Faecal Sludge and Septage Management Operational Guideline of Uttar Pradesh

DRAFT

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Letter- Minister/Secretary, Department of Urban Development, Government of UP Optional

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1. Introduction to Faecal Sludge and Septage Management

1.1 Definition of Faecal Sludge and Septage

"Faecal Sludge" is raw or partially digested, in a slurry or semisolid form, the collection, storage or treatment of combinations of excreta and black water, with or without grey water. It is the solid or settled contents of pit latrines and septic tanks. It differs from sludge produced in municipal wastewater treatment plants. Faecal sludge characteristics can differ widely from household to household, from city to city, and from country to country. The physical, chemical and biological qualities of faecal sludge are influenced by the duration of storage, temperature, soil condition, and intrusion of groundwater or surface water in septic tanks or pits, performance of septic tanks, and tank emptying technology and pattern.

"Septage" is the liquid and solid material that is pumped from a septic tank, cesspool, or another treatment facility after it has accumulated over a period of time. Usually, septic tank retains 60% to 70% of the solids, oil, and grease that enter it. The scum accumulates on the top and the sludge settles to the bottom comprising 20 to 50% of the total septic tank volume when pumped. Offensive odour and appearance are the most prominent characteristics of Septage. It is a host of many disease-causing organisms because of the contamination of significant level of grease, grit, hair, and debris. There appears to be very thin line between Septage and Faecal Sludge. Septage is limited to septic tank contents whereas Faecal Sludge includes contents from other on-site technologies including septic tank.

1.2 Sources of faecal Sludge and Septage

Septic tanks are the primary source of septage generation. A septic tank for the treatment of household wastewater, is a horizontal continuous flow type sedimentation tank. This functions as a settling tank and digestion unit. The solids in the wastewater settle to the bottom of the tank where they undergo anaerobic degradation along with the organic matter in the wastewater. Oil and grease and other lighter material will rise and float on the surface of liquid. This is referred to as scum.

The tank is designed such that the sludge and scum together occupy about half to two-third of the tank's capacity (prior to desludging). A septic tank is generally followed by a soak-away pit to disperse the effluent into the ground. The sludge settled at the bottom and the scum at the top of the sewage is allowed to remain in the tank for several months during which they are decomposed by bacteria through anaerobic digestion.

1.3 Importance of Faecal Sludge and Septage Management

Faecal sludge / Septage management has been neglected in most the Indian cities. The sector has not received much attention because of poor understanding of septage, lack of proper technical guidance, inadequate resources and skills, shortage of manpower and lack of finance. In Uttar Pradesh, as per Census 2011, 83% of households have access to individual toilets of which around 34% households are connected to sewer system, 56% are connected to septic tanks and 10% are connected to other sanitation systems. Most of the cities are depended on onsite sanitation technologies such as single pit,

and twin-pit or septic tank based toilets. The toilets that are connected to septic tanks/ pits often discharge the effluent into road side open drains.

CPHEEO Manual and National Building Code of India (NBC, 2005) has published guidelines for septic tank design, construction, installation, their operations and maintenance. But in reality, the sizes and designs of septic tank vary from one place to another and are influenced largely by the local construction practices, material and skill of masons. Also as per CPHEEO norms and Septage management advisory by Govt. of India, septic tanks need to be cleaned periodically at an interval of 2-3 years. However, since the tanks are emptied very often in 8 to 10 years or whenever they are filled up completely and start oozing out the effluent, the sludge that is solidified at the bottom of the pit/septic tank is hard to remove with the small powered emptier that is typically used. As a result, the pits/tanks are not emptied properly.

As per the Prohibition of Employment as Manual Scavengers (and their rehabilitation) Act, 2013, manual cleaning/emptying of pit toilets and septic tanks is prohibited and all ULBs are required to adopt mechanical processes for cleaning of pits/septic tank. Most ULBs provides mechanised cleaning but it does not affect much because of the accumulation of sludge at the bottom. Thus, most on-site sanitation systems are emptied manually in absence of proper mechanical systems and that too, after long periods.

As the septic tanks are not emptied regularly, the septic tank effluent and septage, with appreciable levels of organics, nitrogen and pathogens are disposed off without proper treatment which can have impact on environment and health of living organisms coming in contact with this untreated septage and effluent.

If we compare sewer options versus a properly managed onsite septage management options, we can have same level of sanitized city with both these options, however septage management can be implemented with the existing financial and institutional capacity of ULB in short term and has a host of other benefits as compared to sewerage systems. The following chart depicts comparison of sewer verses onsite sanitation system across various aspects:

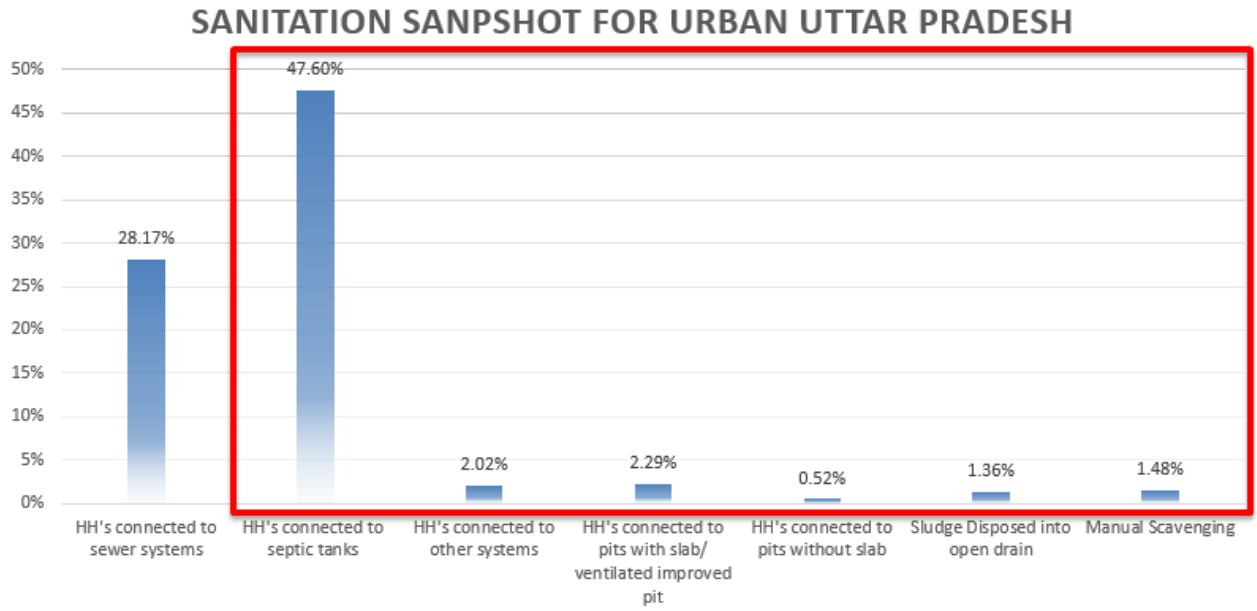
Recognizing the growing importance of safe faecal sludge / septage management practices, there is an emerging need for framing an operative guideline for Septage management for ULBs.

