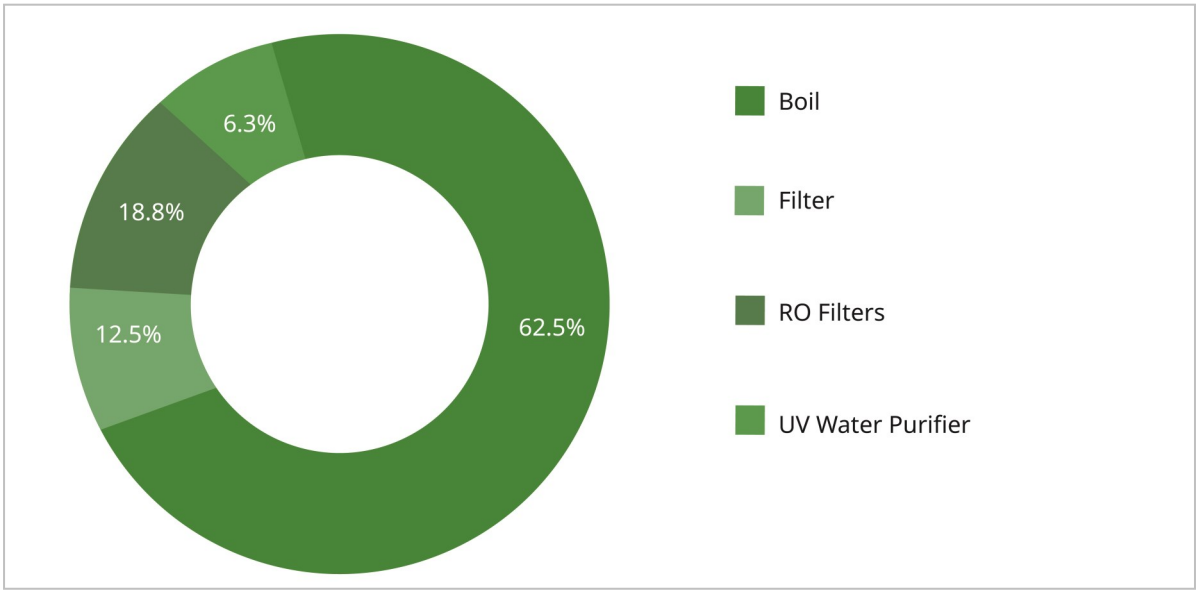


Graph 6

Households practicing purification measures (n=180)

Graph 7

Types of purification measures practiced (n=16)

