SDG 6.0 Urban WASH Lab

Creating Evidence for Safe Sanitation Service Delivery & Waste Water Management

Collaborative efforts for field level interventions under

Maharashtra Urban WASH-ES Coalition

Towards achieving objectives of Swachh Bharat Mission 2.0

Regional Centre for Urban & Environmental Studies of
All India Institute of Local Self Government, Mumbai,
United Nations Childrens Fund, Mumbai Field Office

2022 | 23

MAHA URBAN
WASH-ES COALITION

Secretariat of Maharashtra Urban WASH-ES Coalition

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The Secretariat, Maharashtra Urban WASH-ES Coalition

Regional Centre for Urban and Environmental Studies (RCUES) of All India Institute of Local Self Government (AIILSG), Mumbai

UNICEF Mumbai Field Office

Government Partners

Urban Development Department (UDD), Government of Maharashtra
Water Supply and Sanitation Department (WSSD), Government of Maharashtra
Directorate of Municipal Administration (DMA), UDD, Government of Maharashtra
Sangli Miraj Kupwad City Municipal Corporation
Pune Zilla Parishad
Indapur Municipal Council, Indapur Panchayat Samiti, and 12 GPs *(as mentioned in Annexure 1)*
Junnar Municipal Council, Junnar Panchayat Samiti, and 43 GPs *(as mentioned in Annexure 2)*
Alibag Municipal Council
Bhiwapur Nagar Panchayat

Development Partners

Ecosan Services Foundation, Pune,
Centre for Applied Research and People's Engagement, Aurangabad
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Keynote Message

Under the able leadership of Hon'ble Prime Minister of India, the country accomplished 100% rural sanitation coverage and achieved the milestone of an Open Defecation Free India in 2019, under Swachh Bharat Mission (SBM) the World's largest behavioral change program. To sustain the achievements of the first phase of the mission, SBM 2.0 was launched in February 2020. It encourages the implementation of infrastructure projects to cater to groups of neighboring urban and rural areas, so that the common resources are utilized optimally. The letter dated 14th September 2021, jointly signed by Secretaries, Dept. of Drinking Water and Sanitation, and the Ministry of Housing and Urban Affairs, further promotes urban and rural convergence for sustainable Faecal Sludge and Septage Management (FSSM) and Plastic Waste Management (PWM). Water Supply and Sanitation Department (WSSD), Government of Maharashtra (GoM) is committed to successful implementation of SBM (G) 2.0 in Maharashtra.

In line with the policy interventions, RCUES of AIILSG, Mumbai - the Secretariat of 'Maharashtra Urban WASH and ES Coalition', with support from UNICEF Mumbai Field Office is supporting the State in establishing Urban- Rural Convergence in FSSM through state level assessment and ilot implementation in two identified clusters of Indapur and Junnar in Pune District. This model has come up with an innovative formal institutional mechanism for sustainable service delivery and optimization of existing urban infrastructure to cater to nearby rural areas This approach is leading to mutual benefit of urban and rural bodies and has been integrated in the State's strategy for strengthening FSSM in Maharashtra. I would like to recognize the efforts of UNICEF, RCUES of AIILSG Mumbai, Pune Zilla Parishad, Indapur and Junnar Municipal Councils and Panchayat Samitis and all the concerned Gram Panchayats in these clusters and thank them for demonstrating urban-rural convergence in FSSM in the State, which has influenced the policy framework for waste management in the State.

This report presents the Urban-Rural Convergence model for FSSM in Maharashtra, along with other innovative projects supported by the Coalition under its initiative of 'Maha- Urban INNO-WASH Challenge'. The Five projects captured in this document exemplify innovative approaches for effective waste management with local partnerships and resource optimization, contributing to achievement of targets under SBM 2.0 and moving towards environmental sustainability.

I appreciate the efforts of UNICEF, RCUES of AIILSG Mumbai, ESF Pune, CARPE Aurangabad, SES Pune and other partner organizations of Maharashtra Urban WASH and ES Coalition, for their remarkable efforts in creating evidence, based on which the State's policies for waste management can further be strengthened.

Jaiswal 22/3/23

Shri. Sanjeev Jaiswal, IAS,
Principal Secretary,
Water Supply and Sanitation Department,
Government of Maharashtra

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Keynote Message

Safely managed water, adequate sanitation, and equitable hygiene for all are essential to protect global health and reduce the risk of outbreaks. To achieve this, SDG 6 has been introduced as one of the 17 Sustainable Development Goals established by the United Nations General Assembly in 2015. UNICEF at a global level is working with local governments towards creating healthy communities by undertaking several ventures in WASH sector.

UNICEF India is committed to provide continued support to the Government of India (GoI) on various initiatives pertaining to water and sanitation. UNICEF India is providing assistance to GoI under several national programs and schemes including Jal Jeevan Mission, Swachh Bharat Mission (Urban and Gramin), and AMRUT. UNICEF India is also providing technical support in strengthening the sanitation value chain and service delivery for achieving sustainability in Fecal Sludge and Septage Management.

UNICEF Maharashtra has been in the forefront in supporting Government of Maharashtra (GoM) in the sector of safe and sustainable WASH. UNICEF Maharashtra in partnership with RCUES of AIILSG, Mumbai, has undertaken a joint initiative as Maharashtra Urban WASH & Environmental Sanitation Coalition (Maha-UWES-C), which is a platform for bringing together and supporting the organizations working in WASH and environmental sanitation sectors. The present report compiles output of several interventions in the WASH sector undertaken by the Secretariat, Maha-UWES-C at RCUES of AIILSG, Mumbai, in partnership with other development partners.

I would like to take this opportunity to express my sincere gratitude to Water Supply and Sanitation Department, GoM for showing immense trust and providing support which helped in accelerating the progress of the projects. RCUES of AIILSG, Mumbai needs a special mention for its role in conceptualizing, strategizing and supporting implementation of these projects in the field with involvement of various stakeholders. I would also like to commend all our implementation partners including Ecosan Services Foundation (ESF), Pune; Centre for Applied Research and People's Engagement (CARPE), Aurangabad and Saniverse Environmental Solutions LLP, Pune for successful and timely execution of the projects. Further, I want to express my gratitude to Pune Division, District and Block Administrative Authorities, Concerned Municipal Corporations, Councils, Nagar Panchayat and Gram Panchayats for their leadership in converting these projects into success stories.

Finally, I want to appreciate and congratulate UNICEF Maharashtra and RCUES of AIILSG Mumbai for their honest efforts in putting several interventions in WASH sector into action.

Rajeshwari Chandrasekar
Chief of Field Office
UNICEF Maharashtra

Foreword

The lack of reliable access to safe and sustainable Water, Sanitation and Hygiene (WASH) infrastructure combined with the behavior of hygiene is a significant public health problem impacting large population worldwide. Safe water, Sanitation, and Hygiene are fundamental determinants of individual and social health and thus, their universal availability is the need of the hour. Keeping this in view, the Government of India has launched SBM 2.0 in 2020, with improving and sustaining the sanitation value chain as one of the key focus areas. Currently, India is aiming to provide environmentally safe sanitation to each and every citizen in urban as well as rural areas.

For encouraging the urban local bodies to advance their journeys in sustainable sanitation, there is a need to provide essential technical support and guidance to the ULB officials and relevant decision makers. All India Institute of Local Self Government (AIILSG) has been working in close association with local and state governments to strengthen capacities of local bodies and provide technical support through its more than 35 centers across India.

'Maharashtra Urban WASH & Environmental Sanitation Coalition' is a joint initiative of Regional Center for Urban and Environmental Studies (RCUES) of AIILSG, Mumbai and UNICEF, Mumbai Field Office. It is a platform for bringing together and supporting the organizations and stakeholders working in WASH sector. The Coalition has undertaken several interventions in the sector of WASH to support ULBs in achieving their targets as per the Government programmes and missions. This report presents the interventions undertaken by the Secretariat, Maha-UWES-Coalition at RCUES of AIILSG, Mumbai in the year 2022-23, in collaboration with its partner organisations, in order to provide support to the local bodies in achieving safe and sustainable sanitation. I believe that this report will help in disseminating the innovative solutions related to environmental sanitation and shed light on the valuable learnings from the pilot interventions. I hope that this report will encourage more local bodies to undertake effective solutions for realizing sustainable sanitation and accomplish their targets under several national and international programs and missions.

I would like to take this opportunity to thank the Water Supply and Sanitation Department, Government of Maharashtra for their constant support to our initiative of establishing urban and rural convergence in FSSM. I would like to appreciate the support from Pune Division, District and Block Administrative Authorities, Concerned Municipal Corporations, Councils, Nagar Panchayat and Gram Panchayats for successful implementation of projects in the field. I would like to thank all our implementation partners including Ecosan Services Foundation (ESF), Pune; Centre for Applied Research and People's Engagement (CARPE), Aurangabad and Saniverse Environmental Solutions LLP, Pune for successful and timely execution of the projects.

I extend my appreciation to UNICEF Maharashtra for their continuous support and guidance during all the initiatives. Lastly, I would like to congratulate the Secretariat of MAHA-UWES-C at RCUES of AIILSG, Mumbai, for their sincere efforts for successful implementation of the projects and development of this report as a good resource material.

Dr. Jairaj Phatak, IAS (Retd.)
Director General
All India Institute of Local Self Government

Acknowledgement

Swachh Bharat Mission (Urban) 2.0 was launched in October 2021, with the sanitation focus of the Mission shifted to sustaining the infrastructure created during the first phase of the Mission and moving towards safe containment and treatment of used water. This has underlined the need for building local capacities on various fronts, based on evidence-based learning. Innovative approaches and technological interventions help address local challenges. The evolution, dissemination, and scaling up of such innovative ideas are thus crucial.

Maharashtra Urban WASH & Environmental Sanitation Coalition, a joint initiative of RCUES of AIILSG, Mumbai, and UNICEF, Mumbai Field Office, is a platform created to facilitate collaborative ideation and implementation of such innovations in urban WASH and environmental sanitation. It aims to contribute to the State's journey towards achieving SDGs and the milestones under SBM 2.0 and AMRUT 2.0 among the other development programmes and missions. This report captures five of our field-level interventions in the year 2022-23, in support to the Local Governments, for moving towards sustaining their sanitation infrastructure, adopting locally suitable solutions for effective treatment of used water, and contributing to environmental sustainability.

The Secretariat of Maha-UWES-C takes this opportunity to express its sincere gratitude to the Water Supply and Sanitation Department, Government of Maharashtra, Division and District Administrative Authorities of Pune, Indapur and Junnar Municipal Councils of Pune District, and the Gram Panchayats of Indapur and Junnar Clusters for their constant support in strategizing and undertaking the pilot implementation of Urban and Rural Convergence in FSSM. Recognizing the potential of such a model in sustaining the infrastructure and services, with optimum utilization of resources, it has been incorporated in the policies of WSSD for scaling up FSSM in Maharashtra. We would also like to thank Saniverse Environmental Solutions LLP, for their support in the successful refurbishment of the existing FSTP at Indapur, as an implementation partner of Maha-UWES-C.

'Maha Urban INNOWASH Challenge', was an opportunity created for the ULBs to innovate and implement their ideas in partnership with the local stakeholders. It received an overwhelming response from the ULBs and development partners in the form of joint proposals for innovative projects. Three selected projects

have been successfully implemented with support from the Secretariat of Maha-UWES-C. As we celebrate the closing of this Challenge, we must thank the Directorate of Municipal Administration for encouraging the ULBs to leverage this opportunity while achieving their targets under the SBM (U) 2.0.

The winners of 'Maha Urban INNOWASH Challenge'- Sangli Miraj Kupwad City Municipal Corporation and Ecosan Services Foundation (ESF), Pune for successful execution of 'Scientific Co-treatment of faecal sludge in the existing STP at Sangli'; Alibag Municipal Council and Centre for Applied Research and People's Engagement (CARPE), Aurangabad for Organic Treatment of Greywater in open drains and Bhiwapur Nagar Panchayat for Decentralized greywater Treatment Plant deserve special applause for exemplifying path-breaking approaches for addressing local challenges in effective management of used water.

We take this opportunity to convey our sincere gratitude to UNICEF, Maharashtra for their continuous encouragement and support in the collaborative effort made under Maha-UWES-C. I would also like to thank Hon'ble President and Director General, All India Institute of Local Self Government for their valuable guidance and support in our endeavors.

Lastly, I desire to convey my heartfelt appreciation and gratefulness to my team at the Secretariat of MAHA-UWES-C at RCUES of AIILSG, Mumbai, who have been enthusiastically and diligently working towards the successful delivery of collaborative work under the Maha-UWES-C.

Ms. Utkarsha Kavadi,
Senior Executive Director,
All India Institute of Local Self Government, Mumbai

(Director, Secretariat of Maharashtra Urban WASH-ES Coalition,
Regional Centre for Urban and Environmental Studies, Mumbai)

Table of **Content**

List of Figures

List of Tables

Acronyms

15TH FC: THE FIFTEENTH FINANCE COMMISSION
ABR: ANAEROBIC BAFFLED REACTOR
AF: ANAEROBIC UP-FLOW FILTER
AIILSG: ALL INDIA INSTITUTE OF LOCAL SELF GOVERNMENT
AMC: ALIBAG MUNICIPAL COUNCIL
AMRUT: ATAL MISSION FOR REJUVENATION AND URBAN TRANSFORMATION
BDO: BLOCK DEVELOPMENT OFFICER
BNP: BHIWAPUR NAGAR PANCHAYAT
BOD: BIOLOGICAL OXYGEN DEMAND
CAPEX: CAPITAL EXPENDITURE
CARPE: CENTRE FOR APPLIED RESEARCH AND PEOPLE'S ENGAGEMENT
CEO: CHIEF EXECUTIVE OFFICER
COD: CHEMICAL OXYGEN DEMAND
CPCB: CENTRAL POLLUTION CONTROL BOARD
CT: COMMUNITY TOILETS
CWIS: CITYWIDE INCLUSIVE SANITATION
DMA: DIRECTORATE OF MUNICIPAL ADMINISTRATION
DMF: DUAL MEDIA FILTER
D.O.: DEMI OFFICIAL
DOECC: DEPARTMENT OF ENVIRONMENT AND CLIMATE CHANGE
ESF: ECOSAN SERVICES FOUNDATION
FOG: FAT- OIL-GREASE
FS: FAECAL SLUDGE
FSSM: FAECAL SLUDGE AND SEPTAGE MANAGEMENT
FSTP: FAECAL SLUDGE TREATMENT PLANT
GFC: GARBAGE FREE CITIES
GHG: GREENHOUSE GASES
GOI: GOVERNMENT OF INDIA
GOM: GOVERNMENT OF MAHARASHTRA
GPS: GRAM PANCHAYAT
GR: GOVERNMENT RESOLUTION
HH: HOUSEHOLDS
HRD: HIGH-RATE DIGESTER
IEC: INNOVATIVE ECO-CARE
IOT: INTERNET OF THINGS
IPC: INFECTION PREVENTION AND CONTROL
JJM: JAL JEEVAN MISSION
KII: KEY INFORMANT INTERVIEW
KLD: KILO LITRE PER DAY
MAHA-UWES-C: MAHARASHTRA URBAN WASH & ENVIRONMENTAL SANITATION COALITION
MLD: MILLION LITER PER DAY
MOU: MEMORANDUM OF UNDERSTANDING
MPCB: MAHARASHTRA POLLUTION CONTROL BOARD
NGO: NON-GOVERNMENTAL ORGANIZATION

NGT: National Green Tribunal
O&M: Operations and Maintenance
ODF: Open Defecation Free
OSS: On-Site Sanitation
PEC: Proposal Evaluation Committee
PGF: Planted Gravel Filter
PPE: Personal Protection Kits
RCUES: Regional Centre for Urban & Environmental Studies
RfP: Request for Proposal
SBM2.0: Swachh Bharat Mission 2.0
SDB: Sludge Drying Bed
SDG: Sustainable Development Goals
SMKCMC: Sangli Miraj Kupwad City Municipal Corporation
SMM-U: Swachh Maharashtra Mission- Urban
SOP: Standard Operating Procedures
SPS: Sludge Pumping Station
STP: Sewage Treatment Plant
STT: Settling Thickening Tanks
SWM: Solid Waste Management
UDD: Urban Development Department
UGD: Underground Drainage
ULB: Urban Local Body
UNICEF: United Nations International Children's Emergency Fund
URL: Urban Rural Linkages
WASH: Water, Sanitation and Hygiene
WC: Water Closet
WSSD: Water Supply and Sanitation Department

About SDG 6.0 Urban WASH Lab

'SDG 6.0 Urban WASH Lab' is a publication capturing the field level interventions through the Secretariat of Maharashtra Urban Water-Sanitation-Hygiene (WASH) & Environmental Sanitation Coalition (Maha-UWES-C) within the WASH and Environmental Sanitation sector. 'SDG 6.0 Urban WASH Lab' represents an urban WASH 'Lab'oratory - stemming from its endeavor towards partnerships, collaborations and incubation of innovative ideas with their pilot demonstration, as contributions to the SDG 6 within the focus areas on SBM 2.0 (Urban).

This report encapsulates information on several impactful city level initiatives in the WASH sector undertaken by the Secretariat, Maha-UWES-C at the Regional Centre for Urban and Environmental Studies (RCUES) of All India Institute of Local Self Government (AIILSG) Mumbai for implementation of infrastructure projects in 5 towns of Maharashtra. These five projects are categorized under flagship initiatives of the Coalition, thematically into 'Sustaining FSSM infrastructure' and 'Maha Urban INNO-WASH Challenge'. Under sustaining FSSM Infrastructure the Secretariat, Maha-UWES-C has undertaken urban rural linkages in FSSM and Refurbishment of Indapur FSTP and provided handholding support in implementing innovations in towns for moving towards sustainability of existing infrastructure along with ensuring improved quality of treatment leading to positive environmental impacts. The 'Maha Urban INNO-WASH Challenge' for infection prevention and control launched to support innovations at ground level within the sector and it encouraged local governments for implementing pilot technologies and demonstrations for improved infrastructure, services, environmental and community impacts. This report is a walkthrough of the processes and highlights of each project with its impact on ground. Packing the experiences of the current work into a way forward for further support in the sector as the Maha-UWES-C moves ahead towards integrated development in WASH. It is envisaged that this document assists and encourages other local governments to adopt and replicate these ideas with the required contextualization.

EXECUTIVE SUMMARY

Executive Summary

Ever-increasing population of India has reached 1.42 billion (as on Jan 2023)[1]. Rapid growth in urban population exerts enormous pressure on infrastructure, resources and service delivery particularly on water, sanitation and waste management As per Central Pollution Control Board (CPCB), sewage generation in the urban centers is 72,368 MLD of which only 28% is treated and the remaining 72% of the wastewater remains untreated and is disposed of in rivers/lakes/groundwater.[2] On the other hand, about 60% population in the country is dependent on On-Site Sanitation (OSS) systems.[3] Given the rapid pace of urbanization, Indian cities need to become exemplary models of sustainable urban development.

In light of the above, Government of India launched Swachh Bharat Mission in 2014 with an aim to eliminate open defecation and improve waste management system. Till date, more than 95 million individual toilets have been constructed across rural and urban parts of India[4]. With this, not only the legacy problem of access to sanitation has been addressed, but the Government of India has also continued to show its commitment to sustain infrastructure and move towards integrated Solid Waste Management/sanitation and individual household drinking water connection through Swachh Bharat Mission (SBM) 2.0, Jal Jeevan Mission 2.0 for urban and rural local bodies and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) 2.0. However, with increased implementation of such schemes, the amount of wastewater generated has risen. Subsequently, there is an increased load on wastewater treatment plants as a result of mixing of storm water with wastewater and heightened load of contaminants. Thus, in order to treat greywater separately, the GoI has launched Sujlam 2.0 campaign to mobilize communities, institutions like panchayats, schools, anganwadis to undertake greywater management.

As we move towards 2030, collaborative and persistent efforts will be imperative to achieve the Sustainable Development Goal (SDG) 6.0. However, as per the latest Joint Monitoring Program assessment, in India, only 55% of the total septage generated is safely contained (SDG 6.1.1). Similarly, in Maharashtra, only 60% septage generated is safely contained, although sanitation coverage is 90%. Thus, it is evident that access to toilet does not ensure safely managed sanitation services since sanitation value chain is inclusive of elements like containment/storage, transport, and treatment. Hence, there is a growing impetus in the WASH sector to move towards sustainability with focus on integrated development across the value chain as a result of increased budget outlay and support through 15th FC. As per the 2022-23 assessments, Maharashtra is a front runner in converting single pit septic tanks to two pit septic tanks. However, Maharashtra is still facing a daunting challenge since the state has huge number of toilets with single pit septic tanks. Thus, in order to achieve SDG 6.1.1 in proportion with the population using safely managed sanitation services, it is imperative to implement FSSM practices appropriately, especially in Maharashtra.

In view of this, Maharashtra Urban WASH & Environmental Sanitation Coalition (Maha-UWES-C), a joint initiative by the Regional Centre for Urban & Environmental Studies (RCUES) of All India Institute of Local Self Government (AIILSG), Mumbai and UNICEF, Mumbai Field Office, was launched in March 2021 as a state level collaborative platform for integrated WASH & ES development. Over a period of two years, Maha-UWES-C has extended efforts in varied thematic tasks broadly in the WASH & ES sector. Key

[1] https://worldpopulationreview.com/countries/india-population
[2] National Inventory of Sewage Treatment Plants – Central Pollution Control Board, March 2021
[3] Advisory on On-Site and Off-Site Sewage Management Practices- CPHEEO & MoHUA, July 2020
[4] https://pib.gov.in/newsite/PrintRelease.aspx?relid=191202

initiatives of the Coalition include Action Research, Assessment & Knowledge Management, Policy & Advocacy, Capacity Building, Technical & Strategic implementation support, promotion of WASH practices and WASH in Emergencies under the focus areas of Sanitation, Solid Waste Management, Water, Environment and Climate Change. To foster its association with the Urban Development Department (UDD), RCUES of AIILSG Mumbai also signed an MoU with the Directorate of Swachh Maharashtra Mission (Urban), UDD, Government of Maharashtra, on 30th September 2022 to build capacity, facilitate partnerships, and support innovation in WASH in Maharashtra under SMM (U) 2.0.

In its first year, the Coalition worked to create a base for initiatives through sector assessments, partnerships, and research at State, Urban Local bodies (ULBs) and stakeholder level. Currently, it is actively working to support WASH initiatives and Maha Urban INNO-WASH challenge in collaboration with partners in the areas of Faecal Sludge and Septage Management (FSSM), grey water management & Dry Waste Management. The initiatives by Maha-UWES-C aim to address localization of SDG 6 – Clean Water and Sanitation and SDG 17-Partnerships for the Goals by creating pilot demonstrations of interventions to move towards safely managed, sustainable and affordable sanitation through collaborative partnerships of the stakeholders. These interventions will also create cross sectoral impact for SDG 3 – Good Health & Well-being, SDG 11 – Sustainable Cities & Communities, SDG 12 – Responsible Consumption & Production, SDG 13 – Climate Action.

In the year 2022, key interventions of Maha-UWES-C by implementing five innovative ideas were as follows:

1. **Sustaining FSSM initiatives**
   - i. Establishing Urban Rural Linkages for FSSM (Indapur & Junnar Clusters)
   - ii. Refurbishment of existing FSTP (Indapur Municipal Council)

2. **Maha Urban INNOWASH Challenge**
   - i. Scientific co-treatment of septage at existing Sewage Treatment Plant (STP) (Sangli Miraj Kupawad City Municipal Corporation)
   - ii. Organic treatment of greywater in open drains (Alibag Municipal Council)
   - iii. Decentralized Grey Water Treatment Plant (Bhiwapur Nagar Panchayat)

Sustaining FSSM initiatives

Focusing on FSSM not only addresses public health issues but also addresses certain components of SDG 12 by improving soil fertility and managing natural resources, and SDG 13 by reducing carbon footprint. In light of this, there is an urgent need to further unpack SBM2.0 on the basis of outcomes of FSSM, SLWM and PWM technologies and its impacts on the environment and the communities instead of focusing on the definitions of ODF+ and ODF++ where FSSM is given least priority. Consequently, the SDG 6.1.1 will be addressed with strong monitoring and reporting mechanism along with efficacious supervision practices.

Understanding the significance of effective implementation of FSSM and in light of the request from Water Supply and Sanitation Department (WSSD), GoM, the Secretariat of Maha-UWES-C with support from WSSD undertook a state level preliminary assessment of 141 FSTPs in urban areas to explore the potential Urban and Rural Linkages (URL) in FSSM and to identify clusters based on unutilized capacities of the existing FSTPs in January 2021. In addition to this, GoI passed a Demi Official (DO) letter in September 2021 recommending co-treatment of feacal waste/septage from neighboring villages at an existing or planned STPs/FSTPs in the urban areas. The focus of SBM (Urban and Rural) 2.0 guidelines is on sustainability of the infrastructure created and treatment of solid/liquid waste including fecal sludge, greywater and plastic waste. Maharashtra state, in alignment with the guidelines, has launched Swachh Maharashtra Mission (SMM (U)) 2.0, under UDD, GoM, for urban areas and State Water and Sanitation Mission (SWSM) under WSSD, GoM to implement SBM 2.0 in rural areas. In response to these Government initiatives, Maha-UWES-C undertook a range of below mentioned interventions by putting an emphasis on URL.

Based on the technical feasibility assessment, stakeholder consultations and willingness of ULB administration Indapur (Municipal Council + surrounding 12 GPs) and Junnar (Municipal Council + surrounding 43 GPs), clusters were identified for pilot implementation of urban rural linkages in FSSM. The aim of these urban rural linkages was to ensure sustainability of the existing FSTP and to provide safe sanitation services to the surrounding GPs through persistent efforts, joint consultations and strengthening the institutional mechanism. This pilot demonstration of urban rural linkage in Maharashtra showcased optimum utilization of resources and is providing safe sanitation to 13,200 households covering about urban and rural population of 120000. This intervention has sustained the Operation and Maintenance (O&M) for urban FSTPs and has bypassed the need to construct a new infrastructure for rural FSTPs. Thus, this enables resource saving, reducing potential carbon emissions in construction and O&M of an additional infrastructure. Implementation of U-R linkages in Indapur has helped in avoiding establishment of FSTPs at village level and thus, has avoided emissions from the treatment process units, mainly from anaerobic filters. The total GHG emission reduction will be approximately **608.14 Kg CO_2**[5] equivalent per year for every avoided FSTP as a result of U-R linkages. Improved sanitation services will directly benefit the environment due to reduced disposal of untreated faecal sludge and thus will improvise health condition of the impacted population of the region.

Refurbishment of the exiting FSTP at Indapur was implemented in partnership with Saniverse Environmental Solutions, Pune, an environmental technology company working in the field of Waste Management solutions, to improve efficiency and environmental sustainability. Through this intervention, refurbishment of exiting unit was undertaken, restoring 10 KLD operational capacity of FSTP and adding treatment units, to improve the operations of the plant while making bare minimum changes to the existing treatment units. Based on assessments and gaps identified a two-pronged upgradation was planned with units like screens, Settling and Thickening Tank (STT), Anaerobic up-flow Filter (AF) and tertiary treatment units while units such as Sludge Drying Beds (SDB), Anaerobic Baffled Reactor (ABR) were to be refurbished. Impacted population of this intervention is 25,515 in urban areas and 30,336 in rural areas. Water that has been treated till tertiary level can be either discharged into the environment or can be reused in the premises ensuring safely managed sanitation and resource recovery through treatment. The additional units designed for FSTP improve treatment efficiency of the FSTP while additional design consideration for wet conditions may support the functionality in all-weather situations.

Maharashtra Urban INNOWASH Challenge

In May 2022, Maha-UWES-C launched the 'Maha Urban INNOWASH Challenge' to encourage innovations for implementation of leading-edge ideas and projects to improve service delivery in the sector at ULB/Community level to prevent and control infection. Proposals for innovative ideas were invited from ULBs, NGOs, nonprofit organizations, Institutions, startups etc. across Maharashtra state to encourage ULBs to innovate and implement ideas in partnership with local stakeholders. Based on the evaluation by the Proposal Evaluation Committee which consisted of representatives from the State Government, UNICEF, Mumbai Field Office and RCUES of AIILSG, Mumbai, 3 projects were selected for implementation with support from the Secretariat, Maha-UWES-C.

[5] Dorn M R J 2006 Chapter 6 Wastewater Treatment 2006 IPCC Guidelines for National Greenhouse Gas Inventories Volume 5 Waste 1–56, 2006
Briefing Paper: Opportunities For Reduction Of Ghg Emission From Domestic Wastewater Treatment In Urban Areas: A Brief Orientation For Decision-Makers. GHG Platform India. ICLEI Local Governments for Sustainability. South Asia
G. Vijayan1, R. Saravanane, T. Sundararajan. 2017. Carbon Footprint Analyses of Wastewater Treatment Systems in Puducherry. Computational Water, Energy, and Environmental Engineering. Vol.6 No.3.281-303.

To reduce the risk of waterborne disease outbreak due to sewer overflow during monsoons and to mitigate the risk of emptying the faecal sludge into sewage pumping station (SPS), cotreatment units of 50 KLD were scientifically designed and constructed by Ecosan Services Foundation, Pune in Sangli Miraj Kupwad Municipal Corporation with support from Maha-UWES-C at the existing STP to treat incoming faecal sludge and septage. Scientific co-treatment of faecal sludge in an existing STP is a pilot initiative in the state of Maharashtra. Integration of new treatment units within the existing infrastructure aimed at achieving optimum utilization of existing resources and minimizing additional investments in terms of time and funds. The project has created a positive impact on more than 150,000 people with approximately 50% females and has resulted in direct reduction in GHG emissions[5] of approximately 39,889 kg CO2 per annum and energy saving worth Rs. 900,000 per annum. The cotreatment units are highly sustainable as the 50KLD unit, with modular design, can be directly used or with design modifications in similar capacity as well as larger capacity and at low O&M cost.

In Alibag Municipal Council an organic treatment of greywater in open drains was carried out by Centre for Applied Research and People's Engagement (CARPE), Aurangabad with support from Maha-UWES-C to reduce severe environmental risks of open drains that carry wastewater flow into ecologically sensitive marine and mangrove ecosystems. The technology is a combination of simple modular apparatus to treat wastewater flow in an open drain using non-toxic pH control mechanism and an inoculum of microorganisms to form a secondary culture followed by settling of digestible solids before release of treated water into ecologically sensitive environment. The readings of greywater analysis obtained using IoT based sensors through web server and dashboard shall be used to finalize the dosing. Population impacted due to the project is 11,500 and has caused reduction in algae in grey water, ultimately limiting pollution and protecting marine life and mangroves. The installed system results in annual GHG reduction[5] of 3070 KG CO_2. The used technology and the dose given can be easily modified and replicated in any type of drain. Considering the fact that Maharashtra has approximately 60% ULBs of similar size, this project has extremely high potential of replication in cities with functional FSTPs and in the cities that aspire to treat grey water from open drains. The IoT based feed loop is designed to take shock loads in case of climate crisis and hence it is a resilient technology as well.