2. Current Scenario in Urban Uttar Pradesh

2.1. Status of Septage Management in UP

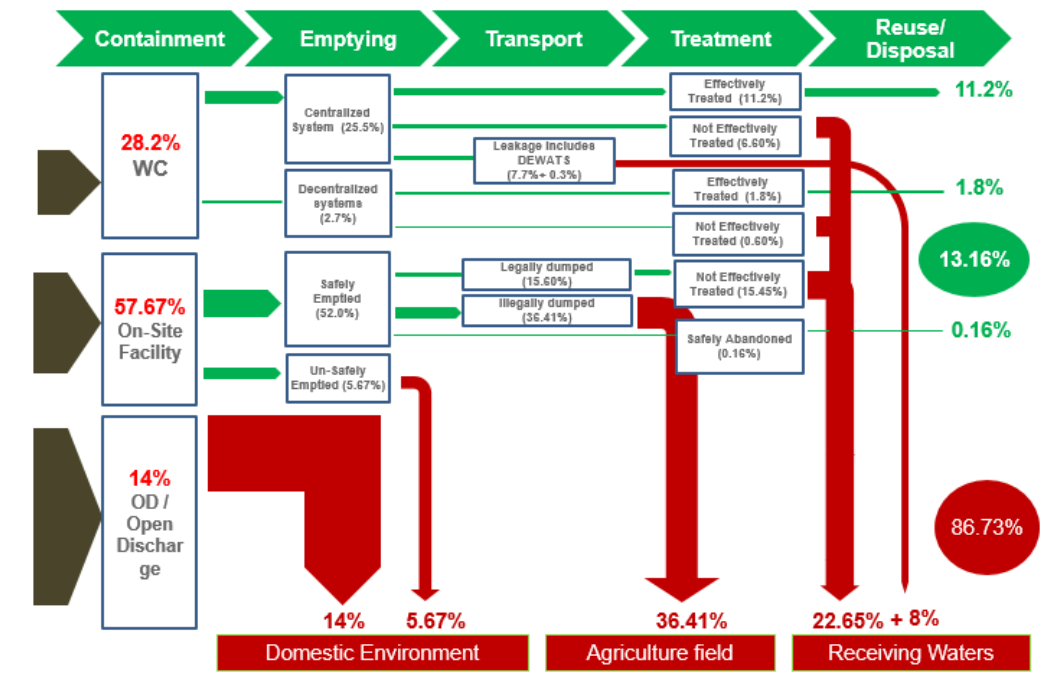
As per the Census 2011, a sanitation snapshot of urban Uttar Pradesh is Figure 1, clearly indicates that there is a need for faecal sludge management in the state. Households with septic tank based sanitation systems (47%) far exceed those with sewer connections (28%). All the households that are connected to septic tanks, and those connected to pit latrines (both sanitary and insanitary), and all the faecal sludge that finds its way to an open drain: need to be covered under faecal sludge management.

Figure 1: Intervention Segment for Faecal sludge management (Census 2011)



2.2. Shit Flow Diagram is a useful tool to understand how the city deals with safe disposal of human excreta. As per the Census (2011), Uttar Pradesh has 648 towns and cities. Out of the 6 million plus households that make up urban Uttar Pradesh, 28.2% of them are connected to the underground sewerage system. Faecal matter and black water are conveyed away from the household environment, either to be treated in an STP or disposed off in an open drain or water body. Around 57.67% households still depend on on-site sanitation systems, 14% households do not have access to any form of toilet facilities and thus resort to open defecation. Only about 13.16% of sewage gets transported and effectively treated. The remaining 86.73% either mixes with the water bodies or is disposed off in the agricultural land or domestic environment which poses a huge risk to public health and the environment at large. This situation is evident in the absence of an effective post toilet infrastructure.

Sewage Today (Urban Uttar Pradesh)



1. For the 14% Households that resort to open defecation, provision of a toilet infrastructure is of foremost importance. This is possible under the Swachh Bharat Mission that has a national mandate to provide every household with a toilet facility.
2. The 5.67% Households having on-site sanitation systems that are unsafely emptied, need to be provided with access to desludging services. Moreover the people who are unable to access such services can be targeted under awareness generation or IEC to disseminate the information widely.
3. The 36.41% Households whose faecal sludge is disposed in the open agricultural fields, the prime intervention would be to provide treatment facilities at optimal distances within the city boundary.
4. Existing centralized and decentralized systems need to be made leak proof to address the 8% faecal sludge and wastewater that escapes due to the same.
5. Existing treatment systems will not be able to cater to the faecal sludge from containment systems who's BOD and COD is very high. To target the 22.67% that finds its way to the water bodies, either new treatment systems should be installed or an optimum mix should be worked out to use the existing treatment plants for treatment.

The State Annual Action Plan (SAAP) for FY: 2016 -17 of Uttar Pradesh under the Atal Mission for Rejuvenation and Urban Transformation (AMRUT) reported a sewerage network ranging from 30% to 0.5% for the UP Nagar Palika Parishads. Efficiency in collection and treatment of sewerage has been reported in less than 60% for the corporation cities. Out of the 60 AMRUT cities, 35 have reported zero efficiency regarding collection and treatment of sewerage.

3. National Developments on FSSM

3.1 Circulars and Letters from Ministry of Urban Development

The National Urban Sanitation Policy (NUSP) of 2008 brought about a paradigm shift in India's approach from 'conventional centralized sewerage network' approach of urban sanitation to a more 'holistic framework'. With regard to FSM, NUSP has very clearly outlined:

i. Promoting proper disposal and treatment of sludge from on-site installations (septic tanks, pit latrines, etc.);
ii. ii. Ensuring that all human wastes are collected safely, confined, and disposed of after treatment so as not to cause any hazard to public health or the environment;
iii. iii. Promoting proper functioning of network based sewerage systems and ensuring connections of households to them;
iv. iv. Encourage recycle and reuse of treated waste water for non-potable applications, wherever possible. NUSP initiated a framework for cities to prepare City Sanitation Plans (CSPs) under the scheme of State Sanitation Strategy and introduced Urban Sanitation Awards based on the benchmarking of sanitation services in cities. However, the message of NUSP received slow response from the states in terms of framing of septage-management policies as NUSP guidelines remained very broad and failed to provide specific suggestions for FSM, leaving further policy development and role delegation to be done by the respective states. As of now, very few states such as Tamil Nadu and Gujarat (2014), Delhi (2015), and Odisha (2016) and Maharashtra (2016) have developed their septage management guidelines.

