

DETAILED PROJECT REPORT

SOLID AND LIQUID WASTE MANAGEMENT

For

GARHI HARSARU GRAM PANCHAYAT

Supported by



Prepared by

 **TARU**

TARU Leading Edge, New Delhi

July 2016

List of Abbreviations

BCM	Billion Cubic Meter
COI	Census of India
DPR	Detailed Project Report
FGD	Focussed Group Discussion
Ft	Feet
GP	Gram Panchayat
GOI	Government of India
HH	Households
IEC	Information Education and Communication
MDWS	Ministry of Drinking Water and Sanitation
NBA	Nirmal Bharat Abhiyan
NCR	National Capital Region
NEERI	National Environmental Engineering Research Institute
PLA	Participatory Learning Action
PPP	Public Private Partnership
PRA	Participatory Rural Appraisal
RRC	Resource Recovery Centre
SBM	Swachh Bharat Mission
SC	Scheduled Caste
SLSSC	State Level Scheme Sanctioning Committee
SLWM	Solid and Liquid Waste Management
TSC	Total Sanitation Campaign
VWSC	Village Water and Sanitation Committee
WPR	Workforce Participation Rate

1. Introduction

Swachh Bharat Abhiyan (Gramin) was launched in October 2014 with an objective to bring about improvement in the cleanliness, hygiene and the general quality of life in rural areas. Solid and Liquid Waste Management (SLWM) is one of the key components of the programme.

The problem of waste has reached a state of crisis. Mountains of waste accumulated on our wetlands, clouds of smoke from burning it, oceans of waste floating in our rivers and canals, groundwater that has turned red and yellow from leachate pollution are all saying to us loudly and clearly: “You cannot ignore us anymore! You need to get your act together now!!”

Where and why did we go wrong? It is important to answer this question in order that we arrive at a sustainable solution. This report will provide the basic information that anybody dealing with waste should have. It helps us understand the nature of waste, the history of waste and waste management, the different solutions already tried out and their results, and the need to turn to Zero Waste Management (ZWM). True ZWM goes beyond managing waste already generated to preventing waste generation

A pilot initiative was launched and Action Research Framework was prepared in this regard implemented by TARU and supported by IWP/GWP **Prepared under Water & Climate Resilience Program of GWP- South Asia** with a ‘hypothesis Integrated Water Resource Management is one of the best approaches to ensure safe and sustainable water in the village’.

In the first phase of action research, village **Garhi Harsaru in Gurgaon** was selected which was water stressed and considered as peri-urban area. The village was assessed qualitatively as well as quantitatively for its water resources, SLWM systems and other related systems. It was found in the study that no SLWM system existed in the village. In this regard, SLWM DPR is prepared with solutions that have been mapped with the community.

Key Indicators of Garhi Harsaru Gram panchayat	
Total population: 8000 approx. (Baseline Survey)	Distance from State Capital (Chandigarh): 318 Kms
Villages: 1 (Garhi Harsaru)	Distance from Delhi: 50 Kms
Distance from Gurgaon Block HQ: 12 kms	

Methodologies followed for preparing DPR

To understand and assess existing SLWM and to develop the DPR, following activities were carried out:

Exhibit 1: Methodologies followed for preparing DPR

Activities	Stakeholders	Tasks
Orientation Discussion	Sarpanch, Key GP officials (Panchayat secretary and other panchayat members)	<ul style="list-style-type: none"> ☐ Project Introduction
Transect Walk	GP officials, villagers (volunteers/motivators)	<ul style="list-style-type: none"> ☐ A quick walk around the village to understand the existing systems and identifying problem areas
Consultation with key stakeholders	GP officials, partner organization	<ul style="list-style-type: none"> ☐ Discussed existing systems of SLMW ☐ Discussed past and current plans/programmes, financial conditions, etc.
Baseline Survey	Villagers	<ul style="list-style-type: none"> ☐ A structured questionnaire was formed and survey was conducted at Garhi Harsaru GP

2. Assessment of Existing SLWM Systems

2.1 Existing Solid Waste Management System

At present, there is no collection and disposal mechanism. The figure below shows the current waste generation and the present methods used for disposal of the waste. The Garhi Harsaru Gram Panchayat does not have any infrastructure to collect and transport the waste and there is no specified location for the waste disposal.

Majority of the respondents dump their biodegradable waste (68.04%) and nonbiodegradable (67.71%) waste in dustbins which is ultimately thrown in the open fields. A very less proportion of households (1.48%) dispose bio-degradable waste in a safe manner. Safe disposal of bio-degradable waste includes disposing solid waste in an identified place, composting, burying, re-using in the garden and having the GP collect the waste and feeding it to the cattle.

