Inclusive Urban Sanitation Stories

A move towards an inclusive sanitation initiative: collaborative engagement in the Indian State of Uttarakhand

Contributed by **Dr Mahreen Matto and Shantanu Padhi, National Institute of Urban Affairs (NIUA)**

Figure 1 – Source: NIUA

Summary

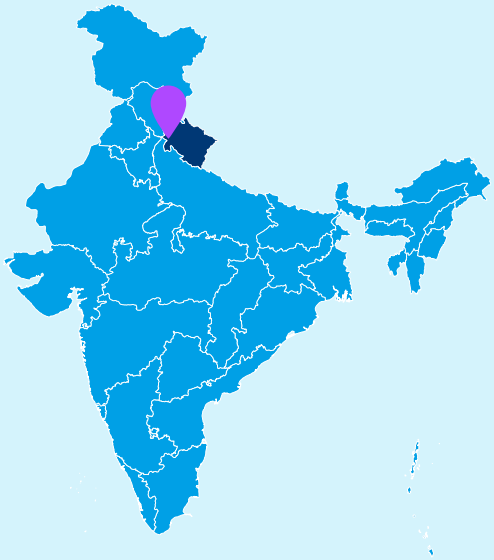
In the Indian State of Uttarakhand, an effort towards CWIS is being initiated with a focus on Integrated Wastewater and Faecal Sludge and Septage Management (FSSM). To improve the sanitation infrastructure, the state government agency, the Urban Uttarakhand State Development Agency collaborated with multiple stakeholders, including a national think tank, the National Institute of Urban Affairs; a donor agency, the Asian Development Bank; and academia, the Indian Institute of Technology Roorkee. A study is being carried out to plan the co-existence of networked sanitation for fast growing city dwellers and non-networked sanitation for left-out households in the city and peri-urban areas. Interim and intermittent measures are taken up to use the current and proposed treatment sites for co-treatment of Faecal Sludge and Septage (FSS) with sewage.

In order to demonstrate the benefits of co-treatment with an inclusivity approach, a technical feasibility study was performed in Dehradun, the State capital. The study supported the implementation of a co-treatment facility of 40 kilo litres per day (KLD) at an upcoming 18 million litres per day (MLD) Sewage Treatment Plant (STP) in Raipur and 130 KLD at the existing Kargi STP, Dehradun. In order to elucidate the advantages of co-treatment of FSS, the proposed framework will benefit more than 78,000 households for a span of 15 years. Consequently, a road map for scaling up CWIS in the state has been developed in order to achieve universal access to sanitation for all including low-income and marginalized households/communities.

Overview

Geographical information

Country: India
City: Dehradun
City population: 800,000



Problem

- No dedicated treatment facility available for treatment of FSS.
- Most of the STPs in the state are found to be running at low utilization.
- Technical scepticism towards co-treatment of FSS with sewage.
- Topography has posed technical challenges for providing sewer connection to every household.

Solution

- The STPs are running at low utilization and thus have spare capacity available to also treat FSS with sewage. Providing sewered sanitation to all the households in the fast growing and hilly cities is difficult task to achieve.
- An integrated approach of FSS and sewage management is to be adopted in the sanitation infrastructure projects.
- The state urgently needs a technical advisory and operational guidelines supported by strong advocacy in order to solve the problem of urban sanitation and river pollution holistically.
- Moreover, prioritizing co-treatment of FSS in STPs can help in accomplishing the national missions on river rejuvenations as well.

Problem

Dehradun, the state capital of Uttarakhand, lies in the Doon valley and is a fast growing and an expanding city. The valley has the Himalayas to its north, the Shivalik range to its south, the river Ganga to its east and the river Yamuna to its west. There are 167,577 households in the city serving a population of just over 800,000. All the households have access to individual household-level toilets, while an additional 31 public/community toilets cater to sanitation requirements of the floating population. As of mid-2020, only 34% of households were connected to the sewer network while the rest are dependent on an On-Site Sanitation System such as a septic tank. It is estimated that the sewage and FSS generation in Dehradun are around 87 MLD and 320 KLD, respectively. The sewer network conveys the sewage to seven different STPs located across the city. The collective treatment potential of these STPs is estimated to be around 115 MLD but they receive only 42 MLD of sewage (see Figure 3).

While the implementation of sewerage projects is ongoing in the city, providing sewer connection to every household has posed technical challenges due to several reasons. Topography is a major reason as many households are situated below the road level. Also, urbanization has caused many households to be densely packed which makes OSS the only possible sanitation infrastructure. With most of the STPs found to have spare treatment capacity, it is envisaged that existing treatment sites will be used for co-treatment of FSS with sewage as an interim solution. To demonstrate the benefits of co-treatment, a technical feasibility study was performed to support the implementation of a co-treatment facility at an upcoming STP in Raipur, Dehradun.

