Inclusive Urban Sanitation Stories

Mitigating river water pollution through comprehensive wastewater treatment in Odisha

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Figure 1 – Operational FSTP and STP in the Capital City of Bhubaneswar in Odisha, India. Source: H&UDD.

Summary

With growing urbanization, sewage and septage have emerged as one of the biggest pollutants of water bodies in the urban areas of the State of Odisha in India. Absence of sewer networks in large parts of the State, lack of treatment facilities, open defecation and lack of regulatory mechanisms were among the major challenges contributing to the water contamination of the river systems.

The Housing & Urban Development Department (H&UDD), Government of Odisha implemented a holistic, decentralized, inclusive and community-led wastewater management model combining a sewage system for large cities (>200,000 population) and Faecal Sludge & Septage

Management (FSSM) for small and medium towns (<200,000 population) that helped in considerably reducing the water pollution caused disposal of faecal sludge and septage. The State created and operationalized 13 Sewage Treatment Plants (STPs) in six bigger cities and 112 Faecal Sludge Treatment Plants (FSTPs) across all the 115 Urban Local Bodies (ULBs). This along with adoption of appropriate (low-cost) technology and engagement of local community groups in the management of FSTPs as well as establishment of regulatory mechanisms together helped in containing the discharge of untreated human waste, thus reducing the degree of water pollution in the major river systems of the State. Institutional strengthening, capacity building, awareness generation and regular monitoring have also contributed to the wastewater management programme, positively impacting environment outcomes.

Consequently, water quality in 17 out of the total of 19 polluted rivers stretches have considerably improved and moved from the polluted to non-polluted category. This impressive reduction in the number of polluted rivers stretches within a span of five years is attributable to the above pollution abatement measures undertaken during the period 2017–2022. The Odisha state model has now emerged as a replicable, scalable and inclusive sanitation model which could be adopted by the low and middle-income countries and cities.

Overview

Geographical information

Country: India
State: Odisha
State population: 45,470,000

Problem

- Water pollution in large number of stretches of rivers in Odisha due to sewage and septage contamination.
- Challenges of adopting underground sewerage system in a state like Odisha with predominantly medium and small towns.
- Absence of treatment facilities for faecal waste emptied from the large number of toilet septic tanks.
- Open defecation owing to lack of access to toilets.
- Absence of regulatory mechanisms for private desludgers.
- Poor awareness about the health and environment impact of indiscriminate and open discharge of sewage and septage.

Solution

- Adoption of a combination of sewerage network and decentralized, community led FSSM.
- Establishing and strengthening interventions across FSSM value chain – from enhancing toilet access and mechanized desludging to scientific treatment.
- Creation and operationalization of 13 STPs and 112 FSTPs adopting low-cost, appropriate technology and O&M through community partners.
- Creation of model FSSM Regulations and their enforcement.
- Strengthening institutions and building capacities for sustainable FSSM.
- Regular awareness creation and institutional monitoring of FSSM.

Problem

The State of Odisha is in the eastern part of India and is characterized by a steady increase in the urban population. More than 19% of the State's population reside in urban areas and the growth of census towns accounts for nearly 40% of the urbanization in the State.

With growing urbanization, sewage and septage emerged as one of the biggest pollutants of water bodies and ground water in the urban areas. A 2014 study by Odisha State Pollution Control Board (OSPCB) on water quality of 11 major river systems across the State revealed water to be unfit for human use at 90 places. The rivers passing through major cities were identified as being contaminated largely due to the flow of untreated sewage and septage. Direct and indiscriminate disposal of untreated wastewater and faecal sludge into open spaces and into the water bodies posed a huge risk to public health and the environment.

Septage from household septic tanks and public toilets is highly contaminated with pathogens and discharging it into water bodies causes depletion of dissolved oxygen and increases nutrients levels in the water. This results in eutrophication and increase in pathogen growth creating health hazards and higher mortality rates of aquatic species. Faecal coliform in water not only affects the health of the people but also affects crops grown with such water.