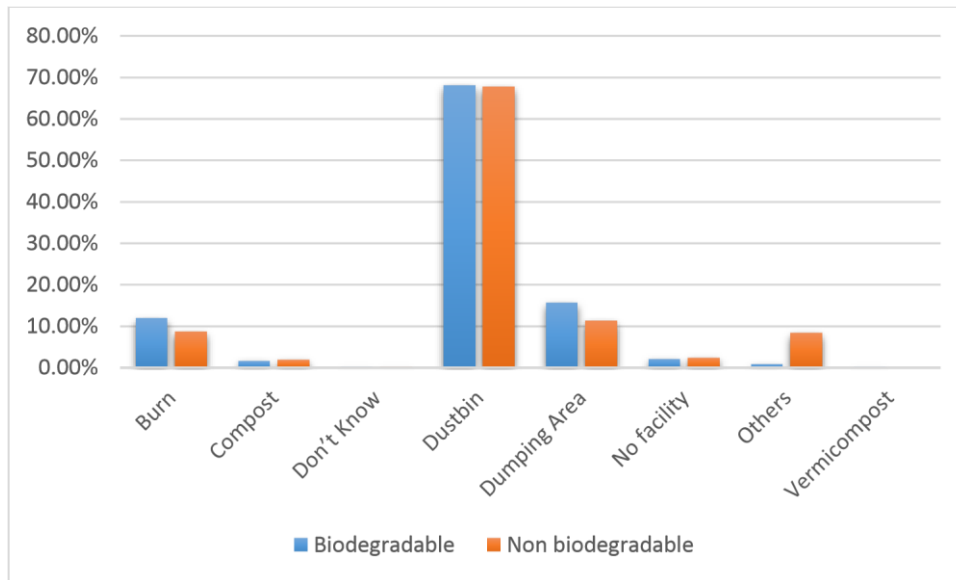
As far as the volume of waste generated is concerned, there is no specific measured data that is available. The national waste generation average can be taken as a basis for designing a management solution for solid waste disposed from the area.

Exhibit 2: Existing Solid Waste Management System in Garhi Harsaru Gram Panchayat

Waste Generation	Collection and Transportation	Disposal
<p>Total estimated Solid Waste Generated:</p> <ul style="list-style-type: none"> ✓ 1.5 – 2 tonnes per day (based on an estimate of 250g per person per day) <p>Types of Solid Waste:</p> <ul style="list-style-type: none"> ✓ Biodegradable: Animal waste, vegetable waste ✓ Non-Biodegradable: Plastic bags, papers, glass <p>Solid Waste Sources:</p> <ul style="list-style-type: none"> ✓ HH, Weekly markets, Schools/Anganwadis, 	<ul style="list-style-type: none"> ✓ Currently there is no scientific system to daily collect and/or transport the solid waste generated ✓ Once in 2 to 3 months, waste is collected from the roads/drains and transported to an open area outside the village ✓ This process is contracted out by the GP 	<p>Current Disposal methods</p> <ul style="list-style-type: none"> ✓ Vegetables & Food Waste: Given to livestock, reused in field ✓ Plastics: Thrown outside in the open area, fields, drains or burnt

Shops, etc.		
-------------	--	--

Exhibit 3: Solid Waste Management Facility within Households



Source: Baseline Survey conducted for the Gram Panchayat of Garhi Harsaru (N=607)

The above figure shows the absence of a systematic solid waste handling method due to which the following issues are being faced

- Accumulation of waste at open spaces, street sides/drains, leading to environmental degradation
- Unhygienic conditions prevailing in the area leading to various health and sanitation related diseases

2.2 Existing Liquid Waste Management System

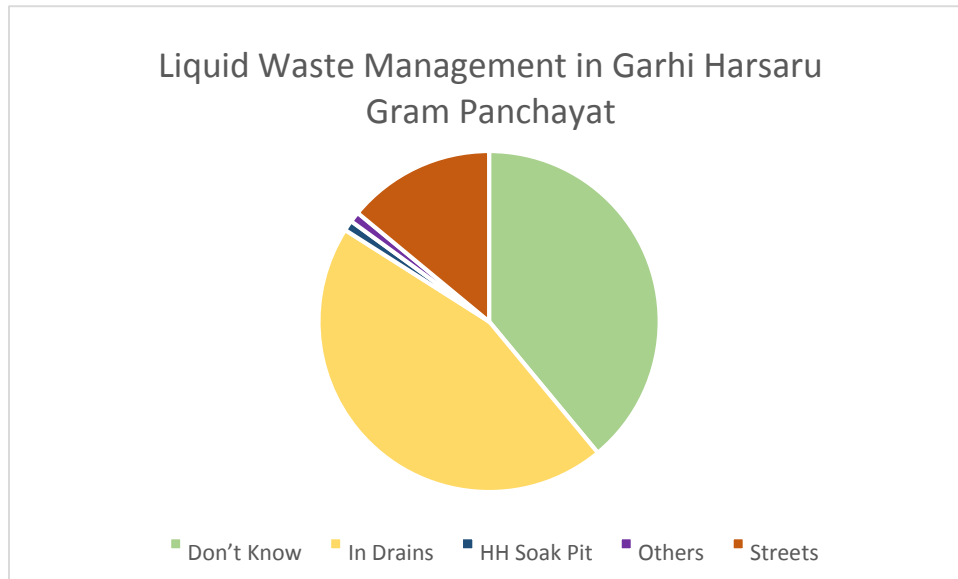
At present, there is a very inconsistent drainage system present in the gram panchayat. A majority of the households as inferred from the baseline data discharge the waste water from the households to be released onto public streets/broken storm water drains. Due to flow of waste water into public areas, it has become a major source of bad odour, disease in the panchayat.

