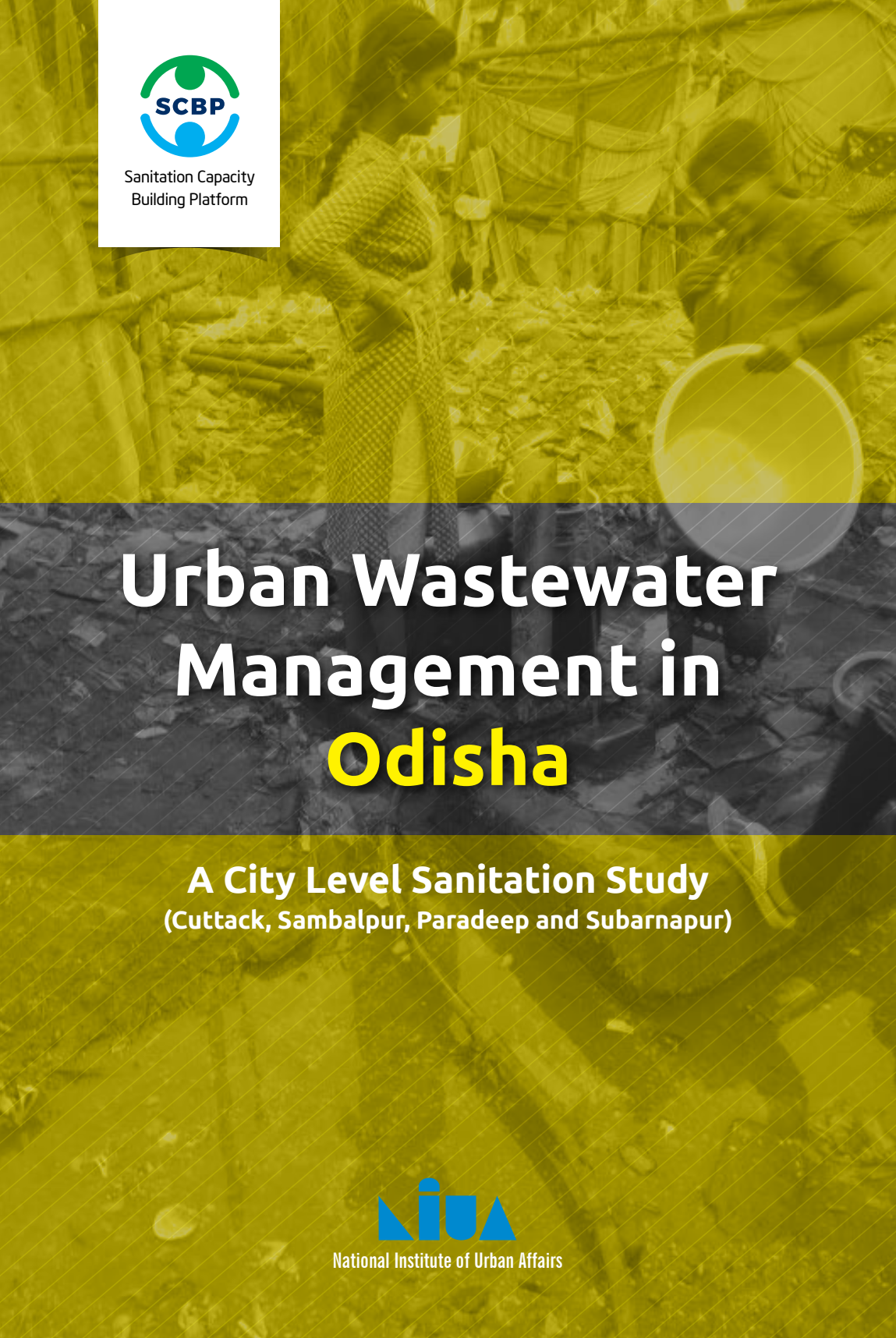

SCBP

Sanitation Capacity Building Platform

Urban Wastewater Management in Odisha

A City Level Sanitation Study

(Cuttack, Sambalpur, Paradeep and Subarnapur)

National Institute of Urban Affairs

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Foreword

Sanitation Capacity Building Platform (SCBP) established in 2016 is a platform anchored by NIUA and works as a collaborative initiative of experts and organisations committed to the goal of sanitation to support and build the capacity of towns/cities to plan and implement decentralized sanitation.

The Platform lends support to Ministry of Housing and Urban Affairs (MoHUA), Government of India, by focusing on urban sanitation and supports states and cities to move beyond Open Defecation Free (ODF) status by addressing safe disposal and treatment of human faeces.

The Platform partners include Center for Water and Sanitation (C-WAS) at CEPT University, CDD Society and BORDA, ECOSAN Services Foundation (ESF), Administrative Staff College of India (ASCI), UMC, Centre for Policy Research (CPR), iDeck and WASHi. The Platform also engages and supports Nodal AMRUT accredited training institutions, universities, research organisations and NGOs. SCBPs work on faecal Sludge and Septage Mangement (FSSM) is a Bill and Melinda Gates Foundation (BMGF) supported urban sanitation programme initiative. It is a knowledge platform on decentralised urban sanitation. It is a resource centre for Learning and Advocacy Material, important Government Orders and Reports, Training Modules, Workshop Reports and other publications produced under SCBP and partner organisations.

ABOUT NIUA

National Institute of Urban Affairs (NIUA) is premier institute for research, capacity building and dissemination of knowledge for the urban sector in India. It is registered as an autonomous body under the Ministry of Urban Development, Government of India. NIUA conducts research in emerging themes such as urbanization, urban policy and planning, municipal finance and governance, land economics, transit oriented development, urban livelihoods, environment and climate change and smart cities. NIUA supports innovations in the urban sector through informed dialogues, knowledge exchanges, training and capacity building. In its mission to promote evidence-based policy-making and urban scholarship, NIUA is currently engaged in inter-disciplinary research and proactive engagements with change agents, which involve projects that create & maintain digital interface solutions.

ABOUT THE STUDY

In order to understand the urban sanitation challenges in the Indian states, a field based research on septage and wastewater management was commissioned by NIUA. The states of Odisha, Madhya Pradesh, Karnataka and Telangana were selected for the study. Under this project 3 towns were also selected per state by the researchers for qualitative and quantitative assessment of current sanitation, septage and waste water management. The ULB's institutional landscape and the major issues and challenges in these towns were analysed. Using the town wise findings, a state level perspective and understanding of urban sanitation management was obtained. The deliverable of the research will be used as inputs into the training material for the Sanitation Capacity Building Platform (SCBP).

The key research areas for the study were:

1. Status of septage containment, conveyance, disposal and treatment systems in each town.
2. Analysis of the sustainability and equitability of the existing and proposed sanitation services in the context of municipal finances and institutional structure of the ULBs.
3. The business and operational model for private sector operators with a special focus on profitability and their relationship with ULB.
4. Impact of unsafe disposal and lack of treatment of wastewater and faecal sludge on ground water and surface water bodies.
5. Possible improvements that can be brought about in septage and wastewater disposal in terms of provisioning and governance in urban areas of the state and towns.

The research focused on primary data collection in the 4 towns and its contextualization and assessment at the state level. Municipal and ULB norms, actual operations of ULBs and government departments were studied along with an analysis of the budgets and expenditures of ULBs related to sewerage management. The study also focused on the affordability, equity and technology comparison between septage and sewerage management. Slum sanitation and wastewater challenges in the 4 towns also provided some perspective on equity issues. Review of other secondary data such as DPRs, performance reports, annual budget documents etc. were also used in the study. Laboratory tests of water samples from surface water, groundwater and potable water were also conducted to provide the evidence for contamination and environmental damage.

Introduction to the Research

A research study was initiated by Ranjan K Panda with support of the National Institute for Urban Affairs (NIUA) in the state of Odisha, covering four cities, to understand the current sanitation situation including the way wastewater is being managed in the cities.

The Key Research Areas of the Project were:

1. Assessing the sustainability and equitability ensured in the existing and proposed waste water disposal systems and services in select urban areas of Odisha in context of their natural resources use and availability, institutional and financial mechanisms vis-à-vis people's concerns (including those of the poor) addressed in the governance of these mechanisms.
2. Analysing surface and ground water contamination due to current faecal sludge and septage management practices of the urban areas.
3. Suggesting probable improvements in waste water disposal and management practices and governance models.

The major objectives of the proposed study were:

- To study the key policy and programmes that deal with faecal sludge management in urban Odisha;
- To identify and study the institutional mechanisms in place in terms of staff engaged, various other agencies (Govt. and Private) involved for septage management in urban Odisha and the challenges;
- To intensely understand current practices viz. the procedure and frequency of cleaning, safe collection, transport of the sludge, disposal and treatment etc. To assess the volume of the sludge being generated and related issues & challenges with general observations on pollution of rivers and water bodies;
- To study about the working condition of workers involved in cleaning on-site sanitation systems – including safety norms and practices;
- To study people's perspective / feedback in strengthening the service delivery, grievance redressal and willingness to do or pay for the service;

- To find out nature and extent of impacts or effects on water resources, particularly rivers;
- To identify possible short-term measures for quick improvement in FSSM status.

Methodology adopted:

The researcher reviewed the policy papers and other documents, discussed with government officials, civil society members, urban local body representatives and staff, people from cross sections of the society – mostly those living in urban slums. The research is therefore an action research study that found out the sanitation situation in four cities of Odisha chosen on the basis of their location on the River Mahanadi, major river basin of the state, and to understand how the ground situation is impacting water quality. It then goes on to give some suggestive measures.

Executive Summary

Odisha, the eighth largest state of India that occupies less than 5% of the total landmass of the country, is one of the least urbanised states of India. As per 2011 Census survey, only 16.88% of the state's total of 42 million population were residing in urban areas. However, the urban growth rate is rapidly incrfeasing and the decadal population growth in urban areas during the last decade has been 26.80%, which is almost double of the overall population growth rate in the same decade.

The Census 2011 reports that 35.2% of urban households do not have toilets. This is the second worst among all Indian states, with Chhattisgarh occupying the top position having 39.8% households who don't have toilets. Of the 64.8 percent of the households in urban Odisha, who have latrine facilities within their premises; 58.8 percent have water closet, 4.2 percent pit latrines and 1.8 percent other types. As high as 33 percent of the urban households were defecating in open while two percent were using public or community toilets.

Census data further suggests that only 12% of urban households had their toilets connected to a sewerage system. While the enormous challenge of safe faecal sludge management is evident from poor toilet access and coverage, the sewerage challenge in Odisha cities and towns is no small either. As per the estimates of Central Pollution Control Board (CPCB) Odisha was generating about two percent of total sewerage generated in India (CPCB Bulletin, July 2016).

Odisha is among the first states to have an Urban Sanitation Policy that was notified on January 03, 2017. This aims at ensuring – in 10 years - 100% ODF, strengthening of sanitation chain, Faecal Sludge and Sewerage Management, Solid Waste Management infrastructure and service delivery in urban areas of the State'. The real challenge in this regard is the way urban slums are placed. Over 1/5th of the urban polulation live in slums devoid of many basic facilities.

In all the four cities studied under this research, there is absolutely no treatment of sewerage and septage. While Cuttack and Paradeep had some facilities in

the past, they are defunct at the moment. Cuttack and Sambalpur are AMRUT cities and thus have initiated SeTPs, they are also coming up with centralised STPs. Paradeep is working on centralised STPs because the Paradeep Port Trust Ltd. (PPT) is doing the same for the Municipality. The fourth city, that is Subarnapur, has neither any plan for STPs nor for SeTP. The cities need to go with decentralised systems and also scout for new and innovative methods being tried across the globe.

With regard to solid waste management, the Municipalities are mostly dependent on privatisation of the wards under various schemes. However, there are huge gaps in the implementation and coverage of both. Cities need to step up their efforts in waste segregation and reuse at source. The Odisha Urban Sanitation Strategy 2017 talks about waste segregation as a priority. However, no city except Paradeep seem to have started any effort towards this. There is an urgent need to promote waste segregation at source and incentivise composting and other business models by roping in NGOs, individual entrepreneurs and experts. There is no indicator at the moment in any of the city's solid waste management activities that can be termed as sustainable. Cities need to think over this seriously and start making business models out of the solid wastes. They can also work for nearby villagers for this.

The slums are struggling with basic amenities. In Cuttack, where 38.5 percent of the city lives in the slums, most of the people resort to open defecation. In Sambalpur, about one-third of city's total population lives in slums, and most of them defecate in the open. In Paradeep, slum population is as high as 79 percent and here too open defecation is common among slum dwellers. In Subarnapur, about 41.2 percent reside in slums. In each city, the slum dwellers complained of garbage and septage being dumped in their neighbourhood. Many of them live on drains and face various health problems.

We tried to understand the staff position of the Urban Local Bodies (ULBs) and found that most of them are understaffed. For ULBs, which have privatise solid waste management and cleaning operations, it was difficult to assess the gap in manpower. However, ground realities were different as people complained of either lack of action or low quality work due to shortage of staff. The ULBs have to have transparent monitoring systems and effective grievance redressal mechanisms which are currently lacking.

Each city has seen an increasing trend in financial allocations and spending. However, it was difficult to assess the complete scenario.

Cities are still having a lot of gaps in terms of establishing effective coordination between all the stakeholders involved. The different line departments involved

in city sanitation are also not able to establish a coordinated approach of work.

The Mahanadi River, on the bank of which each of these cities is located, is a highly polluted river. The ULBs, Govt. of Odisha and Odisha State Pollution Control Board (OSPCB) need to work together in a strategic manner which seems to be lacking at the moment. The OSPCB monitors the river at several stretches and has found out that the river is heavily polluted. Lack of joint pollution strategy despite these finding is surprising. Further, the OSPCB is not monitoring surface water and ground water pollution, which it must start without any further delay. We, as part of this research, tried to monitor water quality of very few samples ranging from ground water to river water to surface water bodies and found out some samples to be highly polluted but maximum sources were found complying with the norms. This is not enough to get a true picture because one time water sample studies are often not sufficient. Then, our sample size was too small. There is certainly a need for regular monitoring by independent sources aided by latest equipment and laboratories. A big challenge for water quality monitoring is the lack of local level reliable facilities and the high cost of this setup. The ULBs should factor in water quality testing, monitoring and abatement into their plans and budgets, which is currently completely missing.

Section I

A review of policies and plans for urban sanitation in Odisha

1. Introduction

As per the World Health Organisation, 'sanitation' generally refers to the provision of facilities and services for the safe disposal of human urine and faeces. The word 'sanitation' also refers to the maintenance of hygienic conditions, through services such as garbage collection and wastewater disposal. The National Urban Sanitation Policy, 2008 defines 'sanitation' as the 'safe management of human excreta, including its safe confinement, treatment, disposal and associated hygiene-related practices'.

The 2011 Census survey findings give a scary picture of sanitation situation in India, including urban India. According to the 2011 Census, 18.6% of total 78.8 million urban households do not have latrines while 32.7% households have latrine facility with piped sewer system, 38.2% households have latrine facility with septic tank and 6.0 % households use public latrine. The 2011 Census figures further suggest that 11% defecate in the open and the rest of those who do not have toilet at home are dependent on shared or community toilets.

Other studies have captured the grim situations equally. The National Sample Survey Organisation (65th Round, 2010) estimated that 8% of the urban households were dependent on pit latrines, and 29% dependent on toilets connected to septic tanks. Around a fifth of the households do not have access to a drainage network, and two-fifths are connected to open drains. The Central Pollution Control Board reported during 2010-2011 that out of 38,254 MLD of sewerage generated by class I cities and class II towns, only 11,787 MLD has been treated and thereby leaving huge gap between sewerage generation and sewerage treatment (Central Pollution Control Board Bulletin, July 2016). This means that cities have capacities to treat only 30.81% of total sewerage generated. When CPCB made estimation in 2015, the situation had gotton worse. CPCB estimated in 2015 that Class I & II cities were generating approximately 61,754 MLD approximately of sewerage but the cities had capacity to treat only 22,963 MLD from 816 STPs. This indicates that the capacity to treat had increased from 30.81% in 2010 to 36.54% in 2015; but the cities and towns were discharging more untreated sewerage water into the ponds, reservoirs and rivers. In 2010 the class I & II cities were discharging 26,467 MLD of untreated sewerage. In 2015, those cities were releasing about 38,727 MLD of untreated sewerage, an increase of 46% in mere five years. This is something that should scare us all.

Census of India 2011 figures indicate that only 32.7% of urban households are connected to a piped sewer system whereas 38.2% dispose of their wastes into septic tanks and about 7% into pit latrines, indicate the predominance of on-site arrangements and it is not clear how the wastes are disposed from this majority of installations. Further, about 5 million pit latrines are insanitary

(have no slabs or are open pits); 1.3 million are service latrines – of which 0.9 million toilets dispose faeces directly into drains, 0.2 million latrines are serviced by humans (illegally), 0.18 million latrines serviced by animals. Forward to the Advisory Note 'Septage Management in Urban India' by Govt. of India says, quoting the 2011 Census, '30 million urban households (38 percent of urban households) have septic tanks. USAID (2010) estimates, that by 2017, about 148 million urban people would have septic tanks'. The same report then says, "Therefore, on-site pit latrines and septic tanks account for a substantial proportion of toilets in urban India – 48% of urban Indian households depend on onsite facilities (2011 Census), and this proportion is increasing'.

The status with respect to the urban poor is even worse. The percentage of notified and non-notified slums without latrines is 17 percent and 51 percent respectively. Septic latrines in notified and non-notified slums is 66% and 35% respectively. In respect of underground sewerage, the availability is 30% and 15% respectively. The National Sample Survey Organisation (69th Round, 2012) had found that at the all-India level, 31 percent of slums had no latrine facility.

1.1 Odisha Scenario

Odisha, the eighth largest state of India that occupies less than 5% of the total landmass of the country, is one of the least urbanised states of India. As per 2011 Census survey, only 16.88% of the state's total 42 million population were residing in urban areas. However, the urban growth rate is increasing rapidily and the decadal population growth in urban areas during the last decade has been 26.80%, which is almost double of the overall population growth rate in the same decade. This is also a much higher rate than the overall urban population growth rate in the last six decades. In fact, in the six decade period between 1951 and 2011, while the total population increased by 2.87 times, the urban population increased by 11.65 times.

The 2011 Census reports that 35.2% of urban households do not have toilets. This is the second worst among all Indian states, with Chhattisgarh occupying the top position having 39.8% households without toilets. Of the 64.8 percent of the households in urban Odisha, who have latrine facilities within their premises; 58.8 percent have water closet, 4.2 percent pit latrines and 1.8 percent have other types. As high as 33 percent of the urban households were defecating in open while two percent were using public or community toilets.

Census data further suggests that only 12% of urban households had their toilets connected to a sewerage system. At the same time 45% of urban households had pour flush toilets connected to a septic tank, 4.2% households were using pit latrine out of which 3.1 percent were with slab or ventilated improved pit and 1.1 percent were without slab or open pit. In 0.8 percent households

there is a toilet facility within the premises but the waste material is disposed directly into open drain i.e. night soil deposited in open drain. In 0.5 percent of households of urban Odisha, even if the latrine facility is available, within the premises, the human excreta is removed physically by human beings. It indicates existence of manual scavenging in urban Odisha.

While the enormous challenge of safe faecal confinement is evident from pathetic toilet access and coverage, the sewerage management challenge in Odisha cities and towns is no small either. As per estimates of Central Pollution Control Board (CPCB) Odisha was generating about two percent of total sewerage generated in India (CPCB Bulletin, July 2016). According to a letter sent by CPCB to Odisha State Pollution Control Board (OSPCB) in April 2015, the CPCB had assessed that total sewerage generated in Odisha was 1513.55 MLD. The state had a capacity to treat only 392.55 MLD, or a mere 25.9% of total sewerage generated in the state.

