

2018

DRAFT DETAILED PROJECT REPORT
SOLID LIQUID WASTE MANAGEMENT

KHERI KARMU GRAM PANCHAYAT,
SHAMLI BLOCK, SHAMLI DISTRICT,
UTTAR PRADESH

Implementing Agency: Kheri
Karmu Gram Panchayat

Technical Support:
Consortium of India Water
Partnership (IWP)

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List of Abbreviations

BDO	Block Development Officer
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
CW	Constructed Wetlands
CSR	Corporate Social Responsibility
DPR	Detailed Project Report
DWSC	District Water and Sanitation Committee
FGD	Focused Group Discussions
GOI	Government of India
GP	Gram Panchayat
HH	Households
IEC	Information Education and Communication
IWP	India Water partnership
MDWS	Ministry of Drinking Water and Sanitation
NBA	Nirmal Bharat Abhiyan
NGO	Non-Government Organization
NGP	Nirmal Gram Puraskar
ODF	Open Defecation Free
PLA	Participatory Learning and Action
PRA	Participatory Rural Appraisal
PRD	Panchayati Raj Department
RRC	Resource Recovery Centre
SBM	Swachh Bharat Mission
SLWM	Solid and Liquid Waste Management
TSC	Total Sanitation Campaign
VWSC	Village Water and Sanitation Committee

1 Introduction

Swachh Bharat Abhiyan (Gramin) (SBM-G) 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.

India Water Partnership (IWP) has agreed to extend technical support to the Panchayati Raj Department (PRD), Government of Uttar Pradesh (GoUP) to develop model Gram Panchayats that showcases replicable models of Solid and Liquid Waste Management. IWP will support the Gram Panchayat in preparing the Detailed Project Report (DPR) for SLWM system (Letter from PRD is attached as **Annex-1**).

Key Indicators of Kheri Karmu Gram panchayat	
No. of Villages: 2 (Kheri Karmu and Shamli Rural)	
Kheri Karmu	Shamli Rural
Total HHs: 1609 (MDWS) Distance from Sub-District HQ Shamli: 5kms	Total HHs: 22 (MDWS) Distance from Sub-District HQ Shamli: 0.5kms

1.1 Methodologies followed for preparing DPR

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

Exhibit 1: Methodologies followed for preparing DPR

Activities	Stakeholders	Tasks
Orientation Workshop (20 th Dec 2017)	Pradhan, GP secretaries, DPRO, Local NGOs	<ul style="list-style-type: none"> Project Introduction Discussion on future plans & stakeholders support
↓		
Transect Walk (20 th Dec 2017)	GP officials, Pradhan, Sarpanch, villagers (volunteers/ motivators)	<ul style="list-style-type: none"> A quick walk around the village to understand existing systems and Identify problem areas
↓		
Consultations with Key Stakeholders (18 th Jan 2018)	GP officials, Local NGOs, select motivators	<ul style="list-style-type: none"> Discussed existing systems Discussed past and current plans/ programmes, financial condition etc.
↓		
Participatory Rural Appraisal & Village Mapping (18 th Jan 2018)	GP officials and Villagers	<ul style="list-style-type: none"> Discussion on existing condition and aspirations for SLWM Preparation of village/resource map in discussion with villagers
↓		
Suggestions on DPR (19 th Jan 2018)	GP officials and Villagers	<ul style="list-style-type: none"> The proposed model shared with villagers Valuable suggestions and comments received and further incorporated
↓		
Final Discussion in Gram Sabha (19 th Jan 2018)	GP officials and Gram Sabha	<ul style="list-style-type: none"> The final DPR shared with villagers and approval from the Gram Sabha on SLWM DPR

All the tasks and discussions carried out for preparation of DPR as discussed in Exhibit-1 have been detailed out in **Annex-2**.

2 Assessment of Existing SLWM Systems

2.1 Existing Solid Waste Management System

At present, there is no collection and disposal mechanism. Exhibit 2 below outlines the current waste generation and the present methods used for disposing off the solid waste. The KheriKarmu Gram Panchayat does not have any infrastructure to collect and transport the solid waste and there is no specified location for the solid waste disposal.

