# KARNATAKA STATE RURAL SANITATION STRATEGY

ANNEXURE-2

KARNATAKA RURAL DRINKING WATER & SANITATION DEPARTMENT

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| | |
|---|---|
| ABR | Anaerobic Baffle Reactor |
| AF | Anaerobic Filter |
| AIP | Annual Implementation Plan |
| APL | Above Poverty Line |
| ASHA | Accredited Social Health Activist |
| ASP | Aerated Static Pile |
| ASP | Activated Sludge Process |
| BCC | Behaviour Change Communication |
| BPL | Below Poverty Line |
| CapEx | Capital Expenditure |
| CBO | Community Based Organisation |
| CEO | Chief Executive Officer |
| CF | Carbon Filter |
| CPHEEO | Central Public Health and Environmental Engineering Organisation |
| CSO | Chief Security officer |
| CSR | Corporate Social Responsibility |
| CW | Constructed Wetland |
| DC | Deputy Commissioner |
| DEWATS | Decentralised Wastewater Treatment System |
| DPR | Detailed Project Report |
| DWSM | District Water and Sanitation Mission |
| EO | Executive Officer |
| EPR | Extended Producer Responsibility |
| FS | Faecal Sludge |
| FSM | Faecal Sludge Management |
| FSSM | Faecal Sludge and Septage Management |
| FSTP | Faecal Sludge Treatment Plant |
| GFP | Government Furnished Property |
| GP | Gram Panchayat |
| GPS | Global Positioning System |
| HDPE | High Density Polyethylene |
| HH | Household |
| HRD | Human Resource Development |
| IEC | Information Education and Communication |
| IHHL | Individual Household Latrines |
| IMIS | Integrated Management Information System |
| KLD | Kilolitre per Day |
| KRC | Key Resource Centre |
| KSNDMC | Karnataka State Natural Disaster Monitoring Centre |
| KSPCB | Karnataka State Pollution Control Board |
| MBBR | Moving Bed Biofilm Reactor |
| mbgl | Metre below ground level |
| MBR | Membrane Bio Reactor |
| MDWS | Ministry of Drinking Water and Sanitation |
| MGNREGS | Mahatma Gandhi National Rural Employment Guarantee Scheme |
| MGNREGA | Mahatma Gandhi National Rural Employment Guarantee Act |

| | |
|---|---|
| MHM | Menstrual Hygiene Management |
| MIS | Management Information System |
| MLALAD | Member of Legislative Assembly Local Area Development |
| MPLAD | Member of Parliament Local Area Development |
| NABARD | National Bank for Agriculture and Rural Development |
| NGO | Non-Governmental Organisation |
| NRLM | National Rural Livelihood Mission |
| NSS | National Service Scheme |
| O&M | Operation and Management |
| ODF | Open Defecation Free |
| OpEx | Operating Expenditures |
| PDB | Planted Drying Bed |
| PDO | Panchayat Development Officer |
| PMAY | Prime Minister Awas Yojana |
| PPE | Personal Protective Equipment |
| PRA | Participatory Rural Appraisals |
| PRI | Panchayati Raj Institutions |
| PVC | Poly Vinyl Chloride |
| PWM | Plastic Waste Management |
| RALU | Rapid Action Learning Units |
| RDF | Refuse-derived Fuel |
| RDPR | Rural Development and Panchayat Raj |
| RDW&SD | Rural Drinking Water & Sanitation Department |
| RLWM | Rural Liquid Waste Management |
| SBM | Swachh Bharat Mission |
| SBM(G) | Swachh Bharat Mission Gramin |
| SC | Scheduled Caste |
| SF | Sand Filter |
| SHG | Self-Help Group |
| SLSSC | State Level Scheme Sanctioning Committee |
| SLWM | Solid and Liquid Waste Management |
| SO | Support Organisation |
| SPMRM | Shyama Prasad Mukherji Rurban Mission |
| ST | Scheduled Tribe |
| STP | Sewage Treatment Plant |
| SWM | Solid Waste Management |
| TP | Town Panchayat |
| UDB | Unplanted Drying Bed |
| UGD | Underground Drainage |
| ULB | Urban Local Bodies |
| VHSNC | Village Health Sanitation and Nutrition Committee |
| VWSC | Village Water and Sanitation Committee |
| WASH | Water, Sanitation and Hygiene |
| WSP | Waste Stabilization Ponds |
| ZP | Zilla Panchayat |

***"An ideal Indian village will be so constructed as to lend itself to perfect sanitation… The very first problem the village worker will solve is its sanitation"***

**Mahatma Gandhi**

## I. INTRODUCTION

1.1 Proper and adequate sanitation facilities are a fundamental part of ensuring safe and healthy environment in rural areas. Safe sanitation facilities and practices at every level – individual and community, are essential in minimising negative impacts on health, environment and economy. In this context, Swachh Bharat Mission (Gramin) was launched on October 02, 2014 by the Ministry of Drinking Water and Sanitation, to bring about an improvement in the general quality of life in the rural areas by promoting cleanliness, hygiene, community managed solid and liquid waste management systems, eliminating open defecation (ODF), and motivating Panchayati Raj Institutions (PRI) to adopt sustainable sanitation practices with a special focus on marginalised communities.

1.2 The Swachh Bharat Mission (Gramin) reinvigorated the state machinery to focus on sanitation in rural areas and the state of Karnataka was declared ODF in 2018. This goal of "Swachh Karnataka" was achieved through 'Jan Andolan' i.e. active participation of the community, elected representatives, PRIs, various government departments, educational institutions, students, religious institutions, development partners, community based and other voluntary organisations. Now the vision of Swachh Karnataka goes beyond construction of toilets and the state is moving towards sustainability of safe sanitation practices and management of solid and liquid wastes generated in rural areas. The state of Karnataka recognises that economic and social development of rural areas cannot be complete without ensuring safe and healthy environment to its residents.

1.3 In 2016, the Ministry of Environment, Forest and Climate Change published the Solid waste Management Rules, 2016 ("SWM Rules") and the Plastic Waste Management Rules, 2016 ("PWM Rules") which laid out specific duties and obligations of the state with respect to management of solid waste including plastic waste generated in rural areas. In addition, as per the 73rd amendment of the Constitution of India and Karnataka Gram Swaraj and Panchayat Raj Act, 1993 ("Karnataka Panchayat Raj Act"), water and sanitation are primary responsibilities of the Gram Panchayat ("GP") in rural areas. On the basis of this regulatory framework, the state of Karnataka will create its implementation framework for sustainability of the ODF status, adoption of safe sanitation practices and holistic management of solid and liquid wastes generated in rural areas.

1.4 The State of Karnataka has already formulated a state policy containing the vision, aims and approach of the state for sanitation and waste management in rural areas ("**Karnataka State Rural Sanitation Policy**"). As a next step, it now proposes to adopt the state strategy as an implementation document with an aim to aid the state and GPs to set up sanitation, solid and liquid management systems in rural areas. The state strategy for sanitation and waste management ("**Karnataka State Rural Sanitation Strategy**") in the following paragraphs includes guidance on technologies for retrofitting of toilets/containment systems, solid and liquid waste management, financial resource planning, capacity building, roles and responsibilities of the different functionaries, information education and communication (IEC) and behaviour change communication (BCC), monitoring and evaluation criteria among others.

1.5 It is clarified that hazardous waste, bio-medical waste, e-waste, construction and demolition waste and industrial waste (solid and liquid components) are not covered by the Karnataka

State Rural Sanitation Strategy and Karnataka State Rural Sanitation Policy because they are governed by different regulations and administered by authorities that do not fall within the Rural Development & Panchayath Raj Department. In the event the management of such types of waste falls within the purview of the Gram Panchayats due to changes in applicable laws, this Karnataka State Rural Sanitation Strategy will be expanded to include the above waste streams.

## II. ADMINISTRATIVE STRUCTURE

The following administrative structure will be followed with respect to the responsibility for implementation of sanitation and waste management systems in rural areas in the state of Karnataka:

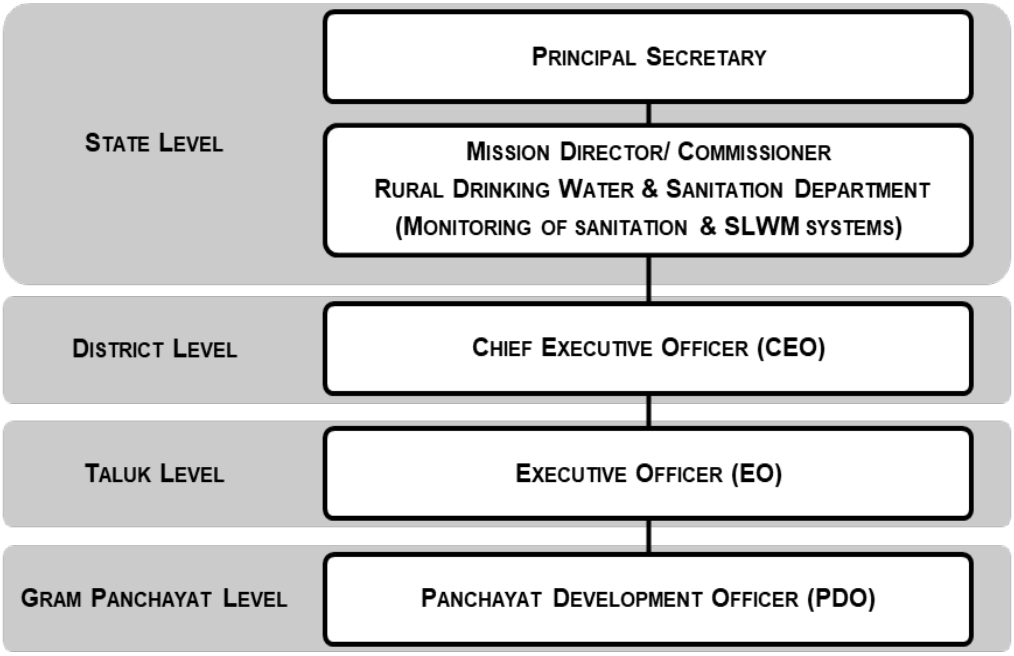



*Figure 1 : Administrative structure*

A coordination committee at the district level headed by the District Collector/Deputy Commissioner and co-chaired by the CEO will be look into matters requiring convergence of urban and rural authorities for waste management. In addition, the state can also form committees for implementation of sanitation activities and management of solid and liquid wastes generated in Gram Panchayats at state, district and taluk levels if it deems necessary.

## III. TOILET CONSTRUCTION: PRESENT STATUS AND TECHNOLOGICAL OPTIONS

### 3.1. Guidelines and technological options for toilet construction

(i) The guidelines of Ministry of Drinking Water and Sanitation ("**MDWS**") state that a household sanitary latrine shall comprise of[1]:
   (a) An adequately designed sub-structure which safely confines human faeces and eliminates the need for direct handling by humans before it is decomposed;
   (b) A super structure with water facilities; and
   (c) A hand wash unit.

(ii) The various options for toilet technologies along with design details including specifications of components, size, location, type of materials, applicability, modifications, advantages and

[1] Guidelines for Swachh Bharat Mission (Gramin), Ministry of Drinking Water and Sanitation, October 2017

disadvantages of different individual household latrines (**"IHHL**") and community toilets are provided in Handbook on Technological Options for On-site Sanitation in Rural Areas[2] released by MDWS in June 2016.

(iii) For additional IHHLs that have to be constructed because they were left out of the baseline survey or for new constructions, the state of Karnataka shall provide incentives as prescribed in the SBM (Gramin) guidelines to all BPL households and APL households belonging to SC/STs, small and marginal farmers, landless labourers with homestead, physically handicapped and women-headed households and other marginalised communities.

### 3.2. Present practices and retrofitting solutions

(i) More than 90% of the IHHLs constructed in the state of Karnataka are of the single pit pour flush type[3]. There are multiple reasons for the construction of single pit in place of other suitable containment systems; primary among them being lack of awareness about the right technology, inadequate funds available with the beneficiary and lack of space. A small percentage of toilets use the septic tank, but many of those have not been constructed as per the correct designs.

(ii) Major flaws that are observed in the existing designs of the IHHLs are:

(a) Improper selection of site including proximity to drinking/non-drinking water sources
(b) Single pit instead of twin pits
(c) Inadequate distance between the pits in a twin pit system
(d) Excessively deep or large pits
(e) Two interconnected pits and/or vent pipe attached
(f) No honeycombing and/or cement finish from inside

(iii) In order for sustained usage and maintenance of the toilets, they must be of good quality and acceptable to the beneficiary. Therefore, with respect to the faulty toilets and sustainability of ODF status, the state of Karnataka shall ensure that the following steps are taken:

(i) Conduct house to house survey and technical assessment to identify faulty designs.
(ii) Categorise the faulty toilets based on design and identified faults.
(iii) Earmark budgets and source of funds for the retrofitting and other correctional measures for faulty toilets, as well as regular desludging of all containments.
(iv) Prepare a plan of action and assign responsibilities for correctional activities.
(v) Carry out focused IEC/BCC activities to correct the above-mentioned flaws from the toilet designs and to ensure community participation.
(vi) Provide technical training in retrofitting to the staff who will be involved in retrofitting and other correctional measures.
(vii) Perform concurrent quality monitoring of toilets.

The details of how the existing faults can be addressed and the possible retrofitting methods are provided in **Annexure I**.

## IV. MANAGEMENT OF SOLID WASTE IN RURAL AREAS

In pursuance of the goal of Swachh Karnataka and as its next focus area, the state of Karnataka will concentrate on management of solid waste generated in rural areas. The management of solid waste will be based on the 4R approach (reduce, reuse, recycle and recover) with the aim to reduce the amount of waste being disposed, while maximising recovery

[2]https://mdws.gov.in/sites/default/files/Final%20Draft_Handbook%20MDWS%2BWaterAid%20%20onsite%20sanitation.pdf
[3] Report of "Household survey for assessment of toilet coverage under Swachh Bharat Mission – Gramin", Quality Council of India, 2017 at page 14

of resources and resource conservation. The manner of adoption of this approach and the principles set out in Karnataka State Rural Sanitation Policy is explained in the following paragraphs:

### 4.1. Segregation and Collection of Solid Waste

(i) Segregation of waste at source is the most critical step of a solid waste management plan. The solid waste will be required to be segregated into biodegradable and non-biodegradable waste. Domestic hazardous wastes including sanitary waste should also be stored separately for collection by the GP. The illustrative examples of each category of waste for the purpose of segregation are set out in **Annexure II**.

(ii) To enable segregation, the GP may consider distributing one bin for wet waste, one bin for domestic hazardous wastes and sanitary waste and one bin and/or HDPE bag for dry waste[4].

(iii) Door to door primary collection shall be carried out by the GP through its staff and they could be supported and/or facilitated by community based organisations (including self help groups and waste picker organisations) using appropriate vehicles. The focus would be primarily on collection of dry waste given that it poses a bigger concern than wet waste in most villages where wet waste could be composted and/or fed to livestock. Regular collection of only dry waste would also automatically result in segregation of waste at the source.

(iv) In cases where wet waste cannot be managed at all at a household level (such as in peri-urban areas) it should be collected and transported to the wet waste management unit. The frequency and manner of door-to-door collection (i.e. manually through pushcarts or through motorised vehicles) should be determined by the density of population, waste characteristics, width of the streets, manpower and funds available with the GP. The suggested normative standards for manpower, vehicles and equipment for door-to-door collection are set out in **Annexure III**.

(v) In peri-urban villages, where finding space for onsite waste processing is difficult, wet, dry and domestic hazardous wastes (including sanitary waste) may need to be collected at suitable periodicity. If the GP does not have the resources to do regular collection of wet waste, it should first focus on collection of dry waste on a weekly basis for the reasons stated above. The flow of waste in a typical rural GP and peri-urban GP level is set out in **Annexure IV**. The collection and processing of solid waste should be based on payment of user charges determined by the GP which is further detailed in paragraph 6.3(ii) relating to own sources of revenue.

(vi) The GPs need to classify waste generators that generate more than 50 kgs of waste per day as “bulk waste generators” and impose certain additional obligations on them with regard to solid waste management. These could include transporting the waste generated by them in a segregated manner to the waste management unit of the GP, onsite processing of wet waste, payment of higher user fees (which is in proportion with the amount of waste generated by such entities) etc. The GP can consider these mechanisms depending on local conditions such as number of bulk waste generators, availability of space for onsite processing, availability of vehicles for hire, capacities of collection vehicles of the GP among others.

(vii) GPs must also register all meat and slaughterhouse vendors so that it can assess the number of collection vehicles required and frequency of collection of slaughterhouse waste. Every

[4] A five-member household will need a 12-15 litre green bin for wet waste and 24 inch*36 inch appropriate grade of HDPE bag for a week’s dry waste. The reasons for suggesting HDPE bag for dry waste include:
(i) HDPE bag for dry waste avoids confusion with two similar bins for the generator,
(ii) HDPE bags are cheaper than bins and are easier to handle for the waste collection staff,
(iii) HDPE bags hold greater volume of dry waste (which is important in case of weekly collection of dry waste),
(iv) Wet waste cannot be disposed in the HDPE bag without it leaking and therefore, acts as a deterrent for mixing of waste streams.

occupier of any premises who generates poultry, fish and slaughter waste as a result of any commercial activity, should store such waste separately in a closed and hygienic condition and such waste should not be mixed with any other category of solid waste. The GP should designate specific days in a week and vehicles for collection of slaughterhouse waste and the relevant occupier should ensure that such waste is ready for collection on the designated days and times. The GP should ensure that slaughterhouse waste is not mixed with any other stream of waste during collection and transportation and is transported directly to the relevant processing centres or for proper disposal.

### 4.2. Processing and Disposal of Solid Waste

**GP level**

The processing of solid waste would be done at three levels i.e. at GP, taluk/hobli and district levels as set out below:

(i) **Processing of biodegradable waste**: Composting is extremely viable in rural areas because the solid waste generated in villages is predominantly biodegradable. While biomethanation is also a viable processing technology for biodegradable waste, it requires greater capital investment and more skilled manpower for operations and maintenance. In addition, the process is most efficient when the biogas generated is used for cooking purposes. Therefore, GPs and/or the state must carry out feasibility studies before setting up biomethanation units. Both of these processing technologies can be adopted at a household or community (village/Gram Panchayat) level. There are different types of composting technologies that are available to the GPs and they should select the appropriate technique depending on the quantities of waste, level of segregation, climatic conditions, geography, area available, infrastructure, financial costs and manpower requirement that are further described in **Annexure V**.

(ii) **Storage, sale and/or transportation of non-biodegradable waste**: Processing of dry waste is not advisable at village or GP level due to lack of its economic viability. Therefore, with respect to non-biodegradable waste, the handling should be limited to aggregation and if possible, sale of recyclable non-biodegradable waste. The ban on plastic materials issued by Forest, Ecology and Environment Department, Government of Karnataka[5], should be effectively implemented by the GP so that the plastic materials covered under the notification do not form part of the non-biodegradable waste collected by the GP. Every GP or a group of GPs (depending on waste quantities, distance between GPs, density of population, space availability etc.) should provide one dry waste storage unit as an aggregation point for dry waste. This could be an old or unused building in the village/GP. If there is no such structure, the GP should construct dry waste storage unit and the suggested design of such unit is set out as **Annexure VI.** In the event there are scrap dealers and market for recyclable non-biodegradable waste at the GP, such recyclable materials can be sold from this dry waste storage unit. The non-recyclable non-biodegradable waste which has a high calorific value should be stored at the dry waste storage unit and transported to the hobli/taluk/zilla level aggregation centre at intervals as maybe determined by the GP. The responsibility of transportation of such streams of waste will remain with Gram Panchayat.

(iii) **Disposal of inert waste and domestic hazardous wastes:** In the event the GP has adequate land, funds and technical expertise to construct and maintain a sanitary landfill as per the stipulated norms; inert and domestic hazardous wastes can be disposed in such sanitary landfill. It should be ensured that not more than 15% of the entire waste generated in the GP is disposed in the landfill. Alternatively, such waste can be stored at the dry waste storage unit and transported to hobli/taluk/zilla level aggregation centre periodically if the hobli/taluk/zilla permits the GP the use of its processing facilities and/or sanitary landfill.

[5] Notification No. FEE 17 EPC 2012, Bangalore dated March 11, 2016

(iv) **Storage and/or disposal of sanitary waste**: The sanitary waste could also be aggregated and treated along with the bio-medical waste generated at primary/community health centres, clinics and other medical establishments in each GP. Till such time linkages with bio-medical waste are identified, the GP could also consider installing safe incinerators (complying with requisite standards) in higher secondary schools, women's community sanitary complexes, dry waste unit, primary health centres, or in any other suitable place in village that is safe for the environment and health of the local populations. Alternatively, the sanitary waste should be disposed in the sanitary landfill if such facility is available in the GP.

(v) **Agricultural waste:** Depending on capacities, infrastructure and financing available with the GPs, it could consider processing agricultural waste in the following order; firstly, local composting in the solid waste management unit and/or faecal sludge treatment plant and if that is not feasible, by turning them into biomass briquettes which could be used for cooking or in industrial plants that are located close to the GPs as a replacement for fossil fuel.

(vi) **Slaughterhouse waste**: Waste generated from slaughterhouses, poultry, meat and fish markets/commercial shops will be processed or disposed through controlled incineration or deep burial where stipulated scientific standards are followed and/or any other method approved by CPCB, KSPCB and/or any other appropriate authority.