In 2011, nearly all the 115 Urban Local Bodies (ULBs) of Odisha had poor access to sanitation facilities including toilets. Extensive open defecation and many insanitary toilets discharging faecal waste directly to the drains also led to the flow of faecal waste into water bodies.

The towns and cities in Odisha are characterized by low sewerage network coverage and high population densities. Sewerage systems for small and medium sized towns were not the solution as they were not only expensive, time-consuming, and disruptive, but also challenging to operate and sustain. Moreover, sewerage networks mostly catered to large cities were unsuitable for the smaller towns. Funds were also inadequate to build large-scale, centralized sewerage systems for all the towns.

Only 11.5% households were connected to sewerage systems in 2011 in Odisha, while 52% relied on septic tanks and other on-site sanitation systems. In 2015, as per estimates, less than 2% of the faecal sludge generated was being treated through Sewage Treatment Plants (STPs), of which there was only one operational in the State.

Besides lack of treatment facilities, the desludging activities in most cities, especially those run by private agencies, were unregulated and did not follow safe practices or provide efficient services. In absence of guidelines, designated disposal sites, awareness and regulations,

cesspool vehicle operators often discharged the collected faecal sludge/septage into open drains, waterways and open fields posing a huge threat to the environment and health.

Lastly, the safe management of faecal waste was a challenge due to dearth of capacity, technical expertise, mandated institutions and funds to implement Faecal Sludge & Septage Management (FSSM) initiatives.

Solution

Considering the serious effects of untreated human waste on the water bodies of the State, the Government of Odisha in 2015 realized the need to act swiftly. Due to the large prevalence of on-site systems in urban Odisha where toilets are connected to septic tanks and pits, the State Government realized that underground sewer networks cannot be the only solution. It decided to opt for an inclusive sanitation model with a combination of decentralized, low-cost, non-sewer sanitation systems through Faecal Sludge & Septage Management (FSSM) and sewage system for large towns to make cities environmentally clean and safe for the citizens. Consequently, a combination of sewerage network and FSSM was adopted in the bigger cities with a population of more than 100,000 and only FSSM was implemented in the smaller towns of the State.

The Housing & Urban Development Department (H&UDD) is the nodal government department responsible for implementing all sanitation programmes through the ULBs along with parastatal organizations like the Odisha Water Supply and Sewerage Board (OWSSB), Public Health Engineering Organization (PHEO) and Water Corporation of Odisha (WATCO). An exclusive Technical Support Unit (TSU) was set up for FSSM at the state level with city level presence to provide technical assistance to both the Department and the ULBs.

While the sewerage network system was operationalized in only one city in 2015 and thereafter extended to another five large cities, the State decided to pilot the FSSM programme in two cities in 2015. Thereafter the FSSM programme was extended to nine bigger cities/towns covering nearly 50% of the urban population and then scaled to all the 115 ULBs of Odisha.

The H&UDD adopted a stepwise, incremental approach, beginning from systematic planning to ensuring availability of funds, infrastructure and human resources for increasing toilets along with safe collection, transportation and treatment of septage. The State envisioned 100% black water treatment through creation of treatment infrastructure, regulations, awareness, capacity building and community engagement.

The programme began with extensive awareness and capacity building programmes along with setting up of FSTPs in all the cities/ towns. It adopted a low-cost, low-technology nature-based

treatment technology (decentralized wastewater treatment systems or DEWATS) that was based on four main functions: solid–liquid separation, stabilization, dewatering or drying, aerobic and anaerobic treatment and pathogen reduction.

Besides, ensuring access to toilets, the H&UDD also improved infrastructure and service delivery for mechanized desludging through procurement of cesspool vehicles of varying capacity for all the 115 ULBs having access to at least one cesspool vehicle Figure 2. It notified guidelines and standard operating procedures for safe emptying, transporting and disposal of septage. Innovations in low-cost and safe temporary disposal at the Deep Row Entrenchment (DRE) sites as an interim solution, technological interventions through usage of Global Positioning System (GPS) for tracking movement of cesspool vehicles and establishment of single window system for seeking cesspool vehicle services were among the other steps taken.

