

FSM

INNOVATION

**Towards a Model Sanitation City:
Operationalizing FSM Regulations
in Warangal**

V. S. CHARY, Y. M. REDDY, S. AHMAD

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EXECUTIVE SUMMARY

Warangal is the first city in India to introduce and implement faecal sludge management (FSM) regulations. Evidence-based advocacy, leadership at city level, citizen engagement, gender focused planning, capacity building of stakeholders particularly the mechanised desludging operators, extensive use of information and communication technology tools for monitoring have played an important role in implementing the regulations.

In the last year, the city government through FSM regulation has successfully introduced: a) licensing and training of masons (as toilet builders) to ensure toilets are built to design specifications, b) site inspection by the sanitation team prior to issuance of building plan approval, c) licences to operate mechanised desludging and service level agreements with private operators, d) usage of personal protective equipment by the desludging operators, e) a mobile app in the vernacular language for record keeping on desludging, f) a dedicated helpline for citizens seeking support with FSM operations, g) awareness campaigns on safe FSM and scheduled desludging and h) planning for two treatment plants to cover the whole city. Also, other urban sanitation interventions such as gender friendly public toilets

Real time recordkeeping of desludging with built-in alerts for the next desludging cycle combined with a comprehensive property database is being developed will enable scheduled desludging of septage in the future. Further, city government has earmarked land and financial resources for two faecal sludge treatment plants (FSTP) one of which would be operational by end of August 2017 demonstrating its commitment to safe FSM. The tendering process for the second FSTP (co-treatment with municipal solid waste) through a public private partnership (PPP) is underway.

Lessons from Warangal are being scaled up with the introduction of state level FSM regulations and operational guidelines. Many cities from India and outside the country have visited Warangal to learn about its experience with a view to replicating the model in their own cities.

CONTEXT

Over 65 percent of people living in urban India rely on onsite sanitation (septic tanks and pits) which operate in the near absence of a regulated system to manage sanitation across the value chain.¹ As a result, there is scant management of faecal sludge. The existing standards for the design of septic tanks and the requirement for periodic desludging are not followed. Emptying and transportation of septage is not based on scientific principles, and in most cities, there are no septage treatment facilities. Indiscriminate disposal of septage has significant health and environmental implications. The Ministry of Urban Development published an Advisory Note and Primer on FSM and Septage Management in Urban India in 2013 and 2016 and encouraged urban local bodies (ULBs) to formulate their own by-laws and rules for management of septage in the city. The Greater Warangal Municipal Corporation (GWMC), recognising the importance of safe FSM, took a lead in developing a regulatory framework covering the entire sanitation value chain.

FSM SERVICES IN WARANGAL

Warangal city, which has a population of 610,000 (2011), is the second largest city in the newly formed state of Telangana, India.² The Administrative Staff College of India (ASCI) conducted a detailed diagnostic study in 2015 to understand the status of FSM in Warangal. Continuous interaction and in-depth interviews with FSM operators and functionaries of the GWMC, field visits and focus group discussions with other stakeholders during 2015–2016, provided a deeper understanding of FSM services in Warangal.



Toilet directly connected to open drain



Dysfunctional pit latrine

Figure 1: Insanitary toilets

In 2015 about 77 percent of households had access to onsite sanitation (59 percent septic tanks, 18 percent pit toilets).³ The design and construction of toilets was not regulated and most were insanitary pit toilets (typically comprising both single and twin pits) and septic tanks (in many cases without soak pits) discharging directly to open drains. Building approval requires citizens to submit house construction plans, including a septic tank design that meets the standards for construction of septic tanks. However, this was largely ignored. Neither did GWMC staff carry out field inspections to ensure compliance. ASCI team field visits to residential areas with low toilet coverage of toilets, particularly to the slum areas of Ambedkar Nagar, BR Nagar, OS Nagar, revealed that toilets did not meet construction standards, including some new toilets constructed under the Swachh Bharat Mission (Figure 1).

PRIVATE OPERATORS WERE NOT REGULATED BY THE CITY GOVERNMENT AND GAM, AND DID NOT OFFER DESLUDGING SERVICES

Desludging was not undertaken regularly and customers and desludging operators had limited appreciation of the reasons for regular desludging or knowledge of the associated requirements, standards and operating procedures. Private operators were not regulated by the city government and GWMC, and did not offer desludging services. Desludging was being carried out only when the septic tanks were full and the household noticed a backflow. The operators were found to be unaware and non-compliant with regulations and procedures related to transportation

(closure of valves, fixing of routes, spillages, traffic conditions etc.). The operators, workers, and officials of GWMC had not received any formal training about FSM procedures. There was no process of formal screening, training and licensing of operators. The municipal sanitation team were not aware of the risks associated with septage handling and disposal practices and treatment technology options.

The transportation of faecal sludge collected from septic tanks did not follow *Central Public Health and Environmental Engineering Organisation (CPHEEO)* guidelines.⁴ Desludging operators and workers were not equipped with protective gear such as gloves and masks. The trucks were not equipped with any safety kit. Also, manual emptying using buckets was practiced in areas where desludging trucks could not reach or where the sludge was too thick or solidified for the pump to work effectively.

Although the truck used by the private desludging operators were found to be in compliance with design requirements, the operators and workers had not received formal training programmes on the transportation and associated aspects, such as use of personal protective equipment and disposal, per regulations and procedures. There was no documentation of the volume of faecal sludge generated, treated and disposed.

The faecal sludge generated in the city was not properly treated and disposed. Sludge collected from households was disposed on agricultural land, drains, low lying areas and water bodies around the city because there was no designated place for disposal and/ or treatment. There was no effective monitoring FSM by the municipal officials due to lack of operative regulation and supporting guidelines. Hence there was a need to develop comprehensive faecal sludge management guidelines.