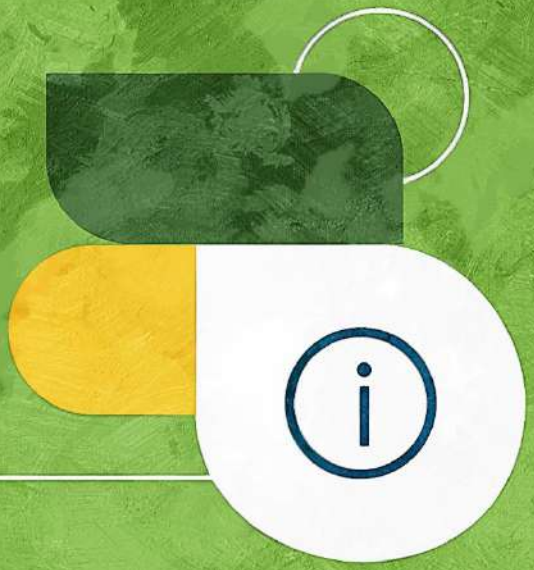
Similarly, in Bhiwapur, a decentralized grey water treatment plant was implemented for one ward with support from Maha-UWES-C to treat the greywater that has been contaminating open plots and waterbodies with harmful pathogens and debris. A 3KLD planted gravel filter was constructed on an open drain. This intervention has impacted a total of 1200 residents and 70 farmers. The implementation of decentralized treatment plant based on planted gravel bed technology has promoted aerobic decomposition of waste resulting in reduction of methane emissions. With this intervention, annual reduction in GHG emissions[5] is 3147 kg CO2. A gravity based compact model with no energy requirement and low O&M cost is highly replicable and sustainable model. The model has a very high potential of replicability in the state of Maharashtra that has approximately 30% Nagar Panchayats.

The implementation of these projects in Maharashtra as part of initiatives under Maha-UWES-C created am impact on 5 ULBs and 58 villages due to improved sanitation services and safely managed wastewater/greywater. These projects have limited the discharge and disposal of untreated sludge/grey water in the open. This has resulted in reduced contamination and destruction of natural habitats and resources. In a nutshell, these projects have improved health and quality of life of 260,000 lives due to reduced negative impacts of untreated waste. Consequently, improved sanitation services have caused better public health and well-being. The interventions are pilot demonstrations and have a better potential to scale up with support from state and local bodies. Successful partnerships through these interventions have created an opportunity for more collaborative efforts in the context of achieving targets as envisaged under the flagship programmes of Government of India including UR Linkages, used water management, co treatment at STP etc. under SBM 2.0, AMRUT 2.0., Jal Jeevan Mission, Sujlam etc. Efforts can be taken

up to create bigger impacts through new innovative technologies that have low per capita implementation cost and have high sustainability potential. Projects that are in alignment with the flagship programmes can also be scaled up in smaller ULBs and rural clusters.

Government of India has accelerated its efforts to achieve SDGs by launching flagship missions like SBM, AMRUT, JJM among others and by adopting policies and frameworks like CWIS. However, the state and local government bodies are striving to achieve sustainable service delivery in WASH in alignment with the frameworks and guidelines issued by the central government. In light of this, there is a need to strengthen capacities of decision makers and implementers by sharing evidence-based learnings and models that have a potential to be scaled and replicated in order to adopt city-wide WASH solutions. Through this report, Maha-UWES-C presents its work in FSSM and wastewater management with a focus to optimize resource utilization and resource recovery, strengthen institutional mechanism, build capacity, encourage innovations, and foster partnerships. Based on the learnings from these interventions, the Secretariat of Maha-UWES-C envisions to support the government in sustaining & scaling up approaches and models for waste management as well as strengthening community and public sanitation with aspirational solutions, while promoting WASH linked climate action, and promoting inclusivity, circularity, and sustainability. The Secretariat is committed to sustain its efforts in creating successful partnerships, managing, and disseminating knowledge and building capacities of the stakeholders.

INTRODUCTION



Introduction

Water, Sanitation and Hygiene (WASH) infrastructure is vulnerable to changing climatic conditions, natural and anthropogenic disasters. With severe impacts of climate change on health and overall well-being, it is crucial for governments and development agencies to protect, strengthen, and enhance the performance of existing WASH infrastructures as well as ensure to universal access to basic WASH lifestyle.

In India, the 73rd and the 74th Constitutional Amendments enlisted responsibilities to ensure water supply, sanitation, and solid waste management services to rural and urban local governments, respectively, with the state governments as a guiding entity for implementation of these services[6]. In Maharashtra, the Urban Development Department (UDD) and the Water Supply and Sanitation Department (WSSD) are the bodies guiding Urban Local Bodies (ULBs) and Gram Panchayats (GPs), respectively in implementation of the missions and schemes through regular announcements of government resolutions and timely policy amendments. Maharashtra is one of the most urbanized states in India with 411 ULBs governing various categories of towns and cities. Rapid urbanization has also spread to peri-urban villages and improvement of infrastructures in these villages is crucial for the GPs. The Government of Maharashtra (GoM) operationalizes its schemes in alignment with the Sustainable Development Goals (SDG 6- Clean Water & Sanitation, SDG 11- Sustainable Cities & Communities, SDG 12- Responsible production & Consumption and cross cutting goals SDG 3- Good Health & well-being, SDG 13 – Climate Action, SDG 17 – Partnerships for the goals), and is committed to support the urban and rural local governments to improve WASH infrastructure and service delivery under various such central and state government missions and schemes.

Several national level and state level programmes are aimed at strengthening the role of ULBs and GPs in ensuring universal accessibility of basic WASH infrastructure as well as improvement in WASH service delivery. The Swachh Bharat Mission (SBM) was launched in 2014 with the objectives of ensuring safe sanitation and improving solid waste management, focusing on creating infrastructure for access and behaviour change for usage. The Atal Mission for Rejuvenation and Urban Transformation (AMRUT) also aims to make urban India water secure by ensuring sustainability of sources and systems. With the launch of SBM-Urban 2.0 and AMRUT 2.0, the central government has aimed for integrated development with focus on treatment and reuse of resources[7].

SBM- Urban is being implemented as Swachh Maharashtra Mission- Urban (SMM(U)) in Maharashtra. Maharashtra's successful journey under SMM(U) has been evident through achievement of milestones and targets, as timely recognized by Government of India. It was the first State to adopt an approach to address the entire sanitation service chain under the Mission and to develop the concepts of ODF and ODF+ Cities. In the forefront, while achieving the targets of solid waste management under the Mission's Star Rating for Garbage Free Cities (GFC), the state launched 'Harit Maha City Compost' - a unique initiative to encourage cities to manage their wet waste efficiently. GoM has launched guidelines for SMM(U) 2.0 under the SBM 2.0 initiative to take forward path-breaking journey towards improved sanitation and solid waste management in urban Maharashtra. The Department of Environment and Climate Change (DOECC), Government of Maharashtra has also launched Majhi Vasundhara Abhiyan for all the ULBs and GPs with a focus on identifying potential action points under the five elements of nature (Air, Water, Earth, Energy, Enhancement) for the betterment of the environment [8]. The concept of Citywide Inclusive Sanitation (CWIS) is also shifting the urban sanitation paradigm, aiming to ensure everyone has access to safely

[6] 74th Constitutional Amendment Act
[7] SBM operational guidelines and AMRUT operation guidelines
[8] Majhi Vasundhara Abhiyan

managed sanitation focusing on service provision and enabling environment with combination of onsite and offsite technologies and effective resource recovery[9].

Apart from GoM, ULBs and GPs, several corporates, NGOs, academic and research organizations, industries, private service providers, financial institutions and several other stakeholders have been working on different aspects of integrated WASH and Environmental Sanitation (ES) in Maharashtra. Several technology innovations have been carried out in the sector through entrepreneurial initiatives of industry specialists, development organizations and private agencies. Academic institutions are spearheading research in the sector. Corporates and financial institutions are eagerly contributing to the improvement of WASH service delivery among underprivileged communities.

All such stakeholders, government, and non-government organizations are working towards a common goal of improving WASH service delivery at the ground level. To attain sustainability and to achieve holistic success in the implementation of projects in this sector in a collaborative and cohesive manner, a platform in the form of Maharashtra Urban WASH and Environmental Sanitation Coalition (Maha-UWES-C) was established jointly by the RCUES of AIILSG Mumbai and UNICEF, Mumbai Field Office. Maha-UWES-C aims to encourage innovation in urban WASH and environment to support the State and local governments to respond to timely needs and to achieve targets under various missions and initiatives of the GoM. It is a collaborative platform to strengthen WASH service delivery by developing capacity of municipal officials and elected representatives, building networks, sharing of knowledge, encouraging cross-learning, and enabling innovations and pilot implementations.

Our Initiatives

Since the launch of Maha-UWES-C, the Secretariat, Maha-UWES-C has been involved in various initiatives. Maha-UWES-C, in its inception year, focused more on action research, WASH in emergency and building knowledge products and partnerships. In response to COVID, the Secretariat undertook activities in selected cities for emergency response in urban WASH through service delivery of essential WASH supplies and community outreach for COVID and WASH appropriate behavior. The Secretariat also conducted research and assessment on topics of sanitation and dry waste management, capacity building and other related activities in the state. The Secretariat undertook creation, management and dissemination of knowledge in the sector through its periodic publications including WASH Action4Change - Documentation of Good Practices, WASH Sector Update- Compilation of published sector updates, WASH Connect - Newsletter capturing an update of work undertaken by the partners of the Coalition and social media platforms. The Secretariat also advocated healthy WASH practices and appropriate behavior among communities by taking up activities like celebration of important days such as World Toilet Day, Global Handwashing Day, World Environment Day, Menstrual Hygiene Day etc.

Figure 1: Initiatives of Maha- UWES-C

[9] City Wide Inclusive Sanitation (CWIS) Initiative – World Bank

In its second year, the Secretariat of Maha-UWES-C moved towards implementation of ideas on pilot basis and strengthening of partnerships with State, ULBs and partner organizations. The Secretariat has been working with selected ULBs, GPs, District level and partner organizations. RCUES of AIILSG Mumbai with UNICEF, Mumbai Field Office has also signed a MoU with the Directorate of SMM (Urban), Urban Development Department, GoM, on 30th September 2022 to build capacity, facilitate partnerships, and support innovation in WASH in Maharashtra under SMM (U) 2.0.

Figure 2: Signing of MoU with Directorate of SMM(U) under SMM 2.0

This report elaborates on the impactful and result oriented implementation of ideas that have been undertaken by the Coalition in the year 2022 in five towns of Maharashtra. All the projects under these initiatives were curated to the needs of the local governments involved and contributed to the attainment of SDG 6 which focuses on availability and sustainable management of water and sanitation for all and SDG 11 which emphasizes on making cities and human settlements inclusive, safe, resilient, and sustainable through collaborative partnerships emphasized in SDG 17. These initiatives are also cross cutting across SDG 3- Good Health & well-being & SDG 13 – Climate Action.

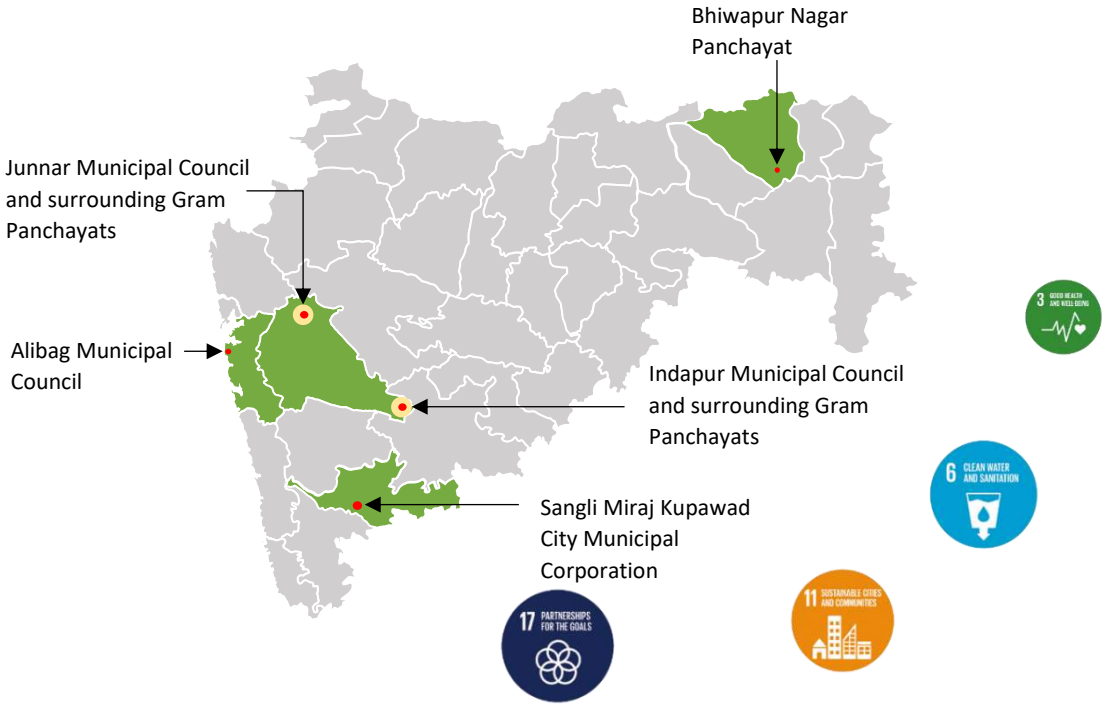


Figure 3: Location of Maha-UWES-C initiatives and supporting SDGs

1) Sustaining FSSM Infrastructure

Faecal Sludge and Septage Management (FSSM) plays a critical role in safe sanitation value chain of any city or town. The Government of India announced National Policy on FSSM in 2017. Since September 2018, the UDD, GoM has focused on FSSM and floated various GRs for prioritizing the co-treatment of feacal sludge from septic tanks in existing Sewage Treatment Plants (STPs) and prioritizing construction of Faecal Sludge Treatment Plant (FSTP) in urban areas which lack sewer networks. With the construction of 200+ FSTPs across Maharashtra, a potential to create urban rural convergence in FSSM was observed.

The Secretariat of Maha-UWES-C with request from WSSD, GoM for exploring urban rural linkages undertook a state level preliminary assessment of 141 FSTPs to explore potential urban and rural linkages in FSSM and to identify clusters based on the unutilized capacities of existing FSTPs. In addition, Government of India passed a D.O. in 2021 issuing directions to Chief Secretaries, Administrators and Advisors to Lt. Governors of all states and UTs which emphasizes on the co-treatment of feacal waste at an existing or planned STPs/FSTPs in the neighboring urban area from surrounding villages. The Secretariat in partnership with Ecosan Services Foundation also carried out a pilot study for Indapur, Pune Division to understand and investigate the feasibility of urban-rural FSSM linkages. In July 2022, the UDD of GoM also released a GR for SMM 2.0 which highlighted urban rural linkages as one of the options for sustainable fecal sludge and septage management.

In response to the Government initiatives that lay emphasis on sustainability of FSSM infrastructure, following projects were undertaken by the Secretariat for implementation:

- Based on assessments, series of stakeholder consultations and interest shown by the ULBs, Indapur and Junnar were finalized as the pilot clusters for implementing urban – rural convergence linkage in FSSM in Maharashtra.
- To ensure sustainability and improve efficiency of the Indapur FSTP without augmenting the capacity of the plant and to make it more environmentally sustainable, the Secretariat in partnership with Saniverse Environmental Solutions undertook refurbishment of FSTP. The FSTP's refurbishment aims to restore the FSTP's 10 KLD operational capacity by adding treatment units and improving the design of existing treatment units.

2) Maharashtra Urban INNOWASH Challenge

To encourage and support localized innovative initiatives by the ULBs and development organizations Maha-UWES-C had launched the Maha Urban INNOWASH Challenge with a focus on innovative hardware infrastructure creation aimed at prevention of communicable infections and healthcare hazards caused by lack of WASH facilities or treatment infrastructure.

This initiative aimed to encourage innovations for implementation of leading-edge ideas and projects to improve service delivery in the sector at ULB / Community level. Proposals for innovative ideas were invited from the ULBs, NGOs, nonprofit organizations, Institutions, startups etc. from across Maharashtra to encourage ULBs to innovate and implement ideas in partnership with local stakeholders. Invitation for proposal was extended through various dissemination and outreach mediums. GoM supported this initiative by encouraging ULBs to participate in the Challenge through a letter sent to all the ULBs. Around 11 different proposals from various Municipal Corporations, Municipal Councils, Nagar Panchayats, and development organizations were received. These proposals were evaluated by the Proposal Evaluation Committee (PEC) composed of representatives from RCUES, UNICEF and Directorate of Municipal Administration. Based on several factors including feasibility, sustainability, innovation, and potential of replication, three projects across Maharashtra were selected for implementation, namely:

1. Scientific co-treatment of septage at the existing STP for Sangli Miraj Kupawad City Municipal Corporation
2. Organic treatment of greywater in open drains for Alibag Municipal Council
3. Decentralized greywater treatment plant for Bhiwapur Nagar Panchayat

INITIATIVES' COMPLIANCE TO POLICIES & PROGRAMMES

Compliance with Programmes, Policies and Treaties

Policy, Programs and Treaties	Sustaining FSSM Infrastructure		Maharashtra Urban INNOWASH Challenge		
	Urban Rural Linkages in FSSM	Refurbishment of FSTP	Co-Treatment of FS at STP in Sangli	Organic treatment of greywater in Alibag	Decentralized greywater treatment in Bhiwapur
Swachh Bharat Mission 2.0 (Urban and Grameen)	The projects fulfil the following- • Driving rural and urban areas towards ODF++ through FSSM • Focus on SBM 2.0 mission strategy (section 2.6.10) of Urban Rural convergence where common facilities can be utilised efficiently on cluster basis. • Treatment of used water before discharge into water bodies. • Eradication of hazardous entry into septic tanks through mechanization of septic tank cleaning operations as mentioned in SMB 2.0 mission (section 2.1.b.iii)	Driving Indapur towards Water+ through implementation of FSTP Refurbishment	Out of total 9500 marks under Swachh Survekshan 2023, 945 marks are allocated for used water management and Safai Mitra Suraksha. With the co-treatment method, all the collected sludge will be safely and scientifically treated and hence secure 170 marks under this section		
AMRUT 2.0			Contribution of CWAP in Sangli through the co-treatment units for faecal sludge		

Policy, Programs and Treaties	Sustaining FSSM Infrastructure		Maharashtra Urban INNOWASH Challenge		
	Urban Rural Linkages in FSSM	Refurbishment of FSTP	Co-Treatment of FS at STP in Sangli	Organic treatment of greywater in Alibag	Decentralized greywater treatment in Bhiwapur
Majhi Vasundhara Abhiyan (State level mission)	direct contribution to the Bhumi and Jal action areas of the Majhi Vasundhara Abhiyan by ensuring scientific treatment of wastewater before release into the environment and preventing contamination of soil. • Scope for scalability of urban rural linkages in FSSM across the functional urban FSTPs to ensure sustainable operations, helps with one of the goals of Mahji Vasundhara Abhiyan, which is to replicate the measure that will lead to sustainable development	direct contribution to Jal action area by ensuring efficient wastewater treatment	Scientific treatment of septage at STP leads to improved treatment quality of wastewater (Jala)	treatment of greywater takes place before it enters the mangroves, hence protecting the ecosystem. (Bhumi)	The treated greywater is used to rejuvenate the Gao talav (Jala)
National Water Policy, 2012 Maharashtra State Water Policy, 2019	Projects ensure water quality of water bodies by preventing the direct discharge of faecal pollutants into surface water bodies, thereby preventing pollution of freshwater bodies. The projects also ensure quality conservation of groundwater by reducing open disposal of untreated septage in the ground	Project ensures recycle or reuse of treated water as outlined in the policy, used for gardening or agriculture purpose	As the quality of effluent is improved through the co-treatment, reuse of water for tertiary purposes like firefighting, farming and for industrial purposes can be explored	Through organic treatment of greywater, the treated water enters the mangroves which eventually meet the sea, thus preventing the pollution of water bodies and ecosystem in sustainable manner	Through decentralised treatment of greywater, the treated water enters the lake, thus preventing the pollution of water bodies and ecosystem in sustainable manner. This treated water can be potentially used for agriculture purposes by nearby farmers.

Policy, Programs and Treaties	Sustaining FSSM Infrastructure		Maharashtra Urban INNOWASH Challenge		
	Urban Rural Linkages in FSSM	Refurbishment of FSTP	Co-Treatment of FS at STP in Sangli	Organic treatment of greywater in Alibag	Decentralized greywater treatment in Bhiwapur
National Policy on Faecal Sludge and Septage Management, 2017	projects in Indapur and Junnar fulfil the following objectives of the National policy on FSSM (section 3.2.ii) • identifying ways and means to creation of an enabling environment for realising safe and sustainable FSSM. • provision of safe FSSM system in both urban and rural areas by facilitating cluster level FSSM • optimum utilisation of urban FSTP. • ensure to set up systems to ensure financial sustainability in provision of FSSM services by defining the roles and responsibilities of various government entities and agencies, for effective implementation of FSSM services through urban rural linkages in FSSM. • monitor and evaluate FSSM strategy and implementation plan in Indapur and Junnar	contributes to ensuring adequate treatment of faecal sludge before discharge	Safe FSSM facilities Achieving CWIS, safe disposal and treatment of sludge and septage, set up systems to ensure financial sustainability in provision of FSSM services and capacity building on sanitation services is achieved through scientific co-treatment of septage at STP (Section 3.3.1 Leveraging FSSM to achieve 100% safe sanitation, 3.3.2 CWIS, 3.3.3 Sanitary and Sage Disposal)		

Policy, Programs and Treaties	Sustaining FSSM Infrastructure		Maharashtra Urban INNOWASH Challenge		
	Urban Rural Linkages in FSSM	Refurbishment of FSTP	Co-Treatment of FS at STP in Sangli	Organic treatment of greywater in Alibag	Decentralized greywater treatment in Bhiwapur
SDG 3: Good Health and Well Being	Focus on meeting SDG target 3.9 of substantially reducing the number of deaths and illnesses water and soil pollution and exposure contamination		By ending water borne diseases and reducing deaths caused by water - borne illness due to spillage of sludge during flood like situations	Reducing water water-borne diseases caused by stagnation of greywater in open drains	Reducing water borne diseases caused by stagnation of greywater in open drains
SDGs 6: Clean Water and Sanitation	(6.2 & 6.3) achieving access to adequate and equitable sanitation and hygiene for all and end open defecation as well as improving water quality by reducing pollution halving the proportion of untreated wastewater and substantially increasing recycling and safe reuse	(6.3) improvement in water quality and reducing pollution by ensuring efficient operation of treatment plant	(6.2,6.3, 6.8) Increased accessible sanitation through co-treatment of septage at existing STP, potential reuse of treated water	(6.6) Restoring and maintaining natural mangroves by preventing untreated wastewater entry	(6.3,6.6) Treated water can be reused for agriculture purpose and ensuring treated water enters the lake hence protecting the lake from pollution
SDG 11: Sustainable cities and communities	(11.6 & 11 a) reducing the adverse per capita environmental impact of cities and supporting positive economic, social and environmental links between urban, peri-urban and rural areas		(11.5, 11.6) Reducing deaths by disasters by creating resilient technology, reducing the adverse impacts on environment through sustainable waste management	(11.6) Reducing adverse impacts through sustainable waste management	(11.6) Reducing adverse impacts through sustainable waste management
SDG 13: Climate Change	The projects aim towards avoiding construction of new FSTPs while ensuring efficient functioning of		Reduced oxygen demand and volume of sludge generation together with		Reduction in BOD in the greywater leads to annual reduction in

Policy, Programs and Treaties	Sustaining FSSM Infrastructure		Maharashtra Urban INNOWASH Challenge		
	Urban Rural Linkages in FSSM	Refurbishment of FSTP	Co-Treatment of FS at STP in Sangli	Organic treatment of greywater in Alibag	Decentralized greywater treatment in Bhiwapur
Nationally Determined Contribution (NDC) of India	existing Urban FSTP and hence leads to annual reduction of GHG emission[5] equivalent to 608.14 kg CO_2 per FSTP avoided in Indapur and 789.80 Kg CO_2 per FSTP avoided in Junnar		reduced energy consumption leads to annual reduction in GHG emissions[5] equivalent to 39,889.96 Kg CO_2		GHG emissions[5]equivalent to 3147 Kg CO_2
SDG 14: Life Below Water				(14.1, 14.2): Reducing marine pollution and preserving costal ecosystems	
SDG 17:	strengthening the means of implementation and revitalize the Global and Local Partnership for Sustainable Development	(17.7) Promote development and dissemination of environmentally sound technologies through partnerships	(17.7) Promote development and dissemination of environmentally sound technologies through partnerships	(17.7) Promote development and dissemination of environmentally sound technologies through partnerships	(17.7) Promote development and dissemination of environmentally sound technologies through partnerships

SUSTAINING FSSM INFRASTRUCTURE

Sustaining FSSM Infrastructure

Background

Government of India (GoI) launched the SBM on 2nd October 2014 with an aim of achieving a clean and open defecation free India by 2019 and announced a national policy on FSSM in 2017 to guide the states and the cities to make rapid improvements in managing their faecal sludge and septage. All the ULBs of Urban Maharashtra with around 50 million population were declared open defecation free (ODF) in October 2017 within 2 years of inception of SMM in 2015 and shifted its focus on maintenance of toilet facilities and creation of treatment facilities. While making the cities ODF, new toilets constructed in cities and towns were connected either to a sewer network or to septic tanks in the absence of a sewer network. In case of a septic tank, it is crucial to empty it and transport the septage safely to a treatment facility.

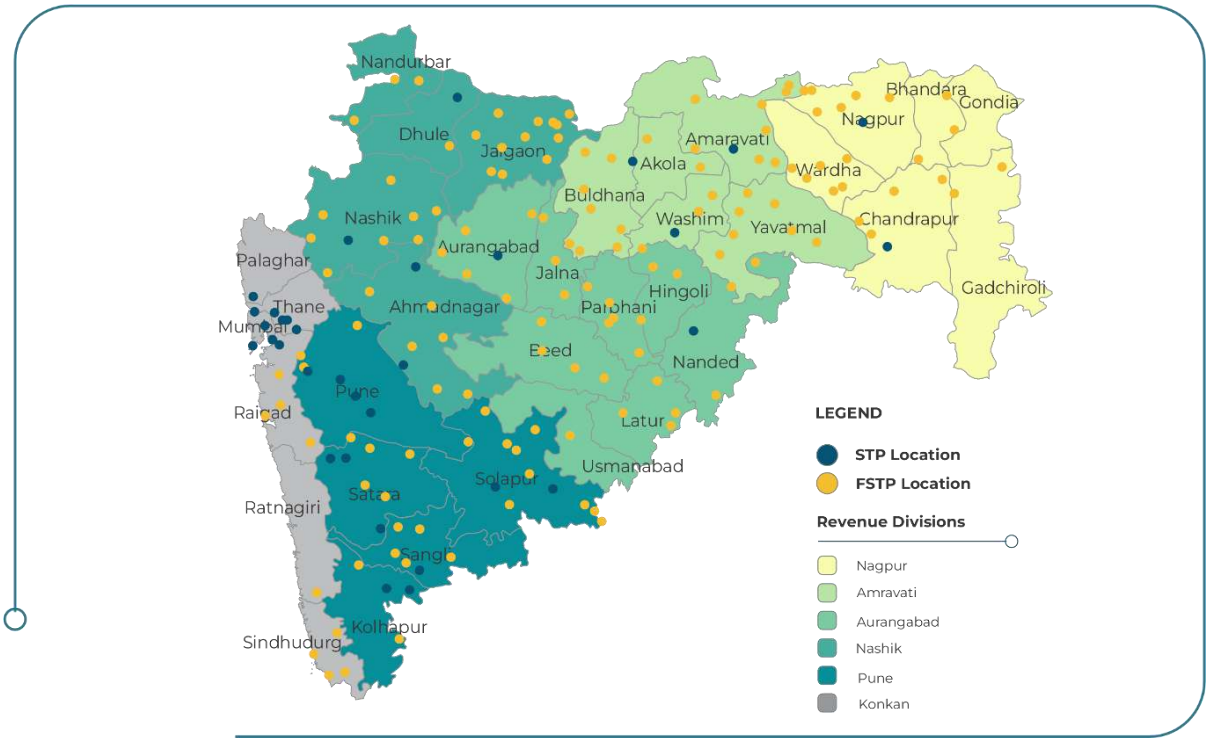


Figure 4: Map of Maharashtra showing the location of existing STPs and FSTPs
Source: Prepared by Secretariat, Maha-UWES-C(February, 2021)

To avail safe management and treatment of septage and sewage, UDD, GoM issued a Government Resolution (GR) dated 15th December 2018, which directed the ULBs in Maharashtra with existing STPs to co-treat the septage received from septic tanks along with the sewage collected from sewer network while ensuring safe emptying and transportation of septage. It emphasized on urban-urban linkages and stated that the cities with STP shall treat the septage from cities having no STP in the periphery of 20 km radius. In 2019, there were total 36 cities in Maharashtra with STPs and 32 cities within 20 km radius from cities with existing STPs, whereas only 5 cities had FSTP for septage treatment. In this way, 73 ULBs out of 384 ULBs in year 2019 could safely manage sewage and septage using existing infrastructure. Thus, to achieve state-wide safe management of septage, UDD, GoM issued a GR, dated 8th November 2019, which instructed the remaining 311 ULBs to construct their own FSTP while selecting suitable technology of appropriate size as mentioned in the GR. This resulted in construction of more than 200 new FSTPs in the state .

To sustain the developments made in the first phase and to catalyze progress, the GoI launched SBM 2.0 (Urban and Gramin) in 2021 and gave an impetus to ODF+, ODF ++ and Water + in addition to ODF. ODF+ focuses on maintenance of toilets, ODF++ mainly focuses on safe management and treatment of sewage and septage whereas Water+ focuses on treatment of wastewater as per CPCB norms and sustainability of treatment facility with respect to reuse and cost recovery[10]. In Maharashtra, 173 cities were declared ODF+, 212 Cities are declared ODF++ and 4 cities were declared Water+ as of March 2021. The second phase of SBM is mainly focused on maintenance of existing infrastructure and safe management of waste.