**Hobli/Taluk or Zilla Level:**

(i) **Aggregation of non-biodegradable waste and domestic hazardous wastes**: The state or district administration should consider aggregation of **(a)** recyclable material to the extent individual GPs do not have market for such material and **(b)** non-recyclable non-biodegradable waste with sufficient calorific value, at a centralised facility at the hobli/taluk/zilla level which can cater to appropriate cluster of GPs for co-processing, RDF, waste to energy units, usage of plastic in roads etc. The transportation and processing of non-recyclable plastic waste could also be done as a part of implementation of extended producer responsibility (EPR) obligations under Plastic Waste Management Rules, 2016. At this level, given the volume of non-recyclable plastic, the extended producer responsibility of plastic producers/brand owners can be enforced by KSPCB and/or any other appropriate state authorities. The domestic hazardous wastes from the GP can also be transported to hobli/taluk/zilla level aggregation centre if such hobli/taluk/zilla permits the GP the use of its processing facilities and/or sanitary landfill.

(ii) **Processing facilities for non-recyclable non-biodegradable waste and domestic hazardous waste**: Resource, technology, and capital-intensive waste management processes such as RDF plants, co-processing in cement kilns, waste to energy projects, sanitary landfills etc. are best planned and executed at the district and/or regional level because they can benefit from economies of scale and for easy management and environmental monitoring. Once these facilities have been set up, district authorities should devise a strategy to link the processing of non-recyclable dry waste and domestic hazardous waste generated at GPs with nearby urban areas especially if such facilities are constructed on land which belongs to the rural administration.

### 4.3. Timelines for setting up processing facilities

The GPs, district and state administration along with other relevant governmental agencies should co-operate and create the abovementioned infrastructure to achieve the goals set out in the Karnataka State Rural Sanitation Policy as per the following timelines:


*Figure 2 : Timelines for setting up processing facilities*

## V. FLOW OF LIQUID WASTE AND ITS MANAGEMENT

### 5.1. Types and sources of liquid waste

(i) Liquid waste generated by domestic consumption consists of wastewater that is used and unwanted and it can be categorised into the following two types:

(a) **Blackwater or faecal sludge/septage**: the wastewater coming from the toilets including human faeces and flush/wash water, either at household level or in commercial establishments, anganwadis, schools, institutions etc.

(b) **Greywater**: the domestic wastewater not containing human excreta, such as household wastewater generated during bathing, cooking and washing activities from the kitchens, bathrooms and include wastewater from commercial establishments and activities such agriculture, dairy and animal rearing etc.

(ii) The approach suggested to be adopted for management of greywater and blackwater is shown below:

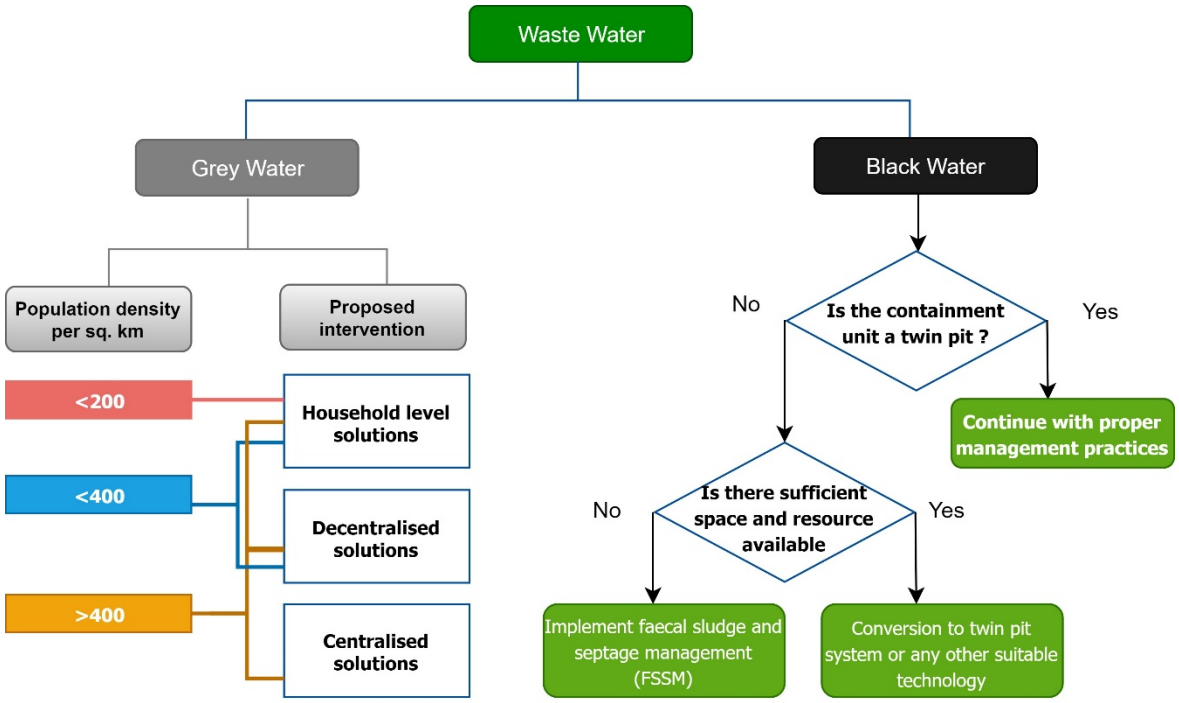



*Figure 3 : Approach for management of wastewater*

## 5.2. Management of Blackwater

(i) The safe management of blackwater should ensure the following: **(a)** no contamination of soil surface, ground water or surface water; **(b)** faecal waste should be inaccessible to flies or animals; **(c)** no manual handling of fresh excreta and **(d)** freedom from odour and unsightly conditions.

(ii) Faecal sludge and septage management refer to the entire management chain from containment (soak pits/septic tanks) to end use or disposal of treated faecal sludge. This includes the safe storage, collection, transport, treatment and end-use or safe disposal of treated faecal sludge which can be better understood through the graphic below:

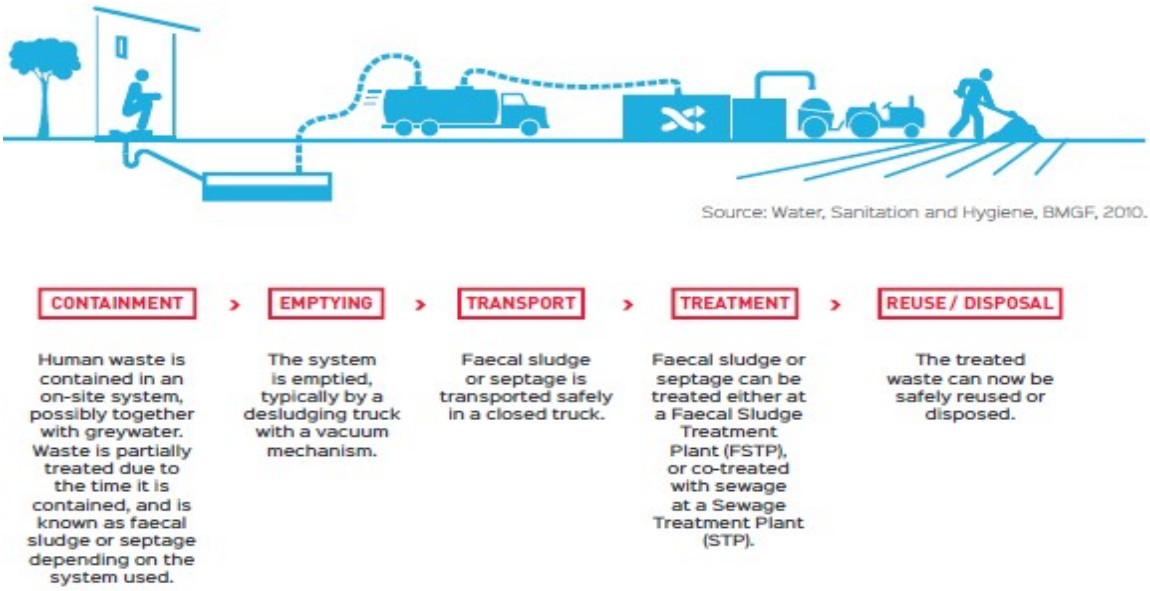



*Figure 4 : Faecal sludge and septage management chain*

(a) **Containment**: As a first step, the single-pit toilets should be converted to twin pit (for areas where ground water table is >=10mbgl and water source is >5m away) and replaced by scientifically designed septic tanks in high water table areas (<10mbgl) and/or any other option set out in **Annexure VII**.

(b) **Emptying and transportation**: Faecal sludge from pits and septic tanks should be emptied using desludging vehicles and transported in sealed containers to faecal sludge treatment plant (FSTP)/sewage treatment plant (STP). With respect to emptying of twin pits, it should be ensured that the sludge has been stabilised (for at least 2 years) and is inert (composted completely) before emptying. During the entire emptying and transportation process, compliance with Prohibition of Employment as Manual Scavengers and their Rehabilitation Act 2013 is mandatory. There should be no exposure to workers employed and standard safety precautions including provision of appropriate equipment and safety gear shall be adhered to during the entire process. These measures are critical to minimise potential health risks to sanitation workers from direct contact with the contents of the pits.

(c) **Treatment**: As the first preference, the treatment of faecal sludge from a GP shall be explored at the STP of the nearest urban conglomerate to optimise use of existing infrastructure if it is under-utilized. However, a detailed assessment of the existing STP, its location, capacity, current performance, distances from identified GP/GPs and future

expansion should be taken into account before linking the treatment of faecal sludge from the GPs. In case such linking is not possible, an FSTP shall be planned either at GP level or for a cluster of GPs depending on the population (households with containments) of the GPs and distance between respective GPs. The GPs can also consider integrating the faecal sludge treatment into the existing biogas plant for solid waste, after thorough technical feasibility assessment with additional treatment modules/facilities in order to meet the discharge standards.

(d) **Disposal/reuse:** The treated solids could be used as soil conditioners or co-composted with organic component of solid waste. The treated water can be used for landscaping or in agricultural fields. Wherever feasible, it can also be piped back into toilets and used for flushing provided it has been appropriately treated. In case of treatment using biogas digesters, biogas can be used for cooking and lighting purposes.

(iii) Different containment, transportation and treatment options for blackwater management with advantages, disadvantages, typical infrastructure requirement and operation and maintenance costs are provided in **Annexure VII**. Further, the guidelines for selection of the different technological options are provided in **Annexure VIII**.

### 5.3. Management of Greywater

(i) In cases where the greywater does not include any component of blackwater, the planning process would mainly be dependent on the density of development. The main intent should be to treat the greywater at or near the source or safely convey the greywater to the required location for treatment, proper treatment as per need of end-use and safe disposal adhering to existing environmental standards.

(ii) The wastewater coming from other commercial activities would need to be treated either in combination with greywater (in cases where it does not contain toxic waste) or separately (in cases where toxic wastes is mixed). Treatment of greywater can be planned at one of the following levels depending on density of development and availability of funds:

(a) **At household level:** In villages where ample space is available around houses, greywater could be used in the garden or directly discharged into soak away pit or dispersion trench.

(b) **Decentralised solutions:** If there is a space constraint around individual households or if there are closely packed cluster of households, greywater shall be discharged into covered surface drains alongside roads which will accumulate in a common location. An appropriate low-cost treatment solution could be planned at this point of accumulation because it would save costs involved in diversion and conveyance etc. of greywater. However, the location and sizing of the treatment system shall be done in conformance to the guidelines provided in the CPHEEO Manual on Sewage and Sewerage Treatment[6]. If this location does not meet the criteria of safe buffer then provision should be made to transport the treated wastewater to suitable location. The water let out after treatment should meet the discharge standards of KSPCB[7].

(c) **Centralised solutions:** If the development of the village is dense or a cluster of villages are located at close proximity, the collection of the wastewater from all kinds of sources can be centralised and planned on the lines of urban sewerage systems. It must be noted that the costs of construction and operations of such heavy infrastructure is high. However, in peri-urban areas where there is a partially laid UGD/sewer network and availability of FSTP/STP nearby, both the streams of black and greywater can be

[6] CPHEEO Sewerage and Sewage Treatment Systems: Part A: Engineering - Chapter 5: Design and Construction of Sewage Treatment Facilities: 5.3.7.1. Buffer zone around the STP

[7] Adopting New Treated Sewage Discharge Standards for STPs, KSPCB, August 30, 2018 available at https://www.kspcb.gov.in/2854_3082018.pdf

managed in a combined sewage treatment plant, thereby reducing the costs of constructing of a FSTP/STP.

(iii) The guidelines for choosing the preferred technological options for the different districts of Karnataka, depending on characterisation based on population density, ground water level, economic characteristics and geo-climatic conditions are provided in **Annexure IX**. In addition, to aid GPs in selecting an appropriate technology for liquid waste management, an excel based workable model is provided in **Annexure X**.

## VI. PLANNING AND IMPLEMENTATION FOR SANITATION, SOLID AND LIQUID WASTE MANAGEMENT

### 6.1. Introduction

(i) Planning of solid waste management should be done in close coordination with planning of management of liquid waste for efficient utilisation of funds and space. This is because there is enormous amount of overlap between the institutional structures, sources of funds (both internal and external), capacity building and IEC/BCC tools, monitoring and evaluation processes for both solid and liquid waste management systems. In this context, the following synergies in solid and liquid waste management systems shall be explored during the planning phase:

(a) Co-composting of organic waste and solids from FSTPs
(b) Common biogas digesters and/or composting of the slurry of biogas at FSTPs with organic waste as well as treatment of liquid streams at a common location
(c) Usage of treated water for composting of organic waste
(d) Co-location of treatment plants, integrated user fee collection mechanisms, common monitoring and evaluation processes, manpower, common IEC/BCC activities and integrated capacity building activities.

(ii) In addition to the above, it must be noted that rural development as a sector has number of schemes operating to cater to needs of the rural masses for enhancement of many aspects of their lives. Given the tendency for such schemes to operate in isolation, one of the priorities of the State of Karnataka is to ensure coordination and convergence among funding arrangements and various schemes operated through various line departments like Rural Development and Panchayat Raj, Education, Health and Family Welfare, Women and Child Development, which have the common objective of enhancing quality of life in rural areas. This will also be necessary to ensure efficient and effective disbursement of funds for the development, ongoing implementation and monitoring of SLWM systems and sustainability of services. The areas of convergence are further detailed in paragraph 6.2(vii) below.

### 6.2. Overview of strategic steps for implementation:

(i) **Survey and audit**: With respect to solid waste, GPs should carry out a waste survey and audit to identify number and type of waste generators in the GP along with waste characteristics (such as waste stream and quantities). This should be done by taking waste samples from different types of waste generators across a 7-day period during different seasons to understand the seasonal variations in waste generation and characteristics. The normative standards for computing waste data on a per capita basis and types of waste streams and generators are set out in **Annexure III**. With regard to wastewater, the GPs should carry out a survey and mapping of all sources of wastewater (black and grey) and drinking water, existing containment systems, vulnerable communities and land use pattern. The waste survey and audit for both solid and liquid wastes should identify bulk waste generators and the amount of waste generated by them separately. This is to ensure that the waste data from exceptional sources such as “bulk waste generators” does not distort the data from regular waste

generators such as households and small shops.

(ii) **Prioritisation and risk assessment**: In determining priority for sanitation and waste management activities, GPs should give priority in the following order: 100% toilet access, ensuring usage of toilets, solid waste management and liquid waste management. Within each segment, streams with maximum risk in terms of human health and environmental concerns should be given priority.

(iii) **Technology selection**: Appropriate technologies for **(a)** collection and processing of solid waste and **(b)** containment, transportation and treatment of blackwater and greywater, based on local conditions and survey data shall be chosen. The GPs should refer to the guiding principles set out in the Karnataka State Rural Policy and technology options in this Karnataka State Rural Strategy for selection of suitable technologies.

(iv) **Gram Panchayat Development Plan, detailed project report and microplans:** The GPs should include sanitation and SLWM systems in Gram Panchayat Development Plan and/or any other development plan for the GP so that development of sanitation and SLWM systems is not overlooked. A detailed sanitation plan in the Gram Panchayat Development Plan targeting toilet construction, correction and usage, personal and public hygiene, liquid and solid waste management, capacity building and IEC/BCC activities shall be prepared. The long-term plan (for 5 years) shall be broken down into yearly plans which should include details of infrastructure, assets, operations, human resources, IEC & BCC, funds required and sources of funds, monitoring and evaluation parameters etc. An implementation timeline should be worked out highlighting the milestones to be achieved annually. The implementation plan should be aligned to the targets and timelines mentioned under the objectives of the Karnataka State Rural Policy. As a part of the sanitation component under Gram Panchayat Development Plan, GPs should prepare detailed project report (DPR) for management of solid waste as per the model DPR set out in the **Annexure XI** which should be based on micro-plans prepared for collection mechanism and processing of solid wastes in the GP. The GPs can take assistance from the relevant consultants or professional agencies which have proven experience in the sector. The Gram Panchayat Development Plan, DPR and micro-plans should be prepared on the basis of ground-level data and field assessment of the factors set out in the model DPR and not only on the basis of assumptions and algorithms. The collection schedules and micro-plans should also consider bulk waste generators separately because they can significantly affect collection schedules and vehicle capacities.

(v) **Roles and responsibilities**: The GP should ensure that VWSC/VHSNC is set up for management of sanitation and waste management activities in the GP. The suggested roles and responsibilities of different stakeholders such as governmental officials, elected representatives, informal sector such as waste pickers and scrap dealers and non-governmental agencies (SHGs/cooperatives/NGOs etc) who will be involved in implementation and monitoring of SLWM systems are set out in **Annexure XII**. These roles and responsibilities should be communicated clearly to the different stakeholders such that SLWM systems can be smoothly implemented.

(vi) **Financial planning and budgets**: Preparation of annual budgets for **(a)** the capital costs required for initial investment in sanitation infrastructure and facilities; **(b)** the recurrent costs/revenues required to operate and maintain the facilities; and **(c)** the programme costs for activities such as training, IEC and BCC activities. The GPs are mandatorily required to set aside at least 25% of their total budget for sanitation and SLWM activities and the overall systems should be designed in a manner that is sustainable with incremental increase in service delivery every year. They can take guidance from the model DPR for solid waste to understand the components of the budgets and from Section VI of the Karnataka State Rural Sanitation Strategy on financial sustainability of SLWM systems. The priority of usage of the

funds available with the GP should be drinking water, sanitation (including solid and liquid waste management), roads and streetlights.

(vii) **Areas of convergence**: The state should identify areas of convergence under various schemes for departmental coordination, capacities, funding and other activities at a GP level to optimise finances and human resource required for the various activities relating to sanitation and waste management. The potential convergence could be explored between the following line departments:

| Department | Possible areas of convergence |
|---|---|
| **NRLM, Ministry of Rural Development** | ▪ Utilising the network of SHGs under NRLM for effective IEC and BCC and implementation of door-to-door collection and processing of solid waste and operations at STP/FSTP at GP or hobli levels.<br>▪ Revolving funds for seed funding of SLWM projects, viability gap funding for initial few years<br>▪ Skill development program for sanitation workers |
| **MGNREGS, Ministry of Rural Development** | ▪ Building of drains<br>▪ Conversion of single-pit to other suitable containment systems<br>▪ Construction of composting assets and dry waste storage area. |
| **Department of Education** | ▪ Including sanitation in school curriculum<br>▪ Building of toilets with WASH facilities in schools<br>▪ Support in IEC and BCC activities through teachers<br>▪ Participation in VWSC/ VHSNC to monitor sanitation and waste management activities |
| **Department of Health & Family Welfare** | ▪ Set up water sanitation and hygiene (WASH) facilities in Anganwadis,<br>▪ Dissemination of IEC and BCC content through village health workers and VHSNC/ VWSC<br>▪ Support in survey and risk assessment, monitoring of impact of safe sanitation practices and proper SLWM activities. |
| **Department of Woman and Child Development** | ▪ Dissemination of IEC content and monitoring through ASHA workers and Anganwadi teachers, awareness about WASH and SLWM systems |
| **Department of Agriculture** | ▪ Subsidies in sale and purchase of compost and treated bio-solids |
| **Department of Ecology and Environment** | ▪ Issuance of relevant consents to operate processing and treatment facilities.<br>▪ Monitoring of the sanitation and waste management systems to ensure least environmental impact and adherence to regulatory standards |

| | | |
|---|---|---|
| **Tandem departments like Youth Groups, Nehru Yuva Kendra Sangathan, Ambedkar Development Corporation** | ▪ | Provide staff for sanitation activities including operators of FSPTs/STPs, subsidies for purchase desludging vehicles etc. |

*Table 1 : Areas of convergence with other departments*

(viii) **Setting up capital infrastructure**: Once Gram Panchayat Development Plan (including sanitation components), DPR and financial budgets are approved, the GPs should commence infrastructural works for wet waste processing, storage of dry waste, wastewater treatment and purchase the required vehicles and equipment. Ideally, such infrastructure for solid waste management should in place by the time the GP decides to start door to door collection of solid waste.

(ix) **Training and awareness**: Training of personnel who will be involved in SLWM systems should begin around the time the infrastructure for SLWM management is going to be completed. The IEC and BCC activities should also run in parallel such that the community, GP members and staff and other relevant stakeholders are prepared to support SLWM systems through sustained use of toilets, source segregation, handing over segregated waste through door to door collection and payment of user fees.

(x) **Monitoring & Evaluation**: The parameters to be monitored, frequency of monitoring, monitoring body, standards against which monitoring is to be done (progress and effectiveness) shall be identified in accordance with the principles set out in Section IX.