With the rapid growth in urbanisation, the slums are also growing. According to the 2001 census, a total of 1.4 million people lived in slums of the state's urban areas. This was more than a quarter of the total urban population. In spite of the remarkable economic development achieved recently, over 1/5th of Odisha's urban population still lives in slums. In some industrialized areas like Rourkela, slum populations are over 1/3rd of the total urban population. Needless to say, the quality of life in slums is abysmal, and over 90% of slum dwellers are without access to housing and adequate basic services like water supply and sanitation.

2. Policies/Strategies

2.1 National Urban Sanitation Policy (NUSP)

The overarching policy in urban sanitation sector is the **National Urban Sanitation Policy (NUSP)** produced by the Ministry of Urban Development, Government of India in 2008.

The NUSP defines sanitation as safe management of human excreta, including its safe confinement, treatment, disposal and associated hygiene-related practices. While this policy pertains to management of human excreta and associated public health and environmental impacts, it is recognized that integral solutions need to take into account other elements of environmental sanitation, i.e. solid waste management; generation of industrial and other specialized / hazardous wastes; drainage; as also the management of drinking water supply.

The vision of NUSP states that ***"All Indian cities and towns must become totally sanitized, healthy and liveable and ensure sustainable good public health and environmental outcomes for all their citizens with a special focus on hygienic and affordable sanitation facilities for the urban poor and women."*** and the overall goal is to transform Urban India into **"community-driven, totally sanitized, healthy and livable cities and towns."**

The specific goals of the NUSP are:

A. Awareness Generation and Behaviour Change

- Generating increased awareness about sanitation and its linkages with public and environmental health amongst communities and institutions;
- Promoting mechanisms to bring about and sustain behavioural changes aimed at adoption of healthy sanitation practices;

B. Open Defecation Free Cities

All urban dwellers will have access to and use safe and hygienic sanitation facilities and arrangements so that no one defecates in the open. In order to achieve this goal, the following activities shall be undertaken:

- Promoting access to safe sanitation facilities (including proper disposal arrangements);
- Promoting community-planned and managed toilets wherever necessary, for groups of households who have constraints of space, tenure or economic constraints in gaining access to individual facilities;
- Adequate availability and 100% upkeep and management of Public Sanitation facilities in all Urban Areas, to rid them of open defecation and environmental hazards;

C. Integrated City-wide Sanitation

- Re-Orienting Institutions and Mainstreaming Sanitation
  - Mainstream thinking, planning and implementing measures related to sanitation in all sectors and departmental domains as a cross-cutting issue, especially in all urban management endeavours;
  - Strengthening national, state, city and local institutions (public, private and community) to accord priority to sanitation provision, including planning, implementation and O&M management;
  - Extending access to proper sanitation facilities for poor communities and other unserved settlements;
- Sanitary and Safe Disposal
  100% of human excreta and liquid wastes from all sanitation facilities

including toilets must be disposed of safely. In order to achieve this goal, the following activities shall be undertaken:
    - Promoting proper functioning of network-based sewerage systems and ensuring connections of households to them wherever possible;
    - Promoting recycle and reuse of treated waste water for non-potable applications wherever possible will be encouraged.
    - Promoting proper disposal and treatment of sludge from on-site installations (septic tanks, pit latrines, etc.);
    - Ensuring that all the human wastes are collected safely confined and disposed of after treatment so as not to cause any hazard to public health or the environment.
- Proper Operation & Maintenance of all Sanitary Installations
    - Promoting proper usage, regular upkeep and maintenance of household, community and public sanitation facilities;
    - Strengthening ULBs to provide or cause to provide, sustainable sanitation services delivery;

Towards achievement of the NUSP goals, the Government of India will support in the following ways:

- States will be encouraged to prepare State Level Sanitation Strategies within a period of 2 years;
- Identified cities will be urged to prepare model City Sanitation Plans within a period of 2 years;
- Providing assistance for the preparation of Detailed Project Report (DPR) as per city sanitation plan as soon as requests for funding are received;
- Promote public-private partnership in respect of key projects/activities identified in the city sanitation plan;
- Provide technical assistance and support for awareness generation and capacity building to states and cities within this financial year;
- Periodic rating of cities with respect to Sanitation, and recognition of best performers by instituting a National Award within this financial year;
- Fund projects wherever possible from existing schemes;

Government of India will support states in developing and implementing innovative strategies to accord priority to urban sanitation. States and cities can explore a number of options in achieving sanitation goals such as;

- Using existing provisions with regard to sanitation in municipal and other Acts to promote compliance;
- Amend municipal Acts, frame bye-laws and regulations (e.g. building

and construction bye-laws) to promote sanitation by public and private agencies, prohibit discharge of untreated sewerage into open areas wherever necessary;

- Create a system of incentives and disincentives including punitive actions and charges on polluters wherever appropriate;
- Re-orienting policies to ensure that urban poor households or residents in informal settlements obtain access to improved sanitation facilities;
- Ear-marking and making land available for community and public sanitation facilities;
- Promoting partnerships with public, private and non-governmental agencies for improved provision, maintenance and management of sanitation facilities;
- Mainstreaming sanitation in all public activities (e.g. by coordinating with health, education and infrastructure sectors);
- Taking up sanitation in a mission mode in order to mobilize joint actions from different public and non-government agencies. This can be accomplished by forming an urban sanitation steering committee at the state level and a task force at the city level;
- Exploring other options and innovations that may be suitable locally.

2.2 Odisha Urban Sanitation Policy (OUSP), 2017

The OUSP, notified on January 03, 2017 has the objective 'of transforming urban Odisha into a community driven, sanitized, safe, healthy and livable towns by aligning with Swachh Bharat Mission (SBM) Urban and other relevant policies of the Government with necessary institutional framework, planning, monitoring, evaluation, Capacity Building and funding support, thereby ensuring 100% ODF, strengthening of sanitation chain, Faecal Sludge and Sewerage Management (FSSM), Solid Waste Management infrastructure and service delivery in urban areas of the State'. The policy has set for itself a 10 year horizon.

The vision of OUSP states that, '***all cities and towns in Odisha are to become totally clean, sanitized, healthy, and liveable, ensuring and sustaining good public health and environmental outcomes for all citizens, in line with the National Urban Sanitation Policy***'.

The OUSP, 2017 has laid out principles that are more precise than the principles suggested in the NUSP, 2008. The OUSP has spelled out seven ***principles*** in OUSP which are as follows:

a. Sanitation will be treated as a basic service;
b. Ensure equity and safety of access and use, particularly to the vulnerable and unserved populations;
c. Increased awareness of the collective goal of sanitised cities;

d. Institutional roles, responsibilities and capacity development in line with 74th Constitution Amendment Act, 1994;
e. Emphasis on operations and maintenance of sanitation infrastructure;
f. Integrating broader environmental concerns in the provision of urban sanitation service delivery; and
g. Choosing technology and solutions appropriate to the context.

The OUSP, 2017 has set six ***outcomes*** to achieve in the next 10 years. These are:
a. Urban areas are open-defecation and discharge free. Though this outcome mostly focuses on toilet use, it also has two paragraphs: (i) 'There is no open discharge of faecal and liquid waste, or raw sewerage into the open drains or environment; and (ii) There is safe containment, collection, transportation, treatment, and disposal of sewerage, septage, and waste water.
b. Municipal Solid Waste is safely managed and treated
c. Sewerage, septage / faecal sludge and liquid waste is safely managed, treated, and disposed: This is the most important outcome indicator in the present study context. The policy explains this indicator as follows, 'to ensure that whatever faecal waste is generated in the urban environment, it is safely confined, regularly collected, safely transported and disposed after adequate treatment'. It further states that, 'In Odisha, where the majority of households and institutions have access to on-site sanitation, the focus of the policy will be on septage/ faecal sludge management (FSM). In the large cities (population of 100,000 or more) with increasing urban density, the state government may, based on context and demand, bring out a separate action plan for sewerage systems in the city'.
d. Safety standards and guidelines are followed in the physical handling and management of waste.
e. Women and girls have access to safe menstrual hygiene management (MHM).
f. Cities/towns do not discharge untreated waste (solid, liquid, and faecal waste) into the water bodies of Odisha. This is also an important indicator in context of the present study. It states, 'The aim of this outcome is the elimination of urban pollutants – septage / faecal sludge, and municipal solid waste – into the rivers and river basins of Odisha from urban and peri-urban areas thus ensuring the conservation restoration, regeneration and integrated development of rivers basins in Odisha'.

The Odisha Urban Sanitation Policy, 2017 is significantly distinct from National Urban Sanitation Policy, 2008 in making a situation analysis and identifying a river-basin centric approach as an important aspect. By conducting a 'situation analysis' the Policy has identified eight distinct situations. The seventh one is the identification that '***The urban sanitation policy must incorporate a river basin pollution abatement policy***'. It states, 'nearly 90 percent of urban areas

in Odisha directly affect rivers in the state; the rest fall within existing river basins. With the open discharge of raw sewerage into drains, it is necessary for the sanitation policy to also consider action of cities within the wider ecosystem of river basin systems in the State.

The OUSP, 2017 has set clear indicators. To ensure that the policy is followed properly and the objectives are achieved, Odisha has formulated an Odisha Urban Sanitation Strategy.

2.3 Odisha Urban Sanitation Strategy (OUSS), 2017

Odisha had formulated an Odisha Urban Sanitation Strategy(OUSS) in 2011. The state declared the new 'Odisha Urban Sanitation Strategy, 2017' in alignment with the Odisha Urban Sanitation Plan, 2017.

The strategy has set measurable indicators or stages or statuses for all the six outcomes. They are quite relevant.

Outcome 1: Urban areas are open-defecation and discharge free:

The identified stages under this outcome are:

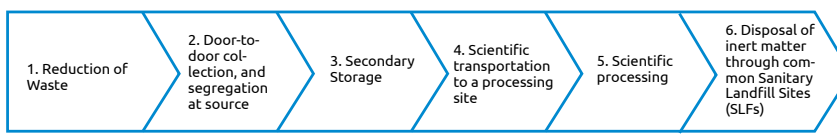
Stage 1: All cities and towns achieve basic open defecation free status where there is (a) no open defecation within city limits; (b) all city residents have access to household, community or public latrines; and (c) all insanitary latrines converted to sanitary latrines, and no incidence of Manual Scavenging observed in any form.

Stage 2: It is a stage that goes beyond basic ODF status. Apart from all the conditions of the first stage this stage envisages 'no undesignated discharge of septage, sewerage and black water'.

Stage 3: This stage goes further than stage two and ensure that there is 'no open discharge of human faecal and liquid waste, and safe containment, transport, treatment, and disposal of all human faecal waste, and waste water (black and grey)'. The strategy stipulates this status as the indicator of achieving all national and global indicators, and the status which ensure 'sanitised' condition.

Outcome 2: Municipal Solid Waste is safely managed and treated:

This outcome has identified the following six important and related functions.



These functions have been clubbed under four broad heads, (a) collection, (b) transportation, (c) processing, and (d) disposal. It aims to cover this status in at least 50% of the wards of Urban Local Bodies (ULBs) in the first stage, 80% wards in the second stage, and 100% in the third stage where 'minimal municipal solid waste (MSW) reaches the sanitary landfill sites as inert matter.

Outcome 3: Sewerage, septage / faecal sludge and liquid waste is safely managed, treated, and disposed

This outcome will be the primary focus of the present study. As the chart below shows in the first stage, Odisha will aim to eliminate 'insanitary single pit dry latrines' and 'open defecation'. The OUSS, 2017 has not specified stages for this outcome, but it has identified the activities. The identified activities are:

a. City sanitation plans (CSPs) will include septage management / FSM plans.
b. The State Government will draft sewerage and septage management guidelines for cities.
c. The State through the ULBs, will ensure provision of the services to both household, and non-household facilities – public, community and establishment - where they exist in the city.

Apart from these, the strategy has identified many other deliverables for the ULBs to achieve.

Outcome 4: Safety standards and guidelines are followed in the physical handling and management of waste

It focus on eliminating manual scavenging and complete enforcement of Manual Scavengers and their Rehabilitation Act, 2013. The other focus of this outcome is to eliminate insanitary latrines.

Outcome 5: Women and girls have access to safe menstrual hygiene management (MHM)

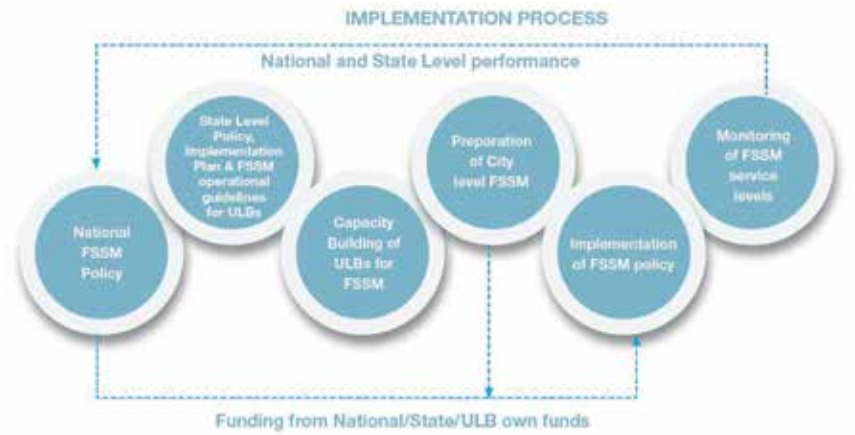
The OUSS, 2017 has identified a 'five-pronged approach to public, community and private institutional sanitation facilities'.

Outcome 6: Cities/towns do not discharge untreated waste (solid, liquid, and faecal waste) into the water bodies of Odisha

This outcome envisages eliminating insanitary latrines and open defecation as an 'immediate strategy'. In the second stage, management of waste water will be ensured at the community/city level and treated waste will be discharged. The OUSS, 2017 has also made considerable efforts on identifying institutional frameworks and roles to achieve this.

2.4 National Policy on Faecal Sludge and Septage Management (FSSM), 2017

Odisha formulated its new urban sanitation policy and strategy in January 2017. In February, government of India declared the FSSM, 2017. It was a response to the 'national declaration' made on September 09, 2016. The FSSM, 2017 was promulgated 'to address the gaps and provide the necessary directions to diverse stakeholders engaged in provision of FSSM services'.



Source: National Policy on FSSM, 2017

The ***vision*** of FSSM, 2017 is, 'All Indian cities and towns become totally sanitized, healthy and liveable and ensure sustenance of good sanitation practices with improved Onsite Sanitation Services together with faecal sludge and septage management to achieve optimum public health status and maintain clean environment with special focus on the poor'.

FSSM, 2017 has set six objectives. It has identified specific milestones, roles and responsibilities. It has suggested an implementation approach which includes technical options and financial plans.

2.5 Odisha Urban Septage Management Guidelines & Regulations, 2016

This guideline covers:

- Standards for septic tanks and other on-site sanitation system
- Safe transportation of septage
- Service delivery standards
- Regulation and Coordination
- Operation and Maintenance
- Monitoring & Evaluation

2.6 Slum Rehabilitation and Development Policy (SRDP)

The state government brought in a coherent Slum Rehabilitation and Development Policy (SRDP) in 2011. SRDP's main objective is to have "slum free cities". The policy aims at creating an enabling environment at the city and state level for up-gradation and poverty reduction. This, in turn, will improve the quality of life for the urban poor. The policy also provides the framework within which the Rajiv Awas Yojna (RAY), a centrally supported programme, shall be implemented.

This policy aims at mainstreaming all slums into city infrastructure with legal, affordable, equitable, and improved municipal networks and social services; providing basic minimum services to all slums till fully upgraded; developing affordable housing for slum dwellers in the neighbourhood who currently reside on untenable sites and are tenants in these settlements; providing joint house titles in the name of women and men with access to microfinance; and implementing reforms for tenure security and legislation of property rights, earmarking budgets for the poor, earmarking developed land in housing projects, rent control, and planning bye-laws.

Further, it suggests institutional arrangements such as constituting a State Level Steering Committee under the chairmanship of the chief minister; constituting an Orissa Slum Development Task Force at the state level under the chairmanship of the chief secretary; constituting a Slum Free City Planning Team in corporation areas and municipalities. It proposes that Notified Area Councils may organize into regional clusters and form Cluster Level Task Forces which may be headed by the municipal commissioner in case of a corporation, chief executive officers in case of municipalities and collectors/revenue divisional commissioners in case of the Cluster Level Task Force.

2.7 Orissa Municipal Act (OMA), 1950

The OMA says that Municipalities would provide water-supply, drainage and lighting subject to rules as may be prescribed and in accordance with sanction granted under such rules the Municipality shall (a) provide sufficient supply of water for the domestic use of the inhabitants; (b) provide and maintain a sufficient system of drainage; and (c) cause the public roads to be sufficiently lighted.

Supply of water for domestic consumption and use shall not be deemed to include supply (a) for any trade, manufacture or business, (b) for gardens or for purposes of irrigation, (c) for building purposes, (d) for fountains, swimming baths, public baths, tanks in or near temples and mosques within the Municipal area for any ornamental or mechanical purpose, but shall be deemed to include

supply (a) for flushing latrines, (b) for all baths other than swimming baths or public baths, (c) for the consumption and use of inmate of hotels, boarding house and the like, d) for baths used by such inmates, and e) for animals or for washing carts or carriages, where such animals or carts or carriages are kept for sale or hire.

It also talks about provision of maintaining public drains and rules to punish people who encroach upon drains, water bodies, etc.

2.8 Orissa Municipal Corporation Act (OMCA), 2003

As per this act each corporation shall have a standing committee for dealing with public health, electric supply, water supply, drainage and environment.

Obligatory duties of the corporation related to overall sanitation:

- The watering, scavenging and cleaning of all public streets and places in the city and removal of all sweepings;
- The collection, removal, treatment and disposal of solid waste, sewerage, offensive matters and rubbish and the preparation of compost manure from such solid wastes, sewerage, offensive matter and rubbish;
- The construction, maintenance and cleaning of drains and drainage works and the public latrines, water closets, urinals and similar public conveniences;

Discretionary duties of the corporation related to overall sanitation subject to the availability of resources:

- The organisation, maintenance and management of chemical or bacteriological laboratories for the examination and analysis of water, foods or drugs, for the detection of diseases or for researches connected with public health;
- Construction and maintenance of swimming pools, public wash houses, bathing places and other institutions designed for improvement of public health;
- Establishment and maintenance of farms or factory for the disposal of sewerage;
- Supplying, constructing and maintaining in accordance with the general system approved by the corporation, receptacles, fittings, pipes and other appliances whatsoever on or for the use of premises receiving and conducting the sewerage thereof into drains under the control of the Corporation;
- Taking measures to meet any calamity affecting the public in the city;
- The taking of any measure not hereinbefore specifically named, likely to promote public safety, health, conveyance and orderly urban growth.

2.9 12th Five Year Plan of (2012-17)

The objective of 12th Five Year plan is faster, more inclusive and sustainable growth of urban areas. Urbanisation should be guided towards inclusive, equitable, and sustainable growth of towns and cities with proper civic amenities. Good urbanisation would ensure that towns and cities are free from slums and provides employment and a decent quality of life to all their inhabitants including the poor. Plan envisions for a small city with all citizens having access to basic services of clean water, sanitation, sewerage, solid waste management, urban roads, safe and affordable public transport system, affordable housing and a clean and healthy environment. The 12th five year plan targets for universalisation of water and sanitation for urban areas.

2.10 Policy Paper on Septage Management in India

Ministry of Urban Development (MoUD) in support of Centre for Science and Environment (CSE) brought out the policy paper on septage management in India, 2011. The document provides the strategies and guidelines for preparation of national level septage management policy paper. The document focuses on management of domestic septage i.e. household, non commercial and non industrial sewerage in a responsible, safe and consistent manner. There was no septage management program or facility in the country as per NUSP 2008. This policy paper talks on stages of septage management, septage collection, transport, treatment, and disposal and treatment options. Policy document also discusses on the existing waste water management framework, key challenges and the policy recommendations.