SBM 2.0 emphasizes on urban-rural convergence or cluster-based approach for waste processing facilities to ensure optimum utilization. In light of this, GoI issued a D.O. letter in 2021 directing all the states and UTs to focus on achieving economy of scale and efforts through adoption of a coordinated approach to deal with faecal septage which covers the entire district, without being hindered by urban-rural divide. An emphasis has been laid on co-treatment at existing or planned STPs/FSTPs in the neighboring urban area in the district where onsite management of faecal waste is not possible and where the village is situated within a radius of 10-15 kms from the urban area. It stated following combinations for safe FSSM:

1. Urban-rural linkages with existing/under construction STP or FSTP in the urban centers facilitating treatment of faecal sludge from surrounding villages within suitable turnaround distance (2-3 hours) from plant location.
2. Formation of urban and/or rural cluster in case of construction of future STPs/FSTPs to cater the needs of the population from the entire catchment area.

Considering the above and as per the meeting with Additional Chief Secretary, WSSD and State Water Sanitation Mission, WSSD with UNICEF, Maharashtra and RCUES of AIILSG, Mumbai on 18th January 2021, it was discussed to explore feasibility to treat septage from rural septic tanks into newly constructed FSTPs in urban areas. Thus, a preliminary assessment was carried out by the RCUES of AIILSG, Mumbai to understand the feasibility and potential of urban rural linkages in FSSM in Maharashtra.

Preliminary Assessment

To assess the feasibility and the potential of urban-rural linkages in FSSM in Maharashtra, firstly the operational FSTPs in the state were identified and mapped. Following the identification of FSTPs, the functional capacities of the existing operational FSTPs were assessed and the gap between operational capacity and functional capacity was calculated to arrive at unutilized capacity of FSTPs in Maharashtra. Subsequently, villages in 10-15 km radius from these FSTPs were mapped. Based on the mapping, feasibility of additional quantity of septage to be treated at the existing FSTPs in city centers was assessed for each of the districts in Maharashtra.

[10] MoHUA (2020), Declaring your city/town SBM ODF+ and SBM ODF++: Toolkit for urban local bodies ; MoHUA (2020), Swachha Bharat Mission (Urban) SBM Water Plus Protocol

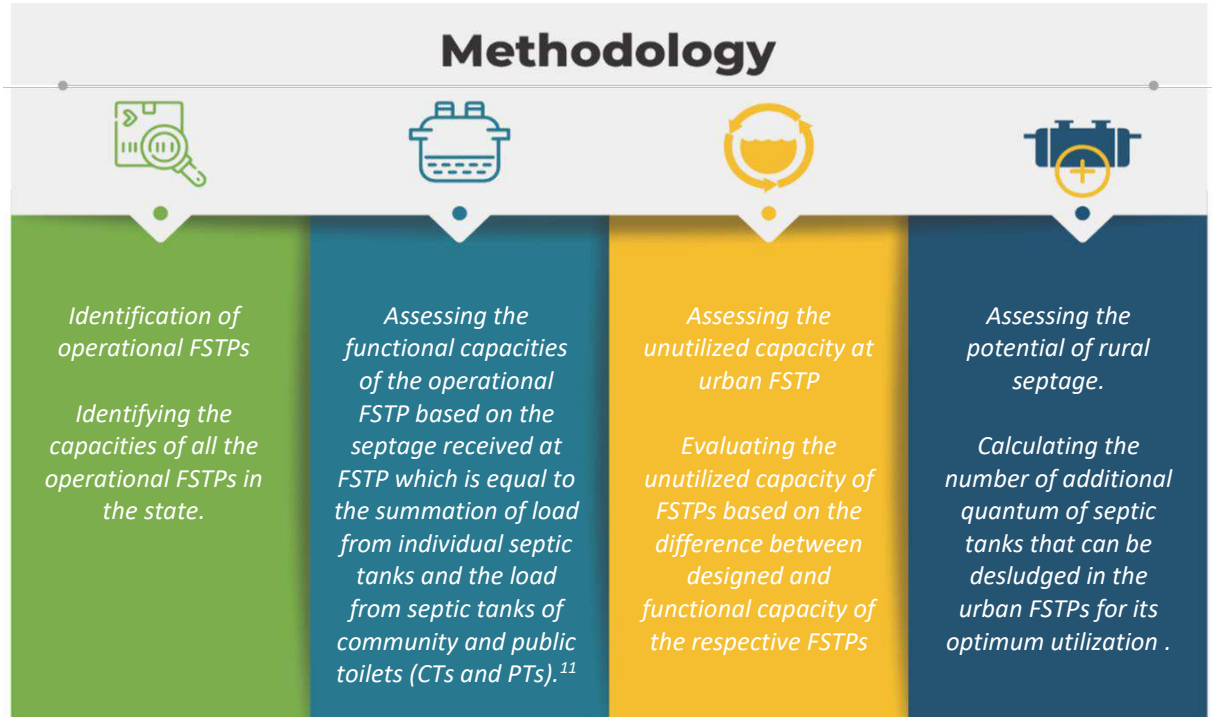


Figure 5: Methodology for assessing the feasibility and potential of urban-rural linkages in Maharashtra

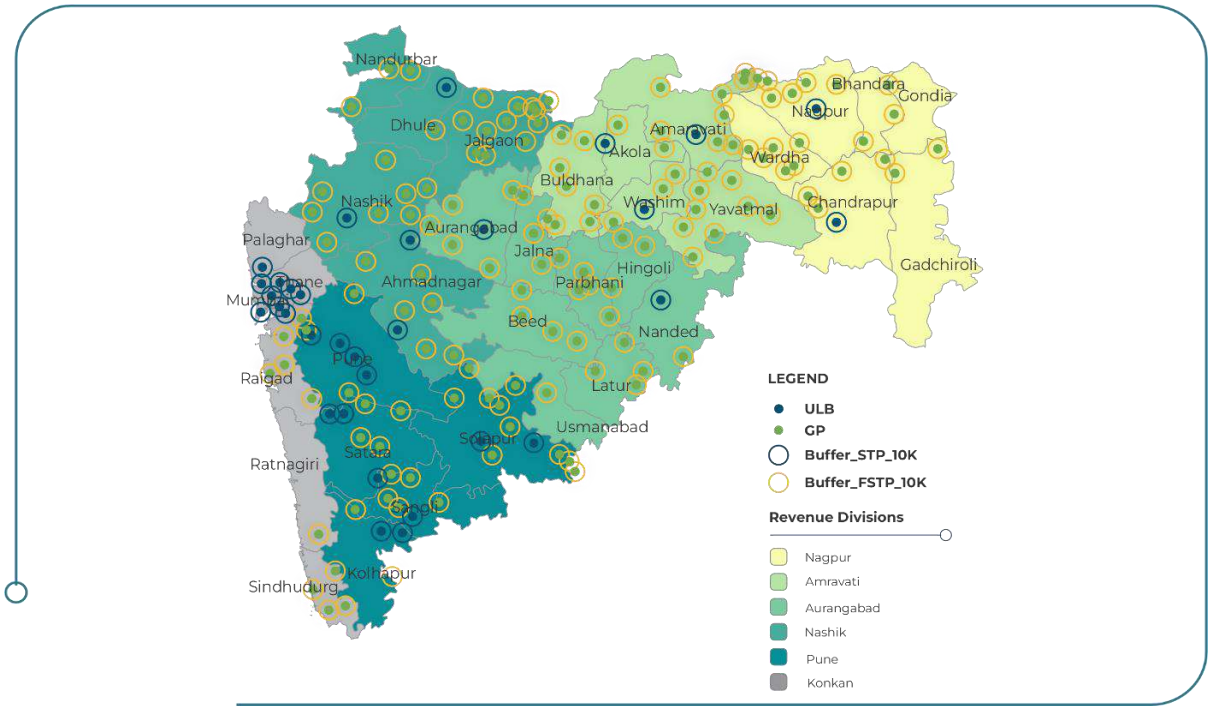


Figure 6: Map showing GPs lying in 10 km buffer from the existing FSTPs in Maharashtra
Source: Prepared by Secretariat, Maha-UWES-C (February, 2021)

[11] **Note:** The existing capacities of FSTPs are calculated based on demand desludging. If the ULB plans to implement scheduled desludging in their jurisdiction, then the existing capacities of FSTPs itself will not be sufficient to cater the load from their jurisdiction and would require augmentation. In such cases, while planning and allocating the resources for augmentation, urban-rural linkages in FSSM can be incorporated in the newly designed systems for optimum utilization of the existing FSTP by treating septage from the surrounding rural areas as mentioned above.

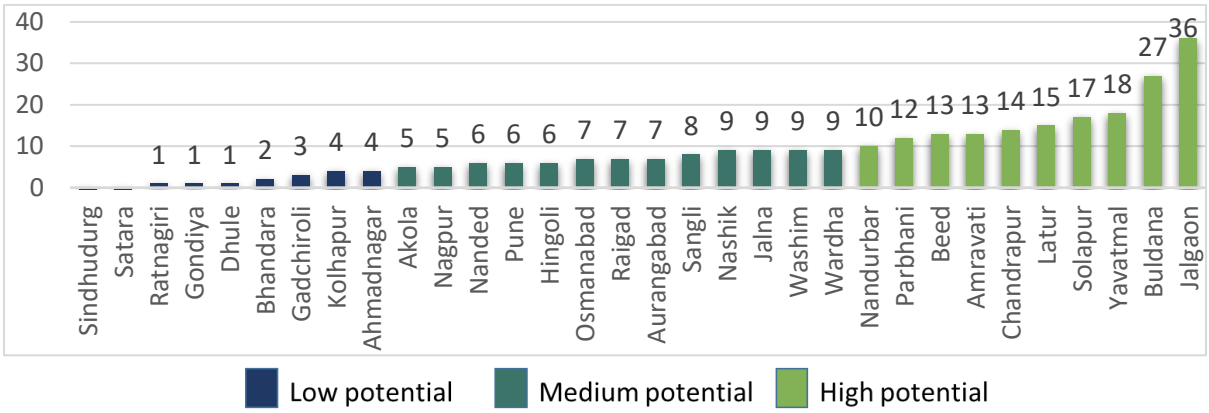


Figure 7: District-wise potential of existing FSTPs (excluding less than 5 KLD FSTPs) to treat septage from surrounding rural areas.[12]

Based on the assessment of few clusters having medium-high potential for urban-rural linkages in FSSM, districts like Pune, Sangli, Solapur, as inferred from Figure 7, were identified due to availability of underutilized FSTP at city center requiring additional septage for its sustainability. Also, these districts matched the demand for management of faecal sludge and septage from surrounding villages due to absence of infrastructure for conveyance/treatment. Thus, urban-rural linkage in FSSM was identified as a suitable option to bridge the rural demand with existing urban infrastructure and to ensure sustainability of operations at the existing FSTP. Further, stakeholder consultations were conducted with several government officials (state, district, and local level). Based on their feedback as well as considering the administrative interest and willingness, Indapur in Pune district was shortlisted for pilot implementation of urban-rural linkages in Maharashtra. Within Indapur, Junnar cluster showed keen interest in implementing urban rural linkages. Accordingly, on the basis of demand from Junnar cluster, work on urban-rural linkages began in the cluster. Along with this, refurbishment of the existing FSTP at Indapur is undertaken to improve efficiency and quality of treatment and also to sustain the O & M of FSTP without augmentation.

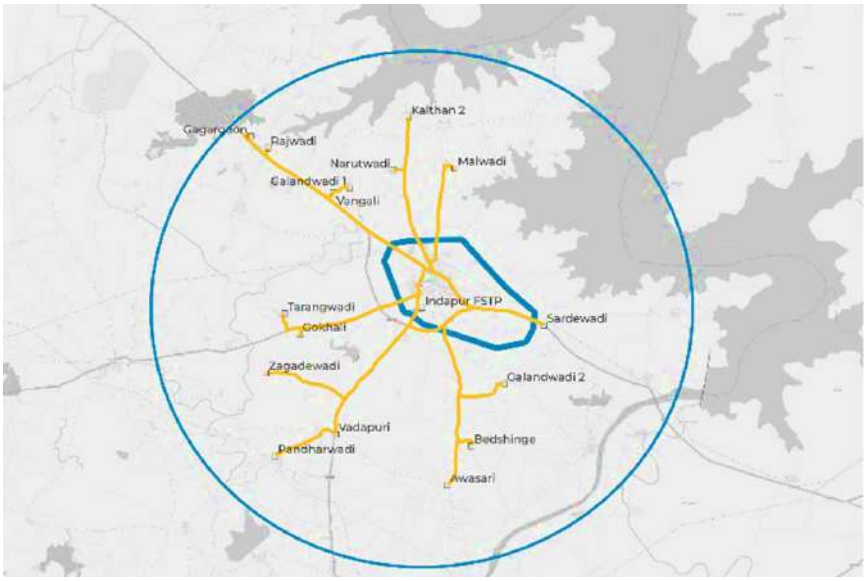


Figure 8: 16 villages selected for feasibility assessment of Urban Rural Linkage in FSSM in Indapur cluster

[12] ***Note:*** *This is based on data available as provided by ULBs in PAS-SLB and calculation. FSTPs with capacities less than 5 KLD are not considered for the assessment.*

Identification of potential villages in Indapur and Junnar clusters

Distance and access to roads are the major factors affecting desludging services. The distance of the villages from the treatment facility inversely affects the financial viability of the desludging services. Therefore, the distance of a village from FSTP is a crucial factor for identification of villages. In case of Indapur cluster, the villages located within the 10 km of aerial distance were marked and further 16 villages governed by 12 GPs lying within 10 km of distance from the FSTP were selected for further assessment as shown in Figure 8. Similarly, in case of Junnar cluster, 49 villages within 15 km distance from the existing FSTP at Junnar were selected as shown in Figure 9 for further assessment and implementation. Further ESF, Pune conducted a baseline survey and accessed the potential for urban rural linkages in Indapur cluster as elaborated under Background section.

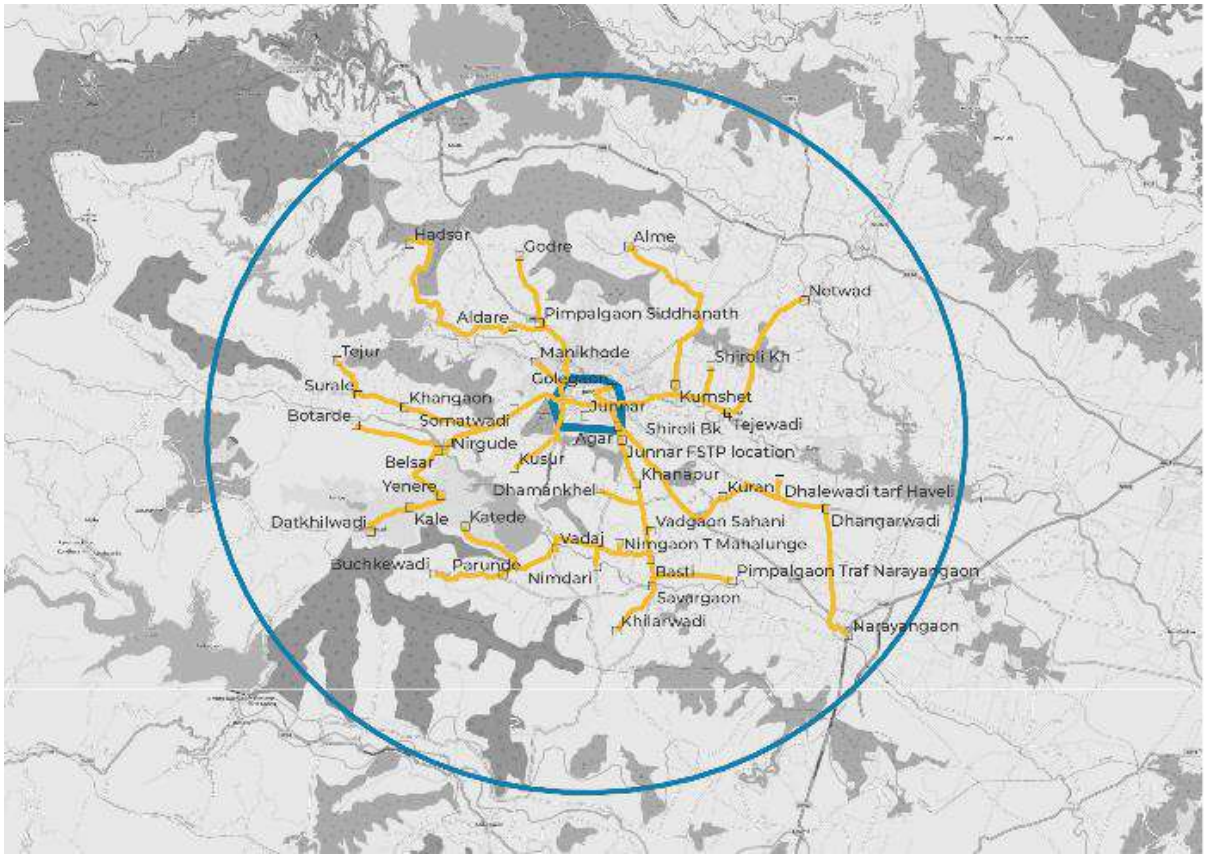


Figure 9: 49 selected villages for URL in FSSM in Junnar cluster

Timeline

Jan'21 to Sep'21

Preliminary Assessment

- Exploring the potential of Urban-Rural linkages in FSSM as per the DO letter jointly signed by Chief Secretary of MoHUA & DDWS
- State-level assessment of under utilized FSTPs & mapping of surrounding GPS
  Identification of potential CL

Oct'21 to Apr'22

Urban Rural Linkages in FSSM in Indapur cluster

- Detailed Assessment of Indapur Cluster
- ESF was on boarded
- Detailed assessment of sanitation value chain with HH survey in 400 Hhs & KII
- Feasibility analysis
- Assessment of FSTP
- Official consent from Indapur city
- Meeting with CO, Indapur
- Official consent letter from Indapur ULB for implementation of urban-rural linkages

May'22 to June'22

Urban Rural Linkages in FSSM in Junnar cluster

- Identified Junnar Cluster

Urban Rural Linkages in FSSM in Indapur cluster

- Consultation with rural authorities- PS, WSSD &CEO, Pune district

July'22

Urban Rural Linkages in FSSM in Junnar cluster

- Official consent letter from Junnar city
- Meeting with CO, Junnar & Engineers
- Visit to FSTP at Junnar
- Consent letter for implementation of urban rural linkages

Urban Rural Linkages in FSSM in Indapur cluster

- Consultation with GPs in Indapur cluster to discuss
- Concept of Urban Rural Linkages
- Institutional Mechanim
- Disludging charges

Aug'22

Urban Rural Linkages in FSSM in Indapur cluster

- Draft MoU prepared by the Secretariat, MAHA- UWES-C in consultation with stakeholders

Sep'22

Urban Rural Linkages in FSSM in Indapur cluster

- Finalization of Institutional mechanism & monitoring framework

Urban Rural Linkages in FSSM in Junnar cluster

- Consultation with 42 GPs on Institutional Mechanism & Desludging Charges

Refurbishment of FSTP at Indapur

- FSTP Refurbishment proposal developed by Sanivers
- Go ahead from CO, Indapur for implementation

Oct'22 to Nov'22

UR Linkages in FSSM in Indapur cluster

- Approach Note on URL shared with all the districts in Maharashtra on WTD 2022

UR Linkages in FSSM in Junnar cluster

- Draft MoU prepared by Maha--UWES-C

Refurbishment of FSTP at Indapur

- Final submission of the proposal to CO, Indapur

Dec'22 to Feb'23

Urban Rural Linkages in FSSM in Indapur cluster

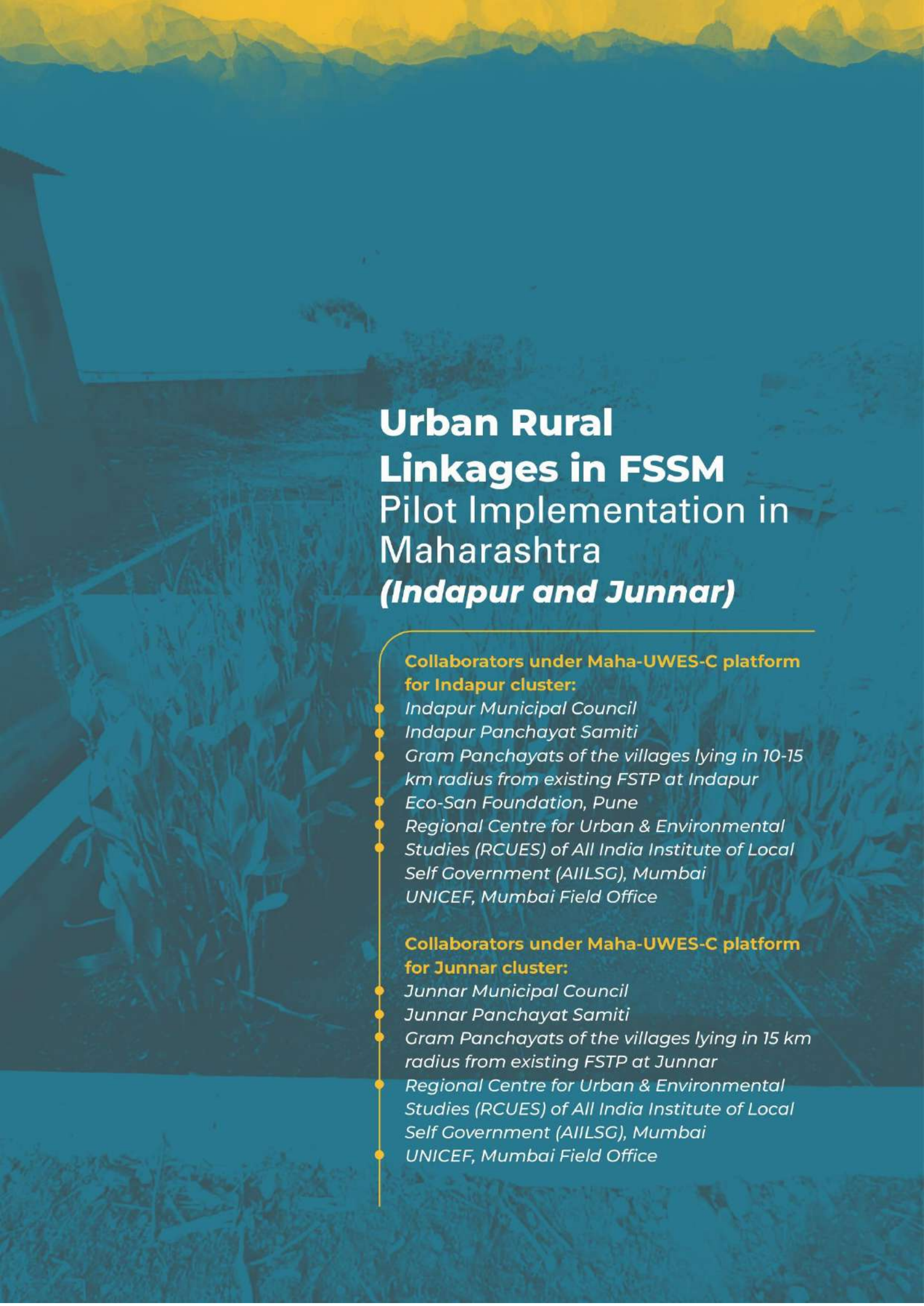
- Finalization of Institutional mechanism & desludging charges
- Formalization of MoU
- Framework for IEC

Urban Rural Linkages in FSSM in Junnar cluster

- Approach Note on URL shared with all the districts in Maharashtra on WTD 2022
- Finalization of mechanism for URL

Refurbishment of FSTP at Indapur

- Triparty agreement signed between IMG Saniverse & RCUES of AIILSG, Mumbai to undertake implementation
- Onboarding of contractor



Urban Rural Linkages in FSSM

Pilot Implementation in Maharashtra *(Indapur and Junnar)*

Collaborators under Maha-UWES-C platform for Indapur cluster:

- *Indapur Municipal Council*
- *Indapur Panchayat Samiti*
- *Gram Panchayats of the villages lying in 10-15 km radius from existing FSTP at Indapur*
- *Eco-San Foundation, Pune*
- *Regional Centre for Urban & Environmental Studies (RCUES) of All India Institute of Local Self Government (AIILSG), Mumbai*
- *UNICEF, Mumbai Field Office*

Collaborators under Maha-UWES-C platform for Junnar cluster:

- *Junnar Municipal Council*
- *Junnar Panchayat Samiti*
- *Gram Panchayats of the villages lying in 15 km radius from existing FSTP at Junnar*
- *Regional Centre for Urban & Environmental Studies (RCUES) of All India Institute of Local Self Government (AIILSG), Mumbai*
- *UNICEF, Mumbai Field Office*

Indapur and Junnar Clusters

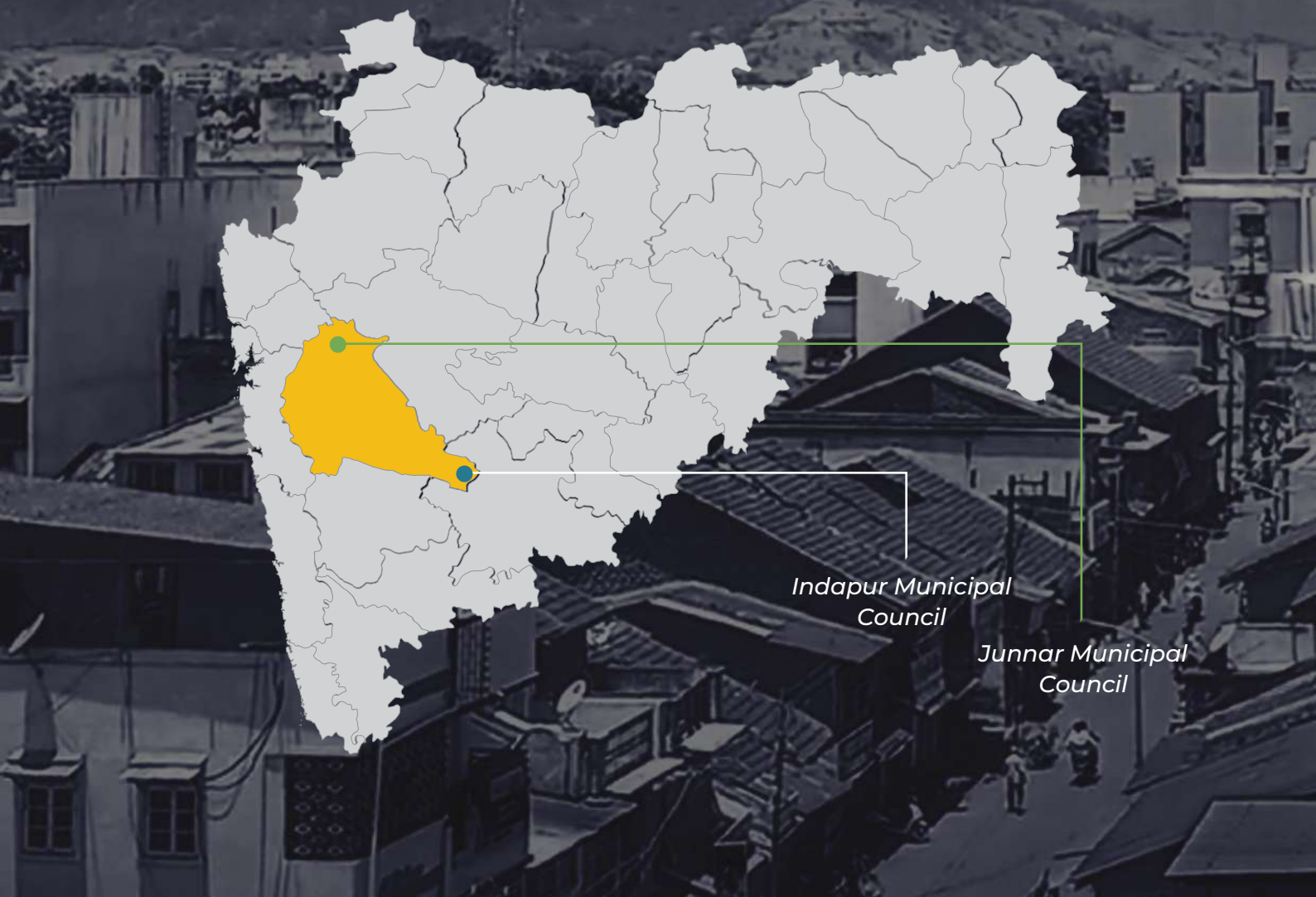
City Profile

INDAPUR CLUSTER
16 villages from 12 Gram Panchayat with a radius of 10 kms from FSTP are selected for URL in Indapur

140 km From Pune City	**25, 515** of city Population	**6008** of Households in selected GP
5.62 km² of Urban Area	**27, 945** of Rural Population	**5228** of Households in selected ULB

JUNNAR CLUSTER
49 villages from 43 Gram Panchayat with a radius of 15 kms from FSTP are selected for URL in Junnar.

