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## Greater Visakhapatnam Municipal Corporation Faecal Sludge and Septage Management Policy and Operational Guidelines



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## foreword



**Shri. Pravin Kumar, I.A.S.**

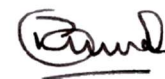
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Safe and sustainable sanitation is a basic requirement for the people living in any city. The Ministry of Housing & Urban Affairs, GoI, have taken steps by way of introducing two major schemes viz; Swachh Bharat Mission Urban (SBM-U) and AMRUT. As per the Swachh Sarvekshan 2017 data, out of 4,041 cities where Ministry of Urban Development (MoUD) is presently focusing, 1012 cities have been declared Open Defecation Free (ODF). Achieving ODF is the first step towards cleaner and safer environment. The cities which have been declared ODF should now take the next step and move towards safer disposal of Faecal Sludge.

The city of Visakhapatnam which has secured the rank of third cleanest city in the 2017 Swachh Sarvekshan. Further steps are being taken to bring improvement in the overall sanitation in the Vizag by taking faecal sludge and septage on par outlined under the National Faecal Sludge and Septage Management Policy. The Policy underscores the seriousness GVMC is indicating in its efforts to meet sustainability and environmental targets.

It gives me immense pleasure to introduce the City Faecal Sludge and Septage Management Policy along with the Operational Guidelines. It provides direction for managing the fecal sludge in a cost-effective manner wherein treatment, resource recovery methods are adopted with focus on efficient management of transportation of septage from source up to the treatment. The attached Operational Guidelines serves as a blue print for service delivery for GVMC and how it aspires an active engagement with the private sector in meeting the common sectoral goals.

I am optimistic that the introduction of this policy will be a paradigm shift in the management of faecal sludge and septage in city as it introduces the best practices which help in achieving the predefined targets set forth. I wish to thank GVMC Officers who have been leading this change process with the active support of other State Government Departments and WSUP [under the Capacity Building for Swachh Bharat Mission - Urban' (CBSBMU) funded by USAID] in taking this sanitation initiative forward.



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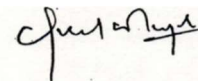
Under the Sustainable Development Goal, India is required to provide safe and healthy environment to its citizens. Safe sanitation practice is extremely necessary to ensure healthy lives and promote well-being for all ages. Government providing cleaner cities is not only to meet the promises made at the global and national front but also increases the economic status of the individuals through reduced medical expenditure as well as increased the disposable income. To achieve this, Ministry of Housing & Urban Affairs, Government of India has come up with two schemes viz; Swachh Bharat Mission Urban (SBM-U) and Atal Mission for Rejuvenation and Urban Transformation (AMRUT) and National Faecal Sludge & Septage Management Policy.

Since the implementation of the SBM-U Programme in October 2014, significant efforts are being made in Visakhapatnam to generate awareness, build capacities of the GVMC officials and create and upgrade sanitation infrastructure, as per the needs of a given area. The consistent efforts have borne fruits and we take pride in the fact the Visakhapatnam is 3<sup>rd</sup> cleanest city in India.

Going forward, it is clear that 60 per cent of Vizag's population are dependent on the On-Site Sanitation (OSS) system. There has been an increase in the percentage as additional sanitation infrastructure created under SBM-U. GVMC aims for 100 percent sewerage coverage for the city in near future. Till such time, an interim arrangement is put in place to manage the faecal sludge generated by adopting the most cost effective and environment friendly treatment techniques.

In this context, instructions have been issued by the Department of Municipal Administration & Urban Development, Government of Andhra Pradesh on Faecal Sludge and Septage Management (FSSM). Working in this direction, GVMC is launching its own City Faecal Sludge and Septage Management Policy and Operational Guidelines to facilitate implementation of FSSM activities within the city. GVMC clearly articulates how it intends to foster FSSM sector, among others, to achieve universal and safe environmental sanitation leading up to outcomes on public health and environment.

It is no mean achievement and I would like to take the opportunity to thank the immense contribution made by Vizag's citizens along with the support extended by the officials from various government departments, non-government organizations and in particular WSUP (under the Capacity Building for Swachh Bharat Mission - Urban' [CBSBMU] funded by USAID) who have provided valuable insights in formulating this policy and following it up tools and instruments to support its roll out. I take pride in reaching the target set up by the GoI and would like to urge all to move ahead and set a benchmark for the others to follow.



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## LIST OF ABBREVIATIONS

|                  |  |
|------------------|--|
| <b>BIS</b>       | Bureau of Indian Standards                                       |
| <b>CPHEEO</b>    | Central Public Health and Environmental Engineering Organization |
| <b>CSE</b>       | Centre for Science and Environment                               |
| <b>CSTFs</b>     | City Sanitation Task Forces                                      |
| <b>FFD</b>       | Faecal Flow Diagram  |
| <b>FSSM</b>      | Faecal Sludge Septage Management                                 |
| <b>FSM</b>       | Faecal Sludge Management   |
| <b>FSTP</b>      | Faecal Sewage Treatment Plant                                    |
| <b>GoAP</b>      | Government of Andhra Pradesh                                     |
| <b>GoI</b>       | Government of India  |
| <b>GVMC</b>      | Greater Visakhapatnam Municipal Corporation                      |
| <b>IHHT</b>      | Individual Household Toilet                                      |
| <b>MA&amp;UD</b> | Municipal Administration & Urban Development                     |
| <b>MLD</b>       | Million Liter per Day  |
| <b>NBC</b>       | National Building Code   |
| <b>OSS</b>       | Onsite Sanitation  |
| <b>PESTLE</b>    | Political Economical Social Technological Legal Environmental    |
| <b>PPE</b>       | Personal Protective Equipment                                    |
| <b>STP</b>       | Sewage Treatment Plant   |
| <b>SWM</b>       | Solid Waste Management   |
| <b>SWOT</b>      | Strength Weakness Opportunity                                    |
| <b>VTO</b>       | Vacuum Truck Operator  |
| <b>WHO</b>       | World Health Organization  |

## TERMINOLOGY

|   |   |
|---|---|
| <p><b>Faecal Sludge</b></p>                               | <p>Faecal sludge comprises all liquid and semi-liquid contents of pits and vaults accumulating in on-site sanitation installations, namely un-sewered public and private latrines or toilets, aqua privies and septic tanks. These liquids are normally several times more concentrated in suspended and dissolved solids than wastewater. The physical, chemical and biological qualities of faecal sludge are influenced by the duration of storage, temperature, soil condition and intrusion of ground water or surface water in septic tanks or pits, performance of septic tanks, and tank emptying technology and pattern.</p>   |
| <p><b>On-site Sanitation</b></p>                          | <p>On-site sanitation is a system of sanitation whose storage facilities are contained within the plot occupied by a dwelling and its immediate surroundings. For some systems (e. g. double-pit or vault latrines), faecal matter treatment is conducted on site and also by extended in-pit consolidation and storage. With other systems (e. g. septic tanks, single-pit or vault installations), the sludge has to be collected and treated off-site. (WHO, 2006, p. 180)</p>   |
| <p><b>Faecal Sludge and Septage Management (FSSM)</b></p> | <p>FSS Management (FSSM) deals with on-site sanitation systems, while wastewater management is concerned with sewerage sanitation. FS may be treated in separate treatment works or co-treated with sludges produced in wastewater treatment plants. (Strauss et al., 2002). Faecal Sludge Management (FSM) involves safely collecting, transporting, treating and disposing the faecal sludge from the on-site sanitation systems. A more commonly used term has been septage management, which is "a historical term to define sludge removed from septic tanks" (Tilley, Ulrich, Lüthi, Reymond, &amp; Zurbrügg, 2014). On-site sanitation systems collect, contain and partially treat the faecal waste and wastewater. The sludge accumulated in these systems need to be periodically removed and treated before being disposed into the environment.</p> |
| <p><b>Septage</b></p>                                     | <p>Septage means the liquid and solid material that is pumped from a septic tank, cesspool, or such on site treatment facility after it has accumulated over a period of time. Usually a septic tank retains 60% - 70% of the solids, oil and grease that enter it.</p>   |
| <p><b>Septic Tank</b></p>                                 | <p>Septic Tank means a water-tight receptacle which receives the discharge of a plumbing system or part thereof, and is designed to accomplish the partial removal and digestion of the suspended solid matter in the sewage through a period of detention.</p>   |
| <p><b>Sewage</b></p>                                      | <p>Sewage means water-borne human or animal wastes, excluding oil or oil wastes, removed from residences, buildings, institutions, industrial and commercial establishments together with such ground water, surface water and storm water as may be present.</p>   |
| <p><b>Sewerage</b></p>                                    | <p>Sewerage means and includes, but not limited to, any system or network of pipeline, ditches, channels, or conduits including pumping stations, lift stations, and force mains, service connections, including other constructions, devices and appliances appurtenant thereto, which includes the collection, transport, pumping and treatment of sewage to a point disposal.</p>  |

# VISAKHAPATNAM FSSM POLICY



## POLICY DOCUMENT

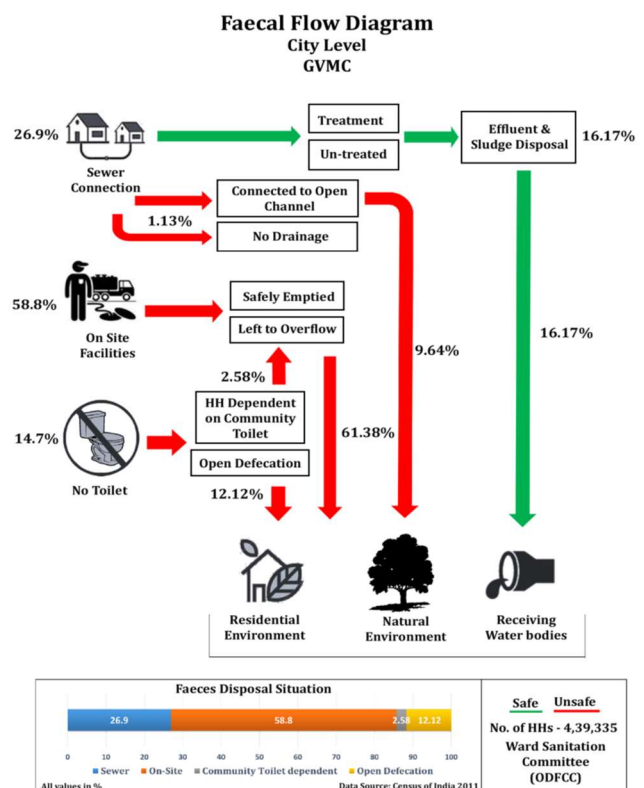
### 1. Background and Purpose

#### 1.1. Sanitation status in Visakhapatnam

As per the 2011 Census, Visakhapatnam has a population of 19, 96,523. The city is divided into 8 Zones including Bheemili and Anakapalli. The municipality of Visakhapatnam came into existence in the year 1858 to fulfil the basic infrastructure requirements of its residents. It was later declared a corporation in 1979. The city is home to some of the important private and public-sector enterprises. Visakhapatnam is one of India’s largest seaports, containing the country’s oldest shipyard. The city has high in-migration, due to large magnitude of economic opportunities available.

Sewerage remains the gold standard of sanitation services in Visakhapatnam despite major shortfalls in coverage and underutilization of existing capacity. The city is divided into 20 sewerage blocks including 32 merged villages (excluding Bheemili and Anakapalli). Based on the 2011 Census, an assessment of the sanitation services was carried out and the resulting data are presented in the faecal flow diagram below.

Visakhapatnam has a mix of on-site sanitation facility coupled with sewerage system for collection of septage and waste water. The Faecal Flow Diagram (FFD) reveals that nearly 14.7 percent household in the city do not have access to adequate sanitation facilities like an individual toilet within their premises. 85.3 percent population do have access to individual household toilets. It further states that out of 85.3 percent, about 58.8 percent households are not connected to the sewerage network and therefore depend on on-site sanitation facility. 14.7 percent households do not have access to toilet, out of this 2.58 percent population use Community Toilet facility to defecate. If we include the community toilet data, a total of 61.38 percent of the household produce faecal sludge, which is not connected with the underground drainage network (UGD) and it is being disposed in open environment without any treatment. Only 26.9 percent of the households are presently connected to the UGD network out of which only 16.17 percent of it is treated through centralized Sewage Treatment Plant (STP). The study informs that in areas which has sewerage network only 50 percent of the households have access to UDG network.



## 1.2. Need for City FSSM Policy

Looking at the current baseline, it is important that departments responsible for managing the portfolio of public health, may undertake necessary precautionary measures, so that Vizag's citizen are not adversely affected. Bearing this in mind, GVMC's earnest effort has been to contain the ill effect of the disposal of faecal matter directly into the environment. There is need to take necessary steps and it is with this view this that the FSSM policy is being conceived and prepared.

Currently there are 8 STPs in GVMC area, which are under operation and are at various stages of construction funded under different schemes. These STPs aggregate to a total of 189 MLD installed capacities for the entire city of which 51 MLD is its current operating capacity. As per Census 2011, 61.38 percent of the total households in GVMC area are using IHHT and CT. With the implementation Swachh Bharat Mission programme, the percentage of users has increased are more IHHTs are sanctioned to the householders, who earlier did not have access to such a facility. Thus, while the containment of human waste will be largely achieved under SBM, but its treatment still poses a huge challenge.

The NUSP of 2008 provides a vision for healthy and liveable cities and outlines different elements that are needed to achieve the vision. While the design standards and guidelines for construction of toilets, septic tanks have already been given and published by the Bureau of Indian Standards (BIS), attention in terms of treatment of septage requires to be addressed in the current scenario. The National FSSM Policy, 2016 provides a framework to managing faecal sludge across the sanitation value chain by cities. The CPHEEO also has provided guidance notes for treatment of septage and faecal sludge with its Sewerage Manual of 2013. The last two years of SBM implementation too has provided impetus towards creating awareness, building capacities of the officials and developing infrastructure to achieve ODF. The Government of Andhra Pradesh also in 2017 adopted an integrated approach to wastewater management allowing cities to jointly manage liquid wastewater and septage in an appropriate manner. Given this overall enabling environment and quantum of households dependent on septic tanks, GVMC proposes a holistic approach for faecal sludge management as a way forward.

This policy document outlines the measures Vizag envisages towards preparedness to handle the sanitation value chain, beyond treatment methods. GVMC meanwhile has also been preparing itself by conducted training programmes, capacity building workshops, monitoring and evaluation plan, financial planning to support the roll out of its policy.

## 1.3. Key areas of improvement to be addressed while formulating policy for FSSM

While onsite sanitation is prevalent in the city, there are major gaps in its implementation across the sanitation service chain. The gaps and consequences on lack of access to toilets are well reported, but the issues pertaining to septage collection, conveyance and treatment remain largely unknown and unaddressed. Apart from a series of technical challenges associated with faecal sludge emptying, haulage and treatment, inadequate political, organizational and regulatory synergies are some areas that also need attention as Vizag moves forward in managing this service. There is urgent need to take appropriate measures to address these issues so that successful implementation is carried out and the goal is achieved. A summary of issues that requires to be addressed also provides the city an opportunity to reform and improve overall services delivery system, are:

- Reaching the unserved and poor
- Improving demand responsiveness
- Scope for integrated city-wide approach
- Strong legal and regulatory framework
- Improvements to city financial capacity
- Increasing awareness of all stakeholders
- Potential for concerted action between stakeholders
- Technology choices

## 2. Objectives and commitments of FSSM policy

### 2.1. Vision

The vision articulated by Visakhapatnam is as follows, “All the inhabitants falling under the GVMC area will live in a city that is free from health hazards, environment pollution and shall be adopting the best practices in sanitation”. It provides for a targeted attention desirous for improved onsite sanitation services together with faecal sludge and septage management for benefitting the whole city with focus on the urban poor.

### 2.2. Objectives

Vizag city through this FSSM Policy articulates and set priorities, commitments and direction for city-wide implementation of FSSM services in all the areas of GVMC, such that safe and sustainable sanitation becomes a reality for all households. More specifically, the Policy will:

- a) Mainstream FSSM in the city by the year 2019. Ensure that all benefits of wide access to safe sanitation accrue to all citizens across the sanitation value chain with containment, extraction, transportation, treatment, and disposal / re-use of all faecal sludge, septage and other liquid waste and their by-products and end-products.
- b) Suggest and identify ways and means, including the methods and resources, towards creation of an enabling environment for realising safe and sustainable FSSM in the City.
- c) Define the roles and responsibilities of various government entities and agencies, and of other key stakeholders such as the private sector, civil society organisations and citizens for effective implementation of FSSM services throughout the country.
- d) Enable and support synergies among relevant Central Government / State Government programs such as SBM, AMRUT and the Smart Cities Mission to realise safe and sustainable sanitation for all at the earliest, possibly by 2019.
- e) While not compromising on the eventual compliance to the strict environmental discharge standards already set, it shall be recognising the constraints in achieving these standards, it will help in adopting an appropriate, affordable and incremental approach towards achieving these standards.

- f) Mitigate gender-based sanitation insecurity directly related to FSSM, reducing the experience of health burdens, structural violence, and promote involvement of both genders in the planning and design of the sanitation infrastructure.

### 2.3. Scope

This policy shall apply to all the areas within GVMC including Anakapalli and Bheemili, whether public or private, residential, commercial, institutional, industrial, proposed/planned or existing.

## 3. Policy outline and commitments

GVMC intends to foster FSSM, among others, as a means to supporting the achievement of universal and safe environmental sanitation leading up to outcomes on public health and environment. The policy statements not necessarily in any particular order translating the intent to action are as follows:

- a) GVMC believes in addressing and achieving public health and environmental safety goals through city wide; integrated and life cycle based planning in tandem with complementing sanitation services like sewerage systems, solid waste management, etc. A step by step planning will serve as a basis for all decisions.
- b) GVMC believes cost-effectiveness and equity (including gender issues) will be two cornerstone principles that will be used while fostering FSSM.
- c) GVMC understands resource management and loop closure as one of the basic pillars of sustainable development and the nexus between different sectors is recognised. In accordance, GVMC will establish formal institutional and programmatic linkages with other state departments / agencies whose could be beneficiaries of some of the products and processes, emerging out of this policy, from time to time.
- d) GVMC will formulate and legalize all rules and regulations required to foster; operationalize the policy as a first step to indicate its intent to providing primacy for operationalizing this policy.
- e) GVMC will formulate clear roles and responsibilities of various actors in the FSSM ecosystem and strive to formalize them institutionally as personnel / service provider / citizen roles using existing tools and instruments.
- f) GVMC intends to continually build institutional capacities and of all personnel involved in identifying solutions and implementation of projects and activities, both within and outside formal delivery process.
- g) GVMC will or cause to kick start actions across all steps of the value chain in equal measure leading to envisaged outputs and outcomes. Where, integration to other schemes / programs is envisioned, the needs of this policy would be considered in equal standing to other schemes / programs.
- h) GVMC assures to create an accurate database to support its evidence-based decision-making at every stage, from planning to service provision and user satisfaction.