Figure 2 – Cesspool vehicle disposing sludge at the plant. Source: H&UDD.

Taking cognizance of the fact that creation of infrastructure alone will not bring the desired results, the Government adopted a holistic approach involving policy level changes, capacity building and social engineering efforts. The ULBs undertook intensive communication and awareness campaigns on key FSSM practices, especially on the importance of sanitary toilets, safe containment, the need for safe and regular desludging, and the criticality of mechanized desludging and treatment. They also provided affordable desludging services to the urban poor.

Addressing regulatory gaps at the city level, the State updated the FSSM Regulations to regulate private cesspool vehicles by licensing them and to mandatorily dispose of the faecal sludge at

the FSTPs. It also helped in streamlining the process and checking faulty septic tanks. Since most of the private desludging operators were unaware of the adverse impacts of unsafe disposal of the septage, the State engaged private players to regulate and support safe desludging services and mandatory disposal at the FSTPs. ULBs imposed high penalty on illegal disposal of sludge and licensing of all the cesspool vehicle operators was mandatory.

Creation of a dedicated nodal body like the State Level Septage Cell (SLSC) in the H&UDD and designating an officer at the rank of Chief Engineer as State Septage Officer within Odisha Water Supply and Sewerage Board (OWSSB) was instrumental in creating a standard, single-window system for fast-tracking construction and operationalizing of more than new 112 FSTPs. Importantly, considering the sustainability and community ownership of the treatment facilities, the government partnered with local women and transgender collectives for the management of the treatment facilities Figure 3.

Figure 3 – Members of women SHGs at the FSTP. Source: H&UDD.

Currently, the State has 13 STPs with 364.5 MLD treatment capacity and 112 FSTPs with 1937 KLD treatment capacity treating wastewater generated from all the 115 ULBs before being reused or discharged into the environment. Urban Odisha has now moved access to safe faecal waste disposal at designated sites from 2% in the year 2015 to 98% in the year 2022.

The efforts of the State over the last few years have now reaped rich dividends. OSPCB data reveals that the frequency of violations regarding water quality of the major rivers has either

gone down or has remained constant with the latest data showing nearly 89% reduction of pollution in major rivers of Odisha.

The 2017 Central Pollution Control Board (CPCB) report identified 19 river stretches of Odisha as polluted by priority category I to V as per the maximum Biochemical Oxygen Demand (BOD) observed in the water samples. However, analysis of latest OSPCB water quality test reports show that the priority (higher to lower pollutant level) of polluted river stretches has improved significantly. As per the report, 17 river stretches out of 19 have been declared as clean. The 19 polluted river stretches spread across 42 monitoring stations were monitored for BOD, and Total Coliform (TC) and Faecal Coliform (FC) counts.

The improvement in water quality in the rivers/streams has been largely attributed to the construction and operation of FSTPs in all the major towns through which the river systems pass, along with STPs and FSTPs in few of the major big cities like Bhubaneswar, Cuttack and Sambalpur. In particular, the average TC count in the cities of Sambalpur and Cuttack (part of the largest Mahanadi River system; Figure 4 had reduced considerably.