Ministry of Urban Development (MoUD), Government of India is the nodal ministry for policy framework at national level for urban sanitation. More recently, MoUD has issued few directions and guidelines for streamlining and focusing on issues of FSM under SBM and AMRUT programme being implemented by states .Few major ones are as below.

a. The MoUD has directed the states to rename the 'Water and Sanitation Board' as 'Water, Sanitation and Septage Boards'. This activity should be made operational at the earliest through dissemination of knowledge, strengthening local administrative and capacity building and thereby integrating septage treatment in an environmentally safe manner.
b. MoUD has issued DO letter number20/3/2016-SBM-2 dated 22nd August 2016 has directed all the Mission Director in states to use rapid assessment tool for FSM developed by MoUD with support from developmental agencies for submission of proposal and investment plan for FSM in state SAAP for submission to MoUD. This rapid assessment tool is available at http://smartnet.niua.org/content/f84d1813-3666-45e5-9392-cc6fdb90e04a

4. Technological Options for FSSM

4.1 Considerations for Adoption of FSM Treatment Technologies

There are many technology options to choose from across the sanitation value chain for implementation of FSM. Below mentioned are technologies available at the user interface, collection, transportation and treatment of faecal sludge from OSS to FSTP.

Faecal Sludge containment technology options included are according to Swachh Bharat Mission Guidelines. In any given context, the technology choice for conveyance system generally depends on the following factors:

- Type and quantity of products to be transported
- Distance to cover
- Accessibility
- Topography
- Soil and groundwater characteristics
- Financial resources
- Availability of a service provider
- Management considerations

Treatment options for faecal sludge are based on the treatment objectives:

i. Solid liquid separation
ii. Dewatering
iii. Stabilisation
iv. Reuse applications

Technologies for Faecal Sludge management based on the above objectives can be adopted as mentioned in Table 1 adopted from IWA publication *Faecal Sludge Management Systems Approach for Implementation and Operation, IWA Publications, 2014. Treatment mechanism and its corresponding end use product have been correlated using a common color code in the table below.*

Urban Local Bodies can choose from a range of treatment options available in the market, depending upon their needs and available finances.

Table 1: Technological interventions to address the sanitation gap across the sanitation value chain

Containment	Conveyance	Treatment			Reuse
		Solid/Liquid Separation	**Dewatering**	**Further Treatment**	
Twin pit system	Gulper system	Imhoff Tanks	Mechanical	Co-composting	Soil conditioner
Septic tank	Portable Pump	Settling /Thickening Tanks	Unplanted drying beds	Deep row entrenchment	Irrigation
Aerobic bio-digester	Vaccutug (Truck)		Thermal Drying	Sludge incineration/pyrolysis	Building Material
Anaerobic bio-digester	Vaccutug (Tractor)		Solar Drying	Anaerobic digestion	Biofuel
	Dung Beetle		Planted Drying beds	Black soldier flies/vermicomposting	Proteins
	Vacuum Tanker			Lime/Ammonia addition	
	Human Powered			Co-treatment with wastewater up to 3% FS of current STP load*[1]	
	Small Volume Transport (Capacity- 1,500 - 3,000 litres)				
	Large Volume Transport (Capacity- 3,000 - 10,000 litres)				

5. Operative Guidelines for Uttar Pradesh on FSSM

Step by step approach: Operationalisation of Septage Management Plan for Urban Local Bodies

5.1 Preparation of Plan for Septage Management

5.1.1 Existing situation assessment across sanitation service chain

- Steps for assessment of existing toilets and septic tanks and creation of database
- Steps for Scheduled septic tank empting services
- Steps for Planning of septage treatment facility

5.1.2 Awareness generation and capacity building activities

5.1.3 Record-keeping , reporting (MIS), monitoring and feedback systems

5.1.4 Explore private sector participation for septage management activities

5.2 Financial Resource Mobilization Plan

5.2.1 Sources of revenues for septage management

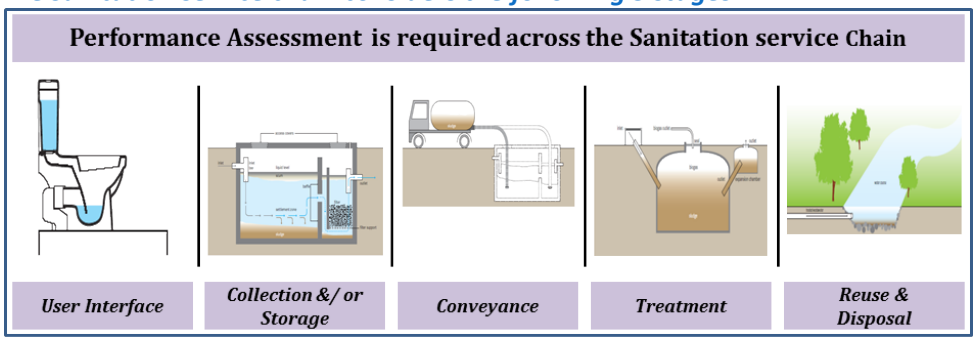
5.2.2 Mobilize financial resources to implement septage management plan

5.1 Preparation of Plan for Septage Management

5.1.1 Existing situation assessment across sanitation service chain

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

The sanitation service chain considers the following 5 stages:



Detailed assessment of services will need to be done across each link in the chain through appropriate field assessments:

a) Access & Collection:

- **Access** describes the type of toilet and captures if the HH uses individual, shared or community facility. The choice of User Interface will depend on the availability of water. At city level it also measures the availability of public toilets. For sullage disposal, it captures access to bathroom facilities and drainage outlets.
- **Collection** and Storage/Treatment describes the ways of collecting, storing, and sometimes treating the excreta, grey water generated at the User Interface. The toilet may be connected to sewerage system; onsite systems like septic tank with soak pits, pits or may be functioning as Ecosan / composting toilets. Similarly for grey water disposal, the HHs may be connected to sewerage system or drains of any kind (Open/covered).