- i) GVMC believes a community driven process could provide equal results to conventional processes and use the tenets of the policy to further ward level approaches currently piloted under SBM in Vizag. GVMC also commits to translate increased citizen awareness into quantifiable demand to support the processes at every stage value chain.
- j) GVMC desires achievement of SDG 2030 goals as a key milestone and institutionalize processes for continued implementation and management of FSSM sector. A critical aspect considered will be renewed emphasis on monitoring and learning to advice time to time the implementation actions.
- k) GVMC believes in the importance of piloting project(s) and R&D to ensure that best learning's are available for decision-making. These iterative processes on various subjects will be used to achieve the envisioned goals.
- l) GVMC intends to use best of the range technologies at every stage of project management. Primacy will be provided to occupational health & safety at all stages involving human involvement with wastes. Mechanization and automation are approaches to be used for service providers, both internal and external and at the generation and treatment end.
- m) GVMC intends to follow applicable standards and norms the available from time to time. Where such aspects are not available, GVMC will strive to follow best value for money approaches and principles. In the context of constructing treatment facilities, the focus will be on achieving treatment compliances against national public health & environmental safety standards / norms, prior to working on recycling & reuse.
- n) Given that GVMC mandate to deliver sustainable sanitation services encompasses more than one sector, and multiple projects / programs are underway, it will undertake strategic annual review of the progress of the sector and address inter-linkages on a priority basis. When needed, GVMC can choose to update the policy in the light of the benefits derived from the program and any changes to external activities.
- o) GVMC will and through its awareness creation under SBM linked IEC activities, aim to create an aware and responsive citizenry. The idea is to ensure citizens are at the centre of the overall planning processes, whose needs specific to FSSM are captured and service satisfaction levels are always considered as performance markers.
- p) GVMC commits to ensure financial sustainability while implementing all activities under this policy. Efforts will be made to ensure financial resources for creation of physical infrastructure, institution building, capacity building, improved institutional processes to advance FSSM on par with other infrastructure.
- q) GVMC intends to foster and formally apply best services management talent from the public and private sector in an appropriate measure, from time to time, best serving to achieve the goals. This intent is to create an enabling environment for the private sector and could include formalization of processes hitherto provided for in an unorganised manner.
- r) GVMC commits to address last mile connectivity, obviate any barriers to access and include all disadvantaged population into the overall system by way of graded financial subsidies and other financial modes at every stage, as a pre-condition.

- s) GVMC believes in the use of state of the art IT and mobile applications to manage all activities related to FSSM, from point of generation until its safe disposal with support of continual monitoring, including reporting of outputs and outcomes.
- t) GVMC will seek institutional support from time to time from established and recognised knowledge platforms and use available support from different projects / programs, to further FSSM sector.

#### 4. Step by Step Approach: Operationalizing FSSM

Benchmarking the service performance across the sanitation value chain through a city level assessment is the first step in the planning process. It is an important exercise, which provides an initial sense of the state of FSSM facility in the city. It helps in understanding the context and identifying the gaps in key services.

Performance assessment is required across the Sanitation Value Chain



Detailed assessment of the services will need to be carried out across each link in the chain through appropriate field assessments. As policies and regulations already exist ensuring user interface and toilet access, the policy and ensuing operational guidelines focuses on the last four stages of the value chain, i.e. collection & / containment; emptying and conveyance; treatment; reuse and disposal. A snapshot of the aspects covered under critical stages are as follows:

##### 4.1. Collect & / Containment

The first step in this regard is that GVMC will undertake necessary steps to create a database of all the onsite sanitation facilities that are currently being used in the city. Although current standards provide for comprehensive guidelines regarding construction of septic tank, it is important to understand compliance levels to take corrective measures to support the overall processes in the subsequent steps of the value chain. It is with this view that GVMC will undertake survey of containment system or on-site sanitation system to understand adequacy and address through a robust action plan. It will further strengthen the permitting and inspection process of the septic tank as a vital requirement in the building plan approval for sanctioning of new houses construction. Group housing will be dealt with provisions of having proper onsite sanitation facility within the said complex. In either case, care will be taken to support future migration to sewerage connections when networks are made available.

## 4.2. Emptying and Conveyance

Conveyance describes the movement of sludge from individual septic tanks to treatment facilities, municipal or regional. Currently, these services are largely unregulated across the city of Visakhapatnam. Immediate steps include measured regulation of operators through a system of licensing directed towards enforcement of health and safety standards for prevention of open dumping; and secondly planning for a system of emptying every containment facility with a pre-defined or demanded frequency (typically once every two to three years subject to use levels of households / public accommodations / community or public toilets, and the like). This containment emptying will be contingent on having completed a survey of individual containment facilities to take a fair judgement on the process of emptying.

## 4.3. Treatment

The focus of treatment will primarily be on reaching public health and environmentally safe levels in the first stage and further subject to end use opportunities, suitable reuse treatment mechanisms will be devised. For treatment GVMC will assess the load of septage and assess the requirement of capacity for treatment plant, either exclusively for septage treatment or co-treatment with wastewater or solid waste.

## 4.4. Reuse and Disposal

Reuse/disposal refers to the methods in which products are ultimately returned to the environment, either as useful resources or reduced-risk materials. The treated septage can be used as a soil enricher or as filling material at construction sites. ULB should carry out primary assessment for availability of market and demand for reuse. It is understood that the State FSSM policy recommends co-locating of pure septage associated infrastructure, i.e. building faecal sludge treatment plants next to either sewage treatment plants or solid waste management plants, to gain advantage from synergies in operation and maintenance (effluent from FSTP can go to STP, or output of FSTP can be co-composted with solid waste, etc.). The understanding is that productive value generation from a resource management and financial sustainability perspective will be the last step of the process and dealt with on a case by case basis, at this stage.

# 5. Legislative and Regulatory Contexts

## 5.1. Central laws and rules

The legal context for FSSM includes environment laws, municipal building byelaws, legal rehabilitation of “manual scavenging” and institutional laws that provide for the establishment, powers and functions of local authorities. The first category includes the Environment (Protection) Act, 1986; the Municipal Law, and the Water (Prevention and Control of Pollution) Act, 1974 which provides a framework for control of effluent, sewage and septage discharge. Further, the Solid Waste Management (SWM) Rules, 2016 under the Environment (Protection) Act apply for the final and safe disposal of post-processed residual faecal sludge and septage to prevent contamination of ground water, surface water and ambient air. Further, the SWM Rules 2016 will also applies on the disposal and treatment of faecal sludge and septage, before or after processing,

at landfills and if used for use as compost. The provisions of the National Building Code of India published by the Bureau of Indian Standards (BIS) as applicable for Septic tanks soak pits, cess pools, leach pits, drainage fields etc. also need to be examined.

The Employment of Manual Scavengers and Construction of Dry Latrines (Prohibition) Act, 1993 has put a ban on the use of dry latrines, i.e., latrines with no water-seal or flushing mechanism, and the stops employment of persons for manually carrying human excreta which is referred as night soil. This was supplemented in 2013 with the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 by which “hazardous cleaning” in relation to sewers and septic tanks was also banned. The law now provides that manual cleaning of sewers and septic tanks, if necessary, may be carried out only in highly controlled situations, with adequate safety precautions, and in accordance with specific rules and protocols framed for the purpose.

It is a fundamental premise that all efforts planned for will be within the ambit of the existing rules and regulations, legally bound principally or otherwise. Safety norms as provided in the Sewerage and Sewage Treatment Manual is decision-making criteria to ensure safeguards under the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013, apart from GVMC’s own rules.

## **5.2. State laws, rules and regulations**

All the stakeholders involved in FSSM in the sanitation value chain should adhere to the requirements of this policy and the State Laws, rules and regulations enacted from time to time and or suitably adapted to Vizag’s requirements. The Model Building Bye-Laws (MBBLs), 2016 framed by the Town and Country Planning Organization and as adapted for Andhra Pradesh in 2017 may be referred.

## **5.3. Formation of rules and regulation at GVMC level**

GVMC will formulate rules and regulation in the form of septage bye-laws, guidelines for registration and operation of VTOs, DSOs, monitoring frameworks of the overall process etc. within the boundaries of the policy. These will be complimented and supplemented with regulations from time to time with an intention further the FSSM sector requirements across the value chain. Site selection for sludge use and application by parties (like residential layouts) and GVMC would need a prior consent to operate from the competent authority (like State Pollution Control Board).

## **6. Roles and Responsibilities**

GVMC and households are the key stakeholders in the overall process of FSSM. They perform different roles given the context and interfaces they are exposed to.

| Level                 | Lead Roles   | Supportive Roles   |
|-----------------------|--|--|
| GVMC                  | <ul style="list-style-type: none"> <li>• Design, develop, plan and implement ULB level FSSM strategy</li> <li>• Set up and ensure operation of systems for 100% safe and sustainable collection, transport, treatment and disposal of faecal sludge &amp; septage</li> <li>• Develop expertise, in-house and outsourced, to provide safe and effective FSSM services</li> <li>• Awareness and behaviour change campaign to engage diverse stakeholders</li> <li>• Develop training programmes for masons to build requisite skills for construction of quality septic tanks as per BIS / NBC norms</li> <li>• Set up systems to ensure financial sustainability in provisioning of FSSM services</li> <li>• Achieve the objectives of FSSM Policy in a time-bound manner</li> <li>• Design and implement plans to eliminate manual scavenging and rehabilitate the manual scavengers</li> <li>• Funding through specific schemes and plans</li> <li>• Monitor and evaluate FSSM strategy and develop its implementation plan</li> <li>• Implement Municipal Byelaws and Septage Byelaws</li> </ul> | <ul style="list-style-type: none"> <li>• Create enabling environment for the NGOs and private sector to contribute to safe and sustainable FSSM</li> </ul> |
| Household / Community | <ul style="list-style-type: none"> <li>• Timely and regular cleaning of septic tanks through approved entities</li> <li>• Regular maintenance and monitoring of septic tanks</li> <li>• Timely payment of user fee and/or charges, if any, towards FSSM services</li> <li>• Ensure Building Byelaws for construction of OSS are followed</li> <li>• Practice of Septage Byelaws as issued by the GVMC</li> </ul>   | <ul style="list-style-type: none"> <li>• Engage with decision-makers at GVMC level to ensure that they receive good quality FSSM services</li> </ul>       |

## 7. Implementation Strategy

Faecal Sludge and Septage Management (FSSM) for the local bodies includes both residential and non-residential/commercial waste (but not including industrial waste). Implementation guidelines are most important as it provides direction, with knowledge, procedure and facilities for the efficient management of FSSM practices. In particular, the City Sanitation Task Forces (CSTFs) shall take up active planning and advisory

role in co-operation with the municipal councils in order to dedicate appropriate resources and attention to the challenges of faecal sludge management.

GVMC has planned to address the city and ward wide FSSM issues by looking at the sanitation value chain of FSSM practices in a manner that addresses the technical, financial, institutional, regulatory and social dimensions to the best possible manner to the benefit its inhabitants. It has a comprehensive plan for faecal sludge and septage management with outlined objectives at each step in the value chain. Idea of conceiving an exclusive Septage Management Cell (SMC) is being considered under the Department of Public Health, which will look at all the modalities of FSSM starting from the awareness generation to its capture and reuse. A Septage Management Committee is being proposed under this policy which will be convened by the Chief Medical Officer Health under the chairmanship of the Commissioner with representative from various line departments to monitor the city-wide implementation programme.

## 8. Timelines

The agreed timelines for operationalizing the policy is as follows:

|           |   |          |
|-----------|---|----------|
| <b>A.</b> | <b>CITIZENS</b>   |          |
| 1         | Upgrade GVMC mobile app to include VTO requisition feature and FSSM-related complaints                                  | Sep 2017 |
| <b>B.</b> | <b>CONTAINMENT</b>  |          |
| 1         | Assess adequacy of on-site sanitation systems (OSS) – disseminate learning (GVMC/state/national/international)          | Sep 2017 |
| 2         | Preparation of action plan to address existing inadequacies if appropriate, & incorporation into FSSM plans             | Oct 2017 |
| 3         | Prepare and implement plan to strengthen permitting / inspection process  | Aug 2017 |
| <b>C.</b> | <b>EMPTYING &amp; CONVEYANCE</b>  |          |
| 1         | Rapid assessment of emptying market (supply and demand)   | Sep 2017 |
| 2         | Prepare VTO licensing programme (including training & enforcement) to improve quality of services (part of C7)          | Sep 2017 |
| 3         | Launch licensing programme for VTOs (coordinate with C6 and D2)   | Sep 2017 |
| 4         | Monitor effectiveness of implementation of licensing program – disseminate learning (GVMC/state/national/international) | Dec 2017 |
| 5         | Pilot FSSM mobile application to improve access to data – disseminate learning (GVMC/state/national/international)      | Aug 2017 |

|           |   |            |
|-----------|---|------------|
| 6         | Prepare Emptying and Conveyance Business Plan (ECBP) to increase demand and affordability of services               | Sep 2017   |
| 7         | Launch ECBP (including training, BCC campaigns, contracts, etc.)  | Sep 2017   |
| 8         | Monitor effectiveness of implementation of ECBP – disseminate learning (GVMC/state/national/international)          | Dec 2017   |
| <b>D.</b> | <b>DISPOSAL, TREATMENT AND REUSE</b>  |            |
| 1         | 1 <sup>st</sup> Phase of Disposal Sites (DS) – Assess feasibility of existing DS, prepare investment plan & upgrade | Aug 2017   |
| 2         | 1 <sup>st</sup> Phase of DS – Prepare SoPs, H&S plan, and monitoring plan; train DSOs and VTOs (coordinate with C3) | Sep 2017   |
| 3         | 1 <sup>st</sup> Phase of DS – Design plan for and monitor effectiveness of upgrades – disseminate learning          | Dec 2017   |
| 4         | Assessment Reuse Market: assess production of and demand for treated FSS – disseminate learning                     | Sep 2017   |
| <b>E.</b> | <b>CITY &amp; WARD FSSM PLANS</b>   |            |
| 1         | Prepare city and ward-level Faecal Flow Diagrams (FFDs)   | Aug 2017   |
| 2         | Prepare City and Ward FSSM Plans through consultative process (coordinate with E3)                                  | Nov 2017   |
| 3         | 2 <sup>nd</sup> Phase of DS – assess feasibility of upgrading new DS as per request from wards (coordinate with E2) | Feb, 2018  |
| 4         | Launch City and Ward FSSM Plan  | Jan 2018   |
| 5         | Support GVMC in implementing, monitoring, and regularly updating FSSM Plans   | Dec 2017   |
| 6         | Disseminate learning on implementation of FSSM Plan within GVMC, state-level, nationally and internationally        | March 2018 |
| 7         | 3 <sup>rd</sup> Phase of DS – if necessary, prepare plans to invest in new DPs                                      | Feb 2018   |

## 9. Expected Outcomes

As this Policy is implemented across the city, it is expected to yield significant benefits in terms of improved public health indicators and service level benchmarks, reduced pollution of water bodies and groundwater, and resource recovery leading to reuse of treated waste and other end products. Envisaged outcomes are;

- Safe containment, collection and conveyance of 100 percent human waste to treatment and disposal sites.
- Cost effective solutions for management of human waste through integrated network sewerage and faecal sludge septage management.
- Clarity among different stakeholders on identifying and implementing best and economically viable sanitation solutions.
- Improvement in technical capability among ULB staff to effectively implement city FSSM.
- Scheduled emptying of septic tanks or other containment systems at an interval of 3 years as recommended by CPHEEO Sewerage and Sewage Treatment Manual and the MoUD Advisory on Septage Management (2013).
- Safe disposal of all collected faecal sludge and septage at designated sites. (Sewage Treatment Plants, Faecal sludge Treatment Facilities for safe and scientific disposal, etc.)
- Continuous improvements in efficiency and effectiveness in the entire FSSM chain: containment, collection, conveyance, treatment and disposal.
- Contamination of water bodies and groundwater from human waste (Faecal matter) reduced to zero levels in all the towns and cities.
- Nuisance from faecal sludge reduced to minimum levels, resulting in nuisance-free living space in the city.
- Maximum reuse of treated sludge as fertilizer in farmlands, parks, gardens and other such venues, reuse of treated sewage, as source of energy where feasible, and any other productive uses.
- Drastic reduction in incidences of diseases due to safe and sustainable FSSM services.

## 10. Policy Evaluation

This Policy shall come in to force from the date of issue of this resolution. Policy may be reviewed as and when required for assessing its effectiveness and making changes if necessary.

## 11. Power of GVMC

Notwithstanding anything contained in the foregoing paragraphs of the Greater Visakhapatnam Municipal Corporation Faecal Sludge & Septage Management Policy and Operational Guidelines, 2017 the ULB by issuance of notification in the official gazette may amend or withdraw any of the provisions and / or the schemes mentioned herein above.

Interpretation – Should any doubt arise as to the interpretation of any of the provisions of these Rules, the matter shall be referred to the Greater Visakhapatnam Municipal Corporation (GVMC), whose decision thereon shall be final.



# **CITY FSSM POLICY**

## **Part B: Guidance Notes to support policy roll out – Planning stage**

# 1. Snapshot of sanitation services in Vishakhapatnam

As Vizag is yet to be well connected with the UGD Network, the sewage treatment plants in the city are not running with full capacity. GVMC’s effort in providing access to the onsite sanitation to its citizens by constructing household toilets and up-grading the existing PT & CT facilities under SBM-U has resulted in making Visakhapatnam Open Defecation Free (ODF). It has increased the toilet coverage significantly in the city, which will be subsequently visible in the results on the census data survey to be undertaken by the Government of India. A graphical representation of the status on urban sanitation, septic tanks, wastewater management in Visakhapatnam is shown in Figures 1, 2, 3 and Table 1 below.