3. Plans and Programmes

3.1 Atal Mission for Rejuvenation and Urban Transformation (AMRUT)

The AMRUT mission was launched in June 2015. The mission focuses on the following thrust areas:

i. Water supply,
ii. Sewerage facilities and septage management,
iii. Storm water drains to reduce flooding,
iv. Pedestrian, non-motorized and public transport facilities, parking spaces, and
v. Enhancing amenity value of cities by creating and upgrading green spaces, parks and recreation centers, especially for children.

Currently nine cities and towns of Odisha are covered under the AMRUT mission.

Slum improvement and rehabilitation projects

There are 35 selected towns/cities where this scheme is implemented in the state with a resource allocation of INR 1.4 trillion to Odisha. A total of 38 projects have been sanctioned under this scheme in 35 towns/cities for over 13,000 dwelling houses and infrastructure. As all the projects are in-situ development, participation by contractors has been poor even after tendering two times. Execution through beneficiaries is also not remarkable. Recently, decision has been taken to involve NGOs in the execution of IHSDP projects. All Municipalities (excluding Puri); Berhampur and Cuttack Municipal Corporations and HQR NACs are eligible to get projects under this scheme.

3.2 Integrated Low Cost Sanitation (ILCS) Programme

ILCS is specially designed to meet the need of economically weaker section of the society in urban areas. Under this programme the low cost sanitation units through sanitary two pit pour flush latrines with super structures are constructed or upgraded. Variation in the option is expected after considering the local situation. For households without toilet and practising open defecation, new toilets are being built under the schemes.

3.3 Odisha Urban Infrastructure Development Fund (OUIDF)

The Government of Odisha (GoO), through its Housing and Urban Development Department (HUDD) envisages setting up an Urban Infrastructure Development Fund (OUIDF) with assistance from Kreditanstalt für Wiederaufbau (KfW) Germany in the form of a Line of Credit and Technical Assistance support to develop and finance urban infrastructure projects in the state of Odisha. The OUIDF, along with a Project Development Fund (PDF) and a Grant Support Fund (GSF) is sought to be managed by an Asset Management Company (AMC) which is to be set up with a partner organisation from the private sector.

This includes water supply and water supply improvement schemes, under ground sewerage schemes, solid waste management, climate adaptation, rehabilitation, provision of basic amenities to informal settlements etc.

4. Guidelines/Advisory Notes

4.1 Guidelines for community and public toilets, 2011

Housing and Urban Development Department, Government of Odisha has prepared a guideline on community and public toilets in 2012 with the objective of helping local ULBs to move towards the policy objectives of Odisha Urban Sanitation Strategy 2011. The guideline covers both socio economic issues as well as technical context. Guideline details out the options, construction, maintenance of community and public toilet units, involvement of community,

specific communication activities for sensitisation, demand generation etc. It encourages the engagement of NGOs as a linkage between community and Government in community mobilisation.

4.2 Advisory Note: Septage Management in Urban India, 2013

Advisory Note on Septage Management published by ministry of Urban Development which is meant for ULBs to refer for details while preparing the Septage Management Plan (SMP) as part of the City Sanitation Plans (CSP). In this advisory there is a separate chapter on regulation and monitoring by ULBs. This will guide state and ULBs for the appropriate selection of septage disposal system.

5. Other Documents

- **5.1 City Sanitation Plans**: The activity report of Housing & Urban Development Department, Government of Odisha states that City Sanitation Plans (CSPs) have already been prepared for 104 ULBs
- **5.2 Service level benchmarks** for the ULBs
- **5.3 Various Court Judgments**
- **5.4 Other schemes and programmes in operation in Odisha such as** Smart City Mission, Swachh Bharat Mission, Awaas and Hriday
- **5.5 Local studies by different agencies,** e.g. studies of water quality in Bhubaneswar by PFI

6. Some immediate issues & prima-facie observations

Government has laid out many innovative and futuristic plans, policies, strategies and guidelines. The Courts have also issued clear directions from time to time. Yet, there continues to be gap in plans and actual implementations. In some cases, the basis or baseline information are misleading. For example, the 2011 Census figures have been taken as baseline by many plans and missions. But, first round studies have found the census information to be incorrect. For example, the Census shows many cities and towns as having piped sewer facilities, which is not true. In many cases, especially in AMRUT cities, it has been found that sewerage and septage management have been relegated in priority order or neglected. There are institutional and coordination gaps among various stakeholders.

Section II

An assessment of wastewater management in the cities of Odisha

Cuttack City

Administration

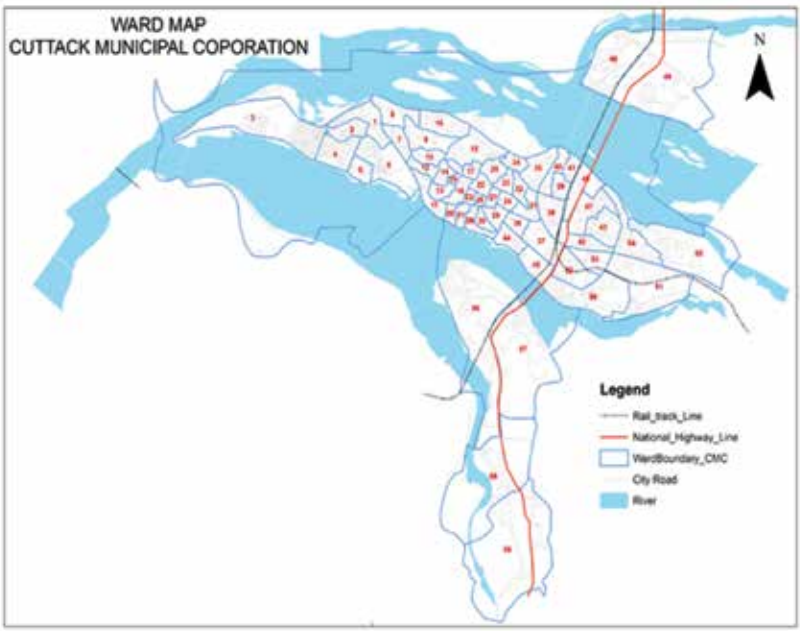
Cuttack is one of the oldest cities of India, and the oldest in the state of Odisha. In fact, the city was the capital of Odisha (earlier known as Orissa) for over nine centuries. The municipality came into existence in 1876 and became a Municipal Corporation on the independence day of 1994 as per the Government Notification No.24145/HUD dtd.28.07.1994. Cuttack is located at 20°30'N 85°50'E at the apex of the Mahanadi delta. Mahanadi, the largest river of the state and its tributaries like Kathjodi, Kuakhai and Birupa surround the city from all the sides. The total area of the Municipal Corporation is 192.5 sq.km.

Demographics

Cuttack Municipality Corporation (CMC) has 59 wards. The total population as per Census 2011 is 6.1 lakhs out of which 3.16 lakhs are male (about 52 percent) and 2.93 lakhs are female (about 48 percent). Population of the city was 5.34 lakhs in as per the 2001 Census. While the number of Households was 1.17 lakhs in 2001, it went up to 1.23 lakhs in 2011. The city population has grown about 14 percent in a decade. The city receives a huge amount of floating population during major festivals. It is estimated that 10,000 odd people from outside visit the city during the Dussehra times and more than 50,000 come during the Bali Yatra time. That's a daily figure!

Photos: Mohit Kapoor, NIUA

Map 1: Ward Map of Cuttack Municipal Corporation



Source: Cuttack Municipal Corporation

Water and Sanitation

The city's current water distribution network supplies 115 million litres of piped water per day, catering to the needs of about half of the city. According to the Census 2011, 21,681 HHs had flush/pour flush toilets connected to piped sewer systems, 69,874 HH had flush/pour flush toilets connected to septic tanks, 1,452 flush/pour flush toilets connected to other systems and 3,073 HHs had pit latrines with/without slabs. For 842 HHs, their night soil was deposited in the open. 1,416 HHs had service latrines whose night soil was removed by humans or animals. While 5,092 HHs depended on public toilets, almost 13,390 HHs (that's about 11 percent of total HHs) resorted to open defecation.

The brief City Sanitation Plan updated at the SBM website shows that city plans to reduce open defecating HHs to 2,414 by 2019. The same site lists the number of HHs having pit latrines at 1844 and those having insanitary latrines at 2,258 which will be reduced to 644 and 493 respectively by 2019. The CMC informs that 7,028 new IHHL have been built so far, in addition to what the Census figure listed.

There are 54 public and community toilets with total number of 126 seats in the city. Almost all of them, except 6, are being maintained by Sulabh. These public

facilities have 727 seats in total, 411 (about 57 percent) of which are for males and 317 (About 43 percent) for females.

Sewerage Management

CMC has been working on a centralized STP with an Official Development Assistance (ODA) from the The Japan International Cooperation Agency (JICA). The Project is now under its Phase II and is being undertaken at a cost of about 2,291 crore rupees (that also includes a project in Bhubaneswar). The city generates 85 MLD of sewerage per day at the moment and there was a sewerage treatment facility at Madgajpur that was capable of treating 33 MLD sewer. That has been defunct for a long time and the new plan, construction for which is underway, is a facility to treat 90 MLD per day, the amount of sewer officials say the city will generate by the year 2045.

Solid Waste Management

The city generates about 183 MT of solid waste, out of which about 141 MT is collected by the municipality. At the moment, this figure has drastically come down as for more than one year now, there is no private agency engaged in this work. Privatisation had been done for 39 wards for door to door collection and transportation of garbage, street sweeping, bush cutting etc. Rest of the wards are being maintained by the CMC itself. The previous contract expired last year and new contract was to be finalized, on the 15th of December 2017. While municipality officials say the garbage is disposed in a dumping yard at Chakradharapur, people of the city complain that most of the garbage is dumped in open spaces including river sides.

Septage Management

The CMC has two cesspool vehicles of which only one is functional. This vehicle makes 5 to 7 calls per day but the demand is much more. The CMC has recently got 4 cesspool vehicles from the Housing & Urban Development Dept (H&UD) that will be operated by private contractors soon. Officials in CMC informed that the contracts have been finalized in November 2017. The old suction machines that were bought with CMC funds had 700 litre capacity each. The new ones come with 1,000 litre capacity each. The CMC septic tank emptier machines charge Rs.1,000 per trip. There are four private cesspool operators in the city who charge between Rs.1,100 to Rs.1,300 per trip. The sludge emptied is taken to a temporary disposal site at Madgajpur where the CMC has dug about 50 trenches measuring 4x4x5 feet. However, both officials and people admit that most of the sludge is deposited in river sides and other open spaces of the city.

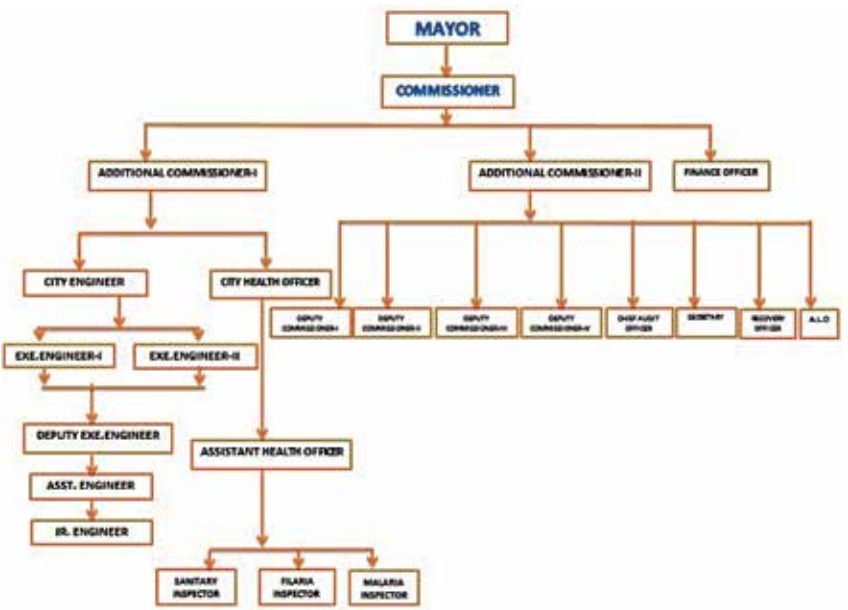
Slums sanitation and waste management issues

There are 264 recognised slums in Cuttack, according to the CMC. Out of these only 180 are authorized slums. Other reports suggest that there are 309 slums

in the city. About 2.35 lakhs people live in these slums. That means almost 38.5 percent of the city lives in the slums. This was about 41 percent as per the 2001 Census. The City had a City Sanitation Plan (CSP) earlier that is now being revived. While the new CSP is yet to be finalized, the All India Institute of Local Self Government (AIILSG) that did a survey for the earlier CSP revealed that most of the poor people, living in slums, resort to open defecation. The slums of this old city are very congested and marred with unhygienic conditions as field visits suggest. Many slums are the places where the city wastes are dumped. Slum dwellers whom we visited complained that they have to live with the dumped garbage and septage both. For most of the slums, bathing source are nearby *nullahs* which have been turned into drains. That's why they complain of skin diseases, itching and other diseases. Most of them even wash their clothes and utensils in these water sources and hence are exposed to unhygienic conditions.

ULB organogram and staffing

Chart 1: Organogram of CMC



Source: Cuttack Municipal Corporation

The Oganogram of the ULB is given in Chart 1 below. The CMC officials say they have the required staff as needed. Besides the Commissioner and one Deputy Commissioner (SBM), there is one Health Officer, 15 Sanitary Inspectors, 19

Jamadar, 59 Mates, 595 Sweepers and 68 Kuli. As SWM has been privatised in most of the wards, it was not possible to assess the staff requirement versus gap in the city. Slum dwellers had many complaints about the cleaning of streets, drains and dumping of wastes.

Financing (Convergence of Existing Schemes, Ongoing Schemes)

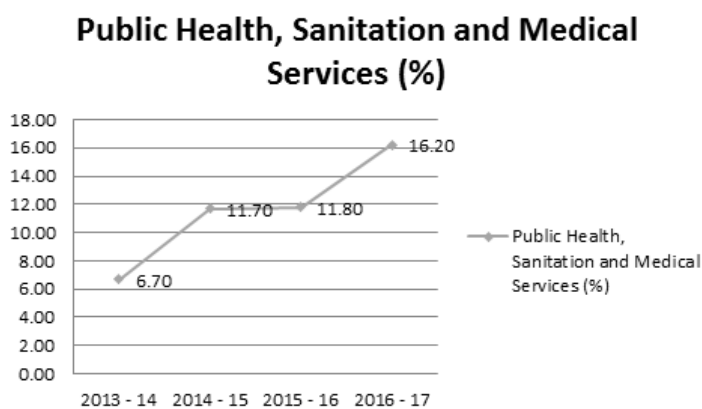
Over the last four years, for which general budget data was made available, the city's budget on public health, sanitation and medical services has been increasing. The following table and graph represent the same.

Table 1: Sanitation Budget of Cuttack Municipality for 4 Years

Budget	Public Health, Sanitation and Medical Services (In Crores)	Grand Total (In Crores)	%	% rounded
2013 - 14	16.70	249.33	6.697776	6.70
2014 - 15	27.72	259.45	10.68407	11.70
2015 - 16	41.40	350.49	11.81174	11.80
2016 - 17	41.43	255.93	16.18784	16.20

Source: Cuttack Municipal Corporation

Graph 1: Increased sanitation expenses of CMC
tion expenses of CMC



Source: Cuttack Municipal Corporation

The trend shows that a substantial increase occurred from 2013-14 to 2014-2015 and then it remained almost at the same level for two years to make another substantial jump in 2016-17.

Discussions with municipality officials as well as officials from the Sewerage Board revealed that there is a lack of coordination with regards to financing. The city is covered under AMRUT. As per the report of the State Annual Action Plan 2017-18 of AMRUT cities, a budgetary provision of 76.41 crore was made for improvement of water supply projects but the physical progress of 10 projects has remained at an average level of 29.4 percent. The financial progress for all these projects has remained at 28 percent. That does not include one project that has just been awarded. Another project is yet to start and out of the 10 projects that have started, the financial progress remains nil for 3 projects. The Septage Management Project, completion date for which is stated to be mid-2018, the budget allocation, as per SAAP 2017-18 is 1.94 crore rupees but there has not been any progress. The Orissa Water Supply and Sewerage Board (OWSSB) is managing the work of the Sewerage Treatment Plant and there is a separate wing for the JICA assisted project. However, we found lack of convergence between this project and the SeTP PMU at the CMC even though the site for both the projects are adjacent.

Sambalpur City

Administration

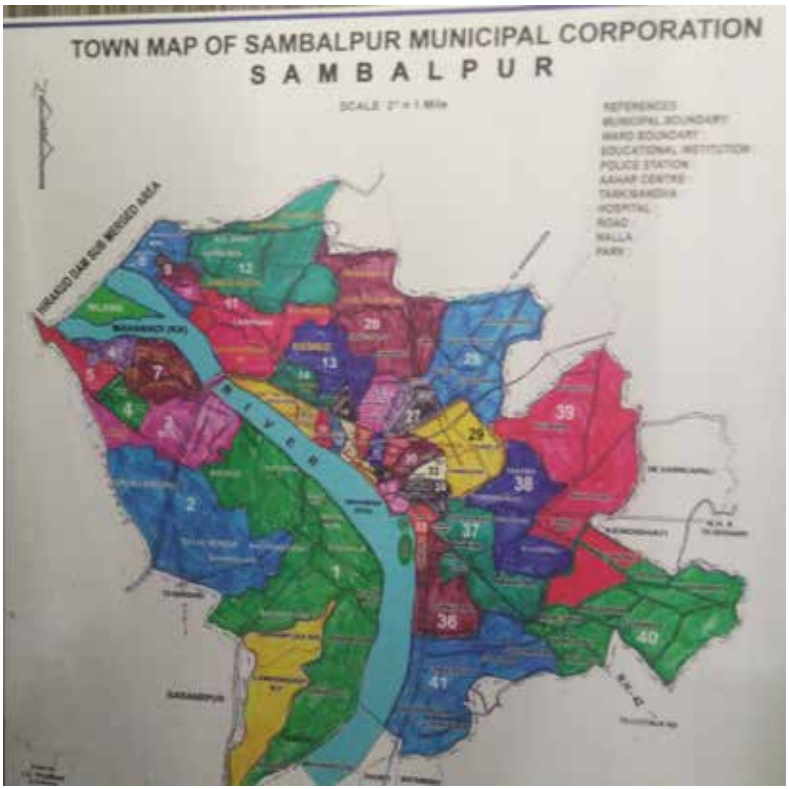
Sambalpur is one of the major cities of Odisha state and the principal city in Western Odisha. Immediately after independence of India, Hirakud dam-reservoir was constructed just upstream of Sambalpur. The city is located at Latitude: 83°58'E Longitude: 21°28'N. The Sambalpur municipality was established in the year 1876. It was notified as Municipal Corporation on November 21, 2014. The current Sambalpur Municipal Corporation (SMC) includes two erstwhile Notified Area Councils (NAC) Hirakud & Burla and 12 Gram Panchayats of two blocks. The SMC area, excluding the newly included Gram Panchayats, is 170 sq km. The total SMC area spreads over 303 sq. km.

Demographics

The total population of SMC, as per 2011 census, was 335,761. There were 78,803 households. The male female sex ratio stood at 946 females to 1000 males. For administration purpose the SMC has been divided into 41 wards as shown in Map 2.