Steps for assessment of existing toilets and septic tanks and creation of database

a. City level assessment of coverage of toilet and on-site sanitation facility using the existing database (like property tax module, Census 2011 etc.) or based on recent survey carried out under SBM.
b. If the ULB do not have database, then ULB shall create database of toilets and septic tanks. Ideally, all ULB shall link the key result related to toilet availability, type of toilet and its connection with waste water outlet with property tax database on e-governance platform.
c. ULB shall keep updated database related to toilet availability and on-site sanitation through property tax assessment survey carried out at every four years of interval
d. Evaluate existing septic tank designs and other storage/treatment systems and modify (in case of variation) based on design mentioned in ***Annexure 1***.

e. Notices should be issued to all property owners whose septic tanks do not meet the standard septic tank design.

f. Identify insanitary toilets[1] and convert them to sanitary latrines for safe collection and disposal of waste as per norms set out in ***Annexure 1.***

g. All existing septic tanks should have access covers for each chamber, so that they can be easily opened during emptying process. Where such covers are not available, it should be made compulsory for all property owners to provide proper covers.

h. The new septic tanks need to be designed and constructed as per the norms suggested in National Building Code, 2005 and CPHEEO Manual, 2013 which takes reference of design norms from IS: 2470 on 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). The design norms CPHEEO Manual, 2013 is compiled in ***Annexure 1.***

b) Conveyance

Conveyance describes the transport of products across the service chain. ULB should plan for scheduled septic tank emptying services for effective implementation of septage management plan. Prior to plan for the same, ULB shall first assess its role and capacity for implementation of septage management plan. ULB should assess various aspects of septic tank empting like how many septic tanks required to be emptied annually as per CPHEEO norm versus how many are emptied in a year, how many vaccum emptying trucks/ capacity of trucks are required if number of septic tank emptied as per CPHEEO norm versus how many trucks are available/working with capacities of emptier trucks, assessing the cost per emptying visit, method of maintaining the register for septic tank emptying services database etc.

If private player is involved in septic tank emptying business in the city, then, ULB shall also review the role of private septic tank emptier and assess their capacity in lines with the number of septic tank empting annually, charges/fees for empting services, location of disposal, registration/licensing with ULB or not etc.

Steps for Scheduled septic tank empting services

a. ULBs should initiate pre-determined scheduled septic tank empting services and develop a route plan for the same.

b. Mobilize or procure adequate number of suction emptier trucks to maintain a three year rotating cycle. Number and type of vehicles to be purchased based on the sizes of septic tanks or septage generation rate[2] for the city, distance from the location of septic tanks to the septage

[1] Insanitary toilet / latrines in households are those where night soil is removed by human, serviced by animals or/and night soil is disposed into open drain or pit into which the excreta is discharged or flushed out, before the excreta fully decomposes. As mentioned in Swachh Bharat mission guidelines, single pit toilets will also be considered as an insanitary toilet/latrine.

[2] Septage generation rates vary widely from place to place depending on practices of septic tank use, number of users, water used for flushing, and the frequency of cleaning the septage. Adopting the (U.S. EPA, 1984) estimate of septage generation of 230 litres/year and an average household size of four, the septage generation/ household would be 920 litres/year. So for a three year cycle the septage generation rate would be 2760 litres or 2.76 cum. Alternatively, assuming an average septic tank volume of 3 m3 and emptying of septage when one-third of the septic tank is filled with settled solids, the volume of septage emptied would be 1 m3.

treatment facility, cleaning frequency of septic tanks and available road width for the suction truck operations.

c. ULBs should either provide the emptying services themselves or enter into appropriate management contracts with private agencies. In case of private sector contract, ULBs should certify and license private septage transporters to de-sludge and transport waste to the designated treatment facility. The license/septage transporter permit is detailed out in ***Annexure 2.1***.

d. All septage transporters need to maintain a collection and transport receipt such as the one detailed out in ***Annexure 2.2***. This needs to be filled duly by the private / ULB service provider and submitted to ULB office.

Measures to be taken during Desludging of septic tanks

a. While desludging the following norms should be followed:
   - 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.
   - No fire or flame should be used near the septic tanks as there may be inflammable gases inside septic tanks
   - Proper safety gears should be used by the operator while desludging / emptying the septic tanks

b. Septage transportation vehicle operators (whether from ULB or private sector) should be well trained and equipped with protective safety gears, uniforms, tools and proper vacuum trucks, to ensure safe handling of sewage/septage. 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. The operating procedure for cleaning of septic tanks is detailed out in ***Annexure 2.3.***

c) Treatment and disposal

Treatment: ULB must not dispose the septage collected from septic tank without any treatment and ULB must comply with CPCB and UPPCB norms before disposal of septage. ULB should assess the load of septage and assess the requirement of capacity for treatment plant. ULB should first try and assess the possibility of setting up septage treatment facility at the solid waste treatment/disposal site and at the STPs within the city or in nearby city.

Reuse/disposal refers to the methods in which products are ultimately returned to the environment, as either 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.

Steps for Planning of septage treatment facility

a. Septage collected from the septic tanks or pits should not be disposed without any treatment.

b. ULB should first assess the possibility of septage treatment at existing STP in the city or STP of nearby city through appropriate agreements with STP operators and receiving ULBs. A list of cities that have STPs in Uttar Pradesh is given in ***Annexure 3.***

c. If STP is not available in the city or nearby that can receive the sludge, then ULB should plan for new septage treatment facility. Such a new septage treatment facility should be designed to cater to expected volumes of septage generated in urban local body and if faecal waste is expected from nearby urban local bodies.
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 during working hours only and a responsible person should be appointed in the facility to ensure that no commercial or industrial waste is unloaded in these facilities.
f. Septage should be reused / safely disposed only after it meets the parameters mentioned in **Annexure 4**. Various possible reuse options are outlined in ***Annexure 4.***

Measures to be taken while planning for Septage treatment facility

Identification of septage treatment site[3]is crucial for effective implementation of septage management plan. Following parameters to be taken into consideration before finalization of treatment sites:

Distance of treatment site: Distance from emptying to delivering and accessibility of the treatment site are major issues. The transport of relatively small faecal sludge volumes (5-10m^3 per truck) on congested roads over long distances in large urban areas is financially unfeasible. A site that is too far away implies fewer trips per day, less revenue and more fuel costs to private operators.

Reliability of electricity: It is also important to assess the availability and reliability of electricity if treatment technology has mechanical operated parts; as in case of fluctuations it will increase treatment time and will affect optimal utilization of treatment capacity.

Neighborhood: A treatment site may generate nuisance, especially bad odors. For this reason it should be located at an appropriate distance from the residential areas.

Land availability: Projects are often delayed because of non-availability or high price of land. ULB should identify the land bank for treatment facility. ULB should also explore the possibility of developing septage treatment facility at solid waste dumping or treatment site.

Geological Parameters: Assessment of existing geological conditions on site like groundwater table, type of soil, prone to flooding is always recommended as it may directly affect selection of technology option.