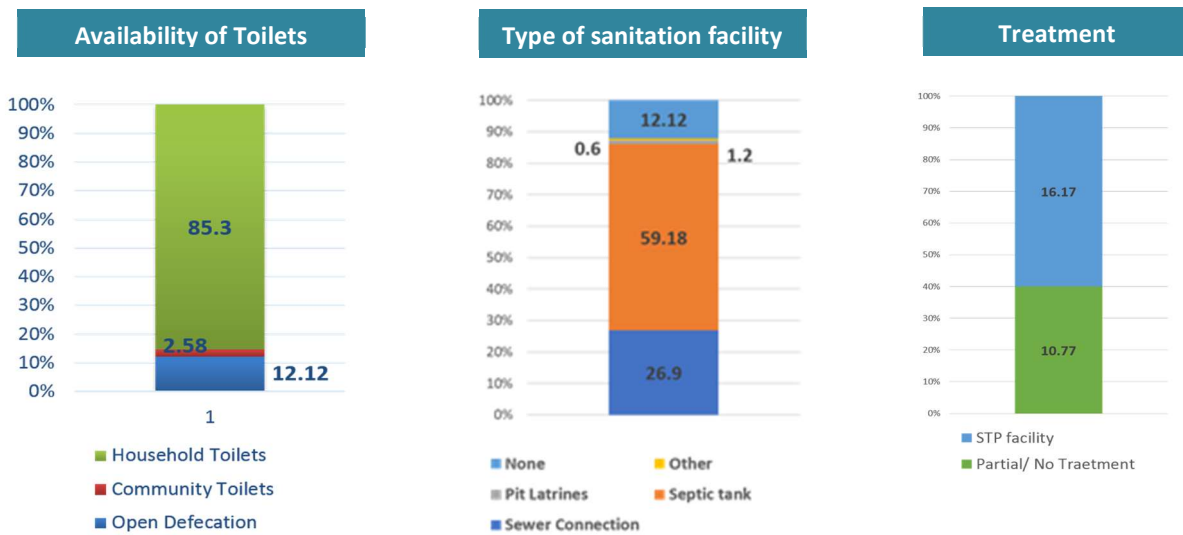
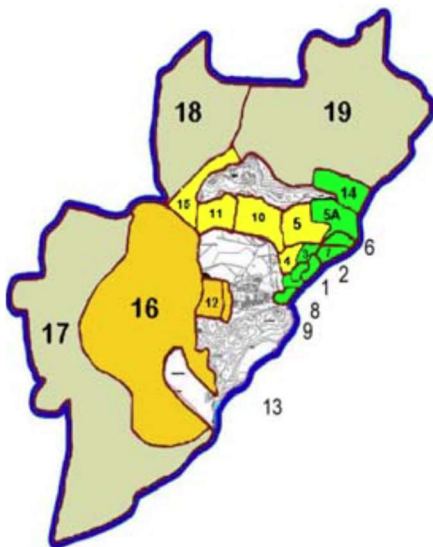


Figure 1: Picture Status of Urban Sanitation in Visakhapatnam



| Legend | Status   | Sanitation Blocks Covered   |
|--------|--|-----------------------------|
| Green  | Completed  | 1, 2, 3, 5A, 6, 7, 8, 9, 14 |
| Yellow | In progress under the Jawaharlal Nehru National Urban Renewal Mission (JNNURM) | 4, 5, 10, 11, 15            |
| Orange | Designs submitted  | 12, 13, 16                  |
| Grey   | Designs under preparation  | 17, 18, 19                  |

Figure 2: Sanitation Blocks in Visakhapatnam

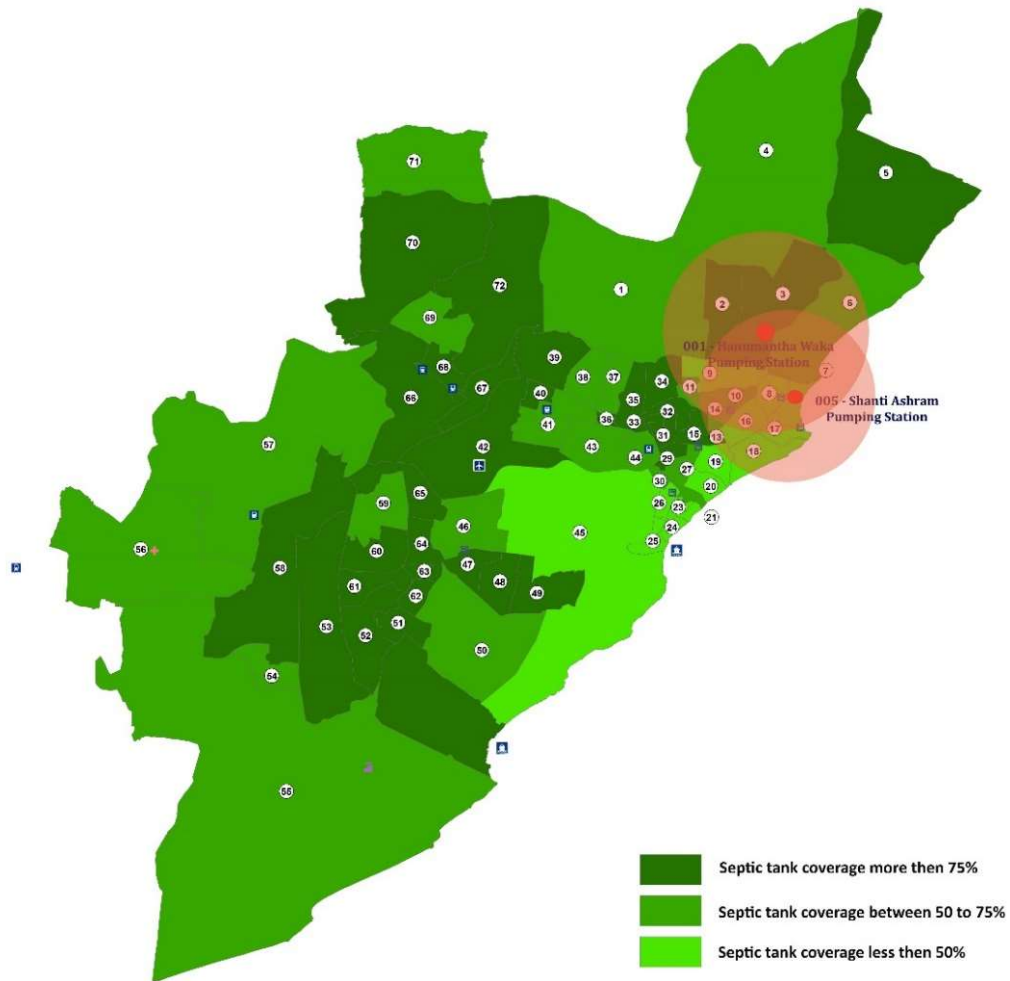


Figure 3: Showing Septic Tank Coverage

Table 1 – Visakhapatnam city wide STPs with capacities

| Sl. No. | City/Town     | STP Location | Status                                | Installed Capacity (MLD) | Current Operating Capacity (MLD) |
|---------|---------------|--------------|---------------------------------------|--------------------------|----------------------------------|
| 1       | Visakhapatnam | Ward - 1     | Operation                             | 13                       | 6                                |
| 2       | Visakhapatnam | Ward - 5     | Operation                             | 1                        | 1                                |
| 3       | Visakhapatnam | Ward - 6     | Operation                             | 1                        | 1                                |
| 4       | Visakhapatnam | Ward - 7     | Operation                             | 25                       | 20                               |
| 5       | Visakhapatnam | Ward - 25    | Operation                             | 38                       | 20                               |
| 6       | Visakhapatnam | Ward - 55    | Operation                             | 2                        | 2                                |
| 7       | Visakhapatnam | Ward - 56    | 54 Trial runs + 54 Under Construction | 108                      | 54 (Trial Run)                   |
| 8       | Visakhapatnam | Ward 71      | Operation                             | 1                        | 1                                |

## **2. Planning Stage steps**

### **2.1 Database Creation**

The following steps shall be followed for creation of a database and determining the adequacy of onsite sanitation system:

- a) City level assessment for coverage of toilet and on-site sanitation facility using the existing database (like property tax module) or based on recent survey carried out under Swachh Bharat Mission – Urban (SBM-U).
- b) In case such database is not available, the database will be created for the toilets and containment units. Information related to toilet availability, type of toilet, containment typology (septic tank, pit latrine, soak pit, etc.), and its connection with waste water outlet shall be collected. This information may be linked with the database on property tax and put up on the e-governance platform.
- c) GVMC will be required to update the database regularly with regard to toilet availability and onsite sanitation through property tax assessment based on the survey which shall be carried out from time to time.

### **2.2 Adequacy assessment**

The following steps shall be followed for reality check on the status of existing systems with an opportunity to integrate them on the future improvement strategy:

- a) GVMC shall evaluate all the existing containment units and other storage / treatment systems and will issue order(s) to modify based on the design mentioned in Annexure 1.
- b) Notice should be issued to all the property owners whose containment facilities do not meet the standard of septic tank design. National/State aid may be sought in order to financially support the conversion of improper containment units into sanitary toilets.
- c) Identification of insanitary toilets and its conversion to sanitary latrines for safe collection and disposal of waste is set as per norms set out in Annexure 2.
- d) All existing containment facilities should have access covers for each chamber, so that they can easily be opened during the process of emptying. Where such covers are not available, it should be made compulsory for all the property owners to provide proper covers.

### **2.3 Capacity creation and building**

The following steps shall be followed for efforts related to capacity building of all stakeholders contributing to the achievement of the policy imperatives:

- a) Pursuant to the previous four steps, municipalities must make efforts to build the capacity of the masons and builders and teach them how to construct proper toilets and refurbish improper

already-built containment units. Details regarding the codes that must be followed and are included in this document as next item.

- b) GVMC with the support of State Government will formulate a strategy on capacity building and training on FSSM. It will identify agencies that will provide orientation to elected representatives, train personnel and improve organizational systems for delivery of sanitation services.
- c) GVMC will create spaces for citizen engagement through CSTF.
- d) Capacity building for municipal staff: Municipal Commissioners, Engineers, Health Officers, Sanitary Inspectors, and Sanitary Workers should be well trained in safe septage management and its best practices. This involves regular training sessions on safe collection, treatment and disposal, septic tank design, periodic inspection and desludging of septage, design of a treatment facility, tender details for engaging licensed transporters, safety norms etc. Additionally, training would also include integration with other national missions like AMRUT, SMART city and SBM.
- e) Capacity building for septage transporters/private vendors: Private operators and transporters should be well trained in safety norms, safe collection and transportation of sewage including vehicle design, process of desludging, safety gears and safe disposal at the nearest treatment facility.

## **2.4 Standards and norms**

From time to time, standards and norms are available as different solutions are tested, understood and legalized. When new containment facilities need to be constructed, they should be in conformation with design norms outlined in National Building Code, 2005 and CPHEEO Manual, 2013, IS: 2470 Code of practice for installation of septic tanks - Part 1: Design and Construction and Part 2: Secondary treatment and disposal of septic tank effluent 1985 (Reaffirmed 1996).

## **2.5 Outsourcing emptying services**

A rapid assessment of emptying and conveyance market will be undertaken to figure out the demand and supply for desludging. Possibility of Public Private Partnership (PPP) venture shall be looked into for carrying out the emptying activities after the finalization of disposal sites with the help of private Vacuum Truck Operators (VTOs). It is therefore essential that GVMC puts in place a proper monitoring and evaluation mechanism for such contract and provide necessary support for training the operators using standard operating procedures (SOPs) and health and safety (H & S) guidelines. Option of providing individual license could also be worked out through guidelines in respect of regularization and registration. To make this service more affordable, an emptying and conveyance business plan will be prepared for the VTOs or the private contractors, doing a SWOT analysis and after looking at the CAPEX and OPEX involved in the cleaning process.

## **2.6 Awareness creation and behaviour change communication**

It is essential that the households clean their septic tank in a cycle of every 3 years and accordingly a Behaviour and Communication Change (BCC) campaign will be conducted by consumer profiling for segmented targeting. Proper marketing mix will be adopted to scale up and to make it a profitable business which will be appealing

for the private sector to invest in this segment. Wherever possible, awareness generation activities should be led by City Sanitation Task Force, or a sub-committee including members of CSTFs and other interested parties.

- a) Awareness generation for residents: Members of Resident Welfare Associations, community organizers, self-help groups and the public should be sensitized periodically on the need for periodic emptying of septic tanks. The health hazards associated with improper collection and treatment of waste, and the ill-effects of sewage discharge into fresh water/storm water drains should be explained to the residents. Where scheduled services is proposed, community should be introduced to the processes at the start and repeated after every second year.
- b) Gender Inclusivity: It is crucial that municipalities look at faecal sludge management also through a gender lens, particularly associated with the empowerment of women and girls. Women should be equitably involved in the planning of faecal sludge management activities or the formation of local regulations, and any CSTF or sub-committee that discusses faecal sludge management should have a minimum of at least one third women representation.

## 2.7 Finance planning

GVMC will identify suitable location within the city or in its outskirts for disposal of faecal sludge. Possibility of co-treatment with existing sewage treatment plant (STP) will also be looked at considering the quantum of investment involved through CAPEX and OPEX. Where such co-treatment facility is not possible, feasibility of decentralized Faecal Sludge Treatment Plant (FSTP) will be considered. Though services towards sanitation is a one of the basic and foremost duty of the ULB, it is equally important that investment put shall yield returns at least to offset its operating cost and where possible the capital cost.

Given this premise, that the reuse market will be surveyed and GVMC will collaborate with Fertilizer Association of India and such other authorities associated with reuse of acceptable by-products for using in farming. The collaboration will also involve sensitization of farmers on the use of sludge as manure in farming, other private and public-sector organizations associated with mineral processing and manufacturing in Visakhapatnam. The possibility of carbon credits from reduced greenhouse gas emissions and capturing high calorific valued methane gas for power generation is also possible avenues of exploration. Sustainability is only possible with efficient and robust recovery of resources as well as finances.

| Private Funding Options   | State and Municipal Funding Options                                  | Additional Funding Options                            |
|---|--|---|
| Desludging fee paid by user to the desludging service provider                        | Conservancy tax under Andhra Pradesh Municipal Corporation Act, 1955 | 14 <sup>th</sup> Finance Commission funds             |
| Fine for faulty containment system construction and illegal disposal of faecal sludge | Periodic revisions for the taxes/ charges                            | IEC funds under SBM                                   |
| Sale of end products (For e.g. Dried faecal sludge, water)                            |  | National schemes such as Smart City Mission and AMRUT |

Property tax or septage tax designated for FSSM

Corporate Social Responsibility funds when available

Financing of projects in GVMC will be taken up with the help of ongoing urban development schemes and programs such as AMRUT, SBM or SMART City initiative. The allocation of funds through 14<sup>th</sup> Finance Commission where applicable can specifically be used for taking up such activities linked to improving service delivery. Options for sustainable finance management through introduction of 4 T's in that is tax, tariff, transfer and trade to meet its CAPEX and OPEX will be explored. Additional options on increasing taxation of property, water charges and sewerage fees, etc. are additional options, in addition to private sector investment for different steps of the value chain.

## 2.8 Grievance redressal

The service level benchmark suggested by CPHEEO which is also applicable to the new sanitation benchmark should at least be 80% to consider it as a success. It is therefore important that FSM related complaints raised by the citizens are addressed in a timely manner by suitable technological interventions like a separate APP, which is inclusive for the entire population especially focusing at the urban poor.

## 2.9 Planning and scheduling emptying of septic tanks

GVMC shall take the following steps for emptying and conveyance.

- a) Determine households using on-site containment systems and ascertain sludge contained and to be emptied every year (presuming a 3-year emptying cycle period for individual households and more accelerated cycles for public and commercial facilities).
- b) Determine price per emptying (and accounting for how it may differ based on volume and containment facility location) that operators could charge.
- c) Estimate trucks required for emptying and design a database for maintaining a register for containment facilities that are emptied.
- d) Create a registration system for private truck operators which permit legally emptying of septic tanks within the ULB jurisdiction. Samples for permits and receipts required for this proposed system are included in Annexures 3, 4, and 5. Pursuant to this, GVMC will establish a system for penalizing trucks that operate without valid permits/licenses.
- e) GVMC will also mobilize additional vehicles, where needed public or private means, to support an agreed emptying system.

## 2.10 Emptying process

GVMC shall take the following steps to facilitate smooth emptying processes:

- a) The septic tanks should not be fully emptied; small amount of sludge of around 1 to 2 inches should be left in the septic tank to facilitate decomposing of incoming faecal waste.

- b) No fire or flame should be used near the septic tanks as there may be inflammable gases inside septic tanks.
- c) Proper safety gear (including uniform, tools, and well-maintained vehicles) or personal protective equipment (PPE) as per specification mentioned in Annexure 7 must be used by the operator while desludging/emptying the septic tanks/pits. The rules under the Prohibition of Employment as Manual Scavengers and their Rehabilitation Act, 2013 provide for a comprehensive list of safety gear that should be used while providing these services.
- d) Operators should clean their surroundings before leaving and after desludging; residents should not find their homes or surroundings dirtier after the desludging activity is carried out around their area.

## 2.11 Treatment process

GVMC shall take the following steps while planning and setting up treatment processes:

- a) Operators shall be forbidden by regulation to dispose sludge collected from the septic tanks or pits into fields, rivers, open drains, forests, outer limits of the cities or barren land etc. These regulations shall be enforced and violations subject to financial and / or legal penalties.
- b) GVMC will assess the possibilities of sludge treatment at the existing STPs in the city or those in the region through appropriate agreements with the STP operators (Part B, section for details of STPs). Proper tests and assessment should be carried out by the STP operators before receiving faecal sludge/septage.
- c) When co-treatment is not possible, construction faecal sludge treatment plant will be taken up. New treatment plant should be designed septage volumes generated within the city and where required also cater to rural areas or neighbouring cities if a pre-agreement is made.
- d) Input quality of the collected septage should be tested at the treatment facility for checking presence of any metal or traces of industrial waste.
- e) The faecal sludge treatment plant should be operational only during working hours and a responsible person should be appointed at the facility to ensure that no industrial waste is unloaded in these facilities.
- f) Septage should be reused/disposed of only after it meets the parameters in Annexure 6.

Parameters for consideration before finalizing the treatment sites

- **Distance of the treatment site:** Distance from emptying to delivery at treatment site, including accessibility are major drivers for financial feasibility.
- **Reliability of electricity:** Availability and reliability of electricity is critical when treatment technology has mechanically operations; often affects optimal utilization of treatment capacity.
- **Neighbourhood:** A treatment site may generate objectionable odours, hence location away from residential areas and neighbouring communities often creates additional consultation linked issues.



- **Land availability:** Projects are often delayed due to non-availability or high price of land with city. GVMC will also explore the possibility of developing treatment facilities close to or within solid waste dumping sites or already existing sewage treatment to minimize land related issues.
- **Geological Parameters:** Assessment of existing geological conditions on site including groundwater table, type of soil, flooding risk is always recommended to ensure that the structure can be safely constructed without environmental damage.

## 2.12 PPP engagement

The city of Visakhapatnam has 68 vacuum trucks owned by private sector operators. They are currently being operated informally and unregulated in operations. To leverage the private sector capability in providing on time services the current policy enables consultation and association with operators'. GVMC will monitor the activities of the VTO with the help of septage bye-laws and will provide training to the operators from time to time. GVMC will further look in to the occupational health and safety requirements of the VTOs by as a welfare measure not only for the person involved in desludging process but also for their family.

GVMC will liaison with the bankers' association and other financial organization existing in the city to help facilitate short term financing towards purchase of new vehicles or modernization, repair and maintenance of the existing vacuum trucks. The private sector operator will be engaged with GVMC under a licensing procedure to carryout necessary work on septage desludging. Option of providing individual license could also be worked out through guidelines, for regularization and registration. To make this service more affordable, an emptying and conveyance business plan will be prepared for the VTOs or the private contractors.

GVMC will also support framing contracts identifying performance level and further to encourage in carrying out ethical practices in sludge disposal. Suitable incentives will be added for the private sector operators.

For effective operationalize of scheduled septic tank emptying service and treatment facilities, GVMC shall also explore the option of private sector participation. The following points should be taken into consideration by the ULB:

- Explore private sector participation for various activities like procurement, operations and maintenance of the suction emptier trucks, construction and operations of septage treatment facility and possible re-users of treated septage within the city as well as in nearby cities.
- Develop performance based contracts such that payment is linked to the performance of private sector for providing the services.

Some of the steps that can be taken up to boost the private sector participation are by the means of;

- **Tax Incentive and Ease of Doing Business:** Business line in sanitation sector especially in faecal sludge management is new in India although the same has been practiced in Western countries and some of the South East Asian countries. Ease of doing business with proper tax incentive to the private operator can increase the possibility of venturing in to the sanitation sector. One stop clearances and active facilitation to the private operators without being propelled in a problematic situation can create a win-win situation for both.

- **Financing at Low Interest Rate:** GVMC will co-ordinate with the Bankers Association of India particularly focusing at Visakhapatnam to come up with loan available at low interest rate particularly for projects in sanitation sector focusing on urban poor. Further funding from bilateral and multilateral agencies in the form of transfer could also be used for financing such projects.

### 2.13 Record keeping, monitoring, evaluation and reporting

Record keeping, monitoring and reporting are an integral part of any infrastructure system. Record keeping requirements will be codified to ensure transparent activities between different partners in the ecosystem – GVMC, households, operators, disposal site owners. A sample manifest form is detailed out in Annexure 5.