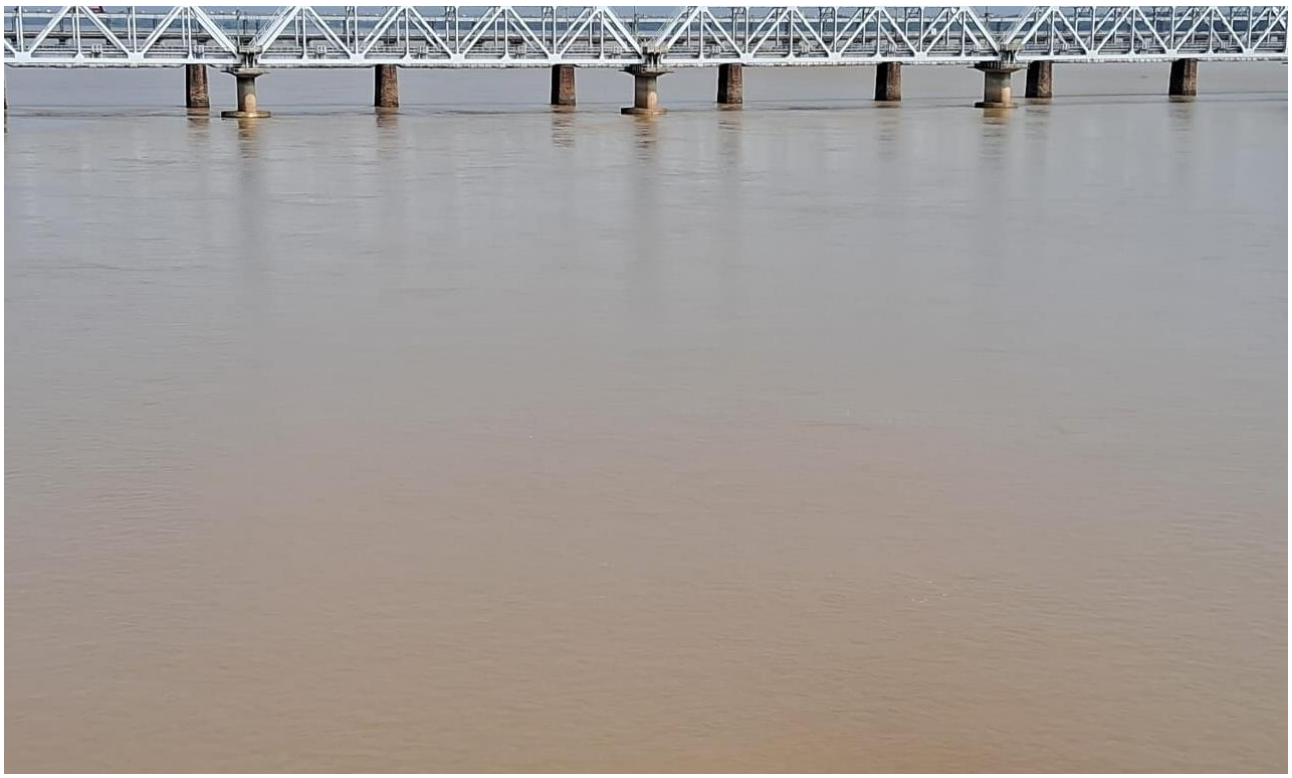

Figure 4 – Mahanadi River, Odisha. Source: H&UDD.

With 112 of the total 120 FSTPs and 13 STPs operational, the government is now focusing on regular monitoring to ensure the sustainability of the interventions. While the low capital expense and operating expenses of a large number of FSTPs ensure that the plants remain sustainable in the future, the H&UDD has been stressing plant stabilization and optimization through various measures. To ensure reuse and recycling of treated water and waste, parks are developed in the

FSTP sites where the treated water is used for watering the lawn and plants. Resource recovery from treated bio-solids is also being explored by the State.

The State has also embarked on Grey Water Management (GWM) across the State which is going to further improve the ground and surface water quality. After a successful pilot in two towns, the blueprint of a state-wide scale up of GWM in a phased manner involving household, commercial and institutional areas is already being planned.

The inclusive wastewater management model of Odisha – combining sewer systems, FSSM and GWM for universal coverage – has not only improved the water quality significantly but also been able to steer the State as an exemplar in India which could very well serve as guiding lessons for other middle- and low-income cities and countries.