[3] Referred to: Faecal Sludge Management: Systems Approach for Implementation and Operation, Linda Strande, Mariska Ronteltap, Damir Brdjanovic, IWA 2014

Indicative Decision making framework for Evaluation of Septage treatment site						
Sr. No.	Particulars	Unit	Treatment location 1	Treatment location 2	Treatment location 3	Treatment location 4
Identification of treatment sites						
1	Distance of existing septage disposal site	km				
2	Distance of SWM treatment or disposal facility	Km				
3	Type of SWM treatment facility					
4	Average distance and duration of emptying trip	Km & mins.				
5	Electricity availability					
6	Neighborhood (Residential/ institutional/commercial/ irrigation/farming areas)					
Land availability						
7	Government or private land					
8	Available/ Non-available for developing site					
Geological parameters						
9	Water table	**mt**				
10	Type of soil					
11	Prone to flooding	**Yes/No**				

5.1.2 Awareness generation and capacity building activities

Awareness generation activities need to be taken up for successful implementation of faecal sludge management plan and community acceptance and adherence to regulations and service plan set up by the ULBs. Associated training and capacity building of municipal staff as well as private sector contractors also needs to be taken up.

a. **Awareness generation for residents**: Members of Resident Welfare Associations, community organizers, self-help groups and the general public should be made sensitized periodically regarding the need for a sound faecal sludge management system including a 3-year cycle. 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. Sample material for awareness generation is in ***Annexure 5.*** Awareness generation activities should be carried out at the beginning of introducing a scheduled service in all wards and then repeated periodically over the three year cycle.

b. **Capacity building for municipal staff**: Municipal Commissioners/ Chief Officers, Engineers, Sanitary Inspectors, Health Officers, 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. Information regarding standard septic tank design, the need for periodic inspection and desludging of septage, design of a treatment facility, tender details for engaging licensed transporters, etc. should be disseminated widely to achieve a safe faecal sludge management system. Training should also be provided on safety standards.

c. **Capacity building for septage transporters / private vendors**: Local Bodies should ensure all safety norms are clearly explained to the septage transporters. Private Operators and Transporters should be well trained in safe collection and transportation of sewage including vehicle design, process of desludging, safety gears and safe disposal at the nearest treatment facility.

5.1.3 Record-keeping, Reporting (MIS), Monitoring and Feedback Systems

a. **Recordkeeping and manifest forms** should be an integral part of a comprehensive septage management program. Recordkeeping requirements should be codified into the law governing the program. A sample manifest form is detailed out in ***Annexure 2.2***

b. 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. Payment to the suction truck operator should only be made if there are signatures of all the stakeholders.

c. A **database system** such as the one discussed in access and collection will need to be developed and maintained.

d. Where possible, **GIS** should be used to be plan the route of suction emptier trucks and tracking these for regular record keeping.

e. **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.

5.1.4 Explore private sector participation for septage management activities

For effective operationalize of scheduled septic tank emptying service and treatment facilities, ULB may also explore the option for private sector participation. Following points to be taken into consideration by ULB:

a. 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.
b. Develop performance based contracts such that payment is linked to the performance of private sector for providing the services.

5.2 Financial resource mobilization

5.2.1 Sources of revenues for septage management

a. As per the Uttar Pradesh Municipal Corporation Act, 1959, Chapter IX : Corporation taxation, Section 173(d), **Conservancy tax** can be levied on all the properties by the Corporation where city undertakes the collection, removal and disposal of excrementitiously and polluted matter from privies, urinals and cesspools.
b. If ULB explore the possibility of Private sector involvement in septage management, then an **escrow account** can be set up where revenues from the sanitation tax/ charge are transferred. The contractual amount for FSM services to the private party can be paid from this escrow account to avoid delays.
c. **Periodic revisions for the taxes/ charges** to be effected based on revisions in costs involved
d. To the extent possible, revenues should be generated from **sale of treated septage** for agriculture or other purposes.

5.2.2 Mobilize financial resources to implement septage management

a. ULB may utilize the funds from **14th Finance Commission** to implement the various components related to septage management plan. Creation of database for toilets and septic tanks, procurement of suction emptier trucks and construction of septage treatment facilities are the permissible components to utilize the 14th FC funds. The funds would also be provided as preparatory activity like preparing detailed project report and prefeasibility report for septage management.
b. **IEC & Capacity building funds:** IEC funds under SBM shall be utilized for various awareness generation activities undertaken for implementing septage management plan includes capacity building activities for ULB staff, septage transporters, treatment plant operators and residents of city.
c. Convergence with existing schemes/activity: ULB can ask for funds under the existing state and national schemes.

6. Financing Considerations for FSSM

6.1. Options for financing

Faecal Sludge and Septage Management treatment options when compared with either centralized or decentralized sanitation infrastructure are more cost effective. Most of the initial source of funding across the sanitation value chain will have to be provided by the joint effort of the central and state government primarily through the allied programme funding like Swachh Bharat Mission, Smart City or AMRUT.

Following are the options for sources of revenue for the private service provider:

1. Desludging fee paid by user to the desludging service provider
2. Fine for faulty containment system construction and illegal disposal of faecal sludge.
3. Sale of end products (For Eg. Dried faecal sludge, water)
4. Property tax designated for FSM

6.2. State Level Funding Options

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Mobilize financial resources to implement septage management

a. ULB may utilize the funds from **14th Finance Commission** to implement the various components related to septage management plan. Creation of database for toilets and septic tanks, procurement of suction emptier trucks and construction of septage treatment facilities are the permissible components to utilize the 14th FC funds. The funds would also be provided as preparatory activity like preparing detailed project report and prefeasibility report for septage management.
b. **IEC & Capacity building funds:** IEC funds under SBM shall be utilized for various awareness generation activities undertaken for implementing septage management plan includes

capacity building activities for ULB staff, septage transporters, treatment plant operators and residents of city.

c. Convergence with existing schemes/activity: ULB can ask for funds under the existing state and national schemes.

Out of the 648 towns and cities is Urban Uttar Pradesh, only 60 have been selected under the AMRUT scheme. The overall planning and implementation process remains the same. The critical part is the CAPEX and OPEX requirement.

An investment plan suited to the local capacities will be needed by the municipality for asset creation. In order to lower the financial burden on public investments, innovative private sector funding ideas will have to be evolved and a revenue model to determine the user charges will have to be worked out for collection and conveyance.

6.3. Other Funding models

In the absence of any special scheme based funding the towns and cities can resort to either of the financial models.

	Public sector	Outsourcing	Hybrid annuity Model	Private sector
CAPEX	State Government / ULB / grant from funding agency (100%)		Government 20-50% Private sector 50-80%	Private sector
O&M	ULB operates and maintains the facility	Operation carried out by private sector with service level agreements		Complete private sector with monitoring mechanism
Capital Recovery	Tax from polluters/ cross subsidization/ Expenditure Budget		Tax from polluters, Revenue from services	Revenue from services
Role of ULB	Ownership of assets and operations	Contract management and monitoring	Monitoring for service level agreements	Regulatory

ULB will be responsible for monitoring and evaluation of its performance related to FSM across sanitation value chain. ULBs in turn need to develop database related to on-site sanitation system, robust reporting format to track compliance of households (establishments, etc.) with outcomes and process standards.

