



Strengthening O&M of
Decentralised Sanitation Systems
and Faecal Sludge Management





List of Acronyms

ADSIS	Association for Decentralised Sanitation Infrastructure and Services
AMRUT	Atal Mission for Rejuvenation and Urban Transformation
CII	Confederation of India Industry
CPR	Center for Policy Research
DEWATS	Decentralised Wastewater Treatment Systems
DMA	Directorate of Municipal Administration
FSM	Faecal Sludge Management
FSTP	Faecal Sludge Treatment Plant
IIHS	Indian Institute for Human Settlements
MoUD	Ministry of Urban Development
NIUA	National Institute of Urban Affairs
STP	Sewage Treatment Plant
TMC	Town Municipal Council
UDD	Urban Development Department

Photographs

All images courtesy of BORDA and CDD Society

Text

Stanzin Tsephel, Isha Dash, Manas Rath, Samyuktha Varma

Design

Bhushanraj, Deepa Khatri, Nithya Bharadwaj

Address

Bremen Overseas Research and Development Association
Am Deich 45
D - 28199 Bremen
Germany

Phone: +49.421.40 89 52 - 0

E-mail: office@borda.de

Web: www.borda.de



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Foreword

Addressing sanitation's service gap

Indian cities have some of the most polluted water bodies in the world. Around 100 million urban Indians presently live without proper sanitation facilities, and 40 billion litres of untreated wastewater is pumped from cities into the environment every day.

India's urban population will grow from 377 to 600 million, nearly 50%, by 2030. If we do not improve urban sanitation and wastewater management systems, we will experience worsening public health, growing water shortages, lower living standards particularly for the poor, and deadly environmental degradation. Urban sanitation infrastructure requires urgent attention and investment.

In 2015, The British Medical Journal identified the sanitation revolution—sewage disposal and introduction of clean water—as the most important medical milestone since 1840. India's sanitation programs have focused largely on building toilets and changing behaviour related to hygiene. Wastewater management and treatment is only now becoming recognised as being absolutely necessary for effective sanitation.

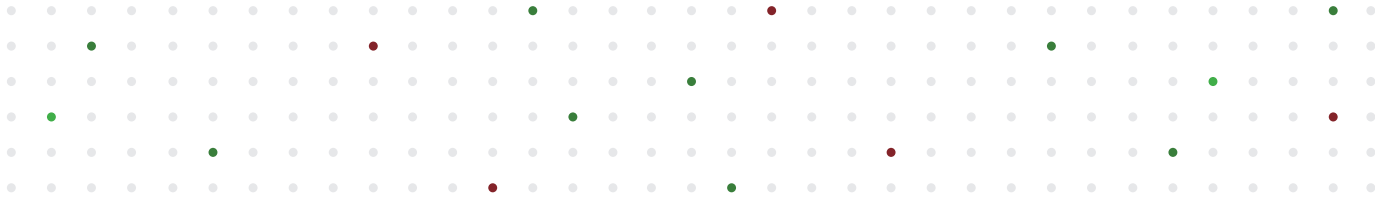
Our government does not, and will not, have the funds to build underground sewerage systems,

estimated to cost Rs. 12,000-18,000 per capita, in our 8,000 towns and cities. Finance aside, such systems are difficult and expensive to operate and maintain. At least 40% of existing sewage treatment systems across India are defunct or ineffective.

It has therefore become critical to evaluate other robust and lower cost options, including decentralised sewage treatment and faecal sludge and septage management.

By 2019, over 70% of urban toilets will have on-site storage systems such as pits and septic tanks. Given this scale, massive attention and investment should be made in designing, operating and managing world-class systems to manage the faecal sludge and septage from this large number of toilets.

The wheels have started moving in the past three years, but we need to double our efforts and collaborate. The decisions we make today will form the backbone of the country's sanitation infrastructure for decades to come. It is critical that we get them right.



Project	Strengthening the O&M Sector for servicing decentralized urban sanitation infrastructure in Karnataka, India
Primary Funder	The Bill & Melinda Gates Foundation
Grantee	The Bremen Overseas Research and Development Association (BORDA)
Implementation Partner	CDD Society
Partner City	Devanahalli, Karnataka (near Bangalore)
Technical Consultants	Infrastructure Development Corporation (iDECK) Intellectap
Budget	\$1.4 Million
Duration	November 2013 to January 2017 (39 months)



Introduction

Exploratory studies and landscape assessment at the start of this project showed that while on-site sanitation systems are present even in large cities including Delhi, Bangalore and Mumbai, they dominate in the country's smaller cities and towns.

Services for managing these systems, however, are still at a nascent stage and without appropriate treatment facilities, there is no way to safely handle, manage or re-use faecal sludge, or to protect people and the environment from its harmful effects.

This report presents the lessons from a project that focused on understanding and developing faecal sludge management (FSM) systems in India, to improve the performance and safety of on-site sanitation.

The lessons and achievements, particularly the demonstrations in our partner town of Devanahalli near Bangalore, have helped start and accelerate work on FSM in other towns and States across

India. The full commitment and support of the Town Municipal Council of Devanahalli, and their willingness to test new innovations, was instrumental in the outcomes of this project.

We thank the team at the Foundation for their support, access to network partners and financial resources, that made this work possible.

Our municipalities require (i) appropriate policy and governance structures, (ii) service delivery plans, (iii) the right infrastructure, and (iv) a fair approach to engage private sector service providers, to provide effective sanitation solutions.

This project enabled us to work on and learn about all these issues, developing expertise based on which BORDA and CDD Society can better support other partners and governments to implement FSM solutions more quickly, more economically and with higher rates of success. Already, several of these lessons are being used in work with partners such as IIHS, NIUA, CPR and Practical Action.