92 km From Pune City	**23, 315** of city Population	**17,249** of Households in selected GP
2.65 km² of Urban Area	**77, 620** of Rural Population	**5637** of Households in selected ULB



Background

Current scenario of sanitation in Indapur cluster

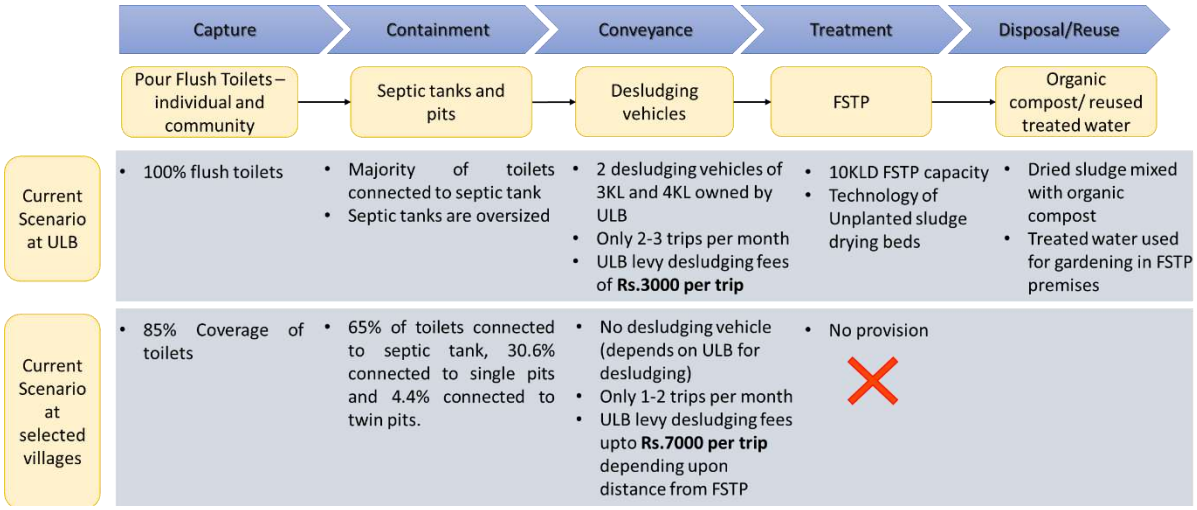


Figure 10: Sanitation Value Chain: Indapur city and 16 villages in Indapur Cluster
Source: RCUES, Mumbai (2021)[13]

In September 2016, Indapur city was declared open defecation free. Indapur city has 100% coverage of toilets, and all these toilets are connected to septic tanks whereas in case of the 16 villages in the cluster, the coverage of toilets is 85% out of which 65% are connected to septic tank, 30% to single pit and remaining are connected to twin pit. However, it was obersved that the desludging frequency is lower in the cluster due to oversized septic tanks. Indapur city has 75% coverage through Underground Drainage (UGD) network which carries outlets/overflow of the septic tanks along with other wastewater from the city and disposes in Bhima River without treatment. This untreated wastewater was found to be used in farming whereas the septage from Indapur city and a few surrounding rural areas was transported by two desludging vehicles of 3 KL and 4 KL capacity and treated at a 10 KLD FSTP at Indapur city. The FSTP was constructed in 2019 as per the criteria and specifications of GoM GR (GR No. SMM 2019/C.R.124/UD-34). The FSTP uses a natural treatment process with components such as sludge drying beds (SDB), anaerobic baffled reactor (ABR) tank and planted gravel filter. It was reported that currently considered 16 villages under the cluster do not own any desludging vehicle or a treatment facility and thus avail the service offered by Indapur Municipal Council (IMC) as per the demand[14].

Accordingly, through stakeholder consultation with officials from the selected GPs and Indapur, current scenario of each stage of sanitation value chain was assessed, as shown in Figure 10. In addition to this, ESF, Pune developed a questionnaire for household surveys, for key informant interviews and for focused group discussions and conducted surveys at various locations including 400 households in 16 villages identified in Indapur cluster. Currently, the households register the demand for desludging at IMC office to avail the service by paying Rs 3,000 per trip (for households within its jurisdiction) and Rs 7,000 per trip (for household in surrounding villages). It was reported that the FSTP receives an average of 2-3 truckloads of faecal sludge and septage per month whereas to run the FSTP at its optimum capacity of 10 KLD atleast 3 truckloads of 3KLD capacity are required on daily basis. This means that only 3% of the FSTP capacity is used in a month. The O&M cost of the FSTP is recovered through:

[13] *Regional Center for Urban and Environmental Studies (RCUES), Mumbai 2021, Research Study on Investigation of Urban-Rural Linkages in FSSM in Maharashtra*
[14] *Regional Center for Urban and Environmental Studies (RCUES), Mumbai 2021, Research Study on Investigation of Urban-Rural Linkages in FSSM in Maharashtra*

1) Sanitation tax of Rs 100 per water closet (WC) [15]collected from each household,
2) Desludging fee of Rs 3000 to Rs 7000 paid by households, and
3) Compost made from dried sludge and sold at Rs 5 per kg.

It was reported that large portion of the O&M cost can be recovered from the desludging fees paid by the households. However, the lower utilization of the existing capacity has made it difficult for IMC to recover the O&M cost with existing demand within IMC.

Assessment of sanitation value chain in Junnar cluster

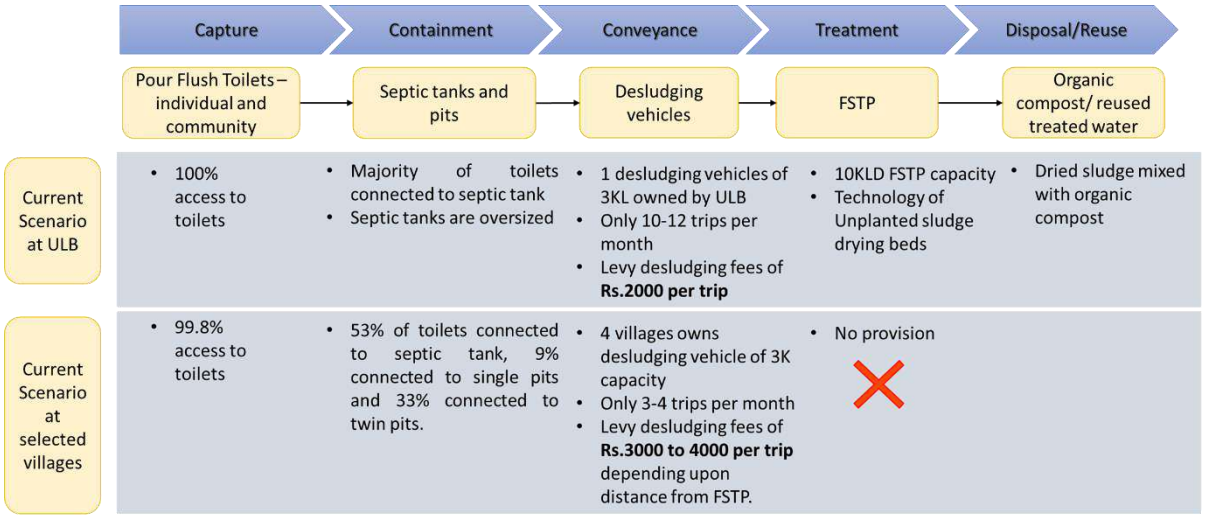


Figure 11: Sanitation Chain: Junnar city and 49 villages (43 GPs) in Junnar cluster

The current scenario of each stage of the sanitation value chain in Junnar was assessed as shown in Figure 11 through stakeholder consultation with officials from Junnar city and the selected GPs listed in Annexure. Junnar city has been declared ODF with 100% access to toilets where 95% of the toilets are connected to septic tanks. As per the data received from Junnar Panchayat Samiti, 53% of the toilets in the villages identified as a part of Junnar cluster are connected to septic tanks and the remaining 47% are connected to single pit or twin pits. Majority of these septic tanks are oversized which has resulted into low desludging frequency. Currently, Junnar Municipal Council (JMC) owns a desludging vehicle of 3 KL capacity whereas the villages in cluster own 4 desludging vehicles of 3 KL capacity. In addition to this, the desludging service is also availed by the households in villages from a private operator. Currently, JMC receives desludging demand from areas within its jurisdiction as well as from few villages within 5-7 kms from ULB. The incoming septage is treated at 10 KLD FSTP in Junnar city which was built as per the GoM GR (GR No. SMM 2019/C.R.124/UD-34) specification. FSTP uses SDB with ABR for treatment. It was reported that, currently, the selected 43 GPs in the cluster do not have faecal sludge and septage treatment facility.

Currently, the households and other users (of community toilets/public toilets etc.) have registered a request for desludging services at the JMC office by making an advance payment of Rs 3000 - 4000 per trip, depending on the distance from the FSTP. The desludging vehicles operating in these villages do not empty the collected septage at a treatment facility. It was reported that the FSTP receives average 10-12 truckloads of faecal sludge and septage per month from the urban area whereas to run the FSTP at its optimum capacity of 10 KLD, at least 3 truckloads of 3 KLD capacity are required daily. This means that only 12% of the FSTP capacity is used in a month. Alike Indapur cluster most of the O&M cost of the FSTP is recovered through the desludging fees paid by the users and since the utilization rate of FSTP is low, operation and management of FSTP is challenging.

[15] IMC,2022

Need for the project

Prior to the intervention, the core challenges faced by the FSTPs in Indapur and Junnar cities were sustaining the O&M of the existing FSTPs at urban centres and unavailability of resources and infrastructure for safe FSSM in rural villages creating a need for bridging the gap to make services available for both urban and rural local bodies.

1) Sustaining the O & M of the existing FSTPs at urban centers

Currently, the FSTPs in Indapur and Junnar cities have monthly utilization rates as low as 3% and 12%, respectively due to lower demand of desludging since the septic tanks are oversized. Lower desludging demand negatively impacts the recovery of operation and maintenance of FSTP as desludging fees recover maximum portion of O & M costs. This further reflects into inefficient operation and management of FSTP.

2) Unavailability of resources and infrastructure for safe FSSM in villages

As per GoM GR by WSSD under SMB, dated 2nd December 2021[16], the GPs shall be responsible for management of fecal sludge and septage generated within the jurisdiction. However, currently, the villages in Indapur and Junnar cluster do not own a treatment facility to treat faecal sludge and septage generated within their jurisdiction. In addition, the GPs lack resources for operation and maintenance of such utilities.

Interventions for U-R Linkages

Urban Rural Linkages in FSSM include linking urban and rural entities in Indapur and Junnar clusters through a formal institutional framework to address the demand of septage management of rural areas at urban FSTPs. This intervention would lead to optimum utilization of existing urban infrastructure and ensure sustainability of its O&M.

Focus areas	Interventions
Engaging GPs in safe sanitation ensuring safe sanitation in non-serviced rural areas with administrative responsibilities and no financial liabilities	**Capacity building** IEC and training activities for developing urban rural linkages in FSSM
Sustaining O & M of existing FSTP by allowing the treatment of rural septage in urban FSTP	**Formalizing the mechanism** by signing MoU between Urban and Rural local governments
Optimization of resources saving the resources for land acquirement, construction of FSTP, Procurement of desludging vehicle, O & M of desludging vehicle and FSTP.	**Framework for monitoring and record keeping** will ensure effective implementation and help in maintaining the records
Government mandates following the GRs and guidelines set out by Central and Government for sustainable sanitation	**Penalties for non-compliance** Provision for penalties in case of illegal dumping of FS and manual scavenging
Cost-effective and Financially sustainable model model to ensure win-win situation in terms of affordability of desludging charges for users, cost-saving model for rural authorities and financially sustainable model for urban authorities	**Promoting partnership among local government** Strengthening the institutional mechanism by engaging urban and rural local bodies

[16] Maharashtra Government Resolution: GOM GR SBM 2021/C.R. 272 /WSSD-16

The Roadmap

Figure 12: Roadmap of the initiative

1) Feasibility Assessment

On the basis of data examined by ESF, Pune through household surveys, key informant interviews and Gram Panchayat questionnaire, urban-rural linkages can be implemented with three possible scenarios as have been mentioned below. The scenarios have been developed based on various combinations of desludging practices in urban and rural areas:

- Scenario 1: Demand desludging in urban area and rural area (surrounding villages)
- Scenario 2: Scheduled desludging in urban area and demand desludging in rural area (surrounding villages)
- Scenario 3: Scheduled desludging in urban area and rural area (surrounding villages)

Table 1 evaluates the quantity of septage and assesses the feasibility of these scenarios in case of Indapur cluster. Similar assessment has been conducted for Junnar cluster as well. It was observed that till demand desludging is practiced in urban area as well as surrounding rural areas, the urban-rural linkages in FSSM are feasible without augmentation of existing FSTP. After the implementation of scheduled desludging in either urban area or rural areas or both urban and rural area, the urban-rural linkages could be made feasible after deployment of additional resources like procurement of additional desludging vehicles, augmentation of FSTP etc. Thus, it is concluded that the urban-rural linkages in FSSM could create win-win situation for urban and rural local bodies by ensuring optimum usage of existing FSTP in urban center by extension of a septage desludging and treatment services to the surrounding non-serviced rural areas without investing in additional resources, considering that demand desludging is the current practice in place in both urban and surrounding rural areas.

Urban-rural linkages are financially feasible in both urban and rural areas as they allow the ULBs to achieve optimum utilization of FSTP to sustain O&M. It can generate profit (if managed properly) by desludging the urban as well as rural septic tanks by collecting desludging charges from them and by selling manure. Utilization of underutilized FSTPs in the urban areas would save the GPs within the vicinity from investing in land for FSTP, construction of FSTP, procurement of desludging vehicles, and O&M of vehicles and FSTP. Hence urban rural linkages in FSSM can be financially feasible in both urban and rural local governments in Indapur and Junnar clusters. A single desludging vehicle is needed to sustain the need of linkages in Indapur cluster and Indapur city owns two trailer mounted desludging machine whereas Junnar has six desludging vehicles including ULB owned, GP owned and a privately-owned vehicle. Hence, for urban rural linkages in FSSM in Indapur and Junnar clusters, no additional resources are needed to procure desludging vehicles. In addition to this, the existing FSTP due to demand base desludging can sustain the fluctuation and increase in load of faecal sludge from rural areas. Thus, it can be financially feasible to establish demand-based urban rural linkages in FSSM, in Indapur and Junnar clusters.

Table 1: Assessment of scenarios for Indapur cluster

S. No.	Scenario	Evaluation factors[17]	Assessment
1	Demand desludging in urban and rural areas	Quantity of septage to be managed: 10.8 KLD No. of septic tanks to be serviced: 3 per day. No. of vehicle(s) required: 1	The existing capacity of FSTP is enough to cater to the rural demand and urban-rural linkages are feasible without augmentation of FSTP.
2	Scheduled desludging in urban area and demand desludging in rural area	Septage to be managed: 32.8 KLD Septic tanks to be serviced: 9 per day. Vehicles required: 3	The implementation of urban-rural linkages will require an additional desludging vehicle along with augmentation of FSTP.
3	Scheduled desludging in urban area and rural area	Septage to be managed: 54.2 KLD Septic tanks to be serviced: 15 per day. Vehicles required: 5	The implementation of urban-rural linkages will require 3 desludging vehicles additionally along with augmentation of FSTP.

2) Institutionalizing mechanism for urban-rural linkages

Assessing administrative commitment through stakeholder consultation

A series of joint stakeholder consultations were conducted with Principal Secretary, WSSD, Chief Executive Officer (CEO) of Pune district to explore possibilities of urban rural linkages in identified clusters. Various rounds of consultations were conducted with Chief Officer of IMC and JMC, Block Development Officer (BDO) of Indapur Panchayat Samitee and Junnar Panchayat Samitee, SBM Co-coordinator, Gram Sevaks/Village Development Officers/representatives of the respective GPs in the clusters as well as the elected representatives of the respective GPs to educate them on the concept of urban-rural linkages in FSSM in order to convince them about the approach and to understand their feedback on urban-rural linkages in FSSM. This effort led to their agreement to adopt solution of urban rural linkages in FSSM.

The next round of consultations with the urban and rural authorities was held after the stakeholders gave their positive approval for moving forward with the initiative. These consultations focused on the problems with the current FSSM system and development of institutional framework, a payment system, finalization of service charges, etc. for the urban-rural linkages in both clusters.

As reported during consultation, it is a common practice to register the demand at the IMC/JMC office by paying in advance for which IMC/JMC deploys a desludging vehicle on a predetermined date for desludging. The septage is then transported to the FSTP for treatment by this desludging vehicle. Based on the current mechanism and the addition of responsibilities pertaining to urban rural linkages, a common task list was prepared as mentioned in Annexure 4 and an institutional mechanism was formulated, as illustrated in Figure 13 and Figure 14 by Maha-UWES-C team in consultation with urban and rural stakeholders. In

[17] **Note:** The above values are evaluated based on the population data derived from the census 2011. According to the Census on India, the decadal population growth rate for IMC is considered as 18% whereas 10% for surrounding rural areas. Considering the decadal growth, population projection for next 15 years were calculated with base year as 2020. The amount of sludge received per day was calculated for the projected years, considering the desludging frequency for demand desludging as 15 years, this frequency was found out from Gram Sevak surveys and Key Informant Interview (KII). For schedule desludging, frequency was considered as 3 years as per GRs and the number of working days for FSTP is considered as 300.

alignment with this, MoUs were developed by Maha-UWES-C team for urban rural linkages. These MoUs, signed by respective individual GPs and ULBs with slight variation in roles/responsibilities etc. as per mutual consensus, were to implement the initiative of urban rural linkages in both the clusters.

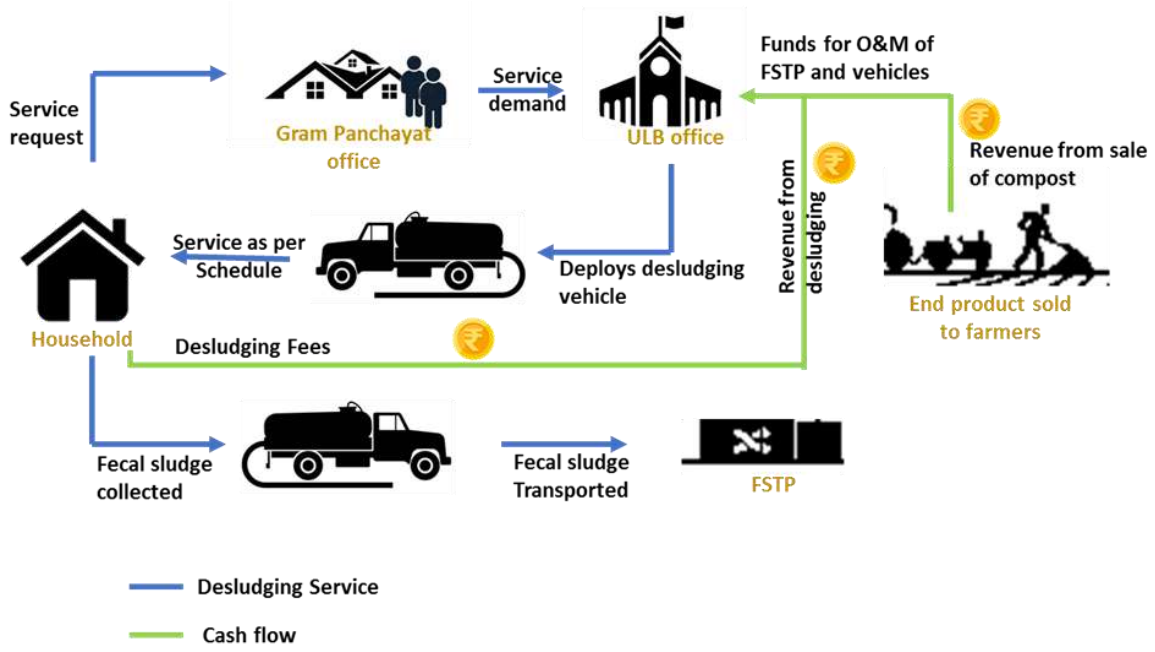


Figure 13: Proposed institutional mechanism for urban rural linkages in FSSM in Indapur cluster

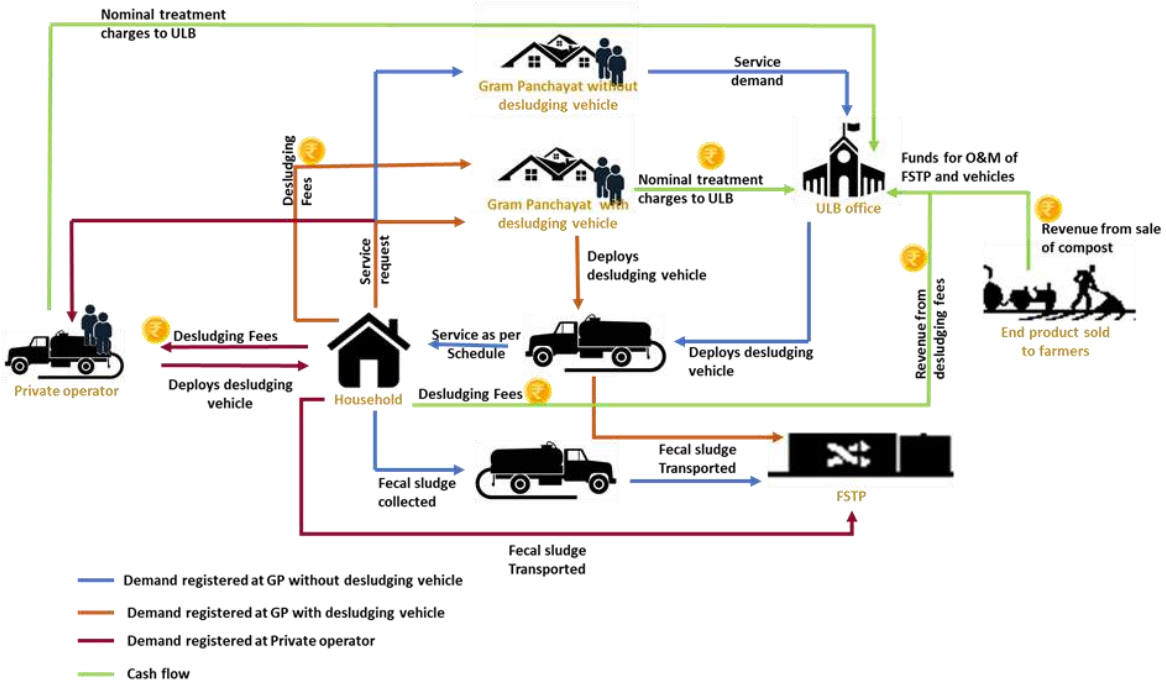


Figure 14: Proposed institutional mechanism for urban rural linkages in FSSM in Junnar cluster.

In case of the institutional mechanism for urban-rural linkages in FSSM, it has been proposed that the rural households would register their desludging request at the respective Gram Panchayat office. The respective GPs would keep the record of the registered request as per the format given in Annexure 6. This

request would be further communicated to the IMC/JMC office by the respective GPs office. IMC would ensure availability of the desludging vehicle and treatment facility without impacting the services offered to the users in jurisdiction of IMC and oversee the deployment of desludging vehicles as per the address provided by the respective GP for treatment of collected faecal sludge. IMC would look after the overall operation and maintenance of the desludging vehicle and FSTP. In case of Junnar cluster, private desludging agencies would be registered either under ULB or respective GP. GPs that have desludging vehicles could be clustered together and would be responsible for deploying these desludging vehicles in the nearby GPs without desludging vehicles. Nominal charges could be taken by JMC for treatment at FSTP from GPs as well as from private desludging vehicles as per the agreement in the MoU.

3) Financial planning

Urban-rural linkages can be financially feasible. However, the implementation largely depends on the acceptance by the users along with financial sustainability of the operations at urban and rural bodies. During stakeholder consultation, it was observed that the users were mainly concerned about affordability of the desludging charges and timely delivery of the desludging services whereas the ULB were keen towards sustaining the operation of FSTP and cost recovery while the GPs aimed towards sustainable management of the septage.

Table 2: Monthly O&M cost of FSTP at Indapur

A	**Operations and Maintenance (O&M) cost of FSTP (Monthly)**			
	Components	Unit	Cost (in Rs.)	Total (in Rs.)
1	Drivers and helpers (monthly salary)	2	14,000	28,000
2	Operator at FSTP (monthly salary)	1	10,000	10,000
3	O&M of truck (as needed)	1	2,800	2,800
4	Fuel cost as per **Error! Reference source not found.** (considering avg. 20 trips - 4 U, 16 R)			7,200
5	Consumables at FSTP including Testing charges (electricity, minor repairs etc.)		20,000	20,000
	Total O&M cost of FSTP (per month)			68,000

Table 3: Monthly Fuel cost of desludging vehicle for IMC

B	Fuel cost of the truck (Per month)[18]				
		Trips/ month	Distance (Both ways)	Diesel charges	Total (in Rs.)
1	Trips within ULB (approximate distance ~ 5 km one way, 10 km to-and-fro - Assuming average 4 trips per month (based on records from 2020-22)	4	10	200	800
2	Trips in rural areas within 10 km from the FSTP (20 km to-and-fro) Assuming average of 1-2 trips per month from 12 Gram Panchayat)	16	20	400	6400
	Total fuel cost per month				7200

[18] **Note:** The average number of trips of 4 per month from ULB and 16 per month (1 trip per month from each village) are assumed based on current situation. The user includes residential, institutions, commercial, recreational etc. and community and public toilets.

IMC and JMC levy Rs 3,000 and Rs 2,000 of desludging charges per trip respectively from each user within their jurisdiction. However, to provide desludging service to the surrounding villages in the cluster, the desludging vehicles must travel additional distance. As the fuel quantity is directly proportional to the travel distance, the desludging charges for the users residing in the villages of the cluster must be worked out to make the desludging operations feasible. Thus, initially O&M of the FSTP to provide services to Indapur cluster was assessed to be Rs 68,000 as mentioned in the Table 2 in consultation with IMC where fuel cost was assessed by considering 4 to-and-fro trips (based on the records of 2020-22) per month within IMC area and 16 to-and-fro trips from each of the 16 villages in cluster in a month as shown in Table 3. Further, monthly O&M cost recovered by the users within IMC area was assessed to be Rs. 12,000 (considering 4 trips per month), which was deducted from the total O&M cost of desludging vehicle and FSTP at Indapur to arrive at desludging charges of Rs 3,500 for the villages in Indapur cluster.

Table 4: Charges payable by the users[19] in villages of Indapur cluster

`	Charges to be levied to the users to recover O&M cost of FSTP	Rs.
1	Desludging charges levied within the jurisdiction of the ULB	3,000
2	Desludging charges required to be levied by users from rural areas for O&M recovery	3,500
3	O&M cost recovered by users within ULB (Assuming 4 trips per month)	12,000
4	O&M cost to be recovered from rural areas (Assuming 1 trip per month from each village)	56,000

Similarly, in case of Junnar cluster, desludging charges have been calculated in light of minor deviation in methodology pertaining to the ownership of desludging vehicles within 4 GPs.

4) Capacity Building and IEC

To ensure effective implementation of urban rural linkages in FSSM in Indapur and Junnar cluster, it is proposed to build capacities of urban and rural local bodies, desludging operator, FSTP operator and to create awareness among users (especially in the villages). In light of this, a few GPs in the cluster have passed a resolution on 26th January 2023 in Gram Sabha and educated the users about the importance of urban-rural linkages. A substantial amount of effort will be extended by Maha-UWES-C Secretariat team in disseminating the information and publicizing the initiative. The team plans to assist the ULBs and GPs in the cluster to create advertising material where the role of Gram Sevaks, Village Development Officer etc. would be crucial. This awareness session could be disseminated to launch this initiative through variety of methods such as Gram Panchayat meetings, Gram Sabhas, announcements, posters, and online media. In addition, technical trainings are planned for the FSTP operator, desludging operator on standard operating procedures (SOPs) for handling and management of septage and FSTP, in collaboration with ESF, Pune. This training will include operation of the vehicles, occupational safety, health hazards and use of PPE during desludging services etc.

5) Monitoring

A robust monitoring mechanism is essential to ensure effective implementation and collection of data to strengthen and further scale up this model. This can be done by maintaining records, tracking desludging vehicles with GPS trackers, etc. A paper-based monitoring system with details and copies of formats for various stages in FSSM has been developed to track collection, transportation and emptying operations for Indapur and Junnar cluster as mentioned in Annexure 5. The GPS tracker on the desludging vehicle will help ensure that the faecal sludge collected from households is only emptied at the FSTP. The tracking system will also aid in the collection of septic tank data. The designated person at ULB and GP will oversee maintenance of the records.

[19] Note: The user includes residential, institutions, commercial, recreational, etc. toilets

Way forward

The IMC and 12 Gram Panchayts of 16 villages will get into an agreement to initiate provision of desludging services to potential villages. MoU is being developed for Junnar cluster to be signed between the JMC and the selected GPs. Resolution was passed by the selected GPs in Indapur and Junnar on urban rural linkages in FSSM on 26th January 2023.

Further, the team at Maha-UWES-C Secretariat shall facilitate the training to the FSTP operator and desludging vehicle drivers when the MoU has been signed between the two parties to undertake the initiative in addition to IEC.

Scalability

Urban Rural linkages in FSSM in Indapur and Junnar are an innovative pilot demonstration for Maharashtra in terms of linking urban and rural authorities through a formal institutional mechanism and optimization of existing urban infrastructure to cater to the needs of nearby rural areas. Studies demonstrated that the assessed FSTPs in Maharashtra are underutilized due to low demand for desludging. Many villages in Maharashtra do not have proper FSSM facilities within their jurisdiction. Hence there is a possible scope for scalability of urban rural linkages in FSSM across functional urban FSTPs to ensure sustainable operations. Pilot demonstration has translated into an approach note, which WSSD shared with all districts as a primary effort that rural authorities should try, before building independent FSTPs. This will also ensure elimination of capital, operation, and maintenance cost at GP level as no new infrastructure and associated costs such as construction, expertise for design, human resources for maintenance and land for construction of new FSTP etc. will be incurred. Urban-rural links in FSSM also foster development of holistic sanitation with end-to-end solutions (from discharge, containment, evacuation, transportation to safe disposal of all effluents from toilets) in urban and rural areas, leading to ODF++. It supports the provision of urban-rural convergence in SBM, where shared resources may be effectively used in clusters to serve communities in nearby rural and urban ULBs. It also ensures that no untreated sewage water is released in the environment.

Potential impact

Implementation of U-R linkages in Indapur has helped in avoiding the establishment of FSTPs at village level and avoiding emissions from their treatment process units mainly from anaerobic filters. The total GHG emission reduction[5] will be approximately **608.14** Kg CO_2 equivalent per year for each FSTP that was avoided using implementation of U-R linkages.

Safe sanitation

ensuring treatment of collected fecal sludge at FSTP

13,200 Households

From 16 villages in Indapur and 49 villages in Junnar will cater through URL

2,640 KL / year of wastewater

from non-serviced or partially serviced urban and rural areas is safely managed

0.12 Million of Population

(Indapur city and 16 villages in Indapur cluster & Junnar city and 49 villages in Junnar cluster)
Will be catered through Urban Rural Linkages

The rural authorities

saved more than Rs. 5 Million

for construction of new FSTP[20] (including O&M cost for a year) plus the cost for expertise for design, human resource for maintenance and land for construction

Reduction in Ground water pollution

Due to reduction in open disposal of sewage and percolation of untreated sewage in the ground

Optimum utilization of existing FSTP

The total GHG emission reduction[5] will be approximately **608.14 KG CO2 eq per year**

For each FSTP, which is due to prevention of establishment of new FSTPs at village level avoiding emissions from their treatment process units mainly from anaerobic filters.