Photos: Rajan K Panda

Map 2 Sambalpur SMC area and its wards



Source: Sambalpur Municipal Corporation

Water and Sanitation

According to the Public Health Engineering Organization (PHEO), Odisha, the city is supplied with 62.32 million litres per day (MLD) of water in Sambalpur SMC area at a rate of 167 litre per capita per day (LPCD). For purpose of this research, we have only taken the population and other figures of Sambalpur Municipality Corporation comprising of Sambalpur, Hirakud and Burla. The newly constituted SMC also incorporates 12 Gram Panchayats of two adjacent Rural Blocks but we have not taken the figures from there. There are 59,726 HHs in the SMC (Sambalpur, Burla, Hirakud combined). According to the Census 2011, 37,701 HHs had toilets inside their premises. 5,091 HHs had flush/ pour flush toilets connected to piped sewer systems, 29,635 HH had flush/ pour flush toilets were connected to septic tanks, 1,186 flush/pour flush toilets connected to other systems and 1,009 HHs had pit latrines with/without slabs. For 573 HHs, their night soil was deposited in the open. 207 HHs had service

latrines whose night soil was removed by humans or animals. While 1758 HHs depended on public toilets, almost 20,267 HHs (that's about 34 percent of total HHs) resorted to open defecation.

11,343 households have applied for IHHL under SBM (U). The authorities have verified 6,211 applications. Out of those, only 5,421 applications have been approved.

Sambalpur has 11 existing public toilets with 83 seats and 10 community toilets with 89 seats.

Sewerage Management

The Orissa Water Supply & Sewerage Board (OWSSB), which is implementing a sewerage project in the erstwhile Sambalpur Municipality area, has planned a 42 MLD capacity Sewerage Treatment Plant (STP). It expects that this plant can cater to the demand of population expected in year 2025. OSSWB informs that the treatment plant will be augmented every 10 years as the population grows to meet the additional capacity. The Detailed Project Report informs that the capacity will be augmented to 52 MLD with 2045 population in mind. The ultimate design period of the plant is 30 years. The technology adopted for the Sewerage Treatment Plant is Activated Sludge Process (ASP). The Sambalpur sewerage project started with an initial budget of Rs 324.32 Crore. Subsequently, Rs 70 Crores from AMRUT has been added it.

Solid Waste Management

Sambalpur Municipal Corporation has notified a 'Solid Waste Management bye laws, 2017' on August 08, 2017. Not many people are aware of it though. The SMC has also started door-to-door garbage collection system. The city generates about 100 metric tonne of solid waste every day. It does not have a proper solid waste disposal system. It is currently dumping the waste near the bank of Mahanadi river at Durgapali. As a part of the proposed integrated municipal solid waste management system, the SMC has identified 31 acres of land for solid waste management at Nildungri. SMC has outsourced cleaning to private parties in 29 wards. Every such ward is considered as beat. The SMC is utilising services of 540 male and female workers from outsourced agencies.

Septage Management

There are a total of five cesspool emptier vehicles to cater to the requirement of cleaning the septic tanks. Two of the cess pool emptier vehicles are operated by the SMC while three are operated by private operators. Two cess pool drivers informed that they dump the waste into the drains. The Municipal Commissioner and Health Officer, however, informed that all cess pool operators have been strictly advised not to dump waste in drains or river.

A comprehensive sewerage management programme is being implementated. The project integrates a 20 KLD capacity faecal sludge management unit. The unit is expected to complete by March 2018. The Odisha Water Supply and Sewerage Board (OWSSB) is implementing the project. However, the OWSSB's project covers not the whole SMC area but the earlier Sambalpur Municipality area only. Sambalpur had not yet become a part of SMC when the DPR for sewerage project was prepared. OWSSB is operating an office here since 2014 which is headed by the Project Engineer.

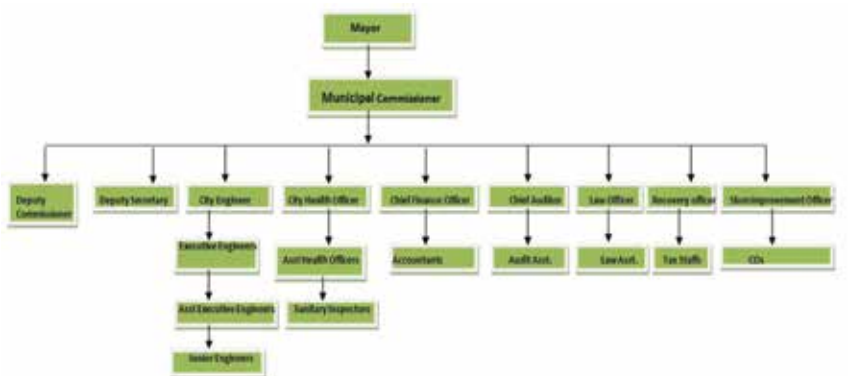
Slum sanitation and waste management issues

As per the information obtained from SMC, there are 171 slums in the SMC area. About one-third of city's total population were living in slums. These slums had a population of 11.3 lakhs in 2011, residing in 34,862 households. That means 34 percent of the city lives in slums. Different data sets suggest that 46 percent of the city people are poor, most of whom live in the slums. Most of the slum dwellers defecate in the open and very few of them depend on CTs and PTs. Many slums are located on drains, river side and other shanty locations. The slum dwellers complain that the municipality dumps garbage and sludge near their habitations. The slum dwellers heavily depend on Mahanadi and local ponds/tanks for their bathing and other domestic water requirements. Mahanadi and some of the local water bodies also see the maximum open defecation by slum dwellers.

ULB Organogram and Staffing

The Mayor is supposed to be the head of the SMC. But election has not taken place for the SMC since its formation on November 21, 2014. Hence, there is no mayor for the SMC. There are no ward members either. The Municipality Commissioner is the executive head.

Chart 2: Organisation structure of SMC



Source: Sambalpur Municipal Corporation

The city has outsourced many regular activities to private parties, including sweeping. Such staff members are not on the regular roll of the SMC and hence not shown here. As per the information provided by the SMC there are 540 male and female sweepers working in 29 wards or erstwhile Sambalpur Municipality alone.

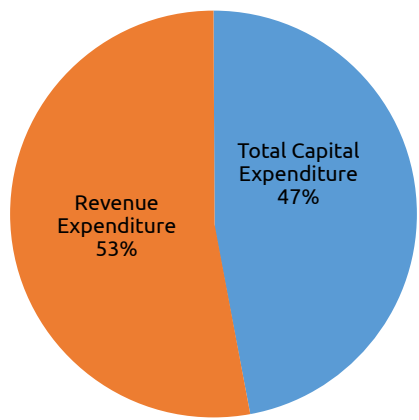
According to the SMC officials, they have no staff shortage. We however found there is lack of coordination among different stakeholders engaged in sanitation. The SMC and the PHEO always blame each other for all the epidemics that have spread in the city. The SMC officials and OWSSB officials also lacked coordination.

Financing (Convergence of Existing Schemes, Ongoing Schemes)

The budget for year 2017-18 of the SMC informs that it will have Rs 357,504,709 of revenue income and will have a total capital receipt of Rs 485,192,800. The budgeted total revenue and capital expenditure for year 2017-18 is Rs 60.94 Crore and Rs 54.73 Crore respectively. Graph 2 depicts the share of revenue and capital expenditure budget of SMC for year 2017-18.

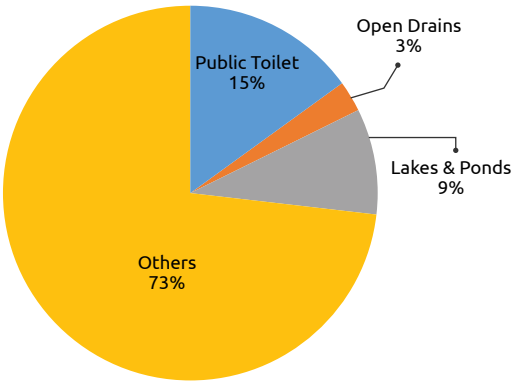
Some expenditure related to wastewater and sanitation, as drawn from the budget have been shown in Graph 3. It shows a substantial expenditure of 15% of total estimated capital expenditure on public toilet.

Graph 2: Share of Revenue and Capital Expenditure in SMC Budget 2017-18



Source: Sambalpur Municipal Corporation

Graph 3: Share of Capital Expenditure Budget for year 2017-18



Source: Sambalpur Municipal Corporation

Discussions with municipality officials as well as officials from the Sewerage Board revealed that there is not much of coordination with regard to the financing. The city is covered under AMRUT. As per the report of the State Annual Action Plan 2017-18 of AMRUT cities, a budgetary provision of 56.18 crore was made for improvement of 7 water supply projects but the physical progress is visible only for 3 projects. Rest 4 projects have not yet started. The physical progress of the 3 projects was 29 percent, while financial progress was 35 percent. The Septage Management Project, completion date for which is stated to be mid-2018, the budget allocation, as per SAAP 2017-18 is 5.37 crore rupees but there has not been any progress. The Orissa Water Supply and Sewerage Board (OWSSB) is managing the work of the Sewerage Treatment Plant and there is an engineer for this project. However, we found lack of convergence between this project and the SeTP PMU at the SMC.

Paradeep

Administration

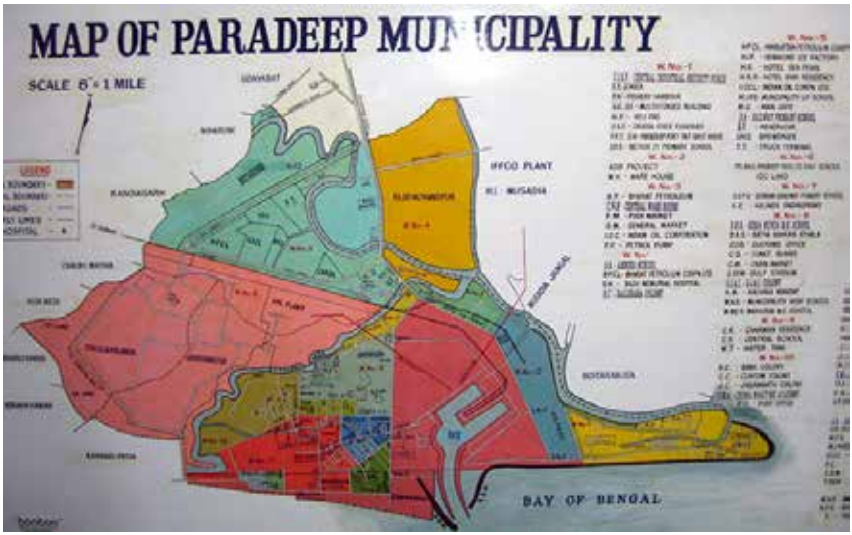
Paradeep is an important industrial township of the state of Odisha. One of the first Ports of India was established here in 1962. The town is situated at 20°18' 59.58"N 86°31'40.9"E on the Bay of Bengal. The Paradeep Municipality was constituted in the year 2002, upgraded from a N.A.C. that had been formed in 1979. The Municipality is spread over 32.40 square kilometres.

Demographics

The Municipality has 19 Wards. The total population of the Municipality as per 2011 Census is 68,585. Males at 37,300 constitute 54.38% of it, while females at 31,285 comprise 45.61%. Paradeep is perhaps a rare case of an ULB where population has decreased between the two Censuses.

Photos: Rajan K Panda

Map 3: Paradeep Municipality with ward boundaries



Source: Paradeep Municipality

Water and Sanitation

It's a port town and the Paradeep Port Trust Ltd. (PPT) supplies about 3 million gallon water daily, which reaches to a few thousand households. Neither the PPT nor the Municipality could give us exact number of HHs covered under this piped water scheme. For other parts of the municipality, including slums, water is provided through deep bore wells and tankers. According to the Census 2011, out of the 18,235 HHs, 301 HHs had flush/pour flush toilets connected to piped sewer systems, 5,887 HH had flush/pour flush toilets connected to septic tanks, 127 flush/pour flush toilets connected to other systems and 145 HHs had pit latrines with/without slabs. For 127 HHs, their night soil was deposited in the open. 63 HHs had service latrines whose night soil was removed by humans or animals. While 2,310 HHs depended on public toilets, almost 9,375 HHs (that's about 51 percent of total HHs) resorted to open defecation.

As of 2011, there were 8 Public Toilets (PT) and 9 Community Toilets (CT) with combined capacity of 256 seats equally divided between men and women. Between 2011 and October 2017, they had built another 23 PTs and CTs. 6 more are under construction.

Sewerage Management

The PPT had two STPs since 1981-82 but those have been abandoned for more than a decade now. The PPT is currently building two STPs of 2 MLD and 2.5 MLD capacities respectively, construction work for which is supposed to be

over by August 2018. There is a plan for building one more with 2 MLD capacity but that's at the planning stage now. Four large industrial establishments have built STPs inside their own complex with a combined capacity of 5,815 KLD. There lies a huge gap in treating Grey Water in Paradeep at the moment.

Solid Waste Management

The Municipality has given the charge of 14 Wards to private agencies and rest 5 Wards are being cleaned by them. 57.45 MT of garbage is generated and collected by the Municipality daily. As per the Chairman of the Municipality, more than 2 Lakh MT of garbage is already piled up in the garbage yard. They had proposed for a Solid Waste Management (SWM) project under the Integrated Coastal Zone Management Project (ICZMP) funded by World Bank to Govt. of Odisha.

Septage Management

The Municipality has 2 cesspool vehicles but no dedicated drivers and helpers for them as the officials feel they don't get ample calls to pay for dedicated drivers. So, the drivers and helpers (basically sweepers) from the overall staff pool are drawn when needed. Both the Cesspool machines are of 3000 litres capacity. The old machine uses oil based technology, while the new one that was added two years ago uses water based technology to suck the faecal sludge from the septic tanks.

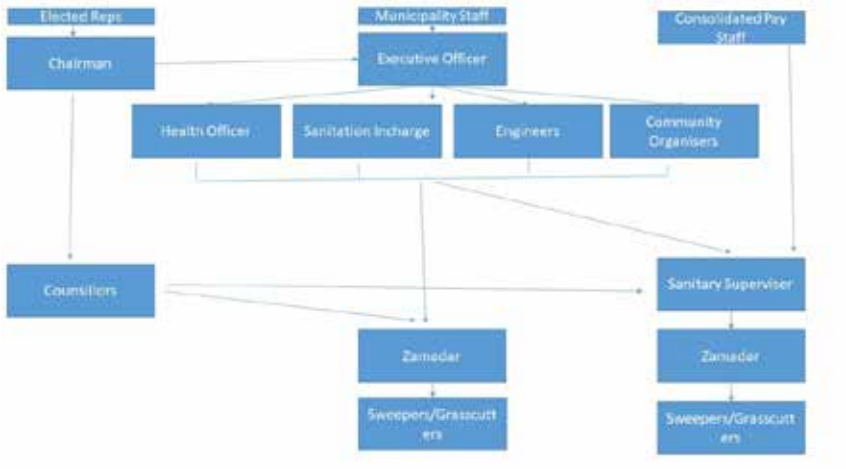
Slum Sanitation and Waste Management Issues

Slum population at 54,240 amounts to 79 percent of the total population. There are 45 slums in the Municipality, out of which only 18 are registered. In fact, the Municipality has always had a problem with regard to land issues as almost 90 percent of the total area of the Municipality is owned by the Paradeep Port Trust Ltd. (PPT). 12 out of the 19 Wards are inside the Port area and about 12,000 slum population resides in these areas. Out of the 17,411 House Holds (as per 2011 Census) residing in Paradeep, 7492 are categorised as BPL families. That's almost 43 percent. Slum dwellers live in unhygienic conditions. There is lack of drainage and toilets in most of the slums and open defecation is common. The slums which are adjacent to the garbage dumping yard face double problem of stink and pollution because the garbage is burnt by miscreants.

ULB Organogram and Staffing

The Municipality's organogram insofar as sanitation operation is concerned is given in Chart 3.

Chart 3: Organogram of Paradeep Municipality's sanitation operation:



Source: Paradeep Municipality

The Municipality officials state they have required staff looking after sanitation operations.

Financing (Convergence of Existing Schemes, Ongoing Schemes)

Budget on Sanitation:

The Municipality's sanitation budget for two years has been given in Table 2 and represented in Graph 4.

Table 2: Sanitation Budget of Paradeep Municipality for two years

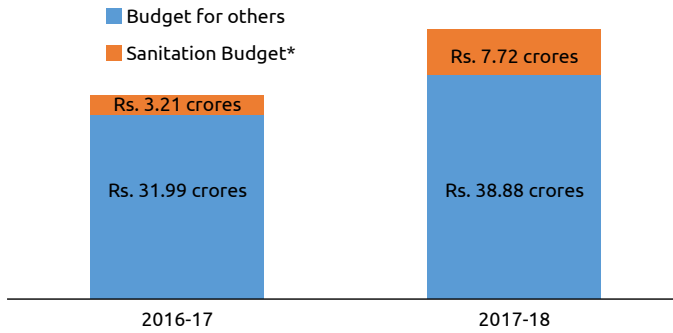
Year	Total Budget (in INR Crores)	Sanitation Budget* (in INR Crores)	Percentage
2016-17	35.20	3.21	9.13%
2017-18	46.59	7.71	16.56%

*This does not include general establishment staff salary who also support sanitation among other works.

Source: Paradeep Municipality

The Municipality has made a huge jump of more than 7 percent in its sanitation budget in one year.

Graph 4 indicates the insignificant share of budget for sanitation to total budget.



Source: Paradeep Municipality

Expenditure on Sanitation

Expenditure of the Paradeep Municipality on Sanitation for two years is given in Table 3.

Table 3: Sanitation expenditure of Paradeep Municipality for two years

Year	Sanitation Budget (in INR Crore)	Sanitation Expenses (in INR Crore)	Percentage Expenditure
2016-17	3.22	3.86	120 %
2017-18 (upto 09,2017)	7.72	3.80	49.29 %

Source: Paradeep Municipality

While the Municipality surpassed its sanitation expenses by 20 percent of budget last year, in seven months of the current fiscal year it has almost spent 50 percent of the budget.

Sources of Finance: The Municipality gets most of its funds from 14th Finance Commission and 4th State Finance Commission, about 30 percent of which is spent on sanitation. Expenses on SWM have been spent from their own funds.

Serious lack of coordination was observed between the Municipality and the PPT which is in charge of both water supply and STPs. The Municipality authorities say that they are exploring new possibilities of cooperation under the current Chairperson, which in fact has improved the situation of IHHLs under SBM, however there was huge lack of information at the Municipality with regard to both water supply and STPs being undertaken by the PPT.

Subarnapur

Administration

Subarnapur (Sonepur) town is located at the confluence of Mahanadi river and one of its largest tributaries the Tel river. Another important tributary of Mahanadi, the Ong River, meets Mahanadi river about 10 kilometres upstream of Sonepur. The town is located between 20°30'N to 21°11'N latitude and 83°27'E to 84°60'E.

The modern Subarnapur town is the district headquarter town of Sonepur or Subarnapur district, which was carved out from Balangir district on April 01, 1993. But the history of Subarnapur municipality dates back to 1951. The Subarnapur Municipality was constituted on April 01, 1951 as per government notification number 58/LSG dated January 03, 1951.

Demographics

The total population of Subarnapur Municipality areas, as per 2011 census, was 20,777. There were 4,841 households. The male female sex ratio stood at 939.41 females to 1000 males. The total literacy rate was 79 percent with male literacy rate significantly higher than female literacy rate.

The Municipality is spread over about 14 square kilometre area, and has 15 wards.

Photos: Rajan K Panda

Water and Sanitation

According to the PHEO, 3 MLD water is supplied on an average to the city. An analysis of various information available points at about 43 percent HH being covered under piped water supply at home. Many more access the supply from public stand posts. According to the Census 2011, 160 HHs had flush/pour flush toilets connected to piped sewer systems, 2373 HH had flush/pour flush toilets connected to septic tanks, 40 flush/pour flush toilets connected to other systems and 102 HHs had pit latrines with/without slabs. For 7 HHs, their night soil was deposited in the open. 37 HHs had service latrines whose night soil was removed by humans or animals. While 55 HHs depended on public toilets, almost 1977 HHs (that's a huge 41 percent of total HHs) resorted to open defecation. The Municipality has no PT or CT. However, 4 of them are being constructed at the moment and may be operational anytime in 2018.