Setting Goals

When the project was conceptualised in 2013, FSM was in its infancy in India. The initial phases had a broad scope, and more specific goals evolved later based on research, experiments and engagement with other players. As the sector developed and a set of more experienced organisations emerged in 2015, partnering with them allowed the project to focus more sharply on deliverables and scaling up impact.



Policy, Regulations and Administration

1. Create awareness on the operation and maintenance (O&M) issues of FSM with 500 decision-makers from 20 cities across India
2. Draft a city-level Policy for managing on-site sanitation systems



Holistic Service Delivery, Financing and Engaging Private Sector Players

1. Study the current economics of FSM services, and develop business models for delivering improved service
2. Implement FSTPs in 3 cities catering to 30,000 people annually
3. Train and support private players to provide better quality services



Technology and Treatment

1. Conduct robust research to understand the characteristics of faecal sludge in India
2. Develop and implement a Faecal Sludge Treatment Plant (FSTP) that is effective and economical
3. Generate data on effectiveness of treatment processes



Research, Advocacy and Communications

1. Conduct a landscape assessment of on-site sanitation infrastructure in Bangalore
2. Produce promotional films and documents about viable and required sanitation solutions
3. Promote the concept of FSTPs through at least 3 trade shows and 10 conferences
4. Organise exposure visits to a FSTP for at least 100 decision-makers from government, funding agencies and ecosystem players



Capacity Building, Training and Ecosystem Development

1. Develop 6 O&M service packages and training modules to teach professionals about designing and maintaining various sanitation systems
2. Establish the Association for Decentralised Sanitation Infrastructure and Service (ADSIS) to create an industry voice and bring self-regulation to the sector

Significant Accomplishments



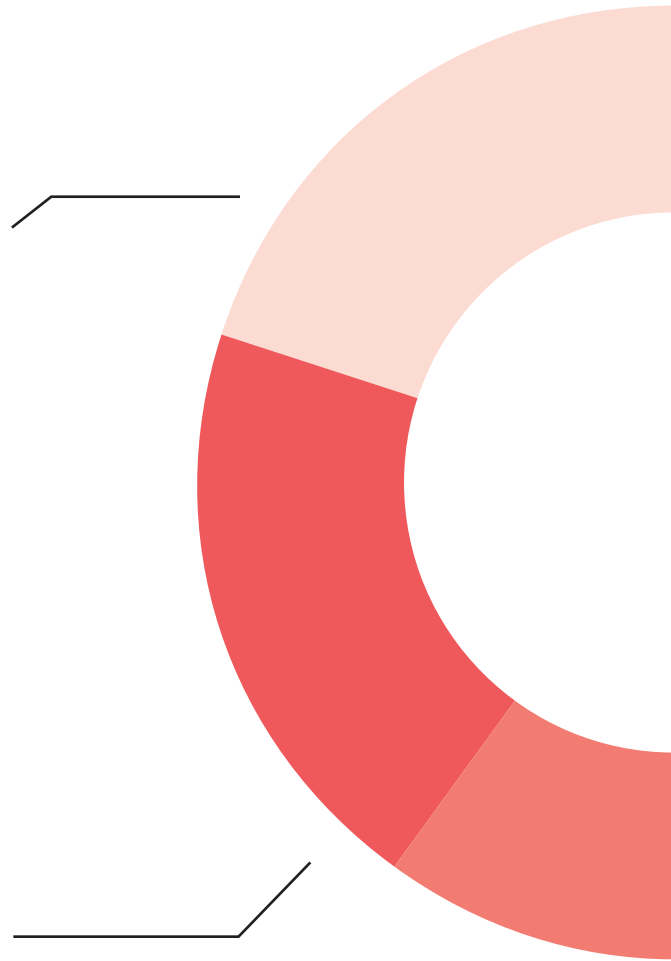
Policy, Regulations and Administration

1. Developed a practical Operative Policy based on which **4 key resolutions related to FSM** were drafted and adopted by the Municipal Council of Devanahalli (p. 37)
2. Approached by Directorate of Municipal Administration (DMA), Karnataka, for consultation on implementation of FSM at State level
3. Contributed to drafting the **National Primer on Faecal Sludge and Septage Management**, which was launched by the MoUD



Holistic Service Delivery, Financing and Engaging Private Sector Players

1. Interviewed over 60 honeysuckers across 4 states to understand business economics, challenges and opportunities
2. Formed partnership with **Blue Water Company** to provide integrated de-sludging and treatment services for ULBs, and with other players to improve quality, adopt new technologies and scale operations (p. 47)
3. Met with about 10 sanitation and waste management companies to understand business models in adjacent sectors, explore synergies and determine paths to scale





Technology and Treatment

1. FSTPs: Designed and submitted DPRs for 5 towns; 1 FSTP is under construction in Trichy and tender out for 2 more
2. **Built 2 FSTPs** in Devanahalli and Nepal that have treated over 1 million liters of faecal sludge in 2016 (p. 29)
3. FSTP regarded amongst the **Top 25 Innovative Technologies** of 2016 by Confederation of Indian Industry (CII)



Research, Advocacy and Communications

1. Presented at **NITI Aayog's Chief Ministers' Workshop**-- personal presentation on FSM to Mr Chandrababu Naidu (Andhra Pradesh) and Mr Siddharamaiah (Karnataka)
2. 325 decision makers, 292 civil society organizations and government employees, and 50+ international visitors have visited the FSTP and CASS to learn more about FSM
3. Participated in more than 10 national conferences and workshops across more than 8 states with a reach to 3,000+ stakeholders