In the absence of systematic liquid waste handling methods, following issues are being faced:

- From few houses, the waste water flows directly into the streets which is leading to puddles forming in front of the households
- The discharges from the toilets/bathrooms are mostly let on to the storm water drains which are either broken or choked
- The waste water gets collected at various points of the village due to nonfunctioning drains and blockages in it at different points

The Garhi Harsaru GP lacks the basic infrastructure across the whole value chain of SLWM. Thus, there is an urgent need to bring in the improved, efficient and sustainable SLWM system for clean and green GP as well as there is need to connect all the houses to the waste water management system.

Exhibit 4: Liquid Waste Management Facility



Source: Baseline Survey conducted in the Gram Panchayat (N=607)

3. Proposed SLWM System

The solutions have been proposed based on the inputs given by the Gram Panchayat and the baseline survey findings and existing situation assessment.

Ideally, domestic waste should be collected within 12 hours' intervals every day. If kept beyond 24 hours, it generates unpleasant odours and attracts flies. Beyond 24 hours, foul smell generates and further beyond 48 hours ends up in bad odour and begins to stink and after 72 hours along with the bad odour formation of maggots take place which is the prime reason for nuisance of domestic flies in and outside homes. Thus to achieve 100% ZWM, collecting garbage every 12 hours is strongly suggested to all concerned.

THE PRIMARY SYSTEM AS KEY POINT TO ZERO WASTE IS IMMEDIATE COLLECTION OF ANY DOMESTIC WASTE AND SEGREGATION AT SOURCE.

ZERO WASTE MANAGEMENT (ZWM)		SOLID & LIQUID RESOURCE MANAGEMENT (SLRM)
Handling of waste stored for more than 24 hours and above	1	Waste is viewed as a „Resource“ if collected within 12 hours of generation.
There will be bad smell, stink, Maggots, House flies, etc...	2	Everything looks odorless, Fresh Raw Material.
The process focus is mainly on management after collection of waste.	3	The process begins with systematic collection of waste and transportation. Hence it becomes easy for management at the collection point.
We are forcing our own people to lift 2 or 3 days old waste and ask them to handle very dirty thing & stinking material.	5	We are not exposing our people to dirt and stinking materials. They are handling fresh items.
Volunteers/Workers are uncomfortable to work here.	6	Volunteers / Workers are happy to work here.
It takes longer period of time to segregate and process waste items. In this process many items become unfit for usage.	7	Here, it is a very easy to process being fresh material is handled.
If collection does not happen in a day it is not collected for the next 24 hours or more	8	Strict compliance to collection schedule ensures no stinking waste at any time.
Garbage dumping, burning happens frequently.	9	There is no chance of dumping of burning of waste

Recyclable items are dirty and not looking fresh or neat. We will get less income.	11	Everything looks fresh, clean and neat and can fetch moderate income.
This manure has less NPK (Nitrogen, Phosphorous & Potassium) values.	15	This compost and vermi-cast has highly rich NPK (Nitrogen Phosphorous and Potassium) values.
ZWM involves additional man power, number of days for processing, leachate problem and less income.	16	Through SLRM, we are getting more income through vermi-wash, Earthworms, vermi-cast etc...
vast area of dumping yard is required		All materials are managed within the centre saving land area and avoiding pollution
Expenses incurred on waste management are very high on transportation, engaging heavy vehicles, dumpers, dumper placers etc.	18	Transportation cost is marginalised and scope for income generation is high, due to decentralised method.

3.1 Salient Features of the Model

- Complete thrust on awareness and behaviour change
- Basic infrastructure to aid and sustain the behaviour change envisaged
- Systematically collect & transport segregated solid waste with dedicated service delivery team
- Complete community and Gram Panchayat ownership to execute, manage, monitor, evaluate proposed SLWM system
- Complete transparency and accountability with management & reporting system and having a dedicated monitoring committee consisting mainly of local villagers
- Self-sustainability of operation and maintenance is ensured with the help of user fee collection and waste by-products. The monthly expenditure for the project can be met from the user fee collection itself if it is made mandatory and everybody adheres to it from the first month itself. Keeping in mind the practical constraints in this maintenance support should be given to the GPs which has to be a part of the SLWM budget. The monthly subscription collected by the service delivery team is accounted for by the SLWM Committee and will be used towards paying the wages for the workers involved in the system.