Sewerage Management

A simple calculation of PHED supply alone means that the city is generating about 2.4 MLD of waste water. Most of the water drain into the river through various small nullas. Many toilet wastes also go directly into the drains and through that into the river. The Executive Officer of the Municipality informed that that there are about 36 kilometers of drain in the town. However, the Municipality has not maintained any specific record of the drains and their discharge capacities. The Municipality has no STP proposal as of now.

Solid Waste Management

According to a rough estimation in the city development plan, the town generates about 22 MT of solid waste a day. Currently, about 16 MT is being lifted and disposed of at random locations. The Executive Officer during interaction, informed that they are in the process of finalising a location for solid waste disposal. The Municipality has given contracts to private parties for cleaning and waste disposal in 11 out of 15 wards in Subarnapur. Municipality staff are responsible for the other four wards.

Septage Management

The Municipality hasn't yet made any estimation of faecal sludge or septage generation in the town. The Municipality has only one cess pool emptier to cater to the requirement of cleaning the septic tanks. That lone cess pool emptier is lying defunct since a year. The Subarnapur Municipality is requesting Binika NAC (a nearby town) to provide cess pool emptier when need arises. There is no private cess pool emptier in Subarnapur town.

The cess pool emptier driver informed that they mostly dump the septage in low lying areas near the bank of River Tel. Sometimes they dump the waste in Arjunpur forest, about seven-eight kilometres from the centre of the town.

Slum Sanitation and Waste Management Issues

As per assessment of the Subarnapur Municipality there are 46 slums in the town. Out of those 16 are authorised slums and 30 are unauthorised slums. As per the information collated by Subarnapur Municipality Authority for submission to National Urban Health Mission, a total of 8,557 individuals belonging to 2,054 households were residing in the slums. This means about 41.2% of population were living in slums. However, another enumeration by the Municipality, quoting census figures, puts the slum population at 9,784. Two wards are heavily slum dominated and they face problems of unhygienic condition.

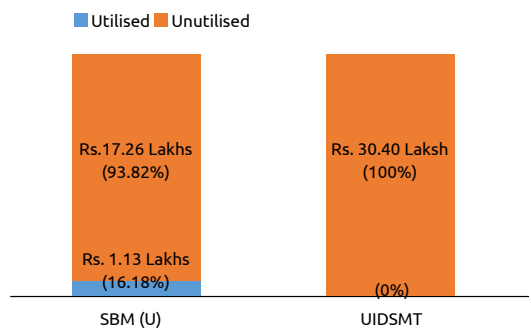
ULB Organogram and Staffing

The Executive Officer of the Municipality informed that currently there are 24 regular staff and 19 contractual staff working in the Municipality. What we could gather from the data provided is that there is a shortage of 33% sweepers. The Municipality has outsourced cleaning and sweeping work of 11 of 15 wards.

Financing (Convergence of Existing Schemes, Ongoing Schemes)

For Subarnapur Municipality we got hold of SBM fund utilisation status for the year 2015-16 and found a dismal record of fund utilisation. For the year 2015-16, the Municipality had received Rs 18.39 lakhs under SBM (U), but it utilised only Rs 1.13 lakhs or a meagre 6.2 percent. The status with utilisation of fund received under UIDSMT is even worse as the Municipality failed to spend any amount from the Rs 30.40 lakhs it had received in the year under that scheme. Graph 5 depicts the poor fund utilisation pattern of two very important programmes related to sanitation.

Graph 5: Utilisation of fund in year 2015-16



Source: Subarnapur Municipality

Subarnapur being a small town, there was better communication between different stakeholders. However, there has not been much progress on water sanitation programmes in the Municipality, as it is evident from the above findings.

Section III

Discussion on key research questions

1. *What is the current status of sanitation, septage and waste water management in 3-4 towns of the State? Presenting the status in terms of quantitative and qualitative assessment of sewerage and septage management in each town. What are the technologies/ systems in use? Or what are the current FSS management practices? These can be roughly categorised by residential/commercial/ locality. Capacities of the existing sewerage system vs capacity currently required)*

In all the four cities studied as a part of this research, there is absolutely no treatment of sewerage and septage. While Cuttack and Paradeep had some facilities in the past, they are defunct at the moment. Cuttack and Sambalpur are AMRUT cities and thus have initiated SeTPs, they are also coming up with centralised STPs. Paradeep is working on centralised STPs because the Paradeep Port Trust Ltd. (PPT) is doing the same for the Municipality. The fourth city, that's Subarnapur, has neither any plan for STPs nor for SeTP. The following table 4 shows the current status of Sewerage and Septage management in the four cities studied.

Table 4: Sewerage and Septage Treatment Generation versus capacity created in 4 cities

Name of the City	Sewerage Generated	STP capacity planned	Septage Generated*	SeTP capacity planned
Cuttack	92 MLD (current)	90 MLD (by 2045) + 400 KLD by one medical hospital (by 2019)	141 cubic meters per day	60 cubic meters per day
Sambalpur	52 MLD (current)	50 MLD (by 2045)	49 cubic meters per day	20 cubic meters per day
Paradeep	13.64 MLD	4.5 MLD (by 2018) + 5815 KLD by industrial units (existing)	9.5 cubic meters per day	No plan as yet
Subarnapur	2.4 MLD	Non-existent	3.7 cubic meters per day	No plan as yet

*For Cuttack and Sambalpur, the OWSSB has made estimations. For Paradeep and Subarnapur the researcher has made the calculation taking the average per HH based on the OWSSB calculation for other two cities.

Source: Data collected from the ULBs under study

While the waste water of all the cities drain into the Mahanadi and its tributaries, the Fecal Sludge (FS) for all households having their toilets connected to septic tanks, are emptied by cesspool machines of the Municipalities at various

locations including open spaces and river side areas. There are a few private operators in Cuttack and Sambalpur but people mostly depend on Municipality machines. In old townships of Cuttack and Sambalpur, where there are narrow roads, if the sucks-on pipes don't reach, then small manual 'thelas' (carriers) are used to empty the FS which is then emptied into bigger vehicles and taken away. People in slums and such narrow locations informed us that the cesspool vehicles as well as other vehicles are used to empty the waste material in low lying lands or open places near to the river and nullahs. Ultimately, all these get drained into the Mahanadi River and pollute the same.

Looking into the data for Municipality operated cesspool machines, there seems to be a huge gap in the amount of FS being generated per day and the amount emptied by the operators. While per day FS generation in Cuttack comes to about 1,41,000 litres per day, the cesspool machines only empty about 4,900 litres per day. The gap therefore stands at near about 94.5 percent. In Paradeep, the estimated FS generated per day comes to about 9,044 litres but the cesspools empty only about 500 litres per day. The gap for Paradeep therefore stands at 94.5 percent. For Sambalpur and Subarnapur we could not get proper data to calculate this gap. It therefore means, either the rest of the FS is being emptied by private operators or are being emptied manually. Looking into the number of private operators for Cuttack (which we could gather from other sources) if we consider that 4 of them empty 2,800 litres of FS per day (1,000 litre each, 7 trips a day), then the gap reduces to 66.5 percent. That's still huge. Cuttack has got another 4 Cesspool Operators from H&UD which will be operational soon. If we add 28,000 litre to be emptied by them based on the above calculations then the city will still have a huge gap of 56.8 percent. What's more important to note here is that Cuttack city's envisaged SeTP capacity caters to the amount of sludge the entire cesspool emptier will transport together. The plan therefore leaves behind almost more than 50 percent of the city's FS untreated.

Rules, according to Pollution Control Board Officials, suggest that residential apartments constructed on or more than 2000 square meters need to establish STPs. Similarly, hotels that are having more than 20 rooms and that generate more than 10 KLD of waste water daily need to establish STPs. While we could not get any data to know how many residential apartments have STPs in the cities, 5 hotels in Cuttack have established STPs and 8 hotels in Paradeep have established STPs. There was no way to check whether these STPs are working or not. However, two hotels in Paradeep confirmed that they are just draining out the treated water to the city drains. For all the hotels, as well CTs and PTs, the cesspools were emptying the FS when needed. Based on the above discussion, we could conclude that the cities are still having a lot of gap in management of their wastes.

2. *How sustainable and equitable are the existing and proposed sanitation, septage and wastewater disposal services in urban areas of the given towns of the state you wish to study. Place this in context to the Municipal Finances and Institutional structure of the Urban Local Bodies and the economic situation of the population in general and the poor in particular.*

With regard to solid waste management, the Municipalities mostly depend on privatisation of the wards. In Cuttack, privatisation has been done for 39 wards for door to door collection and transportation of garbage, street sweeping, bush cutting etc. Rest of the wards are being maintained by the CMC itself. The private agency was paid 1 crore rupees per month for this work. Currently this contract is over since more than one year and a new contract was supposed to be awarded in January 2018. The Municipality officials did not mention any shortage of funds and there was no direct fees being charged from the people for the collection of garbage. At this moment it is purely an expense borne by the Municipality using all its existing sources of funds. In Sambalpur, 29 of the 41 wards have been privatised for collection and disposal or garbage, street cleaning, bush cutting etc. Here also the same system like Cuttack is in operation. We could not get the amount of contract. However, in Sambalpur, they have started a pilot public contribution at a rate of Rs.30 per month from HHs in a few colonies. This is not regularly being collected as per the people of these colonies.

The Paradeep Municipality has given the charge of 14 Wards to private agencies and rest 5 Wards are being cleaned by the Municipality. The system of financing is the same here and no fees is being charged from residents. The Paradeep Municipality had proposed for a Solid Waste Management (SWM) project under the Integrated Coastal Zone Management Project (ICZMP) funded by World Bank to Govt. of Odisha. In this project of about 41 crore rupees, they plan to segregate garbage at source and then process the waste at four places. The project got delayed for 7 years now because of some political and other issues. The Municipality now is confident of starting the project which will have four SWM units throughout the town. The bidding process began on 7th December 2017. However, to aid the project, the Municipality has already started door to door collection and pilot segregation at source in some pockets. In the ICZMP project, the Municipality wants to make a business model by recycling plastics and selling the same through commercial ventures including slum dwellers. However, no concrete plan has been made in this regard yet. The Subarnapur Municipality has given contracts to private parties for cleaning and waste disposal in 11 out of a total of 15 wards. Municipality staff are responsible for only four wards. Here also the Municipality is bearing all the cost and no money is being collected from the residents.

With regard to the Sewerage Treatment Plants, Cuttack and Sambalpur are building centralised STPs. Cuttack Municipality has been working on a centralized STP with an Official Development Assistance (ODA) from the The Japan International Cooperation Agency (JICA). The Project is now under its Phase II and is being undertaken at a cost of about 2,291 crore rupees (that also includes a project in Bhubaneswar). The Municipality officials have not devised any plan as yet to recover this cost from the residents. They could not even tell us if they plan to increase any tax from both residential and commercial establishment once this project is operational. This is a soft loan assistance from Japan and the government has to pay the same with very marginal rate of interest. The Sambalpur sewerage project started with an initial budget of Rs 324.32 crore. Subsequently, Rs 70 crores from AMRUT has augmented it. However, here also, the officials could not spell out if they had any cost recovery plans. The Paradeep STPs are to be maintained by the PPT and it has no plans to recover any cost from the people.

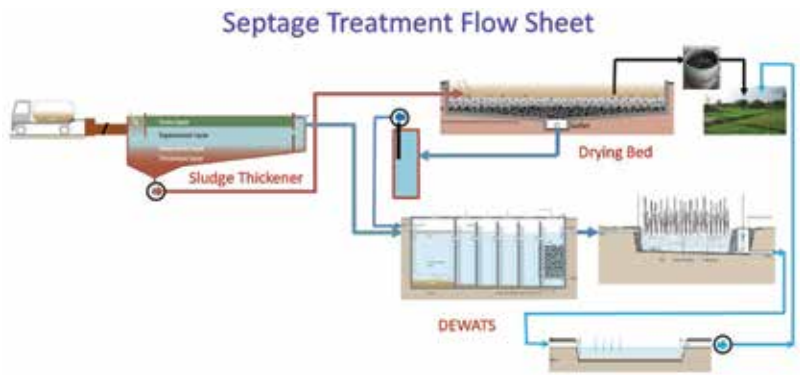
Technology wise, all STPs are same. For Cuttack, the JICA project is building a comprehensive network of around 264 km underground gravity sewers that are equipped with 28 pumping stations and two sewerage treatment plants at Bidanasi and Matgajpur. The 23-km-long two storm water channels would be reconstructed scientifically along with the drains connecting them to ensure maximum efficiency in carrying and discharging water from the city. The treated water will be drained into the rivers. The Sambalpur STP will have 252.8 km long underground gravity sewers equipped with 8 pumping stations. The technology for both these STPs is 'Activated Sludge Process (ASP)'. We could get hold of the DPR of the Sambalpur project and it also has a provision to establish power generation of 13 KWh hydropower based on an elevation of 5 meters of the sewer flow. The cost of this power plant is estimated at 78 lakh rupees with a cost recovery plan in eleven and half years with an yearly expected revenue generation of 6.56 lakh rupees. However, the Municipality officials were not aware of this aspect of the STP.

With regard to the Septage Management, no municipality has a business plan for the cesspool emptier. Hence, it is difficult to understand whether the income received from them is making any sustainable contribution to the municipality exchequer or not. Private operators that we could meet in Sambalpur and Cuttack found this business a loss making one. They opined that there was not much demand to recover cost of their machines, men and maintenance. The Housing & Urban Development Department (H&UD) of Govt. of Odisha with support from the OWSSB has provided 86 new cesspool trucks of 3KL capacity to 57 ULBs. Private operators will be roped in to manage these. Cuttack has got 4 such trucks and they are preparing the contracts with private operators. The private operators will be given these machines on contract and

hence it will again be a model where the municipality will pay them monthly contract amounts. The rates for emptying septic tanks will not grow in the near future, as we could gauge from the discussions with officials. That means, the Municipalities will now get less amount of money from the new cesspool machines than what they used to get from the earlier machines. For rest of the cities, we could not get any data on these new machines.

Technology wise, the OWSSB is using DEWATS system with nutrient reuse. The following image 1 gives a description of the technology.

Image 1: Septage Treatment Technology used by OWSSB in AMRUT Cities

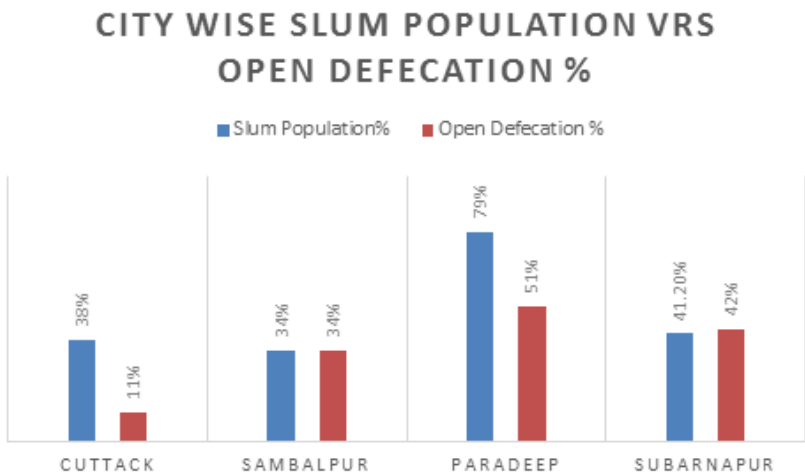


Source: OWSSB office

There are serious inequality issues insofar as water and sanitation provisions are concerned. Both in water supply and sanitation services, all the cities can be described as hosting two worlds in one geography, except for Subarnapur where the gap between slum dwellers and others is less with regard to water supply. In all the cities, while piped water supply reaches the households of non-slum areas, the slums either get public stand posts or have to fetch water from bore wells, hand pumps and water tankers. There is no proper estimation of how much water is being supplied to them. There is huge discrimination between the two segments of the cities.

Most people in the slums don't have toilets in their household premises. In some slums that we visited, on an average about 10 percent people would be having individual toilets. However, the use of these toilets remain a concern. Slum dwellers that we visited reported somewhere between 10 to 30 percent of toilet usage. It's commonly understood that most of the slum people defecate in the open. A comparison between the people living in slums and those defecating in the open, as depicted in Graph 6, shows that while this looks true for Sambalpur and Subarnapur, the figures are different for Cuttack and Paradeep.

Graph 6: City wise slum population versus open defecation

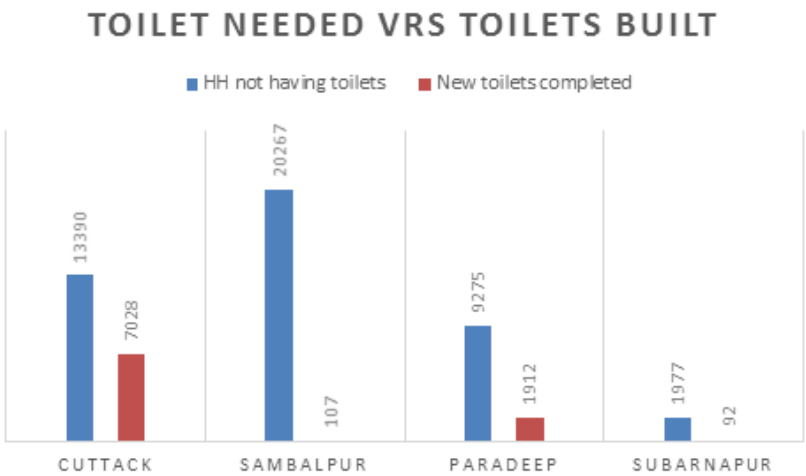


Source: Data from respective ULBs

In Cuttack, the slum population outnumbers the open defecators by almost 27 percent and in Paradeep it does so by 28 percent. However, visit to some slums in both the cities point out that most of the slum dwellers don't have IHHLs. Even the number of PTs and CTs are insufficient. While there is ambiguity with regard to these statistics, as we have seen in the case of toilets connected to sewer lines, the fact remains that slum dwellers in all the cities have not been covered by proper sanitation. The same is with drainage, garbage and other aspects of sanitation including menstrual hygiene which remain poor in slum areas where most of the urban poor live.

While SBM envisages all cities to be Open Defecation Free (ODF) by 2019, the progress of toilet construction for the poor has been abysmal. The Graph 7 gives a city wise comparison between people not having toilets (as per 2011 Census) and the number of IHHLs completed so far.

Graph 7: City wise need for IHHLs as per 2011 Census versus toilets built



Source: Census of India, 2011

As per this graph, while Cuttack at 52.5 percent completion rate has made the maximum progress of building IHHLs between 2014 and 2017 (till the data was available for this study), Sambalpur at 0.5 percent completion rate has made the minimum progress rate. This graph might not give the true picture of the toilet figures because the Municipalities have not been able to provide figures of toilets built after 2011 by people without government assistance. Still, this is an indicator of how slow things are progressing and also an indicator of how slum dwellers still face an inequitable situation insofar has sanitation services are concerned. Further, these are only figures of HHs defecating in the open. If we consider the people depending on PTs/CTs, who can build toilets but have been using either PTs/CTs or defecating in the open (that does not reflect in the statistics, but evident from field visits), then the gap will be wider.

Each city is dumping garbage and septage in areas near the slums or places where the poor live. And then the STPs and SeTPs may not necessarily be covering the slums because of the already existing gaps in these proposals. Given these circumstances inequality in the cities are going to stay for a few decades. The poor will continue to live in unhygienic conditions.

3. *What is the septage containment, conveyance, disposal and treatment systems in each town? What is the business model for the private sector operators(study for a few operators)? Where this is done by the Municipality, what is their operational model?*

We have already discussed this in previous sections.