San-Benchmark framework for revised service level benchmark for sanitation that assess performance of citywide sanitation, which also captures on-site sanitation systems and sewage management. It is envisaged that all ULBs will adopt San-Benchmark framework as revised Service Level Benchmark to capture on-site sanitation related performance.

Annexures

Annexure 1. Conventional septic tank design as per CPHEEO, 2013[4]

Recommended size of septic tank up to 300 users (Source CPHEEO, 1993)

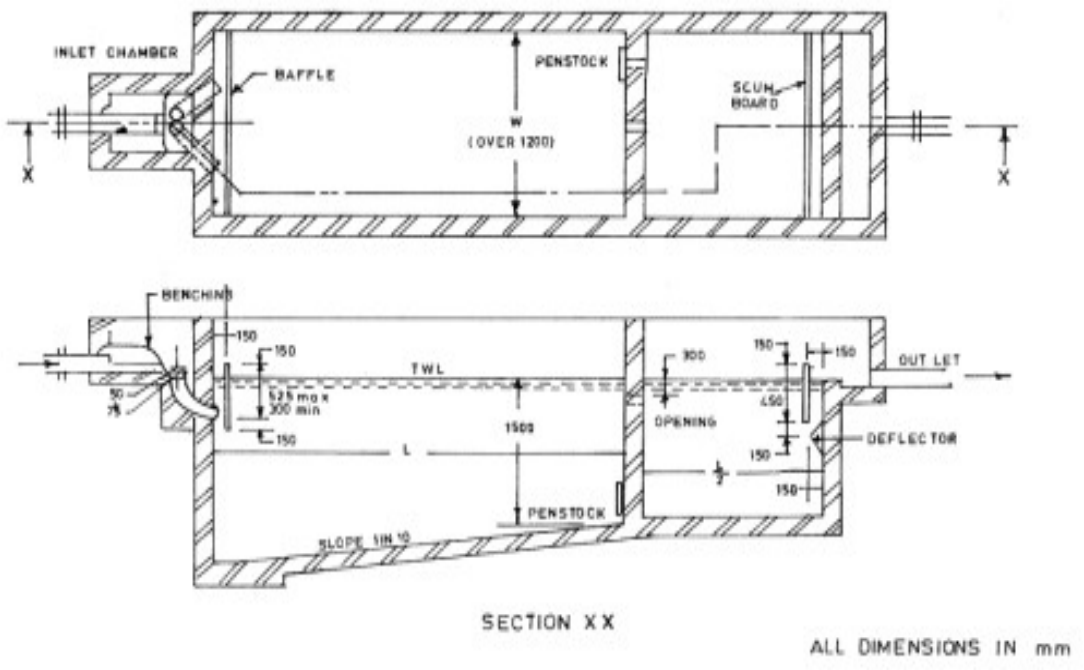
No. of Users	Length(M)	Breadth(M)	Liquid Depth (Cleaning interval of)	
			2 Years	3 Years
Recommended size of septic tank up to 20 users				
5	1.50	0.75	1.00	1.05
10	2.00	0.90	1.00	1.40
15	2.00	0.90	1.30	2.00
20	2.30	1.10	1.30	1.80
Recommended size of septic tank for housing colony up to 300 users				
50	5.00	2.00	1.00	1.2
100	7.50	2.65	1.00	1.2
150	10.00	3.00	1.00	1.2
No. of Users	**Length(M)**	**Breadth(M)**	**Liquid Depth (Cleaning interval of)**	
			2 Years	**3 Years**
200	12.00	3.30	1.00	1.24
300	15.00	4.00	1.00	1.24

Note 1: The capacities are recommended on the assumption that discharge from only WC will be treated in the septic tank
Note 2: A provision of 300 mm should be made for free broad.
Note 3: For population over 100, the tank may be divided into independent parallel chambers of maintenance and cleaning.
Note 4: The sizes of septic tank are based on certain assumption on peak discharges, as estimated in IS: 2470 (part 1) and while choosing the size of septic tank exact calculations shall be made

[4] Source: Central Public Health and Environmental Engineering Organization (CPHEEO) and Japan International Cooperation Agency. (2013). Manual on Sewerage and Sewage Treatment Systems, Part A – Engineering, Chapter 9 – Onsite Sanitation, Page no: 9-15 to 9-21.

Figure 2: Typical sketch of 2 compartment septic tank for population over 50

(Source: CPHEEO, 1993)



Annexure 2. Scheduled septic tank emptying services

2.1. Septage transporter permit (License)[5]

Septage Transporter Permit for_____Municipality

In accordance with all the terms and conditions of the current_____Municipality's Rates, Rules and Regulations, the special permit conditions accompanying this permit, and all applicable rules, laws or regulations of Government of Maharashtra, permission is hereby granted to:

NAME OF PERMITTEE: _____

ADDRESS:_____

For the disposal of septage from domestic septic tank or commercial holding tank at the_____ treatment facility.

This Permit is based on information provided in the Septage Transporter Permit application which constitutes the Septage Management Hauled Permit.

This Permit is effective for the period set forth below, may be suspended or revoked for Permit Condition Non Compliance and is not transferable. The original permit shall be kept on file in the Permittee's office. A copy of this Permit shall be carried in every registered vehicle used by the permittee.

EFFECTIVE DATE:

EXPIRATION DATE:

____ CHECK IF RENEWED PERMIT

Permit is liable to be cancelled in case of violations of any Acts, Rules and Regulations relating to the operation of Septage System or in cases of safety protocols not being adhered to or in case of non-permitted disposal.

[5] Source: Guidelines for septage management in Maharashtra. (2016)

2.2. Collection and transport records form / manifest forms[6]

Sample Form to be filled by Operator / Transporter of Septage

i. Identification of Waste:

a) Volume _____
b) b) Type:_____Septic Tank_____Others
c) c) Source:_____Residential_____Commercial_____Restaurant_____Portable Toilet_____Others

ii. Details of Waste Generator

a) Name:
b) Phone Number:
c) Address:
d) Pin:
e) Property tax no.:
f) Any kind of deficiencies, missing pipes or fittings, improper manholes or access covers, any other cracks or damage observed: _____

The undersigned being duly authorized does hereby certify to the accuracy of the source and type of wastewater collected and transported.