The long-term benefit of this model:

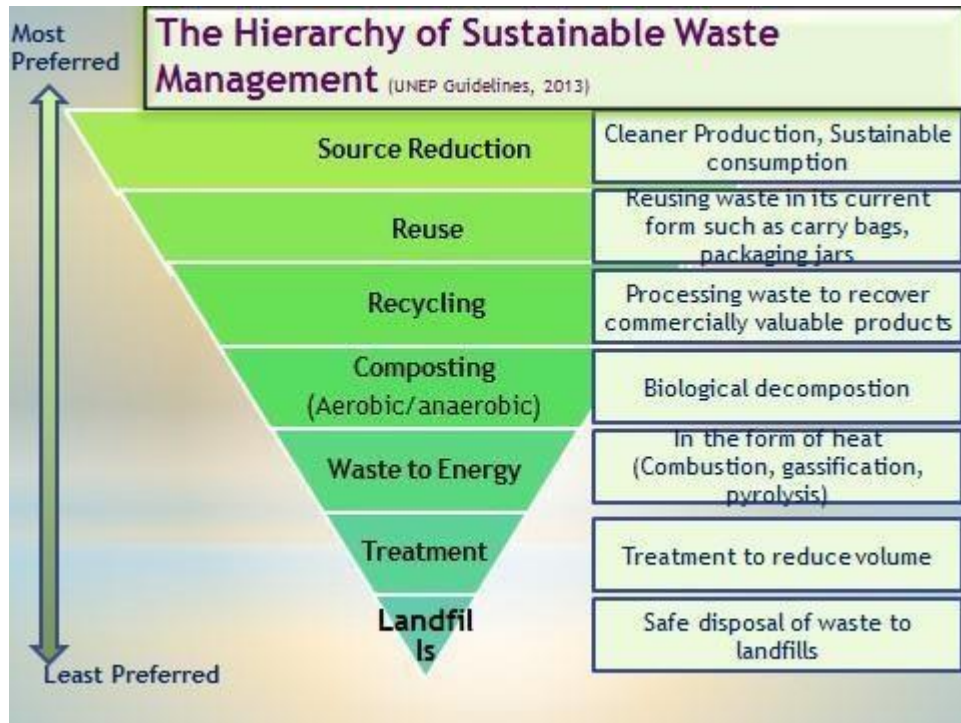
The long-term benefit of this project will be:

- This proposed project will comprise of systematic waste collection in Residential areas Shops, composting of organic waste, recycling of inorganic waste and scientific disposal of non-recyclable waste.
- Establishing the principle of cost recovery from Waste.
- Spreading the concept and practice of converting waste to wealth.
- Civil society can be transformed as informed and sensitized by means of motivation and involving them in similar projects and initiatives in their own territory.
- Creating employment and enterprise opportunities in Green Industry especially among Self Help Groups (Both Women & Men).
- Education and involvement of Youth in general and students in particular in environmental governance.
- A well designed Information system, Info-bank and access through internet.

3.2 Proposed Solid Waste Management System

The SOLID AND LIQUID RESOURCE MANAGEMENT MODEL is based on the sustainable hierarchy of waste management which lays more focus on Reduction to Recycling based on decentralized concepts.

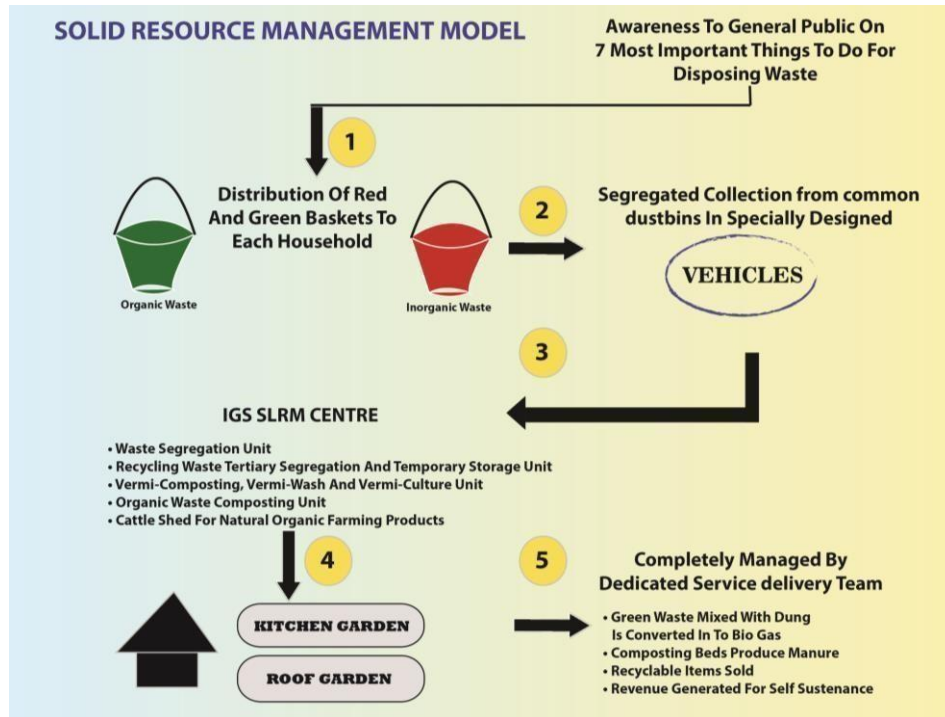
Exhibit 5: Hierarchy of Sustainable Solid Waste Management



This hierarchy can only be achieved by way of DECENTRALISATION of Waste management. This model is a culmination of awareness to systemized and scientific management. Fool proof monitoring and effective documentation are key pillars which will take us to the objective of ZERO WASTE.