[20] Source: Maharashtra Government Resolution for setting up of FSTP: GR No. SMM 2019/C.R.124/UD-34

Refurbishment of FSTP at Indapur

Indapur Municipal Corporation
Saniverse Environmental Solutions, Pune
Regional Centre for Urban and Environmental Studies (RCUES) of All India Institute of Local Self Government, Mumbai
UNICEF, Mumbai Field Office

Indapur

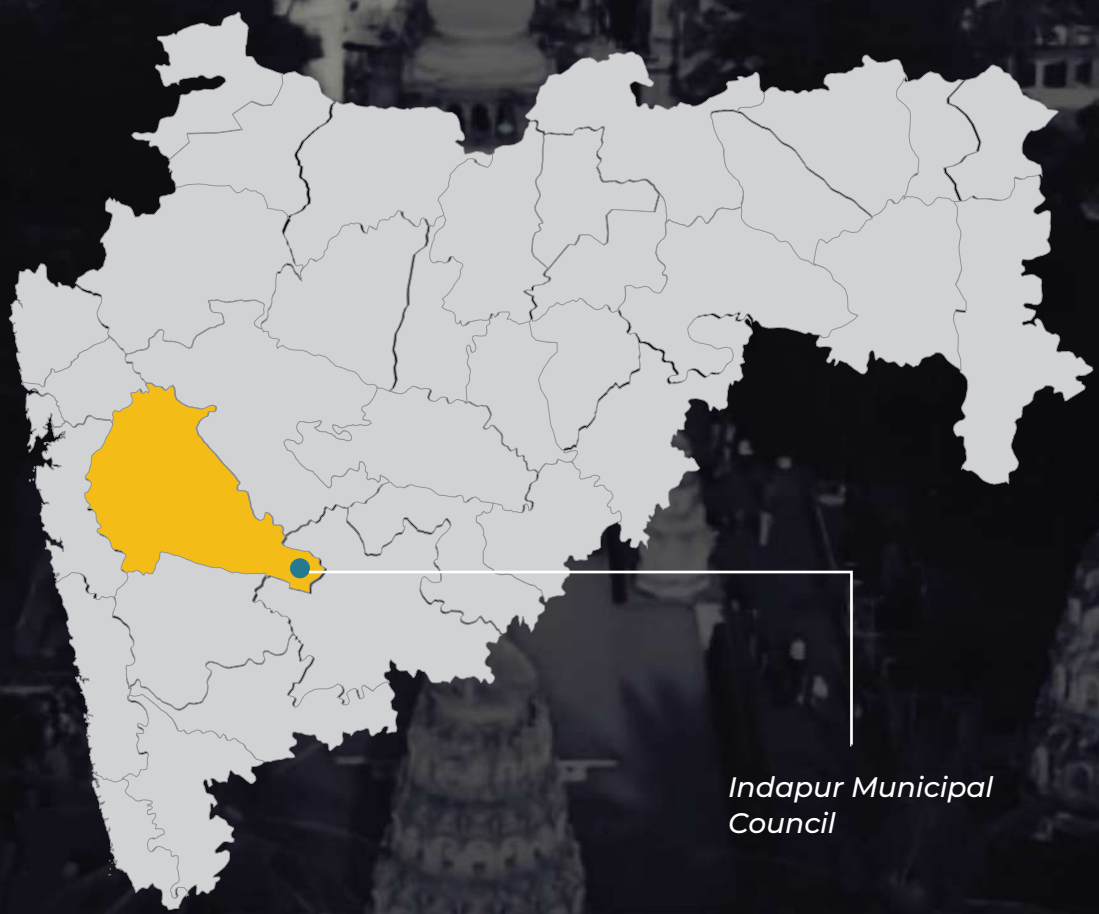
City Profile

25,515
Population as per the census of 2011

5228
Households (in Indapur city as per Census 2011)

5.62
Total Sq. Km area

10 KLD
FSTP Capacity (Natural treatment process with SDB, ABR and PGF)



Indapur ULB declared ODF in September 2016. IMC has 100% access to toilet and safe sanitation facilities. Toilets are connected to septic tanks; 60% septic tanks connected to underground drainage network whereas 40% connected to soak pits. Indapur has 75% underground drainage network which carries grey water from bathrooms, kitchen and septic tank effluents and outlet of septic tanks.

Context

As per the GR issued by UDD, GoM (GR No. SMM 2019/C.R.124/UD-34)[21] dated November 8th, 2019 – a black box model was used to scale up construction of FSTPs across all the ULBs in Maharashtra. Five different design capacities – 3 KLD, 5 KLD, 10 KLD, 15 KLD and 20 KLD were proposed. The technology based on which all the FSTPs would be implemented was 'Unplanted Sludge Drying Beds'.

The FSTP at Indapur was constructed as per the same GoM GR. The design capacity of Indapur FSTP is 10 KLD. An augmented capacity of 36 KLD has been sanctioned for Indapur as per UDD GR (GR No. SMM-2020/C.R.85/UD-34)[22]. It is a natural treatment process with sludge drying beds for solid-liquid separation, followed by transport of the separated liquid to anaerobic baffled tanks and planted gravel filter for treatment as shown in Figure 17. Currently, the FSTP is located at the solid waste dumping site.

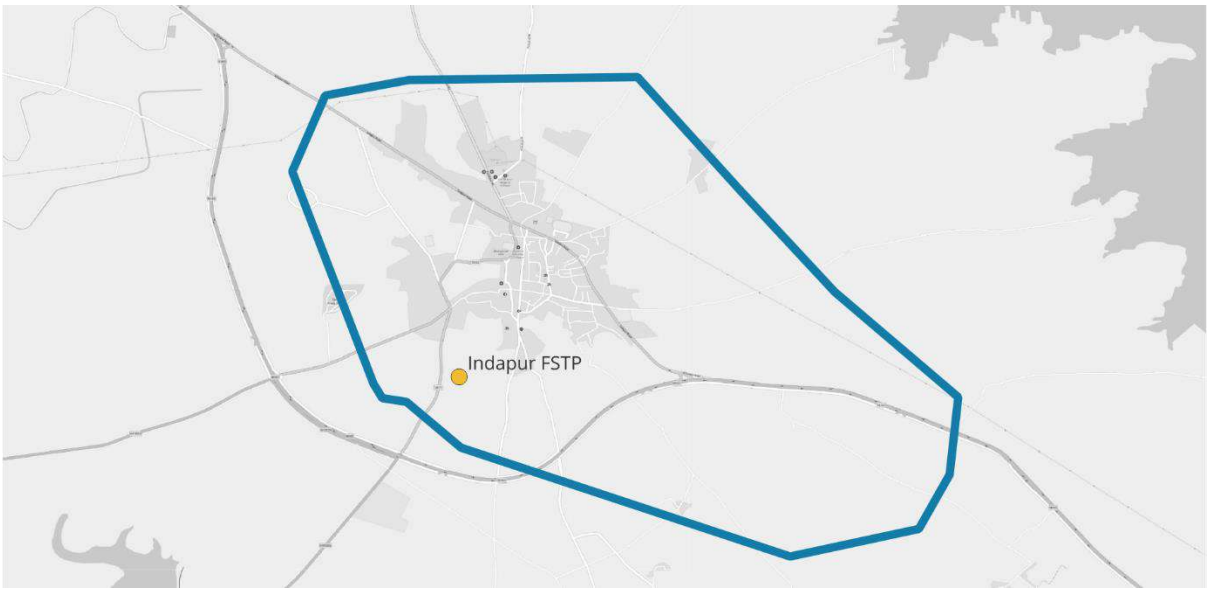


Figure 15: Location map of Indapur showing its FSTP

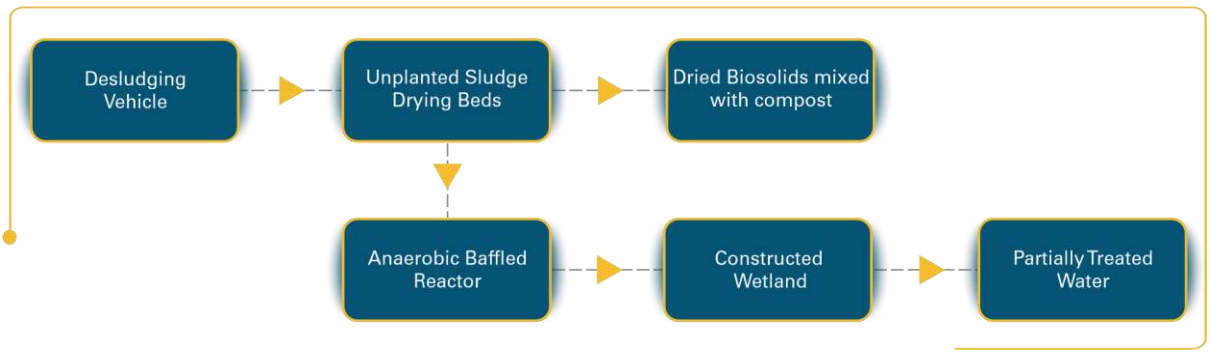


Figure 16: Current Treatment chain at FSTP in IMC

[21] Maharashtra Government Resolution for setting up of FSTP: GR No. SMM 2019/C.R.124/UD-34

[22] Maharashtra Government Resolution for augmentation of existing FSTP capacities: GR No. SMM-2020/C.R.85/UD-34

Figure 17: Treatment Units at the FSTP in Indapur

Challenges at the FSTP prior to the intervention

Inadequate treatment units

Currently, the septage is directly decanted into the sludge drying beds without preliminary screening. This results in mainly two problems – (a) the solid waste collected from the septic tank might end up in the drying beds and (b) the hydraulic loading rate becomes a constraint to design criteria as the solid content of septage is less than 2%.

Due to optimistic design criteria, the estimated and executed area of unplanted drying beds is inadequate for the current configuration of the plant. Especially in monsoon and winter season, the drying process will slow down, and the plant will not be able to accommodate 10 KLD of septage. Due to inefficient operation of drying beds, the bio solids produced at the FSTP will not be free from pathogens and will contaminate the compost produced by mixing the bio solids with city compost. Also, the present design consisting of planted gravel filter does not reduce the pathogens in the wastewater up to the discharge limits as prescribed by the Maharashtra Pollution Control Board (MPCB).

Disinfection treatment is not provided in the treatment chain. None of the treatment components included in the treatment chain eliminate or significantly reduce the pathogens from the liquid. Hence it is challenging for the treated effluent to meet the discharge standards adopted by MPCB. National Green Tribunal's (NGT) sensitivity on non-performing assets in such situations is leading to cases on ULBs and Directorate of Municipal Administration (DMA).

Less desludging demand from urban area

The demand for desludging services in urban areas of Indapur is very low i.e., 2-3 trips per month. It makes the operations of FSTP financially non-viable for the IMC. Currently, there are no private desludging operators, and the services are only provided by the IMC. IMC has two vehicles and charges Rs. 3,000 per trip to the household. Even if, one desludging service happens every week, monthly revenue of Rs. 12,000 generated from the services is not adequate to cover human resource cost of the operator at the plant.

Gaps in the treatment Process

The FSTP is located at the solid waste dumping site. The plant does not have appropriate accessibility to the desludging vehicles. There is no compound wall to discourage unauthorized entry into the FSTP premise during non-working hours. Currently, the treatment plant does not have electricity connection and dedicated space for storing tools required for O&M of the facility. It also lacks provision to keep record of the incoming desludging trucks and maintenance activities carried out at the plant.

The first step towards the refurbishment of the existing FSTP in Indapur was to understand the parameters such as design aspects, financial aspects and technology aspects currently being implemented. The background study to understand all these parameters showed the following gaps:

- Difficult to sustain due to low desludging demand in urban areas.
- Parameters like hydraulic loading and solids loading on the unplanted sludge drying beds were under designed.
- No preliminary treatment like screening of received sludge is available.
- Undigested fresh sludge from community toilets and public toilets is directly added into the sludge drying beds.
- The length of the SDBs is too large for the septage to spread evenly over the surface.
- Dead zones created in the ABR.
- No tertiary treatment available

Need for Refurbishment

A need for FSTP refurbishment was realized to make the FSTP functional for design capacity of 10 KLD. It was crucial, in order to increase the overall efficiency of the FSTP units and to handle additional septage from surrounding rural areas expected to be disposed at the FSTP through urban rural linkages in FSSM. The project for refurbishment also ensured improvement of non-treatment units such as appropriate accessibility, a compound wall discouraging unauthorized entry, a place for record keeping and maintenance activities, etc.

The project aims at refurbishment of the FSTP by reinstating 10 KLD operational capacity of the FSTP by adding treatment units and by improving the design of the existing treatment units. The project also further aims to add treatment units that will improve the operations of the plant while making bare minimum changes to the existing treatment units. This would allow the IMC to accept septage from the Council and the neighboring villages which will organically increase the demand for desludging services.

Following are the primary objectives of the project:

- To undertake a detailed assessment of each treatment unit at the FSTP
- To prepare a hydraulic design and structural drawings indicating the changes to be made.
- To refurbish the FSTP to make it functional for 10 KLD design capacity.
- To handhold the operator and the IMC to commission the plant
- To train the operator appointed by the Council for O&M of the FSTP

Project Execution

Construction of additional and exiting units

Refurbishment of FSTP began from January 2023. Currently, the additional units of settling thickening tank, screens and upgradation of existing units of Anaerobic Baffle reactor and Sludge drying beds are being constructed on site.

Figure 18: Construction work of FSTP refurbishment at Indapur

Technology

The project is a combination of technology for overall upgradation of treatment plant. The selected technology is divided into two parts: additional units and refurbishment of the existing unit. Units such as screens, Settling Thickening Tank (STT), AF and tertiary treatment units will be added and other units such as SDBs, ABR will be refurbished as shown in Figure 19 to increase the efficiency of the FSTP.

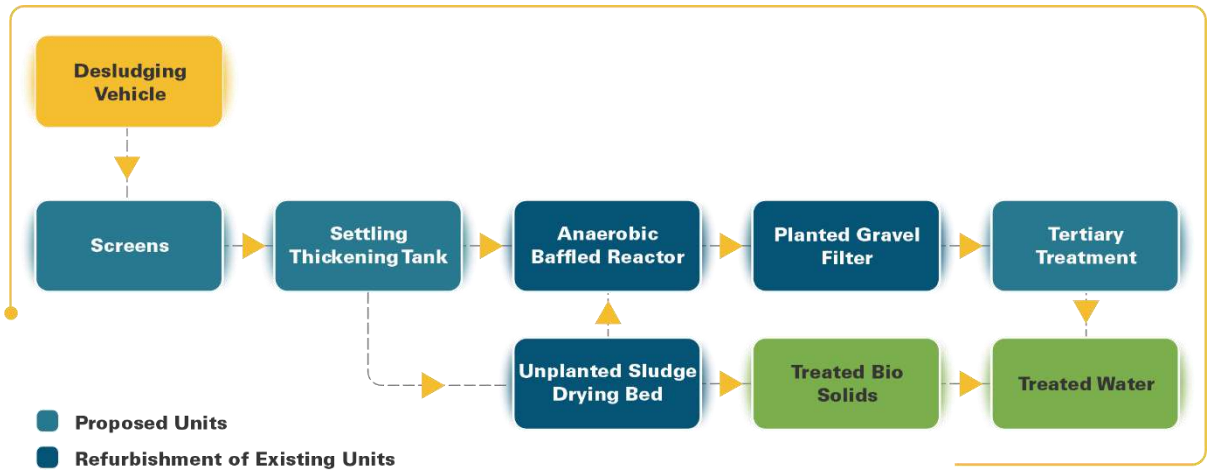


Figure 19: Proposed Treatment Chain at Indapur FSTP

Additional Unit

The following are the new units that will be added to the existing treatment process:

Septage receiving station

The aim of the receiving station is to allow safe transfer of septage from the desludging vehicle to the treatment facility by use of a hose pipe with a cam lock arrangement. The arrangement allows the desludging operator to attach the hose pipe and decant the septage in a controlled manner into the screening unit.

A screening unit will help in arresting solid waste (plastic wrappers, sanitary pads, plastic bottles, rags, twigs, metal pieces and stones etc.) which is sucked into cesspool vehicle while desludging septic tanks. The solid waste will be arrested on top of the screens. The screenings will have to be manually raked using a rake and will be pushed into the tray which has holes for draining water. The screened septage will be then transferred to settling thickening tank.

Settling thickening tank

The aim of the treatment unit is to separate the solid and liquid part of the sludge by gravity. The separation takes place due to difference in the specific gravity of the solids and their masses. The Fat- Oil-Grease (FOG) which has lower specific gravity tends to float up on the surface of water. Hence, in the settling thickening tank, the incoming sludge is given appropriate hydraulic retention time where in the solids and the FOG separate and the liquid effluent comes out from the outlet.

Settling thickening tank helps to increase the solid content in the septage from 2% to 12%. The increased solid content reduces the volume of thickened sludge while keeping the consistency suitable for pumping it from the bottom of the tank to the unplanted sludge drying bed. The reduced volume of sludge reduces the hydraulic load significantly while keeping the solid load similar. This improves the drying cycle of the sludge even during the wet season.

Tertiary treatment unit

A dual media filter followed by chlorination ensures reduction of the pathogens in the secondary treated water up to the discharge standards. The water thus treated can be either discharged into the environment or can bereused in the plant premises.

Refurbishment of the Existing unit

The following are the changes proposed to the existing treatment units. These changes improve the hydraulics and enhance the treatment efficiency of the units.

Unplanted drying beds

Addition of settling thickening tank reduces the hydraulic load on the unplanted drying beds. The area of the single bed is too high and does not allow the thickened sludge to evenly spread across the bed area. The SDB will be refurbished by increasing the number and decreasing the surface area per bed which will facilitate even distribution of the sludge over the beds. Thus, each bed will be divided into two so that adequate drying time is available for the sludge.

Anaerobic treatment unit

After the settling thickening tank, the supernatant (liquid / wastewater) from the tank will be transferred under gravity to ABR. This helps to reduce the BOD and the corresponding COD of the wastewater. BOD reduction of up to 95% is possible in ABR. The length to depth ratio of the chambers of the baffled reactor is higher than recommended. This leads to creation of dead zones thereby reducing the overall treatment capacity of the existing anaerobic treatment unit. Therefore, to achieve the desired effluent quality, the existing design is modified and the ABR will be redesigned to accommodate 7 chambers and an addition of AF in the same structure which will increase the treatment efficiency of the unit.

Planted Gravel Filter

The current area and cross-sectional area of the planted gravel filter does not meet the requirement of BOD loading and hydraulic loading to achieve the expected treatment efficiency. The areas of the filter bed need to be increased in order to meet the loading requirements. This will ensure that the filter media will not get clogged and operational issues such as odor will not be faced by the operator. The filter bed will be modified in order to increase efficiency.

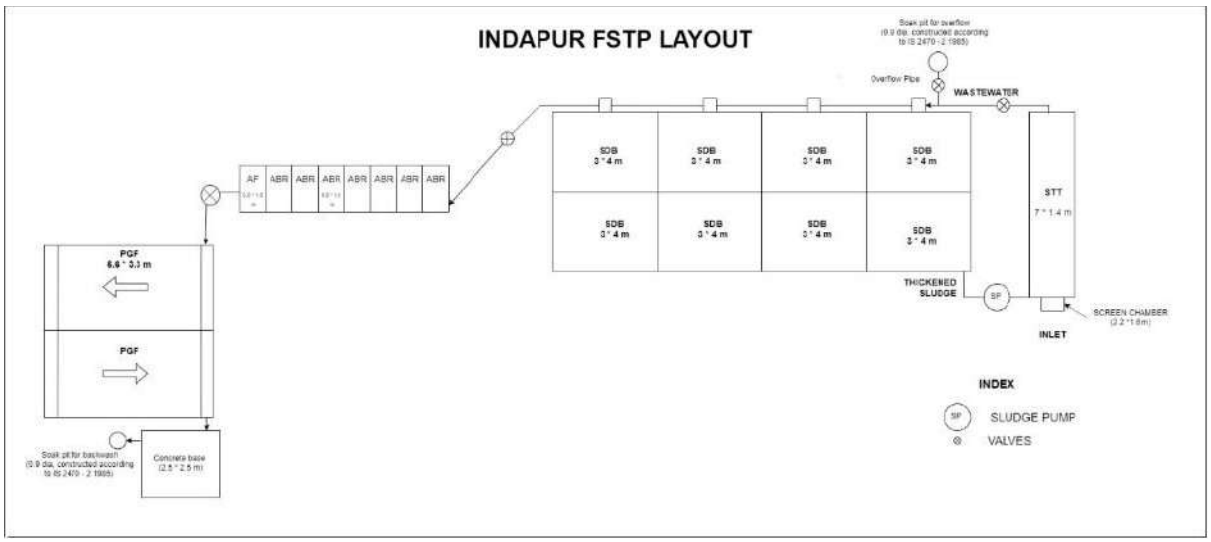


Figure 20: Proposed layout of additional units in Indapur FSTP

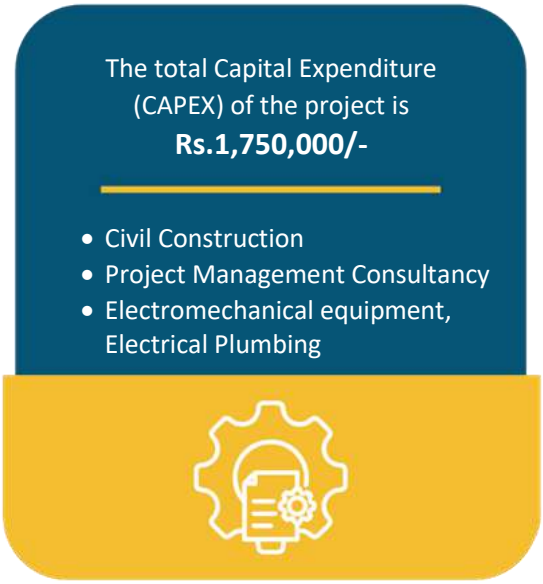
Treatment cycle of the selected technology

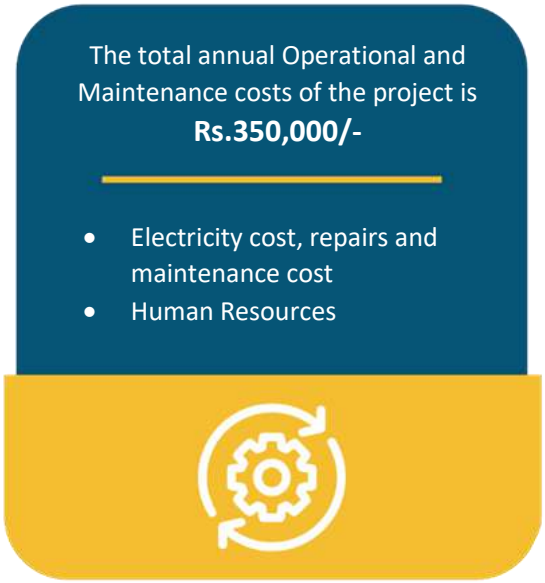
The desludging operator empties the desludging vehicle by connecting it to the treatment facility by using a hose pipe with a cam lock arrangement. The sludge from the screen is transferred to the Settling thickening tank, where the sludge settles at the bottom. The thickened sludge then gets transferred to the SDB with the help of a sludge pump. The wastewater is transferred through the outlet channels of the SDB

to the ABR. An overflow soak pit is provided between the plumbing line connecting STT and SDB. This soak pit functions to divert the wastewater in case of any surpass load. The flow to the soak pit is controlled with the help of valve. The modified design of the ABR has seven ABR chambers and a single chamber Anaerobic up-flow Filter (AF). The wastewater flows through the ABR and AF. Almost 95% of BOD removal rate is achieved due to this combination of seven chamber ABR and an AF. The wastewater after AF flows under gravity to the Planted Gravel Filter (PGF). The PGF is connected in series in order to increase the efficiency of the treatment and to remove the dead zones. The treated water from the PGF is pumped to the Dual Media Filter (DMF) with the help of a water pump. A chlorine dosing is induced inline before transferring it to the treated water tank. Backwash plumbing is provided to the DMF along with a soak pit for backwash water. The expected BOD of the treated water after DMF is less than 10 mg/l.

Project Finances and O&M

IMC has planned to recover OPEX by providing desludging services to the urban and rural households in the adjoining villages. The households will be charged a desludging fee which will cover the OPEX of faecal sludge and septage management facility at Indapur.





Potential Impact

25,515
Population from Indapur City will be catered through FSTP refurbishment

Manage extra load
coming from rural habitants without compromising the quality of treatment

Additional treatment units
To increase the efficiency and quality of treatment.

30,336
Population from 16 villages in Indapur will benefit from refurbishment of Indapur FSTP

9,057
Households from Indapur ULB and 16 villages will benefit from refurbishment of FSTP

Authorized entry to the plant
due to construction of non-treatment units like compound wall discouraging unauthorized entry into the FSTP premise during the non-working hours.

The 10 KLD FSTP will function at its complete capacity and thus will also compliment to establishment of the Urban – Rural Linkages for management of faecal sludge and septage. The refurbishment work will enhance the current treatment process to treat extra load coming from rural habitant (30,336 persons from 16 villages) in addition to the load coming from urban population (25,515 persons as per 2011 census) without compromising the quality of treatment.

Scalability and Sustainability

Under the above-mentioned GR No. SMM 2019/C.R.124/UD-34, for up scaling the construction of FSTPs in all ULBs, 311such FSTPs were to be constructed all over Maharashtra of which more than 200 FSTPs have been constructed. Many such FSTPs constructed are similar to FSTP constructed at Indapur. These FSTP will require further assessment to analyse need for refurbishment to ensure treatment efficiency of the process.

Scalability

The refurbishment model in Indapur can act as a prototype to other FSTPs in Maharashtra. Similar approach for refurbishment can be adopted for all 10 KLD FSTPs which haa been constructed with similar technology. For larger and smaller FSTPs, the treatment unit can be modified considering the BOD removal rate of the treatment units and the achieved efficiency.

Sustainability

With addition of the septage receiving station with a screen and the settling thickening tank, the efficiency of the sludge drying beds and the supernatant treatment system increases significantly. The system will become more robust and can even handle faecal sludge coming from the community toilets.

Way Forward

As further part of the project, a training is scheduled to be provided to the operator and the IMC officials about commissioning, operating, and maintaining the treatment plant. This would ensure smooth functioning of the treatment facility in the future.

Maha Urban INNOWASH Challenge

Implementation of WASH Innovations

Maha Urban INNOWASH Challenge

Urban Water, Environmental Sanitation and Hygiene Innovation Challenge for Infection Prevention and Control.

Maha-UWES-C launched the Urban Water, Environmental Sanitation and Hygiene Innovation Challenge for Infection Prevention and Control (IPC) to support the ULBs and organizations working in alignment with ULBs with innovative ideas to create physical infrastructure/solutions for delivery of services, upgrade value chain of service delivery or provide supplies for WASH and Environmental Sanitation related projects. The objective of the initiative was to provide a time bound financially supported opportunity to ULBs and communities by encouraging local partnerships for ideating and implementing innovations in WASH to create a positive impact in the communities.

The projects under this initiative needed to be localized end-to-end solutions to grass-root challenges or should be a part of an overall system to address grass-root gaps and challenges in the WASH sector. The overall focus of this initiative was to create scalable and replicable infrastructure/models supported by capacity building and human resource management. The project duration was 5 months under this challenge.