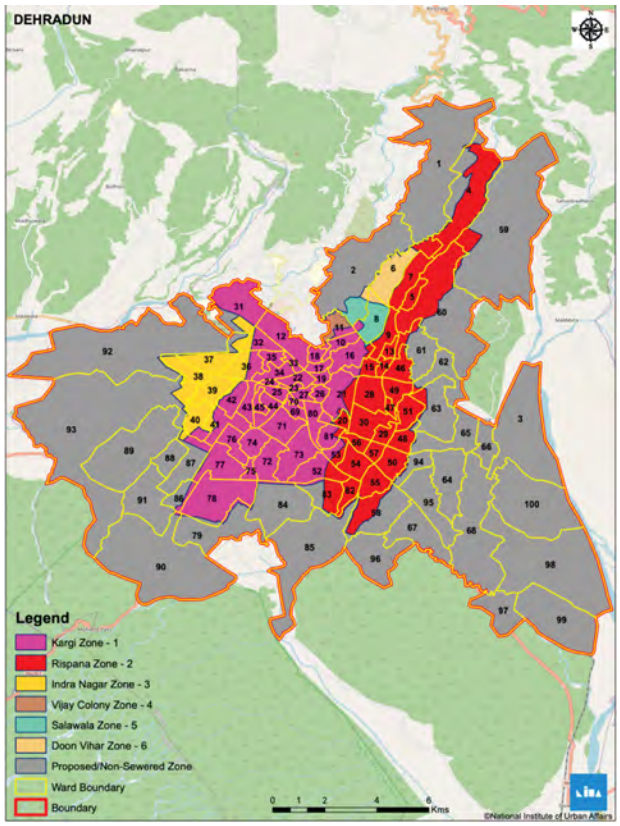


Figure 3 – Sewerage zone map. Source: NIUA

Solution

The topography of the state is hilly, hence providing sewered sanitation to all the households and establishments would be difficult and costly. Co-treatment of FSS with sewage would be a viable solution in the state therefore a study was undertaken by the National Institute of Urban Affairs in collaboration with Indian Institute of Technology, Roorkee in 2019 to evaluate the potential of co-treatment. The study was carried out for nine operational STPs located in five cities of Uttarakhand, including Dehradun.[1] The study included field visits to measure daily

1 Co-treatment of Septage and Faecal Sludge at STPs of Ganga Towns in Uttarakhand. https://niua.org/scbp/sites/default/files/Septage_Co-Treatment_Report_15-09-2020.pdf

and peak wastewater flow, analysing pollution load carried by wastewater and FSS in terms of biological oxygen demand, chemical oxygen demand, total suspended solids, etc. The design and actual loading (both hydraulic and organic) with respect to elapsed time was assessed, and strategies were formulated for safe co-treatment of FSS. Based on this technical study, a desk-based feasibility study and the design of the co-treatment facility was proposed for upcoming STPs at Raipur and Kargi, Dehradun. The capacity of the co-treatment facility will be 40 KLD in Raipur and 130 KLD in Kargi; Wile the STP capacities are 18 MLD and 68 MLD and based on sequential batch reactor technology. The design period of the co-treatment facility is 15 years. As the septage collection will increase in the future, capacity of the co-treatment facility can be increased proportionately.