Exhibit 2: Existing Solid Waste Management System in KheriKarmu Gram Panchayat

Waste Generation	Collection and Transportation	Disposal
Total estimated Solid Waste generated: ✓ 600 gms per HH per day*	✓ Currently there is no scientific system to daily collect and/or transport the solid waste generated	Current Disposal methods: ✓ Animal Waste: Individual compost pit at home or field. Waste is piled & left open outside houses to be used as manure in 6 month
Types of Solid Waste: ✓ Bio-degradable: Animal waste, vegetable waste ✓ Non-Bio-degradable: Plastic bags, papers, glass	✓ Once in 2 to 3 months, solid waste is collected from roads/drains and transported to an open area outside the village.	✓ Vegetable & food waste: Given to livestock, reused in garden/ field
Solid Waste Sources: ✓ HH, Schools/ Anganwadis, Shops etc.		✓ Plastics: thrown outside, in open area, fields, drains or burnt (80% HHs)

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

- Accumulation of waste at open spaces, street sides/ drains, leading environmental degradation
- Absence of regular cleaning of drains/ roads, due to no permanent Safai-Karamcharis in the GP
- Most of the drains get blocked due to waste dumping and leading to overflowing of drains.

With respect to the solid waste generation and disposal, the following trends were observed and also discussed with the residents:

1. There is no dustbin culture in the village. The residents throw their waste out on the street corners as and when they want and hence calculating the volume based on dustbins is not possible.
2. There is no collection mechanism and hence volume analysis based on final dumping is also not possible.
3. Organic waste especially food waste is usually not thrown instead fed to cattle at home by a majority of residents. Hence, calculating the organic waste output based on dustbins is again not possible.
4. Hence, the volume considered has to be based on data available and local dynamics. The assumption hence is to consider only non-degradable items as the output and encourage the culture of not dumping food waste and use it as compost at homes and feed for cattle. The proper way to handle organic waste at source can be included as part of the awareness initiatives.

According to the data available with municipal corporations, the amount of solid waste generated per person per day may range in the values of 0.2 to 0.5 kilograms (Source: Pune Municipal Corporation and Chennai corporation data). Hence, an average value of 0.35 kg was considered. Out of the 0.35kg further assumption is made that around 0.15kg of organic waste is being used as a feed for cattle or dumped along with cow dung for composting. An average mean of 4 adults per house hold is considered which brings the figure to $0.15 \times 4 = 0.6\text{kg}$ per household.

2.2 Existing Liquid Waste Management System

Liquid waste is one of the major issues plaguing the Gram Panchayats all across India. Absence of proper drainage mechanisms is a major contributor to lot of vector borne and water borne diseases. This can be seen as a common picture in all the Gram Panchayats. There were 2 distinct scenarios identified at Kheri Karmu Gram Panchayat at Shamli. In some streets, there are drainages of 1ft width and 1ft depth and in some of the streets the liquid waste flows directly on to the streets.