(xi) **SLWM byelaws**: GPs should prepare and adopt SLWM bye-laws, especially for enforcement of duties and obligations of different stakeholders, imposition of user fees, penalties and reporting requirements. These bye-laws along with the Karnataka Plastic Ban should effectively and continuously be implemented by the GP and other identified officials through surprise checks, imposition of fines for non-compliance etc.

### 6.3. Financial sustainability

In light of the established principle of “polluter pays” and given that the benefits of good and efficient solid and liquid waste management systems are shared between the waste generators and the community as a whole, the costs of collection, transportation, treatment and disposal of waste should be shared with contributions from both the government and citizens. Therefore, solid and liquid waste management systems should be made financially sustainable by ensuring cost recovery of operation, maintenance and asset depreciation costs through **(i)** external sources such as allocation of funds from government grants, viability gap funding from the government and any other schemes; and **(ii)** GP’s own/internal sources of revenues such as property tax, license fees, levy of user fees on the beneficiaries, sale of compost, bio-gas and/or recyclable dry waste, as detailed in paragraphs below.

(i) **External sources of funding:**

(a) The following central and state schemes can be availed by the GPs for implementing sanitation and SLWM activities, as per the scheme guidelines:

| S.no | Source of funding | Activities it can be used for |
|---|---|---|
| 1. | SBM(G) funds amounting to maximum of Rs. 20 lakhs per project per GP[8] | - Capital expenditures like purchase of vehicles or setting up of waste processing units.<br>- The project preparation, supervision and monitoring costs of SLWM projects payable to agencies<br>- Maintenance costs for the first five years of operation |
| 2. | Costs under Mahatma Gandhi National Rural Employment Guarantee Scheme (MGNREGS) can be approved by the GP as assets for SLWM as rural infrastructure assets | Construction of capital/infrastructure assets for SLWM projects such as conversion of single pit toilets, construction of dry waste storage unit and compost pits |
| 3. | Discretionary funds under Chief Minister Grama Vikasa Yojana for capital assets. | Capital expenses |
| 4. | Funds under Central Finance Commission that are earmarked for cleanliness, underground drainage and solid waste management. | Capital expenses |
| 5. | Revolving funds available under National Rural Livelihood Mission (NRLM) | Capacity building and training activities and operational expenses. |
| 6. | Funds by the State Finance Commission which are also the annual grants under Section 206 under Karnataka Panchayat Act by the state government to each GP for different activities including sanitation[9]. | Salaries of existing GP personnel |
| 7. | Discretionary grants under Section 208 under Karnataka Panchayat Act by the state government to GPs, TPs and ZPs which currently given as development grants to TPs and ZPs | Capital expenses |
| 8. | Discretionary funds under Legislators Area Development | Capital expenses |
| 9. | Shyama Prasad Mukherji Rurban Mission (SPMRM) for cluster based development activities including waste management. | Capital expenses |
| 10. | Subsidies under National Biogas Manure and Management Programme/GOBHARDHAN Scheme | Can be utilised for constructing biogas plants by beneficiaries at the GP level. |
| 11. | Revolving credit under SBM(G) | Operating and capital expenses |
| 12. | Micro financing through agencies such as NABARD. | Operating and capital expenses |
| 13. | Special funds such as development grants from state, Niti Ayog etc. awards, performance based incentives | Depend on the fund guidelines |

[8] Funds for Solid and Liquid Waste Management activities with cap of Rs. 7/12/15/20 lakh are available for Gram Panchayats having upto 150/300/500/ more than 500 households

[9] Minimum Rs.10.00 Lakh statutory grant is provided to each Grama Panchayat and for Grama Panchayats having more than 10,000 population, an addition of Rs.1.00 Lakh is being released for every increase of 1000 population

| | | |
|---|---|---|
| 14. | Funds from corporate social responsibility of companies and private donations through Swachh Bharat Kosh or otherwise. | Operating and capital expenses |

*Table 2 : Sources of funding*

(b) In order to assist GPs attain financial sustainability, the state will provide appropriate viability gap funding for the first two years of operation of the project to meet the operational costs of SLWM systems to the GPs that are over and above the share of Government of India. Thereafter, the SLWM systems should reach the level of self sustainability by the 3rd year of operations.

(ii) **Own Sources of revenue:**

(a) **User fees**: In order to financially sustain SLWM systems, it is essential that the waste generators contribute towards its operations and maintenance costs. Therefore, as soon as SLWM systems are set up in the GPs, the GP should approve collection of user fees from every category of waste generator. Typically, quantum of user fees should be based on the size/area of the waste generator, amount of solid and liquid waste generated and managed onsite[10], costs incurred in operation & maintenance of SLWM infrastructure created and the capacity to pay. A list of recommended user fees for the different categories of waste generators is included as **Annexure XIII** of this Karnataka State Rural Strategy. Given the possible reluctance to pay user fees for waste management services, the GP could consider providing the service for a nominal fee which could be increased gradually with increased acceptance among the communities and improved level of services. The user fees should automatically increase by a minimum of 15% (to the nearest multiple of Rs. 10) every three years with effect from April 1 of such year. This is necessary to cover inflation, depreciation of assets and operating costs such as increase in salaries etc.

(b) **Sale of products/by-products**: Revenues can be generated from the recovered products such as compost, biosolids, biogas and from sale of recyclables if markets are established for the products/by-products. It should be noted that no income can be generated from treatment of greywater and cost benefit from treated water that can be used for agricultural purpose or landscaping is minimal and does not contribute towards meeting the operational cost of running a wastewater treatment system.

(c) **Fines and penalties**: In the initial phase of implementing source segregation and to reduce dumping and burning of waste, the GP will need to use a multi-pronged approach to ensure compliance which involves intensive IEC/BCC activities and campaigns and enforcement of fines/penalties for non-compliance of SLWM related obligations through bye-laws. The recommended penalties for SWM related non-compliances are set out in **Annexure XIV.** In addition, the GPs can also provide for a waterfall arrangement in the byelaws where penalties increase proportionately for consecutive and/or repeated non-compliance(s) by the same person. The bye-laws should also provide for escalation of the penalty amounts every year by a specified percentage to take into account the inflation and other costs of recovery for the GP.

(d) **Property tax, license fees and other sources of own revenue**: In the event the SLWM services along with user fees and penalties do not generate enough revenue/income, the GPs could consider offsetting the expenditure for SLWM services with income from other sources such as property tax, license fees, vehicle parking fees etc. Additionally, in tourist areas, Gram Panchayat should levy waste management charges from the tourists at the entry point or in any other manner to make the waste management services in such tourist areas sustainable.

[10] For example, if a waste generator manages biodegradable and/or greywater onsite, the user fees will be proportionately reduced.

### 6.4. Financial planning for wastewater

(i) Given that the financial planning for liquid waste management requires specific contributions from the waste generator and the GP/governmental authorities, the specific responsibilities of such planning for management of blackwater is set out below:

(a) **Emptying of single pit toilet and composted sludge in twin-pit**: The primary responsibility of emptying the pit lies with the owner of the premises. The desludging machines could be hired by the owner from private parties or desludging machines could be procured at Taluk level through government funds. In both cases, the owners of the premises shall bear the emptying charges imposed by the private agency or governmental authority, as the case may be. The slab of such fees for desludging would however, be fixed at a GP or district level with differential pricing for low-income families, other users like commercial establishments, bulk generators, schools/institutions etc.

(b) **Treatment**: The infrastructure cost of FSTP shall be borne by the GP and the operations and maintenance cost of the FSTP should be recovered from the waste generators. These charges can be made a part of the hiring charges of the desludging machine or collected as a separate user fee for SLWM services or indirectly through existing utility charges/ property taxes etc.

(ii) The responsibilities relating to financing of greywater management are set out below:

(a) **Household level**: The cost of containment and treatment may be borne by the owner of the premises.
(b) **Cluster based systems**: The cost of covered surface drains and treatment system may be borne by the GP through different central and state government schemes. Similar to blackwater treatment, the operations and maintenance costs should be borne by the community through user fee.
(c) **Centralised solutions**: The cost of laying the underground drainage systems and setting up the STPs should be borne by the state. The operations and maintenance costs should be borne by the waste generator through user fee and other funding options available with the GP.

### 6.5. Budgets and plans for management of waste

(a) The budget estimate and development plan for each GP under Sections 241 and 309 of the Karnataka Panchayat Raj Act should include a component on the waste management including capital infrastructure and operations.

(b) The budget estimate of the Taluk Panchayat under Section 247 of the Karnataka Panchayat Raj Act should include waste management services (such as treatment of wastewater at FSTP/STP, aggregation and management of dry waste and domestic hazardous waste) which will be provided at a taluk level. In addition, the relevant authorities shall, while integrating the GP plans at an intermediary level, identify areas for integration (resources/schemes/funds) with respect to waste management in accordance with Section 309E of the Karnataka Panchayat Raj Act.

(c) The budget estimate of the Zilla Panchayat under Section 256 of the Karnataka Panchayati Raj Act should include waste management services which will be provided at the district level such treatment of wastewater at FSTP/STP, RDF plants, co-processing in cement kilns, recycling facilities, waste to energy projects and sanitary landfills.

6.6. **Participation by community-based organisations and entrepreneurs:**

(i) The GPs should first assess whether they are able to provide waste management services on their own or if they will need to take assistance from external agencies due to considerations of limited capacity, staffing, and other resources. Suitability of waste management projects for implementation through entities such as NGOs, self-help groups, community-based organisations, entrepreneurs etc. should be ascertained. The GP should ensure that these entities are selected through a transparent selection process in accordance with the provisions of Karnataka Transparency in Public Procurements Act, 1999 and other applicable regulations after carefully prescribing minimum qualification and experience needed to perform the services effectively.

(ii) The GP also has an obligation to ensure that the selected non-governmental players adhere to the local, regional, and national legal requirements. In the event of any non-compliance, the GP should impose penalties/ fines and/or blacklist such entities from providing any further services etc.

6.7. **Wages, benefits and occupational safety**

Payment of minimum wages and statutory benefits to sanitation workers will be progressively realised in accordance with applicable labour regulations. Benefits such as education, housing, healthcare, insurance etc. for sanitation workers employed at the GP shall be as per the eligible welfare schemes operated by the government. The GP shall also ensure occupational safety of its own staff including sanitation workers and staff of any authorised third party involved in solid and liquid waste management activities by providing appropriate and adequate personal protective equipments such as uniforms, shoes, gloves, masks, etc. In addition, the GP should organise for regular medical check-ups of the sanitation workers, sweepers and other eligible employees for occupational diseases and treatment of injuries resulting from solid and liquid waste management activities under applicable welfare schemes.

## VII. CAPACITY BUILDING AND RESEARCH AND DEVELOPMENT

7.1. **Target for capacity building**: Capacity building of personnel involved in SLWM activities in rural Karnataka should be a priority. It is essential that all the stakeholders involved in the process of planning, implementing and monitoring the sanitation and waste management systems have the required knowledge and access to the right resources. This will ensure that the systems built are appropriate and sustainable over a period of time. There are different levels of staff who are involved in planning and implementation of waste management in rural areas and they require specialised training that is different in scope, duration and specialisation. Set out below is an overview of the stakeholders where capacities should be built and the suggested topics for capacity building and training:

| Level | Stakeholders | Suggested Topics |
|---|---|---|
| Level 1 | Sweepers, drivers and SHG members/ ASHA Anganwadi workers, sanitation workers, informal waste pickers, Swachhagrahis, other persons involved in collection, segregation and processing of wet waste. | ▪ Information about different waste streams and wastewater<br>▪ Segregation at source and door-to-door collection<br>▪ Importance of containment and treatment of blackwater<br>▪ Use of tools and equipment<br>▪ Dissemination of IEC and BCC content<br>▪ Vehicle maintenance and preventive checks (specifically, drivers)<br>▪ Occupational safety<br>▪ Standard operating procedures for composting/biogas |

| | | |
|---|---|---|
| **Level 2** | PDO and members of village health, sanitation and nutrition committee (VHSNC) and/or village water and sanitation committee (where no VHSNCs have been formed) | ▪ Financial budgeting and sustainability (preliminary level)<br>▪ MIS systems (for capturing waste data, capital and operating expenses and revenue) and monitoring at a micro level<br>▪ IEC and BCC content<br>▪ Composting and biogas technologies and overview of dry waste management<br>▪ Different containment, transportation and treatment methods for wastewater.<br>▪ Logistics and human resource development<br>▪ Byelaws for SLWM |
| **Level 3** | Executive officers at Taluk level, project/nodal officers, engineers and SWM consultants at district and state levels | ▪ Human resource development,<br>▪ MIS systems, monitoring and reporting at a macro level<br>▪ Financial budgeting and sustainability (advanced level)<br>▪ Comprehensive overview of available technologies for rural waste management (solid and liquid)<br>▪ Logistics implementation and monitoring |
| **Level 4** | CEOs at district level, Commissioners and Secretaries at State levels | ▪ Latest developments and trends in the waste management sector<br>▪ Rules and regulations around waste management<br>▪ Urban-rural linkages for waste management.<br>▪ Linkages to allied sectors such as health, nutrition, education drinking water, environment and agriculture, horticulture and watershed.<br>▪ Information about developmental schemes from central and state governments. |

*Table 3 : Overview of stakeholders and topics for capacity building*

7.2. **Capacity building techniques**: The state of Karnataka will ensure that the following techniques are adopted for capacity building, as may be appropriate in different districts:

(i) The state will prepare different training modules for each level to ensure maximum benefit from training, productivity, efficient use of resources and high motivation among the personnel.

(ii) The officials involved in SLWM and elected representatives should be mandated to attend a minimum number of hours of training and should be certified on the basis of clearing certain exams. In the event the officials do not clear the exams, there should be a provision for re-exam and review and if the official(s) continue to fail in the exams, the concerned head of department and/or CEO can consider taking disciplinary action against such official.

(iii) The state will focus on training of the trainers such that consistent information is disseminated to various governmental stakeholders involved in the implementation of SLWM systems across GPs.

(iv) Training related to safe sanitation and best waste management practices shall be made mandatory at the time of induction for all staff at each level of administration related to sanitation.

(v) The district officials should also consider measures such as deputation of personnel to other GPs and states where good practices regarding SLWM are being carried out for gaining relevant experience.

(vi) Success stories and/or good practices should be publicised in training material, department's monthly magazine, Karnataka Vikas and across other publications.

7.3. **Planning and budgets**: The Gram Panchayat Development Plan should have the details of

capacity building activities covering every village in the GP with identified training agency/institute, training modules and intended trainees. The capacity building action plan in the Gram Panchayat Development Plan shall be made taking into account the needs of the individual GPs based on the existing sanitation conditions in the GP. The state government and GPs should earmark sufficient amounts in state and GP budgets for training and capacity building of all levels of staff at regular intervals.

7.4. **Research and development:** While a number of technical options for solid and liquid waste treatment, processing and disposal are available, there are still challenges in applying them in the rural context due to various factors such as lack of technical expertise, manpower, financial resources etc. Therefore, the state of Karnataka will focus on research and development of appropriate technology for better resource recovery which can be localised and are cost effective. Other areas of research could be simple and easy to use water and sediment quality testing kits, toilets that use less water, sustainable menstruation products, low-cost technologies for emptying pits, as well as treatment of faecal sludge/other streams of waste such that there is no human contact with waste etc. The state will also ensure that any new technology is validated by KSPCB and/or any other appropriate authority and tested through meticulous pilot projects for technical, financial and environmental feasibility before being generally applied across the state.

7.5. **Role of institutions**: Karnataka State Rural Development and Panchayath Raj University and Abdul Nazir Sab State Institute of Rural Development and Panchayat Raj (along with their regional centres in Kalaburagi and Dharwad) have been set up to impart training and capacity building aimed at rural development and strengthening the Panchayat Raj Institutions. These institutions must be used to impart training and awareness for SLWM activities as well. They should also offer short and long term vocational and skill development courses in solid and liquid waste management. In addition, Mahatma Gandhi Institute of Rural Energy & Development and similar institutions can carry out research and development activities and impart training on different aspects of SLWM such as different technologies available for sustainable management of solid and liquid waste. The Knowledge Resource Centres (KRCs), other appropriate agencies/entities and/or subject matter experts should also be leveraged for local level capacity building and research-based activities.

## VIII. INFORMATION EDUCATION AND COMMUNICATION (IEC) AND BEHAVIOUR CHANGE COMMUNICATION (BCC)

8.1. For any policy or initiative to be successful, it requires significant participation, perceived need of the program and acceptance from people and communities. Demand creation is the first key step to ensure success of SLWM systems in the villages. Information, Education and Communication is an important tool in creating awareness and ensuring community demand for safe sanitation practices. Interesting, innovative and rigorous IEC is also one of the significant ways to bring about behavioural change. Set out below is an overview of the factors that the GP/district/state will need to consider while designing appropriate IEC activities:

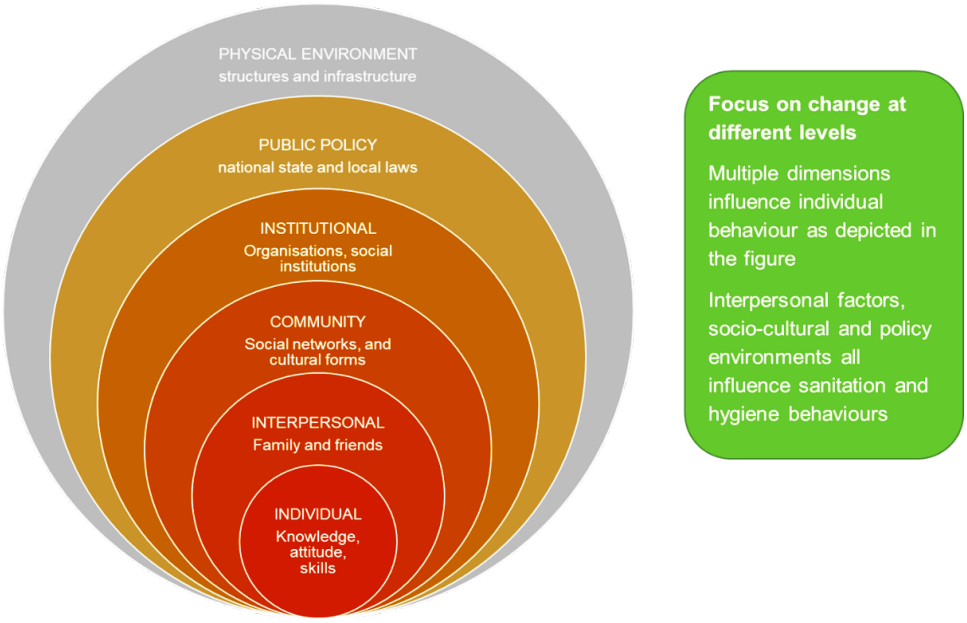



*Figure 5: Factors to consider while designing IEC activities*

8.2. While effective dissemination of IEC plays a key role in generating awareness, BCC takes it to the next level of enabling action and ensuring involvement and ownership of the SLWM practices by community on the ground.

8.3. **Planning an IEC campaign**

(i) While planning a successful IEC campaign, it is imperative to identify the perception of different stakeholders on solid and liquid waste management (i.e. the who?). Thereafter, specific topics/messages that need to be disseminated to different stakeholders should be identified (i.e. the what?). Finally, the manner of dissemination of the IEC/BCC content has to be determined (i.e. how?).

(ii) The IEC activities need to be planned well in advance (and not on adhoc basis) and this planning has to be synchronised in terms of messaging and initiatives with the overall IEC strategy of the district/state. For allocation of resources for conducting IEC activities a baseline survey shall be taken for prioritizing the GP/villages where the IEC campaign shall be taken up. IEC campaigns of other departments like Health, Education, Women and Children etc. can be converged with those of SLWM to increase the effectiveness and outreach.

(iii) The planning and monitoring of IEC/BCC activities shall be done at multiple levels:

| Level | Key Officer Responsible | Role | Supported by |
|---|---|---|---|
| **State** | Mission Director | ▪ Develop state level strategy and plan<br>▪ Operationalize state level activities<br>▪ Ensuring all IEC and BCC related positions are filled<br>▪ Engage relevant agencies and partners<br>▪ Regular monitoring and reporting | State IEC Consultant |

| | | | |
|---|---|---|---|
| **District** | CEO(ZP) | ▪ Develop detailed plans for the district<br>▪ Work out a monthly calendar of activities for the year<br>▪ Engage the services of Zilla Swachh Bharat Prerak<br>▪ Build and use social media platforms at district level<br>▪ Monitor the implementation in the GPs<br>▪ Appoint Swachhagrahis in each GP | District IEC Consultant,<br>Zilla Swachh Bharat Prerak,<br>NGOs/Sector experts |
| **Gram Panchayat/Village** | PDO | ▪ Execute the planned activities in the GP<br>▪ Motivate and identify the Swachhagrahis<br>▪ Identify and communicate local IEC/BCC needs to the district authorities | GP members,<br>local NGOs,<br>Swachhagrahis,<br>Anganwadi workers,<br>ASHA workers,<br>SHGs,<br>Headmaster, village elders,<br>Youth Groups<br>VHSNC/VWSC members,<br>local faith leaders |

*Table 4 : Overview of planning and monitoring of IEC/BCC activities*

8.4. **The Who - IEC target audience and stakeholders:**

(i) Following target groups should be kept in view while planning the campaign:

(a) *Primary Target Group* for creating awareness, raising the profile of SLWM issues and involving people in solving such issues. These include school going children (critical for BCC because they are receptive to new ideas and they could also help influence their parents to adopt good sanitation practices), women, youth, Panchayat members and village elders/ community leaders.