Date:_____Signature: _____

iii. Details of Transporter / Operator

a) Company Name:
b) Permit:
c) Vehicle License:
d) Pump out date:

The above described wastewater was picked up and hauled by me to the disposal facility name below and was discharged. I certify that the foregoing is true and correct:

e) Signature of authorized agent and title: _____

iv. Acceptance by_____Municipality's authorized STP

The above transporter delivered the described wastewater to this disposal facility and it was

accepted. Disposal date:_____Amount Collected from Transporter (if any):_____

Signature of authorized signatory and title: _____

[6] Source: Guidelines for septage management in Maharashtra. (2016)

2.3. Operating procedure for cleaning of septic tanks[7]

2.3.1. Daily Preparation for the ULB / private emptying and transport service

- Receive work orders for the day
- Check the functioning of vacuum emptier and equipment
- Check personal protective equipment – All employees should be responsible for maintaining their own personal protective equipment (such as gloves, boots, hat, face mask, Davy's lamp) in good condition
- Check disinfecting and spill control equipment – Operators should be trained on identifying spills and proper methods of disinfecting. Sprinkle lime over spilled area, wait 15 minutes, then wash with water
- Check Hoses – inspect hoses for cracks and wear– discard or repair worn and broken hoses. Connecting the Hose in the correct manner using the clamp style fitting ensures a tight and leak proof connection. Use of twine and plastic for making connections causes leaks and require cleanup.

Figure 3: Connecting Hoses

2.3.2. Operating the vacuum emptier

Operators should become familiar with the proper operation of the equipment in use for each operation. This includes the physical operation of the truck, and all valves, piping, power take-offs and ancillary equipment for the vacuum emptier (including the tank, valves, hoses, and fittings). The following steps can be followed for operating the vacuum emptier:

- Reach the first site and meet the building owner.
- Before pumping, check the tank to look for obvious damage to the structure and to verify proper piping is in place.
- Check the water level to get clues as to tank condition: high levels (above outlet level) indicate a clogged outlet; low levels (below outlet level) indicate a leaking tank (or tank not in use).
- Check for back flow into tank during pumping and when pumping is complete. Flow back may indicate a problem with plumbing in the house or clogged disposal.
- Open the access covers, inspect the interior and exterior of the tank. If more than one, locate and remove lids from all compartments.
- Each compartment will require pumping after ventilating. Probe the tank with the last length of hose. This will provide an indication on the volume of sludge to pump.
- Start the pump or vacuum equipment. The operator will make sure there is suction and that the pump is operating.
- Volume in the tank should start decreasing rapidly. Use hose to break up sludge and scum to the extent possible.

After pumping is complete, check the tank for remaining sludge. If there are accumulated solids remaining, initiate the pump-back procedure, which is to send the pumped faecal sludge under pressure back into the tank and direct this flow toward the sludge mass. This will break up the mass, making it possible to pump out. When pump-back is complete, pump out the tank again (suction). When pumping is complete, wash the hoses and replace the tank lids. Leave back small amount of sludge of around 1 to 2 inches in the tank so that it microorganisms can act upon the new incoming faecal waste. Clean up any spills and disinfect with lime or bleach solution. Chemicals such as lime can also be added into the suction trucks to neutralize the septage, to render the septage more treatable and to reduce odours.

[7] Source: Guidelines for septage management in Maharashtra. (2016)

Annexure 3. List of STPs in Uttar Pradesh

As per CPCB report[8], Uttar Pradesh has 73 numbers of sewage treatment plants having treatment capacity of 2646.84 MLD. 07 STPs of capacity 89.59 MLD are Non-Operational, 03 STPs of capacity 170 MLD are Under Construction and 01 STP of capacity 15 MLD is proposed. Details of STPs of Uttar Pradesh are shown below:

Sl. No	City/town	STP Location	STP Commissioned in Year	Status	STP Installed Capacity MLD	Technology
1	Agra	Boodhi Ka Nagla	Information not provided	Operational	2.25	WSP
2		Pilakhar		Operational	10	WSP
3		Dhandhupura		Operational	78	UASB
4		Jaganpur, Sikandarpur		Operational	14	UASB
5		Bhim Nagri, Devri Road.		Operational	12	UASB
6		Sadarwan (Bichupri)	2013	Operational	40	UASB
7		Sadarwan (Bichupri)	2014	Operational	36	UASB
8		Dhandhupura New	2014	Operational	24	UASB
9		Kalindi Vihar	2014	Operational	4.5	UASB
10	Etawah	STP at near Tiksi Mandir, Etawah (In Yamuna Action Plan)	2000	Operational	10.445	OP
11		STP at Mauza Umrain, Etawah (In State Sector and UIDSSMT)	2014	Trail run complete but presently Non-	13.5	OP
12	Mainpuri	STP at Moja Ordya, Padaria, Mainpuri (In State Sector and UIDSSMT)	2013	Not Operational on full capacity	23	UASB
13	Mathura	Kalidah, Vrindavan	Information not provided		0.5	Abanded
14		Vrindavan Near Pagal Baba Mandir		Non-Operational	4	OP
15		Masani	2006	Non-	13.59	OP
16		Trans Yamuna, Jamunapar	2006	Operational	14.5	OP

[8] Source : Inventorization of sewage treatment plants , Central pollution control board, 2015

Sl. No	City/town	STP Location	STP Commissioned in Year	Status	STP Installed Capacity MLD	Technology
17	Varanasi	Dinapur	Information not provided	Operational	80	Trickling Filter
18		Bhagwanpur		Operational	9.8	ASP
19		DLW,maduadih		Operational	12	ASP
20	Noida	Sector-50	Information not provided	Operational	34	UASB
21		Sector-54		Operational	27	UASB
22		Sector-54		Operational	9	OP
23		Sector-50		Operational	25	SBR
24		Sector-123		Operational	35	SBR
25		Sector-91		Operational	5	OP
26		Sector-54		Operational	33	SBR
27		Sector-168		Operational	50	SBR
28		Kansa, Greater Noida	2013	Operational	137	SBR
29	Saharanpur	Malhipur	2008	Operational	38	UASB
30	Muzaffarnag	Muzaffarnagar	2008	Operational	32.5	OP
31	Allahabad	STP Naini, Allahabad		Operational	80	ASP
32		Salori		Operational	29	FAB
33		Rajapur, Allahabad	2013	Operational	60	UASB &Aerated
34		Pongahat, Allahabad	2013	Operational	10	BTR (BioTower
35		Numayadahi, Allahabad	2013	Operational	50	BTR (BioTower
36		Kodra, Allahabad	2013	Operational	25	BTR (BioTower
37	Mirzapur	Pakka Pokhara, Ramai Patti	Information not provided	Operational	14	UASB
38		WSB STP, Vindhyanchal		Operational	4	WSP(Waste Stabilization
39	Farrukhabad	Farrukhabad	1992	Operational	2.7	OP
40	Kanpur	STP Jajmau	1989	Operational	5	UASB
41		STP Jajmau	1999	Operational	130	ASP
42		Bingava Kanpur(JNNUR M)	Proposed	Operational Sept, 2014	210	UASB