Capacity Building, Training and Ecosystem Development

1. **ADSIS formed with 42 member** organisations in Bangalore; interest in forming chapters in Trichy and Nagpur (p. 44)
2. 6 Service packages developed and published
3. 7 training programs conducted for 182 senior city and state-level administrators, sanitation engineers and funding agencies
4. 3 trainings of frontline de-sludging service providers, attended by over 40 participants





Project
Highlights





Key Findings

A. Toilets:

- At least 88 of 504 public toilets (18%) are very poorly maintained and most do not have adequate water supply
- 31% of community toilets are unusable, and at least 60% had broken doors, missing pipes, cracked toilet pans, no lights and other similar problems
- About 43% of community toilets are unusable due to water shortages for at least 2-3 months of the year
- Only 41% of users were satisfied with the maintenance of their community toilet

B. Decentralized Sewage Treatment Plants:

- Over 3,600 decentralised, small-scale sewage treatment systems (capacity typically 30,000-800,000 litres per day) serve about 10% of Bangalore's population
- Most commercial establishments with STPs (offices, malls) re-use treated water for flushing, cooling towers and landscaping, saving up to 70% of freshwater
- Large residential apartments or gated communities can save about 40% of water requirement by re-using treated water for flushing and gardening
- Zero Liquid Discharge (ZLD) norms are difficult to fulfil as only a limited amount of treated water can be re-used. Markets for treated water can help manage the excess water productively
- It is difficult to find trained operators for small-scale STPs as there are no vocational training programs, nor regulations. This often leads to malfunctions in STPs, a nuisance for residents and an environmental hazard
- Karnataka State Pollution Control Board does not have the manpower to inspect STPs or penalise offenders
- Up to 70% of these decentralised STPs do not function properly due to various reasons, but high O&M costs is a primary cause

C. Faecal Sludge Management:

- Outside of central Bangalore, about 80% of toilets have septic tanks or pits for containment. The remaining toilets discharge into open stormwater drains or water bodies
- De-sludging services for tanks and pits are easily available (mostly offered by private players) and typically cost Rs 800-2,000
- De-sludging operators can dump faecal sludge in only 2 STPs operated by the Bangalore Water Supply and Sanitation Board. The process however is onerous and expensive and therefore, perhaps 95% of faecal sludge is dumped, untreated, in peri-urban farms and sometimes into lakes
- Untreated faecal sludge, when dumped on farmland, can contaminate food produce and create breeding grounds for mosquitoes—we found e.Coli levels dangerously high at 490 (MPN/g) and faecal coliform as high as 1,400 (MPN/g) on food grown with faecal sludge (these levels should be zero or less than 20, as per Indian food safety norms)

LANDSCAPE STUDY

Extensive field visits and interviews with various stakeholders in and around Bangalore helped assess the real challenges across a wide range of sanitation systems—public and community toilets, wastewater and sewage treatment systems and faecal sludge management.



Despite shifting from manual scavenging to modern machines, workers continue to face health risks

Gaps in Policy and Governance:

- Regulations largely focus on traditional centralised systems with no guidance for management of decentralised systems. Consequently, decentralised options are not even considered by government departments or engineers
- Municipal bodies can raise funds through service fees and taxes for providing more efficient sanitation, sewage and waste management
- Despite the Prohibition of Manual Scavenging Act (2013), small-scale service providers and even government contractors use manual labour for cleaning drains, opening tanks and other activities
- Standards and Building Codes do not have adequate information on designing septic tanks. There are no mechanisms for training masons / architects / contractors, or monitoring adherence

While much remained to be done in the area of de-centralised sewage treatment, water shortages and value of treated water, along with regulations, are spurring the sector.

Faecal Sludge Management, on the other hand, was under-developed and neglected, and there seemed at the time to be no momentum to address this.



Mr Sivasailam, IAS

(Principal Secretary to Govt. of Karnataka)

- Practitioners need to be solution centric, not ideology centric.
- At the policy, technology and implementation level, decentralised solutions have traditionally not been looked into
- We are learning too slowly for comfort—we need to create business interest



Mr Stefan Reuter

(Director, BORDA)

- BORDA was started in 1978 after the oil shocks. Realising that limited energy can suffocate economic development, BORDA focused on both developing alternate energy sources for developing countries (e.g. biogas and micro-hydral), and also developing infrastructure that is energy efficient (e.g. anaerobic wastewater treatment)
- *“What will not be maintained should not be built”*

Inputs from Group Discussions

- IT systems are needed to track data
- Not a single contractor or service provider who operates and maintains decentralised sewage systems has a license or permit. Licensing will create the required demand as well as service quality and standards
- Centralised and decentralised sanitation systems have to work together to solve the problem but at present, decentralised options do not figure in the larger planning and financing paradigm of the State
- Training of public sanitation workers and private service providers must be compulsory. Training must be available for all stakeholders
- There are no ‘decent’ markets to solve the sanitation crisis. Service providers today have a very narrow focus and informal markets are inefficient and do not serve the public good



Decentralised systems will be a key component of the urban sanitation landscape in the future. While the national policy framework has renewed focus on decentralised approaches to sanitation, local governance is still pro-centralised and least interested in decentralised solutions.

KICK-OFF WORKSHOP : 21-22 JANUARY, 2014

29 recognised practitioners and experts from government, consulting firms, international aid agencies, academia and non-profit organisations, all with experience in the sanitation sector, were invited to the workshop.