(b) *Secondary Target Group* such as other important stakeholders and influencers such as programme managers, district officials, etc.

(ii) Overview of target audience at different levels is provided in the picture below:

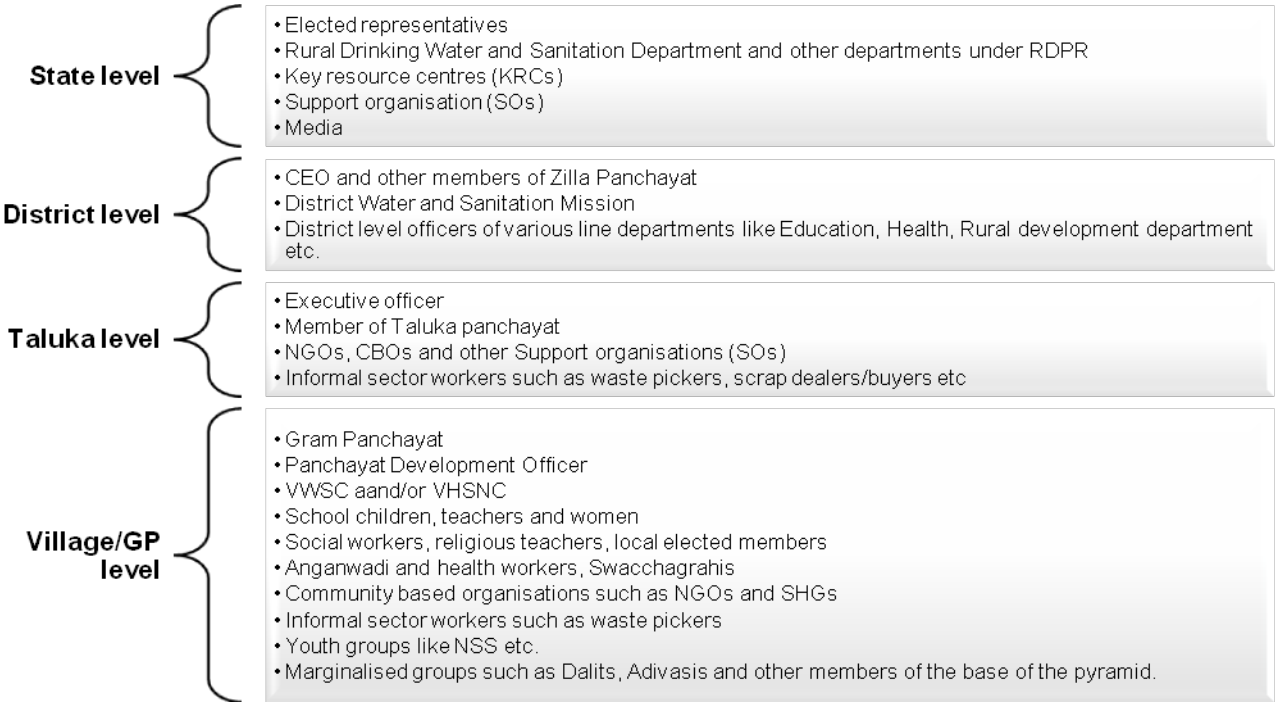



*Figure 6 : Overview of Target audience for IEC activities*

8.5. **The What – the content of the information:**

(i) Considerable evidence shows that trying to change too many behaviours does not work and therefore, the IEC strategy should focus on the following critical areas:

(a) Sustained use of toilets and its maintenance and safe sanitation practices including regular de-sludging.
(b) Prohibition of manual scavenging and health and social impacts of this practice
(c) Segregation: Importance of 3-way source segregation of waste into biodegradable, non-biodegradable and domestic hazardous categories. In this respect GPs should continue supporting existing good practices such as feeding kitchen waste to livestock and home composting.
(d) No open dumping or burning waste
(e) Impact of mismanagement of solid and liquid waste on public health and the environment.

(ii) In addition to the above main issues, the GP could also raise awareness on the following subsidiary issues:

(a) Prevention and minimising of waste at a generator level through implementation of Karnataka Plastic Ban (such as use of disposable items), rejection of products with excessive packaging and use of re-usable/ sustainable alternatives.
(b) Menstrual hygiene, sustainable options and safe disposal of sanitary waste.
(c) Village waste management program details and the need to pay for waste management services.
(d) Proper usage of treated water.

8.6. **The How – Communication strategy**

A well-planned communication strategy is necessary so that information is disseminated effectively. IEC activities to be used to convey the information are given in the table below:

| IEC activities | Target audience and suitability |
|---|---|

| | |
|---|---|
| **Kala Jathas, street plays, folk songs, folk artists** | One of the most impactful tools for awareness generation among primary target group where language and literacy are major barriers |
| **Door to Door awareness including interpersonal communication** | Swachhagrahis and other trained manpower can carry out interpersonal communication with different types of waste generators regarding SLWM activities. This is an extremely critical component of IEC/BCC strategy and the GPs should use this as one of its primary mechanism for awareness and behavioural change. |
| **Wall Painting/writing** | An appealing message displayed through wall paintings can serve as an impactful tool targeting almost everyone in and out of the village and the floating population as well |
| **Melas/ group meetings** | To be conducted at GP/taluk level |
| **Awareness and training workshops, exposure visits to locations of best practices** | To be conducted at all the levels by identifying the need and type of training required. |
| **School programmes like formation of eco-clubs, organising competitions based on solid waste management** | Target audience is school children, who can help in propagating the campaign |
| **Award presentation to villages, GPs or people performing well in the field of solid waste management** | Target audience can be rural population, officials at GP/taluk/district/state level. This promotes healthy competition among GPs and impetuous to perform better. |
| **Mass media** | Use of audio-visual on TV, audio messages through radio, community radio or public announcement in villages. Short films on success stories in other villages |
| **Print media such as pamphlets, hoardings, banners, posters etc.,** | Target audience will be rural population where literacy is not a barrier. |
| **Social media and digital platforms** | Use of social media campaigns is also an effective tool to generate awareness on SLWM. This should be used in districts where majority of the GP populations has access to mobile phones and internet facility |
| **Celebrity endorsements** | Community influencers to promote various SLWM programs /projects |
| **Celebration of major occasions (e.g. Environment Day etc.)** | Helps in promoting engagement of primary and secondary target group |
| **Walk of Pride** | Helps building pride in village residents who have attained successful milestones in the implementation of sanitation plan |

*Table 5 : Overview of IEC activities and the suitable target audience*

## IX. MONITORING OF SLWM SYSTEMS

9.1. Monitoring is one of the critical building blocks of a well-functioning solid and liquid waste management system. It is essential to ensure sustenance of safe sanitation practices and sustainable waste management systems. Performance of SLWM system shall be regularly monitored at all levels of administration i.e. GP, taluk, district and state for proper implementation and progress.

9.2. The monitoring framework for the Karnataka State Rural Sanitation Policy and Karnataka State Rural Sanitation Strategy will contain of the following broad aspects:

(i) Overview of the parameters, key indicators and benchmarks to be monitored.
(ii) The manner (including tools, technology etc.) and frequency at which the parameters and benchmarks will be monitored.
(iii) Complaint redressal system

9.3. **Overview of the parameters, key indicators and benchmarks**:

As a part of the monitoring framework, the different administrative levels should monitor direct output, long-term outcomes and personnel involved in SLWM activities.

(i) **Output monitoring:** Monitoring of direct outputs such as

(a) Extent and efficiency of containment and collection systems including percentage of waste generators covered.
(b) Setting up of proposed waste processing infrastructure within timelines included in approved DPR and implementation plans.
(c) Assessment of incurred expenditure and revenue generated as per the approved DPR and sanitation component of Gram Panchayat Development Plan.
(d) Number of IEC and BCC activities carried out within periodic timelines.
(e) Efficiency in redressal of citizen complaints pertaining to SLWM.
(f) Number of capacity building activities and their effectiveness
(g) Quality of the by-products such as compost, treated solids and water against established standards.

(ii) **Outcome monitoring:** Monitoring of impacts such as

(a) Reduction in waste generation
(b) Level of segregation at source
(c) Usage of toilets and SLWM facilities in terms of efficiency, working capacity and financial sustainability.
(d) Efficient functioning of SLWM systems and equipment
(h) Behaviour change towards waste management among rural population and sensitivity towards personnel working with waste.
(i) Long term impact on health of local populations especially among vulnerable and marginalised communities and cleanliness of the villages
(j) Air, water and soil quality around the treatment plants
(k) Financial sustainability of SLWM systems including collection of user fees.

**(iii) Monitoring of personnel**

(a) Continuous monitoring through people directly engaged in SLWM systems like swachhagrahis/sanitation motivators, ASHA workers, SLWM personnel and unit supervisors etc.
(b) Regular monitoring shall also be carried out for personnel responsible for implementation of SLWM activities as proposed under DPR, district annual implementation plan and annual implementation plan of the state.
(c) Monitoring of CBOs/NGOs/SHGs/other organizations/entrepreneurs engaged in SLWM projects.

9.4. **Manner of monitoring**

(i) **Use of technology**: In order to make monitoring efficient, various technologies like biometric system for attendance, GPS, smart phones, tablets, management information systems (MIS) etc. based on their suitability, shall be explored at each level of administration.

(ii) **Periodic reporting***:* Periodic monitoring as set out in paragraph 9.5 shall be undertaken at each administrative level to ensure quality implementation of activities and suggest remedial measures, if required.

(iii) **Audits and role of third parties**: Independent third-party audit and monitoring can be conducted at district or state level making use of Social Audit team of the districts and/or MGNREGS under Directorate of Social Audit, Government of Karnataka, KRCs and other relevant organisations. The state would aim at carrying out audits in at least 5% of the GPs every year. Rapid Action Learning Units (RALU) can be involved at state and district level to study and analyse the actions taken in rural sanitation, evaluation of their impact and identifying the best practices for up-scaling and suggesting innovations for implementation. CBOs/NGOs/SHGs/other organisations may also be engaged to conduct monitoring and evaluation surveys and participatory rural appraisals (PRA) specifically to determine key behaviour and perception changes regarding sanitation, hygiene, etc.

(iv) **Peer level monitoring***:* Similar to the monitoring during the construction of IHHL and community toilets, the peer level monitoring of a district shall be performed by district officials of another district. In the same way, inter-taluk and inter-GP monitoring of SLWM systems shall be carried out.

(v) Regional offices of Karnataka State Pollution Control Board shall monitor the sanitation and waste management systems for adherence to environmental standards relating to air, water and soil pollution among others.

9.5. **Frequency of monitoring and reporting:**

(i) Evaluation of the performance of the SLWM systems shall be carried out at District and State level on a periodic basis, as suggested in the following paragraphs. Corrective action shall be suggested based on the evaluation of key performance parameters.

(ii) There shall be monthly on-field review of SLWM systems in all GPs by the Executive Officer (EO). In addition, quarterly review of progress of SLWM activities for the taluks in the district shall be conducted by the District Collector/ Deputy Commissioner/ Magistrate/CEO of the Zilla Panchayat. Finally, bi-annual monitoring reports shall be prepared at the state level for each district to assess the progress of SLWM programme against the proposed targets in annual implementation plan.

(iii) Monitoring of the performance of CBOs/NGOs/SHGs/other organizations engaged in SLWM has to be done once every six months by the District Collector/ Deputy Commissioner/ Magistrate/CEO of the Zilla Panchayat and only those showing satisfactory results are to be retained.

9.6. The outcome of the above monitoring and evaluation activities should include corrective actions (in case of deviations, non-compliance and/or lack of progress), awards, publicity and recognition for good performance. The state shall provide detailed instructions to the districts and GPs on monitoring and evaluation parameters including outcomes of such monitoring exercises.

9.7. **Complaint Redressal System**

For effective functioning of SLWM plan and systems, a robust complaint redressal system is imperative. This system creates a platform for citizens to voice their complaints regarding waste management services and is an additional monitoring mechanism for the GP. This system

could be enabled through complaints to the PDO and members of the VWSC/VHSNC and/or any other mechanism which the GP may consider appropriate. The GP shall ensure that each grievance is redressed in a timely and efficient manner bearing in mind the type of grievance, inconvenience caused to public and the remedial action proposed to be taken. The PDO should make an area-wise periodic (daily, weekly or monthly) report of the number and type of complaints received, remedial action taken including time taken for such action, feedback of the complainant and pending complaints. This should be submitted to the EO and CEO as a part of the regular monthly and quarterly reporting formalities.

## ANNEXURE I | METHODS FOR RETROFITTING OF TOILETS

### ODF : Can we make it Sustainable in True Sense ?

### Pit Toilet : Major Flaws observed & possible remedies

### ODF in true sense is…..

- Every Household has a toilet / Access to toilet
- Every Toilet is used
- No one defecates in the open

**Does the story end here…..?**

### Pit Toilets :Major Flaws observed

- Improper Selection of site
- Single Pit instead of two
- Excessively deeper pits
- No safe distance between pits
- No honeycombing
- Cement finish from inside
- Two interconnected pits
- Vent Pipe attached

### Is our program sustainable ???

- Are there some families who are left outs ?
- Are the toilets USABLE in true sense?
- Are there going to be some O&M issues?

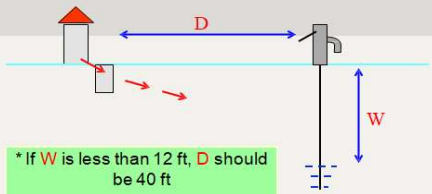
### 1. Selection of site

- Safe distance from drinking water sources
- Safe distance from big trees
- Safe distance from house wall

### Major types of Toilets

- Pit Toilets
- Septic Tank toilets
- Ecosan toilets
- Biotoilets
- Other types (non-descript ?)

### How to determine distance from water source




* If W is less than 12 ft, D should be 40 ft

* If W is more than 12 ft, D can be 10 ft

## Improper site : Repercussions

- Microbial contamination
- Chemical contamination :Nitrate pollution

## Leach pit : Square or round ?

## Improper site :Possible Retrofitting

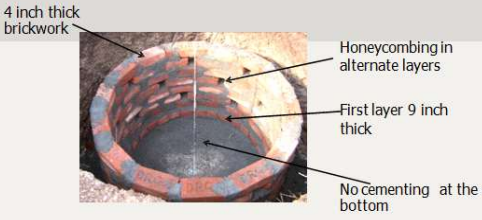
- Check location of Toilet vis a vis ground water source
- If found polluting ground water : Abandon
- If not found polluting : Check water quality periodically

## Possible Retrofitting

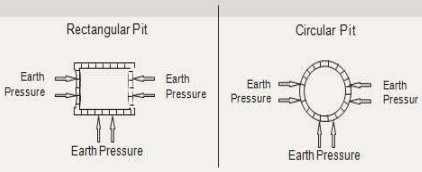
- Square pits : Continue till these sustain
- Replace with new ones with correct design

## 2. Size, shape & construction of pit

## Ideal Construction of leach pit




## Leach pit : Square or round ?




Pits smaller than required

## Excessively deep leach pit

## Possible Retrofitting

- Smaller pits : Continue till these fill up
- Replace with new ones with correct design
- Deep pits :
  - Check for water contamination
  - Abandon if polluting
  - Fill up with compact earth upto safe level

## Possible Repercussions

- Manure will not dry
- Removal difficult
- No congenial conditions for pathogen deactivation

Excessive honeycombing

No honeycombing

## Possible Retrofitting

- Dismantle the pit not in use & construct new one at safe distance
- Construct partition wall in between to extend sideward as well as below the bottom
- For more than one toilets at one place construct two common bigger pits instead of too many smaller ones

## Possible Retrofitting

- Excessive honeycombing : Close extra honeycombs
- Continue till it sustains
- In case of no honeycombing : Have these carved in required numbers

## Errors in junction chamber

## No safe distance between pits

## Possible Repercussions

- Manure will not dry
- Removal difficult
- No congenial conditions for pathogen deactivation

## Possible Remedies

- Dismantle the faulty chamber & replace with correct one.
- Block one way to direct flow to only one pit at a time

## Emptying of pits :Some more Essentials

A well defined protocol is essential

1. Timely change over of pits
2. Proper time of emptying
3. Safety measures
4. Due hygienic measures to be followed
5. No social classism to be encouraged

## Single Pit Toilet

## Single Pit Toilet

- Pit content does not decompose properly & fully
- Removal becomes problematic
- No scope for a change over
- No resting period as per WHO guidelines

## Possible Repercussions

- What after it is full?
- Emptying is problematic / unhygienic / inhumane
- People tend to abandon the toilet

## Possible Remedies

- Best solution would be to have one more pit with a provision of junction chamber
- Vermifiltration
- Removal of manure with due precautions & use the same pit again

## Emptying of pits :Essentials

- Myths about emptying
- Myths about the contents
- Time of emptying
  - When to empty, when not to
- Method of emptying
- Safety measures
- Hygiene measures

## Vermifiltration / Tiger toilet

## Removing manure with due precautions

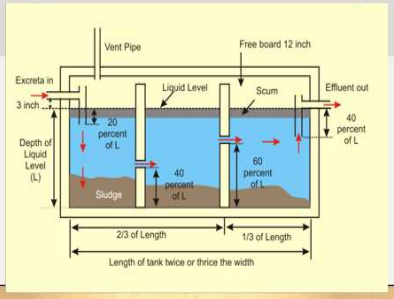
- Remove the pit cover
- Cover the contents with a mixture of soil & ash
- Replace the cover
- Don't use toilet for a week
- Remove cover
- Remove the contents
- Start using the toilet again
- Make a conical heap
- Cover the heap with black polythene
- Keep in sun for 3-4 days
- Safely use the manure

## Septic Tank Toilet :Errors observed

- Inadequate volume of tank
- Errors in internal structure
- Inadequate Baffle walls
- Errors in Inlet / outlet connections
- Has an inlet but no outlet
- Effluent let in open / open drain

## Septic Tank Toilet : Major Flaws observed & possible remedies

## Septic Tank Toilet : Standard design




## Septic Tank Toilet

**Most loved but least understood**

## Septic Tank : Treatment of effluent essential

## Septic Tank Toilet :Myths & Truths

| Myths | Truths |
|---|---|
| eptic tank of any size can work | Size of a septic tank has to be decided according to the number of users |
| luent from a septic tank is safe and hence can et out in the open or into an open drain | The effluent may contain several pathogens and needs to undergo secondary treatment |
| eptic tank lasts very long and does not need ptying at shorter intervals | A Septic tank needs to be emptied as often as necessary (generally once every 2 years) to prevent build-up and filling up of solids as a result of which raw sewage and solids flow out of the tank. |
| eptic tank need not be filled with water before nmissioning | A septic tank is an anaerobic digester of continuous type. It mustbe filled with water before commissioning for a proper functioning. |

## Septic Tank Effluent : What are the right options

*Decentralized* ➡ *Semi-centralized* ➡ *Centralized*

1) Effluent discharged in a individual leach pit
2) Effluent discharged in a community leach pit
3) Stabilization pond with adequate HRT
4) Soil biotechnology / Phytorid systems

- Leach Pit for Effluent discharge

*Decentralized*

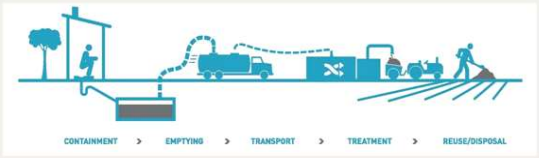
**Where does the sludge go ?**

1. Rivers / water bodies
2. Open drains
3. Open barren land
4. Highways
5. Farms
6. STPs of nearby cities
7. FSTPS specially established for FSM

- Community Leach Pit for group of houses

*Semi-centralized*

FSTP :Recommended Infrastructure forFeacal Sludge Management




**Retrofitting of Septic Tank Toilet**

- Check volume of the tank
- Check the inlets & outlets & replace by "Tees"
- Check for the vent pipe & make necessary corrections
  - Location, Cowl, Mosquito net
- Effluent Treatment : Complete ban on discharge in open / Open drains
- Construct leach pit for Effluent discharge
- Tell user about Desludging intervals : Once in 2 years
- Monitor Desludging

Steps In FSM

1. Containment (Toilet)
2. Emptying
3. Transportation
4. Treatment
5. Reuse / Disposal

Septic Tank : How to manage the Sludge??

**Retrofitting of Septic Tank Toilet**

- Check volume of the tank
- Check the inlets & outlets & replace by "Tees"
- Check for the vent pipe & make necessary corrections
  - Location, Cowl, Mosquito net
- Effluent Treatment : Complete ban on discharge in open / Open drains
- Construct leach pit for Effluent discharge
- Tell user about Desludging intervals : Once in 2 years
- Monitor Desludging

## A few words about Super structure

## ODF Sustainability :Some useful tips

- Fact finding exercise : House to house survey
- Categorization of faulty toilets
- Plan of action
  - Who is to do what ?
  - Involving people in the process
- Focused IEC
- Technical training in retrofitting
- Concurrent quality monitoring

## Vent pipe not needed in pit toilet

Very less production of gases

Gases get leached in surrounding soil like water

Vent pipe in pit toilet can cause mosquito breeding & methane gas in atmosphere

## Vent pipe is a must in septic tank

1) Vent pipe dia = 2- 3 inch
2) Vent pipe should be minimum 2 ft above the nearest wall
3) Vent pipe should not have bends
4) A cowl is essential in a vent pipe
5) Cowl should be covered with a mosquito net.
6) Vent pipe should protrude from tank & not from the inlet pipe.