- The completed document or documents with signatures of the household / property, suction truck operator, and treatment plant operator should be submitted to the local government for their records. These documents would validate that the sludge collected from households is disposed of at proper treatment facilities.
- A database system such as the one discussed in access and collection will need to be developed and maintained.
- Where possible, GIS should be used to be plan the route of suction emptier trucks and track emptying trucks for regular record keeping.
- Consumer grievance redressal system for faecal sludge management should also be set up as a part of urban local body record keeping systems and helpline numbers to be shared with residents as a part of monitoring and record keeping systems for faecal sludge management.

### 2.14 Service level benchmarks

The service level benchmarks suggested by CPHEEO is also applicable to the new sanitation benchmark should be at least 80% to consider it a success. It is therefore important that FSM related complaints raised by the citizens are addressed in a timely manner by suitable technological interventions like a separate APP, which is inclusive for the entire population, especially focussing at the urban poor.

At the ULB level, the GVMC is adopting Sanitation Benchmark framework of revised service level benchmarks for sanitation that assess performance of citywide sanitation, capturing on-site sanitation systems and sewage management. Sanitation Benchmark framework for revised Service Level Benchmarks for Sanitation is as under:

| Current SLB indicators (Sewerage System)  | Proposed Sanitation Benchmark (Sewerage + Onsite systems)  |
|---|--|
| <b>1. Coverage of sewerage network services</b>   | <b>1. Coverage of adequate sanitation system</b>   |
| Total number of properties with individual connections to sewerage network as a percentage of total number of properties in the city. | Percentage of households with individual or group toilets connected with adequate sanitation systems (sewer network/ septic tank / double pit system) to total households in the city. |
| <b>2. Collection efficiency of sewerage network</b>   | <b>2. Collection efficiency of sanitation system</b>   |

| Current SLB indicators (Sewerage System)  | Proposed Sanitation Benchmark (Sewerage + Onsite systems)   |
|---|---|
| Quantum of sewage collected at the intake of the treatment plant to the quantity of sewage generated (as per CPHEEO, 80% of water consumed is generated as sewage).   | Weighted average of collection efficiency of each sanitation system, weighted by share of households dependent on each sanitation system.   |
| <b>3. Adequacy of sewage treatment capacity</b>   | <b>3. Adequacy of treatment capacity of Sanitation System</b>   |
| Adequacy is expressed as secondary treatment capacity available as a percentage of normative wastewater generation.   | Weighted average of adequacy of treatment plant capacity available for each sanitation system, weighted by share of household's dependent on each sanitation system.  |
| <b>4. Quality of sewage treatment</b>   | <b>4. Quality of treatment of sanitation system</b>   |
| Quality of treatment is measured as a percentage of WW samples that pass the specified secondary treatment standards, that is, treated water samples from the outlet of STPs are equal to or better than the standards laid down by the Gol agencies for secondary treatment of sewage. | Weighted average of quality of treatment of each sanitation system, weighted by share of household's dependent on each sanitation system.   |
| <b>5. Extent of reuse and recycling of sewage</b>   | <b>5. Extent of reuse and recycling in sanitation system</b>  |
| Quantity of sewage that is recycled or reused after secondary treatment as a percentage of quantity of sewage received at the treatment plant.  | Weighted average of extent of reuse of treated wastewater and sludge after adequate treatment as a percentage of sewage and sludge received at the treatment plant, weighted by share of household dependent on each sanitation system. |

GVMC will develop a database, registry of certified on-site sanitation system, robust reporting format to track compliance of households (establishments, etc.) with outcomes and process standards. These sanitation benchmark will further be linked to the Service Level Improvement Plan (SLIP) to address the gaps and create new investment projects.

All these activities will be performed by the Septage Management Cell (SMC) under the direct supervision of the head of the Department of Public Health prior to approvals from Commissioner. The Cell will be created out of the funds provided by the external agency or from funds available under the 14<sup>th</sup> Finance Commission or through State/GVMC budget. As per City FSSM plan, a database will be developed by the city for all such properties having a septic tank under different property categories, i.e. residential, commercial, industrial, institutional etc. and shall be monitored daily by GVMC in such a way that necessary cleaning is carried out every 3 years. A Management Information System (MIS) will be developed accordingly to monitor the progress.

## 2.15 Community Engagement and Stakeholder Involvement

FSSM practice is designed keeping community at the centre is incomplete without their active participation in conceptualizing projects and subsequent involvement at development and implementation stage through Participatory Learning Action (PLA) and Participatory Urban Appraisal (PUA) process for an inclusive growth which creates employment opportunity and helps in reducing poverty.

It is therefore important that all the stakeholders are involved in an integrated coordinated approach for a successful implementation FSSM programme. GVMC will take necessary steps by involving community, Self Help Groups (SHGs), NGOs and CBOs in implementing the sanitation program. Particularly in the management of decentralized FSTP in terms of construction, operation and management with community participation creates a sense of ownership amongst each individual benefitted from the community.

It is essential that the households clean their septic tank every three years, and for achieving this a Behaviour and Communication Change (BCC) campaign will be conducted and further adopting segmentation, targeting and positioning will be carried out as per the consumer behaviour. Proper marketing mix will be adopted to scale up and to make it a profitable business, which will be appealing for the private sector to invest in this segment.

## 2.16 Actions by Community

Citizen having onsite sanitation should also be considered for following the option to push the business opportunity and thereby helping them draw benefit from such a scheme;

- a) All the individual households of the RWAs shall treat their sludge in a decentralized manner wherever the system is not connected through sewer and will get a property tax rebate of 10%.
- b) All the new apartments which will be constructed and are do not access to sewer lines will be required to design their own sludge management system and will use the recycled water in their premises. In doing so they will get a rebate of 10% towards the construction permit fee or Rs. 2,00,000/- (Two Lakhs) whichever is less.
- c) All the new malls, big hotels, industries, clubs, colleges, universities, hospital, sports stadium etc. which will be constructed and not having access to a sewer line will have to design their own sludge management system and will use the recycled water within their premises. In doing so they will get a rebate of 10% of the construction permit fee or Rs. 2,00,000/- (Two Lakhs) whichever is less.
- d) A separate tax called septage tax will be created which may be levied in the property tax or water charges for operation and maintenance of septage.

## 2.17 Actions by GVMC

Rules, Regulations and Operational guidelines for Faecal Sludge and Septage Management should address the following:

- a) Delineation of private (Individual houses, Group Housing, Institutions etc.) and public responsibilities (Urban Local Bodies and local authorities) in relation to faecal sludge and septage management.

- b) Detail of the planning and implementation process for carrying out safe and sustainable management of all faecal sludge and septage. This may be integrated with over all city land use planning, within a time-based plan of holistically addressing waste water management via onsite, decentralized and centralized systems.
- c) Design of septic tank, pits etc. (adopted as per local condition) including siting and method of approval of building plan or retrofitting existing installations to comply with the rules.
- d) Special provisions for medium and large format real estate developments.
- e) Periodicity of desludging and O & M of installations and the responsibilities of the households (owner/occupant)
- f) Operating procedure for desludging including Occupational H & S procedures.
- g) Licensing, record keeping, monitoring and reporting arrangements for faecal sludge and septage service providers.
- h) Methods and location of transport (conveyance), treatment and safe disposal.
- i) Tariff or cess/tax etc. for septage management in the city.
- j) Penalty clauses for untreated discharge for households as well as desludging agents.
- k) Regular monitoring and evaluation of the entire process of FSSM.
- l) Training, accreditation, education and awareness programs under FSSM.

### 3. City and Ward FSSM Plan

City and ward level FSSM plan will be developed to identify the gaps through sanitation benchmark as prescribed under the National FSSM policy document. This will be implemented through the ward sanitation committee with the help of community based organization or NGOs and will further be integrated to the City FSSM plan. The development plan for the ward and the city will be considered after finding the gaps, and through a step wise approach by addressing the low-level benchmark first and then further to intermediate level and lastly to the high level. It will be the earnest effort of GVMC to provide 100 percent sewerage coverage and 100 percent sewage connection facility for its citizen in the years to come. Recovery of cost is one of the most important benchmark as suggested by the CPHEEO which has a baseline of at least 20 percent and will try to achieve it through various marketing mix.

It is important to understand the performance of the Sewage Treatment Plant (STP) if at all it is considered for co-treatment. Therefore, the operation and monitoring of the plant shall be taken up on a pilot basis for a month to understand its effect on the plant output parameter, managing sludge lines and addressing the breakdown of the pumps, motors and valves.

GVMC will look in to the intervention tools that are required for successful implementation of such FSSM plan in the city. Some of the important intervention tools that will be considered are as below;

| Tool               | Purpose                                 | Examples / Information   |
|--------------------|---|--|
| Capital Investment | Provide new / renewed hardware capacity | Investment can be in upgrading, rehabilitating or new infrastructure (e.g. treatment facilities, IT network, etc.) and / or equipment. |

| Tool                                      | Purpose  | Examples / Information  |
|---|--|---|
| <b>Regulation</b>                         | Ensure public safety and fairness                            | Regulations are a ‘stick’ that should be applied only in extreme circumstances when all other ‘carrots’ have been tried and not proven to be effective enough. For instance, in case behaviour change campaigns (BCC), educating and encouraging households to empty their OSS once in every 3 years do not result in improved behaviour, scheduled emptying regulations can be introduced, along with investment in the necessary IT infrastructure and BCC campaigns. Regulation could also be introduced to regulate the price of emptying. Similarly, it is preferable to influence the market (e.g. invest in more disposal points, improve competition, etc.), as enforcement of prices is notoriously difficult. |
| <b>Experimentation</b>                    | Trial of innovative approach that may either succeed or fail | Research, design, trial, learning and iteration / or failure of innovative approaches. Experimentation can be undertaken along with any of the other intervention tools. Monitoring, evaluation and learning is a crucial part of experimentation. Failure of the innovation is a possibility that should be expected, however failure due to poor learning from previous mistakes should not be accepted.  |
| <b>Institutional Evolution</b>            | Trial of innovative approach that may either succeed or fail | Redesigning of institutional structure and / or incentives to address new challenges. First is, citizens’ needs as it relates to FSS management should be assessed. Based on these needs, institutional structures and / or incentives should be re-evaluated and if necessary redesigned to ensure they are responsive.  |
| <b>Information</b>                        | Improve effectiveness of response to citizen needs           | Data on existing sanitation systems, services or citizens’ needs is necessary to design solutions. Some information may already be available and needs to be used. Information that is not available needs to be collected (either one-time or regular collection, depending on the requirement).   |
| <b>Behaviour Change and Communication</b> | Inform, motivate, and sustain changes in citizen behaviour   | Regular emptying of septic tanks is necessary, even before it starts overflowing. Citizens should be made aware and motivated to regularly empty it by way of behaviour change and communication campaigns (BCC), and the behaviour needs to be sustained through regular reminders (e.g. vacuum tanker operators send targeted reminders every 3 years).   |
| <b>Licensing</b>                          | Ensure safety of public and                                  | Licensing is a way for public authorities to ensure service providers (i) have been trained on safe and appropriate ways of service delivery to ensure health and safety of the public and the  |

| Tool | Purpose                              | Examples / Information   |
|------|--------------------------------------|--|
|      | operators, ensure competitive market | operators, (ii) are regular and up to date on their training, (iii) their equipment is appropriate and safe, (iv) privileges can be revoked if public health and safety is jeopardized, (v) provide a competitive market – e.g. limited licenses can be provided to avoid over-saturation of market with VTOs. |

# CITY FSSM POLICY

## Part B: Guidance Notes to support policy roll out – O&M stage



## OPERATIONAL GUIDELINES FOR SEPTAGE MANAGEMENT

These operational guidelines are framed by GVMC drawing from the provisions and specifications related to septage management of the National Building Code, 2005, revised CPHEEO Manual on Sewage and Sewerage Treatment 2012, Advisory Note on Septage Management in Urban India, 2013 and National FSSM Policy 2017.

The objective of these guidelines is to promote a comprehensive and integrated approach to septage management covering collection, storage, desludging, transportation, treatment, disposal and reuse and ensure compliance with various national level guidelines and regulations.

The guidelines cover the following key elements of septage management.

- a) Design and construction of septic tanks
- b) Conversion of insanitary latrines into sanitary latrines
- c) Septic tank pumping and de-sludging
- d) Septage transportation
- e) Treatment, disposal and reuse of septage
- f) Information, education and communication
- g) Training programs
- h) Record keeping and reporting (MIS)
- i) Help line for septage management

The operational guidelines for each of these key elements are as follows.

### 1. Design and construction of Septic Tanks

The household are encouraged to adopt the improved version of the designs of septic tanks as prescribed by the NBC and IS Code 2470 and CPHEEO manual. GVMC shall adopt regulations on septic tank designs and construction methods as part of building plan regulations.

The town planning department of the Municipal Corporation shall ensure that the septic tank designs conform to the guidelines at the time of approval of building plan. The town planning department and/or sanitation department shall inspect the septic tanks during their construction to ensure that there are no deviations from the approved design. The existing guidelines for septic tanks and suggested designs need to be adopted by the households are provided under Annexure 1.

### 2. Conversion of Insanitary Latrines into Sanitary Latrines

The Public Health Department of the Corporation shall undertake a survey to identify the insanitary latrines and improperly constructed septic tanks. All households with insanitary latrines shall be given notices to convert them into septic tanks and twin pits as per the provisions of the Manual Scavenging Act 2013 and Septage Bye-laws of GVMC. Households with improper septic tanks shall be educated to retrofit them as per

the approved designs. For slums and informal settlements twin pits may be permitted as per guidelines laid down in Annexure 2.

### **3. Pumping and desludging**

The households, institutions, commercial entities etc., shall undertake desludging of the septic tanks and pits once in every three years or when they get filled-up whichever is earlier as per the NBC code and CPHEEO guidelines. The operators shall obtain licenses for collection and transportation operations as per the formats provided in Annexure 3 and 4 of these guidelines. The households are required to engage the licensed operators for collection and transportation to desludge the septic tanks and pay the user charges as per the market rates or rate/tax as prescribed by the GVMC. The GVMC reserves the right to regulate and fix the user charges in case the market rates are observed to be high and unaffordable to households.

The licensed operators shall have trained workers equipped with uniforms, safety gear, tools and vacuum trucks as defined in the Manual Scavenging Act 2013. The operator, drivers and workers shall have adequate training in septage desludging and transportation. The licensed operators are required to adopt approved standards and procedures for pumping and desludging. Desludging workers shall wear appropriate personal protective equipment, including rubber gloves, rubber boots, a face mask, and eye protection. The operator shall ensure the availability of protective gear for workers and materials for cleaning on a daily basis. After desludging, workers should follow proper hygiene practices such as washing hands with soap. The workers should avoid entering into septic tank and it should be done in exceptional cases with proper care and use of safety equipment. After each desludging operation, the area shall be properly cleaned and disinfected with relevant cleaning agents such as bleaching powder and lime.

### **4. Septage transportation**

Service providers shall deploy septage vehicles as per the scheduled of emptying of the household for the purpose of desludging. The septage vehicles shall be fitted with Global Position System (GPS) and the details of GPS shall be shared with GVMC for monitoring purpose.

The driver and service providers shall be responsible for safe operation of the vehicle and equipment at all times and only drivers and workers with adequate training shall be deployed. Transportation shall be undertaken on pre-designed routes avoiding busy roads and peak traffic. In the event of accidental spillage of sludge/septage, the operator shall immediately initiate action to contain the sludge/septage, minimize the environmental impact, and begin the clean-up procedures. The operator shall notify the concerned officials about the spillage and the nature of remedial action within 24 hours. Penalties may be imposed on the operators who shall not comply with the guidelines.

## 5. Septage treatment, disposal and reuse

The GVMC shall facilitate construction and operation of a septage disposal sites in the existing sewage treatment plant. GVMC may adopt appropriate financing model including Public Private Partnership (PPP) for construction and O&M of faecal sludge/septage treatment plant and shall levy user charges as appropriate for meeting capital and O&M expenditure.

The operator of the sewage treatment plant in case of co-treatment and the septage treatment plant shall implement a comprehensive environmental management plan to ensure compliance with environmental and social standards. The septage treatment plant shall adopt appropriate technology for treating septage and the disposed sludge and waste water after treatment shall strictly comply with the norms as per the relevant legislations.

It is the responsibility of the operator of the treatment plant to ensure the compliance with treatment and discharge norms as per APSPCB guidelines. The reuse of treated waste shall be permitted as per the standards and norms. It shall be mandatory for all licensed operators for collection and transportation of septage to dispose the septage only at the plant or any such place as designated by GVMC. The de-sludging service providers are prohibited to dispose the septage at any other location and would attract penalties for the same. GVMC will notify penalty structure as framed in the septage bye-law and may revise the same from time to time.

The guidelines in this section 5 shall become effective only after identification and construction of disposal sites. The GVMC reserves the right to suggest the septage disposal locations and the operators of collection and transportation shall comply with the same.

## 6. Information, Education and Communication (IEC)

The GVMC shall develop appropriate IEC materials and undertake IEC campaigns through print and electronic media, outdoor medium and consultations and workshops targeting the residents to promote adoption of proper toilet designs, construction methods, periodic desludging and safe sanitation practices.

The builders, masons and suppliers of the septic tanks and pits shall be exposed to better designs and better methods of construction. The operators of collection and transportation shall be provided information on standard operating procedures. Non-government Organization (NGOs), Community Based Organizations (CBOs), women's groups and school children shall be extensively involved in undertaking IEC campaigns. Operators and other involved parties shall also develop IEC material and educate communities on safe management of septage.

## 7. Training programs

GVMC shall support capacity building of various stakeholders including its own staff through appropriate institutions of repute namely Department of Civil Engineering (Andhra University), Indian Institute of

Technology, Tirupati, and National Institute of Technology, Tadepalligudem etc. GVMC shall engage these agencies to undertake training needs assessment, design training modules and deliver the training programs.

## **8. Record keeping and MIS**

GVMC shall create a computerized MIS platform for monitoring and evaluation (M&E) for baseline data and progress on implementation of septage management guidelines through a separate cell formed under the health department as Septage Management Cell. GVMC shall maintain data base and information related to septage generation from households and commercial establishments, insanitary latrines, location of septic tanks, details of operators responsible for collection of desludge and details of septage treatment plant. GVMC shall ensure that the operators of collection and transportation and treatment of septage maintain detailed records of their operations as listed at Annexure 5.

## **9. Help line for septage management**

GVMC shall establish a dedicated help line with trained staff for providing support to residents on all aspects of septage management including septic tank designs, approval process, methods of construction, information on masons, and periodicity of desludging, contact details of operators and so on.