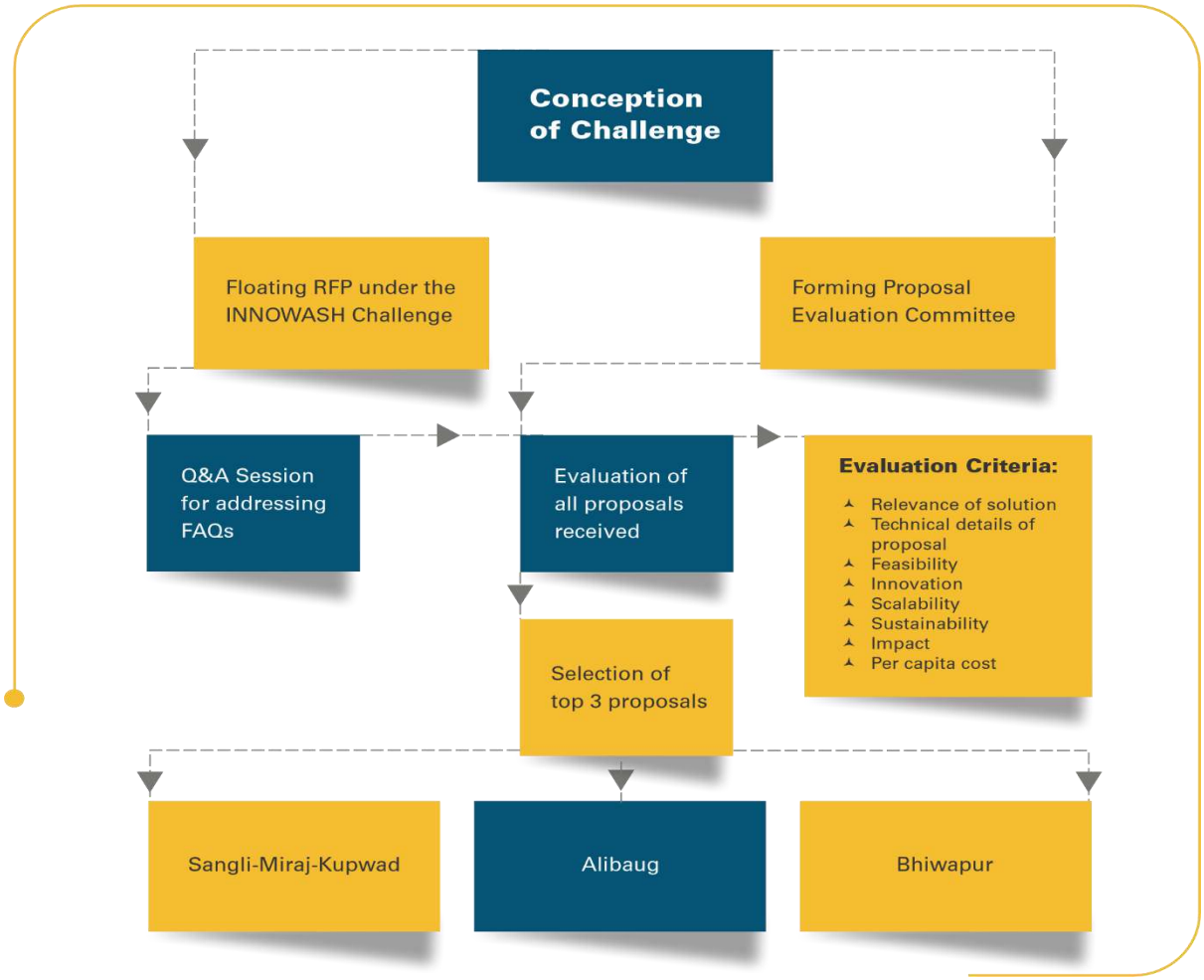
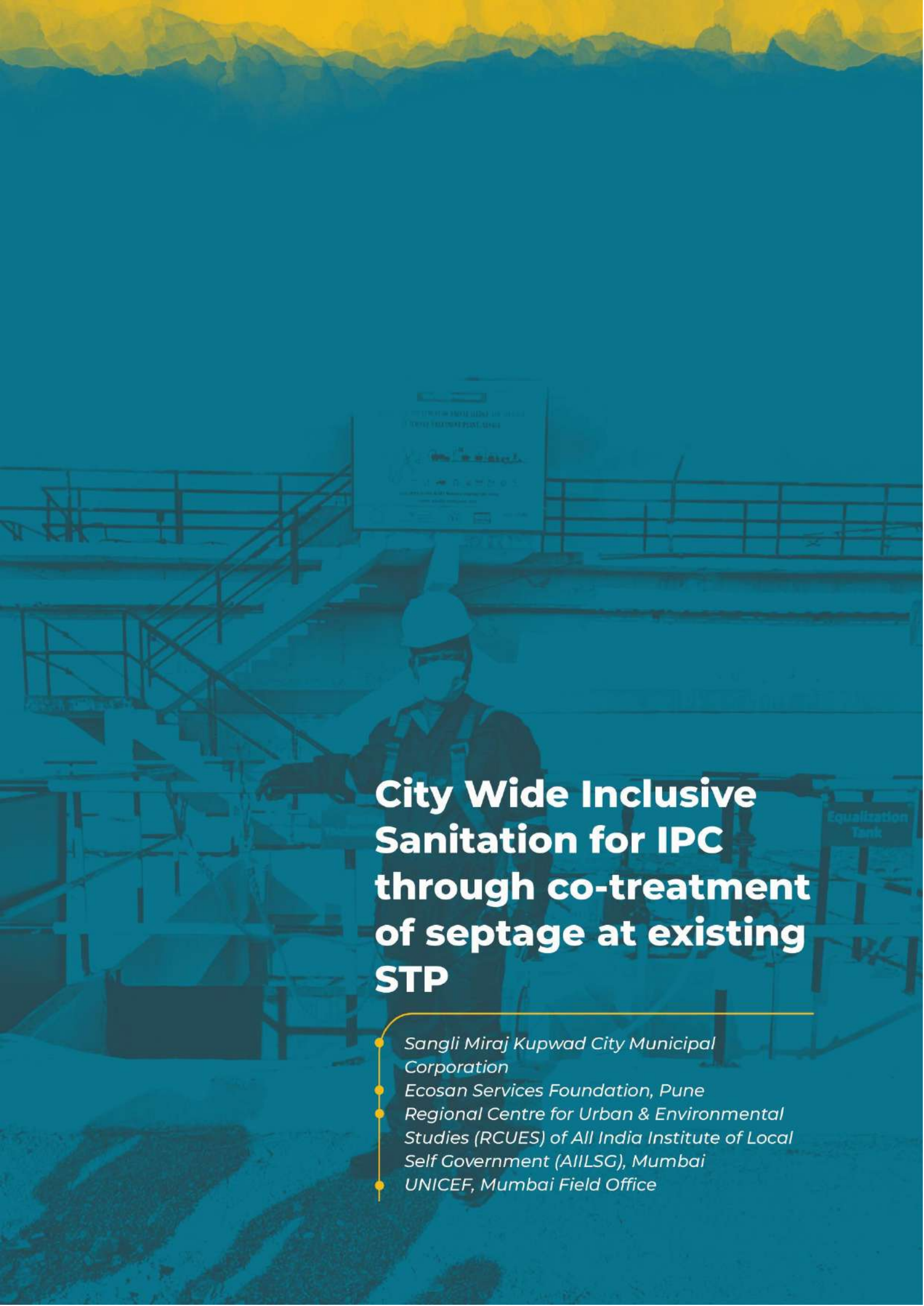


Figure 21: Process flow of RFP selection through Maha Urban INNOWASH Challenge

Under this challenge, a Request for Proposal (RfP) was floated on 26th May 2022 to invite proposals from across Maharashtra. The RFP included detailed description on eligibility criteria, project proposal details, categories for funding, timeline, and evaluation process. Further clarifications to the participants of the challenge were provided via an online Question and Answer Session. Proposals were accepted till 20th June 2022. A total of 11 proposals were received from ULBs and organizations under the RfP. The received proposals were shortlisted and evaluated as per the evaluation criteria (refer Figure 21) finalized by the Proposal Evaluation Committee (PEC), which comprised of representatives from RCUES, UNICEF and Directorate of Municipal Administration. During evaluation, the criteria of feasibility, innovation, sustainability, and potential for replication were given significance. Accordingly, following three proposals were selected for implementation across Maharashtra :

- City Wide Inclusive Sanitation (CWIS) for IPC through co treatment of septage at STP for Sangli Miraj Kupawad City by Ecosan Services Foundation (ESF), Pune with Sangli Miraj Kupawad City Municipal Corporation (SMKCMC)
- Organic Treatment of greywater in open drains for Alibag by The Centre for Applied Research and People's Engagement (CARPE), Aurangabad with Alibag Municipal Council (AMC)
- De-centralized Grey Water Treatment Plant for Bhiwapur by and with Bhiwapur Nagar Panchayat.



City Wide Inclusive Sanitation for IPC through co-treatment of septage at existing STP

Sangli Miraj Kupwad City Municipal Corporation
Ecosan Services Foundation, Pune
Regional Centre for Urban & Environmental Studies (RCUES) of All India Institute of Local Self Government (AIILSG), Mumbai
UNICEF, Mumbai Field Office

Key Project Highlights

A joint proposal was developed for the RFP by Sangli Miraj Kupwad City Municipal Corporation (SMKCMC) in partnership with Ecosan Services Foundation (ESF), Pune for scientific co-treatment of septage at the existing STP at Sangli.

The proposal was selected for implementation based on the feasibility, sustainability and innovation of the project.

A bilateral agreement inclusive of scope of work, timeline and finances of the project was signed on 16th July 2022 between Maha-UWES-C and ESF for implementation.

Excavation and construction activities under the project started in September and were completed by the end of December 2022.

An online monitoring platform was provided by the Maha UWES-C to keep a track of the progress of the project. Online consultations, review meetings and site visits were conducted by the Secretariat team with SMKCMC during the implementation phase of the project.

Capacity building of plant operator was conducted in January 2023 and on 20th January 2023, a formal handover of the newly constructed co-treatment units to the SMKCMC was done.

Sangli-Miraj-Kupwad

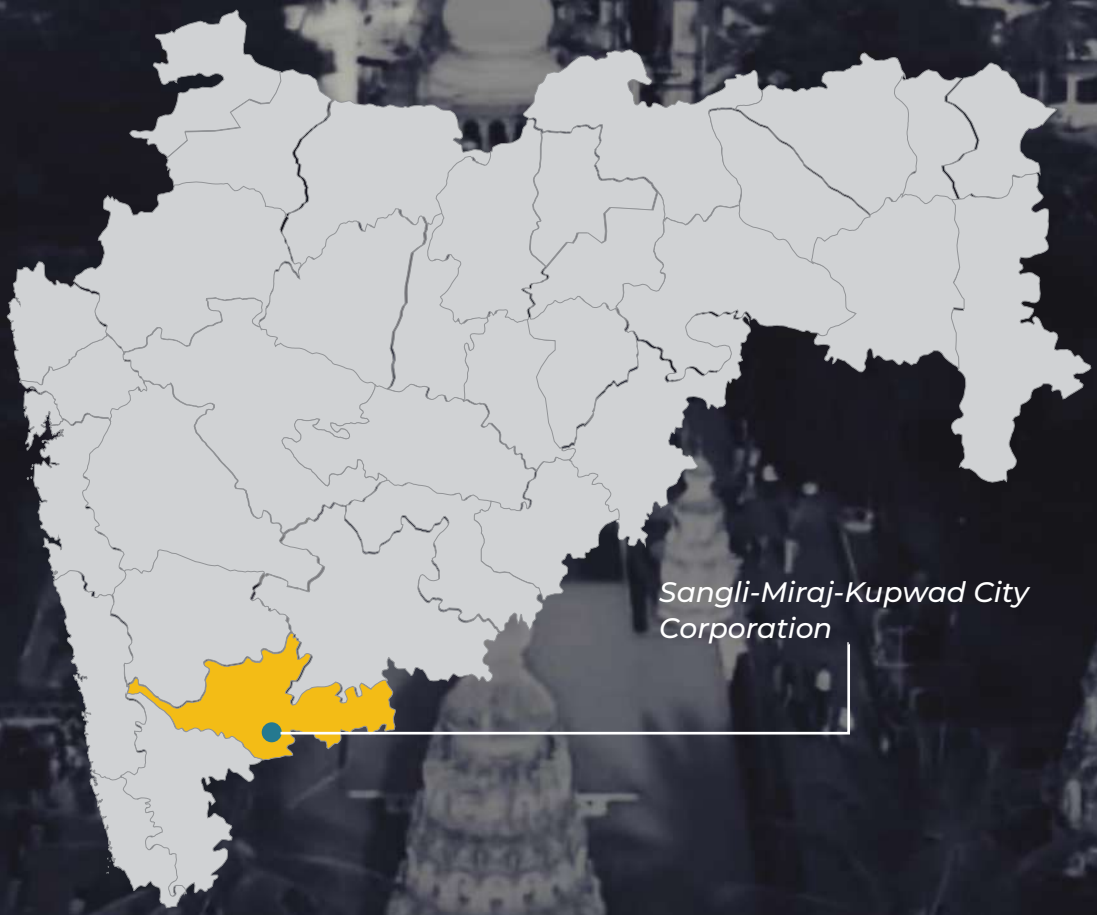
City Profile

5,02,793
Population as per the census of 2011

1,07,914
Households as per Census 2011

118.8
Total Sq. Km area

63%
Coverage of piped sewer network in Sangli city



The sewers and sewage pumping stations overflow due to daily dump of faecal sludge from desludging vehicles. As a result, severe outbreaks of waterborne diseases occurred in 2019 and 2021. The faecal sludge and septage co-treatment unit constructed under the project, supported by Maha-UWES-C, will receive the faecal sludge and septage directly at the STP and thus will prevent emptying of sludge in pumping stations. Consequently, it will reduce the risk of waterborne diseases because of sewer overflow during monsoons.

Context

Sangli has 63% spatial coverage[23] of underground sewer network which transports both, sewage water and stormwater. The sewage from these sewered areas is conveyed through network pipelines to the two STPs within the jurisdiction of SMKCMC. The non-sewered areas in the city have individual household toilets as well as community and public toilets connected to containment units such as septic tanks. The faecal sludge and septage from these containment systems is conveyed by vacuum trucks to the Sewage Pumping Stations (SPS).

One of the STPs in the city was commissioned at Hanuman Nagar in 2018 for a design capacity of 23.5 MLD with C-Tech Sequential Batch Reactor (SBR) based treatment system. The current utilization of this STP is about 12-13 MLD. The sewer network conveying sewage to this STP has 2 existing and 1 planned Sewage Pumping Station. Out of 10 vacuum desludging vehicles owned by the Sangli Miraj Kupwad City Municipal Corporation (SMKCMC), 4 are dedicated for desludging the containment systems in the non-sewered areas of Sangli city. On an average, daily 8-10 trips are made to empty the faecal sludge and septage from these areas into the SPS nearest to the Hanuman Nagar STP.

[23] Performance Assessment System (PAS), 2020-21, Overview Sangli

Need for the project

The desludging vehicles dumped the collected septage from households and from community and public toilets directly into the last pumping station without any screening or grit removal. From here, septage was transported to the STP for co-treatment. As the septage added into the STP was not screened and digested, this unscientific approach posed risks to the operation of the existing parts of the STP as well as drastically increased the biological parameters of the effluent. Along with this, the floods of 2019 and 2021 caused overflow of sewers and sewage pumping stations resulting in severe outbreak of water borne diseases.

SWOT analysis of the existing practice of septage treatment in the STP was carried out by Ecosan Services Foundation (ESF), Pune and it was found that threats were much higher. Hence, a need to treat the high amount of incoming fresh septage in the STP was realized. Case study analysis of previous attempts in addressing similar septage treatment problems was done. For Sangli, a scientific septage and sludge co-treatment unit for pre-treatment of the received septage was proposed by ESF with SMKCMC based on Septage Treatment Plant (SeTP) constructed in Mangalghat, Puri in the year 2017 for cotreatment of septage.

Intervention

The proposed intervention was to construct a scientifically designed septage receiving station to decant faecal sludge and septage at the existing STP and to construct an additional co-treatment unit to safely pre-treat and separate the solid and liquid streams of incoming faecal sludge and septage for further treatment within the existing SBR units of the STP.

Feasibility Assessment

With the consent from SMKCMC, a pre-feasibility study was conducted by ESF to assess if the project can be implemented and will cater to the needs, before submitting the proposal. This included collection and testing of the faecal sludge samples that were directly added into the STP from the sewage pumping station without any pre-treatment. The tests showed that the samples contained very high volatile organic content. Once the presence of high volatile organics was confirmed, tests were carried out to check whether a co-treatment facility in the STP will mitigate the risks of emptying faecal sludge and septage into the SPS and benefit the operation and management of the existing STP. Parameters like sludge generation in the STP, oxygen requirement and solid retention time were tested as well as a scenario where the STP is provided with additional co-treatment unit for pre-treating the incoming sludge was tested.

Table 5: Feasibility Check

Parameter	Design Limit (based on capacity of STP as per CPHEEO)	Direct addition of sludge in liquid stream	After co-treatment	Feasibility check
Sludge Generation (cum/hr)	≤ 16.85	21.64	10.58	Satisfied
Solids retention time (hrs)	≥ 17.44	13.58	27.17	Satisfied
Oxygen requirement (KgO2)	≤ 6909	8874	4338	Satisfied

The pre-feasibility studies showed that the STP can safely treat the FSS with existing aeration and sludge handling arrangement in SBR, only if pre-treatment is provided. The unit was found to be beneficial to the STP rather than adversely affecting the existing sewage treatment. These results were presented to the SMKCMC and the corporation with consultations from ESF, realized the need to scientifically treat the septage in the existing STP. As the construction of FSTP to treat sludge and septage would be cost intensive, an alternative option of co-treating the septage at the STP with nominal infrastructure additions was agreed considering its feasibility and cost-effective nature. Hence, a non-financial commitment agreement was signed between the SMKCMC and ESF to carry out the CWIS for IPC through co-treatment of septage at STP. Following the agreement, a proposal for construction and installation of a 50 KLD capacity septage and sludge co-treatment unit inclusive of need, innovation, technology, and finances of the project was developed by ESF in partnership with SMKCMC and was submitted to the Secretariat of Maha-UWES-C under the Maha Urban INNOWASH Challenge.

Based on feasibility, sustainability and innovation of the project, this proposal was one of the selected projects by the Secretariat for implementation under the INNOWASH Challenge. Under the challenge, this project was granted a total funding of Rs. 2.98 million, 70% of this amount was allotted as capital cost.

Project Execution

Detailed Assessment

Upon selection of proposal for implementation, detailed site assessment was carried out as a first step of the project. This included capacity assessment of the existing units of the STP and a site suitability assessment to select the best location for construction of the co-treatment units. The capacity assessment results showed that the existing equipment is capable of separate treatment of thickened sludge.

In view of the site suitability assessment and site investigation results, the proposed site near the sludge dump was found suitable and was finalized for construction of the co-treatment units.

Figure 22: Lineout for Co Treatment Units

Figure 23: Construction of the co-treatment units at the STP

Design and Construction

On finalization of the site, designs of the co-treatment units, viz., a receiving station, screens, high-rate digester, settling thickening tank and an equalization tank were developed. Following that, a contractor was selected through SMKCMC's tender process for construction activities and the construction commenced in September 2022. Construction activities were mainly divided into three phases: site cleaning and layout marking, excavation and stagewise casting and concreting. Procurement of goods required during the construction activities and for installation of the co-treatment units was done simultaneously. A third-party quality check/quality assurance of concrete and castings was conducted, and the results were found to be satisfactory. On 1st November 2022, the Secretariat, Maha WASH ES-C conducted a site visit to review the progress of the entire project. Discussions and consultations with SMKCMC and ESF, Pune were done to understand the on-ground challenges faced and measures taken up to overcome them.

Figure 24: Mid-construction stage at Co treatment Plant

After the construction and installation of co-treatment units, the STP operators were trained by ESF to run the co-treatment units. PPE kits were also provided to the operators to ensure safe handling of faecal

sludge and septage. Following the training, the co-treatment unit at the Hanuman Nagar STP was formally handed over to the SMKCMC on 20th January 2023. The event gained traction through media coverage.

Figure 25: Training by ESF to STP operators

Technology

A co-treatment facility of 50 KLD has been designed to pre-treat faecal sludge and septage at the existing STP. The objective of this co-treatment facility is to facilitate pretreatment of sludge and separation of solid-liquid before further treatment at the STP. The main components of this co-treatment facility are a high-rate digester (HRD), Settling Thickening Tank (STT) and an equalization tank. The liquid fraction from the equalization tank is pumped into the STP for further treatment and the solids (sludge) are sent to the centrifuge units where further dewatering of sludge takes place. The design calculation and construction of the co-treatment unit has been done assuming sewage and septage dump from an average of 10-12 trips daily by the desludging vehicle from the non-sewered areas and community and public toilets. However, currently, there is an average demand for about 8 trips in Sangli city and the STP is operational for 24 hours. Hence the co-treatment units are designed such that they can handle higher sludge intake making this a resilient technology.

Technology Process Flow

The co-treatment is facilitated using the existing equipment along with newly introduced units viz., manual screen, high-rate digester, settling thickening tank and equalization tank. These units have been integrated in the existing treatment chain.

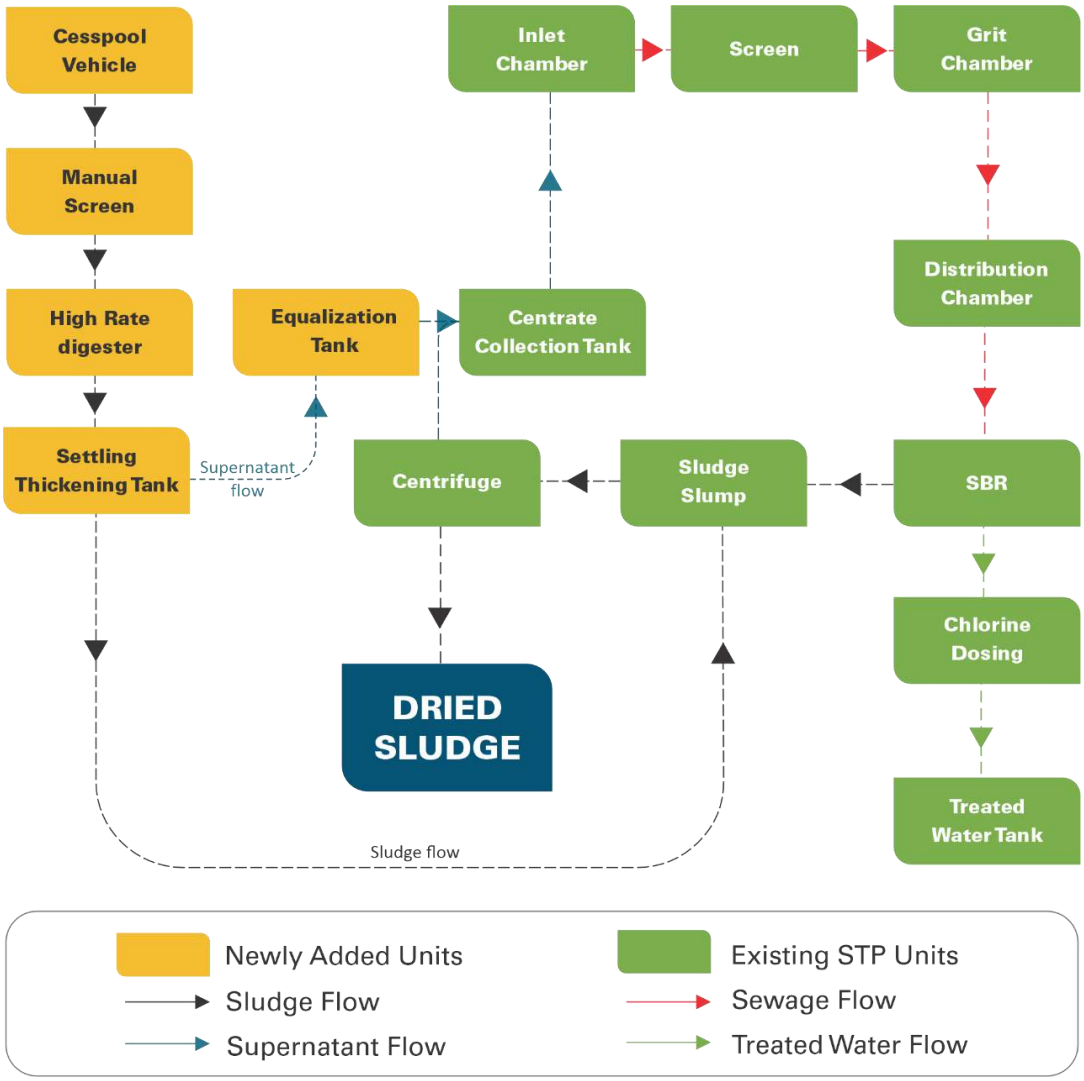


Figure 26: Technology Process Flow Diagram with existing Treatment Chain and added Co-treatment Units

The Co-treatment is divided further into primary and secondary treatment. Primary treatment is provided through screening arrangements at the receiving station.

- **Septage Receiving Station:** A receiving station is provided to accept the sludge and ensure controlled addition of sludge to the sewage and co-treatment unit. The screening arrangement at this station removes solid trash (sanitary napkins, clothes, rags, plastic bags, etc.).

Secondary treatment is done through following components:

- **High-Rate Digester:** A HRD is provided to facilitate the mixing of raw sludge with septage and thus, creates a homogeneous environment for digestion.
- **Settling Thickening Tank:** The solid-liquid separation of septage in co-treatment is proposed through STT. STTs rely on three fundamental mechanisms viz – settling, thickening and floatation. Lamella media is also provided in the STT. Lamella media makes the system robust against shock loads or increased suspended solids content.

- **Equalization Tank:** Equalization tank in the co-treatment unit is provided to ensure safe transfer of supernatant to the centrate collection tank. After solid-liquid separation in the STT, most of the solids settle down in the tank. The supernatant is allowed to overflow through launders of the lamella plates and is collected in this equalization tank. A pump is provided in the equalization tank to transfer the supernatant in the centrate collection tank.
- **Centrifuge:** The thickened sludge from STT has high water content and requires further dewatering. Thus, centrifuge becomes a crucial unit in the co-treatment to dewater thickened sludge. The existing STP at Hanuman Nagar has two centrifuge units and each unit is of 30 cum/hr capacity.

Figure 27: Newly added Secondary Co-Treatment units

Challenges in Execution

Major challenges faced during construction phase were high groundwater flow and existing footing. Along with this, frequent landslides were another challenge as the STP location was earlier used as an oxidation pond (results of site investigation assessment). Techniques such as scaffolding, mud pump and multiple reinforcements during construction activities were used to overcome these challenges.

Figure 28: Scaffolding to address landslide and waterlogging on site

Innovation:

Scientific co-treatment of faecal sludge in an STP

- A pilot initiative in the state of Maharashtra where faecal sludge and septage is received, pre-treated and channeled for further treatment at a dedicated unit that has been designed and installed as a component of the STP.
- Integration of new units within the existing infrastructure for optimum resource utilization.
- Co-treatment facility provided addressed the third and fourth component of FSSM sanitation chain viz- treatment and disposal.

Project Finances and O&M

The total project cost is

₹ 2,986,816/-

- Excavation costs
- Construction costs
- Supply and installation of electromechanical equipment
- Technical and project management

The total annual Operational and Maintenance costs of the project is

₹ 230,000/-

- Electricity costs to run the additional co-treatment units.
- Human Resources (additional pert payment)

The total project cost was funded by the Secretariat, Maha UWES-C under the Maha INNOWASH Challenge. There are no private desludging operators in SMKCMC and the corporation charges INR 600/- per trip. As a result, the corporation generates a revenue of INR 720,000 per year (considering 300 working days in a year). The O&M costs incurred here can thus be recovered through desludging fees and hence no additional funds will be required to run the co-treatment units. The implementation cost for this project is ₹ 14.78 per capita.

Under the guidelines of SBM 2.0, treatment of sewerage and septage in STP has been included. This project can be used as a prototype to scientifically cotreat septage in STP without putting the existing STP at risk. ULSBs can mobilize the funds available under SBM 2.0 for implementing this scientific cotreatment.

Potential Impact

More than ***150,000 urban population (74,300 females)*** (approximately 30,000 households) residing in the non-sewered areas of Sangli city are directly benefited with improved sanitation services through FSSM because of scientific co-treatment at existing STP.

Prevention of sewer overflow during monsoon with discontinuation in emptying of untreated sludge into pumping station will control disease outbreak and lead to infection prevention and control.

Regular demand-based desludging of septic tank encouraged through promotion of FSSM will ***reduce groundwater pollution*** and induce Infection Prevention and Control measures against water borne diseases.

Reduced oxygen demand and volume of sludge generation has direct reduced CO_2 and Methane emissions. Together with energy savings at existing SPS and STP, the annual ***reduction in GHG emissions***[5] ***is 39,889.96 Kg CO2***[24].

Direct emptying of faecal sludge into the new co-treatment unit will not only safeguard sewerage appurtenances and STP but also will cause optimal use of existing STP at a fractional capital cost in comparison to the investment involved in construction of an FSTP. Consequently, there is a ***total capital saving of INR 10 million.***

Reduced hydraulic load on flow pump at Sewage Pumping Station and reduced operation time of oxygen blower and sludge pump at the existing STP after the operationalization of the Co-Treatment unit leads to annual electrical ***energy savings of approximately Rs. 900,000.***

Scalability and Sustainability

SBM 2.0 highlights safe handling and scientific treatment of faecal sludge and septage in rural and urban areas. This can be achieved by co-treating fecal sludge in the existing STP/FSTP or by constructing a new FSTP.

However, using this technology, cities that have an STP in their jurisdiction or within a close radius of 10-15kms with a non-sewered network and with high demand of desludging can scientifically co-treat the fecal sludge in their existing STP. Additionally, this will address the issue of safe handling of septage from rural areas as the underutilized STPs with co-treatment units can take septage from nearby rural areas via Urban-Rural linkages.

[24] CO2 avg of emission factors combined margin for last 5 years 2016-2022, CEA CO2 emission factor database, version 18 (Government of India), http://www.cea.nic.in/reports/planning/cdm_co2/cdm_co2.htm

Scalability

The 50 KLD co-treatment unit installed is being constructed in a modular design which can be replicated in similar capacity as well as larger capacity as per the requirement and land availability. SMKCMC is replicating the model at 22.5 MLD STP at Miraj city which receives only 8 MLD sewage daily, on trial basis.

Sustainability

New infrastructure unit constructed at the STP is such that it requires minimum pumping and can be easily operated and monitored by the same STP operator at existing capacity. The additional cost of O&M per month is low (approx. Rs. 20,000/month) and cleaning and maintenance of the installed screens and other co-treatment units is easy. Hence it ensures long-term sustainability of the project.


पुढारी

राज्यातील पहिला शास्त्रोक्त मल:निस्सारण प्रकल्प हस्तांतर

महापालिकेची दीड कोटींची बचत : वक्षिसाच्या ३० लाखांतून साकारला प्रकल्प

महापालिकेतून

राजकीय ने

Sangli Miraj Kupawad has a total population of about 6,00,000 and is a semi-urban area. About 1,00,000 population of Sangli is not connected to underground sewerage system and handling this septage was a major challenge. Construction of a new FSTP would have costed a capital investment of about Rs. 1 Cr. The co-treatment units of 50 KLD capacity installed at the existing STP now help in mitigating this problem by scientifically treating the sewage and septage in the existing units of the STP.

— Smt. Smriti Patil, Deputy Municipal Commissioner

The co-treatment units installed at Sangli were constructed by Ecosan Services Foundation, Pune with support from Maha-UWES-C and UNICEF, Mumbai Field Office. We are honored that Sangli was selected as one of the intervention sites under the Maha-INNOWASH Challenge. We, at Sangli Miraj Kupwad City Municipal Corporation, always strive to implement long term and sustainable solutions and the project, scientific co-treatment of septage, aligned with our vision. Constant support from all the partners and stakeholders involved in this project helped in completion and commissioning of the treatment units in a short period. Design, technology and construction of the newly added co-treatment units has been done very efficiently. Handling the septage scientifically was one of the major issues in Sangli and we are glad to have found a sustainable solution for the same.

— Dr. Taate, Health Officer – Sangli Miraj Kupwad City Municipal Corporation

Organic Treatment of Greywater in Open Drains

- *Alibag Municipal Council*
- *Centre for Applied Research and People's Engagement (CARPE), Aurangabad*
- *Regional Centre for Urban & Environmental Studies (RCUES) of All India Institute of Local Self-Government (AIILSG), Mumbai*
- *UNICEF, Mumbai Field Office*

Key Project Highlights

A joint proposal was developed and submitted by Alibag Municipal Council in partnership with and with technical consultation from CARPE for organic treatment of greywater.

The proposal was selected for implementation based on the criteria of: innovation, sustainability and environmentally safe solution.

A bilateral agreement inclusive of scope of work, timeline and finances of the project was signed on 16th July 2022 between the Maha-UWES-C and CARPE for implementation.

Under the project, site assessment and finalization, and design finalization was initiated by August 2022 and was completed by November 2022. Procurement of sensors began in November 2022.

An online monitoring platform was provided by Maha UWES-C to keep a track of the progress of the project. Online consultations, review meetings and site visits were conducted by the Secretariat team during the implementation phase of the project.

Installation of sensors and monitoring stations at the site was completed by January 2023 and the organic treatment of grey water began in February 2023.