Ms Alyse Schrecongost

(Program Officer, The Bill & Melinda Gates Foundation)

- Sewerage technology today is unaffordable and technically inappropriate for a large majority of urban communities
- The Foundation is interested in pilots for not only city level solutions, but also to cover underserved parts of urban areas
- Technology is not the only solution. We need innovative markets, business models, governance, political will and investment





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PILOT FSTP ESTABLISHED AT CASS

The plant studies Indian faecal sludge characteristics (which vary wildly based on weather, containment system, de-sludging frequency etc), tests different treatment technologies and help us understand sector dynamics as we work with de-sludging operators to receive sludge.

Parameter	Reference: Raw Sewage	Input Faecal Sludge (FS)	FS After Treating in FSTP
BOD (mg/L)	110 - 350	10,000 - 35,910	30 - 50
COD (mg/L)	250 - 800	25,000 - 100,265	250 - 320
Total Suspended Solids (mg/L)	120 - 400	10,000 - 40,000	<100
Total Solids (mg/L)	390 - 1,230	32,230 - 15,000	1,159 - 2,000
Ammoniacal Nitrogen (mg/L)	20 - 70	620 - 1,200	60 - 70
Phosphorus (mg/L)	4 - 12	681 - 900	13.9 - 20

Clearly, faecal sludge is much more concentrated than sewage, and needs a treatment system that can handle such characteristics. A regular STP just will not do. Additional filters (such as sand+carbon) will be added to the FSTP to further manage the effluent characteristics.







THE TOWN MUNICIPAL COUNCIL OF ANEKAL

The town south of Bangalore, requested help to help improve sanitation in the town by implementing FSM systems. Conducted training program and exposure visits for town officials and conducted a town-wide survey of 9,000 households and properties to understand sanitation situation:

- Found that less than one-third of properties use septic tanks and pits—not ideal location for demonstrating FSM services
- Town received funds for FSM from Karnataka Urban Infrastructure Development Board, but also got funds for underground sewerage systems—lost interest in pursuing FSM as underground drainage was the political preference

By November, Anekal was dropped as a pilot location. This was a major setback at the time.





RECOGNISED AS KRC BY MoDWSS

CASS (CDD's technical training wing) was recognised nationally as a **Knowledge Resource Centre** by the **Ministry of Drinking Water Supply and Sanitation**. A major milestone, making it one of the very few organisations certified and able to deliver trainings on sanitation and FSM to government officers, engineers and sanitation inspectors.

DEVELOPED 6 SERVICE PACKAGES

Created guidelines and instruction manuals on servicing various types of sanitation solutions. These are used in training programs and can help to create standards and protocols for critical sanitation services.

List of Service Packages:

1. Desludging a Septic Tank
2. Operating STPs based on Activated Sludge Process (ASP)
3. Decentralised Wastewater Treatment Systems (DEWATS)—Comprehensive Maintenance Contract
4. Public Toilet Maintenance
5. FOG Device Maintenance
6. Maintaining a Horizontal Planted Gravel Filter (HPGF)



TRAINING DESLUDGING OPERATORS

Conducted 2 training programs for over 30 desludging operators to understand how they work and challenges they face

- Blocked septic tank access points increase time for service and require ground breaking—standard designs and access connectors can address this problem
- Dumping faecal sludge is a major problem as there are no convenient, legitimate locations
- Face harassment by residents and fines by police while dumping illegally (many players pay Rs 2,000-5,000 in fines each month)
- Government STPs that accept faecal sludge have complicated processes, accept sludge only from certain types of tanks and require large deposits and fees. Very few players dump at these locations
- Sloppy, untrained operators do a poor job, upset the customer and give the sector a bad reputation. Training operators will help improve services standards and customer satisfaction
- Even though this is a critical sanitation service, there is no recognition, license or permit process, which could help organise the sector



TECHNOLOGY FOR ENFORCEMENT

KSPCB requested help in creating a digital database and monitoring tool to track all small-scale STPs in and around Bangalore (over 3,000).

Lack of IT systems hampers enforcement efforts. Accessible and useable data is critical, but even government agencies often do not have what they need.



Septage and faecal sludge was dumped, untreated, on farms, as there was no treatment facility

GENESIS OF ADSIS

Invited private sanitation service players for discussion on forming an industry body, to give the sector a voice and help it grow. The Landscape Study had pointed several gaps that such an organisation could bridge:

1. Design and deliver training programs for operators
2. Self-regulation to weed out unethical or incompetent players
3. Present operating challenges to authorities, seeking policies and procedures to formalise the sector

Attendees were enthusiastic about the idea and The Association for Decentralised Sanitation Infrastructure and Services (ADSIS) was eventually born from this discussion.

ENTRY INTO DEVANAHALLI

Upon the recommendation and introduction by advisory board member Prof. Vishwanath, the town of Devanahalli, about 30km north of Bangalore was identified as a potential pilot location for FSM.

Conducted a training workshop for town officials and private sanitation players, and signed MoU for:

- I. Implementing holistic FSM systems
- II. Constructing a FSTP

Site identification and technical planning started right away, given the enthusiasm of local officials.





FSM POLICY WORKSHOP

The workshop engaged professors and students from the National Law School to draft a state policy for Faecal Sludge Management.

- Workshop with 39 participants including legislative experts and municipal leaders
- Recommendation was to prepare an enforceable Policy, not just guidelines
- The discussion, in context of government's responsibilities and powers, energised present officials and gave new perspectives on why they should pursue FSM
- The Karnataka legislature urged towns to study and adopt relevant parts of the draft policy that was produced



WORK COMMENCES IN DEVANAHALLI

A site was selected to build the FSTP and work order was issued by the Town Municipal Council to begin construction. Due to encroachment of a private party on government land, however, the site had to be changed. TMC provided space within a proposed solid waste treatment site, right on a National Highway.