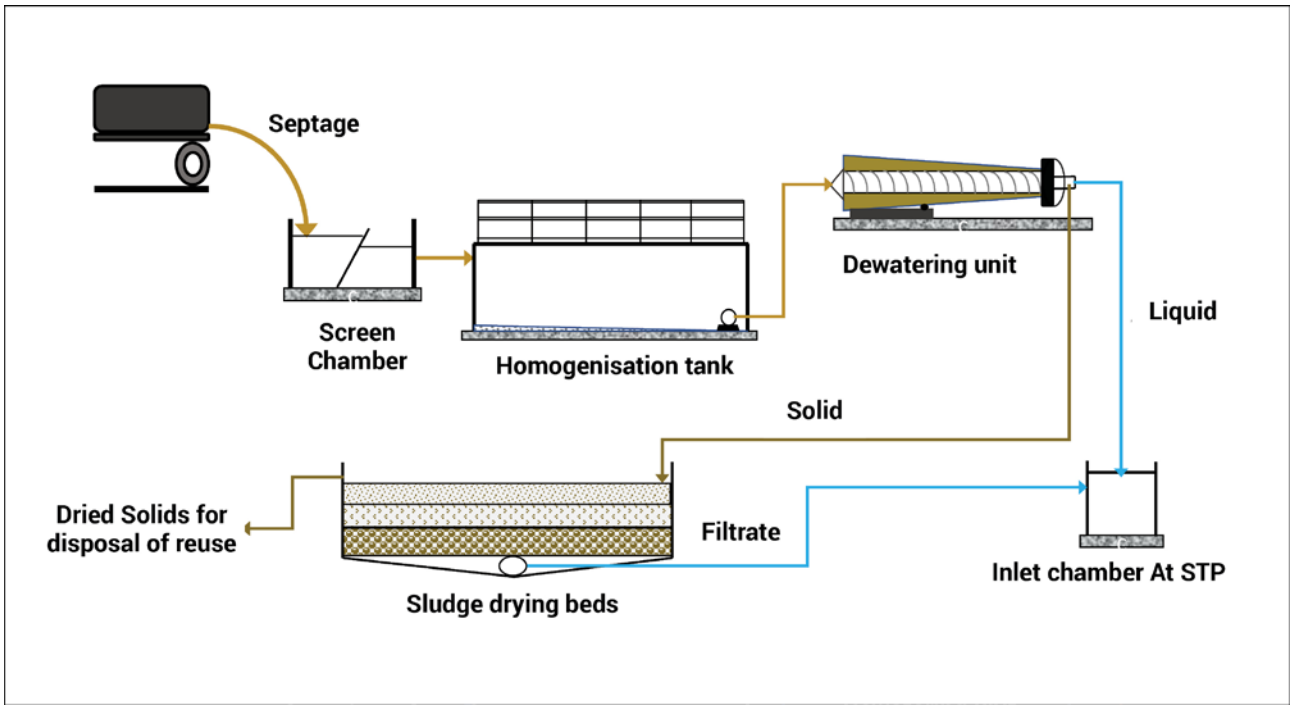


Figure 4 – Process flow diagram of co-treatment units. Source: NIUA

A pre-treatment facility is proposed for FSS treatment before adding it to the sewage stream. Thus, it will ensure scientific treatment of FSS as direct discharge leads to operational difficulties and treatment process may be compromised at the STP. The pre-treatment facility includes a septage receiving station, screen chambers, homogenization tanks, centrifuge unit for solid / liquid separation and sludge drying (see Figure 4).[2] Following further discussion, the co-treatment infrastructure proposal was accepted and included in the detailed project report for sewerage systems for Raipur; the project has recently been put out to tendered for procurement of the works. A simple low-cost co-treatment infrastructure will ensure proper treatment of FSS from non-sewered and low-income group areas in the city, but also those from the peri-urban areas and the nearby villages which will benefit 24,000 households. In parallel, a 130 KLD co-treatment facility is planned and designed for the existing 68 MLD capacity STP in Kargi zone, in Dehradun city which is estimated to cater for around 54,000 households, including

2 Design Modules for Co-treatment of Faecal Sludge at STPs Part -A, B, C: https://www.niua.org/scbp/?q=training-modules

households which are planned to be connected with sewers in a phase-wise manner.[3] The Kargi zone STP was receiving septage through direct discharge into the wet well unit from 2020. It was observed that due to lack of pre-treatment facility, the STP encountered a few operational issues. Therefore, a pre-treatment facility of 130 KLD capacity for co-treatment is proposed for this STP. The advocacy for co-treatment through various research and technical reports paved the way for scaling-up co-treatment across the state to address FSS treatment from households dependent on on-site sanitation. Henceforth, a policy-cum-advisory report has been released cordially endorsed by respective departments to adopt scientific method of co-treatment of FSS with sewage.

Adopting the co-treatment approach can help in achieving CWIS as it is in line with four of the CWIS principles: a) everyone benefits from safe services and public investment equitably, b) human waste is safely managed along the sanitation chain, c) authorities operate with a clear, inclusive mandate and d) authorities deploy a range of hardware, funding and business models which enables adoption of simple, local and financially sustainable technologies that increase the scope of FSS treatment while benefiting all the stakeholders, especially the citizens relying on on-site sanitation systems.

Decentralized and non-sewered sanitation systems are a paradigm shift in urban planning and infrastructure creation in most developing countries. The case study identifies the critical path and activities ranging from capacity development of state officials, policy engagement and advocacy at national level, research, engagement with implementing agencies for their buy in, funding for FSSM, technical assistance for preparing designs and technology options, and on ground hand-holding support for implementing solutions. These activities are not possible without a collaborative engagement of key stakeholders and pressing the right levers at all levels.