Alibag

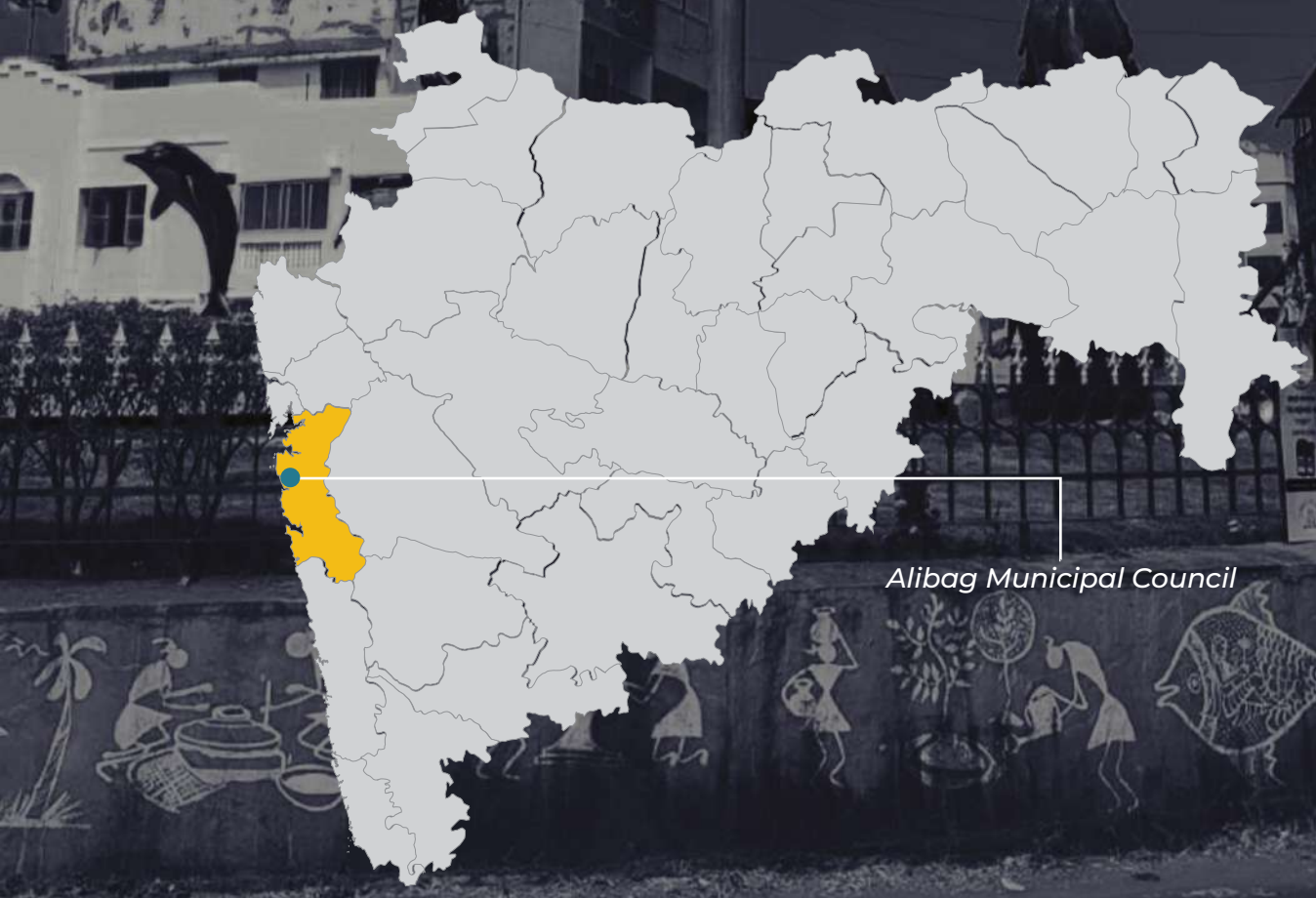
City Profile

20743
Population as per the census of 2011

4612
Households in Alibag town as per Census 2011

1.81
Total Sq. Km area

13
Km open drainage system in the city



Sewage conveyance and treatment through cost intensive underground network and STP infrastructure was deemed to be challenging in Alibag due to the geology. Open drains that carry wastewater flow into ecologically sensitive marine and mangrove ecosystems were posing severe environmental risks. Organic treatment of wastewater in these open drains under the project, supported by Maha-UWES-C, not only reduces environmental risks of untreated grey water but also work towards infection prevention and control by limiting growth of pathogens.

Context

Alibag is situated in a low-lying coastal area with an elevation of 1 m above mean sea level. The town has a high sub-surface water table which makes it difficult to construct an underground sewer network. High sub-surface water level also poses a threat of seepage. All the toilets in the city are connected to on-site containment systems. The septage from these containment units is treated at the FSTP of 5KLD capacity whereas the overflow supernatant is sent into open drains. Greywater and supernatant sullage from the buildings is carried along with other organic and inorganic liquid waste through these open drains into estuarine mangroves near coastline. Additionally, construction and demolition (C&D) waste and littering waste is also dumped into these drains.

The open drains form a visual nuisance for the residents as well as tourists and give off pungent smell because of hydrogen sulphide and ammonia emerging from uncontrolled microbial activity.

Need for the Project

Within the existing 5KLD FSTP, the septage from the containment systems is safely treated but the grey water flows through the open drains. Since these drains convey untreated organic matter, the drains carry highly infectious pathogens, bacteria and fungi. Consequently, these drains pose a threat of pathogen contamination during monsoons due to lack of a treatment facility to treat this liquid wastewater. Uncontrolled microbial activity in these drains also result in odor related health issues among the residents.

These drains flow into the Arabian sea and coastal mangrove belts posing a threat to the adjoining marine ecosystem and mangrove habitat.

Discussions with the officials from Alibag Municipal Council (AMC) also revealed that the proposal for construction of STP and an underground sewer network has been approved but the project is extremely cost intensive and has low feasibility considering the geography of Alibag. The overall implementation would be challenging in terms of funds and execution. Thus, an innovative technology was needed to treat greywater flowing into the open drains.

CARPE had carried out a similar pilot exercise in Aurangabad in collaboration with Innovative Eco-Care (IEC), Ahmedabad to treat water flow in a natural drainage channel using non-toxic organics and microbes in 2022. The pilot run resulted in improved water quality in the drainage channel and the same has been recommended for grey water treatment in Alibag.

Intervention

The proposed intervention introduction of a simple modular apparatus to treat wastewater flow in an open drain using both, non-toxic pH control mechanism and an inoculum of microorganisms, to form a secondary culture followed by settling of digestible solids before releasing treated water into the ecologically sensitive environment.

Feasibility Assessment

Following a preliminary discussion with CARPE and IEC, AMC requested CARPE to conduct a feasibility study for implementation of organic treatment technology in the open drains of Ailbag. As per the assessment, few big and small open drains of the city were in alignment with the main requirements to implement the proposed organic treatment in open drains.

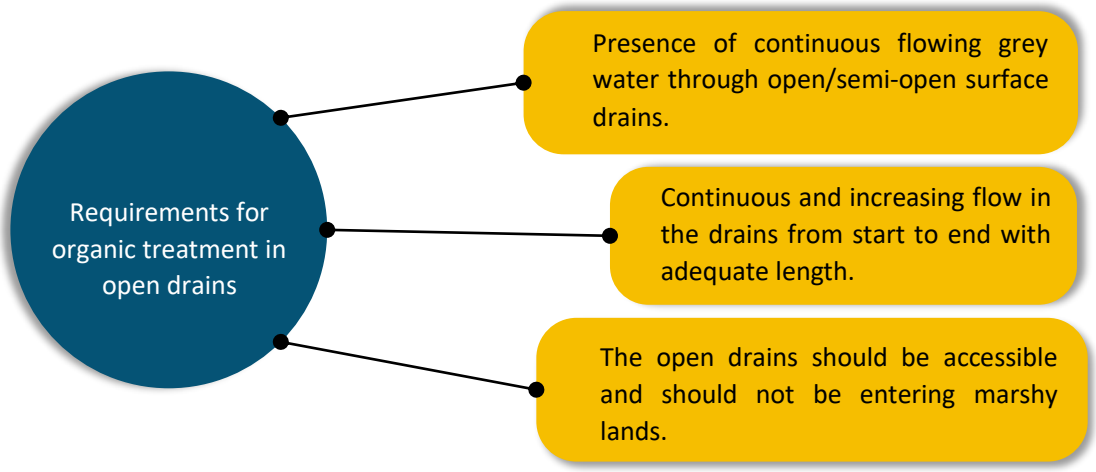


Figure 29: Requirements for organic treatment in open drains

Based on this assessment, a proposal was submitted to the Maha Urban INNOWASH Challenge by CARPE with IEC and AMC for greywater treatment. The proposal for Alibag was selected based on innovation,

potential for replicability and feasibility. A total funding of Rs. 3.14 million was granted to the project; 70% of this total amount was allotted as capital cost.

Project Execution

Detailed Assessment

A citizen survey was conducted in October 2022 to understand the impacts of non-treated greywater flowing through open drains on residents. A detailed assessment of four different open drains was conducted in September 2022 by CARPE in consultation with AMC to determine appropriate site for intervention. The drain that perfectly fits the requirements of the intervention is about 2km long and the treatment was proposed to be conducted over a stretch of 600m of the total length of the drain. The treatment is proposed to start at Shivaji Circle and end near Sanman Hotel where the open drain meets a mangrove which eventually ends up in the sea.

Figure 30: Map location of selected drain in Alibag

The drain under assessment collects sullage and greywater from Tilak Road area. As per the citizen survey, the selected drain is a source of mosquitoes and foul smell and thus, poses a serious threat to the health of the residents. After finalization of the site, detailed design of the dosing station was developed in November 2022 and measurements were taken for manufacturing of modules by the end of November 2022.

Procurement, Assembling and Installation

The dosing station that encases the organic solution and the microbe booster was manufactured at a local vendor facility. Sensors required for monitoring the stations were procured from Atlas, a USA based company by November 2022. The design and instrumentation of the entire system was done by the IEC team. Organics, viz., wholesome, Inno-care, Aquachill and Eco-clean[25] (herbal infusion) for the dosing stations were procured in December 2022 by Innovation Eco-Care as per the requirements. After the completion of the procurement of dosing station, sensors and organics, began the assembling of the system on ground in December 2022. A site visit by the Secretariat, Maha UWES-C team was conducted in November 2022 to assess and review the overall progress of the project. A meeting was organized with CO of Alibag along with CARPE and IEC team to understand the ground challenges and assess the project progress in terms of implementation.

[25] Innovative Eco-Care (IEC), Material Safety Data Sheet, https://iec-biotech.com/resource

Figure 31: Component Installation

Project Completion

The dosing station and monitoring stations were installed and connected to a control panel by January 2023. After installation of all the units, raw data of the greywater flowing in the open drains was monitored. Based on this raw data, the dosing of the organics was finalized and treatment started by mid-February 2023. Usually, in such systems, the readings stabilize over a period of two months. An official handover of the project will take place once the readings stabilize.

Technology

The treatment will take place for over a length of 600m out of 2km stretch of the selected open drain. The treatment system consists of one dosing station to add organics into the greywater and two monitoring stations: one used to monitor pre-treatment parameters (installed at the inlet of the open drain near the Shivaji Circle) and the other for post treatment parameters (installed at the outlet of the open drain near Alibag Beach). The two monitoring stations installed at the start and at the end of the open drain help in creating a feedback loop for the system. All the parameters measured will be stored using cloud-based systems accessed through handheld devices like Smartphones. With use of IoT interface, parameters can be monitored to get timely inputs on the current scenarios.

The sensors in the monitoring stations are centrally connected through a control panel. The control panel design and electrical diagrams are prepared specifically considering the requirements of the project. Since the system is completely automated, the feedback from sensors is transmitted to the motherboard of the control panel and the corresponding changes are made in the dosing pattern.

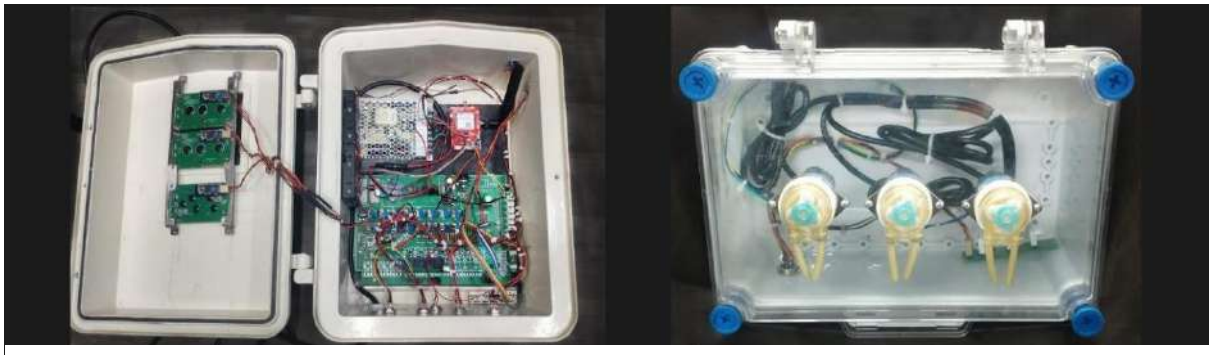


Figure 32: Sensors for parameter readings and dosing

Table 6: Readings for grey water at pre and post treatment

Particulars	Unit	Pre-Dosing		Immediately Post-Dosing		Post Treatment	
		Low	High	Low	High	Low	High
pH		6.0	11.0	6.5	7.5	6.0	8.0
TDS	ppm	100	600	100	500	500	800
EC	µS/cm	200	800	200	1000	1000	1600
DO	% Saturation	10	110	10	110	85	110
Turbidity	NTU	70	90	70	90	30	40
Temp	Centigrade	23	27	23	27	23	27

The data shown in Table 6 is taken over a period of 10 days. All parameters show very heavy fluctuations throughout the day which can be related to load of grey-water inflow, time of day, temperature, etc. Because of these high fluctuations, the readings have been reported as range of values with mean of highs and mean of lows.

In the data shown in Table 6, we see stabilization of pH values from 6.0 to 8.0 post treatment and decrease in turbidity from the range of 70-90 NTU to 30-40 NTU. It is important to note the change in dissolved oxygen (DO) figures from a low 10% and high 110 % at pre-dosing to a consistent range of 85%-110% after treatment.

Technology Process Flow

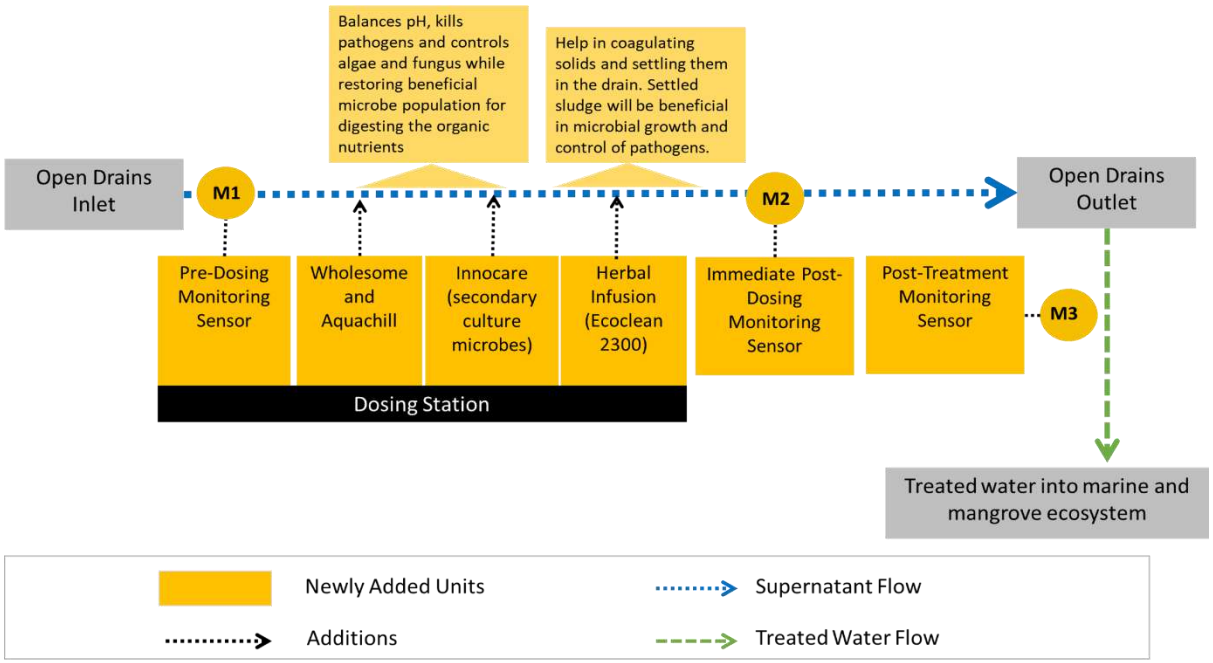


Figure 33: Technology Process flow diagram

A solution of Wholesome (organic sulphur) and Aquachill is added to the inflowing greywater in the drain from the dosing station. This solution helps in balancing the pH and controlling the growth of algae, bacteria and fungi which in turn improves the concentration of dissolved oxygen and increases penetration of sunlight in flowing water.

Simultaneously, a secondary culture prepared using Innocare, local soil and jaggery is added into the greywater from the same dosing station. This secondary culture improves the microbial profile in the open drain required for digestion of remaining nutrients in the wastewater. The secondary culture added will transform a few hundred liters of grey water into a brewing media of microorganisms which will then treat the rest of the grey water that encounters it. Hence the secondary culture added will create an inoculation of microorganisms which treats increasing volume of greywater.

An herbal solution of Eco-clean 2300 is added simultaneously to the greywater. The herbal infusion will help in coagulating the solids that are formed along the treatment in the open drain. These settled solids support in microbial growth of organisms and control the growth of pathogens.

The sensors installed can measure greywater parameters such as dissolved oxygen, turbidity, electrical conductivity, total dissolved solids and pH whereas it can also measure ambient air parameters like ambient temperature, relative humidity, absolute humidity, barometric pressure etc. The sensors also gauge the diurnal flow rate at different times of the day. At the start of the open drain, the flow rate is comparatively low (1-10 L/min) and gradually increases (1000L/min) towards the end of the open drain.

Challenges in Execution

As a pilot project, site selection for organic treatment was challenging. For this, different open drains were assessed and the best suited open drain for the treatment was selected for implementation. This assessment will be a reference for replicating this treatment over different open drains in Alibag.

Another challenge was to gauge the flow of greywater in the open drains. The flow-rate of water is the principal factor for determining the quantity and the concentration of organic solution. Thus, several trial runs were done to understand the flow-rate pattern of the selected drain.

Innovation:

The most innovative aspect of the technology is the use of sludge and waste-matter in the open drain as a medium for culturing beneficial organisms and increasing their diversity and population. Higher load of such microbes will transform the rest of the contaminated water in contact with it into a flowing culture for further treatment. The technology hence has an innovative approach to treat greywater through:

- Beneficial microorganisms for creating a snowballing effect.
- Automated system with cloud-based data collection
- Feedback communication loops for real time adjustment of volumes of treatment solutions

Project Finances and O&M

The total project cost is

₹ 3,146,200/-

- Design and Procurement of dosing stations, sensor cables, monitoring units and peristaltic pumps.
- Organics required for treatment
- Technical and project management support

The total annual Operational and Maintenance costs of the project is

₹ 204,407/-

- Cost of organics
- Energy costs
- Maintenance of mechanical and electrical components of the dosing and monitoring stations

This organic treatment system can handle greywater flow from 1L/min to up to 1000 L/min. The flow rate of greywater in the open drain where the treatment takes place is about 5 L/min. The cost of treatment of greywater based on the dosing of organics will decrease with the increase in quantum of greywater as well as the length of the drain. Additionally, AMC will seek CER support from nearby industries for long-term operations of the entire treatment system. The implementation cost per capita, ₹ 179 per capita, will further decrease if the organic treatment is implemented across the entire city.

Potential Impact

	Approximately 8000 residents and 2500 daily tourists are benefited in the area where the project has been implemented. The benefits include: reduced odor, reduced pathogen exposure and mosquito breeding due to organic treatment.
	Improvement in pH, dissolved oxygen levels and reduction in algae in the water of the open drain will limit pollution and will help in protecting the marine and mangrove ecosystems in which the drain flows. With a reduction in COD of 67%, the installed system leads to annual GHG reduction[5] equivalent to 3070 KG CO_2.

Scalability and Sustainability

As per the SBM 2.0 guidelines, no untreated used water (wastewater including grey water, sullage and sewage) should be released into the environment. Accordingly, this organic treatment system is being implemented in Alibag to treat organic greywater flowing through open drains. However, it is important to note that this treatment system can be easily replicated in cities with major coverage of on-site faecal matter containment systems like septic tanks rather than the areas that have conventional sewer systems.

Scalability

The technology is easily modifiable for replication in any other open drain which fulfills the flow rate criteria of this system. The nature of the technology makes it a viable alternative to expensive conventional infrastructure for treatment of greywater and sullage. It is an easy to adopt wastewater treatment system for low-lying coastal towns and villages in India.

Sustainability

The IoT based feedback loop system enables the set up to handle higher volumes of greywater and shock loads. Use of easy to procure organics and microbe culture and a monitoring system that can be adapted to solar energy makes the technology sustainable. The treated greywater is environmentally safe and contributes to a healthy and sustainable ecology.

Alibag City needs a cost-effective and operation efficient intervention for managing grey water situation. The current proposed centralized STP is a very capital-intensive project. Also, considering the geography of the city, it does not completely fit in all the criteria required for construction.

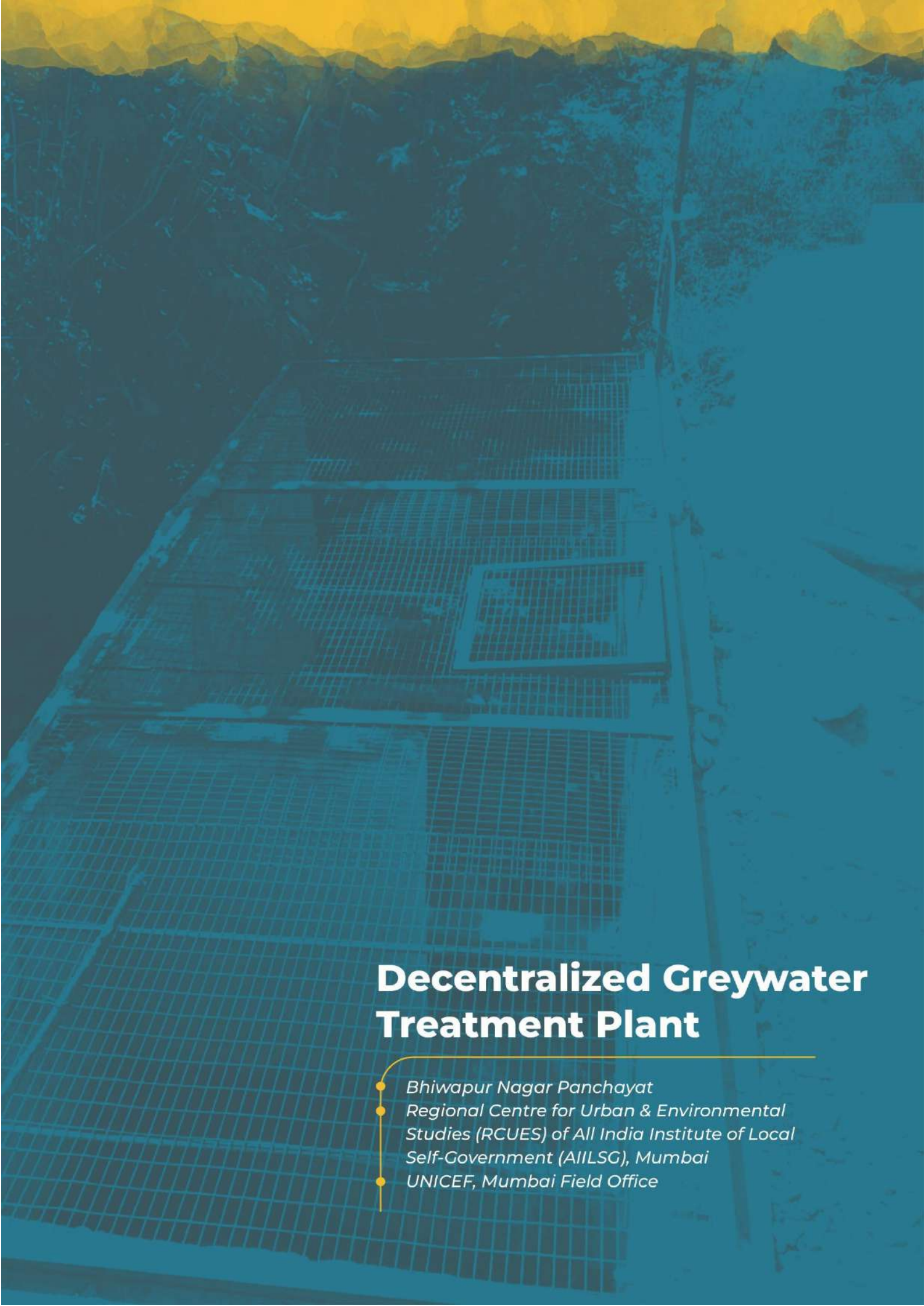
The solution being executed under this pilot Drain Treatment project by CARPE as part of the Maha INNO-WASH Challenge is extremely innovative. The early results show it as a solution to a major sanitation, health and environmental challenge in the open drain. The technology put together for this project is cutting-edge and the integrated dashboard facilitates easy monitoring, management and reporting.

Given similar trends across Raigad district, the project also has immense scope for replication. We will aim to scale this model for the entire Alibag city and will hope to see adoption in other geographies as well.

— Ms. Angai Salunkhe, Chief Officer (Alibag Municipal Council)

MAHA-UWES-C in collaboration with UNICEF, CARPE Aurangabad and IEC Technologies piloted an innovative open-drain sanitation project in Alibaug Nagar Parishad limits. In this novel and innovative project, IOT-enabled Automatic Drainage Water Analysis Sensors and Dosing points have been installed and water is being treated with organic solutions. With more and more treatment, we are confident that Alibaug will benefit from clean environment, better health and beauty of the city. Along with improvement in water quality in the drains, it will also reduce the nuisance of mosquitoes and stop their breeding and help in getting rid of the smell. Due to this, we look forward to using the treated drain water for gardening, agriculture, construction etc.

— Prakash Pandurang Tambe, Supervisor, ANP



Decentralized Greywater Treatment Plant

Bhiwapur Nagar Panchayat
Regional Centre for Urban & Environmental Studies (RCUES) of All India Institute of Local Self-Government (AIILSG), Mumbai
UNICEF, Mumbai Field Office

Key Project Highlights

A proposal in response to the INNOWASH RFP was developed and submitted by Bhiwapur Nagar Panchayat for decentralized wastewater treatment.

The proposal was selected for implementation based on feasibility, cost-effectiveness & sustainability.

A bilateral agreement inclusive of scope of work, timeline and finances of the project was signed on 16th July 2022 between the Maha WASH-ES-C and Bhiwapur Nagar Panchayat for implementation.

Under the project, site assessment and finalization, and design finalization started by August 2022 and construction was completed by December 2022.

An online monitoring platform was provided by the Maha UWES-C to keep a track of the progress of the project. Online consultations, review meetings and site visits were conducted by the Secretariat team during the implementation phase of the project.

The treatment of greywater through the decentralized plant started in January 2023.

Bhiwapur

City Profile

13,950
Population as per the census of 2011

3071
Households as per Census 2011

14
Total Sq. Km area

10
Km of drainage network in the Nagar Panchayat area

Untreated greywater flowing through open drains into the local waterbody not only contaminates the waterbody but also poses health risks to the residents. In this project, supported by Maha-UWES-C, decentralized treatment unit in the absence of centralized treatment facility has been adopted to reduce health risks to residents as well as local farmers who re-use water for irrigation.

Context

Bhiwapur Nagar Panchayat (BNP) being a very small town does not have an underground sewer network and most of the toilets in the town are connected to septic tanks. Supernatant from these septic tanks flow into open drains along with greywater from households. These open drains often receive solid wastes, plastics and C&D waste from nearby households which cause water stagnation. Open drains in the town either flow into waterbodies or designated open plots managed by the Nagar Panchayat. Currently no treatment facility exists for treatment of either greywater and sullage or faecal sludge and septage. An FSTP has been proposed by the BNP which is yet to be constructed.

Need for the Project

The open drains flow through the residential areas collecting greywater and sullage along with solid waste and C&D waste before draining into open plots and waterbodies. The untreated wastewater contaminates open plots and waterbodies with harmful pathogens and debris. Stagnation of greywater in certain pockets caused by debris accumulation leads to high rate of mosquito breeding and puts people's health at risk.

Simultaneously, contamination of waterbodies leaves farmers in adjoining agricultural land exposed to pathogens as they use these waterbodies as a local source for irrigation. Crops in the adjoining fields are also at risk due to poor quality of water. Since a conventional sewer and sewage treatment is impractical and expensive for a small town like Bhiwapur, a need for a decentralized treatment technology was realized. This technology will be relevant even in the presence of an FSTP since the open drains will still carry greywater and supernatant from septic tanks.

Intervention

The proposed intervention is decentralized treatment of greywater in one ward of Bhiwapur Nagar Panchayat, through construction of a planted gravel bed filter on an open drain such that the solids, small amounts of sludge and any other wastes present in the greywater can be removed and thus the pretreated water entering the waterbodies can be safely re-used.

Feasibility Assessment

BNP conducted a preliminary study to understand the impacts of untreated greywater from open drains. Several residents living in the vicinity of these open drains confirmed presence of foul smell and high mosquito breeding. Local farmers also confirmed that the water quality of nearby lakes is deteriorating and cannot be used for agriculture purposes leading to increased stress on fresh water supply.

Based on this preliminary assessment, Bhiwapur Nagar Panchayat developed a proposal for decentralized treatment of greywater in open drains and submitted under the INNOWASH Challenge. The project was selected on the basis of the sustainability and cost effectiveness parameters of innovation and was granted a total funding of approximately Rs. 317,070; 70% of this total amount was allotted as capital cost.

Project Execution

Detailed Assessment

A detailed site assessment was conducted on 3 different open drains in ward 8 (near Telephone Exchange Office), ward 11 (near Bhima devi Temple) and ward 12 (near Gujar/Gao talav) to finalize the site. The drain in ward 12 was finalized on the basis of the below mentioned selection criteria. Following the site finalization, assessment for design feasibility was conducted on the selected drain and appropriate designs were developed.