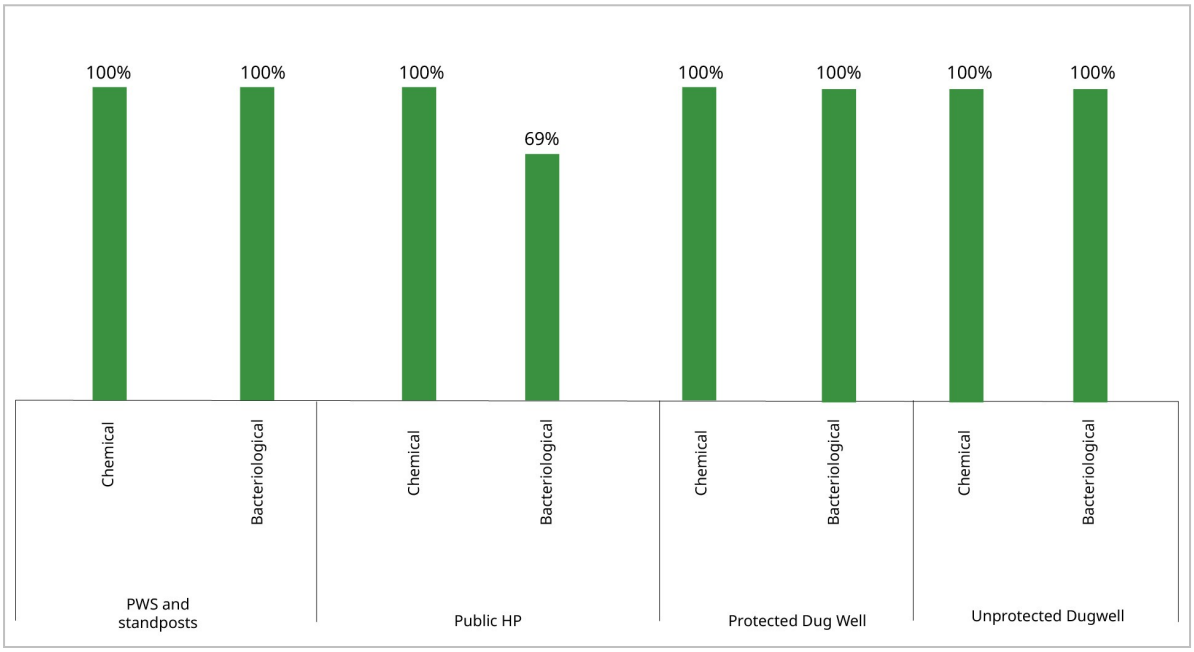


Water quality test findings

Chemical contamination above acceptable limits was detected in 100 per cent source samples. The primary chemical contaminants were total dissolved solids, total hardness, total alkalinity, and magnesium. Bacteriological contamination was detected above acceptable limits in 85 per cent of the source samples, with the primary contaminants being total coliform, faecal coliform and E. coli. 100 per cent of the public service delivery sources—piped water supply, public stand posts, and public hand pumps - were detected with chemical contamination while 80.95 per cent were found to have bacteriological contamination (Graph 8).

Graph 8

Water contamination by source (based on lab test results) (n=27)



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Sustainability measures

In Bhadrak district, while saline water is available at a depth of 15ft, potable water is available at 1,200ft. According to officials, no water conservation measures have been adopted in the town, thereby impacting groundwater which has been depleting at the rate of 0.5 metre per year over the last ten years. Despite 100 per cent reliance on groundwater resources for access to water, measures for source sustainability—other than the traditional practice of community ponds—have not been adopted. According to a respondent during the FGDs, “We are not aware of the need to conserve water. We fill up the ponds in our premises with soil so that we have more land to expand our houses”. Only one surveyed household had taken steps to recharge its defunct bore well. The officials from the PHED stated that water conservation and drainage facilities should be given priority because 50 per cent of the town faces water logging during the monsoon.

Sanitation

Safe sanitation, together with good hygiene and clean drinking water, is fundamental to good health. Though Chandbali has achieved the open defecation free (ODF) status in the year 2019, only 53.9 per cent of the surveyed households reported having a functional household toilet. This indicates that almost half of the households either depend on the four public toilet complexes located in the fish market or defecate in the open.

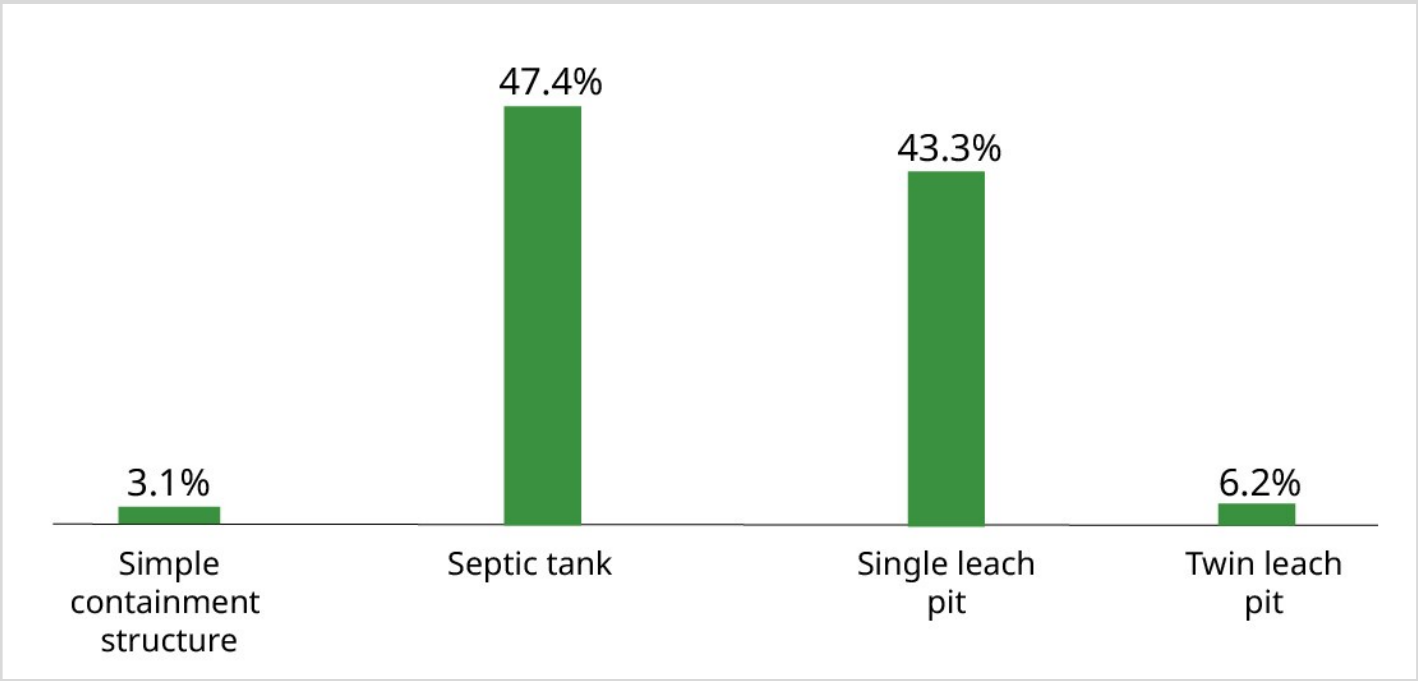
In terms of types of toilets, close to half of the households (47.4 per cent) had septic tanks while a large number (43.3 per cent) had single leach pits (Graph 9)[7]. Though proper management of faecal sludge is of primary importance, 70.1 per cent of the toilet pits had not been de-sludged in the past. Faecal sludge is not being managed safely in terms of collection and treatment, as solid and liquid waste from households is emptied into drains which flow into the local river Baitarani .