The key components of the proposed SWM system are shown in Exhibit 6 below:

Exhibit 6: Proposed Solid Waste Management system for Garhi Harsaru Gram Panchayat



Note: The photos and diagrams of the components shown are just basic representation of the original components to be provided in the Gram Panchayat

As shown in Exhibit 6 above, dustbins (2 nos.) will be distributed to HHs to ensure source segregation, and segregation will further be ensured by compartmentalized community dustbins and transportation vehicles. The HHs will dump their waste in the community dustbins which will be collected by service delivery team from these community dustbins and will be disposed-off to resource recovery centre. Exhibit 7 below outlines detailed specifications of resource recovery centre.

Exhibit 7: Key specifications of the Resource Recovery Center

Description	Volume	Description	Volume
Total Building Area	2000 square feet	Flooring	Cement Flooring
Height Of The Building	15 Ft	Side Walls	4ft Brick Walls On All Sides*
Vermi Compost Tanks Inside The Centre	Tanks of capacity 54 cu. Ft (4x3x4.5 Ft)	Iron Mesh	9 Ft
Waste Handling Capacity	4000 kgs /day	Roof	GI-Sheet Welded with Side Mesh
Gate	Iron Gate 4 Ft Height		

3.3 Proposed Liquid Waste Management

The system for liquid waste management is broadly based on the system of soak pits traditionally adopted for building toilets in rural areas but with certain modifications to allow for disposal of household waste water

The model envisages clusters of houses such that for every 10 houses, a soak pit is built to allow water only from the 10 houses to flow into. The water from the houses flow in to these soak pits via underground channels and fall into the soak pit. The water will gradually soak into the sides of the pit and filter down to the ground water table.