- Legislative Councilors and elected officials were engaged and invited to discussions and groundbreaking ceremony
- Monsoon season delayed construction and increased cost
- Labour was hard to find during festival and harvest season, leading to additional delays
- National Highway Authority of India objected as the site was along the highway. Plant layout and access road had to be changed to satisfy their regulations. This increased costs and taught us that land selection must be handled with focus and attention





THIRD ADSIS MEETING

We presented a vision and roadmap, and 12 members agreed to formally sign up.

Key decision was whether to make a formal, registered body or keep it as an informal body.

Formalising would give the organisation standing with the Government and legal stature, but members had to be willing to pick up associated expenses and statutory responsibilities.



KSPCB and ADSIS held consultation meetings. Chairman of KSPCB also visited.

MUNICIPALIKA, 2015

Exhibited the FSTP at Municipalika 2015 in Jaipur. **Chief Minister Vasundhara Raje** asked the Chief Secretary to understand FSM in depth.

After various site visits and training programs for State officials, we have been asked in January 2017 to **study the need and feasibility for FSM in 100 towns.**



BUSINESS MODELS IN FSM

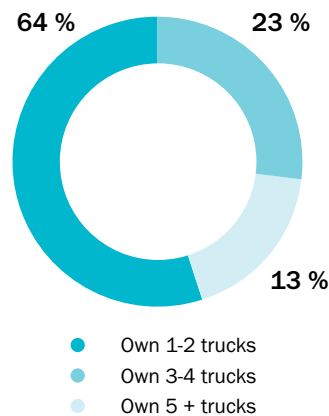
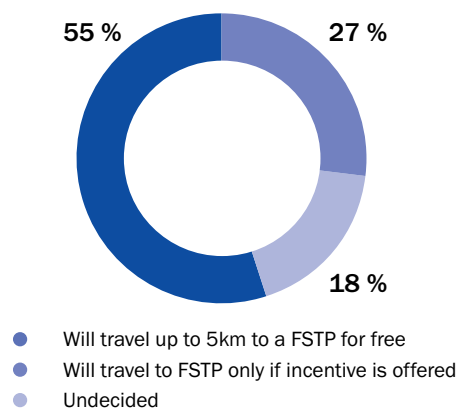
To better understand business models in the sector, a study of de-sludging operators was conducted across 12 large and mid-size cities across 4 states (Karnataka, Andhra Pradesh, Maharashtra and UP).

Our team interviewed 30 players, observing their activities, understanding operating challenges and studying fees charged to customers, business scale and profitability.

Key Findings:

- Lack of safe dumping location is the top operating problem
- Finding and retaining reliable, skilled, desludging operators was the 2nd biggest problem
- Players do not use any kind of technology to manage operations or provide customer service
- **Revenue:** Rs 60,000 – 190,000 per truck per month
- **Profit:** Rs 15,000 – 80,000 per truck per month
- Players with more trucks had higher revenue and profits per truck as they catered to industrial and commercial clients with regular cleaning contracts, leading to higher asset utilisation
- Players focused on serving households do 2-3 cleaning operations per day. Those catering to large apartments and commercial buildings often do **6-12** trips per day
- **<30%** said that access to finance to buy trucks is a major problem
- **36%** said they would readily leave this business if other opportunities were available
- **23%** see good growth potential in this business

Even private desludging operators understand the need for safe dumping locations and treatment plants—but need it to be accessible and quick to reach—that is, close to or within city limits.





Over 600 people including 50+ senior decision-makers from government and funding agencies have visited, including:

1. **Susan Desmond-Hellmann:** CEO of the Bill and Melinda Gates Foundation
2. **Ramesh Jigajinagi:** Minister of State for Drinking Water & Sanitation, Govt. of India
3. **Qamar ul Islam:** Cabinet Minister for Municipal Administration and Public Enterprises
4. **Laura Elizabeth Kohler:** Kohler Industries
5. **Chris Buckley:** Head of Pollution Research Group, University of Kwazulu-Natal, RSA
6. **Kulwant Singh:** Regional Advisor, UN HABITAT
7. **Keiichi Tamaki:** Asian Development Bank
8. **R. Lalnun Tluanga:** Urban Development and Poverty Alleviation, Govt. of Mizoram
9. **Mr Quamrul-Islam:** Secretary, Urban Development Department, Karnataka
10. **Dr Vishal R:** Director of Municipal Administration, Karnataka
11. **Dr N Manjula:** Ex- Director of Municipal Administration, Karnataka
12. **Dr Preetam Yashwant:** Director, Rajasthan Urban Infrastructure Development Project (RUIDP)
13. **Apurva Varma:** I.A.S: Principal Secretary to Government, Tamil Nadu
14. **Ramanagowda:** Executive Engineer, Bangalore Water Supply and Sewerage Board
15. **PV Nandakumar:** Executive Engineer, Kerala Water Authority

Clean. Odourless. Safe. Easy to maintain



INAUGURATION OF THE FAECAL SLUDGE TREATMENT PLANT, DEVANAHALLI

On World Toilet Day, 19th November, 2015, the FSTP opened its gates to the public. CDD Society had committed to manage the plant for one year, and use it for R&D and experiments. Several improvements were made subsequently to optimise its performance:

1. Addition of a windrow co-composting facility to further treat faecal sludge with organic waste, to improve safety and nutritional characteristics
2. Tested mechanisms to dry sludge more rapidly to reduce space required by sludge drying beds
3. Reduced number of valves and processes to simplify operations processes and potential for errors



Financial Summary

Capacity: Serves 20,000 people

Operating Life: 15-20 years

Capital Cost to construct: Rs 90 Lacs (US\$ 130,000)

Per Capita: Rs 450 per person

Direct Operating Cost per Year: Rs 6 Lacs (US\$ 9,000)

Per Capita: Rs 30 per person per year

Sustainability: Property Taxes, revenue from sale of sludge compost and ancillary income from advertising rights can cover operating and maintenance costs



The Leap Forward

After two years of conducting training programs, town surveys, research on faecal sludge characteristics, building and operating a FSTP, studying business models and sector economics, developing policies, and intensively interacting with decision-makers and frontline sanitation workers, the team had developed a deep, intimate and holistic understand of faecal sludge management in India.