It was, however, found that the concept of a safe distance between the toilet pits and groundwater source was followed by the residents as a good number of households (95 per cent) had toilet pits at a horizontal distance of minimum ten metres from the primary groundwater source. A safe distance between groundwater source and toilet pit is important as 100 per cent of the households use the primary source of water for drinking and cooking purposes and a staggering 91.1 per cent of the households do not use any measures to purify their water.

The concept of safe horizontal distance of minimum ten metres between the toilet pits and the primary groundwater source was followed by 95 per cent of the surveyed households having a functional toilet.

Graph 9

Types of toilets Technology (n=97)



[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

- To extend piped water supply to the uncovered wards, the town authorities need to make the system more participatory wherein community-based institutions are established to create a demand for piped water supply and increase people's participation in water management with support from the NAC.
- There is a need to focus on operations and maintenance (O&M) of various water sources including hand pumps, since 20 per cent of them are already defunct. Some of the tube wells and hand pumps that cannot function due to lack of groundwater availability could be converted into recharge structures. This can be implemented if the community-based institutions for water management are trained in O&M functions like daily operations, regular maintenance and repair, and water quality management.
- PHED has not prioritised and regularised water tariff collection at the household level. Due to the failure in receiving monthly water tariffs from households, cumulative charges are taken. Moreover, it is important to identify unauthorised PWS connections to reduce the non-revenue water.
- Chandbali has 100 per cent households dependent on groundwater resources for meeting its water supply needs. Regardless of this, the town has not initiated any source sustainability measures. While the administration of Odisha's capital Bhubaneswar has reiterated that all buildings built on a minimum area of 300sqm should install rainwater harvesting systems, small towns in the state do not have similar mandates in place.
- Piped water supply is not tested for quality as it is chlorinated. But the water quality tests conducted as part of the study detected both chemical and bacteriological contamination in the water. Therefore, periodic sample collection at the household level from each ward should be part of the water testing protocol for the town as mandated by the Odisha Water Quality Monitoring Protocol. Besides, behaviour change communications to promote water handling habits can also be undertaken at the NAC level.
- The small ponds located within or near the premises, which otherwise served as a recharge body, have been converted into land to construct or extend houses. This goes against the Orissa Prevention of Land Encroachment Rules, 1985. Therefore, the town authorities need to ensure that all earlier encroachment cases are settled and no new encroachment of water bodies is permitted.
- Since many areas in this town face water logging during monsoon, drainage management should be given prime importance. Each district should prepare a master plan for waste management wherein sewage waste and wastewater are disposed off in different pipes.
- As reported, the faecal waste is dumped in drains and contaminates the local river Baitarani. Therefore, legislative provisions with regard to water pollution and environment protection should be enforced in the town. Sewerage treatment plants also need to be installed to prevent ground and surface water contamination.
- There is a need to revise the grievance redressal mechanism. As of now, customer complaints are registered manually and the grievance redressal mechanism is weak and slow.


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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 East India, with support of partner NGO, Pragati Jubak Sangh, (PJS).

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