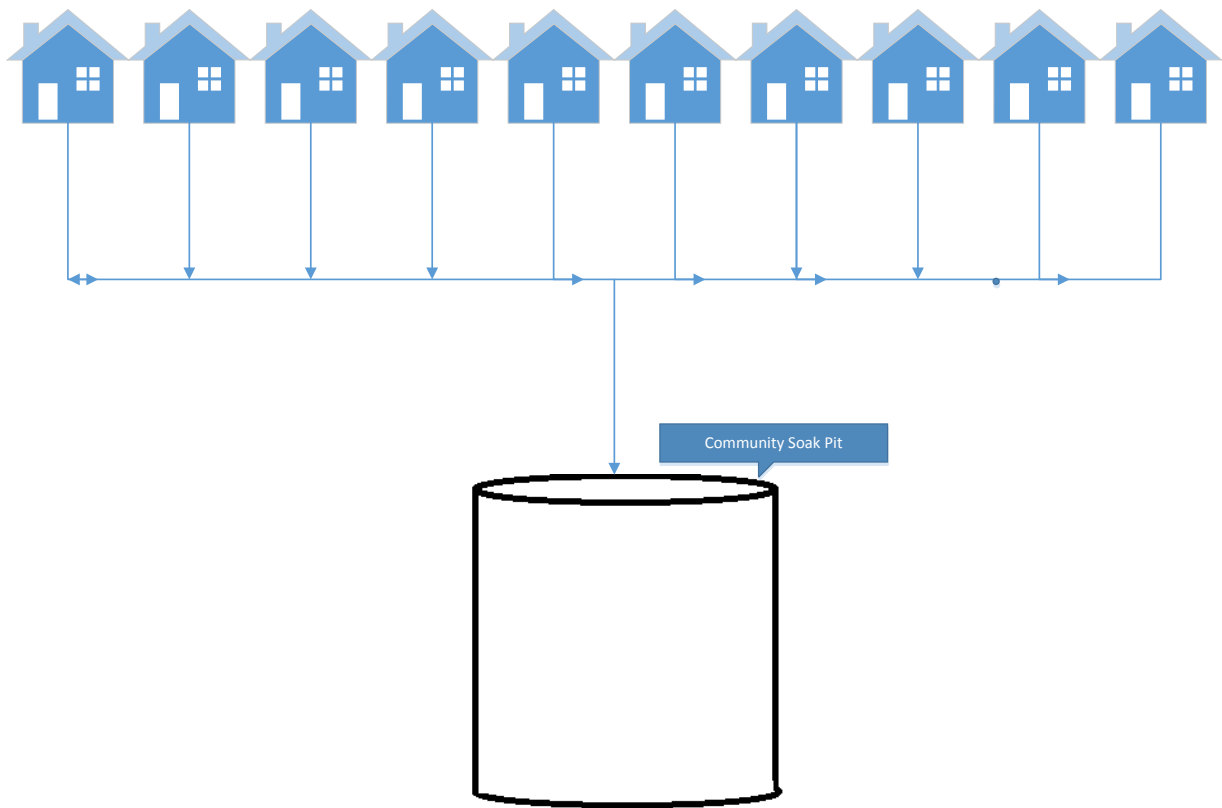


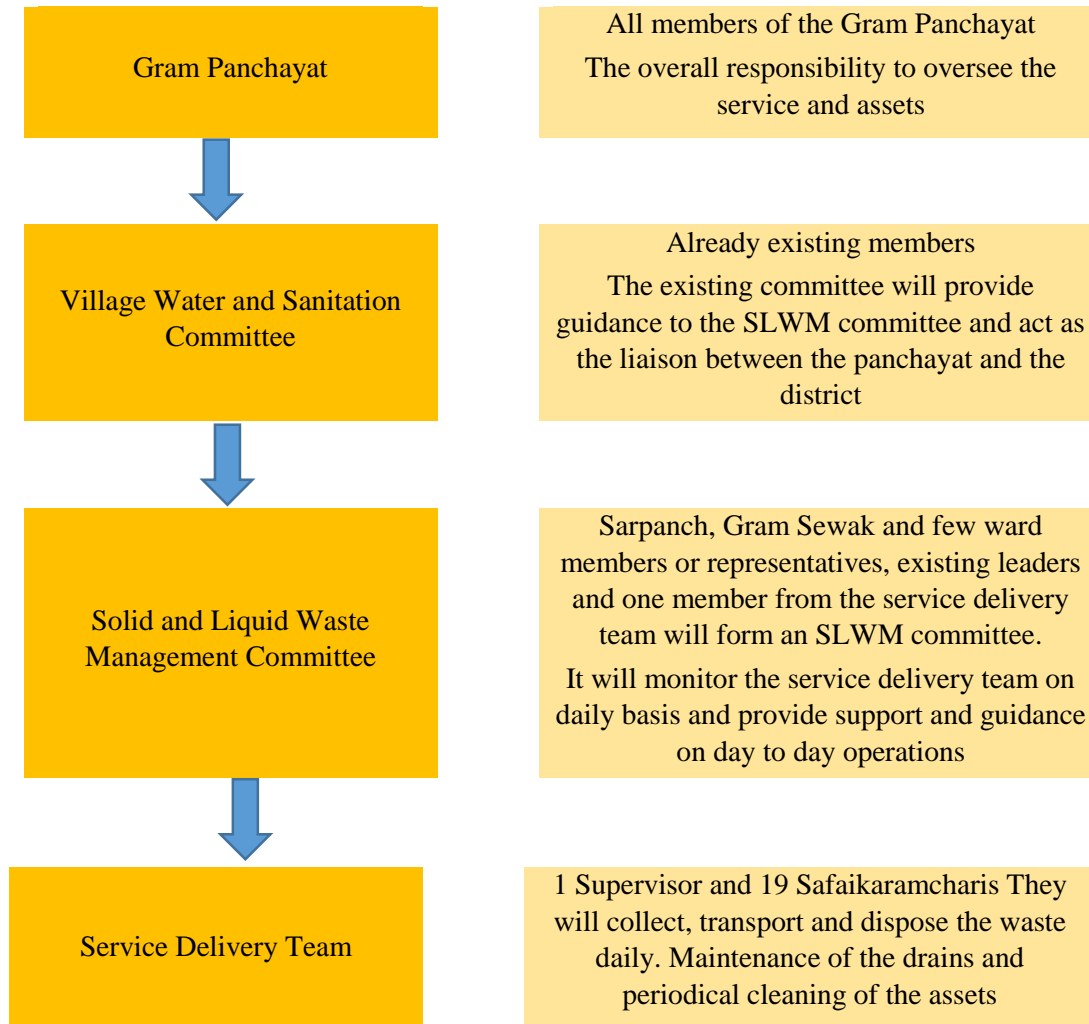
Fig. 1 Schematic diagram of process flow for community soak pit

The soak pit being constructed will be 2m in diameter and 10m in depth. After analyzing the soil conditions around the village, it was found that the soil is porous and loamy. This kind of soil has a low soaking capacity due to which this soak pit will have a longer depth than traditional community soak pits.

3.4 Proposed Institutional Structure

Accountability, Monitoring and sustainability of the initiatives are of extreme importance in order to sustain the activities initiated as part of the SLWM. For this purpose, Exhibit-13 outlines the proposed institutional structure for sustainability of the proposed SLWM system:

Exhibit 8: Proposed Institutional Structure for proposed SLWM System



SLWM committee will be separately formed as there is no Nigrani Committee in the panchayat. They will play the role of monitoring the SLWM project as well as work towards sustaining ODF status of the gram panchayat.