Lessons learned

The study has brought the technical domain for co-treatment of septage with sewage in the State of Uttarakhand to the forefront. The state is utilizing this for scaling FSS treatment by manoeuvring co-treatment techniques at their existing STPs that have additional capacity and for the forthcoming sewerage plans. The state is also integrating FSSM at a city-wide scale through co-treatment, which is quite perceptible through the various notifications and advisories on co-treatment and FSSM being circulated/disseminated by the authorities. Treatment of FSS at STPs is cost effective as it utilizes the spare capacity at existing STPs. Minimal cost would be required for preliminary treatment of FSS during co-treatment as compared to capital and land cost which would be incurred for a dedicated Faecal Sludge Treatment Plant.

Recently, Ministry of Jal Shakti (water resources) in May 2022 has approved funds for co-treatment units for four existing STPs under its flagship programme, the National Mission for

3 Design Recommendations for Co-treatment of Faecal sludge and Septage with Sewage, at Kargi Sewage Treatment Plant, Dehradun: https://www.niua.org/scbp/?q=content/design-recommendations-co-treatment-septage-sewage-kargi-stp-dehradun

Clean Ganga (NMCG) in Uttarakhand, thus indicating the replicability within the State. The capacities of individual units are:

- Haridwar 150 KLD (100 KLD Jagjeetpur + 50KLD Sarai)
- Rishikesh 50 KLD
- Srinagar 30 KLD
- Devprayag 5 KLD

The project component includes development of septage co-treatment plant at the existing STPs and O&M for 5 years. This has been proposed to address the issue of septage collected from septic tanks being disposed illegally into drains/manholes, which affects the functioning of the existing STPs.

Useful links

Uttarakhand State Advisory note – Co-treatment Faecal Sludge and Septage with sewage in sewage treatment Plant: https://scbp.niua.org/sites/default/files/Co-treatment%20AdvisoryNote_UK.pdf

Further reading and references

- NIUA 2020 Design Recommendations for Co-treatment of Faecal sludge and Septage with Sewage, at Kargi Sewage Treatment Plant, Dehradun. National Institute of Urban Affairs, New Delhi.
- NIUA 2019 Co-Treatment of Septage at STPs of Ganga Towns in Uttarakhand. National Institute of Urban Affairs, New Delhi.
- NIUA 2020 Co-Treatment Feasibility (Septage with Sewage), Dehradun, Uttarakhand; Asian Development Bank supported Banjarawala, Mothrawala and Raipur Sewerage projects. National Institute of Urban Affairs, New Delhi.
- NIUA 2020 Urban Faecal Sludge & Septage Management in Uttarakhand – A City Level Sanitation Study: https://niua.org/scbp/sites/default/files/Septage_Co-Treatment_Report_15-09-2020.pdf

About the authors

Dr Mahreen Matto is the Team Lead for the Sanitation Capacity Building Platform (SCBP) at the NIUA. Mahreen is an environmental researcher and capacity building trainer with 12 years of experience in mainstreaming urban water and sanitation management across human settlements in India, South Asia and African Countries. The work includes research, capacity building, advocacy and project implementation on decentralized wastewater management, citywide inclusive sanitation, water and sanitation safety planning, preparation of city sanitation plans, and faecal sludge and septage management. She has authored reports/guides/research articles, including Water Sensitive Urban Design and Planning: A practitioner's guide. Her major clients have been the World Health Organization, Asian Development Bank, Bill and Melinda Gates Foundation, Swedish International Development Cooperation Agency, Ministry of Housing and Urban Affairs, India; Water Aid (India, Bangladesh and Rwanda), Water Research Commission, South Africa and Rwanda Water and Forestry Authority.

Mr Shantanu Kumar Padhi, an environmental engineer, works as a Senior Programme Officer (Technical) - SCBP at NIUA. Shantanu has closely worked with the governments at city, state and national level in India and African countries to jointly find solutions for achieving sanitation for all. He has authored reports/guides, including Integrated Wastewater and Faecal Sludge for Ghana, Guidebook on Co-treatment for Dehradun and contributed to development of web-based tools like Shit Flow Diagrams. Prior to joining NIUA he was working with Centre for Science & Environment where he was co-ordinating technical support units in two small towns of Uttar Pradesh for mainstreaming faecal sludge and septage management to achieve citywide sanitation.

About the institution / organisation

The **National Institute of Urban Affairs (NIUA)** is India's leading national think tank on urban planning and development. As a hub for the generation and dissemination of cutting-edge research in the urban sector, it seeks to provide innovative solutions to address the challenges of a fast-urbanizing India and pave the way for more inclusive and sustainable cities of the future.

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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.