FSM IN NATIONAL AND CITY URBAN SANITATION POLICY

GWMC addressed this multi-faceted FSM challenge by introducing FSM regulations and septage management guidelines derived from provisions and specifications on septage management in various national level guidelines and regulations. These included the 2005 National Building Code, 2012 revised CPHEEO Manual on Sewage and Sewerage Treatment, 2013 Advisory Note on Septage Management in Urban India, and the 2008 National Urban Sanitation Policy.⁵

The National Urban Sanitation Policy (NUSP) aimed to develop a conducive environment for the adoption and implementation of FSM, and called for the creation of community driven, sanitary, healthy and habitable cities through provision of toilet facilities and safe disposal of waste after treatment. The scope extends to all the projects, national government programs and schemes that facilitate and support sanitation services, urban development and improved delivery of services in urban and peri-urban areas of India. The policy sets the context, priorities, direction and to facilitate, nationwide implementation of FSM services in all ULBs.

To put the NUSP into action the Ministry of Urban Development issued the Septage Advisory, which focuses on the development of a septage management sub-plan as a part of the city sanitation plan. The advisory emphasises the importance of a multi-stakeholder approach through establishment of city sanitation task force as advocated by NUSP. Each state is expected to have a FSM policy and the ULBs should have resolutions to implement this policy directive.

The legal context for FSM includes (a) municipal building by-laws, which provide a framework for control of effluent, sewage and septage discharge; (b) environmental laws which apply to the final and safe disposal of post-processed residual faecal sludge and septage to prevent contamination of ground water, surface water and ambient air and possible use as compost; (c) laws prohibiting “manual scavenging”, which bans dry latrines and hazardous cleaning of sewers and septic tanks; and (d) institutional laws that provide for the establishment, powers and functions of local authorities.^{6,7,8}

GWMC formalised FSM regulations and supporting operative guidelines by issuing a council resolution on 25th March 2016, **making Warangal the first**