Service Delivery Team is the most important part of the structure as it has to run the whole system on the daily basis. The team will be identified once the construction of the Resource Recovery Centre is completed. The service delivery team will have specific responsibilities. Few of those are:

- ▶ Every day collection of waste from the common dustbins and maintenance of the dustbins, transportation of the waste collected to the resource recovery centre and its maintenance;
- ▶ Daily segregation and packing of the non-degradable items and composting of the biodegradable items;
- ▶ Kitchen garden and eco park maintenance;
- ▶ Maintenance of the drains and periodical cleaning of filter bed and chamber
- ▶ Maintenance of all accountability registers and reporting on a daily basis to the SLWM committee

Additionally, service delivery team will offer certain value added on call services. Few of them are:

- ▶ Setting up Animal Waste compost beds (execution or training)
- ▶ Individual soak pit construction (where needed especially for black water)
- ▶ Sale of sanitation related products (6 months after the initiation of project based on demand)

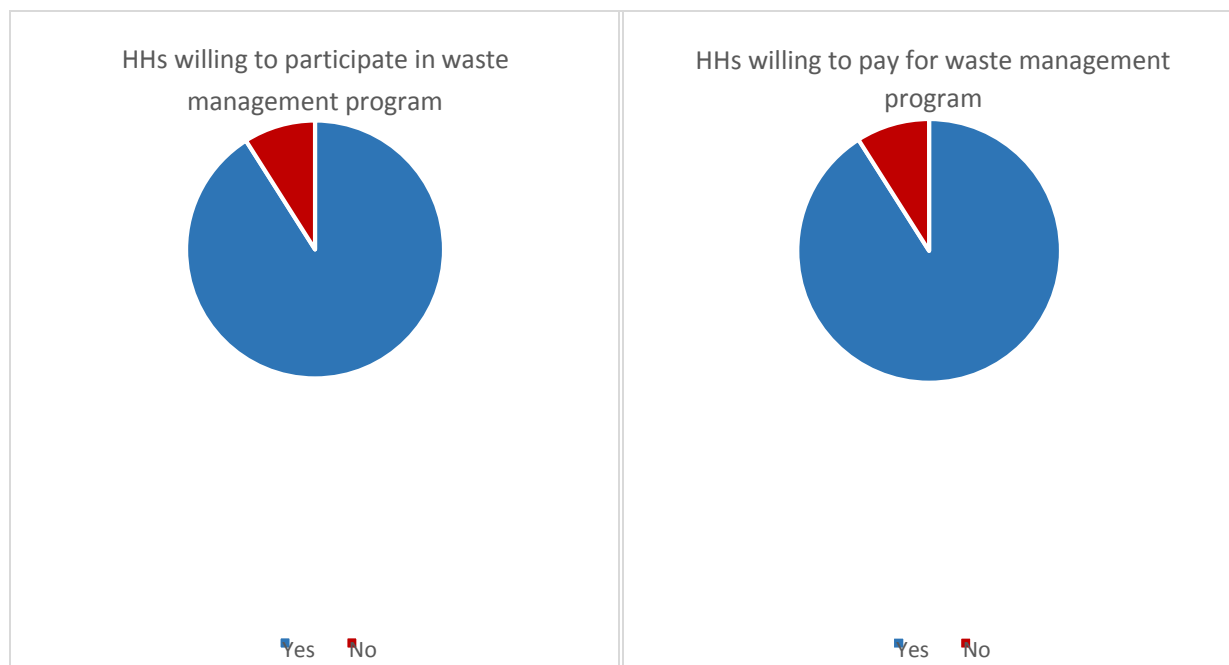
Besides these responsibilities to maintain transparency, the attendance registers, collection registers, volume registers, sales registers and feedback/ suggestion register will be maintained.

3.5 Proposed Awareness Campaigns

In order to sensitize the villagers to encourage using these SLWM services a series of awareness campaigns will be conducted covering; personal hygiene and sanitation, safeguarding water source, HH level segregation, cleanliness and maintenance of drains, open spaces etc.

The figure below shows that more effort has to be put in for the awareness campaigns in the area as a majority of the people do not wish to participate in the initiatives. This could be due to various factors. Hence a considerable amount of time has to be spent in making them understand the initiative and its importance.

Exhibit 9: Waste Management Programs



Our current linear resource flow uses huge amounts of raw materials and generates huge amounts of waste. This will lead our society to resource depletion. SRM is about redesigning this resource flow so that most of what is generated as waste can be reused as raw material for further production. This resource flow is more sustainable and will take us closer to goal of „zero waste“. This requires focused actions before and after production.

Pre-production Actions

- Reducing Production (consumption): Producing and consuming only as much as needed.
- Redesigning Production processes: Producing using cleaner processes and packaging using less material.

- Production of safe and recyclable materials: Avoiding the use of toxic and nonrecyclable materials, so that maximum resource can be recovered with least harm to the environment.