We not only witnessed the problems, but were beginning to grasp the opportunities to solve them. We had realised that treatment plants and technology are critical, but they were not the entire solution. We could see the role the government must play at every level—national, state and city; as well as the important roles that private players can play.

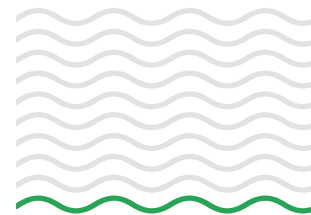
During our journey, awareness of FSM in the country as well as demand for solutions had increased significantly.

Many municipalities came to see FSM as a quick fix—quicker, cheaper and simpler to implement than sewerage systems. But this meant that a few challenges would emerge in coming months:

- As interest and demand increased, there was still a problem of supply of professionals and organisations that could design and implement robust FSM systems for interested towns
- Lack of service providers who could deliver high quality de-sludging services and operate FSTPs
- Political leaders may view FSM as a temporary, short-term solution until the town gets its underground sewerage system—and therefore, not invest enough in institutional mechanisms, and build low quality infrastructure that would fail soon. FSM has to be seen as a **long-term requirement** (as UGDs also rarely reach 100% of the population; and most cities will not get UGD in the near-term) that can **successfully manage “black water”**, which carries most of the organic load and pathogens

It was important to show demonstration cases that were successful, educate public officials about the potential and limitations of FSM, and train more operators and service providers.

Relationships with a wide range of sanitation sector partners and rising government investment in sanitation infrastructure created the perfect opportunity to leap forward.



WORKING IN GULBARGA

Mr Qamar ul Islam, ex-Minister for Urban Development of Karnataka, had attended the inauguration in Devanahalli and invited our technical team to evaluate potential for FSM in Gulbarga. After studying the local conditions and meetings with officials including the Regional Commissioner, we made a presentation to the Hyderabad-Karnataka Regional Development Board.

Rs 1 Crore was immediately allotted for building a FSTP and the Government asked for a roadmap and technical plan.

In August, CDD was awarded an official contract to develop FSM plans.

By November, a site at the local Agricultural University was selected for FSTP. Administrative processes are underway to allot the land.

By March 2017, we expect a tender to be floated for construction of the FSTP.

Other actions related to policy, capacity building and stakeholder engagement will be conducted in parallel.

Gulbarga, with a population of 1 million, has invested about Rs 450 Crores over the decades in building underground sewerage serving 80% of its population, or about Rs 6,000 per person.

FSM will initially serve over 20,000 people (including peri-urban areas) and will cost about Rs 600 per capita.



Presenting to municipal council about need for and potential impact of FSM on Gulbarga



SHIMLA

Plans for a FSTP were submitted to the Municipal Corporation of Shimla. Nearly a year later, a tender was released for construction of this plant.



MoU TO FINANCE PPPs

Signed a MoU with Janalakshmi, a leading financial institution with strong municipal finance expertise, to develop Public-Private Partnerships in FSM.

ESTABLISHING ADSIS

Founding members decided that ADSIS should be legally registered under the Karnataka Societies Registration Act, 1960.

17 members paid Rs 210,000 as membership dues, establishing a secretariat and putting it on the path to sustainability. Office bearers were selected through voting.

A presentation was made at the National Sustainable Water and Sanitation Conference in Bangalore in January.

SUPPORTING ENPHO, NEPAL

Training on designing an end-to-end FSM system, business model and economics, and Policy related to FSM, so they can pioneer FSM in Nepal.



PREPARING TOWN-SCALE FSM PLAN

Created an AMRUT funding proposal for the town of Robertsonpet (Karnataka, pop. 160,000) for end-to-end FSM—including building standard septic tanks, scheduled de-sludging and treatment. **Rs 75 Crores (\$11 Million)** was allotted, but last minute political preference for UGD overturned the proposal.





EDUCATING CITY OFFICIALS

The City Managers Association of Karnataka (CMAK) brought in 215 ULB representatives from small and medium size towns to CASS for training in FSM, introducing most of them to the concept for the first time.



ADSIS EXPANDS ITS SCOPE

Over 90 de-sludging service providers from across Bangalore were brought into a chapter of ADSIS, the Desludging Service Providers Association, to work with the Government in implementing viable and inclusive FSM regulations.