# **CITY FSSM POLICY**

## **Part C: Annexures**

## ANNEXURE 1: SEPTIC TANK SPECIFICATIONS, GUIDELINES, AND DESIGNS

Depending on the geography, soil condition, water seepage capacity of the soil the design can be prepared and approved by the Local Bodies. Proper septic tank design considers the following factors:

- Sized properly with appropriate sludge detention time, volume and hydraulic retention time
- Proper inlet and outlet structures
- At least one baffle separating the tank into multiple compartments
- Water tight
- Access port for each compartment that allows for inspection and pumping

**Table 1: Recommended Sizes of Septic Tanks as per Number of Users** (Number of Users Length (M) Breadth (M) Liquid Depth for a Cleaning Interval)

| Number of Users | Length (M) | Breadth (M) | Liquid Depth for Cleaning Interval of 3 Years |
|-----------------|------------|-------------|---|
| 5               | 1.5        | 0.75        | 1.05  |
| 10              | 2.00       | 0.90        | 1.40  |
| 15              | 2.00       | 0.90        | 2.00  |
| 20              | 2.30       | 1.10        | 1.80  |
| 50              | 5.00       | 2.00        | 1.24  |
| 100             | 7.50       | 2.65        | 1.24  |
| 150             | 10.00      | 3.00        | 1.24  |
| 200             | 12.00      | 3.30        | 1.24  |
| 300             | 15.00      | 4.00        | 1.24  |

**Notes:**

1. CPHEEO Manual and NBC code IS 2470 Part I 1985 may be referred for exact calculations
2. A provision of 300 mm should be made for free board.
3. The sizes of septic tank are based on certain assumption on peak discharges, as estimated in IS: 2470 (Part -1) - 1985 and while choosing the size of septic tank exact calculations shall be made.
4. For population over 100, the tank may be divided into independent parallel chambers of maintenance and cleaning.

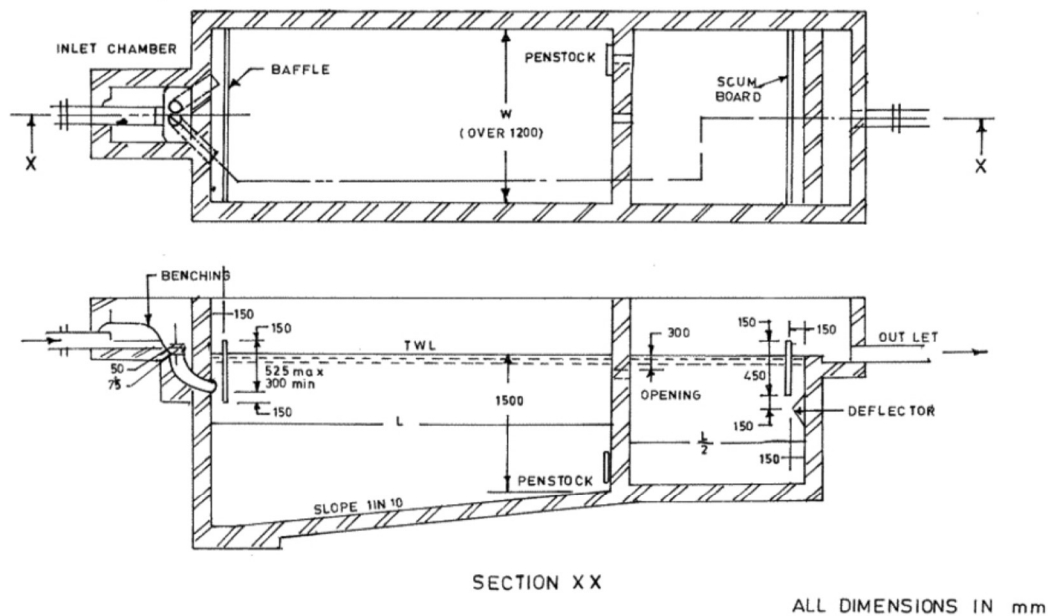
### 1. Construction details

The inlet and outlet should not be located at such levels where the sludge or scum is formed as otherwise; the force of water entering or leaving the tank will unduly disturb the sludge or scum. Further, to avoid short-circuiting, the inlet and outlet should be located as far as possible from each other and at different levels. Baffles are generally provided at both inlet and outlet and should dip 25 cm to 30 cm into and project 15 cm above the liquid. The baffles should be placed at a distance of one-fifth of the tank length from the mouth of the straight inlet pipe. The invert of the outlet pipe should be placed at a level 5 to 7 cm below the invert level of inlet pipe. Baffled inlet will distribute the flow more evenly along the width of the tank and similarly a baffled outlet pipe will serve better than a tee-pipe.

For larger capacities, a two-compartment tank constructed with the partition wall at a distance of about two-thirds the length from the inlet gives a better performance than a single compartment tank. The two

compartments should be interconnected above the sludge storage level by means of pipes or square openings of diameter or side length respectively of not less than 75 mm. Every septic tank should be provided with ventilation pipes, the top being covered with a suitable mosquito proof wire mesh. The height of the pipe should extend at least 2 m above the top of the highest building within a radius of 20 m. Septic tanks may either be constructed in brick work, stone masonry or concrete cast in situ or pre-cast materials. Pre-cast household tank made of materials such as asbestos cement / HDPE could also be used, provided they are watertight and possess adequate strength in handling and installing and bear the static earth and superimposed loads. All septic tanks shall be provided with watertight covers of adequate strength. Access manholes/covers (minimum two numbers one on opposite ends in the longer direction) of adequate size shall also be provided for purposes of inspection and desludging of tanks. The floor of the tank should be of cement concrete and sloped towards the sludge outlet. Both the floor and side wall shall be plastered with cement mortar to render the surfaces smooth and to make them water tight. A typical two compartment septic tank is shown in figure below;

### Structure of a Septic Tank



TYPICAL SKETCH OF TWO COMPARTMENT SEPTIC TANK FOR POPULATIONS OVER 50 (IS : 2470 (PART 1)-1 985)

Source: CPHEEO, 1993

**Table 2: Existing guide lines for design and construction of septic tanks**

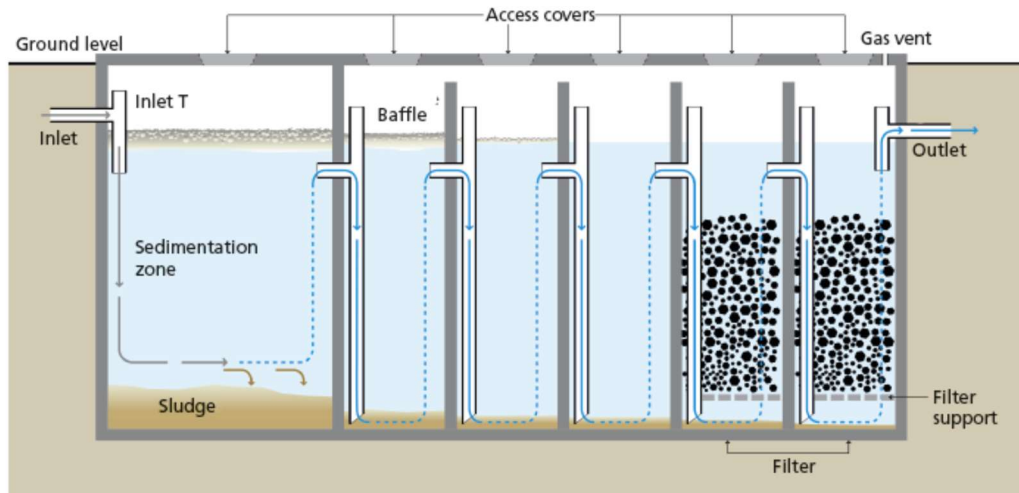
| Parameters                     | Existing Guideline   | Source   | General Observations   |
|--------------------------------|--|--|--|
| <b>Location</b>                | Septic tanks are recommended only for individual homes, small communities and institutions whose contributory population size doesn't exceed 300   | CPHEEO Manual  | While all existing guidelines state that the location of septic tank should be given due consideration, in reality, the location of the septic tanks is practically based on the land availability within the household Vicinity                       |
|                                | A sub soil dispersion system shall not be closer than 18 meters from any source of drinking water, such as well, to mitigate the possibility of bacterial pollution of water supply  | NBC, Part 3: Development Control Rules and General Building Requirements |  |
|                                | Septic tank should be located at a place open to sky, as far away as possible from the exterior of the wall of building and should not be located in swampy areas or areas prone to flooding   | IS 2470, Part-1  |  |
| <b>Design and Construction</b> | Septic Tank should have minimum width of 750mm, depth of 1 meter below water level and a minimum water capacity of 1 cubic meter. The length of the tank shall be 2 to 4 times the width. The minimum nominal diameter of the pipe shall be 100 mm. Further at junctions of pipes in manholes, direction of flow from a branch connection shall not make an angle exceeding 45 degrees with the direction of flow in main pipe                               | NBC, Part 3: Development Control Rules and General Building Requirement, | Local masons unaware of the existing design/construction guidelines for construction of septic tanks. The criterion governing the design and construction broadly in the land availability and the funds available with the owner / property builders. |
|                                | Every septic tank shall be provided with a ventilation pipe of at least 50mm diameter.   | IS 2470, Part 1  |  |
|                                | The liquid depth should be 1-2 m and the length to depth ratio should be 2-3 to 1. The liquid depth of the septic tank should be calculated depending on the cleaning interval of the septic tank (For detail length, breadth and liquid depth for various number of users please refer the Manual)<br>A provision of 300 mm should be made for free board. When served for a population above 100, the septic tank may be divided into independent parallel | CPHEEO, IS 2470, Part 1  |  |



| Parameters | Existing Guideline   | Source   | General Observations |
|------------|--|--|----------------------|
|            | <p>chambers for operation and Maintenance</p> <p>Baffles are provided at inlet and outlet and should dip 25 to 30 cm into and project 15 cm above the liquid. The invert of the outlet pipe should be provided at 5 to 7 cm below the invert level of inlet pipe.</p> <p>The height of the ventilation pipe should extend at least 2 m above the height of the highest building within 20 meters radius</p>  |  |                      |
|            | <p>Improved Septic Tank” - the walls of the conventional septic tank can be replaced with baffle walls to have a multi chambered baffled septic tank.</p> <p>The paper states “This movement of wastewater inside the tank helps in creating the turbulent flow which causes enhanced mixing of the raw sewage with already existing activated sludge and accelerates the decomposition of the solids because of intensive contact between the activated sludge and fresh influent”.</p> | <p>CSE Policy Paper on Septage Management in India</p> |                      |

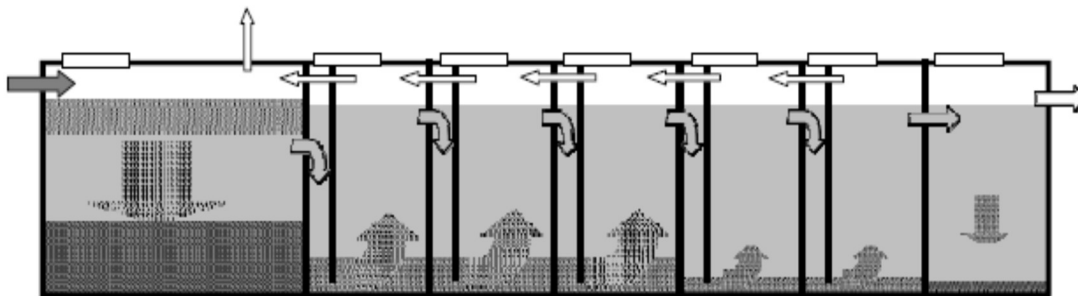
## 2. Design for improved septic tank- three chamber with Anaerobic Baffled Reactor (ABR)

An ABR with filter is an improved septic tank (see Figure below: Anaerobic baffled reactor with filter). ABRs incorporate one or more baffles which force the sewage to flow from the bottom to top until it starts to flow into the next chamber. The up-flow chambers catalyse the sedimentation of solids and digestion of organic matter. BOD may be reduced by up to 90 per cent, which is far higher a percentage than a conventional septic tank. The filter chambers typically remove 50–80 per cent BOD as sewage flows through them. The filter chambers typically remove 50–80 per cent BOD as sewage flows through them.



Source: Manual on Sewerage and Sewage Treatment—Part A: Engineering. CPHEEO, 2012

## Anaerobic decentralized waste water treatment systems (DEWATs)



## ANNEXURE 2: GUIDELINES FOR CONVERSION OF INSANITARY LATRINES INTO SANITARY TOILETS

**Table 1: Existing guide lines for leach pits**

| Parameters                     | Existing Guidelines   | Source |
|--------------------------------|---|--------|
| <b>Size (five members)</b>     | Dia. - 1000mm preferred but 750 mm also permitted where space is a constraint, Depth – 1300mm   | CPHEEO |
| <b>Emptying</b>                | Single pit – 6 years, Twin pit – 3 years each   | CPHEEO |
| <b>Shape</b>                   | Circular is preferred; but rectangular, oval and square also allowed where space is a constraint  | CPHEEO |
| <b>Location</b>                | Pits should be placed symmetrically at the back side of the pan. Can be located within premises, under foot pat/road/narrow lane. The distance between foundation and pit should be between 0.2 to 1.3m. A minimum distance of 3 to 10m from water source such as tube wells and 3 to 10m from water mains. Water pipe should not cut across the pit  | CPHEEO |
| <b>Design and Construction</b> | The pits should be lined to avoid collapsing. Bricks joined in 1:6 mortar commonly used for lining. Stones or laterite bricks of cement concrete rings could also be used. Lining brick work 115 mm thick (half brick) with honey combing up to the invert level of size of holes 50mm wide up to the height of brick course pit bottom should be left in natural condition. RCC slab is used for pit cover. Toilet pan is connected to the pit through 1 75-mm brick channel of U shape. | CPHEEO |

**ANNEXURE 3: FORM FOR APPLICATION FOR THE LICENSE THE COLLECTION, TRANSPORTATION AND DISPOSAL OF SEPTAGE IN GVMC**

Place Self-Attested  
Recent Passport Size  
Photograph

1. Name of the applicant (as per vehicle registration certificate): Shri/Ms.

1. దరఖాస్తుదారుపేరు (వాహన రిజిస్ట్రేషన్ ఆధారంగా) : శ్రీ/శ్రీమతి -----

2. Details of Employee

2. ఉద్యోగి యొక్క వివరములు

| S. No. | Category of Employee<br>ఉద్యోగి యొక్క కేటగిరీ | Name<br>పేరు | Aadhar Number<br>ఆధార్ నెంబర్ |
|--------|---|--------------|-------------------------------|
| 1      | Driver (డ్రైవర్)                              |              |                               |
| 2      | Assistant 1 (సహాయకులు 1)                      |              |                               |
| 3      | Assistant 2 (సహాయకులు )                       |              |                               |
| 4      | Others (if any) (ఇతరులు)                      |              |                               |

3. PAN Number of the Applicant

3. దరఖాస్తుదారుపాన్ సంఖ్య -----

4. GST Number of the Applicant

4. దరఖాస్తుదారు జీఎస్టీఎస్ సంఖ్య -----

5. Bank Account No. of Applicant

5. బ్యాంక్ ఖాతా సంఖ్య -----

Savings

Current

## 6. Details of Personal Health Insurance

### 6. వ్యక్తిగత ఆరోగ్య బీమా వివరాలు

| S. No. | Category of Employee<br>ఉద్యోగి యొక్క కేటగిరీ | Name<br>పేరు | Number<br>నంబర్ | Validity<br>నిర్దిష్ట సమయం | Name of Insurance<br>Company<br>ఇన్సూరెన్స్ కంపెనీ పేరు |
|--------|---|--------------|-----------------|----------------------------|---|
| 1      | Driver (డ్రైవర్)                              |              |                 |                            |   |
| 2      | Assistant 1 (సహాయకులు 1)                      |              |                 |                            |   |
| 3      | Assistant 2 (సహాయకులు 2)                      |              |                 |                            |   |
| 4      | Others (if any) (ఇతరులు)                      |              |                 |                            |   |

## 7. Whether member of NTR Vaidya Sewa Scheme

### 7. ఎన్.టి.ఆర్.వైద్య సేవ పథకం లో వున్నారా

| S. No. | Category of Employee<br>ఉద్యోగి యొక్క కేటగిరీ | Yes (ఉంది) | No (లేదు) |
|--------|---|------------|-----------|
| 1      | Driver (డ్రైవర్)                              |            |           |
| 2      | Assistant 1 (సహాయకులు 1)                      |            |           |
| 3      | Assistant 2 (సహాయకులు )                       |            |           |
| 4      | Others (if any) (ఇతరులు)                      |            |           |

## 8. Whether covered under PM Chandrana Bhima Yojana

### 8. పి.ఎం. చంద్రన్న భీమా యోజన పథకంలో నమోదు అయి వున్నారా

| S. No. | Category of Employee<br>ఉద్యోగి యొక్క కేటగిరీ | Yes (ఉంది) | No (లేదు) |
|--------|---|------------|-----------|
| 1      | Driver (డ్రైవర్)                              |            |           |
| 2      | Assistant 1 (సహాయకులు 1)                      |            |           |
| 3      | Assistant 2 (సహాయకులు )                       |            |           |
| 4      | Others (if any) (ఇతరులు)                      |            |           |

### 9. Medical Fitness Certificate for Employees Available

9. దరఖాస్తుదారుకు ఫిట్ నెస్ సర్టిఫికేట్ ఉందా

| S. No. | Category of Employee<br>ఉద్యోగి యొక్క కేటగిరీ | Yes (ఉంది) | No (లేదు) |
|--------|---|------------|-----------|
| 1      | Driver (డ్రైవర్)                              |            |           |
| 2      | Assistant 1 (సహాయకులు 1)                      |            |           |
| 3      | Assistant 2 (సహాయకులు )                       |            |           |
| 4      | Others (if any) (ఇతరులు)                      |            |           |

10. Driver License Number

10. డ్రైవింగ్ లైసెన్స్ నెంబరు

License Number లైసెన్స్ నెంబరు.

11. Nature of Vehicle for which license is available

11. ఏ తరహా వాహనం యొక్క లైసెన్స్ కలిగి వున్నారు

HCV

LCV

TW

12. Address (Regd. Office)

12. చిరునామా (రిజిస్టర్డ్ ఆఫీస్)

(Head office)

(హెడ్ ఆఫీస్)

13. Telephone No. (O)

(Mobile No)

13. ఫోన్ నెంబరు: (O)

(సెల్ ఫోన్)

14. E-mail id

14. ఇ-మెయిల్ ఐడీ

15. Registration No. of Vehicle

15. వాహనం రిజిస్ట్రేషన్ నెంబరు

16. Does the Vehicle belong to the applicant?

16. వాహనం దరఖాస్తుదారుదేనా?

Yes ఉంది

No లేదు

17. Engine Number

Chassis Number

17. ఇంజిన్ నెంబరు

చాసి నెంబరు

**18. Pollution Certificate**

18. కాలుష్యనియంత్రణధ్రువీకరణపత్రం

Number బీమాపాలసీనెం

Validity తుదిగడువు

**19. Vehicle Insurance Certificate**

19. వాహనబీమాపత్రం

Number బీమాపాలసీనెం

Validity తుదిగడువు

**20. Vehicle Fitness Certificate**

20. వాహన సామర్థ్యపత్రం

Number బీమాపాలసీనెం

Validity తుదిగడువు

**21. Vehicle fitted with GPS**

21. వాహనానికిజీపీఎస్ఉందా

Yes ఉంది

No లేదు

**22. Details of the vehicles indicating model, type, capacity (Document proof of any may be enclosed).**

22. వాహనానికి సంబంధించి ఇతర సౌకర్యాల పత్రాలేవైనా జతచేయవచ్చు

(a) Model

(a) నమూనా -----

(b) Type

(b) రకం -----

(c) Capacity

(c) సామర్థ్యం -----

23. Processing fee for license: Rs. 1000/- (Non-refundable)

23. లైసెన్స్ సేసింగునుం: రూ. 1,000 (తిరిగిఇవ్వబడదు)

D.D. No.:

Date:

Bank:

డీడీనెం: \_\_\_\_\_

తేదీ: \_\_\_\_\_

బ్యాంక్: \_\_\_\_\_

I/We certify that above mentioned information given by me/us is true to the best of my knowledge and belief. I also certify that I have read and understood all the attached terms and conditions and agree to abide by them. I agree that if any information furnished by me is found wrong or factually incorrect in license will be liable for cancellation without prior intimation.