Desludging operators have no safety equipment for desludging septic tanks



Disposal of faecal sludge directly onto a field



Septage disposal point at Alankar bridge

Figure 2: Faecal sludge transportation and disposal in Warangal

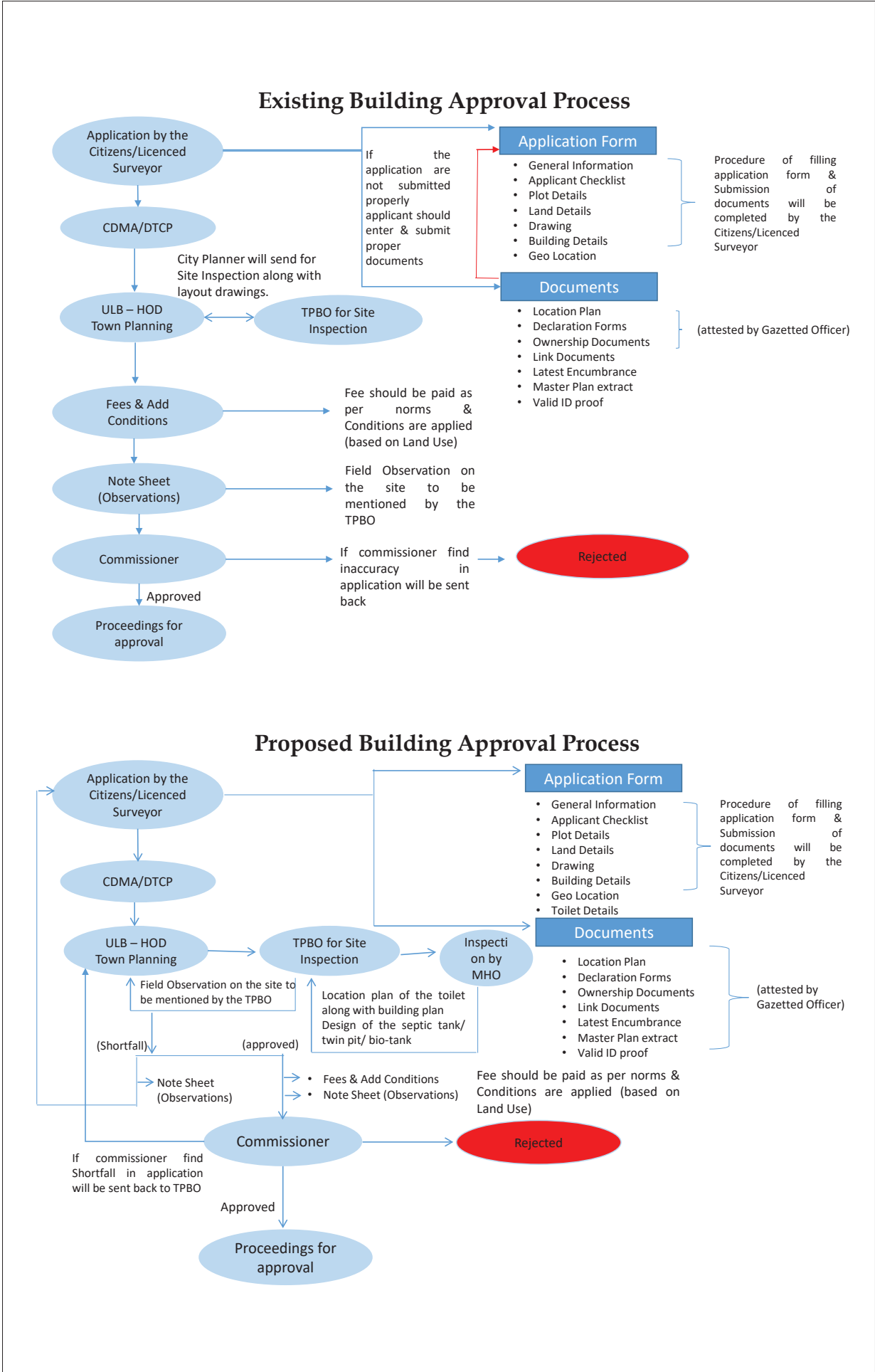


Figure 3: The previous and revised building plan approval process

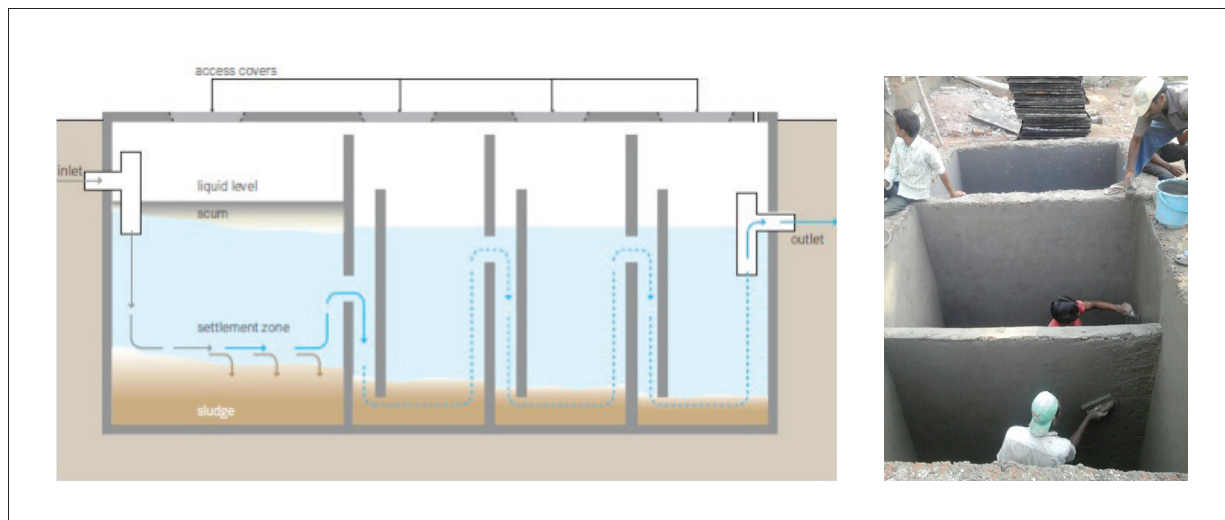


Figure 4: Design of the three chamber septic tank

city in India to introduce a comprehensive FSM regulatory framework. The objective of the regulation and guidelines was to promote a comprehensive and integrated approach to FSM and septage management covering collection, storage, desludging, transportation, treatment, disposal and reuse.

THE OBJECTIVE OF THE REGULATION AND GUIDELINES WAS TO PROMOTE A COMPREHENSIVE AND INTEGRATED APPROACH TO FSM AND SEPTAGE MANAGEMENT

The guidelines cover the following key elements of septage management:

- Design and construction of septic tanks
- Conversion of insanitary latrines into sanitary latrines
- Septic tank pumping and desludging
- Septage transportation
- Treatment, disposal and reuse of septage
- Information, education and communication
- Training programs
- Record keeping and reporting (MIS)
- Help line for septage management (S-line)

The GWMC council defines the policy and commissioner and GWMC acts as a regulator. The GWMC sanitation department ensures effective implementation of the regulation. Currently, there is no independent regulator for FSM.

Following the introduction of regulation in Warangal, the Ministry of Urban Development, Government of India released National Policy on Faecal Sludge and

Septage Management (FSSM), February 2017. The Warangal experience was used as a reference while developing the national policy.

OPERATIONALIZING THE FSM REGULATIONS

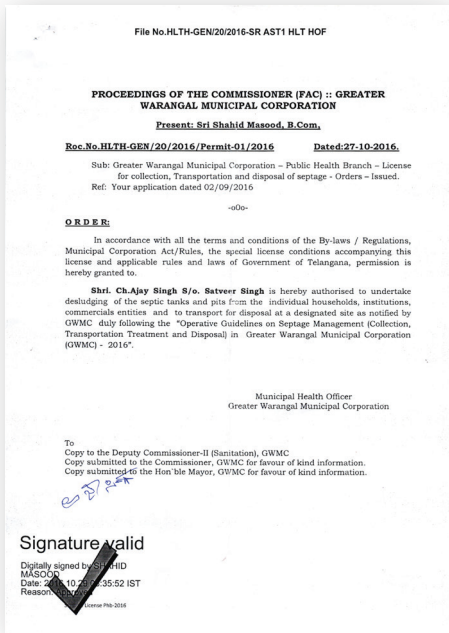
The city has developed an institutional framework defining the roles and responsibilities of stakeholders and enforcement and monitoring strategies for successful implementation of FSM systems. During the last year, the city government has introduced several initiatives:

Improving design and construction of septic tanks

Adoption of improved designs of septic tanks for households, as well as the use of advanced septic tanks (three chamber septic tanks that offer better settling capacity and retention time) and Decentralized Waste Water Treatment (DEWAT) systems by institutional and bulk consumers such as hotels, colleges and apartments. This is being achieved by adopting regulations on septic tank designs and construction methods as part of building plan regulations. As a first step, revision of the building plan approval process means that the town planning department and/or sanitation department of the municipal corporation approves the septic tank design during the building plan approval process and also inspects the septic tanks during their construction to ensure they meet the approved design. These inspection reports are filed with GWMC.