Sl. No	City/town	STP Location	STP Commissioned in Year	Status	STP Installed Capacity MLD	Technology
43		Jajmau (JNNURM)	Proposed	Operational Sept, 2014	43	ASP
44		Sajari Kanpur	Proposed	Operational Dec., 2014	42	ASP
45		Baniyapur Kanpur	Proposed	Proposed	15	UASB
46	Ghaziabad	Indirapuram Trans Hindon	2001	Operational	56	UASB
47		Dudahera, Vijay Nagar, Sis Hindon	2001	Operational	70	UASB
48		Indirapuram Trans Hindon	2012	Operational	56	SBR
49		Dudahera, Vijay Nagar, Sis Hindon	2012	Operational	56	SBR
50		Indirapuram Trans Hindon	2012	Operational	74	SBR
51		Govindpuram Sis Hindon	2013	Operational	56	SBR
52		Sadullabad, Loni	2012	Operational	30	SBR
53		Madhuban Babudham Yojna GZB. Sis Hindon	Yet to commission	Construction completed (Development of Housing Project is under Construction)	56	SBR
54		Morti Ghaziabad Sis Hindon	Information not provided	Under Construction	56	SBR
55		Doulatganj	2002	Operational	56	FAB
56		Bharwara	2011	Operational	345	UASBR
57		STP Near Hathiya Nala Sultanpur	2008	Operational	5	OP
58	Bulandsahar	Ahara Road, Zone-A, Anupshar	2009	Operational	0.805	OP
59		Ahara Road, Zone-B, Anupshar	2009	Operational	1.75	OP
60	Meerut	MDA STP Ganganagar	2012	Operational	10	ASP

Sl. No	City/town	STP Location	STP Commissioned in Year	Status	STP Installed Capacity MLD	Technology
61		MDA STP, Shradhapuri, Phase-	2012	Operational	6	ASP
62		MDA STP Rakshapuram,	2012	Operational	6	ASP
63		MDA STP Sports Complex, Delhi	2013	Operational	7	ASP
64		MDA STP Sports Vedvyaspuri,	2013	Operational	15	ASP
65		MDA STP Pallavpurm-I	2012	Operational	7	ASP
66		MDA STP, Shradhapuri-I,	2012	Operational	6	ASP
67		MDA STP Shatabdinagar	2011	Operational	15	ASP
68		MDA STP Lohia Nagar, Hapur Road,	2011	Operational	10	ASP
69		MDA STP Pandavnagar, Meerut	2007	Operational	1	ASP
70		MDA STP Pallavpurm-II,	2009	Operational	5	ASP
71	Moradabad	Rampur Road Near Hanuman Murti Tiraha, Gulabbari	Information not provided	Under Contstruction	58	SBR
72		Mordabad Delhi Road,Vikas Pradhikaran, MDA	2012	Non Operational (non availability of	20	ASP
73	Rampur	Kemri Road	2014	Non Operational (connectivity problem due to non availability of sewage)	15	UASB

Annexure 4. Safe reuse/disposal of treated septage[9]

Table 1: Compost Quality as per MSW Rules, 2000

Parameter	Concentration not to exceed (mg/kg dry basis, except for pH and carbon to nitrogen ratio)
Arsenic	10
Cadmium	5
Chromium	50
Copper	300
Lead	100
Mercury	0.15
Nickel	50
Zinc	1000
C/N ratio	20 – 40
pH	5.5 – 8.5

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

MSW Rules (2000) recommended the quality for compost as referred to Table below.

In the absence of any standards, it is recommended that these be adopted until such time standards are notified by the Central Pollution Control Board.

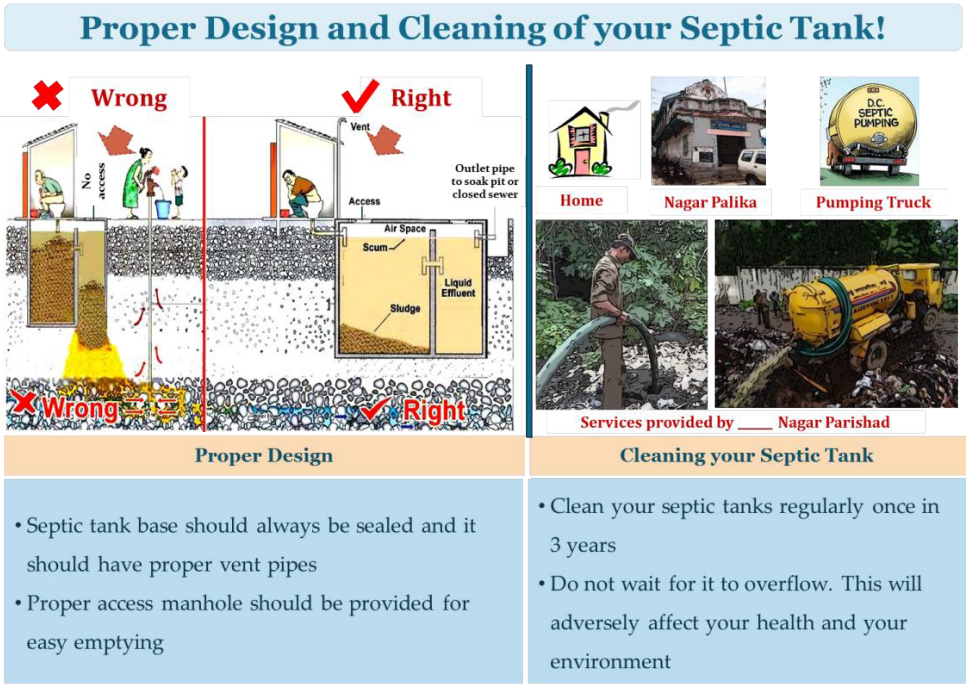
Properly treated sludge can be reused to reclaim parched land by application as soil conditioner, and/or as a fertilizer. Deteriorated land areas, which cannot support the plant vegetation due to lack of nutrients, soil organic matter, low pH and low water holding capacity, can be reclaimed and improved by the application of treated septage. Septage sludge, as a result of 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 a number of plants.

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.

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.

[9] Source: Advisory note: Septage Management in Urban India, Ministry of Urban Development, Government of India. (2013) and Guidelines for septage management in Maharashtra. (2016)

Annexure 5. Sample IEC materials



Source: Guidelines for septage management in Maharashtra. (2016)

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