## Super structure :Common errors & Possible remedies

| Errors | Remedies |
|---|---|
| Height not adequate | Extend the height to adequate standards |
| No ventilators provided | Provide a small window at appropriate place |
| Platform around pan does not have smooth finish & proper slope towards pan | Correct the platform finish accordingly |
| No roof / no door | Provide necessary roof & door |

## ANNEXURE II | ILLUSTRATIVE LIST OF BIO- DEGRADABLE WASTE, NON BIO- DEGRADABLE WASTE DOMESTIC HAZARDOUS WASTE AND SANITARY WASTE FOR THE PURPOSE OF SEGREGATION

**Part A – Illustrative list of Bio-degradable Waste:**

- Kitchen/market waste including fruit and vegetable peels, leftover and/or stale food, tea leaves, eggshells
- Meat and bones
- Leaf litter, including flowers
- Coconut shells
- Wood/ leaf ashes

**Part B – Illustrative list of Non Bio-degradable Waste:**

- Newspapers
- Paper, books and magazines
- Glass
- Metal objects and wire
- Plastic
- Aluminum cans
- Rubber
- Wood /furniture
- Packaging
- Fabrics
- Styrofoam
- Thermocol
- TetraPak

**Part C – Illustrative list of Domestic Hazardous Waste and Sanitary Waste**

**Part C1– Illustrative list of Domestic Hazardous Waste**

- Aerosol cans
- Bleaches and household kitchen and drain cleaning agents
- Batteries, oil filters and car care products and consumables
- Oils, chemicals and solvents and their empty containers
- Cosmetic items, chemical-based insecticides and their empty containers
- Medicines including expired medicines
- Paints, oils, lubricants, glues, thinners, and their empty containers
- Pesticides and herbicides and their empty containers
- Photographic chemicals
- Thermometers and mercury-containing products

**Part C2 – Illustrative list of Sanitary Waste**

- Used diapers
- Sanitary towels or napkins, menstrual cloths and similar items containing bodily fluids
- Condoms,
- Band aid, household gauze and soiled cotton
- Syringes from households

## ANNEXURE III | NORMATIVE STANDARDS FOR MANPOWER AND VEHICLES

### 1. MANPOWER AND VEHICLES FOR COLLECTION AND TRANSPORTATION

| Type of vehicle | Population density (per sq. Km) and terrain | Carrying Capacity | Number of vehicles | Basis of manpower allocation |
|---|---|---|---|---|
| **Primary collection** | | | | |
| Pushcarts[11] | Dense (>400 persons per $km^2$), flat terrain and narrow streets | 250 L /125 Kg | 1 pushcart per 300 households and small shops | Door to Door collection @1 worker per 150 households and small shops |
| | | | | Along the street mechanism with a whistle or announcement @1 worker per 240 households and small shops |
| Pedal Tricycle[12] | Moderately dense (<400 persons per $km^2$), flat terrain and narrow streets | 500 L/ 250 Kg | 1 pedal tricycle per 300 households and small shops | Door to Door collection @1 worker per 150 households and small shops. |
| | | | | Along the street mechanism with a whistle or announcement @1 worker per 240 households and small shops. |
| Electric vehicle/any smaller motorized vehicle[13] | Sparse (<200 persons per $km^2$) persons, hilly terrain and wider roads/streets | 1000L/350 Kg | 1 electric /motorised vehicle per 200 households and small shops | One driver per vehicle |
| Auto tippers[14] | Irrespective of population density and terrain but should be deployed in wider streets (may have to supplement with pushcarts for access to narrow lanes) | 1500 L/ 750 – 1000 Kg | (i) One per 800 households and small shops.<br>(ii) Separate vehicle required for slaughterhouse waste if the generation exceeds 100 Kg per day | One driver and one helper/loader per vehicle |
| **Secondary collection** | | | | |
| Auto tippers | - | 1500 L/ 750 – 1000 Kg | One per 2000 households and small shops. | One driver and one helper per vehicle |
| Tractor | - | 4000 - 5000 kg | Shall be considered only for multi-GP solid waste management plan | Not applicable at a GP level |
| Trucks | - | 6000 kg | Shall be considered only for multi-GP solid | Not applicable at a GP level |

[11] Secondary collection vehicle needed if the waste unit is more than 500m away from the farthest collection point.
[12] Secondary collection vehicle needed if the waste unit is more than 2km from the farthest collection point
[13] Secondary collection vehicle may not be needed if the waste unit is within 5km of the farthest collection point
[14] Secondary collection vehicle may not be needed if the waste unit is within 5km of the farthest collection point

| | | | | |
|---|---|---|---|---|
| | | | waste management plan | |

## 2. MANPOWER FOR WET WASTE MANAGEMENT AND SORTING OF DRY WASTE

(i) The standard that can be used for secondary sorting of dry waste into 8 different categories is 16 - 22 kgs per hour per person.

(ii) The standard that can be used for composting is one person in case the incoming wet waste is less than 200 kgs per day and working for 2-3 hours.

**Notes:**

(i) Collection can be done in one shift of 6 hours or in two shifts of 3 hours each in morning and evening.

(ii) Each primary waste collection vehicle should have two workers who can together cover twice the number of households as compared to a single waste collector. In case of electric vehicle/ motorized vehicle, the driver can be accompanied by 1 helper.

(iii) After collection, the collection staff can be engaged for two hours for secondary sorting/segregation at the dry waste storage shed in the afternoon. Alternatively, the GP can also consider using the staff at the wet waste processing unit for composting of wet waste. The collection staff can be also engaged in sweeping of the village as well.

(iv) In case of transfer of dry waste from dry waste storage unit to the nearest ULB aggregation point, the GP should consider leasing trucks/tractor rather than purchasing them.

## 3. NORMATIVE STANDARDS FOR ESTIMATION OF WASTE GENERATION[15]

Waste management planning shall be done to sustain the population increase for at least next 10 years. Population projection can be done using the formula given below:

**Population projection**

$P_n = P_p (1 + r)^n$

Where $P_n$ = Future projected population after "n" number of years
$P_p$ = Present population
r = population growth rate (population increase per year)[16]
n = number of years

**Average per capita generation[17]**

Per capita generation for solid waste: 150-650 gm[18] per day.

[15] Please refer to the model DPR included in Annexure VI for the categories of waste generators.
[16] Population growth rate for each state is available from Census of India
[17] Waste generated by one person per day: This can be calculated by taking total waste generated by all the sources divided by total population of the area (in this case GP)
[18] This is excluding bulk waste generators (i.e. waste generators generating more than 50 Kg per day)

## ANNEXURE IV | WASTE FLOW IN GRAM PANCHAYATS

### PART A – PERI – URBAN DENSELY POPULATED GRAM PANCHAYATS



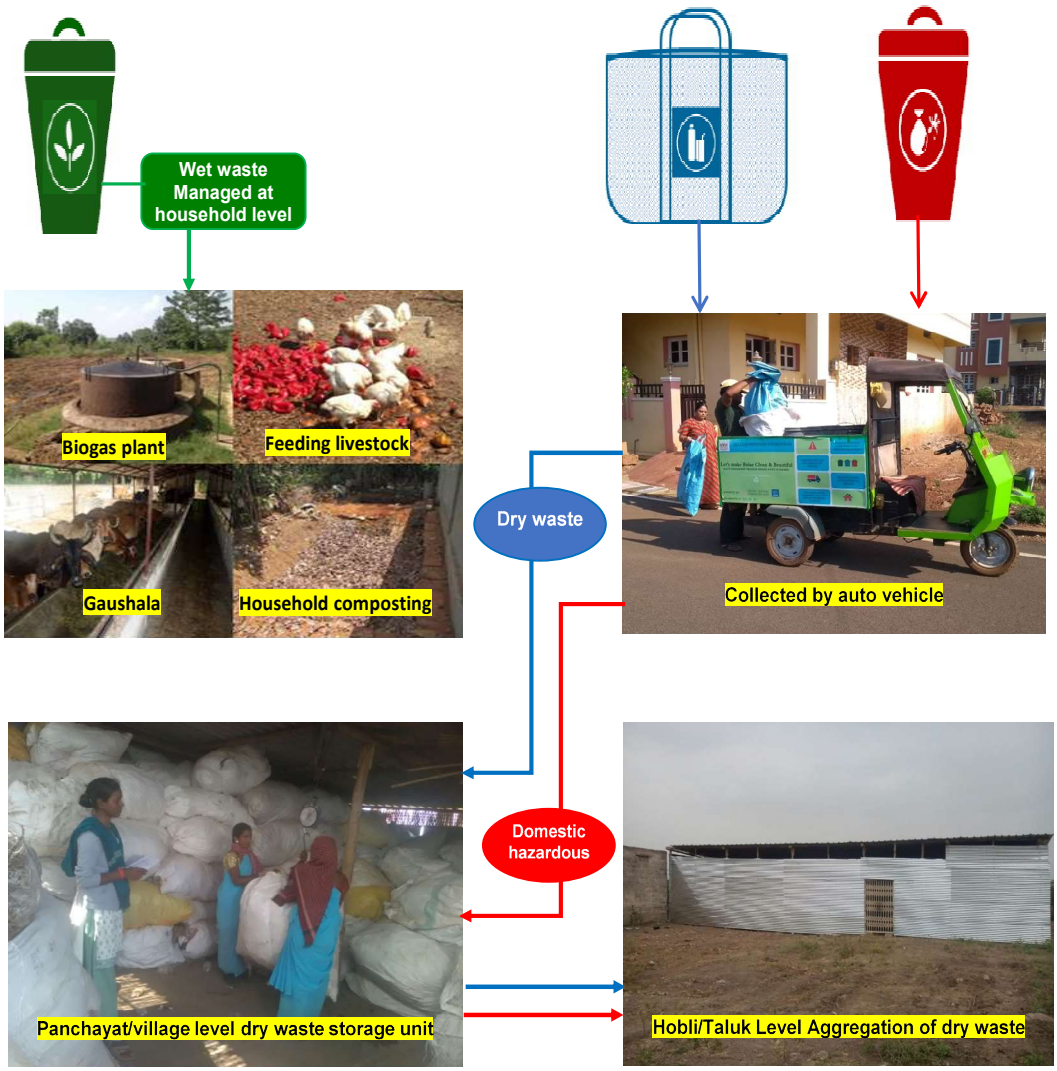

Wet waste

Dry waste



Domestic hazardous

## PART B – RURAL SPARSELY POPULATED GRAM PANCHAYATS



## ANNEXURE V | WET WASTE PROCESSING TECHNOLOGIES

### Household and street level composting

| Technology | Applicability | Financial Costs[19] | | | | Limitations |
|---|---|---|---|---|---|---|
| | | Household (average 5 members) | | Community/street level (about 50 households) | | |
| | | Capital cost | Operational cost | Capital cost | Operational cost | |
| **Underground unlined manure pit or garbage pit** | Rural areas with low rainfall<br>Houses with an open space of about 7 sq.m<br>Houses with no cattle or with single cattle. | **Materials**: Nil<br>**Manpower**: Rs. 500 per pit (2-man days unskilled labour to dig the pit) | Nil | **Materials** – Nil<br>**Manpower**: Rs. 750 per pit (3 man days unskilled labour) | Nil | Not suitable for heavy rainfall areas and rocky terrain. |
| **Underground brick lined manure pit or garbage pit** | Rural areas with low rainfall<br>Houses with an open space of about 7 sq.m<br>Houses with no cattle or with single cattle<br>Loose soil structure. | **Materials** - Rs. 1800-2000 (Approximately 200 bricks, 1/3 bag cement, 3 cubic feet sand)<br>**Manpower**:<br>Rs. 450-500 per pit (one-man day unskilled and 1/2 man day skilled labour) | Nil | **Materials** – Rs. 11,000-11,500 (Approximately 1200 bricks, 3 bags cement,<br>20 cubic feet sand)<br>**Manpower**: Rs 1500-2000 per pit.<br>(3 man day unskilled labour and 2 man days skilled labour) | Nil | Not suitable for heavy rainfall areas and rocky terrain. |
| **Overground heap** | Rural areas with high rainfall and rocky terrain<br>Houses with an open space of about 7 sq.m<br>Houses with no cattle or with single cattle. | **Materials** - Nil<br>**Manpower**: Rs. 250 (1-man days unskilled labour to make the platform. | Nil | **Materials** - Nil<br>**Manpower**: Rs 500 (2-man days of unskilled labour) per heap. | Nil | |
| **Over ground brick lined compost tank** | Rural areas with high rainfall and rocky terrain<br>Houses with an open space of about 7 sq.m | **Materials** – Rs. 3500-4000 (Approximately 400 bricks, 1/2 bag cement, 5 cubic feet sand) | Nil | **Materials** – Rs. 11,000-11,500 (Approximately 1200 bricks, 3 bags cement, 20 cubic feet sand) | Nil | |

[19] Labour and material rates as per MNREGA schedule of rates

| Technology | Applicability | Financial Costs[19] | | | | Limitations |
|---|---|---|---|---|---|---|
| | | Household (average 5 members) | | Community/street level (about 50 households) | | |
| | | Capital cost | Operational cost | Capital cost | Operational cost | |
| | Houses with no cattle or with single cattle. | **Manpower**: Rs.450-500 per tank (one man-day unskilled and 1/2 man-day skilled labour) | | **Manpower**: Rs 1500-2000 per tank.<br>(3 man day unskilled and 2 man days skilled labour | | |
| **Pipe composting** | Applicable to houses with shortage of space.<br>Houses with no cattle or with single cattle. | **Materials** – Rs. 1000 per set (2 pipes)<br>**Manpower**: Nil | Nil | NA | NA | |

**Community level organic waste management**[20]

| Technology | Brief description | Suitability (TPD) | | Area ($m^2$) | | CapEx (INR In Lakhs) | | OpEx (INR per annum) | | Handling Expertise |
|---|---|---|---|---|---|---|---|---|---|---|
| | | Min | Max | Min | Max | Min | Max | Min | Max | |
| **Vermi Composting** | Vermi compost is the product of the composting process using various species of worms, usually red wigglers, white worms, and other earthworms, which feed in mixture of decomposing vegetable or food waste, and release droppings called vermi cast which can be used as compost for soil | 0.10 | 2 | 100 | 2500 | 0.25 | 2.50 | 2800 | 6000 | Unskilled |
| **Windrow Composting** | Windrow composting is the production of compost by piling biodegradable waste, in long rows (windrows) and turning them. This method is suited to producing large volumes of compost. | 50 | 1000 | 12141 | 60705 | 650 | 5500 | 83 | 467 | Skilled + Semi + unskilled |
| **Pit Composting** | Pit or trench composting is the process of burying organic waste directly into soil. This is a slower composting process than composting in well-managed windrows, but the trenched materials will retain more nitrogen during the process. | 0.10 | 2 | 100 | 2500 | 0.25 | 3 | 500 | 6200 | Unskilled |
| **Aerated static pile Composting** | Aerated Static Pile (ASP) composting, refers to the system used to biodegrade organic material without physical manipulation (turning) during composting. | 0.10 | 10 | 300 | 1000 | 2.50 | 11 | 183 | 6000 | Unskilled |
| **Biomethanation / Biogas** | Biomethanation is the anaerobic (in the absence of free oxygen) fermentation of biodegradable matter in an enclosed space under controlled conditions of temperature, moisture, pH, etc. | 0.50 | 300 | 350 | 37000 | 15 | 9000 | 100 | 1000 | Skilled + Semi + unskilled |

[20] The numbers in this annexure are on the basis of literature review and will need to be authenticated as per actual ground operations.

## ANNEXURE VI | MODEL DRY WASTE CENTRE/UNIT

Model shed for dry waste

Low and open segregation areas for easy sorting and storage of segregated dry waste.

Segregation of dry waste

Weighing of incoming dry waste

**NORMATIVE STANDARDS FOR DRY WASTE UNIT**

| S.no | Particulars | Details |
|---|---|---|
| 1. | Waste handling capacity of dry waste management unit | 1000 Kgs per day |
| 2. | Maximum period of storage considered | 1 month |
| 3. | Height of storage unit (in feet) | 8 |
| 4. | Area required for incoming waste (in square feet) | 40 |
| 5. | Area required for sorting of waste (in square feet) | 25[21] |
| 6. | Area required for baling unit (if baling is planned) (in square feet) | 20 |
| 7. | Area required for storage of sorted waste (baled) (in square feet) | 714.3 |
| 8. | Area required for storage of sorted waste (unbaled) (in square feet) | 1200 |
| 9. | Toilet block and washing areas (in square feet) | 150 |
| 10. | Vehicle parking area for one vehicle, if required (in square feet) | 300 |
| 11. | Extra space for unforeseen circumstances (in square feet) | 200 |
| 12. | **Total area required for Dry waste management unit (with baling facility) (in square feet)** | 1449.3 |
| 13. | **Total area required for Dry waste management unit (without baling facility) (in square feet)** | 1915 |

[21] This is the minimum area to be considered. In case more than 2 persons are employed this area can be increased to 10% of the total area required for storage.

## ANNEXURE VII | SUGGESTED TECHNOLOGY OPTIONS FOR TREATMENT OF LIQUID WASTE

Though there are several treatment technology options for liquid waste, when it comes to rural context, availability of skilled resources and technical services for operations and maintenance play a key role in deciding the most suitable technology in addition to the availability of funds and land for construction. Technologies which are easy to maintain and operate should be chosen to ensure sustained operation.

Following are a few technology solutions suggested for treatment of both streams of domestic liquid waste.

### I. Blackwater/faecal sludge/septage:

In order to manage the blackwater/faecal sludge/septage efficiently, it is important to give due consideration to each activity along the sanitation services chain as shown on paragraph 5.2 of the Karnataka State Strategy above. The following sections detail out a few options available for the same.

### 1.1. Containment systems

(i) **Twin-pit:** Twin-pits are two underground chambers (pits) provided to hold faecal sludge. Both the pits should be at least 1 meter apart. A single pipe leads from the toilet to a small diversion chamber, from which separate pipes lead to the two underground chambers. The pits should be lined with open jointed brickwork. Each pit should be designed to hold at least 24 months accumulation of faecal sludge. Wastewater is discharged to one chamber until it is full and then switched to the second chamber by changing the flow in the diversion chamber. Just before the second chamber is full of faecal sludge, the contents of the first pit are dug out. During the time of storage, digestion would ensure that it is odourless and free of pathogens. However, safety measures should be taken against direct human contact during the emptying of the first pit.

**Advantages**

(a) Takes care of faecal sludge at source, no further treatment is required as the composted faecal sludge is used in farms. If not used in farm, then arrangements should be made for safe disposal
(b) Simple technology
(c) No electrical energy is required
(d) Low operating costs
(e) Long service life
(f) Small land area required (can be built underground)

**Disadvantages**

(a) Not applicable in high water table areas due to risk of polluting ground water.

**Costs**

The cost of construction of each unit might be in the range of Rs. 5,000-7,000 depending on the size, cost of local material and labour. There is no maintenance requirement for this option, however after one of the pits is filled up and allowed enough resting time of at least 2 years the composted sludge would need to be removed and used for farming/horticulture etc. which might involve some labour. However, in practice, mostly the household owner carries out this activity hence we can assume a near zero maintenance cost.

(ii) **Septic tank:** A septic tank is a watertight chamber made up of brick work, concrete, fibreglass, PVC or plastic provided to hold back water from cistern flush or pour flush toilets and includes a soak pit. A properly designed septic tank provides primary treatment to certain degree. Settling and anaerobic processes reduce solids and organics, but the treatment is only moderate. Accumulating faecal sludge needs to be dug out of the chamber at a regular interval and correctly disposed of after proper treatment in another facility. Effluent is infiltrated into the ground through the adjoining soak pit or transported via a sewer to a treatment plant in another location. During designing, the Standards specified by the CPHEEO Manual, IS: 2470 or SBM-G guidelines would need to be followed on ground.

**Advantages**

(a) Simple and robust technology
(b) No electrical energy is required
(c) Low operating costs
(d) Long service life and suitable in high water table areas
(e) Small land area required (can be built underground)

**Disadvantages**

(i) Low reduction in pathogens, solids and organics
(ii) Regular desludging must be ensured
(iii) Effluent and sludge require further treatment and/or appropriate discharge

**Costs**

Though the septic tank can be constructed on site along with the toilet or other building structure, readymade septic tanks are also available in the market today (with different materials used for construction). The cost range could vary between Rs. 5,000 – 18,000 depending upon the type of material and size considered (which would need to be calculated depending on number of users). The operating costs for these would ideally include some repairs over a longer period of time and regular desludging after at least 2-3 years (depending on the size of septic tank) which would cost the user anywhere between Rs. 800 to 3000 in these areas (as per information provided during site visits).

1.2. **Faecal sludge collection and conveyance mechanism.**

There are desludging vehicles available in market to extract and transport faecal sludge known as “Cesspool vehicles” or “Vacuum trucks” commonly referred to as “Honeysuckers” in recent times. Most commonly available and used desludging equipment in India have been listed below. Depending upon the accessibility and capacity of containment unit most feasible desludging vehicle should be procured.

*Cesspool vehicle options*

| Capacities | Carriage | Capital Cost | Width |
|---|---|---|---|
| 500 – 1000 Litre | Mounted on Auto | Rs. 4- 5 Lakhs per vehicle | 1.5 meter |
| 1500 – 2000 Litre | Mounted on a four-wheel LCV | Rs. 7 -8 Lakhs per vehicle | 1.5 meter |
| 3000 – 5000 Litre | Mounted on a Tractor | Rs. 12-15 Lakhs per vehicle | 2 meters |
| 3500 – 5000 Litre | Mounted on a mini Truck | Rs. 15-16 Lakhs per vehicle | 2.5 meter |

| | | | |
|---|---|---|---|
| 5000 – 6000 Litre | Mounted on a truck | Rs 20 – 22 Lakhs per vehicle | 3 meters |

For each emptying machine irrespective of the size at least one operator and one driver will be required for ensuring smooth operations.