Conversion of insanitary latrines to sanitary latrines

The GWMC public health department has completed a survey of all households to identify the insanitary latrines and improperly constructed septic tanks. The information will be used to educate and give notice to households with insanitary toilets to bring them into line with the approved designs. Funding support



మల బరద (సిప్టిక్ ట్యాంక్) నిర్వహణ లైసెన్స్ అపరేటర్ల వివరములు
Details of licensed Fecal waste operators

క్రమ సంఖ్య SI.NO	అనుమతి పొందిన లైసెన్స్ అపరేటర్ పేరు Name of the licensed Operator	అడ్రస్ Address	సంప్రదించవలసిన ఫోన్ నంబర్ Contact No.
1	డిల్లీ సంపత్ రావు Mr.Dilly Sampath Rao	ఎస్ ఆర్ సెప్టిక్ క్లీనర్స్ # 1-1-27 /F, ప్రతిభాపూరి కాంపస్, కాజిపేట్, చిరంగల్. S R Septic cleaner, # 1-1-27 /F, Chaintanyapuri Colony, Kazipet, Warangal.	9849145043/ 9866584455
2	సి.ఎ.ఎ.సింగ్ Mr.Ajay Singh	ఎస్ఎస్ యూనివర్సల్ టాయిలెట్స్ రిజిస్ట్రేషన్ నెం: 46 of 2008, ఇటిసెం కాంప్లెక్స్, నియర్ ఓపెన్ నాలా, లింగంపల్లి, చైరాలాచర్ MS Universal Toilets, Reg: 46 of 2008, KTCM Complex, Near Open Nala, Lingampally, HYD	8187814905
3	సి.ఎ.ఎ.సింగ్ Mr.Ajay Singh	ఎస్ఎస్ యూనివర్సల్ టాయిలెట్స్ రిజిస్ట్రేషన్ నెం: 46 of 2008, ఇటిసెం కాంప్లెక్స్, నియర్ ఓపెన్ నాలా, లింగంపల్లి, చైరాలాచర్ MS Universal Toilets, Reg: 46 of 2008, KTCM Complex, Near Open Nala, Lingampally, HYD	8187814905



Figure 5: Copy of the order to licence desludging operators

of USD 90.00 is being made available to households for the conversion. To date, 176 of 181 applications have been approved. Of these 176 households, 148 have completed the conversion of their toilets. Toilet conversion notices have been issued to more than 12,000 households.

Septic tank pumping and desludging GWMC has established a formal process of licensing desludging operators. As of 26 October 2016, GWMC had issued licences for collection and transportation operations to three operators running eight trucks. The licence is valid for five years and needs to be renewed every year. While the GHMC reserves the right to regulate and fix the user charges, it has decided to leave this to market

forces. Currently an operator charges USD 30.00–40.00 per visit. Households are reminded to engage the licensed operators for sludge collection. The contact details of licensed operators is available on GWMC website. GHMC has sent a written request to the police commissioner to seize the vehicles and operators of unlicensed desludging operations. Multiple rounds of training and demonstrations have been organised to explain the approved standards and procedures for pumping and desludging and about the importance of using personal protective equipment (PPE).

Septage transportation Licensed desludging operators have trucks that meet the approved standards for desludging and transportation, and trained workers equipped with uniforms, safety gear,



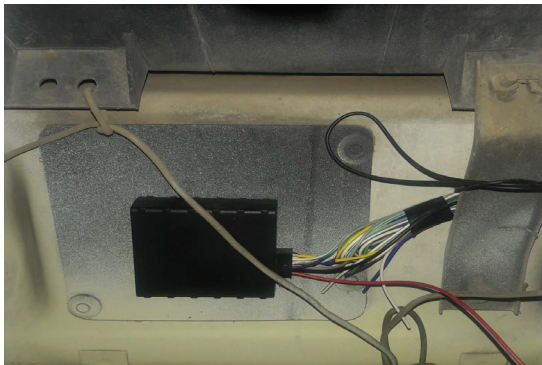
Figure 6: Licensed operator with an emptying vehicle truck

tools and vacuum trucks. The vehicles have been fitted with GPS by the operators at a cost of USD 120.00 per truck. For the purpose of monitoring vehicles, the data is tracked by GWMC.

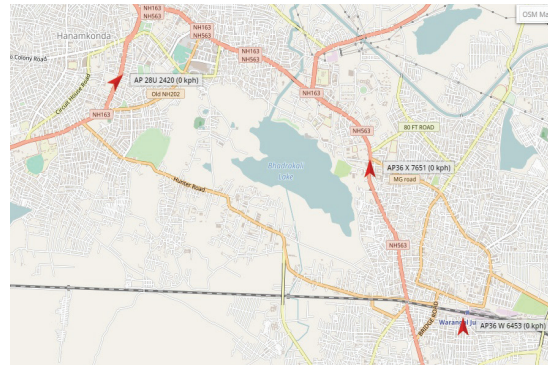
SUITABLE TECHNOLOGIES THAT MEET THE LEGAL REQUIREMENTS HAVE BEEN IDENTIFIED

Septage treatment, disposal and reuse Following a series of interactions with technology vendors, suitable technologies that meet the legal requirements have been identified. GWMC has earmarked two land parcels of five acres and two acres that meet the environmental requirements and standards for construction of septage treatment plants. Detailed Project Reports (DPRs) have been prepared and appropriate financing models for construction and operation and maintenance (O&M) of septage treatment and disposal facilities have been finalised.