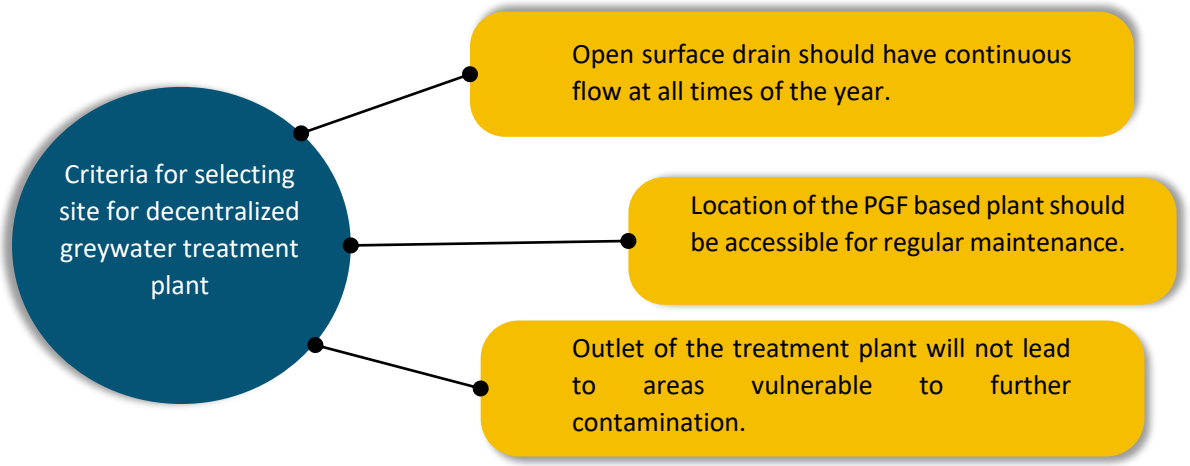


Figure 34: Grey Water logging at project site

Figure 35: Map Location of selected drain in Ward 12, Bhiwapur

Construction

Tender was floated in July 2022 for selecting a contractor for construction of the decentralized treatment plant. The contractor was required to procure goods and equipment as per the design provided in the tender and was selected based on minimum bid. Construction activity commenced in September 2022 and was completed by the end of November 2022. A site visit was conducted by the Secretariat, Maha WASH ES-C on 17th October 2022 to review the progress of the entire project. The site visit included discussion with the city coordinator of BNP on technical recommendations and guidance for implementation of the project.

Figure 36: Construction activities on drain in Bhiwapur

Project Completion

The decentralized greywater treatment plant was operational by the end of December 2022. The project was concluded with a quality check by The Government Polytechnic Institute, Nagpur. Operation and maintenance of the infrastructure is being carried out by the BNP.

Figure 37: Completed project site

Technology

A 3 KLD planted gravel filter-based treatment unit has been constructed on open drain of ward 12. The decentralized unit is a compact, cost-effective, and low maintenance unit which consumes zero electrical energy while facilitating solid liquid separation. The entire set up consists of a screen, a series of baffle walls and a planted gravel filter. Solids settle down in the filter while clean water flows through the outlet.

Technology Process Flow

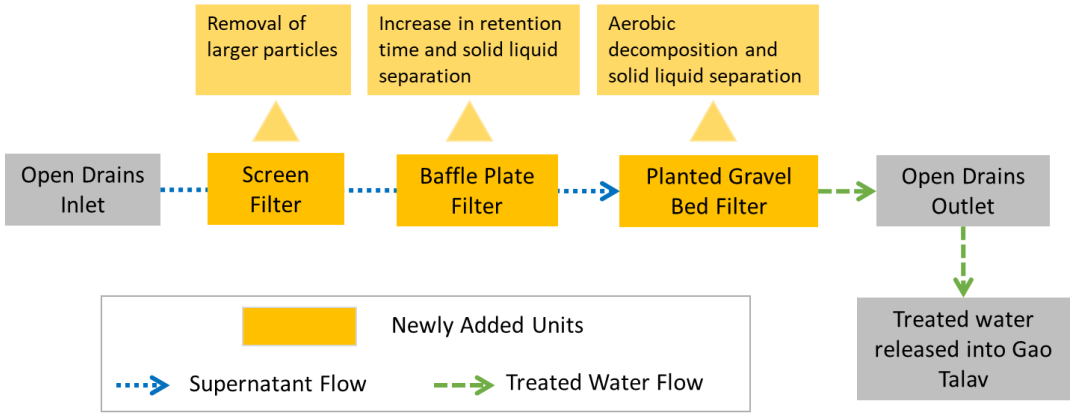


Figure 38: Technology Process Flow Diagram of GTP at Bhiwapur

- **Screen Filters:** The primary stage of treatment consists of screening process. For this, screens of 8mm diameter are used to remove any larger particles like leaves, plastic bits, stones, papers etc. Manual cleaning of the screens will be done regularly to avoid any blockage of the mesh screens.
- **Baffle Walls:** The overflow from the primary process comes to the secondary treatment unit, where baffle walls have been provided. These baffle walls facilitate solid-liquid separation by increasing the retention time of the greywater in the system.
- **Planted Gravel Bed:** The supernatant from the baffle plates passes into the planted gravel bed where the tertiary treatment takes place. The gravel bed consists of different-sized gravels, which act as a filter media to trap the remaining solids from greywater. The locally available Kardali plants on the planted bed help in aerobic decomposition of greywater and further reduce dissolved organics from water.

The treated supernatant that flows into the nearby lake can be further utilized for farming and agriculture. The settled sludge in the filter beds helps in aerobic decomposition of incoming greywater. The bed shall be cleaned once in six months by the drainage cleaning department of the ULB.

Challenges in Execution

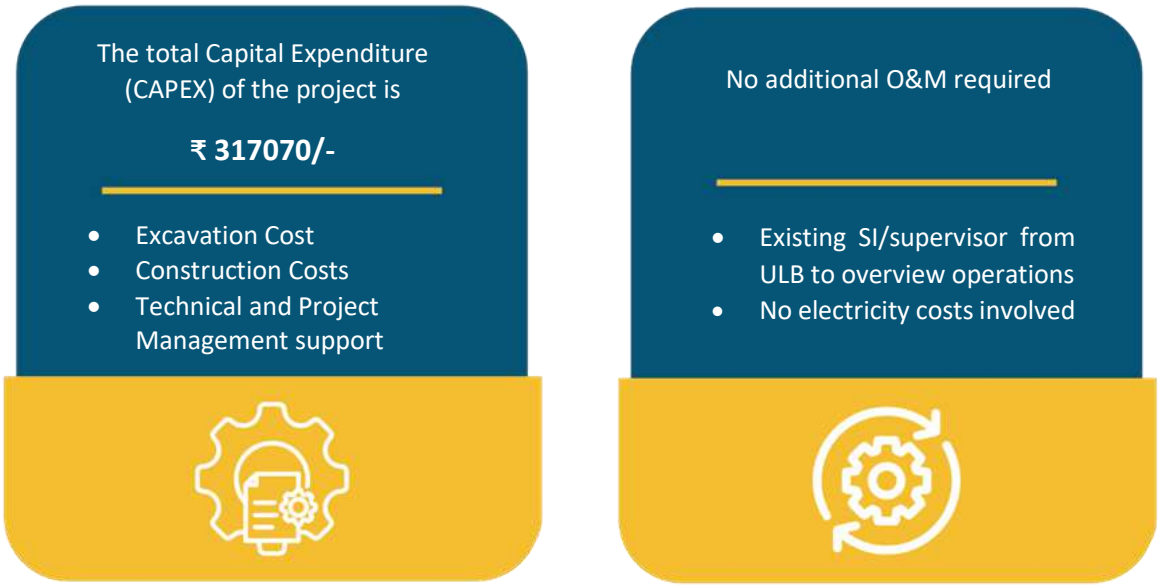
As the technology implemented did not require any sophisticated tools or methods, the only challenge that was faced during implementation was some changes in the design based on the on-ground situation. Initially, total 5 baffle walls in the treatment plant were proposed. This design requirement was later changed to only 2 baffle walls which are sufficient for the treatment based on the quantum of greywater flowing in the open drain.

Innovation:

BNP self-designed the treatment plant without external support. The most innovative aspect of this treatment plant is the compact design and low capital cost which is independent of complex instruments and moving parts like pumps, valves etc. This makes the operation and maintenance of this plant extremely easy. The flow of greywater into the plant is through gravity which makes it easy to sustain without any external energy source.

Project Finances and O&M

The total capital expenditure was provided under the Maha INNOWASH Challenge. As there are no moving parts and the flow of greywater is completely through gravity, there are no additional operational costs to the BNP. The implementation cost for this project is ₹ 264 per capita.



Potential Impact

	The treatment plant on the open drain in ward 12 will reduce health risk posed to 250 households located along the drain and 70 farmers who have farmland adjoining the lake into which the drain flows. This way the project directly benefits approximately 1200 individuals.
	The treatment of greywater and sullage reduces pollution and restores water quality of the adjoining lake which is a source of water for irrigation and agriculture and reduces the risk of groundwater contamination. Implementation of decentralized treatment plant based on planted gravel bed technology has promoted aerobic decomposition of waste resulting in reduction in methane emissions. With this intervention, annual reduction in GHG emissions[5] is 3147 kg CO2.

Scalability and Sustainability

Re-use of treated used water (wastewater including greywater and sullage) is a major component of the SMB 2.0. Decentralized treatment has been promoted in both SBM 2.0 and AMRUT 2.0 making this technology for treatment of greywater widely implementable.

Scalability

The treatment unit is compact and modular and can be designed with minor modification to handle high volumes of greywater wherever required. This makes the technology easy to replicate in places lacking centralized treatment facility. Capital cost-effectiveness also makes it a feasible option for settlements which cannot afford expensive infrastructure.

BNP designed the treatment plant internally with support from technical staff and developed an easy to implement compact design which can be replicated by other NPs

Sustainability

Low O&M costs and gravity-based design makes the unit independent of external energy source and self-sustainable. The treatment of greywater facilitates safe re-use of the wastewater for irrigation purpose and leads to reduced dependency on ground water sources for irrigation.

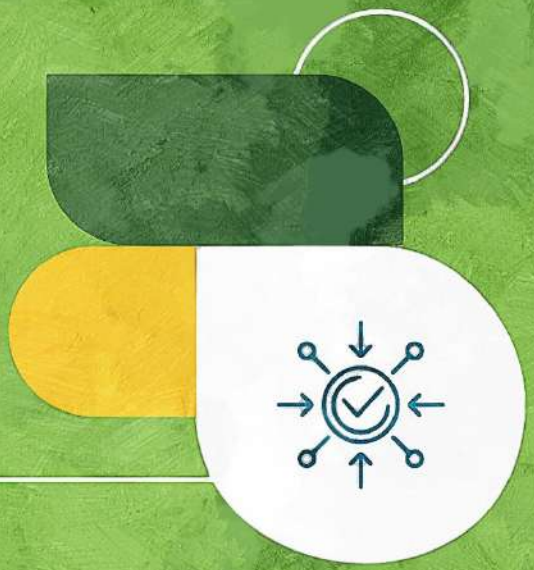
The greywater treatment plant constructed by the Bhiwapur Nagar Panchayat with the guidance from Maha UWES-C treats greywater in a decentralized manner. The treatment units help in managing and treating greywater properly. After implementation of the decentralized treatment unit on open drain of Bhiwapur, 3 more such decentralized plants are being proposed for other parts of the local body.

— Mr. Parasram Wavare, Sanitary Supervisor; Bhiwapur Nagar Panchayat

The greywater treatment plant installed in Bhiwapur Nagar Panchayat treats incoming greywater from all the households of ward 12. Currently, the treated water is sent to Gao Talav to replenish the lake. The decentralized planted gravel bed treatment unit helps in managing and treating greywater and hence helps in addressing issues like mosquito breeding and pollution of water bodies. The treated water, which is sent to the lake, is planned to be further utilized for farming and agricultural purposes.

— Ravindra Selote, City Coordinator of Bhiwapur Nagar Panchayat

POTENTIAL PROJECT IMPACTS



Potential Project Impacts

The innovations are spread across Maharashtra impacting around 2.6 lakh population residing in 5 cities and 58 villages. The projects aim to safely manage more than 13 MLD of wastewater from non-serviced or partially serviced urban and rural areas, eliminating the negative impacts on health and environment due to unsafe management of wastewater. Along with t, reduction in untreated wastewater, the projects also aim towards sustainability of the projects not only providing support in development of hard infrastructure but by supporting the soft infrastructure like handholding support in implementation, capacity building for the treatment plant operator to efficiently manage the treatment plant while enabling involvement of multi-disciplinary stakeholders including government organization, non-government organizations and private organizations from the stage of ideation till implementation and monitoring.

01

State

WASH innovations across Maharashtra, the 2nd most populated state and the 3rd largest state in India

05

Cities

Innovation across 5 cities namely Indapur, Junnar, Alibaug, Bhiwapur, Sangli-Miraj-Kupwad

65

Villages

Innovation across 16 villages and 49 villages from 10-15 km distance from Indapur and Junnar respectively

40,000

Households

Overall, our work has potential to provide improved the sanitation services to 0.4 Lac households.

260,000

Lives Improved

Overall, our work has potential to enhance the lives of 2.6 Lac people through improved WASH services.

13 MLD

Wastewater-safe management

Overall, our work has potential to enhance the lives of 2.6 Lac people through improved WASH services

Figure 39: Project Impacts

The projects directly and across cross cutting themes address the SDGs below.

Contributions of the Projects to the SDGs

6 CLEAN WATER AND SANITATION

- Reducing the proportion of untreated wastewater, substantially increasing recycling / reuse
- Support from local communities
- Capacity Building for wastewater treatment

11 SUSTAINABLE CITIES AND COMMUNITIES

- Reduce per capita environmental impact
- Access to basic services
- Support links between Urban and rural areas

12 RESPONSIBLE CONSUMPTION AND PRODUCTION

- Sustainable management and efficient use of natural resources
- Reduce waste generation through prevention, reduction, recycling and reuse

3 GOOD HEALTH AND WELL-BEING

Reduction in number of deaths / illness due to air, water and soil pollution and contamination

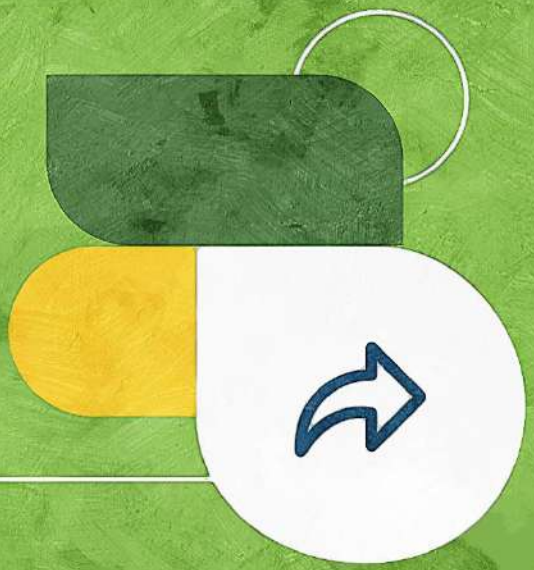
13 CLIMATE ACTION

Education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction.

17 PARTNERSHIPS FOR THE GOALS

- Multi-stakeholder partnerships
- Promote PPP and civil society partnership

WAY FORWARD



Way Forward

Embedded within the broader plans to improve WASH and Environmental Sanitation, encouraging partnerships and collaborative ideation and implementation shall always be the core of all Maha-UWES-C initiatives. Maha-UWES-C plans to stride ahead in alignment with the flagship missions of SBM 2.0 and AMRUT 2.0 that aspire to make cities 'Garbage Free' and 'Water secure' through sustainable sanitation/SWM and household level water supply for all by focusing on optimum resource utilization and resource recovery. With an impetus by the government in terms of increased outlay of funds under SBM 2.0 and provision for 50% fund utilization through 15th FC for smaller ULBs the focus areas would be smaller ULBs, growth centres and low-income settlements. In line with the missions the GoM has also launched the SMM (U) 2.0 and AMRUT 2.0 guidelines and is actively pushing the implementation of the missions.

The experiences and learnings from the collaborative efforts showcased by the Secretariat with the partners in the sector through the pilot demonstrations of convergences and innovative technology implementation. These will become the steppingstone for the vision of Maha UWES-C. The Secretariat will have a multistakeholder approach within the sector to support a broader spectrum of coverage for integrated WASH development utilizing the variegated expertise of different stakeholders. In alignment to the SDG 17 the Secretariat of Maha-UWES-C is committed to move forward in the sector working in the following areas.

The approach and roadmap of Maha-UWES-C is aligned to support thrust areas of GoM including departments like UDD, DoECC, WSSD etc. With the focus of the UDD on integrated SWM / achieving ODF+ and Water+, creating aspirational toilets and the dignity of sanitation workers and given the MoU of Maha-UWES-C under SMM(u) 2.0 for building capacities, facilitating partnerships and supporting innovations the Secretariat of Maha-UWES-C intends to extend support to the State based on their expertise in the focus areas. The DoECC has also highlighted the need for climate action plans for Maharashtra State and in line with their interest and SDG 13 Maha-UWES-C will prioritize efforts

Sustaining and Scale up of FSSM / Dry Waste Management.

Urban Rural Convergence

- Urban rural linkages and cluster level approach for FSSM and Dry Waste Management will leverage the existing FSTP / MRF infrastructure and desludging / transport services in urban areas to provide services in neighbouring rural areas.
- This will help ensure sustainability of the treatment plant / MRF, bypass the need for creating additional infrastructure and provides opportunities for optimum resource utilization by strengthening the institutional mechanism and creating convergence through administrative association by creating a win-win situation for all.
- Maha-UWES-C will focus on scaling up of urban rural linkages of FSSM from its experiences of Indapur and Junnar and implement it to more clusters. It will also work towards creating cluster level dry waste management set ups with urban MRF facilities addressing the needs of urban and rural dry waste management.
- By virtue of providing services in urban / rural areas, this approach will have consequential positive impact on local environmental pollution abatement and minimizing health risks associated with unsafe management of faecal/dry waste.

Enabling Environment

- The effort for scale up shall also be supported by creating enabling guidelines and framework of mechanisms in terms of governance aspects, implementation aspects, financial models etc to assist the local bodies in adopting the most viable option.
- Model MoUs for multiparty agreement will be created for local bodies to adopt with ease for collaborating to implement convergences.

Supporting Innovations

- Innovations is about testing new ideas and cultivating a practice of continual learning and adaptation of new ideas and solutions. Innovations and technology will play an important role by providing resource-efficient approach to overcome the gaps and challenges and implement sustainable solutions within the WASH sector.

Technical Innovations

- Maha-UWES-C through its partnerships and projects aims to support innovations at localized level with innovative technologies and systematic approaches to create more evidence-based demonstrations of adoptable models that are scalable and sustainable at local body as well as community levels.
- These innovations will be need specific and implemented through to local staff and partners to create more localized O&M opportunities and create models for institutional / system strengthening of local bodies. The effort will also focus on dissemination and amplification of such workable models through its platform and publication for awareness of stakeholders.

Innovative Funding

- Maha-UWES-C with its experience and outreach will explore funding options locally to support the smaller ULBs, growth centers and low-Income settlements for innovative technologies and system upgradation.
- Maha-UWES-C will also explore innovative funding options to collaborate with the State for implementation of WASH innovations and pilot demonstration in selected smaller ULBs.

Strengthening Community and Public Toilets

- Maha-UWES-C will work towards identifying, compiling and advocating models for aspirational toilets as support under SMM (U) 2.0
- Strengthen the capacities of NGOs / CBOs / SHGs for effective O&M of community sanitation linked with livelihood opportunities

Ensuring Implementation

- Since the advent of multiple competitions and certifications under various urban missions by the Central Government the local bodies are constantly involved in MIS reporting and working towards task completion.
- There is a need to conduct city level assessment to understand the ground realities in the ULBs in terms of achievement of actual mission targets.
- Maha-UWES-C through its team intends to conduct the city level assessment for selected cities to apprise on the ground situation and identifying gaps and challenges in target achievement
- This will help in realigning the action plan to ensure implementation at ULB Level

WASH linked to climate action

- WASH sector is very closely integrated to climate in terms of impacts of climate change, which presents a huge opportunity of the sector to contribute to climate adaptation and mitigation goals.
- Building WASH resilient cities and creating climate action plans are the need of the hour. The DoECC recognizes the need for preparing the State Climate Action Plans.
- Maha-UWES-C will work towards developing sectoral climate action recommendations that can support the unpacking of climate action plans of the state.
- Maha-UWES-C will also have climate action as one of its focus areas to conduct action research and implementation support.

Inclusivity

- Maha-UWES-C with its approach towards work safety and dignity, also intends to skilling of sanitation force to professionalize of WASH services and enable more safely managed sanitation system.
- With the lens of integration Maha-UWES-C will also involvement of waste pickers within the SWM value chain. With focus on women waste pickers and SHGs Maha-UWES-C will conduct action research and move towards pilot demonstration of an integration model in the smaller ULBs
- Maha-UWES-C will also explore involvement of children, youth and WASH professionals within their focus implementation areas with a gender balanced approach.

Knowledge Management

- Maha-UWES-C will explore innovations in IEC through knowledge products and other formats that can create outreach and impact for helping achieve objectives of SBM 2.0 to SMM(U) 2.0 viz. IEC for achieving 100% segregation.
- Creating, managing, and disseminating knowledge in urban WASH and environmental sanitation and bringing to the forefront the work within the sector by the partners, good practices, and implementation efforts through its variety of periodic publications, the Maha-UWES-C will continue to contribute as a knowledge management platform.
- Maha-UWES-C through its knowledge repository on the website portal will continue to highlight various sector related works, action research and reports etc.

Though the direct impact of the Secretariats initiative is in terms of SDGs 6 (Water & Sanitation), SDG 11 (Sustainable Cities and Communities) and SDG 12 (Responsible Consumption and Production) the initiatives will also focus on the cross sectoral impacts in terms of SDG 13 (Climate action), SDG 3 (Good Health and Well Being) and SDG 5 (Gender Equality)

As an integrated approach model in WASH, through its individual and partner organization initiatives the Secretariat is committed to continue its efforts for ‘CO’llaborations and ‘LAB’oratary for evidence-based pilots and informed decision making in the sector in alignment to the need of the State and in support of ULBs and partner organizations for moving forward towards a common goal, .

ANNEXURE

Annexures

Annexure 1: List of villages in Indapur cluster

SN	Name of GPs	Number of villages	Distance from FSTP (Km)	SN	Name of GPs	Number of villages	Distance from FSTP (Km)
1	Awasari	2	8.10	7	Malwadi	1	6.70
2	Bijawadi	3	8.20	8	Pandharwadi	1	9.20
3	Galandwadi 1	2	6.70	9	Sardewadi	1	10.20
4	Galandwadi No.2	1	5.10	10	Tarangwadi	1	6.80
5	Gokhali	1	7.00	11	Vadapuri	1	6.70
6	Kalthan No.2	1	9.00	12	Zhagadewadi	1	8.50

Source: Census (2011)

Annexure 2: List of villages at 15 km of distance from the FSTP at Junnar

SN	Name of GPs	Number of Villages	Distance from FSTP (Km)	SN	Name of GPs	Number of Villages	Distance from FSTP (Km)
1	Agar	4	3	23	Kusur	1	6
2	Aldare	1	6	24	Manik Doh	1	9
3	Alme	1	12	25	Narayangaon	1	15
4	Arvi	1	10	26	Netvad	2	12
5	Basti	1	10	27	Nimdari	1	14
6	Belsar	1	8	28	Nimgaon T. Mha	1	7
7	Botarde	1	11	29	Nirgude	1	7
8	Buchakewadi	1	15	30	Padali	2	5
9	Datkhilwadi	1	15	31	Parunde	1	12
10	Dhalewadi Haveli	2	12	32	Pimpalgaon Tarf Narangaon	1	11
11	Dham Khel	1	7	33	Pimpalgaon Siddhnath	1	9

12	Dhangarwadi	1	13	34	Savargaon	1	10
13	Godre	1	10	35	Shiroli Bk.	1	6
14	Golegaon	1	3	36	Shiroli Kh.	1	7
15	Hadsar	1	15	37	Somatwadi	1	4
16	Kale	1	14	38	Surale	1	10
17	Katede	1	13	39	Tejewadi	1	7
18	Khanapur	1	5	40	Tejur	1	14
19	Khangaon	1	9	41	Vadaj	1	9
20	Khilarwadi	1	13	42	Vadgaon Sahani	1	10
21	Kumshet	1	5	43	Yenere	1	10
22	Kuran	1	9				

Annexure 3: Design capacities of FSTP as per GR of GoM

Sr. No.	Population	Design Capacity of Sludge Drying Bed [KLD]	Cost of treatment units [lakh INR/KLD]
1	Up to 15,000	3	3.1
2	15,001 to 25,000	5	2.3
3	25,001 to 50,000	10	1.7
4	50,001 to 75,000	15	1.5
5	Above 75,0000	20	1.3

Annexure 4: Roles and responsibilities of ULB and GPs

SN	Tasks	Responsibilities of IMC	Responsibilities of GPs
1	Signing of MOU to undertake Urban Rural linkages in FSSM	The IMC and participating GPs shall mutually agree to Urban rural FSSM linkages and sign a Memorandum of Understanding as developed by Maha-UWES-C as per the feedback received during stakeholder consultation.	
2	IEC in the selected villages	The IMC shall support the respective GPs in conducting training and creating awareness regarding the FSTP.	The respective GP office would be responsible for creating awareness about importance of urban-rural linkages for FSSM.
3	Registration of desludging request	The IMC office would be responsible for registering the desludging request along with location details as communicated by the respective GPs office.	The respective GP office would be responsible for the registering the desludging request received from the users in the respective jurisdiction and to communicate the same to IMC office. The GP office shall collect details like name of the person, location of septic tank etc. during the registration of desludging request.
4	Deployment of desludging vehicle	The IMC shall ensure availability of desludging vehicle and FSTP for the treatment of septage from urban and rural users of the selected GPs. The IMC shall communicate the date and time of desludging with the individual users. The IMC shall deploy its own desludging vehicle for desludging to-and-fro from households/community toilets to the FSTP. In the case of a private operator, IMC shall appoint a licensed desludging operator and plan for a registered desludging vehicle	-

SN	Tasks	Responsibilities of IMC	Responsibilities of GPs
		and provide their information to the users at the time of registering the desludging request.	
5.	Collection of desludging charges	The IMC shall collect the desludging charges from the respective GPs after the desludging is completed, through the desludging vehicle operator. The desludging vehicle operator shall collect the desludging charges paid by the users at the time of registration and get the receipt, signed from the user and the respective GP office.	The user shall pay the desludging charges in advance while registering the desludging request at the GPs office.
6.	Records of desludging trips	The ULB shall maintain a record of fecal sludge and septage desludging and processing demand received from the participating GP and within its jurisdiction.	The participating GP shall maintain a record of the demand received from respective households/institutions / community toilets and public toilets in their respective GP
7.	Treatment of Collected waste	The IMC shall be responsible for treating the collected faecal sludge from the respective GPs and its jurisdiction at the FSTP.	_
8.	Treated Products	The ULB shall ensure best results for treated products.	_
9.	O&M of FSTP and desludging vehicle.	The IMC shall be responsible for the O&M of the FSTP as well as desludging vehicles.	_
10.	Monitoring and record keeping	The IMC shall monitor and ensure the implementation of urban-rural linkages and maintain the records.	The GPs shall monitor and ensure the implementation of urban-rural linkages and maintain the records.

Note: The user includes residential, institutions, commercial, recreational etc. and community and public toilets.

Annexure 5: Sample Receipt for HH, and FSTP operators

Desludging of Septic Tanks Record Receipt

Receipt No: Date :

User Details

GP/ULB Name:

Type of property :

Name of the user:

Address:

Contact Number :

Type of containment system:

Charges paid:

Truck Operator Details

Driver Name:

Vehicle Number:

Truck capacity:

Service details

Accessibility of the tank (yes/no) :

Volume of tank emptied (In KLD):

Number of trips taken to empty the tanks:

Time required to empty the tank:

Emptying Date :

Emptying time:

Signature of User Signature of Truck operator

Treatment and safe disposal at FSTP

Disposal Date :

Disposal Time:

Quantity of sludge received (in KLD):

Signature of Truck Operator Signature of FSTP Operator

Annexure 6: Registration record

Responsible person: Appointed person in GP /ULB

SN	Demand ID / Receipt No.	Date of demand	Demand from GP/ULB	Type of Property (Residential / Commercial / Institutional / CT / PT)	Name of the user	Address	Contact no.	Charges paid	Type of containment system (Ensuring it is a septic tank)	Accessibility of septic tank (Yes/No)	Date and time of desludging
										In case of no, The GP should make sure that the tank is made accessible before desludging	

Annexure 7: Collection and Transportation record

Responsible person: vehicle operator

Sr. No.	Demand ID/ Receipt no.	User Name	User address	Driver Name and Vehicle No.	Desludging Date	Type of system	Accessibility of septic tank	Volume of tank emptied (in KLD)	Number of trips taken to empty the tank	Time required for emptying the tank	Receipt photo given to user
						(Ensuring it is a septic tank)					The receipt must be signed both by the user and the vehicle operator.

Annexure 8: FSTP Record

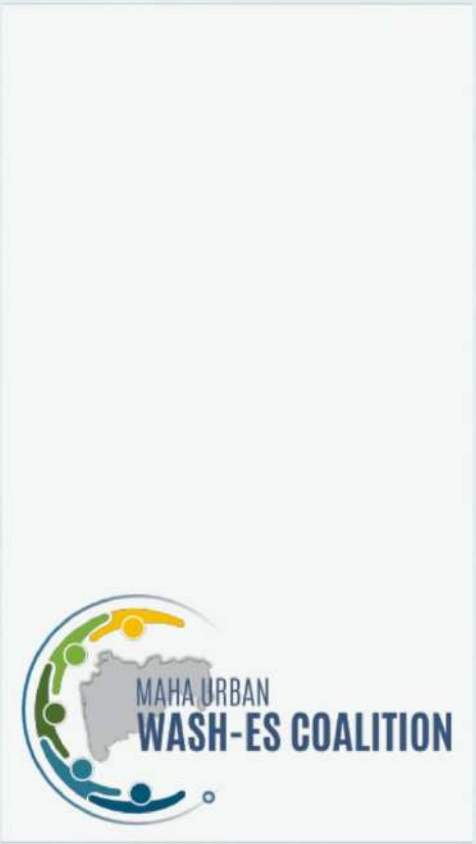
Responsible person: FSTP operator

Demand ID	Disposal Date and time	Quantity of Fecal sludge received (in KLD)	Receipt photo
			Signed by both vehicle and FSTP operator

***Annexure 9:** Treatment Record*

Responsible person: FSTP operator

Date and time	Compost generated from the treated sludge in a day (in Kg.)	Method of reuse of Compost generated	Treated water generated after treatment (in liters)	Method of reuse of Treated water	Treated water sent to water bodies and Nallas (in liters)



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