4. *What is the contribution if any of unsafe disposal and treatment, contributing to the contamination of ground water and surface water?*

The Odisha State Pollution Control Board (OSPCB) has been monitoring water quality of Rivers. We are presenting below (from Table 5 to 19) average figures for five years from 2011 to 2015 of pH, BOD and TC values for relevant points downstream of each of the four cities studied. The figures are from both Mahanadi and Kathajodi rivers.

Table 5: Average of Seasonal pH* value in Mahanadi at Sambalpur Downstream and Further Downstream

Season	Downstream 1 Value	Downstream 2 Value
Winter	8	7.7
Summer	8	7.8
Monsoon	7.8	7.8
Post Monsoon	7.9	7.8
Yearly average	7.9	7.8

Criteria for Class A River: pH value = 6.5 to 8.5 (CPCB)

Table 6: Average of Seasonal pH value in Mahanadi at Subarnapur Downstream

Season	Downstream Value
Winter	8.1
Summer	8.1
Monsoon	8
Post Monsoon	8.1
Yearly average	8.1

Table 7: Average of Seasonal pH value in Mahanadi at Cuttack Downstream and Further Downstream

Season	Downstream 1 Value	Downstream 2 Value
Winter	7.9	8.1
Summer	8.1	8.2
Monsoon	7.8	8
Post Monsoon	8.1	7.9
Yearly average	8	8.00

Table 8: Average of Seasonal pH value in Kathajodi at Cuttack Downstream and Further Downstream (Mattagajpur)

Season	Downstream 1 Value	Downstream 2 Value
Winter	8.1	7.6
Summer	8.1	7.5
Monsoon	7.9	7.6
Post Monsoon	7.8	7.6
Yearly average	8	7.6

Table 9: Average of Seasonal pH value in Mahanadi at Paradeep Downstream

Season	Downstream 1 Value
Winter	8
Summer	8
Monsoon	8
Post Monsoon	8
Yearly average	8

Table 10: Average of Seasonal BOD* (mg/l) value in Mahanadi at Sambalpur Downstream and Further Downstream

Season	Downstream 1 Value	Downstream 2 Value
Winter	3.2	2.5
Summer	2.8	2.2
Monsoon	2.3	1.9
Post Monsoon	2.7	2.1
Yearly average	2.8	2.2

*Criteria for Class A River: BOD (mg/l) = 6 mg/l or more

Table 11: Average of Seasonal BOD (mg/l) in Mahanadi at Subarnapur Downstream

Season	Downstream Value
Winter	1.5
Summer	1.6
Monsoon	1.5
Post Monsoon	1.2
Yearly average	1.5

Table 12: Average of Seasonal BOD (mg/l) in Mahanadi at Cuttack Downstream and Further Downstream

Season	Downstream 1 Value	Downstream 2 Value
Winter	2.5	2.1
Summer	2.4	1.7
Monsoon	2.2	2.3
Post Monsoon	2.4	1.9
Yearly average	2.4	2

Table 13: Average of Seasonal BOD (mg/l) in Kathajodi at Cuttack Downstream and Further Downstream (Mattagajpur)

Season	Downstream 1 Value	Downstream 2 Value
Winter	3.9	10
Summer	4	10.8
Monsoon	3.1	6.4
Post Monsoon	3.3	9.6
Yearly average	3.6	9.2

Table 14: Average of Seasonal BOD (mg/l) in Mahanadi at Paradeep Downstream

Season	Downstream 1 Value
Winter	2
Summer	1.8
Monsoon	1.5
Post Monsoon	2.1
Yearly average	1.9

Table 15: Average of Seasonal TC* ('00) (MPN/100 ml) value in Mahanadi at Sambalpur Downstream and Further Downstream

Season	Downstream 1 Value	Downstream 2 Value
Winter	532.3	205.8
Summer	614	143.9
Monsoon	578.3	261.2
Post Monsoon	302	146.6
Yearly average	506.65	189.4

*Criteria for Class A River: TC ('00) (MPN/100 ml) = 50 or less

Table 16: Average of Seasonal TC ('00) (MPN/100 ml) in Mahanadi at Subarnapur Downstream

Season	Downstream Value
Winter	15.4
Summer	27.6
Monsoon	53.5
Post Monsoon	28.8
Yearly average	31.33

Table 17: Average of Seasonal TC ('00) (MPN/100 ml) in Mahanadi at Cuttack Downstream and Further Downstream

Season	Downstream 1 Value	Downstream 2 Value
Winter	373.9	177.7
Summer	551.1	262
Monsoon	662.3	522
Post Monsoon	310	857.5
Yearly average	474.33	454.8

Table 18: Average of Seasonal TC ('00) (MPN/100 ml) in Kathajodi at Cuttack Downstream and Further Downstream (Mattagajpur)

Season	Downstream 1 Value	Downstream 2 Value
Winter	613	656
Summer	844.2	678.5
Monsoon	748	721.6
Post Monsoon	441	388
Yearly average	661.6	611

Table 19: Average of Seasonal TC ('00) (MPN/100 ml) in Mahanadi at Paradeep Downstream

Season	Downstream 1 Value
Winter	41
Summer	19.6
Monsoon	154.1
Post Monsoon	365.3
Yearly average	580

Source for Table 5 to 19: Odisha State Pollution Control Board

The OSPCB has found that the water quality at the downstream of Sambalpur and Cuttack do not conform to Class – C with respect to both BOD and TC. Further, the water quality at all stations conform to Class-D and E. Mahanadi River at Paradeep do not qualify even for Class-E with respect to several parameters like EC, SAR, Chloride, sulfate and total dissolved solid.

With regard to wholesomeness, water quality of all stations are below acceptable level, mostly due to FC, TKN, TSS and phosphate. An additional factor at Paradeep is EC. This is according to the analysis done by OSPCB.

By doing a comparison of BOD data for the above five year period in study with the tolerance limits for Class-C River the OSPCB has found out fourteen highly polluted river monitoring stations in Mahanadi and tributaries. The polluted monitoring locations in continuous sequence are identified as the polluted river stretches. There are five polluted river stretches among which the Sambalpur stretch is of 3 kilometres (Priority V), Cuttack stretch on Mahanadi is of 15 kilometres (Priority V), Cuttack stretch on Kathajodi river is of 19 kilometres (Priority II), Cuttack stretch on Serua river is of 30 kilometres (Priority V) and also a Paradeep Downstream stretch on Mahanadi river (Priority V). (Priority II are monitoring locations with BOD concentration between 20-30 mg/l and Priority V are locations with BOD concentration between 206 mg/l).

Water pollution analysis done by the project

The project collected 7 water samples each from all the four cities and sent it for laboratory test to understand the pollutants. While the detailed report is attached herewith, the following are some of the conclusions:

Total bacterial count

From the results observed the water sample with code CTK4, PRDP2, PRDP3 was found to be most contaminated among the water samples collected.

MPN (Most probable number)

For the FIB analyses, most probable number (MPN) test water sample with code like SNP3, CTK4, CTK5, PRDP2, PRDP3 are considered as unsatisfactory according to WHO standards for presumptive coliform.

Table 20: Physiochemical analysis for water samples

Sl. No	Cities	Sample / Bottle Code	BOD (mg/l)	DO (mg/l)	pH	TDS (ppm)	Chloride (ppm)	Nitrate (ppm)	Ammonia (ppm)
1	Jagatsinghpur	PRDP01	0.9	8.54	7.85	1.143	410	3.8	1.1
2	Jagatsinghpur	PRDP02	1.34	8.64	7.99	1.205	360	34	4.1
3	Jagatsinghpur	PRDP03	0.31	9.12	7.2	1.07	460	4.7	1.8
4	Jagatsinghpur	PRDP04	1.32	9.04	8.01	8.77	250	3.6	1.1
5	Jagatsinghpur	PRDP05	0.33	8.86	8.04	693	180	2.8	2.2
6	Jagatsinghpur	PRDP06	0.82	8.5	7.37	1.4	610	3.4	2.1
7	Jagatsinghpur	PRDP07	0.75	8.46	7.17	1.18	1100	4.7	4.1
1	Sonepur	SBP01	0.55	8.91	8.05	166.1	15	1.3	0.25
2	Sonepur	SBP02	0.32	9.2	7.9	170.3	12	1.4	0.27
3	Sonepur	SBP03	0.55	9	7	165.8	19	1.7	0.72
4	Sonepur	SBP04	0.69	9.08	6.5	165.2	20	1.5	0.42
5	Sonepur	SBP05	1.06	9.01	7.14	177.1	160	1.6	0.81
6	Sonepur	SBP06	0.97	9.2	7.37	268.1	73	1.3	0.94
7	Sonepur	SBP07	0.41	9.36	7.22	178	73	1.7	0.93
1	Sambalpur	SBL01	1.13	9.8	7.61	134.1	18	0.95	0.29
2	Sambalpur	SBL02	0.12	9.26	7.59	736.7	17	1.1	0.46
3	Sambalpur	SBL03	0.42	9	7.51	132.1	15	0.85	0.28
4	Sambalpur	SBL04	1.11	8.36	7.83	134.7	9.5	0.75	0.3
5	Sambalpur	SBL05	0.8	8.77	7.69	718.9	120	6.6	0.93
6	Sambalpur	SBL06	1.36	8.45	7.86	135.1	0	0.83	0.22
7	Sambalpur	SBL07	0.44	8.93	7.46	262.1	47	0.63	0.79
1	Cuttack	CTK01	0.55	9	7.37	281.1	45	4.4	1.3
2	Cuttack	CTK02	0.75	8.92	7.32	164.1	6.8	1.3	0.91
3	Cuttack	CTK03	0.71	9.3	7.53	177	25	1.1	1.2
4	Cuttack	CTK04	0.12	8.96	7.2	473.8	89	1.5	4.2

Sl. No	Cities	Sample / Bottle Code	BOD (mg/l)	DO (mg/l)	pH	TDS (ppm)	Chloride (ppm)	Nitrate (ppm)	Ammonia (ppm)
5	Cuttack	CTK05	0.67	7.64	7.36	516.6	82	2.4	37
6	Cuttack	CTK06	1.78	7.45	7.46	170	54	10	1.4
7	Cuttack	CTK07	1.49	7.62	7.33	410.5	57	6.8	1.4

Source: Water Pollution Laboratory Test done for this study, details in Annexure II

Water pollution remains a concern for the cities in study, especially Cuttack and Sambalpur.

Cuttack city has many times been in news for diseases and epidemics spread due to contaminated water. The latest incidence was reported in March 2017 affecting over hundreds of people in Tulsipur and nearby areas in the western parts of the city. Water samples tested by the authorities found out that majority (almost 97 percent) of drinking water sources were contaminated with hepatitis A and E viruses. CMC officials blamed the public health department (PHD) saying potable water supplied through pipelines was infected due to sewerage contamination. Jaundice epidemics such as this are common in Cuttack, according to locals. Newspaper reports confirm the same.

Sambalpur had a major outbreak of jaundice in 2014. The city infrastructures, especially water supply and drainage, was urgently cleaned and repaired during that period. Sambalpur has also suffered many floods in the last decade. Some floods became ferocious as polythene and other wastes chock the drains at critical places. Sambalpur is a leading city in enforcing ban on plastics.

Section IV

Conclusion & Recommendations

Looking at the four cities that were studied, the following are some of the key recommendations that need to be considered by the ULBs to improve their wastewater management concerns –

Proper generation of data and universal access

There are many gaps and lacunae in the data available at the ULB level with regard to both solid waste and liquid waste generation, disposal and treatment. The ULBs should immediately equip their MIS facilities with better computerisation and coordination for pooling all data from all sources and make them available to the planners as well as other stakeholders in a single-window facility. Universal access of data is needed to get a clear and updated picture of the waste management of the cities for all stakeholders to be able to gauge the current scenario and plan towards effective participation in the efforts of the ULBs.

The SMC is now considering a fresh enumeration of the toilet status. However, for all other cities, no such effort is seen. The OUSS 2017 talks about replacing all insanitary toilets with sanitary ones. However, no ULB seems to be having exact information about such toilets and there are no plans at the grassroots level towards attaining this. The ULBs should therefore put in place a dynamic monitoring and data generation system in place without waiting for the next Census.

There is also a mismatch between the current condition, usage and need for PTs and CTs both for the people who don't have toilets, can't build them and for floating population. A system of dynamic monitoring of data having such a component can address this issue. Data with regard to transportation of wastes (both solid and liquid) and dumping are also not available in any of the ULBs.

There is an urgent need for technological integration through GPS enabled transportation system to work towards making this more transparent for effective management of the wastes.

Convergence and coordination between schemes and stakeholders

There are various stakeholders engaged in sanitation. However, the convergence and coordination between schemes seemed seriously lacking. In all the ULBs, private parties have been involved in SWM. However, these engagements are more like owner-contractor relationships. The contractors have no knowledge or care about the environmental concerns of the wastes they handle. There is hardly any sensitisation. Similarly, the NGOs that are involved in each ULB are working in isolation. NGOs are involved in all the ULBs with independent financial support but working with information provided by the ULBs.

Their engagement is seen mostly in awareness generation on hand washing, menstrual hygiene, use of toilets, etc. There is no comprehensive plan for NGO/CSO engagement for integrated sanitation management of the ULBs. In cities like Cuttack and Paradeep corporate houses are engaged in taking care of such activities in a few wards/slums. Each organisation that works in the ULBs are in communication with the ULBs, however there is no mechanism where all of them can come together and participate in the sanitation management of the ULBs.

The ULBs need to put in place a coordination mechanism where all stakeholders including PHEOs, OWSSB, OSPCB, CSOs/NGOs, Private/Corporate Sector, etc. need to be regularly involved in the sanitation management of the city so that role division, resource management and other aspects of governance can be taken care of. At this moment, it's only the District Collectors who take a call for meeting between all these stakeholders as and when required. In Paradeep, there has been a long standing discontent between the PPT which owns most of the land of the city and the Municipality which has been a hindrance towards toilet building and management of other sanitation programmes. At such places, there is a need for larger efforts by the state government and central government to end such logjams and plan sanitation management in proper coordination of all stakeholders engaged.

Programmes like ICZMP sponsored SWM at Paradeep and JICA financed STP at Cuttack have been getting inordinately delayed due to political and other conflicts. In case of the ICZMP, the state government and central government needs to act more proactively and in case of JICA project, there is a need for having more communication and coordination with the local people. People of ULBs are generally considered 'beneficiaries' and hence their participation in the projects and plans. Lack of transparency also is a factor why people feel alienated from the ULBs' projects and plans is limited. In most of the ULBs, even the Ward Members felt alienated and complained of higher officials and politicians taking all the decisions. Such bottlenecks need to be eliminated with better communication and relationship building.

Waste generation, segregation and decentralised treatments

The OUSS 2017 talks about waste segregation as a priority. However, no city except Paradeep seem to have started any effort towards this. There is an urgent need to promote waste segregation at source and provision to incentivise composting and develop other business models by roping in NGOs, individual entrepreneurs and experts. While there is a talk about segregation by municipality officials and others, there is no idea of what they are going to do with the segregated materials. Ultimately, even if segregation starts without

any plan for management of the wastes, everything will end up in the landfill sites and the purpose of segregation will be defeated.

The current STPs and SeTPs in both the AMRUT cities are centralised systems and do not cater to the entire city population. There remains a huge gap. The cities should take this as an opportunity to introduce decentralised systems that can be linked to creating urban greenery, vegetable farming and other such activities so that the urban poor can be engaged in waste management activities while gaining livelihood opportunities. The ULBs should scout for available models and technologies for this and engage in capacity building and exposure of its officials as well as other stakeholders to promote the same.

Hotels, commercial establishments and industrial establishments should be strictly monitored for their waste generation and the ULBs need to engage with them to see that they comply to the existing rules of wastewater reuse and discharge into drains. Currently, there is no such mechanism available in any of the cities.

There is a huge gap between the number of cesspool vehicles in each ULB and the amount of septage generated. The private operators, who are very less at the moment, work in isolation and there is no coordination with the ULBs. The ULBs need to maintain an inventory of the private cesspool operators as well and encourage more operators by working out some incentives.

The current models of garbage collection and dumping rests the entire financial burden on the ULBs. Except for Sambalpur we could not find any effort to collect fees/charges from HHs towards the garbage collected from their places/ areas. Even at Sambalpur the collection is not regular. Such models cannot sustain and the ULBs need to engage with people and make efforts to realise the cost of the collection and dumping from the people except those living in the slum areas.

The slum areas and urban poor face lot of hardships due to the non-availability of toilets, poor drainage & garbage collection facilities, and pollution of soil and water bodies near their habitations due to the dumping of municipality wastes. This is the case with most of the slums. The ULBs need to have Environmental Monitoring Plans (EMPs) to ensure that the poor and slum dwellers are given healthy atmosphere to live. A lot of awareness drive is also required for inducting more hygienic behaviour among the slum dwellers.

Another important aspect that the ULBs need to work out is building regular and coherent relationship with nearby local villagers who bear the brunt of the pollution of the ULBs. There are regular conflicts between the ULBs and villages

in almost all the ULBs we studied. Cities like Cuttack and Sambalpur are facing challenges from nearby villagers as they want to locate their landfill sites in nearby villages. The OUSS 2017 recognises these challenges as well. While the cities should try their best to segregate and reuse maximum of their wastes within their own limits, they need to engage with rural communities with a 'cooperation model' when they need land from rural areas for dumping their wastes. Such a model should enhance the soil fertility and income generation avenues for the villagers by developing manure from the city wastes that the villagers can access either free or at a reasonable cost. Then the cities should invest in cleaning the rural areas and maintain the environmental standards, and help the villagers conserve their environment.

Public Toilets, Community Toilets and Open Defecation

Most of the available PTs and CTs are managed by the Sulabh. There are a very few of them which are managed by local groups/NGOs. Looking into the slum population and their difficulties (in terms of availability of space, water connection, financial constraints etc.) there is a need to build more PTs and CTs and encourage its management by the local people of the slums. One such model has been established in Cuttack where a local NGO has organised slum women to manage a PT and that has been hailed as a good example by various NGOs and other agencies. Involving women could also mean effective awareness building about water, sanitation and hygiene behaviours. The ULBs should incentivise these groups and also build good business models around the same with the assistance of NGOs.

Open Defecation is a big challenge for all the ULBs and the statistics available with regard to that grossly mismatches the real situation that one observes while visiting these cities. The existing situation of toilets – both IHHL and PT/CT – makes it clear that it is going to be difficult for meeting the ODF status for all these ULBs by the envisaged 10 years in the OUSS 2017. The ULBs should therefore invest in innovative ways such as building more PTs/CTs and Mobile Toilets. The SMC has started experimenting with bio-digester toilets but so far the results do not seem to be encouraging. An evaluation of the PTs/CTs and all such public facilities needs to be done as fast as possible and corrective course of action needs to be taken. Mobile Toilets need to be encouraged specially at the time of festivals when floating population increases significantly.

ULBs at present are investing almost nil in changing public behaviour and awareness building. It's only when some NGOs/CSOs are involved that awareness building is being done. This needs to be looked into seriously and awareness drive has to be a regular component in all programmes. ULBs need to engage more NGOs, Theatre Groups, Celebrities and other possible people and institutions to build continuous awareness.

Water Pollution Abatement and River Conservation

A huge issue that Odisha as well as the nation as a whole faces now is of pollution of Rivers and water bodies. At present, the Govt. admits that all the ULBs drain their wastewater directly into the rivers. Cities that we studied have no proper treatment of wastewater whatsoever. What is important to note is that there is a lack of coordination among the ULBs and the pollution monitoring institution i.e. OSPCB. The OSPCB comes into action only when there is a complaint with regard to any epidemic. The ULB officials were not aware of the regular pollution monitoring done by the OSPCB. There is no regular monitoring of drinking water sources, surface water bodies and point of use (PoU) of drinking water and water for other uses.