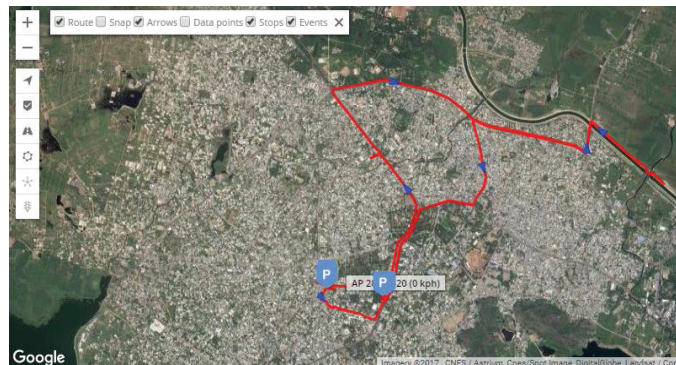
One technology solutions that has been identified is co-treatment with municipal solid waste (bio-methanation). The tender process began in June 2017. The private partner is expected to make a capital investment of USD 2.5 million, and absorb the O&M costs for 15 years. The second solution is treating



GPS tracker inside a vehicle



FSM vehicle location: red arrows show locations of vehicles



Vehicle route map: Route is marked in red, blue arrows indicates the direction in which vehicle travelled

Figure 7: GPS tracking of septage trucks

faecal waste using a thermal process called pyrolysis. The plant is being established with an investment of about USD 0.23 million. The memorandum of understanding was signed on 25h March 2017 and plant with a capacity to treat 15 kl of septage per day is expected to be operating by August 2017. These disposal options are approved by Government of India as well as State Pollution Control Board.

RESIDENT WELFARE ASSOCIATIONS AND WOMEN SELF-HELP GROUPS IN SLUMS HAVE BEEN ENGAGED IN PROMOTING SAFE FSM PRACTICES

Information, education and communication GWMC has held awareness raising events in slums and other areas and also established sanitation resource centres in some slums to promote adoption of proper toilet designs, construction methods, periodic desludging and safe sanitation practices. Workshops have been held with masons, builders and desludging operators to expose them to improved designs and methods of construction. Posters have been displayed on public toilets and on septic tanks to raise awareness and informing citizens where to seek information. School children have participated in information, education and communication (IEC) campaigns. Resident welfare associations (RWAs) and women self-help groups in slums have been engaged in promoting safe FSM practices.

Training programs GWMC is supporting capacity building of stakeholders including its own staff through appropriate reputable institutions such as ASCI and CDD. An organisational strengthening and training needs assessment study has been commissioned to Kakatiya Institute of Technology and Science (KITS), to identify the training and capacity building requirements of each stakeholder. CDD has been engaged to design and deliver a 'toilet builder' training program leading to certification and licensing of masons. More than 70 masons have been licensed so far and their details are available at the GHMC office and on the GWMC website. Masons trained in the first round of training were invited to share their experiences with the participants of the second training program. Regular interaction with trained masons and field visits were carried out to assess the quality of their construction post training. A formal training effectiveness assessment has been commissioned to KITS.

MASONS TRAINED IN THE FIRST ROUND OF TRAINING WERE INVITED TO SHARE THEIR EXPERIENCES WITH THE PARTICIPANTS OF THE SECOND TRAINING PROGRAM

Record keeping and reporting (MIS) GWMC is building a database of insanitary latrines, location of septic tanks, details of operators responsible for collection of sludge and details of septage treatment plants. As mentioned, the septage vehicles are being fitted with GPS and the details are being used by GWMC for monitoring. An FSM tracker mobile app was developed and is used to capture information on septage collection in real time and aid effective implementation of the regulations. All the licensed operators are required to report information as required by GWMC. A daily follow up system is in place to encourage operators to report information. Detailed records of operations, including household, area and location, type of septic tank, age of septic tank, date of desludging, quantity of septage, user charges collected, accidents and spillages and the next date for desludging are maintained. In November 2016, 41 records were made by the eight trucks run by the three licensed operators. In December 2016, and January, February, March and April 2017 the number of records made were 69, 86, 87, 110 and 126 respectively.

A draft framework linking information gathered through mobile app to the city property database has been developed to help ensure scheduled desludging.

GWMC HAS ESTABLISHED A SANITATION HELPLINE CALLED S-LINE AS THE SINGLE POINT CONTACT FOR CITIZENS TO REACH OUT FOR FSM SERVICES

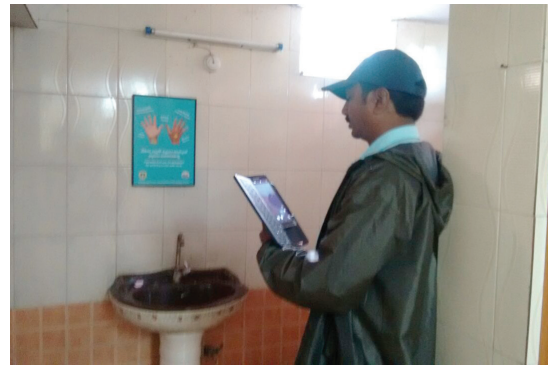
Helpline for septage management GWMC has established a sanitation helpline called S-Line as the single point contact for citizens to reach out for FSM services. Customers can use the GWMC toll free phone line to request new toilets, get technical support for toilet construction such as toilet design, construction materials and details of licensed masons.