పైన తెలియజేసిన సమాచారము అంతయూ నిజమని నా పూర్తి సమ్మతితో తెలియజేయడమైనది. పైన తెలియజేసిన సమాచారము అంతయూ పూర్తిగా చదివి నిబంధనలు అనుగుణంగా అంగీకారం తెలియజేస్తున్నాను. నేను ఇచ్చిన సమాచారము అసత్యమైనట్లయితే నా యొక్క లైసెన్స్ ను ఎటువంటి విచారణ లేకుండా రద్దు చేయవచ్చునని తెలియజేస్తున్నాను.

Signature(s) of applicant(s)

Thumb impression

దరఖాస్తుదారు(ల) సంతకం(లు) \_\_\_\_\_

వేలిముద్ర(లు) \_\_\_\_\_

No. of document attached

Date

జతచేసినడాక్యుమెంట్లసంఖ్య \_\_\_\_\_

తేదీ \_\_\_\_\_



**CHECK LIST OF DOCUMENTS FOR SUBMISSION FROM APPLICANT FOR LICENSE OF  
COLLECTION, TRANSPORTATION AND DISPOSAL OF SEPTAGE IN GVMC AREA**

**దరఖాస్తుదారుజతచేయాల్సినవివిధసర్టిఫికేట్లుఇతరద్రువీకరణపత్రాలచెక్‌లిస్ట్**

1. Copy of ADHAAR Card (ఆధార్ కార్డు (జిరాక్సుకాపీ)
2. Copy of PAN Card (పాన్ కార్డు కాపీ)
3. Copy of GST (జీఎస్టీ కాపీ)
4. Copy of the Driving License (డ్రైవింగ్ లైసెన్స్ కాపీ)
5. Copy of Vehicle Registration Certificate (వాహన రిజిస్ట్రేషన్ సర్టిఫికేట్ కాపీ)
6. Copy of Pollution Certificate (కాలుష్య నియంత్రణ సర్టిఫికేట్ కాపీ)
7. Copy of Vehicle Insurance Certificate (వాహన బీమా సర్టిఫికేట్ కాపీ)
8. Copy of Fitness Certificate (వాహనం ఫిట్నెస్ సర్టిఫికేట్ కాపీ)
9. Bank DD of INR 1000/- (Rs. One Thousand)
10. Photographs of Vehicle (all four directions front, rear and sides) (రూ. 1,000 డిడి-  
& వాహనానికీనాలుగువైపులనుంచి తీసిన ఫోటో కాపీలు).

**GREATER VISAKHAPATNAM MUNICIPAL CORPORATION**  
**TERMS AND CONDITIONS FOR APPLICATION OF THE LICENSE**

**గ్రేటర్ విశాఖపట్నం మునిసిపల్ కార్పొరేషన్ (జీవీఎంసీ) లైసెన్సు దరఖాస్తు నియమనిబంధనలు**

1. The application to be submitted along with a **self-attested photocopy of the Driving License of the Driver, Vehicle Registration Certificate, ADHAAR number, all certificates pertaining to vehicle, identity of assistants and photo of truck from four angles.** Any change in driver or its associates, the photocopy of driving license of the driver and identity of the associates are to be submitted to the authority. Lapses of validity of any certificate must be replaced with a new one before the last date of the validity of the existing one.

1. ప్రతి దరఖాస్తుకు తప్పనిసరిగా డ్రైవర్ సొంత అటెస్టేషన్ తో ఉన్న డ్రైవింగ్ లైసెన్స్, వాహనం రిజిస్ట్రేషన్ సర్టిఫికేట్, దరఖాస్తుదారు ఆధార్ సంఖ్య, వాహనానికి సంబంధించిన అన్ని సర్టిఫికేట్లు, సహాయకులకు సంబంధించిన వ్యక్తిగత గుర్తింపు (ఐడీ) కార్డులు, నాలుగు వైపుల నుంచి తీసిన ట్రక్ ఫోటోలు జత చేయాలి. డ్రైవర్/ సహాయకులవరైనా మారిపోతే.. వెంటనే కొత్తవారికి సంబంధించిన డ్రైవింగ్ లైసెన్స్ తదితర అన్ని ఆధారాలనూ వెంటనే సమర్పించాలి. ఏ సర్టిఫికేట్లైనా తుది చెల్లుబాటు గడువు ముగిస్తే.. ఆ లోపే కొత్త సర్టిఫికేట్ పొంది.. దాన్నే అధికారులకు సమర్పించాలి.

2. Merely applying for the license for collection, transportation and disposal of septage is not automatically makes the person eligible for getting the license. **GVMC will check the authenticity of the information provided in this form and is the final authority** to take a call whether license will be issued or not.

2. కేవలం.. సెప్టేజి సేకరణ/ రవాణా మరియు డిస్పోజల్ పనుల నిర్వహణ లైసెన్స్ కోసం దరఖాస్తు చేసినంత మాత్రాన.. లైసెన్స్ పొందినట్లుగా భావించేందుకు వీల్లేదు. దరఖాస్తుదారుకు లైసెన్స్ మంజూరు చేసేందుకు లేదా తిరస్కరించేందుకు కేవలం జీవీఎంసీకి మాత్రమే అధికారం ఉంది. దరఖాస్తులను క్షుణ్ణంగా పరిశీలించి.. లైసెన్స్ ఇవ్వాలా? వద్దా? అనే విషయమై జీవీఎంసీదే తుది నిర్ణయం.

3. The application to be accompanied with a **non-refundable draft of Rs.1000/- drawn in favor of 'Commissioner, GVMC', payable at SBI, GVMC Branch, Visakhapatnam.** The draft should not be issued not earlier to the date of this notification.

3. అన్ని దరఖాస్తులతో తప్పనిసరిగా 'కమిషనర్, జీవీఎంసీ' పేరిట.. ఎస్ బీఐ- జీవీఎంసీ బ్రాంచ్, విశాఖపట్నంలో తీసుకున్న రూ. 1,000 (తిరిగి చెల్లించబడదు) డీడీని జత చేయాలి. డీడీ తప్పనిసరిగా జీవీఎంసీ నోటిఫికేషన్ తేదీ తర్వాత మాత్రమే తీసుకోని ఉండాలి.

4. Incomplete form, without having a self-attested passport size photograph, documents, demand draft, signature/thumb impression will result in rejection of the application. No further communication will be made on this account with the operator by the authority. The operator has to get a receipt from the authority after 15 days of application to get confirmation that their application is successful.

4. అసంపూర్తిగా ఉన్న దరఖాస్తులు.. అంటే.. సొంత అటెస్టేషన్ లేని ఫోటోలు ఉన్నవి., సంబంధిత డాక్యుమెంట్లు, రూ. 1,000 డిమాండ్ డ్రాఫ్ట్ (డీడీ) లేనివి., దరఖాస్తుదారు సంతకం/ వేలిముద్ర లేనివి తిరస్కరింపబడతాయి. ఈ దరఖాస్తులకు సంబంధించి మరెలాంటి సమాచారం ఇవ్వరు. ఒకవేళ దరఖాస్తు అన్ని విధాలుగా సంతృప్తికరంగా ఉంటే, దాన్ని స్వీకరిస్తున్నట్లు.. 15 రోజుల తర్వాత

సదరు దరఖాస్తుదారు(ట్రక్ ఆపరేటర్)కు రిసీట్ పంపిస్తారు.

5. It is assumed that information provided by the operators and its associates are true to the best of their knowledge and no wrong information to be furnished knowingly or unknowingly. **GVMC may scrutinize the details at any time** before and after the issuance of license and the operator must co-operate with the officials in carrying out so. Furnish of wrong information or hiding any information at the time of filling the form may liable to rejection of license later stage.

5. దరఖాస్తులో పేర్కొన్న అన్ని విషయాల్నూ.. ఆ దరఖాస్తుదారులు మనఃస్పృశితంగా, అన్నీసత్యాలే తెలిపారని, ఎవరూ.. ఉద్దేశ్యపూర్వకంగా/అనుకోకుండా .. ఏ రకంగానూ అసత్యాలు/ అర్థసత్యాలు పేర్కొనలేదని జీవీఎంసీ భావిస్తుంది. దీనికి సంబంధించి.. ఎప్పుడైనా ఆయా అంశాలపై నిజ నిర్ధారణ/ విచారణ చేసేందుకు.. అసత్యాలు/ తప్పుడు వివరాలు వెల్లడించారని నిర్ధారణ అయితే, సదరు ట్రక్ ఆపరేటర్లపై క్రమశిక్షణ చర్యలు తీసుకునేందుకూ జీవీఎంసీకి సంపూర్ణ అధికారం ఉంది.

6. The licensee shall comply with the provision of the **Septage Bye-laws, Operational Guidelines and Standard Operating Procedures of the Greater Visakhapatnam Municipal Corporation.**

6. లైసెన్స్ పొందిన ట్రక్ ఆపరేటర్లంతా తప్పనిసరిగా జీవీఎంసీ విధించే సెప్టేజి నియమ- నిబంధనలు (బై లా-స్), నిర్వహణ మార్గదర్శకాలు, ప్రామాణిక నిర్వహణ పద్ధతులన్నీ తు.చ. తప్పకుండా పాటించాలి.

7. The licensee shall perform the activities in a manner so as to achieve the performance standards and directions issued by the issuing authority.

7. లైసెన్స్ పొందిన వీటీవోలంతా (ట్రక్ ఆపరేటర్లు) ఎప్పటికప్పుడు తమ సామర్థ్యాన్ని పెంచుకునేలా, జీవీఎంసీ ఆదేశాలు పాటిస్తూ .. పనితీరు మెరుగుపరుచుకునేందుకు కృషి చేయాలి.

8. The licensee shall comply with the local legislations as may be applicable from time to time to the activities being performed under this license.

8. లైసెన్స్ దారులంతా ఎప్పటికప్పుడు స్థానిక సంస్థలు అమల్లోకి తెచ్చే నియమ నిబంధనలను తెలుసుకుంటూ.. వాటికి అనుగుణంగా జీవీఎంసీ ఇచ్చే ఆదేశాలన్నీ కచ్చితంగా పాటించాలి.

9. The license shall maintain the specified vehicles in good and workable condition so as to avoid any accidents.

9. లైసెన్స్ దారు ఎప్పటికప్పుడు తన వాహనం పరిస్థితిని.. సామర్థ్యాన్ని తనిఖీ చేస్తూ.. అవసరమైన మరమ్మతులు చేయిస్తూ.. వాహనం ఎప్పుడూ సర్వసిద్ధంగా ఉండేలా చూసుకోవాలి.

10. The licensee shall employ only trained personnel for performing the licensed activities and provide protective gears to all such personnel.

10. లైసెన్స్ దారు ఎప్పుడూ తన వాహనంలో చక్కగా శిక్షణ పొందిన సిబ్బందినే నియమించుకోవాలి. వాహనానికి ఇచ్చిన లైసెన్స్ ఎట్టిపరిస్థితుల్లోనూ దుర్వినియోగం కాకుండా చూడడంతో పాటు.. తన సిబ్బంది రక్షణకూ తగు ఏర్పాట్లు చేయాలి.

11. This license is not valid for collection of industrial waste of any nature whatsoever.

11. ఈ వీటివో లైసెన్స్‌దారుకు .. ఎలాంటి పారిశ్రామిక వ్యర్థాల సేకరణకూ అనుమతి లేదు.

12. The issuing authority reserves the right to vary any of the conditions of this license or impose further conditions from time to time during the validity of this license.

12. ఈ లైసెన్స్ జారీ చేసినప్పటి నియమ-నిబంధనల్లో ఎలాంటి మార్పులు చేసేందుకు లేక కొత్త నిబంధనలు చేర్చేందుకు లైసెన్స్‌జారీ సంస్థ (జీవీఎంసీ)కు సర్వహక్కులుంటాయి.

13. The operator is required to maintain adequate and correct records of collection, transportation and disposal of septage as required by GVMC.

13. జీవీఎంసీ ఆదేశాలపై .. చేపట్టే సెప్టేజి సేకరణ/రవాణా/ డిస్పోజల్ పనులకు సంబంధించి.. లైసెన్స్‌ వీటివో ఎప్పటికప్పుడు సరైన నమూనాల్లో.. కచ్చితంగా రికార్డుల్ని నిర్వహించాలి.

14. The licensee has to agree with the fees levied by the authority for disposing septage at the designated disposal site. The authority from time to time can review the fees imposed on the licensee and may reduce the charge or increase the charge for such activities.

14. లైసెన్స్‌దారులంతా జీవీఎంసీ నిర్ణయించే నిర్దేశిత సెప్టేజి డిస్పోజల్ రుసుంను తప్పనిసరిగా చెల్లించాలి. అధీకృత సంస్థ.. (జీవీఎంసీ) ఎప్పటికప్పుడు ఈ రుసుం మొత్తాలను సమీక్షిస్తూ.. కాలానుగుణంగా నిర్ణయిస్తుంటుంది. దీన్ని అంతా ఆమోదించాల్సిందే.

15. Fees to be paid to the licensee for carrying out the emptying of septage are come under the purview of the GVMC. It is the authority to take a rational call on such charges based of best scientific judgment from time to time.

15. సెప్టేజి వ్యర్థాల్ని ఖాళీ చేసేపనికి సంబంధించి లైసెన్స్‌ వీటివోలు రుసుంగా ఎంత వసూలు చేసుకోవచ్చన్నది ఎప్పటికప్పుడు అధీకృత సంస్థ (జీవీఎంసీ) శాస్త్రీయ పద్ధతుల్లో నిర్ణయిస్తుంటుంది. ఆ ప్రకారమే వీటివోలు రుసుం వసూలు చేయాలి.

16. This license will be issued to dispose the septage only at the designated disposal points as identified by GVMC. Violation of this or indiscriminate disposal of the septage to the environment (land, water bodies or drain) without permission of the authority may call for rejection of license by the authority.

16. ఈ లైసెన్స్‌తో కేవలం ఆయా వీటివోలు సెప్టేజి వ్యర్థాలను అధీకృత సంస్థ (జీవీఎంసీ) నిర్దేశించిన అధీకృత డిస్పోజల్ పాయింట్ల వద్ద డిస్పోజ్ చేసేందుకే అనుమతి లభిస్తుంది. దీనికి మించి.. ఎలాంటి ఉల్లంఘనకు పాల్పడినా.. జీవీఎంసీ అనుమతి లేని ఇతర ప్రాంతాల్లో సెప్టేజిని డిస్పోజ్ చేసినా.. (నీటి వనరులు.. నేలపై లేదా మురుగు కాలువల్లో..) తక్షణం లైసెన్స్ రద్దు చేయబడుతుంది.

17. The application complies with the requirements of the septage bye-laws and hence the operator has to submit the certificate of permit to transport the septage from APPCB and a declaration for environmental sanitation clearance and sanitary permit to the Department of Health, GVMC.

17. దరఖాస్తు సెప్టేజి నియమ- నిబంధనల (టై-లాస్)కు అనుగుణంగా ఉండాలి. దీనికోసం.. రాష్ట్ర కాలుష్య నియంత్రణ మండలి (ఎపీసీబీ) జారీ చేసే సెప్టేజి రవాణా అనుమతి సర్టిఫికేట్ జత చేయడంతో పాటు.. జీవీఎంసీ హెల్త్ డిపార్ట్‌మెంట్ నుంచి పర్యావరణ-పారిశుధ్య అనుమతి ఇమ్మూని కోరుతూ ఒక డిక్లరేషన్ నూ జత చేయాలి.

18. The application form along with all self-attested documents, demand draft and certificates complete in all respect will have to be submitted within seven days of receiving the application form from the municipal corporation.

18. అవసరమైన అన్ని డాక్యుమెంట్లు (సొంత అటెస్టేషన్ చేసినవి..), నిర్ణీత రుసుం చెల్లించిన డీడీ కూడా జత చేసి.. సమగ్రంగా నింపిన దరఖాస్తును .. (జీవీఎంసీ నుంచి దరఖాస్తు పొందిన తేదీ నుంచి..) ఏడు (7) రోజుల్లోగా సంబంధిత కార్యాలయంలో అందజేయాలి.

**GREATER VISAKHAPATNAM MUNICIPAL CORPORATION**

**DECLARATION CUM PERMIT CERTIFICATE ON ACCOUNT OF ENVIRONMENTAL SANITATION CLEARANCE CUM SANITARY PERMIT**

I Shri/Ms \_\_\_\_\_ on individual capacity hereby solemnly declare that I will abide to all the rules, regulations and standard operating procedures framed by GVMC and will undertake the work of de-sludging, transportation and disposal in most appropriate and sanitary means and will carry out my duties as set forth in the standard operating procedure during the possession of the license.

I understand that this permit is given for the period of validity of the license. I further understand that this is a supporting document to the license and fail to produce this document whenever asked may debar myself in carrying out intended activities in GVMC area.

**Applicant Signature with Date:**

**Name (In capital letter):**

**Thumb Impression:**

**FOR OFFICE USE ONLY**

This is to certify that Shri/Ms \_\_\_\_\_ is hereby given permit on account of environmental sanitation clearance and sanitary permit in respect to his/her declaration for the period of \_\_\_\_\_ to \_\_\_\_\_. Misconduct or misuse of this permit is liable for legal action on the operator. This permit given is non-transferable in any case. Loss or theft of this document must be brought to the notice of the Chief Medical Officer Health, GVMC immediately for reissue after following due process.

**Commissioner**

**Greater Visakhapatnam Municipal Corporation  
Visakhapatnam**

**మహావిశాఖపట్నం నగరపాలకసంస్థ**

**పర్యావరణపరిశుభ్రత కేటక్కు సంబంధించి దరఖాస్తుదారుడి క్షరేషన్**

**మరియు పర్యావరణ పరిశుభ్రతకు సంబంధించిన శానిటరీ శాఖ అనుమతి పత్రం**

శ్రీ/ శ్రీమతి ----- అనునీను ఈ సందర్భంగా వ్యక్తిగత హోదాలో మన స్వాక్ష్మిగా ప్రకటించునది ఏమనగా.. నేను జీవీఎంసీ విధించే అన్ని షరతులు.. ప్రభుత్వ నియమ నిబంధనలు / సెప్టిజివ్యధాల సురక్షిత డిస్పోజల్ కు సంబంధించి పర్యావరణకు సంబంధించిన అన్ని ప్రామాణిక నిర్వహణ పద్ధతులను తప్పనిసరిగా పాటిస్తాను. అధికృత సంస్థ ఈ లైసెన్సు జారీ చేసేందుకు రూపొందించిన అన్ని నిబంధనలనూ గౌరవిస్తూ.. ఆ మేరకు నా విధుల నిర్వహణలో నిబద్ధతతో వ్యవహరిస్తాను.

ఈ ప్లేజిరవాణా పర్యావరణ పరిశుభ్రత అనుమతి పత్రం కేవలం నా లైసెన్సు చెల్లుబాటు తుది గడువు తేదీ వరకూ మాత్రమే అమల్లో ఉంటుందని అర్థంచేసుకున్నాను.