This is a serious problem and ULBs must not wait for the STPs and SeTPs to be completed. They should make plans to see that no polluted water is let into the rivers: Mahanadi, Kathajodi and Serua in this case. A mechanism for regular pollution monitoring and awareness building would help in this regard. Strict monitoring of rules with regard to STPs of hotels, commercial establishments and industrial houses will also help.

The ULB officials as well as other stakeholders need to be trained on the Environment Protection Act, Water Protection Act and other rules that are there to abate pollution.

Even the wastewater that the cities want to drain out from proposed STPs to the Rivers should be channelized for irrigation. There are models available for this. This will further increase cooperation between urban and rural areas.

The surface water bodies and low lying lands such as floodplains in cities need to be made pollution free. At the moment they bear the maximum brunt of open defecation and wastewater from the cities. Overall, a River Conservation Plan needs to be worked out by all cities along the Mahanadi river. The government of Odisha has to take immediate measures towards that.

Annexures

Annexure I

List of people with whom we met and/or discussed during the assignment

Bhubaneswar

Er. Prasanta K Mohapatra, MD, Odisha Water Supply & Sewerage Board.
Dr. Dillip K Behera, Sr Scientist, Odisha State Pollution Control Board.
Mr. H. Mohanty & Mr. A. K. Hial, Practical Action.
Ms. Biraja Kabi Satapathy, Consultant, H&UDD, Govt. of Odisha.
Mr. Pritish Nanda & Ms. Elisa Patnaik, Consultants (E&Y), PMU, OWSSB.
Mr. Santosh Panda, PMU, SBM.
Ms. Rashmita Patel, Tata Trusts.

Cuttack

Mr. Bikash Mahapatra, Commissioner, Cuttack Municipal Corporation.
Ms. Nirupama Swain, Dy.Commissioner(SBM), Cuttack Municipal Corporation.
Ms. Rahmita Mohanty, Consultant(E&Y), PMU, SBM, Cuttack Municipal Corporation.
Mr. Krushna Chandra Parida, Engineer, JICA assisted STP Project, Cuttack.
Mr. Ashok Kumar Hota & Mr. Dipu, SAI, NGO.
Dr. Sohan Giri, Regional Manager, Cuttack for Odisha State Pollution Control Board.
Focus Group Discussion held with slum dwellers at: Pithapur Pana Sahi, Pilgrim Road Das Sahi and Pithapur Pana Sahi
Ms. Itishree Das, Corporator, Ward No. 27, Icchapur Area
Ms. Gouri Das, Corporator, Ward No. 21, Purighat Area
Ms. Lochani Das, Asha Karmi, Ward No. 38
Mr. Lenka, Sanitary Inspector, Cuttack Municipal Corporation
Mr. Saroj Das, Slum Improvement Division, Cuttack Municipal Corporation
Mr. Panchanan Das, Secretary, Puri Ghat Bauri Sahi Basti
Mr. Raj Kishor Naik, Sanitation Worker.
Public Toilet at Puri Ghat Bauri Sahi, managed by SAI, was visited.
Mr. Naik, Cesspool Operator,
Raj Kishor Naik, Sanitation Worker under Private Contractor
Ms. Basanti Das, Mahila Arogya Samiti, Puri Ghat
Ms. Bindurani Jena, Anganwadi Worker, Ward No. 27
Ms. Pramila Behera, Anganwadi Worker, Ward No. 26
Public toilets visited: Puri Ghat Baurisahi (maintained by SAI), Ichhapur Panasahi and Pilgrim Road Das Sahi

Paradeep

Mr. Dillip Mohanty, Executive Officer, Paradeep Municipality
Mr. Basant Biswal, Chairman, Paradeep Municipality
Mr. Mukesh Mahaling, Manager, Odisha State Pollution Control Board, Paradeep Office
Pada Babu, Cesspool incharge, Paradeep Municipality
Mr. Sukanta Das, Sanitary Incharge, Paradeep Municipality
Mr. Akshaya & Sanjay Mohanty, Sanitation Contractors.
Natabara Bacchar, Sweeper.
Dr. Rajendra Nayak, Health Officer, Paradeep Municipality.
Dr. Dixit, Chief Medical Officer, Paradeep.
Focussed Group Discussions held with slum dwellers at Jagannath Colony & Sandhakuda slums.
Mr. Litu Patra, Sanitation Superviser, Paradeep Municipality
Mr.Khambada Rambabu, Ward Councillor, Ward No. 17 (Sandhakuda area)
Ms. Sashmita Parida, Ward Councillor, Ward No. 19
Mr. Dipti Mohanty and Parsuram Nayak, SVS, NGO.
Mr. Kanthamani Seth, Contractor for Community Toilets.
Public Toilet visited at Nuabazar (Ward No.14)
Community Toilet visited at Sandhakuda (Word No. 17)
Asim Ranjan Mohanty, in charge of ICZMP Project, Paradeep Municipality.
Ms. Pranati Barik, SBM Section, Paradeep Municipality
Mr. Gangadhar Sethi, Water and Sanitation In Charge, Paradeep Port Trust.

Sambalpur

Mr. Bimalendu Roy, Municipal Commissioner, Sambalpur Municipal Corporation
Dr. Mahendra Nanda, Health Officer, Sambalpur Municipality
Er Manoranjan Dash, Executive Engineer, Sambalpur Municipality
Mr Pradip Kumar Mahapatra, Sanitary Inspector, Sambalpur Municipality
Mr Suprit Dash, Sonepur Municipality (looking after sanitation), Sambalpur Municipality
Mr Nilam Prakash Kujur, Accountant, Sambalpur Municipality
Er. B N Das, Project Engineer, OWSSB, Sambalpur
Mr Ashish Mohanty, E&Y (for OWSSB)
Mr. Sachi and Ms. Bhumisuta, Patang, NGO
Focus Group Discussions held with slum dwellers of Thelko Pada, Tanlapada and Badbazar.
Mr. Susant Mahapatra, Ex-councillor, Budharaja area.
Mr. Saroj Dalpat, Ex-councillor, Jharuapada area.
Mr. Hemanta Mahapatra, local activist
Public toilets visited at Jhaduapada and Private bus stand.

Subarnapur

Mr. Maghadan Bag, Executive Officer, Subarnapur Municipality
Mr. Sivaram Sahu, ATS / PIO, Subarnapur Municipality
Mr. Brundaban Routray, Junior Engineer, Subarnapur Municpality
Mr. Brajaraj Pradhan, Accountant, Subarnapur Municipality
Mr. Tapas Beura, Councillor, Ward No 1
Mr. Kairu Swain, Councillor, Ward No 8 (and former Chairman, Subarnapur Minicipality)
Mr. Somnanth Sahu, Councillor, Ward no 3
Focussed Group Discussions were held in Khadalpada,, Ghodaghatpada, Badbazaar Tentli Ghat area, Brahmni Ghat, Pannagar bandh.

Annexure - II

Water quality test report

Table 1: Water Sample location and source details

Sl. No.	District	Bottle Code	Location
1	Jagatsinghpur	PRDP01	Tube well
2	Jagatsinghpur	PRDP02	Tube well
3	Jagatsinghpur	PRDP03	Pond
4	Jagatsinghpur	PRDP04	Tube well
5	Jagatsinghpur	PRDP05	Tube well
6	Jagatsinghpur	PRDP06	Tube well
7	Jagatsinghpur	PRDP07	Tube well
1	Sonepur	SNP01	Mahanadi River
2	Sonepur	SNP02	Public Tap
3	Sonepur	SNP03	Mahanadi River
4	Sonepur	SNP04	Mahanadi River
5	Sonepur	SNP05	Open Well
6	Sonepur	SNP06	Pond
7	Sonepur	SNP07	Pond
1	Sambalpur	SBL01	Harad jor
2	Sambalpur	SBL02	Mahanadi River
3	Sambalpur	SBL03	Mahanadi River
4	Sambalpur	SBL04	Household Tap
5	Sambalpur	SBL05	Tubewell handpump
6	Sambalpur	SBL06	Public tap
7	Sambalpur	SBL07	Pond
1	Cuttack	CTK01	Public tap
2	Cuttack	CTK02	Tube well
3	Cuttack	CTK03	Tap
4	Cuttack	CTK04	Pond
5	Cuttack	CTK05	Public tap
6	Cuttack	CTK06	Public tap
7	Cuttack	CTK07	Public Tap

Water Sample Analysis

Microbiological assessment for quality and safety of water traditionally relies upon the enumeration and specific detection of pathogenic and spoilage microorganisms.

Conventional testing methods make use of growth media and cultivation to

enumerate and isolate cells of microorganisms from water samples brought into suspension with diluents.

Total Bacterial Count of Water

Water samples were collected and the 10^{-2} dilutions were made and spreaded on nutrient agar plates and simultaneously spread on Bile Esculin agar, TCBS (Thiosulfate-citrate-bile salts-sucrose agar), Slantez and Bartley agar medium. The plates were incubated at 37°C for 24 hours. The bacterial density was expressed in number/ml of the sample.

Table 2: Total bacterial count of the water samples

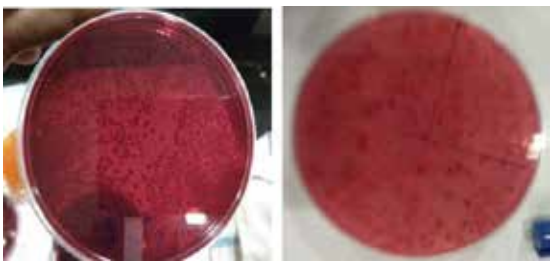
Sl. No	Sample Cities	Total Bacterial Count (CFU/ML)	Total Count EMB	Coliform Mac Conkey	Total Enterococci Count (CFU/ML)	Total Vibrio Count (CFU/ML)	Total Streptococci Group D Detection (CFU/ML)
1	SNP-1	1×104	0	0	0	0	0
2	SNP-2	0	0	0	0	0	0
3	SNP3	2×104	0	0	0	0	0
4	SNP4	0	0	0	0	0	0
5	SNP5	2×104	0	1×103	0	0	0
6	SNP6	16×104	0	0	0	0	0
7	SNP7	12×104	0	0	0	0	0
8	CTK1	0	0	0	0	0	0
9	CTK2	0	0	0	0	0	0
10	CTK3	2×103	0	0	0	0	0
11	CTK4	23×104	2×105	2×103	0	0	23×104
12	CTK5	2×104	0	0	0	2×104	0
13	CTK6	0	0	0	0	0	0
14	CTK7	2×103	0	0	0	0	0
15	PRDP1	3×105	2×105	16×104	0	0	0
16	PRDP2	2×105	36×104	3×105	0	0	0
17	PRDP3	2×104	36×104	2×105	0	0	0
18	PRDP4	0	0	0	0	0	0
19	PRDP5	4×105	0	0	0	0	0
20	PRDP6	2×105	1×104	8×104	0	0	0
21	PRDP7	0	0	0	0	0	0
22	SBP1	1×104	1×104	0	0	0	0
23	SBP2	2×104	0	0	0	0	0
24	SBP3	1×103	0	0	0	0	0
25	SBP4	1×104	0	0	0	0	0
26	SBP5	0	0	0	0	0	0
27	SBP6	0	0	0	0	0	0
28	SBP7	0	0	0	0	0	0

a) Total Bacterial Count Result:

Figure1: Showing Nutrient Agar plate for total bacterial count for some of the water samples

b) Total Coliform Count Result:

Figure2: Showing EMB and MacConkey Agar plate for enumeration of total coliform count for some of the water samples



c) Total Vibrio Count

Figure 3: Showing TCBS Agar plate for enumeration of total Vibrio cholerae count for water samples

Conclusion:

From the results observed the water sample with code like **CTK4, PRDP2, PRDP3** was found to be most contaminated among the water samples collected.

The fecal indicator bacteria are used to measure the sanitary quality of water for recreational, industrial, agricultural and water supply purposes. The fecal indicator bacteria are natural bacteria of the gastrointestinal tracts of humans and other warm-blooded animals. They are released into the environment with feces, and are then exposed to a variety of environmental conditions that eventually cause their death.

MPN (Most probable number):

This procedure used to estimate bacterial population in the water samples, which includes Presumptive test and Confirmatory test.

a. Presumptive Coliform test:

Principle: Measured aliquots of water samples are to be treated were added to flasks with lactose fermentation broth (MacConkey broth) containing an inverted Durham's tube. When the bacterial cells were exposed to lactose, a Lac operon was induced; β-galactosidase is an enzyme which catabolizes the lactose into glucose and galactose. The catabolism of lactose into glucose and galactose is an indicative of fecal contamination in water and their detection was facilitated by the use of lactose fermentation broth. After incubation at 37^{o}C for 24 hours, the development of gas and aid production in the broth is the presumptive evidence for the coliform bacteria.

Procedure:

10 ml of sample was added to flasks containing double strength MacConkey broth. 1ml sample and 0.1ml sample were added to individually to flasks containing 5ml MacConkey broth. This test were carried out in triplicates (i.e. for 10 ml, 1 ml and 0.1 ml) sample 3 flasks each were taken).All the flasks were Incubated at37 o C for 24 hours in an incubator for gas and acid production.

b. Confirmed coliform test:

Principle: The presence of doubtful and positive presumptive test immediately suggests that, the water is not potable. The selective media used for the confirmation of coliform bacteria is Eosin methylene blue (EMB) agar & MacConkey agar medium.

Procedure: A loop full inoculums from positive tubes were taken and streaked

on the respective medium and incubated at 37 o C for 24 hrs. On EMB medium the E. coli cultures produced a green metallic sheen and other coliforms like Enterobacter aerogenes produces dark pinkish color colonies.

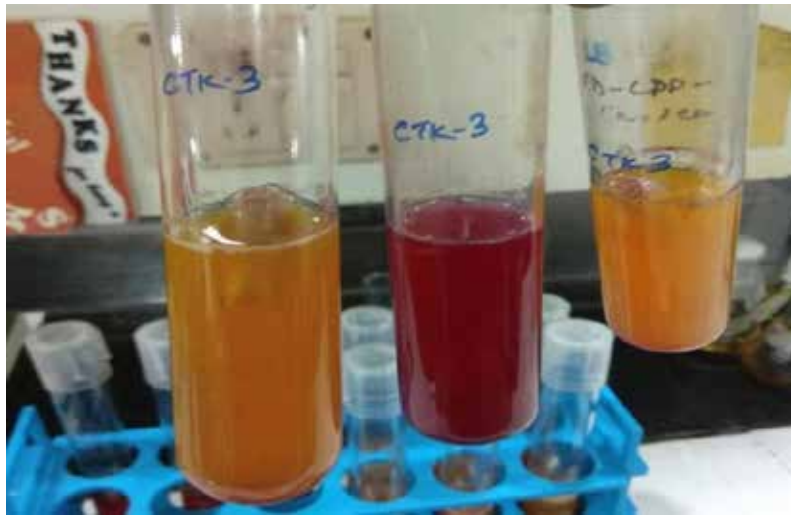
Results:

Table 3: Each water sample was analyzed in triplicate using 10ml (double strength (DS) lactose broth), 1ml (single strength (SS) lactose broth) and 0.1ml (single strength (SS) lactose broth). The MPN Index was calculated using standard methods for examination of water and waste water, APHA, New York 1998. Measurement of total coliforms (CFU/ml) was performed on water samples using EMB agar.

SL. NO	Sample code	Number Of Positive Tubes			MPN Index Per 100ml
		T1 (10ml) (DS)	T2 (1ml) (SS)	T3 (0.1ml) (SS)	
1	SNP-1	1	0	0	4
2	SNP-2	0	0	0	3
3	SNP3	3	3	1	460
4	SNP4	2	2	1	28
5	SNP5	2	1	0	15
6	SNP6	2	0	0	9
7	SNP7	2	1	1	20
8	CTK1	0	0	0	3
9	CTK2	0	0	0	3
10	CTK3	2	1	0	15
11	CTK4	3	3	2	1100
12	CTK5	3	3	3	2400
13	CTK6	0	0	0	3
14	CTK7	2	0	0	9
15	PRDP1	2	2	1	28
16	PRDP2	3	3	2	1100
17	PRDP3	3	3	2	1100
18	PRDP4	0	0	0	3
19	PRDP5	2	2	0	21
20	PRDP6	3	1	0	43
21	PRDP7	0	0	0	3
22	SBP1	2	1	0	15
23	SBP2	2	0	0	9
24	SBP3	1	0	0	4
25	SBP4	1	0	0	4
26	SBP5	0	0	0	3
27	SBP6	0	0	0	3
28	SBP7	0	0	0	3

MPN Result:

Figure 4: The MPN positive presumptive test results for water sample



Conclusion:

For the FIB analyses, Most probable number(MPN) test water sample with code like SNP3, CTK4, CTK5, PRDP2, PRDP3 are considered as unsatisfactory according to WHO standards for presumptive coliform.

Physicochemical analyses of water samples

A Detailed physicochemical characterization of water samples collected during post monsoon season (APHA 1998. Standards Methods for the examination of water and waste water, 20th edition, American Public Health Association, Washington, D.C.) was conducted.

Physical analysis: pH, TDS (ppm) were measured immediately once received with the help of a water quality Meter (OAKTON model no PCD650, USA).

Chemical analysis: All water samples were diluted ten times (dilution factor recorded) with MilliQ (RiOs 16 Century, Millipore, USA) water and filtered using Whatman (no.1) filter paper. The chemical analysis like DO, Nitrate ion, Chloride ions were measured by the help of the instrument (OAKTON model no PCD650, USA).

Table 4: Physico-chemical analyses of water samples collected from different cities of Odisha. The MPN Index was calculated using standard methods for examination of water and waste water, APHA, New York 1998.