Mason training programmes



Sanitation improvement workshop for sanitation inspectors



Desludger operator training in PPE and use of the FMS tracker mobile app



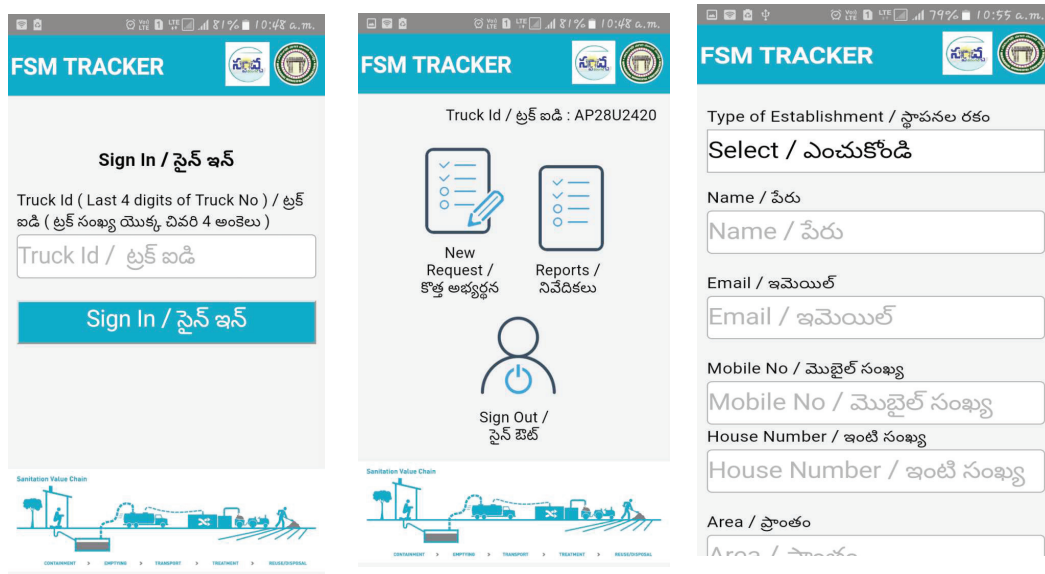
Campaigns related to the sanitation helpline



Figure 8: IEC initiatives and training programs

Customers can also use the helpline to access citizen services related to desludging services, and subsidy flows, and to make complaints and suggestions for instance on the provision of public toilet facilities. The S-line services are institutionalized under the GWMC information technology department and works closely with the corporation's sanitation and town planning departments. A project implementation unit (PIU) within GWMC has been established for the speedy implementation of sanitation improvements. Led by an additional commissioner, town planners, town level federation members and ASCI team members, the PIU meets once a week to review the progress of work.

Launched in May 2016, S-line has become popular and on an average receives 45 requests a day. Sixty percent of callers are women and 80 percent of the calls received are for new applications. During the four-month pilot phase, 542 grievances were resolved and technical assistance was provided to all the 160 callers. S-line has started receiving calls to book trucks for desludging. To date, S-line was able to facilitate GWMC to release subsidies amounting to USD 615,384 to 2,000 new beneficiaries and to clear pending subsidies for close to 4,000 beneficiaries. The successful pilot is being scaled up city wide towards making Warangal a model sanitation city.



FSM Tracker app downloadable from the Google Play store

#	FSMID	FSM Name	TruckId	Truck DriverName	Operator Id	Operator Name	Aadhar Number	Email	Mobile no	Booking Date	HouseNO	Area	City
1	100180	RD collage	1008	Narasimha Rao	10008	Mr Dilly Sampath Rao			9059910298	06/01/2017	2-2-126	Naimnagar	Hnk
2	100179	Raju	1006	Srinivas	10008	Mr Dilly Sampath Rao			9966451421	05/01/2017	22-7-62	Dr colony 1	Wgl
3	100178	Rsinivas	1008	Narasimha Rao	10008	Mr Dilly Sampath Rao			8328234215	05/01/2017	15-2-287	Rangampeta	Warangal
4	100177	G kranthikumar	1002	Yakalah	10006	Mr Vjay Singh so Satveen Singh	245788015763		7386053753	04/01/2017	25-3-60/1	Somedi	Gwmc
5	100176	Kumar	1008	Narasimha	10008	Mr Dilly			9866898141	04/01/2017	5-11-269	Naimnagar	Hnk

The FSM Dashboard provides real time information for analysis and decision making