MUNICIPAL RESOLUTIONS FOR HOLISTIC FSM

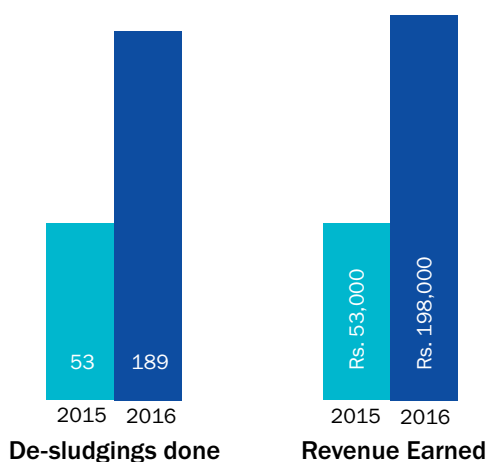
The Town Municipal Corporation of Devanahalli passed four important resolutions:

1. Inviting private operators to manage the de-sludging truck and FSTP, through a tender process
2. Introducing scheduled de-sludging of septic tanks and pits every 3 years
3. Raising property taxes to pay for all FSM services
4. Design for new septic tanks or pits have to be submitted and approved before the TMC gives a No-Objection Certificate for construction

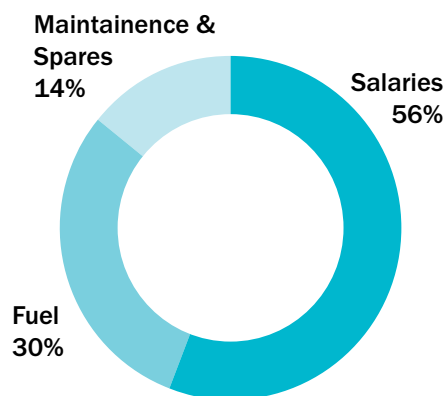
Most importantly, this **increased political ownership of FSM**, making it a bona fide, sustainable service offered by the government to residents.

Improving operations of the treatment plant, engaging local operators to bring sludge to the plant and building awareness within the city have been on-going activities.

Due to better oversight, the de-sludging truck of the TMC has also become more efficient and sharply reduced operating losses. There is significant scope to improve services further and make the truck profitable.



With support from BORDA and CDD, the TMC truck did 3.5x as many de-sludging services in 2016 compared with 2015, and earned 3.7x the Revenue



Operating Costs of the Desludging Truck (2016): Through better customer services, efficiency and cost control, operating costs can be reduced and revenues increase significantly. Truck revenues can nearly triple to Rs 5,40,000 (USD 8,000)



Program Officers of the Bill & Melinda Gates Foundation visit the FSTP: Dipika Ailani (left, with Sasanka Velidandla, CEO of CDD Society) and Roshan Shrestha (right)



HANDING OVER FSTP TO TMC

After successfully operating the FSTP in Devanahalli for a year, ownership and management was handed over to Town Municipal Council on 19th November 2016, World Toilet Day. CDD will continue to assist the TMC in operating it until a private party is awarded the O&M contract.

The FSTP will remain a test, and we will continue to have access to supervise its operations, monitor technical performance, and experiment with new technologies and devices, such as Black Soldier Flies, Centrifuges, and solar energy based heaters.

Re-use of treated sludge is a major area of activity. A co-composting unit has been added to treat the faecal sludge with organic waste, thereby creating a superior organic compost with better balanced characteristics. This will increase demand and selling price.

As on 31st Jan 2017:

No. of FS loads recieved	390
Volume of FS treated	801,450 litres
Solid sludge generated	35.2 tons
Average Volume per load	2,055 litres

Pathogen	Ideal	Co-Composted Sludge*
Faecal Coliform (CFU/100ml)	Nil	12,000
E. Coli. (CFU/100ml)	Nil	Nil
Helminth Eggs (EPG)	Nil	Nil

** Results after only 15 days, which will reduce further after 90 days which is the standard process time. Other materials may be added to achieve ideal values consistently. These tests are in progress at this time.*

2nd NATIONAL SUMMIT ON SUSTAINABLE WATER AND SANITATION

BORDA and CDD were co-organisers and knowledge partners of the 2nd National Summit on Sustainable Water and Sanitation in New Delhi.

Day 1 focused on water while Day 2 focused on wastewater management and FSM with discussions on financing for FSM, Technology options and the O&M requirements for successful FSM.







Impact
Stories



Women Leaders Shape Change

Meet the women-led team that implemented Devanahalli's faecal sludge management plan.

The country's first FSTP was steered by a team of women scientists and officers.

Three team members drove the technical works: **Susmita Sinha**, senior technical advisor for BORDA; **Shamala S**, systems engineer and implementation supervisor; and **Rohini Pradeep**, research and development Manager.

Susmita oversaw much of the research and experimentation at the CASS pilot plant, and her expertise in environmental management drove the design and process parameters. She also contributed to policy and advocacy work, helping shape the thinking on better management of faecal sludge in urban India. She was recognised as one of the **50 Most Influential Knowledge Management Professionals in 2016** by the Global Knowledge Management Congress.

Shamala led the team that designed the FSTP, and oversaw construction, battling monsoons and local regulations to set up the plant on tight budgets.

Rohini monitored the efficiency of the system and helped to continually run experiments and made improvements.



TMC, CDD and BORDA team with Susan Desmond-Hellman, CEO, and Madhu Krishna, Project Officer, of the Bill & Melinda Gates Foundation at the FSTP



She has made many technical presentations to Government authorities to explain the risks of faecal sludge and efficacy of the treatment process.

The project simply would not have been possible without the proactive efforts and determination of officers from the Devanahalli Town Municipal Council.

A key figure was **Ms. Mamatha**, the environmental engineer who monitored the plant's operations and backed the resolutions that needed approval by all the councilors of the administrative body.

Ms Biji and **Ms Sayeeda**, health inspectors, educated community members about sanitation, helped households get funds from the Swachh Bharat Mission to build toilets and mobilised de-sludging operators to receive training to improve skills and learn about health and safety standards.

Ms Ambika, Chief Officer, provided the leadership, vision and political co-ordination to initiate the project, and educated and motivated elected town officials to understand and support FSM.

Every Indian town needs a determined team like this one.

Building a platform for decentralised service providers in Bengaluru

ADSIS is the first of its kind organisation that brings together small and medium sanitation services providers.