ఆపై.. ఇదినా లైసెన్సు పత్రానికి ఒక అనుబంధ డాక్యుమెంట్ గా మాత్రమే జారీ చేశారనీ.. అధికారులు ఆ దేశించినప్పుడు వీటిని వారికి చూపించలేకపోతే.. తక్షణం నన్ను విధులనుంచి తప్పించేందుకు జీవీఎంసీకి సర్వహక్కు లు ఉన్నాయనీ అర్థంచేసుకున్నాను.

**తేదీ:** **దరఖాస్తు దారు సంతకం:**

**పూర్తి పేరు (పెద్ద అక్షరాలలో...)** **దరఖాస్తు దారు బొటన వ్రేలి ముద్ర**

**జీవీఎంసీ కార్యాలయం కోసం..**

శ్రీ/ శ్రీమతి ----- గారికి, వారు పైన జతపరిచిన సొంత పూచీ కత్త పత్రం (డిక్లరేషన్) ఆధారంగా.. పర్యావరణ పారిశుద్ధ్య రక్షణ పరమైన అనుమతి పత్రాన్ని మంజూరు చేస్తున్నాం. ఈ అనుమతి కేవలం తేదీ ----- నుంచి ----- తేదీ వరకూ మాత్రమే చెల్లుబాటు అవుతుంది. ఈ కాలపరిమితిలో లైసెన్సు దారు అధికృత సంస్థ ఆదేశాలు.. పాలన పరమైన నియమ నిబంధనలు,

చట్టాలు, ప్రామాణిక కార్య నిర్వహణ మార్గదర్శకాలను ఉల్లంఘించి పర్యావరణ.. పారిశుద్ధ్య నిర్వహణకు విఘాతం కలిగే చర్యలకు పాల్పడినట్లు రుజువు చేసినా తే.. చట్టపరమైన చర్యలుంటాయి. ఈ పర్యావరణ అనుమతి పత్రం ఇతరులకు బదిలీ చేయడం చెల్లదు. ఈ అనుమతి పత్రం చోరీ గురైనా.. ఎక్కడైనా పోయినా.. వెంటనే మరో అనుమతి పత్రం జారీ చేయడం కోసం.. జీవీఎంసీ- ఛీఫ్ ఇంజనీరింగ్ ఆఫీసర్ (సీఎంఓ) గారికి తెలియజేయాలి.

**కమిషనర్ ,**  
**మహావిశాఖ పట్టణ నగర పాలక సంస్థ**  
**విశాఖ పట్టణం**

**ANNEXURE 4: LICENSE FOR COLLECTION AND TRANSPORTATION OF SEPTAGE**

Place Self-Attested  
Recent Passport Size  
Photograph

In accordance with all the terms and conditions of the By-laws/ Operational Guidelines/Regulations, Municipal Corporation Act rules, the special license conditions accompanying this license and applicable rules and laws of Government of Andhra Pradesh, the permission is hereby granted to:

**NAME OF LICENSEE**.....

**NAME OF THE OWNER OF VEHICLE** *(If different from Licensee)* .....

**PERMIT NUMBER** .....

**ADDRESS**.....

**For the disposal of septage from septic tanks in GVMC**

This license is based on the information provided in the Form for Application for the License of Collection, Transportation and Disposal of Septage in GVMC Area and further to compliance to the Standard Operating Procedure set forth by the Authority. This license is effective for a period set forth below.

**EFFECTIVE DATE -**

**EXPIRATION DATE -**

The license may be suspended or revoked for Condition of Non-Compliance of any Acts, Rules and Regulations, Operational Guidelines, Standard Operating Procedures and is not transferable. The original license shall be kept on file in the Licensee’s office. A copy of this license shall be carried in every registered vehicle used by the Licensee.

**Commissioner**  
Greater Visakhapatnam Municipal Corporation  
Visakhapatnam



**ANNEXURE 5: COLLECTION AND TRANSPORT RECORDS THROUGH SEPTAGE MANIFEST FORM (SMF)**

**Date:**

**Time of Collection:**

**Space for STAMP by VTO, STAMP should contain Name, License Number and Vehicle Registration Number**

**1) Septage Origin**

|               |                          |
|---------------|--------------------------|
| Residential   | <input type="checkbox"/> |
| Institutional | <input type="checkbox"/> |
| Commercial    | <input type="checkbox"/> |
| Other         | <input type="checkbox"/> |

|   |  |  |  |  |
|---|--|--|--|--|
| Name (household or unit, mention unit numbers if more than one household) |  |  |  |  |
| Ward No.  |  |  |  |  |
| Phone Number  |  |  |  |  |
| Volume emptied (in m3), mention separately for each household             |  |  |  |  |

**2) Septage Discharge**

|  |     |    |
|--|-----|----|
| DSO Name   |     |    |
| Designated Disposal Site   |     |    |
| Septage Inspection comments ( <i>Odour / Colour / Solid waste / Soil and grit / FOG scum</i> ) |     |    |
| Sample Taken   | Yes | No |
| Load Accepted  | Yes | No |
| Load Rejected  | Yes | No |
| Volume emptied (in m3)   |     |    |

**Sign of VTO:**

**Sign of Household:**

**Sign of DSO**

**Date of Discharge:**

**Time of Discharge:**

## ANNEXURE 6: SAFE REUSE AND DISPOSAL OF TREATED SEPTAGE<sup>2</sup>

MSW Rules (2016) recommended the quality for compost as referred to Table 1 below.

**Table 1: Compost Quality as per MSW Rules, 2016**

| Parameter  | Concentration not to exceed (mg/kg dry basis. Except for pH and carbon to nitrogen) |
|--|---|
| Arsenic  | 10  |
| Cadmium  | 5   |
| Chromium   | 50  |
| Copper   | 300   |
| Lead   | 100   |
| Mercury  | 0.15  |
| Nickel   | 50  |
| Zinc   | 1000  |
| C/N ratio  | <20   |
| pH   | 6.5 – 7.5   |
| Moisture percent by weight, maximum  | 15 – 25   |
| Bulk Density   | <1  |
| Total Organic Carbon   | 12  |
| Total Nitrogen (as N) percent by weight, minimum                               | 0.8   |
| Total Phosphate (as P <sub>2</sub> O <sub>5</sub> ) percent by weight, minimum | 0.4   |
| Total potassium (as K <sub>2</sub> O) percent by weight, minimum               | 0.4   |
| Colour   | Dark brown to black   |
| Odour  | Absence of foul odour   |
| Particle size  | Minimum 90% material should pass through 4.0mm IS sieve                             |
| Conductivity (as dsm – 1), not more than                                       | 4   |

### 1. Use of treated output

The treated output could find many uses in different climatic and use zones, subject to following norms and guidelines governing the respective uses. A snapshot the same is indicated

- a) Compost (final product) exceeding the above stated concentration limits shall not be used for food crops. However, it may be utilized for purposes other than growing food crops. The FCO norms for quality of compost needs to adherence and approval prior to application and use.
- b) For dewatered septage/sludge can be used as fertilizer in agriculture application, it should satisfy the following criteria of Class-A Bio-solids of US EPA: A faecal coliform density of less than 1000 MPN/g total dry solids, Salmonella sp. density of less than 3 MPN per 4 g of total dry solids. WHO (2006) suggests Helminth egg concentration of < 1/g total solids and E coli of 1000/g total solids in treated septage for use in agriculture.




- c) Properly treated sludge can be reused to reclaim parched land by application as soil conditioner, and/or as a fertilizer. Deteriorated land areas, which cannot support the plant vegetation due to lack of nutrients, soil organic matter, low pH and low water holding capacity, can be reclaimed and improved by the application of treated septage. Septage sludge with lime stabilization has pH buffering capacity that is beneficial for the reclamation of acidic soils. Treated septage contains nutrients in considerable amounts, which supports the growth of plants.
- d) Drip irrigation is the preferred irrigation method for settled septage effluent when irrigation is feasible. Crops which could be safely grown are corn, fodder, cotton, trees including fruit trees, eucalyptus and poplar.
- e) Aquaculture can be practiced for settled septage effluent when freshwater is available to achieve dilution to ensure dissolved oxygen is above 4 mg / l. Fish species of tilapia and carp are preferred since they tolerate low dissolved oxygen. Both drip irrigation and aquaculture need land and are feasible at city outskirts.


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<sup>2</sup> Source: Advisory note: Septage Management in Urban India, Ministry of Urban Development, Government of India. (2013), SWM Rules - 2016 and Guidelines for septage management in Maharashtra. (2016)

## ANNEXURE 7: PROTECTIVE GEAR FOR PERSONNEL

Protection gear is essential for occupational health and safety of personnel involved in the cleaning and treatment services for septage treatment and management. It is ideal that at all times functional gear are available for each truck / emptier. The list of items, specifications and images are presented in the table below.

| Item Description               | Specifications  | Image   |
|--------------------------------|---|---|
| <b>1. Safety Helmet</b>        | <ul style="list-style-type: none"> <li>• ISI Mark: IS 2925</li> <li>• MOC: PVC Safety Helmet</li> <li>• Colour: White / Yellow / Blue</li> <li>• Helmet with Ratchet band, fully adjustable</li> <li>• Sweat band and nylon chin strap</li> </ul>   |    |
| <b>2. Safety Goggles</b>       | <ul style="list-style-type: none"> <li>• EN 166:2001 approved</li> <li>• ANSI Z 87.1 approved</li> <li>• MOC: Impact resistant polycarbonate</li> <li>• Scratch resistant (should have scratch resistant coating)</li> <li>• 100 % polycarbonate lens with 100% UV protection</li> <li>• Adjustable temples</li> <li>• Chemical splash proof (side and front impact protection)</li> <li>• Provide protection against flying particles, dust, spark and glare</li> <li>• Extremely light weight and soft nose pads.</li> <li>• Should have side shield and brow bar must fit snugly to forehead for extra application.</li> </ul> |  |
| <b>3. Nose Mask (Reusable)</b> | <ul style="list-style-type: none"> <li>• ISI Mark: IS 8522</li> <li>• Nose mask with elastic head band</li> <li>• Filtering Efficiency: As per ISI requirement (confirming to EN 149 FFP1 / FFP1S requirement)</li> <li>• Efficiency: Filters dust 85% to 90% upto 3 microns size of dust</li> <li>• Made of cotton</li> <li>• Filter media should be on whole respirator surface</li> </ul>  |  |

| Item Description                        | Specifications   | Image   |
|---|--|---|
|   | <ul style="list-style-type: none"> <li>• Head bands: twin head bands having very good elastic retention properties with good face seal throughout the usage of life.</li> </ul>  |   |
| <p><b>4. PVC Rubber Hand Gloves</b></p> | <ul style="list-style-type: none"> <li>• Acid alkali proof hand gloves</li> <li>• Propylene rubber hand glove</li> <li>• Should be made of acrylic propylene latex with soft 100% cotton flock for added comfort which absorbs perspiration and adds insulation</li> <li>• Should have excellent chemical resistance to heavy hydrocarbons, hydrocarbon derivatives, aromatic solvents, alcohols, oil greases</li> <li>• Size: 12 to 18 inches</li> </ul>  |    |
| <p><b>5. Acid Alkali Proof Suit</b></p> | <ul style="list-style-type: none"> <li>• MOC: PVC</li> <li>• Acid alkali resistant suit should be made of PVC with nylon reinforced laminated material</li> <li>• Consist of acid alkali proof coat, pant and full-face mask (separately)</li> <li>• Have higher tensile strength &amp; good chemical resistance</li> <li>• Have full opening from chest for easy wearing and double flap in front to prevent / protect liquid entry splashed on it while use</li> <li>• Lined with reflecting tape</li> </ul> |   |
| <p><b>6. Gum Boot</b></p>               | <ul style="list-style-type: none"> <li>• IS: 12254</li> <li>• Steel toe material 10" / 14"</li> <li>• Excellent fitting and grip as per Indian fit sizes</li> <li>• 100% virgin soft and flexible PVC in the upper for comfortable walk</li> </ul>   |  |
| <p><b>7. Safety Lite / Torch</b></p>    | <ul style="list-style-type: none"> <li>• As per ISI Mark</li> <li>• 0.5 km range</li> </ul>  | <p>-</p>  |

## ANNEXURE 8: TECHNOLOGICAL OPTIONS FOR TREATMENT

This section presents an overview of the mechanisms on which faecal sludge (FS) treatment processes are based, and highlights those on which the treatment technologies are discussed in subsequent sections. Many FS treatment technologies are based on those developed for wastewater and wastewater sludge treatment, but have limitations for direct transfer and use. FS characteristics greatly differ from wastewater, and have a direct impact on the efficiency of treatment mechanisms (Spellman, 1997; Kopp and Dichtl, 2001). Important properties of the sludge to consider include stabilisation, organic load, particle size and density, dissolved oxygen, temperature, pH, water content and viscosity. The current understanding of physical, biological and chemical mechanisms in FS management (FSM) is limited and has been acquired via empirical observations over the years.

### 1. Treatment Mechanisms

#### 1.1 Physical Mechanism

Physical mechanisms include dewatering, drying and volume reduction. One of the most important treatment mechanisms in FSM is dewatering. FS mainly comprises of water, the proportion of which is dependent on the type of onsite technology. Water is heavy and expensive to transport, and discharging this polluted water to the environment has significant negative impact. Dewatering is also necessary prior to resource recovery for applications such as composting, or combustion as a fuel and is mostly based on physical processes such as evaporation, evapotranspiration, filtration, gravity, surface charge attraction, centrifugal force and pressure.

#### 1.2 Biological Mechanism

In FSM, biology is essential for the achievement of treatment objectives through transformation of organic matter and nutrients, including an understanding of pathogen reduction. Biological mechanisms allow the removal and transformation of organic constituents, nutrients and pathogens via the activity of microorganisms. Biological treatment harnesses the metabolism and growth rate of microorganisms in naturally occurring processes and employs them in controlled situations to optimise the desired outcomes. As the microbes grow, they dynamically alter the system by modifying forms of organic matter and releasing & binding up nutrients. They also release gases and other by products that can affect the environment.

#### 1.3 Chemical Mechanism

Chemical mechanisms involve employing additives to optimise and control desired reactions, and are mainly used for disinfection and enhanced dewatering. Chemicals can be mixed with FS to improve the performance of other physical mechanisms (e.g. addition of a cationic polymer to increase the flocculation and the settling efficiency), or to inactivate pathogens and stabilise FS. The addition of chemicals can represent a significant increase in the overall cost of treatment, and the benefits therefore need to be carefully weighed.

There are different treatment facilities that are available, but each technology has different fields of application. They can be used for the treatment or co-treatment of undigested FS (e.g. from public toilets), or digested or pre-treated FS. Given the high content of coarse wastes such as plastics, tissues and paper in the discharged FS, preliminary screening is needed for most treatment technologies. Also, the characteristics of FS collected

at industrial and commercial facilities should be checked as they can be contaminated with metals, have high concentrations of fats, oil and grease, or other concerns. That should be segregated and treated separately. After treatment, three types of end products can be distinguished – screenings, treated sludge and liquid effluent. Therefore, selection of the technologies, or combinations thereof, should be done considering local context, existing regulations and the end use goals.

## **2. Established Faecal Sludge Treatment Technologies**

### **2.1 Co-composting of faecal sludge**

Composting is a biological process that involves microorganisms that decompose organic matter under controlled predominantly aerobic conditions. The resulting end product is stabilised organic matter that can be used as a soil conditioner. It also contains nutrients which can have a benefit as a long-term organic fertiliser. There are two types of composting systems, open and closed, of which open systems are lower in capital and operating costs but typically require more space. In an open composting system, raw organic matter is piled up into heaps (called windrows) and left for aerobic decomposition. To increase space efficiency, the heaps of waste can also put into walled enclosures which are called box composting. If untreated waste feedstock is placed in a closed container this is called in-vessel or closed drum composting and is considered in the category of closed systems.

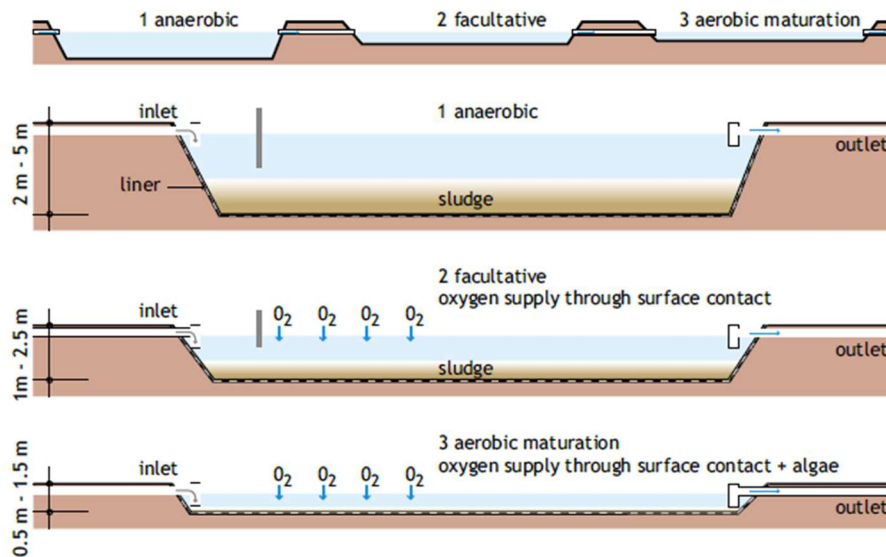
*Potential advantages and constraints of co-composting:* The main advantage of co-composting is formed by the thermophilic conditions and the resulting pathogen inactivation. The output of co-composting is a good soil conditioner which provides potential for income generation depending on the demand for compost. However, operating a co-composting plant and generating a safe product with value requires technical and managerial skills, which can be limiting if not available.

### **2.2 Co-treatment in waste stabilisation ponds**

Waste stabilisation ponds (WSPs) are widely used for the treatment of municipal wastewater. The mechanisms for stabilisation are based on natural processes that occur in aquatic ecosystems. WSPs are considered as good options for wastewater treatment in low-income countries when adequate land is available, particularly in tropical climates. WSPs consist of several ponds having different depths and retention times. A combination of three types of ponds in a series is frequently implemented in wastewater treatment:

- a) Anaerobic ponds that are two to four meters deep are used for settling of suspended solids and subsequent anaerobic digestion. The effluent flows to the facultative pond.
- b) Facultative ponds that are 1 to 1.8m deep allow for remaining suspended solids to settle. In the top layer of the pond dissolved organic pollution is aerobically digested, while anaerobic conditions are prevalent at the bottom.
- c) Maturation ponds that are 1 to 1.5 m deep allow for pathogen reduction and stabilisation. The ponds are mainly aerobic. Oxygen is supplied through algae and diffusion from the air. Pathogen reduction occurs via UV rays from the sun.

**Figure – Design and principles of the three types of ponds constituting waste stabilisation ponds**



Potential advantages and constraints of waste stabilisation ponds: WSPs are simple to build and require relatively low O&M requirements. The technology is appropriate for tropical climates, and achieves relatively high pathogen removal in the effluent. Constraints include land availability, high rate of solids accumulation if preliminary solids separation is not performed, and potential inhibition due to high salt and ammonia concentration. The removal of sludge that accumulates in the anaerobic ponds may require heavy mechanical equipment.