Figure 9: FSM tracker and dashboard

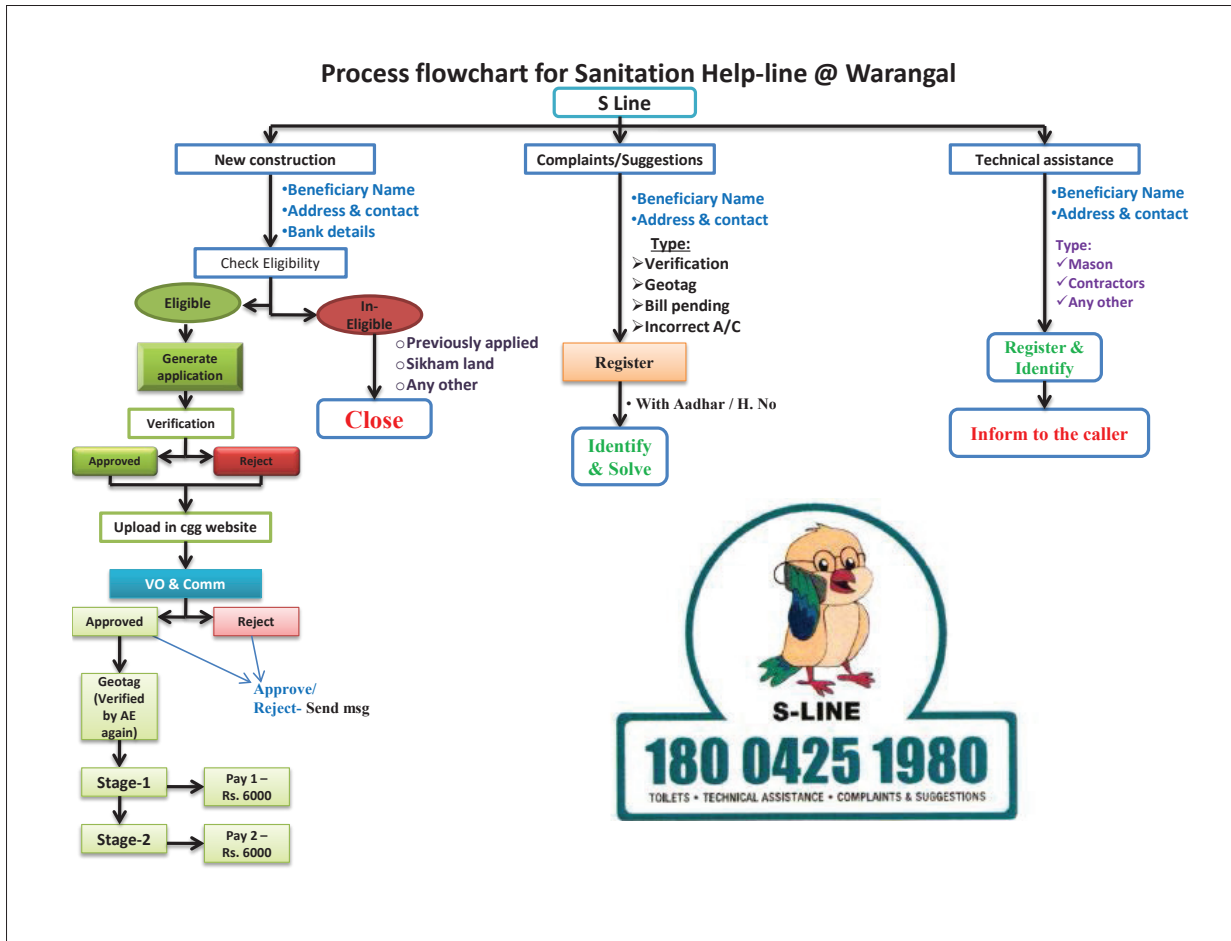


Figure 10: S-line process flow and operations

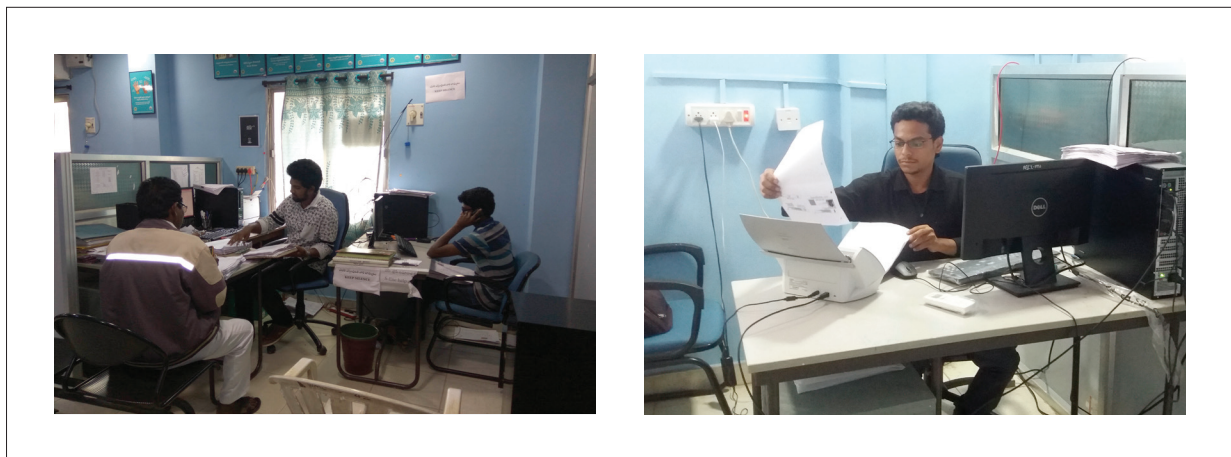


Figure 11: The S-Line office

FINANCIAL AND ECONOMIC ASPECTS AND BUSINESS MODELS

The combined subsidy of the national and state governments for individual toilet provision is USD 182.00. Households have to cover any additional costs for construction of the toilet. Public toilets are financed through a PPP mechanism, with a fee of USD 0.03 for toilet use and USD 0.08 for bathing. The operators are procured through a competitive bidding process.

The desludging operations are provided by the private firms operating in a competitive environment. The cost of desludging ranges from USD 24.00 to USD 40.00 based on the capacity of the septic tank. The tariff for desludging operations is left up to market forces.

As mentioned, one of the faecal sludge treatment plants (co-treatment) is being established using the PPP model. The private operator will cover capital expenditure and operating expenditure for 15 years.

In return, the private operator will be entitled to retain the proceeds from the sale of gas. The second FSTP is being established under a corporate social responsibility model with the private operating covering capital expenditure and GWMC covering O&M expenditure.

CAPACITY DEVELOPMENT

At the request of GWMC, a detailed capacity enhancement needs assessment was carried out by ASCI. Stakeholders were identified and mapped using an influence and interest matrix. Taking on board a recommendation of the needs assessment, ASCI developed a curriculum to build the capacity of each stakeholder. Training programmes were conducted at different levels – from masons to the city leadership team including elected representatives. Hand-on training programmes were provided for desludging operators. Study tours were also carried out for elected representatives. The capacity of civil society groups were also built through exposure visits and short term training/peer learning. Kakatiya Institute for Technology and Sciences (KITS) University was engaged as knowledge partner for sustained capacity building.

DRIVERS OF CHANGE AND LESSONS LEARNED

Key triggers that enabled the situation to change in Warangal:

Evidence based advocacy Compelling evidence gathered through diagnostic study of FSM practices revealed potential public health and environmental risks and inverse linkage to health. These findings were shared extensively with city stakeholders and state government. Bringing evidence into the public domain was a wakeup call and led to stakeholder consensus for action.

City level leadership Committed leadership at state and city level which recognised the need and urgency of addressing unregulated septage management practices. Introduction to national and international good practices through exposure visits led to confidence building.

Environmental concerns Evidence of contamination of drinking water bodies in faecal waste disposal areas as reported by local media led to public outcry for action.

Civil society participation Active dialogue with RWAs, City Sanitation Task Force members, town level federation members, non-governmental and private sector players led to ownership of FSM initiatives and acceptance of new practices.