Lessons learned

- A combination of sewered solution for bigger cities along with non-sewered, decentralized FSSM for smaller cities can be effective solutions for middle- and low-income countries in effectively tackling river water contamination as demonstrated by the State of Odisha.
- Urban Odisha could move access to safe faecal waste and septage disposal through a collaborative, inclusive and participatory effort.
- Planning for an appropriate, holistic and comprehensive community-led model is key to sustainable wastewater management.

Useful links

https://orissadiary.com/city-wide-swachhta-fostering-inclusive-sanitation-and-transforming-urban-landscapes/

https://www.youtube.com/watch?v=EkMzGHBikIQ-

https://www.youtube.com/watch?v=0-TAUEWUNw8

https://odishabytes.com/nepal-delegation-visits-odisha-to-study-decentralised-inclusive-urban-sanitation-model/

https://www.3ieimpact.org/sites/default/files/2023-01/Odisha-SLLP-Learning-brief.pdf

https://www.firstpost.com/opinion/safe-sanitation-odishas-pathbreaking-initiatives-empowering-workers-and-vulnerable-communities-12804952.html

Further reading and references

- https://government.economictimes.indiatimes.com/blogs/g-mathi-vathanan-fssm-solutions-for-preventing-river-pollution/3805
- https://sbmgramin.wordpress.com/2023/07/08/fstp-provides-livelihood-opportunities-for-transgender-persons-in-odisha/

About the author

G. Mathi Vathanan, Principal Secretary, Housing & Urban Development Department, has been leading some of the flagship urban development missions of Odisha. He has anchored the inclusive sanitation model and the 24x7 Drink from Tap Mission in Odisha, two globally acclaimed initiatives in the Water & Sanitation sector that serve as exemplars for the developing world.

Durgesh Nandini Sahoo, Additional Secretary, Housing & Urban Development Department, is the nodal officer for the FSSM programme in Odisha and is leading the interventions across the State. She has been instrumental in strengthening community partnership and monitoring the programme.

Elisa Patnaik is from Ernst & Young and is the Communication & Inclusion Lead of the FSSM PMU. Elisa has nearly 20 years of experience to her credit in the development sector with expertise in communication, inclusion, project management and has successfully led interventions across multiple sectors and partners.

About the institution / organisation

The **Housing & Urban Development Department** is the nodal Department of Government of Odisha for ensuring proper and planned growth of cities and towns with adequate infrastructure, amenities and services provided to the citizens through the ULBs and parastatal agencies. The Department has been taking concrete measures for efficient management and delivery of civic services like provision of affordable housing, safe drinking water, sanitation (liquid and solid waste management), storm water drainage, sewerage, roads, public transport, and creation of livelihood opportunities by accelerating economic growth of cities/towns and building capacity of the urban poor.
https://urban.odisha.gov.in/

About the IWA Inclusive Urban Sanitation Initiative

IWA's Inclusive Urban Sanitation initiative responds to a huge and growing public need - safe sanitation in combination with access to safe drinking water and hygiene underpins good health. The aim of this initiative is reshaping the global urban sanitation agenda by focusing on inclusive sanitation service goals--and the service systems required to achieve them - rather than the traditional singular focus on expanding sewer networks and treatment works. This forms part of IWA's larger agenda to promote inclusive, resilient, water-wise, and sanitation-secure cities.

About the Inclusive Urban Sanitation Stories

The Inclusive Urban Sanitation stories are documenting some of the policies, practices, and approaches that demonstrate how stakeholders especially those in urban areas (e.g., public sector, operators, academics, regulators, and other key actors) are taking part or contributing to Sustainable Development Goal 6 which require water and sanitation concepts and norms to look beyond technology and the usual focus on building infrastructure. Increased focus is on safety, inclusion, environment, public health, and multiple technology solutions tailored to different geographies and socio-economic contexts for building climate-resilient cities. The stories aim to inspire urban stakeholders to discuss ways for advancing inclusive urban sanitation, especially in low- and middle-income countries.