1.3. **Treatment of blackwater/faecal sludge/septage**

(i) Faecal Sludge treatment can be divided into four steps:

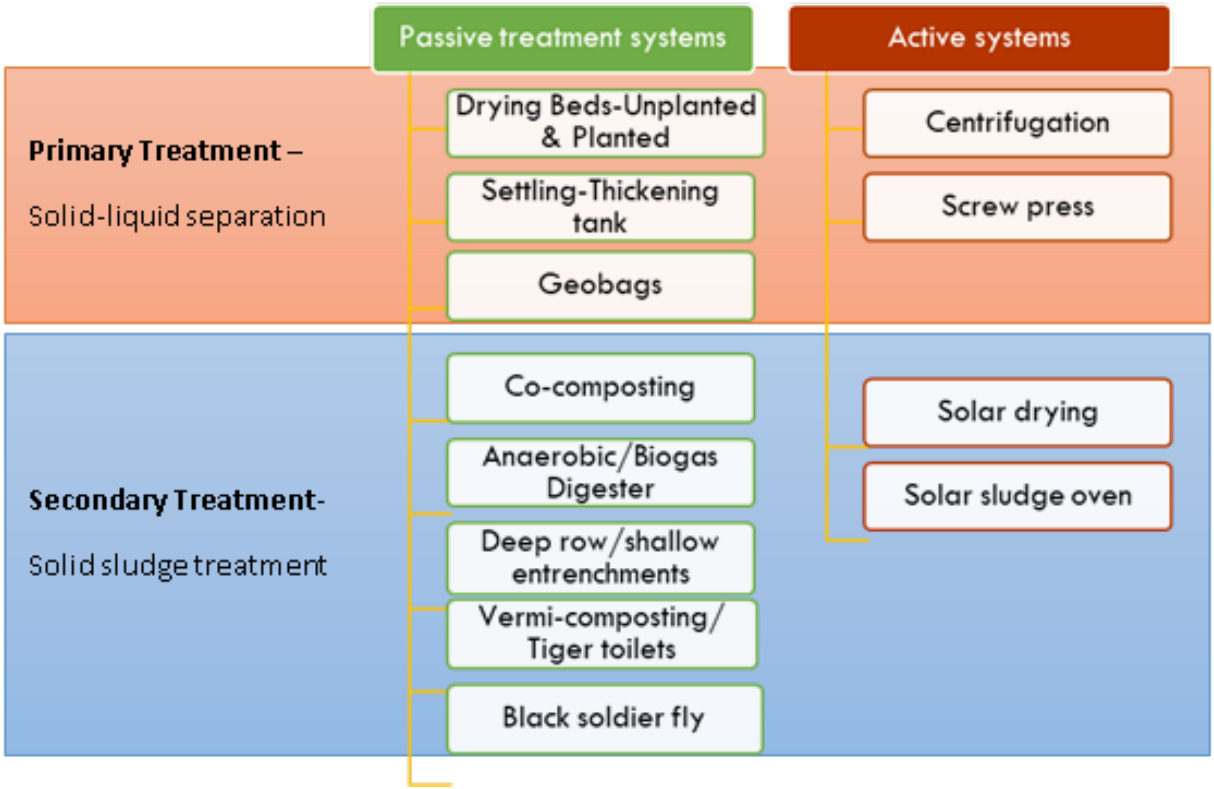
(a) Primary treatment (separation of solids and liquids)
(b) Secondary treatment of solid part/sludge (solid which is generated from the primary treatment)
(c) Secondary treatment of liquid part/ effluent (liquid which is generated from the primary treatment) and finally
(d) Tertiary treatment of effluent from the secondary treatment modules (final treatment of the liquid and solid parts).

(ii) In the rural context, technologies selected for treatment of wastewater and faecal sludge should be low on Capex, Opex and should be easy to maintain by local level entities. Technologies available in market can be classified into passive and active systems as shown below. In order to arrive at a logical quantity of FS to be treated, the existing desludging numbers per day/week shall also be identified by discussion with the GP/Taluk officials and vehicle operators. The final design quantity of faecal sludge to be treated shall be arrived at based on discussions on the theoretical (generation) and practical (desludging practice) findings. In order to decide on setting up of an FSTP, the first consideration shall be given to availability of a sewage treatment plant (STP) or FSTP in nearby urban areas. These existing plants could be used (with suitable modifications) for treating FS from rural areas. In case no such treatment facility is available, then a cluster level FSTP could be planned such that all villages falling within a radius of upto 15 kms could be catered to. Finally, if both these solutions are not feasible then a GP level FSTP would need to be designed with a suitable capacity.

(iii) While deciding on an FSTP for a village or group of villages, due considerations will have to be given to the ideal location of such an FSTP to:

(a) Optimize the distance to be travelled by the desludging vehicles/vacuum trucks
(b) Availability of sludge on daily basis.
(c) The type and width of roads available for proper access to the FSTP
(d) The administrative set-up to ensure continued co-operation between all the villages which share such an FSTP facility
(e) Common understanding and agreement on the structure and modalities of investment on construction of FSTP as well as sharing of the operational expenditures among all the related villages.
(f) Contract and reporting structure to be entered into with the operator and modalities of the funds transfer for both construction and operation & maintenance.

(iv) The passive systems are designed around nature-based systems while the active systems use electrical or mechanical energy for the process of treatment.

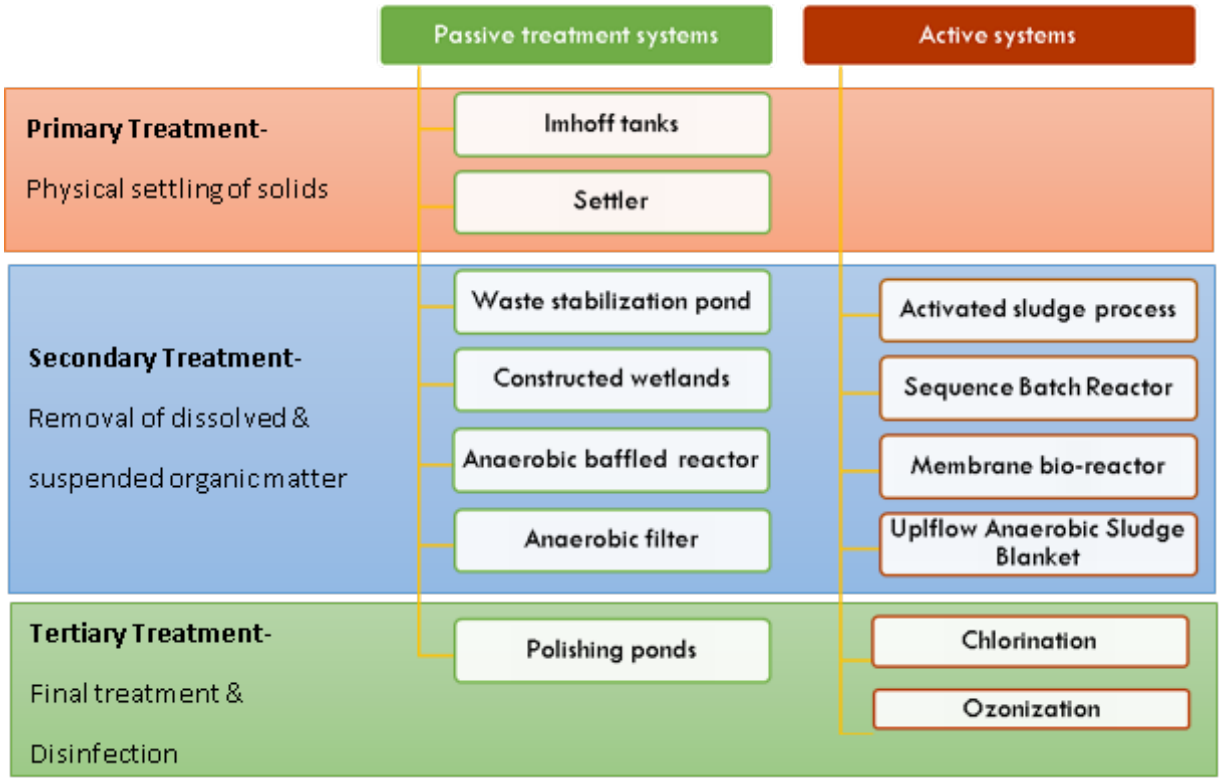



*Faecal sludge treatment options*

The capital cost for the passive systems cannot be standardized based on capacity but will be dependent of several factors like loading rate, drying period, climatic conditions, level of treatment preferred, costs of materials & human resources in different locations, etc.

**II. Greywater**

The different technology options available for treatment of the greywater as well as liquid percolate of faecal sludge/septage have been provided below on the same basis of Passive and Active systems as defined above. In order to keep the CapEx and OpEx low, it is advised that passive treatment systems be chosen in rural areas.




*Liquid component treatment options*

While discharging of final by-products of both solid and liquid components of the above, the adherence to environmental norms and existing standards prescribed by the regulatory authorities/KSPCB shall be ensured. Suitable tests would need to be conducted on samples regularly through designated laboratories for ensuring such adherence.

## ANNEXURE VIII | GUIDELINES FOR SELECTION OF SUITABLE TECHNOLOGIES FOR LIQUID WASTE MANAGEMENT

As each of the treatment options listed out in **Annexure VII** provides for treatment of different parts of liquid waste, a combination of the same would be required to plan an integrated and efficient treatment system on ground. As the existing examples of treatment in terms of combination are limited in faecal sludge, following could be the suggested approach for rural areas in Karnataka based on the category of rural area (as provided in **Annexure IX**: classification of districts in Karnataka):

*Suggested models of liquid waste management*

| Technologies | Advantages | Limitations | Costs | Applicability |
|---|---|---|---|---|
| **Faecal sludge/septage treatment** | | | | |
| Twin-pit Upgrade: | Relatively cheap; Household level intervention; single pits can easily be upgraded to twin-pits; | Minimum distance from groundwater table and drinking water sources (e.g. wells) has to be maintained | Rs. 10,000-14,000/ Rs. 5000-7000(single pit upgrade) | • Areas with low ground water table<br>• Agrarian areas<br>• Hilly terrain and arid regions |
| Deep row trenching: | Relatively cheap; Caters to low/irregular loads; no skill required to construct/operate, No/low nuisance. Retention Time:6-8months | Minimum distance from groundwater table and drinking water sources (e.g. wells) has to be maintained, Land required as per the amount of sludge to be disposed | Capex: Rs. 14 Lakhs (over a period of 10 years) Rs.500/KLD | Same as above |
| Planted drying beds | Low O&M, semi-skilled labour required, relatively higher flexibility in terms of irregular load intake, Half the cost of Devanahalli; doesn't depend on groundwater levels | Demands digested sludge, not suitable for intake from public toilets; Modifications in case of heavy rainfall adds to the Capex, Feasible for an intake of above 3KLD | Capex: Rs.15-30Lakhs (3-6KLD) Opex: Rs.10Lakhs p.a | • Ideal for low population densities with irregular desludging practises<br>• Agrarian villages<br>• Central plains as well as dry hilly terrain |
| Anaerobic digestion with un-landed drying beds: | Low/no electricity required, Low area requirement, Easy O&M, semi-skilled labour; Intakes of as low as 0.8KLD to a 3KLD plant possible | Relatively expensive for low population villages; Designed on the basis of collection (Most of the collection trucks are of 3KL capacity); Continuous operations; cleaning operations every 4-5 months; Pathogen removal requires tertiary treatment | Capex: Rs.25-55 Lakhs (3-6KLD); Opex: Rs. 10 Lakhs p.a | • Medium to high densities<br>• Does not depend on ground water levels<br>• Agrarian and peri-urban areas<br>• Suitable for hot and dry areas |
| Pyrolysis or thermal treatment: | Treats FS completely; End product is biochar, acts as a soil enhancer, Easy implementation | Minimum feasible capacity of 5KLD; High Capex and Opex; Higher land required; Fuel/Electricity intensive | Capex: Rs.22-27.6 Lakhs (5-6KLD); Opex: Rs. 19-21 Lakhs p.a | Suitable for areas with good/ continuous power supply and availability of skilled human resources |
| **Greywater/liquid percolate (from faecal sludge) treatment** | | | | |

| | | | | |
|---|---|---|---|---|
| Kitchen garden | Household level greywater management; Independent of central conveyance system; Easy to implement, no skills required and low cost | Not every household/ cluster of households have enough space | Rs. 300-500/KLD Opex: Minimal for cleaning solid waste/slime | • Areas with large spaces available around houses<br>• Areas with low ground water table |
| Dispersion Trenching/Soakaway Pit: | Relatively cheap; Caters to low capacities (upto 0.8 KLD); no skill required to construct/operate, No/low nuisance; ideal for low groundwater table. Can be done at household and community level | Requires some cleaning activities every 4-5 months depending on the amount of solids clogging the soaking mechanism | Rs. 300-500/KLD Opex: Minimal for cleaning solid waste/slime | • Areas with low ground water table<br>• Hot and arid areas |
| Covered drains-Treatment facility (WSP/Settler+ CW) | Applicable to densely populated clusters; without any space for HH-level solution; Lower cost | Additional costs for laying drains for all HHs; Village/Cluster level intervention | Rs. 700-940/KLD | • Peri-urban and densely populated areas<br>• High rainfall areas |
| **Combined wastewater treatment** | | | | |
| DEWATS | Applicable to villages with complete sewer coverage; Modular upgrade of capacity possible; | Can handle very low inflow to very high inflow; Low O&M; Low life-cycle cost | Rs. 6.6-14 Lakhs(3-6KLD) Opex: 2-2.5 Lakhs p.a | • Peri-urban and densely populated areas<br>• Areas with erratic power supply and lack of skilled labour |
| MBBR based STP | Applicable to villages with complete sewer coverage; Modular upgrade of capacity possible; | Minimum feasible inflow of 10KLD; Capex intensive; Infrastructure demands spatial planning | Capex: 10-100 KLD: 6-50 Lakhs 100-500KLD: 53 Lakhs-1.75 Cr 500-1000 KLD: 1.75-2.35 crores Opex: Rs. 3 -17 Lakhs(10-100 KLD) | • Peri-urban and densely populated areas<br>• Areas with reliable power supply |

In addition to the above suggested treatment options, any other technologies/innovations could be chosen depending on the suitability for the regional context. Biogas digestors/plants could be used for treatment of cow dung and other organic wastes at a cluster level which could be considered for capacities ranging from10-20 KLD. However, the output slurry would require further treatment before discharge into open environment.

## ANNEXURE IX | CLASSIFICATION OF DISTRICTS IN KARNATAKA

Suggestions for different approaches to liquid waste management based on classification of districts across the sanitation value chain:

| Sl. No. | Division Key Category | Bengaluru | Mysuru | Belagavi | Kalaburagi | Suggestions for LWM |
|---|---|---|---|---|---|---|
| **1.** | **Population Density (per sq.km)** | | | | | |
| **a)** | <200 | Chitradurga | Kodagu<br>Chikkamagalur<br>Chamrajnagar | Uttara Kannada | | • Conversion to twin-pit if feasible<br>• Household level interventions for greywater |
| **b)** | 200-400 | Tumkur<br>Chikkaballapur<br>Shimoga | Hassan<br>Udupi<br>Mandya | Bijapur<br>Gadag<br>Bagalkot<br>Belagavi<br>Haveri | Yadgir<br>Raichur<br>Gulbarga<br>Koppal<br>Bellary<br>Bidar | • Conversion to twin-pit + GP level FSTPs<br>• Decentralized solutions for greywater management |
| **c)** | >400 | Bengaluru Rural<br>Bengaluru Urban | Mysuru<br>Dakshina Kannada | Dharwad | | • Conversion to twin-pit + GP level FSTPs<br>• Centralized or decentralized solutions based on distance of treatment system from habitations |
| **2.** | **Groundwater table level in meters below ground level (as per KSNDMC) [Districts (no. of Taluks)]** | | | | | |
| **a)** | <10 | Shivamogga(5) | Mysuru(5),<br>Mandya(3),<br>Dakshina Kannada(2),<br>Chikkamagaluru(1),<br>Hassan(2),<br>Kodagu(1),<br>Udupi(3) | Uttara Kannada (10),<br>Gadag(1),<br>Bagalkote (1),<br>Belagavi(6), | Kalaburagi (9),<br>Bellary(3),<br>Koppala(3),<br>Raichur(3), | • Promote conversion of soak pits into properly constructed septic tanks or any other water tight containment system<br>• Avoid trenching or similar solutions |
| **b)** | >10 | Bengaluru Urban(4)<br>Bengaluru Rural (4) | Chamarajanagar (4)<br>Chikkamagaluru(6) | Belgaum(4)<br>Bagalkot (4) | Bellary(3)<br>Bidar(5)<br>Koppal (1)<br>Raichur(2) | • Promote soak pits and dispersion trenching |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Chikkaballapur (5) Chitradurga(6) Davanagere(4) Kolar(5) Ramanagara(2) Tumakuru(10) | Dakshina Kannada(2) Hassan(6) Kodagu(2) | Dharwad( 5) Gadag(3) Haveri(6) Vijayapura (5) | Yadgir(1) | solutions<br>• Promote kitchen gardens wherever feasible |
| **3.** | **Economic characteristic** | | | | | |
| **a)** | Agrarian (more than 70% population) | Chitradurga Chikkaballapur a | Chikkamagalur Chamrajnagar Dakshina Kannada | Gadag Dharwad | Yadgir Koppal Bagalkot Bidar | • Promote twin-pits, drenching depending on groundwater levels<br>• Co-composting, biogas digesters etc. may be promoted |
| **b)** | Peri-urban/ Industrial developments/ Educational hubs | Bengaluru Urban Bengaluru Rural Tumkur Ramnagara Davanagere Kolar | Hassan Udupi Mandya Mysuru | Haveri Belgaum | Raichur Gulbarga Bellary | • Combined treatment systems<br>• Electro-mechanical solutions depending on availability of funds and continuous power supply |
| **c)** | Tourist attractions/high footfalls | Shimoga | Kodagu | Uttara Kannada | Bijapur Bellary | • Solutions to be chosen based on groundwater table levels, availability of space and funds. |
| **4.** | Geo-climatic conditions | | | | | |
| **a)** | Coastal region | | Udupi Dakshina Kannada | Uttara Kannada | | • For selection of treatment technology, rainfall and humidity to be considered<br>• Given that mostly water tables are high avoid soak pits and drenching solutions |
| **b)** | Central plains | Tumkur Chikkaballapur | Chamrajnagar Hassan | Gadag Bagalkot | Bijapur Koppal | • Depending on space and |

| | | | | | | |
|---|---|---|---|---|---|---|
| | | Ramanagara<br>Davanagere<br>Mandya<br>Kolar<br>Bangalore Rural<br>Bangalore Urban | Mysuru | Haveri<br>Belgaum<br>Dharwad | Bidar | funds availability choose the most suitable treatment technology |
| **c)** | Hilly terrain-rainfed | Shimoga (1500-2500mm) | Kodagu (>2500mm)<br>Chikkamagalur (1500-2500mm) | | | • Avoid systems requiring conveyance/ transportation over long distances (mostly decentralized solutions) |
| **d)** | Hilly terrain-dry | Chitradurga (<600mm) | | | Bellary (600-900 mm) | |
| **e)** | Arid regions | | | | Yadgir<br>Raichur<br>Gulbarga | • Soak pits and drenching solutions could be considered depending on availability of space |

## ANNEXURE X | WORKABLE MODEL FOR LIQUID WASTE MANAGEMENT

**Layout of the workable model for liquid waste management in rural areas of Karnataka**

The workable model shall be used to arrive at the appropriate technological models and approximate costs. The sheet shall be available online at the website of RDPR, http://rdpr.kar.nic.in