Active support for desludging operators The two major private desludging operators experienced difficulties disposing sludge due to growing citizen vigilance. Prior to the regulation, they had requested that the city government earmarked land for sludge disposal. Operators welcomed regulation and asked the city government to prioritize FSTP. Another reason for their support is the perceived risk to their business from small time, manual/semi manual desludging operators and the need to create a level playing field.

Lessons learned during the past year from implementing FSM regulations in Warangal are:

Establish a faecal sludge treatment plant as early as possible Because of delay in establishing FSTPs, operators continue to dispose sludge in an unregulated manner and citizens did not see significant change. Technology selection process, DPR preparation and earmarking of land for FSTP should begin early on in the project cycle and FSTP should be prioritised and implemented alongside other components of regulations.

Select FSTP sites close to the market The land parcel identified for FSTP is over 20 km away from the city limits. Selection of suitable land parcel(s) closer to the market, preferably within a travel distance of 10 km will enhance compliance and improve financial viability of the initiative.

Define institutional arrangements for FSM There is no clear assignment of the roles and responsibilities of stakeholders for safe management of faecal sludge. State government could play an enabling role and define the responsibilities of, for example, citizens, GWMC, Pollution Control Board and civil society groups. Also, at the municipal level, organisational structure and staff responsibilities should be clearly defined to ensure the success of FSM activities.

Strengthen data systems at municipal level The city level database of toilet coverage, toilet typology and property details is disorganised, hindering effective planning of FSM. It is important to strengthen data systems using GIS tools to enable effective planning and introduction of scheduled desludging of toilets.

THE WAY FORWARD

Following the successful enactment of FSM regulation, the city is geared up to address outstanding challenges by undertaking various initiatives along the sanitation value chain:

Establishing FSTPs A detailed FSTP project report has been prepared, land and financial resources have been earmarked, and a technology partner identified.

A public private partnership model based on SLAs is being considered for FSTP.

Introducing city-wide GIS mapping International best practices have been identified, consultant and technology finalised, and mapping households and linking the data to desludging schedule is underway.

Conversion of insanitary to sanitary toilets The city has appointed designated officers for each of its 58 election wards for better supervision and coordination of works. S-line is being scaled up for the quick processing of applications, fund disbursal and toilet construction/repair.

Conducting awareness campaigns involving RAW, bulk generators and municipal functionaries, emphasising the need for conversion of insanitary to sanitary toilets, periodic desludging practices etc. Monitoring environmental quality around existing disposal areas to sensitize residents is also planned.

Monitoring desludging operators to ensure the use of PPE and other commitments outlined in SLAs is a must. The city has appointed a sanitary office responsible for monitoring desludging operators. Study tours and exposure visits for the desludging operators are being planned.

Determining desludging fees Currently the price charged by the operators is market determined. However, going forward as the number of operators increase and periodic desludging sets into motion, it may be prudent to regulate prices to protect the public interest.

Enforcing strict restrictions on the growing number of unlicensed operators and charge fines for non-compliance of scheduled desludging by households and bulk generators.

In summary, Warangal City has introduced several innovative processes and solutions (S-line, co-treatment of faecal sludge and municipal solid waste, FSM tracker, GPS systems in desludging trucks to name a few) to operationalize FSM regulation. Also other necessary sanitation interventions such as gender friendly public toilets. The response from stakeholders is encouraging thanks to concerted evidence based advocacy. The city is poised to address challenges, deepen implementation and earmark financial resources. PPP models are also considered. Lessons from Warangal are being scaled up across the State of Telangana through the introduction of State level FSM policy and operational guidelines.

NOTES

- ¹ National Policy on Faecal Sludge and Septage Management (FSSM), Ministry of Urban Development, Government of India, 2017
- ² Census, 2011
- ³ *Report on City-Wide Plan and Technical Proposals through PPP for Delivery of Sustainable and Equitable Sanitation Services in Warangal Phase- I, ASCI 2015.*
- ⁴ Central Public Health and Environmental Engineering Organisation (CPHEEO) is the Technical Wing of the Ministry of Urban Development, Government of India
- ⁵ Ministry of Urban Development, Government of India (2008) *National Urban Sanitation Policy*, 2008
- ⁶ 2013 Prohibition of Employment as Manual Scavengers and their Rehabilitation Act
- ⁷ Specifically, the Building Code of India as applicable to septic tanks, soak pits, cess pools, leach pits, drainage fields etc. and the 2016 Model Building By-Laws framed by the Town and Country Planning Organisation.
- ⁸ Specifically (Municipal Law, the 1986 Environment (Protection) Act, and the 1974 Water (Prevention and Control of Pollution) Act), and 2016 Solid Waste Management Rules

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ABBREVIATIONS AND ACRONYMS

ASCI	Administrative Staff College of India
CDD	Consortium of DEFATS Dissemination
CPHEEO	Central Public Health and Environmental Engineering Organisation
DEFATS	Decentralized Wastewater Treatment System
FSM	faecal sludge management
FSTP	faecal sludge treatment plant
GWMC	Greater Warangal Municipal Corporation
NUSP	National Urban Sanitation Policy
PPP	public private partnership
S-line	Sanitation Helpline
SLA	service level agreement
ULF	urban local body

ACKNOWLEDGEMENTS

Greater Warangal Municipal Corporation, Warangal
Municipal Administration & Urban Development, Government of Telangana
Rotary International
Oriental Insurance Company Limited
Resident Welfare Associations
Mission for Elimination of Poverty in Municipal Areas
Bill and Melinda Gates Foundation

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Published by the Bill & Melinda Gates Foundation

This publication was funded in part by the Bill & Melinda Gates Foundation. The narrative, findings and conclusions contained within are those of the authors and do not necessarily reflect positions or policies of the Bill & Melinda Gates Foundation.

Digital versions of this publication and the complete volume of case studies (ISBN 978-1-5136-2513-3) are available at www.susana.org.

August 2017