Post-production Actions

- Reuse: What is produced should be reused as many times as possible. Eg. Bottles, containers, bags, etc.
- Recycle: Recycling those materials that cannot be reused. Eg. Organic waste into compost, PET bottles into polyester fibers, glass bottles into glass panes, cotton rags into paper, etc.

These will be some of the key inputs in terms of awareness programs and advocacy initiatives. There will be a scheduled and systematic awareness building initiatives.

The awareness campaign and the entire initiative will follow the hierarchy of sustainable waste management. It is important for a larger group to understand the importance of having systems in place for waste management. This objective of ZERO WASTE cannot be obtained unless the hierarchy is understood.

4. Sustainability and Implementation of the Project

The SLWM project is envisaged to have both physical and financial sustainability. It is imperative to ensure that the behavioral modifications and new practices established are also sustained

4.1 Physical Sustainability

- A set of rules and regulations with respect to disposal of garbage inside the village will laid down and every resident will be oriented about the same.
- The periodical awareness programs and information materials will be supplied so that the old and also the new residents are aware of the practices
- A new monitoring committee will be set up which will constantly monitor the work of the implementation team as well as the compliance of the residents
- Periodical documentation reports of the project and newsletters related to progress will be released to ensure that all the residents are aware of the progress of the project

4.2 Financial Sustainability

By financial sustainability it is envisaged that the project will generate an income which breaks even the monthly recurring expenditure of the project. It is expected that the project can attain self-sustainability over a period of about 18 months and it will start earning revenue to meet a substantial part of the revenue expenditure after the seventh month of its implementation.

The Revenue can be generated in many ways but the volume of revenue depends on various factors including the consistency and the nature of garbage generated.

1. Sale of compost (organic markets, farmers and individuals – Direct and/or Online marketing)
2. Sale of Recyclables (Plastics, papers, bottles and other items) – Directly to the factories will be profitable
3. Other service fees for the service delivery team
4. User fee collection (It is important to note that most of the residents at this stage are not in favour of this user fee – Source – Baseline survey data).

The Financial sustainability can be worked out only after a substantial period of implementation which will give a clear picture of the cooperation and the attitude of the villagers towards such a project.

5. Costing and Finances

CAPITAL EXPENDITURE (Non Recurring)

S. No.	Particulars	Quantity	Unit Price (Rs.)	Total Cost (in Rs.)
	Solid Waste Management			
1.	Construction of waste collection centre	2000 sq.ft	As discussed with contractor post finalization of DPR 12,00,000 (approximately)	
2.	No. of dustbins installed			
2.1	Common dustbins of 100 kg capacity (including school, anganwadi and panchayat building)	160	500	80,000
2.2.1	Dustbins for households green colour (10 litres)	1551	135	2,09,385
2.2.2	Dustbins for households red colour (15 litres)	1551	175	2,71,425
3.	System for collection, segregation and disposal of household garbage			
3.1	Workers Uniforms, safety equipment; hand gloves, canvas shoes, first aid kits etc.	20	3000	60,000
3.2	Packing materials for a year **	1	15,000	15,000
3.3	Tools required (Shovels, Brooms etc.)	1 set		15,000
3.4	Waste Collection Vehicles (Battery operated vehicles)**	4	2,00,000 (approx..)	8,00,000
4.	Other SWM Activities, Landscaping and Beautification	Lump Sum		30,000
	Sub Total for Solid Waste Management			Rs.26,80,810
	Liquid Waste Management			
	Community Soak Pits	150	40000	60,00,000
	Sub Total for Liquid Waste Management			Rs. 60,00,000

Total Cost for Solid and Liquid Waste Management	Rs. 86,80,810*
---	-----------------------

*The cost is an estimate and is subject to change as per quotations provided by vendors before starting construction

** The actual rate of vehicles will be given as per quotations by corresponding vendors **RECURRING COSTS**

S. No.	Particulars	Quantity	Unit Price (Rs.)	Total Cost (in Rs.)
	Solid Waste Management			
1	Salary for the workers	20	7000	140000
2	Safety tools and equipments	LS	5000	5000
3	Water and Electricity charges at the RRC	LS	5000	5000
4	Stationaries and monitoring tools	LS	2000	2000
5	Vehicle maintenance	LS	3000	3000
	TOTAL			1,55,000

5.1 Implementation Plan

During implementation phase, the key responsibilities of the consultant team is to facilitate and support in; (i) the setting up of complete infrastructure facilities, (ii) recruitment and training of the service delivery team, (iii) ensuring that the SLWM system and monitoring structure is in place. Furthermore, the key responsibilities of Panchayati Raj Department and the district administration shall include facilitation and support in; (i) approval of DPRs, (ii) release of funds for the project implementation, (iii) periodical visits at project site to provide feedback.

Fund Position of the Village

The discussions with the Gram Panchayat show that they will receive some funds which can be utilized for the implementation of Solid and Liquid Waste Management initiatives. However, utilization of other funds to compensate the remaining amount is a very critical point of discussion. This entire project is aimed at providing a long term and sustainable solution to the initiatives.