Set up in 2015, The Association for Decentralised Sanitation Infrastructure and Services (ADSIS) brings together sanitation service providers from across the value chain—players that install, operate and maintain sewage treatment plants, operate de-sludging trucks and so on, to come together and collectively address existing industry challenges through an institutionalised forum.



CDD Society played a vital role in conceptualising and establishing ADSIS, with the following primary goals:

- Establish standards and service level benchmarks for the sector
- Enable collective representation for better policies that will improve the quality of products and services delivered by the sector
- Set training requirements to establish minimum qualifications of technical operators
- Facilitate sharing of experiences and learning amongst service providers
- Serve as a repository of information and resources for service providers, operators, suppliers, government entities and the general public

Thus, ADSIS aims to create a progressive business environment for the sanitation sector.

In 2016, 40 new members were enrolled, and since then, interaction with government agencies has increased, and training programs have been conducted.

ADSIIS was officially registered so it has legal standing and a voice. A management committee was established with 14 founding members, and a secretariat was established. ADSIS has the potential to become a powerful voice of the country's sanitation industry.

Enquiries have come in from Nagpur, Hyderabad and Mumbai to start local chapters.





Using Technology:

Learning from other services such as ambulance, and cash management, BWC is deploying GPS, sensors and on-board cameras to monitor movement of its trucks, to optimize operations and also ensure that sludge is only dumped at approved locations.

Great Customer Service:

The Control Centre can provide high quality customer service and convenient payment options to make the entire process smooth. Trained and well compensated staff will change perception of the service.

Integrated Service:

By operating trucks and treatment plants, we can provide a turnkey solution to municipalities, ensuring that public health and the environment are protected, while meeting statutory requirements of government.

Emphasising Re-use:

Treatment and re-use of water and sludge has tremendous potential to ease urban water stress, develop safe organic farming, improve farmer incomes and promote the circular economy.



Helping private service providers to improve performance

Understanding industry economics and performance of existing private players, points to a larger role that private players should play in developing and managing FSM systems:

1. Current private de-sludging operators do not have sophisticated operations management, do not use technology and provide rudimentary customer service
2. The number one reason why STPs fail is high O&M costs. Therefore, selecting treatment technology with very low operation costs, maximizes chances of long-term success



Implementing a high-quality FSM system will cost a town only Rs 800-1,000 per capita, while operating it costs Rs 60-80 per capita.

Through strong management systems and skilled teams, the right technology and partnerships with private players and government, BWC aims to become a leading player providing effective, efficient and reliable sanitation and faecal sludge services in India.

BORDA is now supporting Blue Water Company (BWC) to provide high-quality FSM services, primarily to towns with population below 100,000 people, by:

- a. Operating de-sludging cesspool vehicles, providing scheduled and on-call cleaning services
- b. Building and managing FSTP and decentralized STPs (allowing water re-use)
- c. Operating town-level control centers to track FSM services and help enforcement

Thus, BWC can ensure that all sludge is brought to the treatment plant, and treated properly to be safe and meet standards.

BWC will have three business models:

- 1. Service Contracts for Government:**
The Government invests in the infrastructure (trucks and treatment plant) and outsources operations for a fee, typically for a 3-5 year period
- 2. Public-Private Partnerships:**
BWC and its financing partners will invest in the infrastructure, and BWC will operate the system for a 12-15 year period
- 3. Independent Services:**
BWC will invest in assets and operate them based on market demand





Insights & Learning: Looking Ahead

While we made significant progress in supporting the town of Devanahalli to implement FSM, it remains a work-in-progress, as it continues towards becoming Open Defecation Free and providing world-class FSM services to its residents.

This Project has already created several new opportunities for CDD Society and BORDA to scale the lessons and impact. In addition, it helped identify gaps that need to be addressed to strengthen the sector.

Licensing desludging operators:

All operators should require permits from city authorities to operate within the city, and must dump the collected sludge only at treatment plants or designated disposal locations. The trucks should have GPS and on-board cameras and sensors to help detect violations.

Cluster Implementation of FSM:

Rather than have each small town plan and build its own FSM system, areas of 20-30km radius (1,200 – 3,000 sq. km.) should be managed by a single party. Thus an optimised network of FSTPs can be developed so as to **minimise capital costs** (economies of scale) and **minimise transit time** for a truck to reach the nearest plant. The right technology and financial instruments can also be deployed at such scales.

Training and Certification of Operators:

All operators of STPs, FSTPs, de-sludging trucks etc, must be trained at vocational institutes (30-90 days training programs with on-job support), and only such certified personnel should be allowed to operate these systems.

The FSTP is critical:

Many cities should start their FSM journey by quickly collecting relevant data and then planning to **build an FSTP as soon as possible**, without which, other aspects of FSM cannot be properly or safely managed.

Public Private Partnerships:

Where the Government can invest at least 30% of the total capital cost, PPPs are viable for FSM. **Private capital and know-how** can be invested in building FSTPs, acquiring de-sludging trucks and operating the entire system for a long period of time. Thus, government can get a financial and effective operational partner and most importantly, **pays only when the service is properly delivered**. The Hybrid Annuity Model (HAM) is ideal.

Engaging elected officials is crucial:

FSM will be 'owned' by the government only if elected officials get behind it. Exposure visits, workshops, pilot projects in every region or State and continuous effort will build this awareness.

In 2017, BORDA will focus on :

1. Developing and implementing PPPs in FSM
2. Delivering world-class service to cities
3. Helping partners maximize their impact and scale, through innovative technology, world-class operations and customer-centric strategy
4. Maximising re-use of treated wastewater to ease urban water stress