### 2.3 Deep row entrenchment

Deep row entrenchment is a technology that can be considered as both a treatment and end use option. Deep row entrenchment consists of digging deep trenches, filling them with sludge and covering them with soil. Trees are then planted on top, which benefit from the organic matter and nutrients that are slowly released from the FS. In areas where there is adequate land available, deep row entrenchment can present a solution that is simple, low cost, has limited O&M issues and produces no visible or olfactory nuisances. Benefits are also gained from the increased production of trees. However, the availability of land is a major constraint with deep row entrenchment, as is the distance/depth to clean groundwater bodies. Deep row entrenchment is considered most feasible in areas where the water supply is not directly obtained from the groundwater source and where sufficient land is available, which means the sludge would have to be transportable to rural and peri-urban areas.

Potential advantages and constraints of deep row entrenchment: The main advantage of deep row entrenchment is that very little is needed for it no expensive infrastructure or pumps that are very susceptible to poor maintenance. In addition, growing trees has many benefits such as extra CO<sub>2</sub> fixation, erosion protection, or potential economic benefits. Constraints are that sufficient land has to be available in an area with a low enough groundwater table and, moreover, legislation still needs to catch up in many countries to allow for this technology.



## 2.4 Transferred sludge treatment technologies

Activated sludge wastewater treatment produces waste sludge that needs treatment. Technologies that are typically applied there may be transferable to application in FSM. The benefit of these technologies is that they have generally been applied for many years and much knowledge is present regarding design, operation and maintenance. The difficulty is however that the application of these technologies to FS has not been researched in much detail yet, which is key for successful long-term implementation.

### 2.4.1 Anaerobic digestion

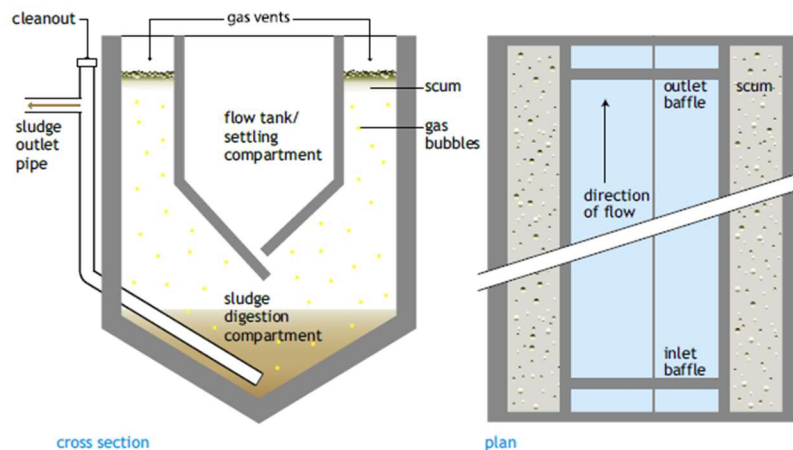
During anaerobic digestion, organic matter is converted into biogas and the remaining sludge is referred to as slurry or digestate. Biogas is a mixture of mainly methane and carbon dioxide and the digestate is relatively biologically stable and can be used as a soil conditioner. Anaerobic digestion treats organic waste in airtight chambers to ensure anaerobic conditions. Anaerobic digestion has been widely applied in centralised wastewater treatment facilities for the digestion of primary sludge and waste activated sludge, typically with plug flow (PFR) or continuously stirred reactors (CSTRs). Anaerobic treatment technologies also include up flow anaerobic sludge blanket (UASB) reactors, anaerobic baffled reactors (ABRs) and anaerobic filters. Anaerobic treatment is also well known and developed for industrial wastes and highly loaded wastewater treatment plants.

*Potential advantages and constraints of anaerobic digestion for faecal sludge management:* Anaerobic digestion has the potential to produce biogas while stabilising FS, reducing sludge volume and odours. However, operation and maintenance (O&M) of anaerobic digesters requires a relatively high level of skilled operation. Inhibition of digestion *needs* to be considered due to the inconsistent nature of FS, and also detergents and heavy metals should be addressed at the household level. A constraint of anaerobic digestion as a technology for FS treatment is that, despite the vast amount of knowledge on anaerobic digestion, it has not yet been proven for FS alone in semi-centralised to centralised treatment in urban areas. Hence, further research is needed, and pilot scale facilities need to be installed prior to full scale implementation in order to learn more about the safe and sustainable application of this technology.

### 2.4.2 Imhoff Tank

An Imhoff tank is a compact sized tank that combines the effect of a settler and an anaerobic digestion system in one. It is a compact system which is well-known for wastewater treatment. Imhoff tanks are most often used as a primary treatment technology in wastewater treatment where it serves as a solid-liquid separation system including partial digestion for the settled sludge. The same considerations for sludge characteristics that were described under anaerobic digestion apply here.

*Potential advantages and constraints of Imhoff tanks:* The main advantages of Imhoff tanks compared to settling-thickening tanks are the small land requirement, the possibility of operating only one tank, and the physical separation between the settled sludge and the liquid fraction. The main constraints compared to settling thickening tanks are the increased operational complexity, slightly higher costs as the Imhoff tanks require an additional elevation to accommodate the inclined baffles, and the risk of damage to the sludge draw-off pipe in case of an inadequate draw-off frequency. Operation and maintenance of an Imhoff system is not as complex as some technologies, but it requires skilled operators. Cleaning of flow paths, the sides of the tank as well as the removal of scum is very important.



### 2.4.3 Sludge incineration

Incineration of sludge is a form of disposal which involves the burning of sludge at temperatures between 850-900°C. It does not typically take advantage of the potential for resource recovery; however, energy can be captured from the incineration of sludge. The ash that is produced from incineration could potentially be used, for example as a cover material for urine diversion dry toilets or in construction, or it can be disposed of in landfill sites. Depending on the source of sludge, the ash may contain high concentrations of heavy metals. Sludge needs to be dewatered prior to combustion, but stabilisation treatment is not necessary as it decreases the volatile content of the sludge. Commonly used incineration systems are multiple-hearth incineration, fluidised-bed incineration and co-incineration with municipal solid waste.

*Potential advantages and constraints of sludge incineration:* Disadvantages include potential emission of pollutants; the need for highly skilled operating and maintenance staff, high capital and O&M costs; and residual ashes. Advantages are substantial reduction in sludge volume and pathogens removal.

### 2.4.4 Mechanical sludge treatment

Mechanical dewatering or thickening can be carried out prior to, or following other treatment steps. Dewatering and thickening are important for reducing the volume of sludge that needs to be further treated or managed. After the sludge thickening process, additional reduction of the water content is necessary, and this can be done either naturally or by machine processes such as centrifugation or pressing. Four technologies that are widely used for dewatering WWTP sludge are the belt filter, the centrifuge, the frame filter press, and the screw press. Only few examples are available in the literature for the implementation of these technologies to FS, but theoretically the technology is transferable.

*Potential advantages and constraints of mechanical sludge treatment:* The main constraints of these technologies in comparison to non-mechanical options are the investment costs, the O&M requirement, the need to add flocculants and the dependency on electricity. The general advantages are the compactness, and the speed of the process. To transfer these types of technologies to treat FS, information from manufacturers, laboratories, and pilot-scale tests is necessary.

### 2.4.5 Lime addition

Lime is used for wastewater sludge treatment to achieve the reduction of pathogens, odours, degradable organic matter, apart from being a sludge conditioner to precipitate metals and phosphorus. The process of pathogen reduction during alkaline stabilisation is based on an increase of pH, temperature (through exothermic oxidation reactions) and ammonia concentration. Its effect is enhanced by a longer contact time and higher dosing amount. An added benefit of lime is that heavy metals can precipitate with the lime. However, the pathogen removing effect of lime also affects desired microbial processes such as composting and other soil processes. Moreover, safety is very important: as lime is corrosive to the skin, eyes and lungs and proper personal protection equipment (PPE) is crucial. Furthermore, protection from fire and moisture must be ensured.

*Potential advantages and constraints of lime treatment:* The main disadvantages of this technique are the requirement of consumables (lime), and a dry storage area. Pathogen regrowth is also a concern. Lime is an alkaline material which reacts strongly with moisture and high risks of hazard to the eyes, skin and respiratory system are observed. Therefore, skilled staff is required who must follow health and safety procedures and make use of good protective equipment.

## **2.5 Innovative technologies for faecal sludge treatment**

There is currently a great deal of research being conducted on innovative FS treatment technologies.

### **2.5.1 Vermicomposting**

Earthworms are a member of the oligochaetes sub-class and they appear to be very effective in organic waste reduction. An example is the “vermi-filter”, which treats diluted domestic wastewater sludge in a system inoculated with earthworms. Interestingly, the earthworms seemed to function in synergy with bacterial communities within the filter. Worms cannot survive in fresh faeces and need support in the form of layers of soil and vermi compost. Vermicomposting is not a reliable method to ensure adequate pathogen removal. However, when carried out under proper conditions the technology of vermicomposting can lead to a complete removal of coliforms.

*Potential advantages and constraints of vermicomposting:* In general, the advantages and constraints for vermicomposting are similar to composting. However, vermicomposting cannot be carried out at the thermophilic temperatures of co-composting. Therefore, if adequate pathogen reduction is not achieved during treatment, further treatment steps are required. Constraints are that the technology is still under development; the worms can be susceptible to toxic components (or higher concentrations in general), and the time span until matured compost is reached can be longer than for thermal composting. The production of worms can be beneficial provided there is a market for them.

### **2.5.2 Ammonia Treatment**

Ammonia treatment can be applied for pathogen reduction. Pathogen inactivation by uncharged ammonia ( $\text{NH}_3$ ) has been reported for several types of microorganisms, bacteria, viruses and parasites. The principle of pathogen reduction with ammonia is based on ammonia ( $\text{NH}_3$ ) enters cells, takes up intracellular protons for the formation of ammonium ( $\text{NH}_4^+$ ) and as a charged ion disturbs the functioning of organisms. Ammonia addition to sludge has been applied for wastewater sludge, where it is commonly referred to as alkaline stabilisation. More recently, investigations have been conducted on using the ammonia from excreta for pathogen reduction in Faecal Sludge. This can be done by collecting urine separately, and then mixing it with

FS, as urine has high ammonia concentration. For sludge with low ammonia concentration, additional ammonia in the form of the synthetic urea can be added to enhance the treatment.

*Potential advantages and constraints of ammonia treatment:* In comparison to lime treatment, ammonia requires less stringent storage conditions. It seems particularly applicable in areas with urine diverting dehydrating toilets (UDDTs). In the cases where synthetic urea needs to be applied, the costs become higher, which may limit the economic feasibility and sustainability of the technology. Another constraint is the stability of nitrogen in treatment end products, and whether the full nutrient benefit can be achieved.

### **2.5.3 Thermal drying and pelletising**

Thermal drying allows the removal of all types of liquids from FS. It has been applied in the management of wastewater sludge for many years, and the technology has been taken up and improved from its original application in other industries (e.g. paper industry). Several types of technologies exist, all based on the ability of evaporating water with heat. The end products are stable and in a granular form allowing easier storage or transport.

*Potential advantages and constraints of thermal drying and pelletising:* Thermal drying results in a significant reduction in volume as well as pathogen content. Dried sludge is easy to handle and to market, and can be used in agriculture. The main constraints are the expense, high energy requirements, the potential risks of fire or explosion due to the gas and dust in the system, and the high maintenance requirements. Pelletising combines mechanical dewatering and thermal drying technologies. The dried pellets can then be used as an energy source or soil conditioner, and are relatively easy to transport.

### **2.5.4 Solar drying**

A special form of drying is applied in solar sludge driers. They also have been used on a large scale since the nineteenth century in Europe and USA for the treatment of wastewater sludge. This technology is generally constructed in greenhouse structures with transparent covers, concrete basins and walls. Sludge is disposed into these basins and processed for about 10 to 20 days. Options exist for batch or continuous operation, with devices to control the conditions in the greenhouses (e.g. ventilation, air mixing, temperature). The main factors influencing the evaporation efficiency in these systems are the solar variation, the air temperature and the ventilation rate, with initial dry solid content of the sludge and air mixing also influencing the process

*Potential advantages and constraints of solar drying:* The main advantages of this option are the low energy requirements, the limited complexity of the technology and low investment costs, and the high potential dewatering efficiency. The main constraints are the space requirements and the need for mechanical means to turn the sludge, as well as to ventilate the greenhouses. Although pilot tests are being carried out for the moment, no information is available on the use of this technology for the treatment of FS in low-income countries or on design and operating parameters that need to be considered for this purpose.

## ANNEXURE 9: BUILDING ON EXISTING SYSTEMS: CO-TREATMENT WITH SEWAGE TREATMENT PLANT (STP) WITH PPP ENGAGEMENT IN VISAKHAPATNAM

### 1. Background

A sewage treatment plant (STP) is often a convenient and an environmentally sound location for septage disposal. The city has four major STPs that cater to the need of treating the daily sewage generated. These plants can be modified to receive and treat septage effectively along with sewage. Septage addition, however, can have a significant impact on plant operations or performance if receiving facilities are not properly designed or not having adequate reserve capacity to take extra load. Septage handling increases plant operation and maintenance (O & M) costs in proportion to the amount of septage received. However, if effectively designed and operated they perform as expected, during the planning stage of the plant without causing any affect to the plant operation.

#### 1.1 Estimating plant capacity

Determining the ability of a plant to handle septage and estimating the amount of material that can be effectively handled are complex processes. The lists the potential impacts of septage addition to a STP are as below.

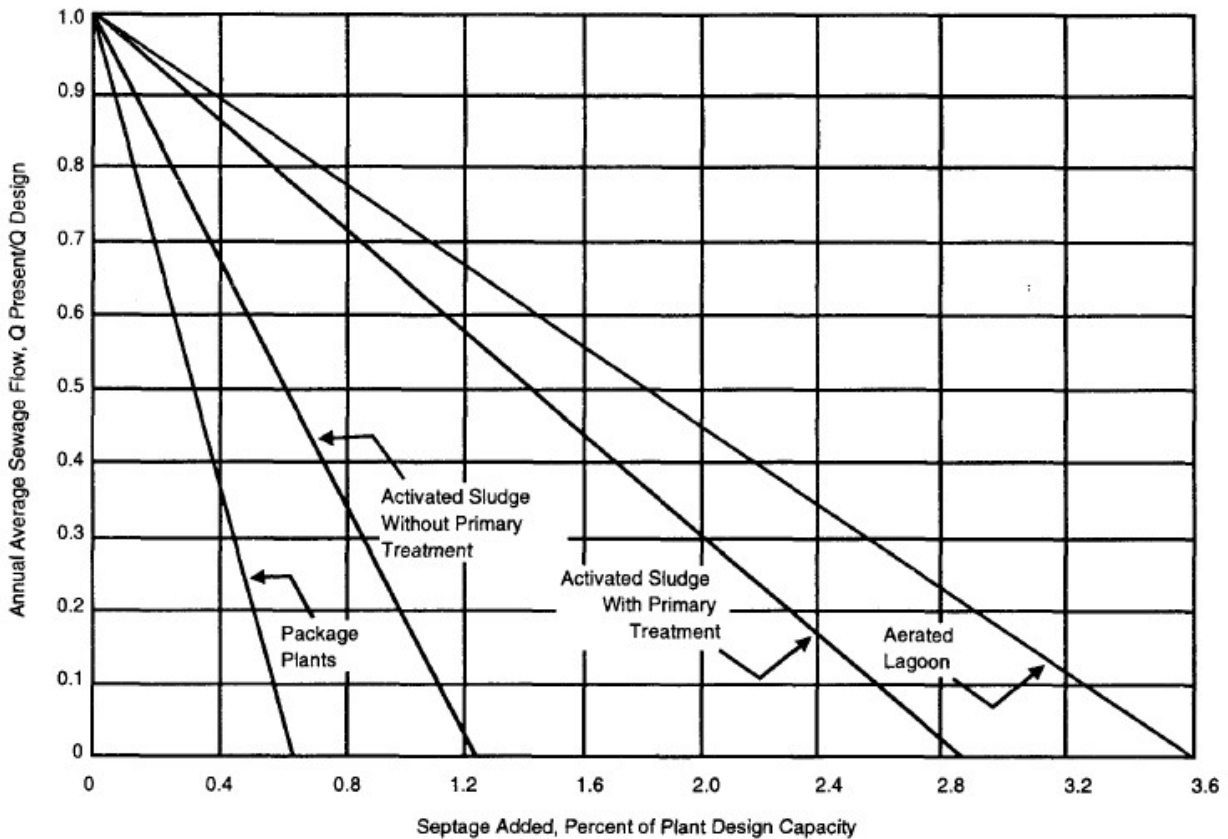
##### Impact of Septage addition in STP

- Increased volume of screenings and grit requiring disposal
- Increased order emissions from head works
- Scum accumulation in clarifiers
- Increased organic loadings to the biological process
- Potential order and foaming problem in aerated basins
- Increased loading to sludge handling process
- Increased sludge volume requiring final disposal
- Increased housekeeping requirements

Figure below provides a method to estimate the allowable rates of septage addition, assuming that a holding tank is provided and that septage is added to the sewage flow on a semi-continuous basis. This chart takes into account the current loadings to the plant compared with its design loadings. Package plants or other activated sludge processes that do not employ primary treatment are the least amenable to septage handling. Allowable septage volumes may be reduced due to septage characteristics, treatment plant operations, and sewage flow patterns. A factor of safety should be included in establishing allowable septage volumes.

If septage is added to the solids handling train, allowable loadings must be estimated based on site-specific information and will vary depending on both the existing solids handling processes used at the plant and their design capacity. First, information on current versus design hydraulic and solids loadings must be compiled for those processes that will be employed to cotreat septage-sludge mixtures. Such processes may include thickening, aerobic or anaerobic digestion, dewatering, chemical stabilization and composting. Then,

conservative estimates of the volumes of septage that could be processed without exceeding the design capacity of each unit process can be developed.



Allowable septage loadings to a sewage treatment plant having a septage holding tank (1).

## 1.2 Present proposal

The present study is to scientifically dispose the faecal sludge generated from household level in the city to the existing sewage treatment plant. Considering that GVMC is planning for construction of UGD network in future for the entire city, it is important that until such services are in operation, an alternative arrangement is in well in place. GVMC will undertake technical feasibility study of the all STPs in the city and will identify their ability to take septage load. In this context, a guiding document called Technical Feasibility Guideline will be prepared by GVMC, which shall consist of general guidelines as well as a Field and Desk survey form. Data of the existing STPs will be collected and the septage load will be calculated with use of the graph shown in above Figure. Based on the density of the septic tank in a particular area the nearest pumping station will be designated for disposal for septage coming from that area however if needed some septage may be allowed to dispose from the neighbouring area as well.

With these available information, a Detailed Project Report will be prepared, which will discuss the demand estimation, CAPEX, OPEX, recovery of O & M cost, VTO market size and implementation framework to carry out the up-gradation work at selected Sewage Treatment Plant (STP) for disposal of septage.

### 1.3 Operation and maintenance

There are several important factors to be considered while planning co-treatment of faecal sludge with the existing sewage treatment plant or by setting up a new Faecal Sludge Treatment Plant (FSTP) which has direct impact on O & M and monitoring. Since O & M aspects are important for overall long-term success of the programme, O & M planning, including the financial provision of funds should be included in the terms of references (ToR) for designing such facilities. Furthermore O & M should be reviewed and approved along with engineering designs and specifications by including operation and maintenance cost. The following points should be kept in mind for developing such a facility;

- Location of disposal sites and its proximity to the residential areas.
- Volume and schedule of FS collection.
- Degree of mechanization of technologies.
- Final end use or disposal of end product.
- Recovering the money by the way of user charges.
- Running it on PPP mechanism and charging the household with a septage tax or on number of trips made by vacuum trucks.

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