**1. Sheet providing guidance to the model- Provides description of the model and instructions for use**

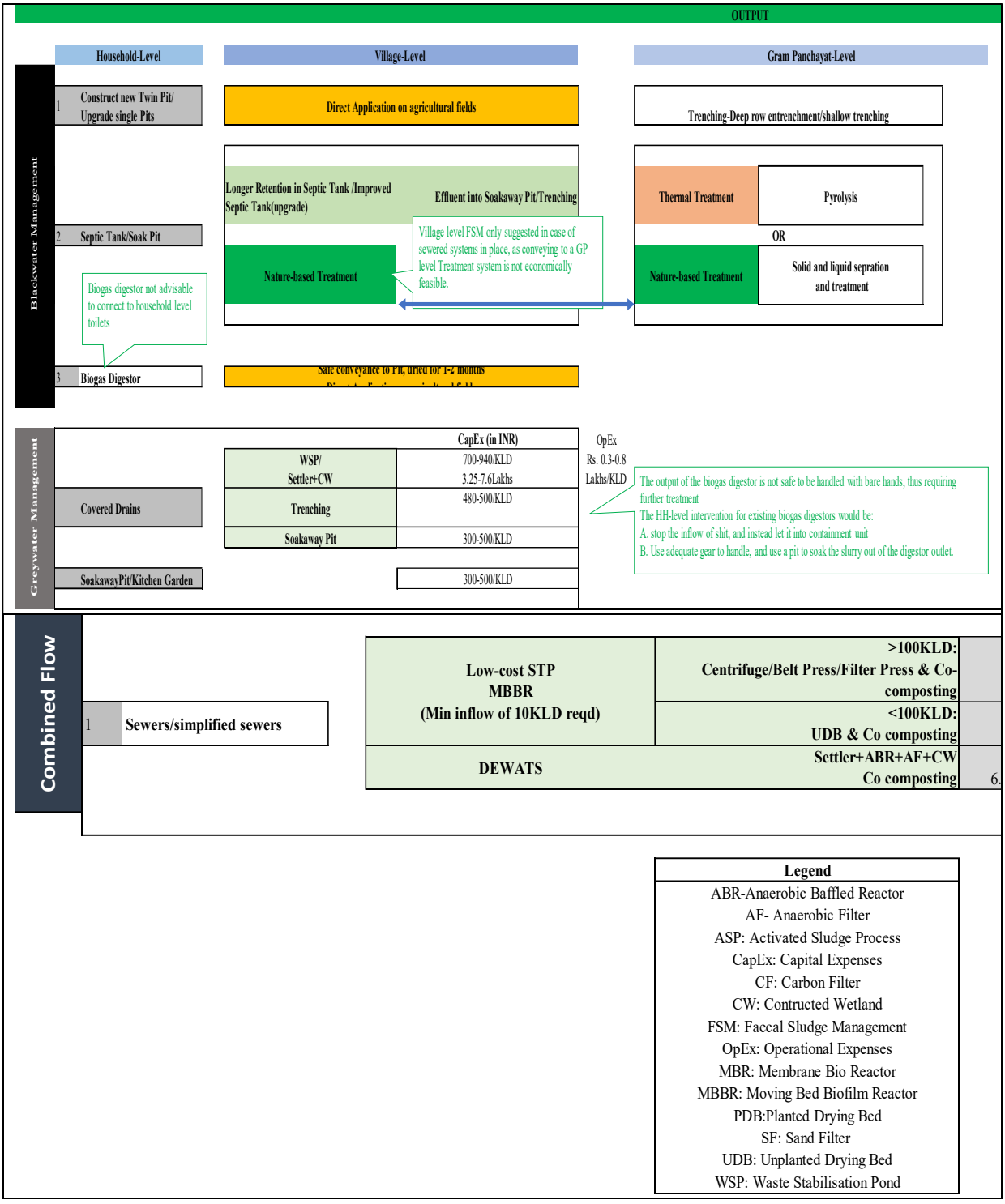
| | |
|---|---|
| **1** | **Introduction to the model** |
| | This excel based workable model has been prepared with an intent to help local administration including PDOs, EOs, DCs etc. at the Gram Panchayat, Taluk or District level in planning implementation of liquid waste management project. The excel sheet is an input based model wherein the user would be required to feed in basic information of the current wastewater management practices, including population details, numbers and types of assets available, geo-climatic and ground water related details etc. |
| | |
| **2** | **Key components of the model** |
| | The model includes the following key components- |
| a | Basic information about the Village/GP/Taluk/District for which RLWM plan is being prepared including details of the population, number of households, types of containment systems etc. |
| b | Information necessary for making decision on the approach to RLWM planning including ground water table details and desired approach to RLWM |
| | |
| **3** | **Instructions for using the model** |
| a | Fill in the cells highlighted in Yellow with the required input data |
| b | The cells coloured green are mandatory to display only the suitable solutions. |
| c | The suggested solution will appear in grey cells |
| d | Explanation/guidance for feeding the input data provided on the right of the respective cells in '{ }' parenthesis |
| | |
| **4** | **Understanding of the decision-making process-** |
| | The decision for the most suitable solution would be taken at three levels as indicated in the diagram: |
| | |
| **5** | **Assumptions** |
| a | Considering the population of villages as per Census 2011 and the minimum collection capacities the treatment capacity for nature-based technologies at a village level for Faecal Sludge Management is considered to be 3KLD-6KLD, the prices are provided as a range for this capacity range |
| b | The primary end use is assumed to be discharge on land; therefore, disinfection and tertiary treatment is specified as optional systems. |
| c | Twin pits/Single Pits are ruled out in cases where groundwater is less than 10m below ground level |
| d | Nature based Treatment Plant |

**2. Input sheet- provides template for capturing basic inputs required for planned LWM at village/GP level**

| INPUT | | | |
|---|---|---|---|
| | **Workable model for planning RLWM for** | | **{Enter name of GP/Taluk/District** |
| **1** | **Basic information-** | | |
| **1.1** | **Demographic details** | | |
| **a** | Name of Village/GP | | |
| **b** | Taluk | | |
| **c** | District | | |
| **d** | Total population as on date | 10000 | {If current population is not available, provide the projected population for next 15 years based on growth in past decade} |
| **e** | Total number of households | | {As per the recent surveys or data available along with the source of information} |
| **1.2** | **Details about Sanitation coverage** | | |
| **a** | Percentage of coverage of toilets | | {Percentage of households/commercial properties/institutions having toilets out of the total population} |
| **b** | Percentage of toilets connected to- | | |
| | Septic tanks | | {As a percentage of total number of properties if available or households} |
| | Single soak pits | | |
| | Twin-pits | | |
| | Piped sewer network | | |
| **c** | Does the village/GP have desludging vehicles | | {Please mention Yes or No} |
| **d** | How many vehicles are available in the village/GP | | {Please mention the number of vehicles} |
| **e** | What is the total capacity of the vehicles | | {Please calculate total capacity by Multiplying number of vehicles with same capacity and summing up all the capacities. For example- if there are 2 vehicles of 3000 litres and 1 vehicle of 5000 litres, the answer will be - (2x3000) +(1x5000) =11,000 litres or 11 KLD} |
| **f** | Is there a sewage treatment plant available in the village/GP or at a distance of upto 15 kms from the centre of the village/GP | | {Please mention Yes or No} |
| **g** | Is there a solid waste treatment plant available in the village/GP or at a distance of upto 15 kms from the centre of the village/GP | | {Please mention Yes or No} |

| 2 | Details of geo-climatic conditions | | |
|---|---|---|---|
| | Groundwater Table (in mbgl) | <10 | {Please select the value based on available information from reliable sources} |
| | Population | 10000 | |
| | Geo climatic Parameters/Taluk | | {Please select the applicable category. Refer to the classification table provided in guidance sheet} |

### 3. Output sheet- contains the main output in terms of suggested solutions and block cost estimates against each




| Legend |
|---|
| ABR-Anaerobic Baffled Reactor |
| AF- Anaerobic Filter |
| ASP: Activated Sludge Process |
| CapEx: Capital Expenses |
| CF: Carbon Filter |
| CW: Contructed Wetland |
| FSM: Faecal Sludge Management |
| OpEx: Operational Expenses |
| MBR: Membrane Bio Reactor |
| MBBR: Moving Bed Biofilm Reactor |
| PDB:Planted Drying Bed |
| SF: Sand Filter |
| UDB: Unplanted Drying Bed |
| WSP: Waste Stabilisation Pond |

## 4. References to OP- Provides further information not covered in the output sheet highlighting comparison between different technology solutions

| | Combinations of Technologies | | Cost (in INR) | | Assumptions/dimensions |
|---|---|---|---|---|---|
| Nature Based Treatment | PDB/Centrifugation+Presses | WSP/(ISABRAF+CW) Co composting | 26.7Lakhs-54Lakhs | Trenching/ Soakaway Pit | Trenching:480/KLD [lxbxd:4mx0.5mx0.8m; variable length and width as per inflow] Soakaway Pit: 300-400/KLD [diaxdepth:1mx1.3; 0.3 free board] |
| | Settling Thickening Tank/Stabilisation Tank | WSP/(ISABRAF+CW) UDB+Co composting | [illegible] AF) '+12.85(3KLD)-25.4(6KLD) | | |
| | Imhoff Tank+Stabilisation Tank | | ***Stabilisation Tank:*** 13.7-27 Lakhs(without AF) 12.85-25.4 Lakhs (w/WSP) | | |
| | Geobags | (ISAF+CW)/WSP Trenching/Co composting | AF) '+12.85(3KLD)-25.4(6KLD) (without WSP) | | |

### Comparison of Technologies/Decision making guidance

**PDB vs Centrifugation**
**PDB:** Higher Land, Lower O&M, low/no electricity, Low/no chemicals, Skilled labour not required, High CapEx but lower OpEx
**Centrifuge**: Compatible with existing STPs for augmentation and enabling the option of co-treatment, unlike PDB
Centrifuge independent of climatic conditions, esp. rain

**Stabilisation Tank/Biogas+UDB**
CapEx: ST>Biogas+UDB
OpEx:
ST have higher land requirement; BP and SP require electricity while Geobags don't
Biogas is practical to an inflow of undigested sludge only, compared to ST

**Settling Thickening Tank vs Imhoff Tank**
STT has higher CapEx & OpEx, treatment efficiency, higher land reqd., trained operator reqd., requires pump

**WSP v/s AF**
**WSP** has higher land requirements
Provides higher degree of pathogen and nutrient reduction compared to AF
**AF** requires primary or pre treatment to minimise risk of clogging of filter media, whereas WSP is resistant to organic and hydraulic shocks;
higher O&M requirements compared to WSP

**Screw Press/Belt Press/geobags**
CapEx: SP BP<Geobags
OpEx:
BP and SP require electricity, while Geobags have to be replaced after each use,
Geobags have higher land reqt than other two; Treatment efficiency Geobags<BP<SP
BP and SP are more compatible to existing STPs than Geobags

**WSP/ AF/ABR**
Compared to ABR and AF, **WSP** has higher land requirement; provides higher degree of pathogen and nutrient reduction compared to ABR and AF
**AF** requires primary or pre treatment to minimise risk of clogging of filter media, whereas WSP and ABR is resistant to organic and hydraulic shocks.
AF has higher O&M requirements compared to WSP

**ASP/MBBR/MBR**
Treatment efficiency MBR > MBBR > ASP
Land Requirements ASP (very high) > MBBR > MBR
Energy consumption of ASP and MBR is higher than MBBR
Cost of MBR is greater than MBBR
Sludge generation :ASP>MBBR>MBR
ASP demands the sludge treatment modules for the effluent to be of higher capacity

**CW/Sand filter/Carbon filter**
Operational Cost: SF/CF>CW
CapEx of CW>SF/CF
Treatment efficiency CW>SF/CF
*CW has a higher threshold to be able to tolerate TSS and nutrient removal of the influent compared to SF/CF*
Land Requirements CW (very high) >SF/CF
Energy consumption SF/CF>CW

## ANNEXURE XI | FORMAT OF MODEL DETAILED PROJECT REPORT

### 1. Introduction

### 1.1 Details of villages covered

| Particulars | Details | | |
|---|---|---|---|
| **Name of the Gram Panchayat** | | | |
| **Name of Taluk Panchayat** | | | |
| **Name of the District** | | | |
| **No. of villages covered in the GP** | | | |
| **Village wise population** | **Name of the village** | **Current Population** | **Projected population in 10 years**[22] |
| | | | |
| | | | |
| | | | |
| | **Total population** | | |
| **Name of the closest urban local bodies (ULBs)** | | | |

### 1.2 Basic amenities and infrastructure available in the GP:

| Particulars | Details |
|---|---|
| Availability of electricity | |
| Water supply | |
| Drainage system | |
| Road length (in kms) | |

### 1.3 Existing solid waste management system

| **Collection and segregation** | | | |
|---|---|---|---|
| **Particulars** | **Please tick (√) if applicable** | **Percentage of coverage/ number/ frequency** | **Any other details** |
| Segregation at source, if yes, categories of segregation (% of generators segregating waste) | | | |
| Door to door collection (% of coverage) | | | |
| Number of persons employed (including sweepers, driver, helpers etc.)[23] | | | |
| Frequency of collection of dry waste | | | |
| Frequency of collection of wet waste | | | |
| Frequency of collection of sanitary waste and domestic hazardous waste | | | |

22 Please use the formula set out in Annexure II containing the normative standards
23 If there are any other persons who are not GP employees and are involved in waste management activities, please provide details in the column “Any Other Details”.

| **Transportation** | | | |
|---|---|---|---|
| **Type of vehicle** | **Please tick (√) if applicable** | **Number** | **Owned or leased** |
| Pedal tricycle | | | |
| Push carts | | | |
| Auto tipper | | | |
| Tractor | | | |
| Truck | | | |
| Others, if any | | | |
| **Existing processing/recycling/disposal facilities** | | | |
| **Waste stream** | **Type of facility** | **Capacity (in terms of kg/tons per day)** | **Any other details** |
| Biodegradable waste (wet waste) | | | |
| Recyclable waste (dry waste like plastic, glass etc.) | | | |
| Non-recyclable non-biodegradable waste (like multilayered packaging, low grade plastics etc.) | | | |
| Mixed waste, sanitary waste and inert waste | | | |

## 2. Proposed solid waste management system

### 2.1 Data on waste generation

| S.No. | Particulars | Number | Daily Wet waste generation (in Kg) | Daily Dry waste generation (in Kg) | Daily generation of Domestic hazardous (including sanitary waste) (in Kg) |
|---|---|---|---|---|---|
| 1. | Households[24] | | | | |
| 2. | Canteen, lodges, hotel, restaurants and similar establishments. | | | | |
| 3. | Schools, colleges and other educational institutions | | | | |
| 4. | Commercial shops | | | | |
| 5. | Markets | | | | |
| 6. | Anganwadis | | | | |
| 7. | Marriage halls | | | | |
| 8. | Temples, churches, mosques and other places of worship | | | | |
| 9. | Chicken, mutton, fish and other meat shops | | | | |
| 10. | Tourist attractions | | | | |

[24] Please consider the standard family as consisting of 5 members.

| | | | | | |
|---|---|---|---|---|---|
| 11. | Government /private offices | | | | |
| 12. | Any other category of waste generator | | | | |
| | **Total** | | | | |

### 2.2 Material and Equipment

| S.no. | Particulars | Quantity | Total cost (in INR) |
|---|---|---|---|
| **A.** | **Waste bins** | | |
| 1. | Number of dustbins having a capacity of 5 L required (Number of households or waste generators x 2) @80 per unit | | |
| 2. | Number of HDPE bags admeasuring 2 feet x 1.5 feet required (Number of households or waste generators x 1) @30 per unit | | |
| 3. | Number of bins having a capacity of 20 L required at commercial units (number of commercial units x 2) @400 per unit | | |
| **B.** | **Personal protective equipment for sanitation workers** | | |
| 1. | Gloves @38 per unit | | |
| 2. | Mask @Rs. 15 per unit | | |
| 3. | Apron @Rs. 350 per unit | | |
| 4. | Shoes @ Rs. 500 per unit | | |
| 5. | Detergent soap and other cleaning agents | | |
| **C.** | **Other equipment and tools** | | |
| 1. | Bags for sorted dry waste | | |
| 2. | Bailing machine, if required | | |
| 3. | Incinerators for sanitary waste | | |
| 4. | Thread | | |
| 5. | Bins for collection | | |
| 6. | Any other equipment or tool | | |
| | **TOTAL** | | |

### 2.3 Transportation[25]:

Distance between solid waste unit to villages (Km):

| Type of vehicle | Population density (per sq. Km) | Transportation type | Carrying Capacity | Price per unit | No. of vehicle(s) to be procured | Total price |
|---|---|---|---|---|---|---|
| Pushcarts | Dense (>400 persons) | Primary | 250 L /125 Kg | 15,000 | | |
| Pedal Tricycle | Moderately dense (< 400 persons) | Primary | 500 L/ 250 Kg | 35,000 | | |
| Electric vehicle/any smaller motorized | Sparse (<200) persons | Primary | 1000L/350 Kg | 1,50,000 | | |

[25] Calculation can be done on the basis of density of population and amount of waste generation

| | | | | | | |
|---|---|---|---|---|---|---|
| vehicle | | | | | | |
| Auto tippers | - | Secondary | 1500 L/ 750 – 1000 Kg | 4,50,000 | | |
| Tractor | - | Secondary | 1500 Kg | 3,25,000 | | |
| Trucks | - | Secondary | 6000 Kg | 8,00,000 | | |
| **TOTAL** | | | | | | |

### 2.4 Manpower Planning

| **Manpower**[26] | **Number of persons** | **Unit Salary** | **Total salary** |
|---|---|---|---|
| Door to Door collection @1 worker per 150 HH and small shops using pushcarts | | | |
| Along the street mechanism with a whistle or announcement @1 worker per 240 HH and small shops using pushcart/tricycle/motorised vehicle | | | |
| Sorting manpower at the dry waste unit (to be filled only if in addition to the collection staff) | | | |
| Driver (for secondary collection) | | | |
| Helper (for secondary collection, optional) | | | |
| Street sweeping (to be filled only if in addition to the collection staff) | | | |
| Manpower at the wet waste processing unit (to be filled only if in addition to the collection staff) | | | |
| **Total** | | | |

### 2.5 Wet Waste Management

It is suggested to go for a low-cost composting such as pile composting, pit composting, windrow composting, vermi-composting as per the capacities and requirements. The design capacity of the unit should be based on future projection of 10 years for population and waste generation etc.)

| **S.no** | **Particulars** | **Details** |
|---|---|---|
| **A.** | **Composting** | |
| 1. | Type of composting | |
| 2. | Capacity (daily amount of waste handled) | |
| 3. | Area required for wet waste management | |
| 4. | Number and size of pits required | |
| 5. | Leachate management facilities | |
| B. | **Biomethanation** | |
| 1. | Type of biogas plant | |
| 2. | Capacity (daily amount of waste handled) | |
| 3. | Biogas generation capacity | |
| 4. | Area required | |
| 5. | Leachate management facilities | |

[26] Method of collection will be selected based on the density of population and type of vehicle that can be deployed in the given terrain and road conditions

### 2.6 Dry Waste Management

The dry waste management unit should comprise of storage and sorting area, office (if required) and toilet and washing facilities. The dry waste management unit shall also be planned on the basis of future projection of 10 years for population and waste generation etc.

| S.no | Particulars | Details |
|---|---|---|
| 1. | Waste handling capacity of dry waste management unit | |
| 2. | Maximum period of storage considered | 1 – 3 months |
| 3. | Height of storage unit (in feet) | 8 |
| 4. | Area required for incoming waste | |
| 5. | Area required for sorting of waste | |
| 6. | Area required for baling unit (if baling is planned) | |
| 7. | Area required for storage of sorted waste (baled and unbaled) | |
| 8. | Toilet block and washing areas | |
| 9. | Vehicle parking area and buffer area, if required | |
| 10. | Extra space for unforeseen circumstances | |
| 11. | **Total area required for Dry waste management unit** | |
| 12. | Transportation costs for transporting non-recyclable/recyclable dry waste to the nearest ULB. | |

**Note**:

1. In determining area of the dry waste unit, the standards that should be considered are **(i)** 25 kgs of loose dry waste can be stored per square feet and **(ii)** 42 kgs of baled dry waste stored per square feet.
2. The sorting area should be at least 25 square feet. In the event more than 2 persons are employed for sorting, the area should be at least10% of the total dry waste unit.