Sl. No	Cities	Sample/ Bottle Code	BOD (mg/l)	DO (mg/l)	pH	TDS (ppm)	Chloride (ppm)	Nitrate (ppm)	Ammonia (ppm)
1	JAGATSINGHPUR	PRDP01	0.9	8.54	7.85	1.143	410	3.8	1.1
2	JAGATSINGHPUR	PRDP02	1.34	8.64	7.99	1.205	360	34	4.1
3	JAGATSINGHPUR	PRDP03	0.31	9.12	7.2	1.07	460	4.7	1.8
4	JAGATSINGHPUR	PRDP04	1.32	9.04	8.01	8.77	250	3.6	1.1
5	JAGATSINGHPUR	PRDP05	0.33	8.86	8.04	693	180	2.8	2.2
6	JAGATSINGHPUR	PRDP06	0.82	8.5	7.37	1.4	610	3.4	2.1
7	JAGATSINGHPUR	PRDP07	0.75	8.46	7.17	1.18	1100	4.7	4.1
1	SONEPUR	SBP01	0.55	8.91	8.05	166.1	15	1.3	0.25
2	SONEPUR	SBP02	0.32	9.2	7.9	170.3	12	1.4	0.27
3	SONEPUR	SBP03	0.55	9	7	165.8	19	1.7	0.72
4	SONEPUR	SBP04	0.69	9.08	6.5	165.2	20	1.5	0.42
5	SONEPUR	SBP05	1.06	9.01	7.14	177.1	160	1.6	0.81
6	SONEPUR	SBP06	0.97	9.2	7.37	268.1	73	1.3	0.94
7	SONEPUR	SBP07	0.41	9.36	7.22	178	73	1.7	0.93
1	SAMBALPUR	SBL01	1.13	9.8	7.61	134.1	18	0.95	0.29
2	SAMBALPUR	SBL02	0.12	9.26	7.59	736.7	17	1.1	0.46
3	SAMBALPUR	SBL03	0.42	9	7.51	132.1	15	0.85	0.28
4	SAMBALPUR	SBL04	1.11	8.36	7.83	134.7	9.5	0.75	0.3
5	SAMBALPUR	SBL05	0.8	8.77	7.69	718.9	120	6.6	0.93
6	SAMBALPUR	SBL06	1.36	8.45	7.86	135.1	0	0.83	0.22
7	SAMBALPUR	SBL07	0.44	8.93	7.46	262.1	47	0.63	0.79
1	CUTTACK	CTK01	0.55	9	7.37	281.1	45	4.4	1.3
2	CUTTACK	CTK02	0.75	8.92	7.32	164.1	6.8	1.3	0.91
3	CUTTACK	CTK03	0.71	9.3	7.53	177	25	1.1	1.2
4	CUTTACK	CTK04	0.12	8.96	7.2	473.8	89	1.5	4.2
5	CUTTACK	CTK05	0.67	7.64	7.36	516.6	82	2.4	37
6	CUTTACK	CTK06	1.78	7.45	7.46	170	54	10	1.4
7	CUTTACK	CTK07	1.49	7.62	7.33	410.5	57	6.8	1.4

REFERENCE

MPN Table (Reference, APHA, 1998)

Table 5: The most probable number (MPN) of coliforms (source; Standard methods for examination of water and waste water, APHA, New York, USA 1998)

3 of 100ml each	3 of 10ml each	3 of 1ml each	MPN Index per 100ml
0	0	1	3
0	1	0	3
1	0	0	4
1	0	1	7
1	1	0	7
1	1	1	1
1	2	0	1
2	0	0	9
2	0	1	14
2	1	0	15
2	1	1	20
2	2	0	21
2	2	1	28
3	0	0	23
3	0	1	39
3	0	2	64
3	1	0	43
3	1	1	75
3	1	2	120
3	2	0	93
3	2	1	150
3	2	2	210
3	3	0	240
3	3	1	460
3	3	2	1100
3	3	3	2400

Table 6: WHO standards on water, sanitation and hygiene in health care facilities (WHO, 2008)

Item	Recommendation	Explanation
Water quantity	5–400 litres/person/day.	Outpatient services require less water, while operating theatres and delivery rooms require more water. The upper limit is for viral haemorrhagic fever (e.g. Ebola) isolation centres.
Water access	On-site supplies.	Water should be available within all treatment wards and in waiting areas.
Water quality	Less than 1 *Escherichia coli*/ thermotolerant total coliforms per 100 ml. Presence of residual disinfectant. Water safety plans in place.	Drinking-water should comply with WHO Guidelines for Drinking-water Quality for microbial, chemical and physical aspects. Facilities should adopt a risk management approach to ensure drinking-water is safe.
Sanitation quantity	1 toilet for every 20 users for inpatient setting. At least 4 toilets per outpatient setting. Separate toilets for patients and staff.	Sufficient number of toilets should be available for patients, staff and visitors.
Sanitation access	On-site facilities.	Sanitation facilities should be within the facility grounds and accessible to all types of users (females, males, those with disabilities).
Sanitation quality	Appropriate for local technical and financial conditions, safe, clean, accessible to all users including those with reduced mobility.	Toilets should be built according to technical specifications to ensure excreta are safely managed.
Hygiene	A reliable water point with soap or alcohol based hand rubs available in all treatment areas, waiting rooms and near latrines for patients and staff.	Water and soap (or alcohol based hand rubs) should available in all key areas of the facility for ensuring safe hand hygiene practices.

Annexure - III

Checklists used for the NIUA Research

Checklist/Interview Guides[1] for ULB leaders (CEO / Chairperson)

Name & designation of the respondent:

Period since (s)he is in charge:

Information from him/her:

1. Has the city/ULB developed City Sanitation Plan or any similar plan? If yes, some details about the plan

2. What are the major ongoing schemes/programmes (or, previous) for wastewater and fecal sludge management being implemented in the ULB? If yes, some details.

3. What are the new and proposed schemes/programmes for sanitation, waste water and fecal sludge management? If yes, some details.

4. What are the administrative mechanisms to implement sanitation, wastewater, fecal sludge management programmes/activities?
   a. Wings in the ULB and officials involved and their roles
   b. Third parties and private service providers involved
   c. Regular staffs (or persons on regular contract)

5. What are the financial mechanisms to implement sanitation, wastewater, fecal sludge management programmes/activities?
   a. Own sources
   b. Government grant (both Central and State)
   c. Third party interventions (such as World Bank, ADB etc)

6. Has the ULB placed any special fund request for sanitation, wastewater, and fecal sludge management programmes/activities?

[1] This is just a broad set of checklist cum interview guide and not a questionnaire. Keep them as your guide and ask questions through which we can get all information that we need.

7. What is the fund utilization pattern in the last three years for sanitation, wastewater, fecal sludge management programmes/activities?

8. What are the current water quality test mechanisms (by the ULB or sourced from other agencies)? Has it been discussed in recent years or any major observations?

9. What are the mechanisms to coordinate with other related wings, such as PHEO, OWS&SB, health department, and private water suppliers etc.?

10. Has the ULB received any specific order (from regulators, authorities, Courts, Tribunals, Government etc) to ensure a particular standard(s) of sanitation, wastewater and fecal sludge management/coverage? If yes, some details.

11. Has there been any major evaluation or study of sanitation, waste water and fecal sludge management in recent past?

12. Has the ULB taken any special resolution on sanitation, waste water and fecal sludge management?

13. What is the redress mechanism for sanitation, waste water and fecal sludge management related complaints?
    a. Call centre, Phone no, Website/Social media, Other
    b. Time line for redress, if any
    c. Status of complaints and redress in the past

14. Any significant achievement or case study or development related sanitation, waste water and fecal sludge management?

15. Any major challenge(s) related to sanitation, waste water, septage and fecal sludge, open defecation management in the recent past?
    a. Problem in coordination with departments (service providers)
    b. Natural calamities / epidemics
    c. Fund shortage
    d. Personnel shortage
    e. Lack of support from outsourced agencies
    f. Other

16. What is the vision and action for next five years or so to improve sanitation, waste water and fecal sludge management (including universal toilet coverage, waste water and septage management)?

Checklist/Interview Guides[2] for ULB Officials

Name & designation of the respondent:

Period since (s)he is in charge:

Information from him/her:

1. **Population & HHs**
   a. Total population as per 2001 and 2011 census
   b. Total HH as per 2001 and 2011 census
   c. Current estimated population & HHs of the ULB area
   d. Any major occasion when floating population increase significantly (if yes, extent of such floating population)
   e. Slums and Population
      i. No of slums
      ii. Population/HHs living in slum
      iii. Any identified trend in population growth (locations of the slums)

2. **Area**
   a. Current geographic area of the ULB (along with information if the area of the area has changed between 2001 to 2011 and thereafter)
   b. Total number of wards in the ULB

3. **Toilet infrastructure in the ULB area**
   a. Individual toilets
      i. Number of individual toilets (As per census & own figures)
      ii. Information of new toilets created in last 7 years
      iii. Total number of individual household toilets (as per 2011 census) and recent
      iv. Types of individual/households toilets (Census and ULB's own)
         1. Connected to sewer
      v. Connected to septic tank
      vi. Pit toilets
      vii. Other

   b. Public Toilet
      i. Total number of public toilets
      ii. Their current capacity
      iii. Management strategy / mechanism (ULB, Private, Outsourced and their details)

[2] This is just a broad set of checklist cum interview guide and not a questionnaire. Keep them as your guide and ask questions through which we can get all information that we need.

4. **Waste Water Discharge/Disposal/Management**
    a. Estimated total volume/quantity of waste water generated in the ULB area.
    b. Existence of mechanisms
        i. Treated and disposed/reused
        ii. Direct discharge into the river or water bodies
        iii. No intervention
    c. Connected to piped sewerage network
        i. Area already covered through underground sewerage infrastructure (Area and population)
        ii. Area for which underground sewerage network is being currently built.
        iii. Volume / quantity of sewerage/sewerage generated and transported through the UG sewerage network.
    d. Location and current capacity of Sewerage Treatment Plants.
    e. Location (s) where open drains discharge into the river or water bodies

5. **Fecal sludge/septage management/disposal**
    a. Machine / Vehicle to empty and dispose cesspits etc (Types and nos).
    b. Average number of calls received and attended in a day
    c. Any information about private operators
    d. Place(s) where the waste is disposed off
    e. Mechanism (own or outsourced, cost involved)
    f. Human resources/personnels involved in septage management
        i. Numbers (with municipality, private operators and informal sanitation workers?)
        ii. Their residence/settlement
        iii. Type of engagement
        iv. Security measures
    g. Complaint grievance mechanism (including any major complaint on waste disposal)
    h. Costs, charges and budgets for this?
    i. Any specific plans for FSM?

6. **Budget for sanitation, wastewater, septage/FSM etc**
    a. Annual budget allocated for sanitation promotion (all components)? Its proportion in the total annual budget. (Present cost, budget, cost recovery, operation and maintenance issues can be asked here)
    b. Current government schemes and their budget (Amrut / SBM etc)
        i. What schemes are now available to motivate people to get covered under sanitation programmes? And then, we can say what works and what not? And then we can go to this question “Do you think subsidy helps?’ If yes, how and if no why? What you think could be done on this?

ii. What is the status / experiences so far in implementing those programmes/schemes?
iii. What are the major constraints for achieving universal coverage of sanitation?

c. Has any financial or infrastructural estimation been made to ensure comprehensive toilet coverage, total sanitation, waste management?
d. What are the plans to increase access in low sanitation coverage areas? (Which are the low sanitation areas and why are those such?) (Note: the interviewer may also ask a bit of historicity of the low sanitation areas. Are their specific areas which are low covered for any historical reason such as old bastis which have geographical constraints? Then the next type of low sanitation covered area are the new bastis and in this it would be good to know the trend in which slums have developed and what are the future projected areas for growth slums. Does the ULB have any plan for settling slums? And if not, then what are the sanitation coverage plan? We should also look at the water supply plans along with the sanitation plan considering the fact that sanitation is dependent on water at the moment. So, an overview of situation for the uncovered bastis would be better to get)

7. **Perception / Preference**
   a. On onsite sanitation against off site sanitation?
   b. Water contamination

8. **Water quality and pollution issues**
   a. Current water supply coverage (area and people)
      i. PWS
      ii. Public supply
      iii. Tanker supply
      iv. Own individual supply (groundwater)
      v. Other
      vi. Agencies responsible (PHEO, ULB, Private, other)
      vii. Existing monitoring mechanism
      viii. Existing complaint redress mechanism
   b. Does the ULB maintain record of water quality? (of government drinking water sources, ground water, surface water bodies, rivers etc)
   c. Has it identified polluted water bodies/areas?
   d. Has it got any order, advice on water quality problems in the ULB area relating to water pollution and/or wastewater management and/or faecal sludge management? (from government, regulatory bodies, Courts or Tribunals)

9. **History of pollution/water-borne diseases & epidemics**

a. Has there been any epidemics related to water contamination in the municipality. If possible, get a 10 year long history of the same with all details possible – what kind of epidemic? What measures were taken to contain? What plans are in place so that these will not happen in future?

10. Main stakeholders and their participation

a. Who are the main stakeholders in the promotion of sanitation? What have been their roles so far?
b. What should be an ideal role for these stakeholders?
    i. Community
    ii. NGOs
    iii. Private sectors
    iv. Local Government (ULB)
    v. State Government / Central Government (specific departments)
    vi. Media
    vii. Other
c. Any good work, best practices, prizes, accolades etc

11. The roadmap / future

a. To improve services of FS collection and management (technology and otherwise)?
b. To improve public toilet coverage and quality (Areas of improvement for efficient service in public toilets.) (Scope of private sector involvement in operating public toilets)?
c. To improve status of wastewater management in general (Improving status of most polluted water bodies and/or points (in rivers/rivulets, etc.)?
d. Ensuring water quality:
    i. Water quality testing issues: a. Regular water quality testing of various surface and ground water sources
    ii. Safeguarding the water bodies/water channels/groundwater

Cesspool operators (both Municipality and private)

(Sample size – 2 per municipality)

1. Cesspool operators in municipality office as well as private, if any
2. How many cess pool machines are there in the city?
3. Number of trips they make per day/week/month?
4. What is the charges for using cess pool services (different category of customers – individual HH, apartments, hotels, industrial houses, etc.)
5. How many people are engaged with the cess pool machines and what are their roles?
6. Where do they empty the FS?
7. What are the issues and challenges with cess pool machines (time, distance, difficulty to move to narrow areas, etc., repair and maintenance problems)
8. Are they aware of any new technology and will they be trying the same? Has there been any discussion in the municipality of any such new techs or improvement of the existing ones?

I/NGOs

(Sample size: 2 per municipality)

1. How you are involved in sanitation promotion in the city?
2. Coverage area in the city?
3. What are the challenges in the field implementation while promoting sanitation? (Please talk some details about toilets, FSM, wastewater treatment, pollution of rivers, waterbodies, etc.)
4. What are the constraints in universal coverage of sanitation in the city?
5. How do you perceive the awareness level of people on the importance of sanitation?
6. What should be an ideal role for these stakeholders?
   i. Community
   ii. NGOs
   iii. Private sectors
   iv. Local Government
   v. State Government
7. How feacal sludge (FS) is being managed in the city? (To get some specifics on distance, health hazards, etc. May be it would be good to find out if any conflicts arose and they know about it. Any political or other issues would also be good to know)
8. What's your view about water pollution in the city? Do you know of any regular monitoring of water quality? Are you aware of any plans and programmes to check pollution of rivers and waterbodies? What are they and what is the effectiveness of the said programmes in your opinion?

9. How are you supporting the plans and programme of Government in promoting sanitation promotion?
10. What improvements do you suggest in FSM, wastewater management and overall sanitation of the city?

Ward Members/Corporators

(Sample size: 2 per municipality)

1. How you are involved in sanitation promotion in your ward?
2. How many service providers are there in FS collection and management in your ward?
3. How much does this facility cost? Per trip/per unit volume.
4. Where do you dispose FS?
5. What are the major constraints maintaining proper sanitation in the ward? (It would also be important to know conflicts and other issues if any involved in this in the particular city)
6. How do you resolve such issues? How often you supervise the work of sanitation contractors/workers?
7. What should be an ideal role for these stakeholders?
   i. Community
   ii. NGOs
   iii. Private sectors
   iv. Local Government
   v. State Government
8. What favorable environment (technical support, financial support, new technology, more decision making power, etc.) can help you perform better in giving your ward population better sanitation?
9. What are you doing to keep the water bodies and rivers of your Ward/city clean?
10. Are you aware of water quality testing of various sources in your Ward?
11. Do you think your Ward needs to improve its FSM and wastewater management practices? If yes, how?

Private Sector (including the ones who have taken contract of cleaning storm drains, if any)

(Sample size: 2 per municipality)

1. How you are involved in sanitation promotion in the city?
2. Coverage area in the city?
3. How do you see the potentiality in sanitation sector?
4. How many service providers are there in FS collection and management?

5. How much does this facility cost? Per trip/per unit volume.
6. Where do you dispose FS?
7. What are the major constraints for private sector in operating sanitation services? (It would also be important to know conflicts and other issues if any involved in this in the particular city)
8. What should be an ideal role for these stakeholders?
   i. Community
   ii. NGOs
   iii. Private sectors
   iv. Local Government
   v. State Government
9. What favorable environment can attract private sector to invest in sanitation promotion?
10. What sort of support (technical/financial) can improve the city sanitation management in private sector's perspective?

Community (low coverage area/slum areas)

(Sample size: 2 per municipality) (women members must be included)

1. Coverage of sanitation?
2. Is there a problem of open defecation?
3. Major constraints for universal coverage of sanitation?
4. Willingness to pay or contribute in building individual toilet?
5. How fecal sludge is being managed?
6. How much do the private sectors charge to collect FS?
7. Is the service provided by private sectors in collecting FS satisfactory? Suggestion for improvement.
8. Willingness to pay for FS collection?
9. Preference of onsite against offsite sanitation?
10. Willingness to pay for sewer connection (offsite sanitation) and treatment?
11. Preference on individual toilet against public toilet?
12. Is there any sanitation project/programme going on? Please mention.
13. What should be an ideal role for these stakeholders?
    i. Community
    ii. NGOs
    iii. Private sectors
    iv. Local Government
    v. State Government
14. What's your opinion about pollution of water bodies, rivers that are nearby your habitation? What is your dependence on them? Have any effort been taken in the past either by you or any NGO or municipality/govt. to clean the same? Please give details.

15. Has your building/apartment/housing society ever been sent notice by any government authorities for non-maintenance of sanitation? If yes, details.
16. What would you suggest to improve sanitation situation and abate pollution of water bodies and rivers in your city? What role you expect municipalities/ NGOs/private agencies/others to play in that? What role can you play in the same?

Sanitation Workers

(Possibly go to their community/habitation area
and talk to them looking at their living condition there)

(Sample Size: 1 habitation per municipality)

1. Number of years engaged in service
2. Changes with regard to employer, if any? (Details)
3. Changes with regard to service conditions, if any? (Have their employers changed from Municipality to private contractors)
4. What support they receive from their employers and government? (housing, equipment, safety gears, etc.)
5. How do they do the FS operations? (understand the number of times per day/week/month they have to clean toilets, types of toilets they clean, how do they do it? Where do they dump the FS?) (we need to get a sense of what type of toilets, tanks, etc. are there in city)
6. If they are employed with Cess pools? If yes, we need to get a details of the operations. How many trips? Where do they dump the FS? How many people are engaged in one cess pool machine? Number of calls they receive per day/week/month? Do they have problem because the machine cannot go to some parts of the city? What do they do in such cases?
7. Do they do extra job by taking private calls, including dumping FS in open fields during nights?
8. What are their grievances with regard to salary, safety, equipment, other support?
9. What's their opinion about storm drains? Which part of the city has more problems?
10. What sanitation facilities they themselves enjoy? Do their community members practice open defecation?
11. Have they been facing social discriminations?

Public/Community toilets

(Sample size: 1 per municipality)

1. Type of the toilet? Year of establishment? Who manages? (municipality, Sulabh, local NGO, PPP, private agency, etc.)
2. Number of toilets and bathrooms in the complex?
3. Water supply to the complex?
4. Number of people who use the toilets daily/monthly/average (male, female, children)
5. Any seasonal/festival related changes in use? (get some details)
6. Type of toilets, load (when they have to empty and how?)
7. Cost of using, maintenance, etc.
8. Problems with regard to the public toilets(operation maintenance, FSM, wastewater issues, etc.)

Sewerage Board

1. Details of sewerage generation from the city?
2. Capacity generated and utilized in the city to treat sewerage?
3. Technologies in use and their effectiveness?
4. STP details (project details, funding, partnerships, constraints)?
5. Technological changes being worked out if any?
6. What holds for the future for the city with regard to sewer treatment? Any plans? Visions? Constraints/challenges?

Pollution Control Board

1. Any assessment of sewerage, FS and other pollutants?
2. What is the state of water (surface, ground, and river) pollution from different sections of the society? (Apartments, hospitals, hotels, industrial houses, toilets, open defecation, dumping of wastes, etc. (any specific statistics would be useful)
3. What actions has the pollution control been taking to make the municipalities address these pollutions? (Details of notices issued, actions taken, etc.)
4. How often do you take water quality monitoring exercises in cities and what are the results? How do you communicate the same to the municipality authorities?
5. Have you been suggesting specific pollution control measures for different segments of polluters? What kind of acceptability you see of those from the municipalities and others? Challenges/constraints?
6. Has the Board got a plan to make cities pollution free by particular year/ period? Do you integrate your plans with the SBM?

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NIUA is a premier national institute for research, capacity building and dissemination of knowledge in the urban sector, including sanitation. Established in 1976, it is the apex research body for the Ministry of Housing and Urban Affairs (MoHUA), Government of India. NIUA is also the strategic partner of the MoHUA in capacity building for providing single window services to the MoHUA/states/ULBs.

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