## 3. Financial planning

### 3.1 Capital expenditure

| S.no. | Particulars | Cost (in INR) |
|---|---|---|
| 1. | Cost of acquisition of land for SWM units | |
| 2. | Cost of civil works of solid waste management shed | |
| 3. | Cost of civil works of compost pits | |
| 4. | Cost of civil works of Biogas plant | |
| 5. | Total cost of vehicles | |
| 6. | Total cost of equipment and machinery and PPE | |
| | **Total Cost** | |

### 3.2 Operational expenditure

| S.No. | Particulars | Amount per year (in INR) |
|---|---|---|
| 1. | **Salaries** | |
| | (i) Personnel for street sweeping, collection, wet waste management | |
| | (ii) Drivers | |

| | | |
|---|---|---|
| | (iii) Manager of the waste management unit, if any | |
| 2. | Water and electricity | |
| 3. | Consumables (such as PPE, bio-solution, worms) | |
| 4. | Fuel | |
| 5. | Repair and maintenance (vehicle and equipment maintenance) | |
| 6. | Transportation costs for transporting non-recyclable/recyclable dry waste to the nearest ULB. | |
| 7. | Any other recurrent expenditure | |
| | **Total Expenditure per year** | |

### 3.3 Sources of income

| S.no | Particulars | Number | Unit rate per year (in INR) | Amount per year (in INR) |
|---|---|---|---|---|
| 1. | **User fees** | | | |
| (i) | Households | | | |
| (ii) | Canteen, lodges, hotel, restaurants and similar establishments. | | | |
| (iii) | Schools, colleges and other educational institutions | | | |
| (iv) | Commercial shops | | | |
| (v) | Markets | | | |
| (vi) | Aanganwadi | | | |
| (vii) | Marriage halls | | | |
| (viii) | Temples, churches, mosques and other places of worship | | | |
| (ix) | Chicken, mutton, fish and other meat shops | | | |
| (x) | Tourist attractions | | | |
| (xi) | Government /private offices | | | |
| | **Total** | | | |
| 2. | Sale of compost and/or biogas | | | |
| 3. | Sale of recyclables | | | |
| 4. | Fines and penalties | | | |
| 5. | Any other source of income | | | |
| | **Total income** | | | |

## 4. Implementation Plan

### 4.1 Proposed timelines for different activities

| Particulars | Responsibility | Proposed timeline |
|---|---|---|
| Approval of DPR | | |
| Allocation of funds | | |
| Procurement of land | | |
| Procurement of vehicles | | |
| Setting up of infrastructure facilities | | |
| Appointment of manpower required | | |
| Commencement of door-to-door collection | | |
| Commencement of processing of wet waste and storage and/or sale of dry waste. | | |

### 4.2 Proposed IEC/BCC activities

| Topic of IEC activity | Target Audience | Mode of communication/Type of activity | Cost incurred |
|---|---|---|---|
| | | | |
| | | | |
| | | | |
| | | | |

## ANNEXURE XII | ROLES AND RESPONSIBILITIES FOR SLWM IN RURAL AREAS:

**PART I: Roles and responsibilities at state, district and taluk levels**

| Task | State level | District level | Taluk level |
|---|---|---|---|
| **Primary responsibility** | Rural Drinking Water and Sanitation Department | The Chief Executive Officer of the district and the District Water and Sanitation Mission (DWSM) | Executive officer (EO) along with Taluk Panchayat |
| **State policy, plan and strategy** | ▪ Preparation of state level rural solid and liquid waste management (SLWM) policy and strategy and model by-laws for planning, implementation and enforcement of SLWM activities.<br>▪ Setting up objectives for achievement of various components of SLWM systems for the state.<br>▪ Preparation of state plan that includes a 5 year project implementation plan and 5 independent annual implementation plans, providing details of:<br>○ Implementation of SLWM systems including capital assets, infrastructure and manpower<br>○ Financial support<br>○ Capacity building and training<br>○ Monitoring and evaluation<br>○ Information Education and Communication (IEC) and Behaviour Change Communication (BCC) | ▪ Providing inputs for the state SLWM policy and strategy<br>▪ Facilitate detailed baseline survey to assess the status of SLWM practices in talukas and GPs within its jurisdiction.<br>▪ Develop District Annual Implementation Plan (AIP) in consultation with talukas and GPs and submit it to state.<br>▪ Undertake manpower planning and hiring (specialists/ consultants/ agencies in the areas of HRD, IEC, school WASH, SLWM etc.) for SLWM activities at the district level.<br>▪ Identify and prioritize talukas and GPs for commissioning SLWM projects in consultation with various stakeholders. | ▪ Consolidate Annual Implementation Plans of GPs |
| **Capital Finance** | ▪ Financial planning and budget estimation for various proposed projects in the state.<br>▪ Examination and approval of district level projects and other proposals of technical nature at the State level through State Level Scheme Sanctioning Committee (SLSSC).<br>▪ Disbursement of funds to all the GP projects as per the approved state and district annual implementation plans.<br>▪ State level monitoring of expenditure under various schemes and projects through review meetings. | ▪ Manage and allocate funds for SLWM projects from various sources in the district.<br>▪ Submit utilization certificates containing details of expenditure against the funds allocated for proposed SLWM projects to the State.<br>▪ Plan for dovetailing funds from centre/state/ corporate social responsibility (CSR) initiatives/funding bodies/ multilateral organizations.<br>▪ Constitute revolving fund for SLWM activities at district level. | ▪ Extend technical and financial guidance and support for construction and operating SLWM system in GPs. |
| **Organisational** | ▪ Ensure that there is adequate administrative, | ▪ Selection of agencies and/ NGOs and enter into | ▪ Provide training to |

| | | | |
|---|---|---|---|
| **development** | technical and support supervisory staff at the state, district, taluk and GP levels for SLWM activities<br>▪ Conduct regular need assessment exercise for ensuring that the different departmental levels are optimally organised in terms of staff, finance and skills.<br>▪ Engaging Institutions (Key Resource Centres (KRC)) for imparting training for capacity development of all stakeholders and undertaking communication campaign. | agreements for social mobilisation, capacity development, communication, project management and supervision.<br>▪ Engaging institutions for imparting training for capacity development to all stakeholders and undertaking communication campaign.<br>▪ Obtain financial, technical and organisational support from CSR initiatives of corporate, CBOs and other organisations for SLWM projects | personnel engaged in SLWM system at GP level<br>▪ Act as a bridge between GPs and districts. |
| **Implementation** | ▪ Facilitate convergence mechanism between line departments like health department, education department etc. and amongst various schemes like NRLM, MNREGS etc.<br>▪ State shall provide guidance for planning, designing and establishing a successful solid waste management system highlighting the most feasible solid and liquid waste management options in terms of finance, technology, skills and expertise required.<br>▪ State shall be responsible for resolving any sort of divergence related to solid and liquid waste management among districts. Such conflicts/discrepancies shall be directed to RDW&SD and be discussed during six monthly meeting. | ▪ Plan convergence mechanisms with line department, state schemes and priority programs such as MGNREGS, Prime Minister Awas Yojana (PMAY) etc.<br>▪ Identification and procurement of suitable land for SLWM activities.<br>▪ Plan, coordinate and monitor urban and rural linkages for waste management such as usage of recycling facilities, RDF units, co-processing at cement plants, waste to energy plants, sanitary landfills, FSTP etc. Implementation of extended producer responsibility for plastic waste.<br>▪ Interaction with relevant central and state governmental authorities involved in planning and implementation of SLWM systems in rural areas.<br>▪ Scrutiny and approval of the schemes/projects/programs submitted by the Taluk Panchayat/ Gram Panchayat and forwarding them to the State where necessary. | ▪ Overall responsible for taluk level implementation of SLWM projects such as aggregation of dry waste, logistics/ transportation of such waste to appropriate processing facilities etc.<br>▪ Provide continuous support in terms of awareness generation, motivation, mobilization, training and handholding of village communities, GPs and VWSCs. |
| **IEC and BCC** | ▪ Develop and implement state IEC strategy and plan<br>▪ Ensuring a proper human resource structure for | ▪ Preparing a detailed IEC plan for the district based on the state plan which factors local conditions and requirements | ▪ Undertake triggering exercise to create demand for solid and |

| | | | |
|---|---|---|---|
| | IEC at state and district level<br>▪ Regular progress monitoring and reporting on IMIS on IEC activities<br>▪ Facilitate organisation of workshops and events related to SLWM at the state level | ▪ Develop an annual calendar of IEC activities at GP, taluk and district levels<br>▪ Sensitising the public representatives, elected officials and the general public about solid and liquid waste management. | liquid waste management among the village communities. |
| **Monitoring, audit and reporting** | ▪ Review progress of SLWM systems with the district officials on a monthly/fortnightly/quarterly basis and prepare action points at the end of each such meeting<br>▪ Regular monitoring and evaluation of SLWM sector and performance of various schemes and projects across various districts. This should be audited by an independent third party for assessing the progress of SLWM schemes and projects. | ▪ Concurrent district level monitoring of SLWM projects shall be conducted periodically through meetings and with the help of independent agencies/CSOs/NGOs<br>▪ Submission of regular progress reports to the state.<br>▪ Monitor capacity building and training activities at the district level<br>▪ Ensure social audit meetings for verifying officially recorded work at ground level, are conducted at the GP level once in six months<br>▪ Monitor the activities of social organization/ CBOs/ NGOs/ SHGs/ support organizations engaged in SLWM activities | ▪ Maintain GP level data on waste quantity collected and processed.<br>▪ Monitor and review progress of SLWM systems/projects in GPs at least every fortnight. |
| **Research and Development** | ▪ State shall be responsible for promoting newer technologies for SLWM handling and management after thorough technical, financial and environmental evaluation by expert organisations and governmental authorities. | ▪ Facilitate promotion of new successful technologies at district level | |

**PART II: Roles and responsibilities at GP level**

The Project Development Officer of the GP and the Village Water and Sanitation Committee (VWSC) and/or Village Health, Sanitation and Nutrition Committee (VHSNC) are primarily responsible for the solid and liquid waste management activities at the GP level. The specific roles and responsibilities at GP level include:

| Tasks | Gram Panchayat and VWSC/VHSNC | Panchayat Development Officer (PDO) |
|---|---|---|
| **Meetings and organisation** | ▪ Meet as required by Karnataka Panchayati Act and other regulations | ▪ Attend GP and VWSC meetings |
| **Planning** | ▪ Identify and allocate GP land for SLWM activities at village level<br>▪ Approve annual plans and budgets and present annual budgets in the Gram Sabha with provision for SLWM activities<br>▪ Approve user fees for SLWM activities after discussion in the Gram Sabha<br>▪ Interact with TP for management of waste at Multi-GP/Taluk level | ▪ Prepare and update plans, budgets for SLWM and provide inputs for use fees.<br>▪ Provide information to the GP members about various technologies, schemes etc. relating to SLWM. |
| **Implementation** | ▪ Approve works for SLWM activities.<br>▪ Procure capital infrastructure such as machinery, vehicles and equipment.<br>▪ Organise for agencies for capital infrastructure such as toilets, dry waste shed, composting units, STP/FSTP, underground drains, purchase of vehicles etc.<br>▪ Hire personnel for different SLWM activities such as collection, transportation and processing.<br>▪ Organize people for awareness creation for waste management.<br>▪ Provide logistical support for transportation of non-recyclable dry waste. | ▪ Supervise and work with GP members for implementation of SWM activities such as construction of compost pits and dry waste storage units.<br>▪ Assist GPs in procuring suitable vehicles and equipments.<br>▪ Menstrual hygiene management (MHM) activities including awareness generation among adolescent girls and safe disposal of sanitary waste. |
| **Operation and maintenance** | ▪ Approve manpower, vehicle and other operational activities.<br>▪ Authorizing expenditure payments.<br>▪ Assessment of quantifiable impacts such as improvement in source segregation, reduced dumping and burning etc. | ▪ Supervision of operation and maintenance of SWM facilities.<br>▪ Daily financial management and maintenance of records. |
| **Monitoring, audit and reporting** | ▪ Half yearly review of budgets against the expenditures.<br>▪ Quarterly and annual reports on implementation progress and operational performance. | ▪ Monthly review of accounts<br>▪ Weekly review of resources, assets and systems.<br>▪ Periodic reporting on SWM systems as stipulated. |

**PART III: Roles and responsibilities of NGOs and other community based organisations**

(i) Support the GP in dissemination of IEC by planning and executing activities involving the entire community
(ii) Involvement in training and capacity building of the GP officials, Swachhagrahis and other voluntary organizations in the village.
(iii) Involvement in planning and implementation of village sanitation and waste management programs.
(iv) Carry out surveys and monitor the impact of the sanitation and waste management programs.
(v) Be involved in collection, transportation and processing of waste generated in the GP.

**PART IV: Roles and responsibilities of Swachhagrahis/Sanitation Motivators**

(i) Swachhagrahis/ Sanitation Motivators are motivators and triggering agents from within the community who have keen interest in sanitation and who are assigned the task of supporting the Gram Panchayat in executing the sanitation and waste management plan. Every village shall have at least one Swachhagrahi/ Sanitation Motivator, with preference to women candidates. The Swachhagrahi/ Sanitation Motivator is envisaged to be a voluntary position and is not permanent in nature. The Swacchagrahis/ Sanitation Motivators shall be engaged by the district based on the recommendation of the Gram Panchayat. The Swachhagrahis/ Sanitation Motivators shall be incentivised based on the criteria spelt out in the guidelines issued by the MDWS, from time to time.

(ii) The role of Swachhagrahis/ Sanitation Motivators shall remain post the ODF declaration stage and they shall assist in ensuring sustainability of the ODF status of the village. It is important that there is sustained engagement with the Swachhagrahis/Sanitation Motivators, they are regularly trained and motivated through incentives. The Swacchagrahis/ Sanitation Motivators shall play the following crucial role in all three stages: planning, implementation and sustainability of the GP sanitation and waste management plan:
   (a) Carry out pre-triggering activities and community preparation.
   (b) Involve in triggering activities to motivate people to participate in the sanitation programs.
   (c) Participate in preparation of GP sanitation and waste management plans.
   (d) Facilitate formation and strengthening of VWSC/VHSNC.
   (e) Assist in IEC dissemination and facilitate sustained behaviour change.
   (f) Monitor the quality of the infrastructure being built.
   (g) Support in retrofitting and improvisation of assets.
   (h) Ensure sustainability of the program by constantly monitoring the programs and engaging the community in the programs.
   (i) Raise awareness about the proper operations and maintenance of the assets created for safe sanitation and waste management.
   (j) Assist the PDO in maintenance of records of data at the GP level.

## ANNEXURE XIII | RECOMMENDED USER FEES

| S.no | Type of Waste Generator | User Fee per month (in INR) from each Waste Generator to be not less than: | | |
|---|---|---|---|---|
| | | Population >= 50 and < 500 | Population >= 500 and < 2000 | Population >2000 |
| 1. | Houses up to 200 sq.ft. built-up area | 20 | 20 | 20 |
| 2. | Houses over 200 sq.ft. built-up area up to 500 sq.ft | 30 | 30 | 30 |
| 3. | Houses with over 500 sq.ft built up area | 40 | 50 | 60 |
| 4. | Small commercial establishments, shops and eating places (such as hotels, dhabas, messes, tiffin rooms, canteens and sweet shops) having an area less than 200 sq.ft. | 60 | 75 | 90 |
| 5. | Large shops, commercial establishments and eating places (such as hotels, dhabas, messes, tiffin rooms, canteens and sweet shops) having an area more than 200 sqft and less than 700 sq.ft. | 100 | 150 | 200 |
| 6. | Large shops and commercial establishments having an area more than 700 sq.ft. | 200 | 300 | 500 |
| 7. | Guesthouse, lodges, dharamshalas having an area less than 1000 sq.ft. | 150 | 200 | 250 |
| 8. | Guesthouse, lodges and dharamshalas having an area more than 1,000 sq.ft. | 200 | 300 | 500 |
| 9. | Hospitals, clinic, dispensary up to 20 beds) | 110 | 130 | 150 |
| 10. | Hospitals, clinic, dispensary (more than 20 beds) | 200 | 300 | 500 |
| 11. | Small and cottage industry units (only non-hazardous) | 200 | 250 | 300 |
| 12. | Halls for marriage and festivals with area up to 1000 sq. ft. **per event** | 800 | 1000 | 1200 |
| 13. | Halls for marriage and festivals with area over 1,000 sq.ft. **per event** | 1200 | 1500 | 2000 |
| 14. | Vegetable and other markets generating less than 50 kgs of waste per day | 150 | 200 | 250 |
| 15. | Vegetable and other markets generating more than 50 kgs of | 200 | 250 | 300 |

| | | | | |
|---|---|---|---|---|
| | waste per day | | | |
| 16. | Institutions such as schools, colleges, places of worship tourist attractions etc. generating less than 50 kgs of waste per day. | 200 | 250 | 300 |
| 17. | Institutions such as schools, colleges, places of worship tourist attractions etc. generating more than 50 kgs of waste per day | 200 | 300 | 500 |
| 18. | Other places/activity not marked as above | As decided by GP by general or special order/notification. | As decided by the GP by general or special order/notification. | As decided by GP by general or special order/notification. |

## ANNEXURE XIV | RECOMMENDED PENALTIES

| S.no | Non-compliance and type of Waste Generator | Fines (in INR) to be not less than: | | |
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| | | **Population >= 50 and < 500** | **Population >= 500 and < 2000** | **Population >2000** |
| 1. | Littering, spitting, urinating in open areas | 500 | 700 | 1,000 |
| 2. | Failure to segregate solid waste by the bulk waste generators. | 2000 | 3000 | 5000 |
| 3. | Failure to segregate and/or handover solid waste by waste generators who are not bulk waste generators. | 500 | 700 | 1000 |
| 4. | Disposal of solid waste by burning, dumping and/or unauthorised burial by a bulk waste generator | 2000 | 3000 | 5000 |
| 5. | Disposal of solid waste by burning, dumping and/or unauthorised burial by any waste generator who is not a bulk waste generator | 500 | 700 | 1000 |
| 6. | Other places/activity not marked as above | As decided by GP by general or special order/notification. | As decided by the GP by general or special order/notification. | As decided by GP by general or special order/notification. |

## GLOSSARY OF TERMS

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| **Biodegradable waste/Wet Waste/Organic Waste** | Any organic material that can be degraded by micro-organisms into simpler stable compounds. |
| **Bio-methanation** | A process which entails enzymatic decomposition of the organic matter by microbial action to produce methane rich biogas; |
| **Bulk waste generator** | Waste generators such as buildings occupied by the Central government departments or undertakings, State government departments or undertakings, GP, public sector undertakings or private companies, marriage halls, hospitals, nursing homes, schools, colleges, universities, other educational institutions, hostels, hotels, commercial establishments, markets, places of worship etc. having an average solid waste generation rate exceeding 50kg per day. |
| **Bye-laws** | Regulatory framework notified by Gram Panchayat for facilitating the implementation of solid and/or liquid waste management effectively in their jurisdiction |
| **Composting** | A controlled process involving microbial decomposition of organic matter |
| **Co-processing** | Use of non-biodegradable and non-recyclable solid waste having calorific value exceeding 1500k/cal as raw material or as a source of energy or both to replace or supplement the natural mineral resources and fossil fuels in industrial processes; |
| **Desludging** | The operation of removing sludge (and septage) from septic/digestion tanks, pit latrines or any other primary treatment units is called desludging. Usually this is done by mechanical means (by vacuum suction pumps) but manual desludging is sometimes used despite it being banned in India. |
| **Dispersion trench** | A trench in which open jointed pipes are laid and surrounded by coarse aggregate media and overlaid by fine aggregate. The effluent gets dispersed through the open joints and is absorbed in the neighbouring soil. |
| **Domestic hazardous waste** | Discarded paint drums, pesticide cans, CFL bulbs, tube lights, expired medicines, broken mercury thermometers, used batteries, used needles and syringes and contaminated gauge, etc., generated at the household level. |
| **Door to door collection** | Collection of solid waste from the door step of households, shops, commercial establishments , offices , institutional or any other Waste Generator non residential premises and includes collection of such waste from entry gate or a designated location on the ground floor in a housing society , multi storied building or apartments, large residential, commercial or institutional complex or premises. |
| **Non-Biodegradable /Dry inorganic waste** | Any waste that cannot be degraded by microorganisms into simpler stable compounds |
| **Extended producer responsibility (EPR)** | Responsibility of any producer of packaging products such as plastic, tin, glass and corrugated boxes, etc., for environmentally sound management, till end-of-life of the packaging products; |
| **Faecal Sludge** | It is the solid or settled contents of pit latrines and septic tanks. Faecal sludge differs from the sludge produced in the municipal waste water treatment plants. Faecal sludge characteristics can differ widely from household to household, from city to city, and from country to country. |

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| | The physical, chemical and biological qualities of faecal sludge are influenced by the duration of storage, temperature, intrusion of ground water or surface water in septic tanks or pits, performance of septic tanks, and tank emptying technology or pattern. |
| **Informal waste collector** | Includes individuals, associations or waste traders who are involved in sorting, sale and purchase of recyclable materials; |
| **Processing** | Any scientific process by which segregated solid waste is handled for the purpose of reuse, recycling or transformation into new products |
| **Recycling** | The process of transforming segregated non-biodegradable solid waste into new material or product or as raw material for producing new products which may or may not be similar to the original products |
| **Refused derived fuel (RDF)** | Fuel derived from combustible waste fraction of solid waste like plastic, wood, pulp or organic waste, other than chlorinated materials, in the form of pellets or fluff produced by drying, shredding, dehydrating and compacting of solid waste |
| **Sanitary landfill** | Facility designed for the final and safe disposal of residual solid waste and inert wastes that has protective measures against pollution of ground water, surface water and fugitive air dust, wind-blown litter, bad odour, fire hazard, animal menace, bird menace, pests or rodents, greenhouse gas emissions, persistent organic pollutants slope instability and erosion. |
| **Sanitary waste** | Wastes comprising of used diapers, sanitary towels or napkins, tampons, condoms, incontinence sheets and any other similar waste |
| **Segregated combustible fraction (SCF)** | Non-biodegradable, non-recyclable, non-reusable, non-hazardous solid waste having minimum calorific value exceeding 1500 kcal/kg and excluding chlorinated materials like plastic, wood pulp, etc |
| **Septage** | Contents of the septic tanks. It includes the liquids, solids (sludge) as well as the fats, oils and grease (scum) that accumulates in the septic tanks over a period of time. |
| **Septic tank effluent** | The supernatant liquid discharge from a septic tank. |
| **Sludge** | It is the settled solid matter in semi-solid condition. It is usually a mixture of solids and water deposited on the bottom of septic tanks, ponds etc. The term sewage sludge is generally used to describe residuals from centralized wastewater treatment, while the term septage is used to describe the residuals from septic tanks. |
| **Soakaway pit** | A pit through which effluent is allowed to seep or leach into the surrounding soil. |
| **Solid waste** | Includes solid or semi-solid domestic waste, sanitary waste, commercial waste, institutional waste, catering and market waste and other non-residential wastes, street sweepings, silt removed or collected from the surface drains, horticulture waste, agriculture and dairy waste, treated bio-medical waste excluding industrial waste, bio-medical waste and e-waste, battery waste, radio-active waste generated in the area under the Panchayati Raj Institutions |
| **ULB** | Urban local body which means and includes the city municipal corporation, city municipal council, town municipal councils and town panchayat, notified areas and notified industrial townships with whatever name they are called in Karnataka. |

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| **User fee** | A fee imposed by the Gram Panchayat on the waste generator to cover full or part cost of providing waste collection, transportation, processing/treatment and disposal services |
| **Vermi composting** | The process of conversion of bio-degradable waste into compost using earth worms |
| **Waste picker** | A person or groups of persons informally engaged in collection and recovery of reusable and recyclable solid waste from the source of waste generation the streets, bins, material recovery facilities, processing and waste disposal facilities for sale to recyclers directly or through intermediaries to earn their livelihood. |