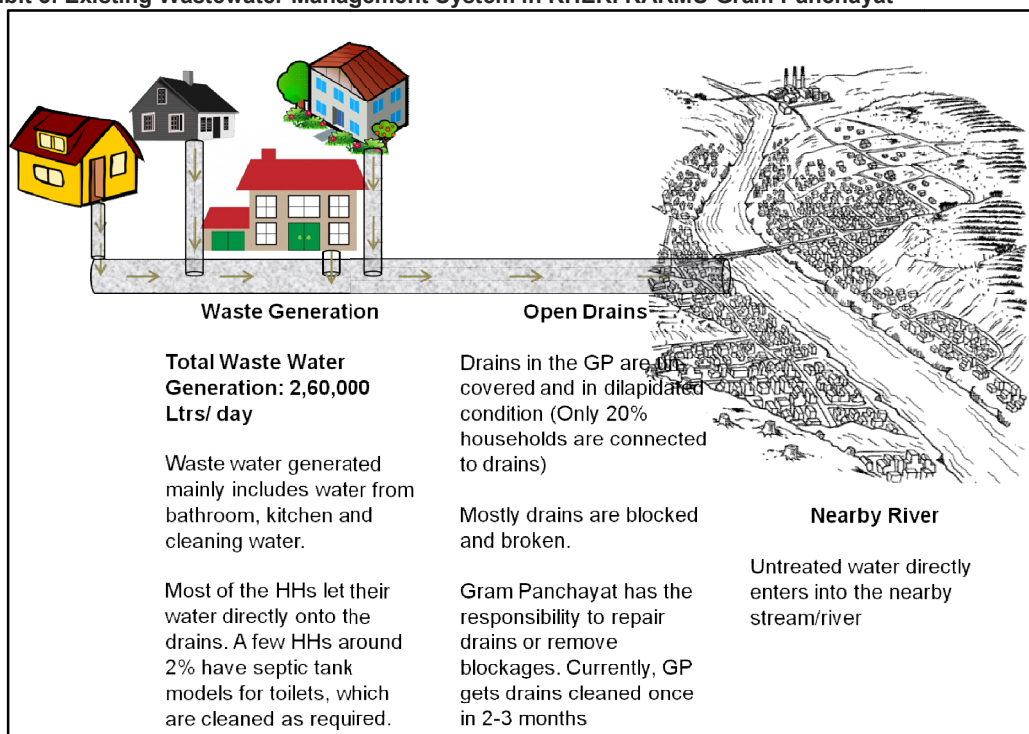
The Liquid waste from the streets and drainages flows in to the stream running parallel to the Gram Panchayat from 7 different locations. The water from the streets is directed to the stream via makeshift drain paths. The following points with regards to Liquid waste output from the gram panchayat are important

1. The volume of water entering the stream cannot be determined at the end point accurately as the water flow is from different locations and is not defined.
2. The distance between residential houses and the water stream is a maximum of 300ft in most of the areas. In other words, the houses are almost in the banks of the stream and the waste water flows in between houses. So, there is very limited space for any kind of treatments to be done at the exit points.
3. The village is divided in to 2 parts. There are settlements on either side of the main road. Hence, a single system of waste water treatment for the entire village is not possible.

As per standards laid down by the CPHEEO (Central Public Health Environmental & Engineering Organisation), the fresh water consumption per day per person should be between 135 to 150 litres per day in urban settings and between 50 – 80 litres in a rural setting. It is officially expressed as “litres per capita daily” (lpcd). Since, accurate calculation of volume of waste water is difficult as explained above; an average of 60 litres per day per person is taken as the basis for calculation.

The eastern side of Kheri Karmu has around 1000 houses and the western side has around 609 houses (data from Gram Panchayat records). The eastern side hence will generate on average 2,40,000litres per day (60litres*4 persons per household*1000 houses). An additional 20,000 litres is added as miscellaneous. The western side in the same lines of calculation will generate 1,50,000litres. For the purpose and scope limited to this DPR the eastern side is taken as the implementation zone.

Exhibit 3: Existing Wastewater Management System in KHERI KARMU Gram Panchayat



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

- Open drains pose a serious health issue for the entire village. The waste water is stagnated in most of the areas and act as breeding spot for mosquitoes and other insects.
- As per the data from the Swachh Bharat Mission (SBM), the village has been declared as ODF. The transect walk along the entire GP gave a picture that most of the houses with toilets have a simple tank based system. Soak pits are not very popular in this area for reasons of not having space. There are still a few houses which directly pass the black water on to the streets.
- The waste water gets collected in the village ponds which is leading to its contamination and pose serious health issues for the entire village.
- The untreated water directly drains into the stream, thus polluting it.

The KheriKarmu 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.

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.

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 (*Gram Sabha collectively endorsed the proposal to collect user charges of Rs. 20 per HH per month*). Keeping in mind the practical constraints to collect user charges from the project commencement, the maintenance support should be given as a part of SLWM budget.

3.2 Proposed Solid Waste management System

The Solid Resource Management is divided into 5 stages:

1. Generation of waste
2. Responsible disposal of waste
3. Timely collection of waste
4. Segregated transportation of waste
5. Scientific processing of waste with area consideration

The system that is described above works on all the 5 stages with different approaches. A successful waste management program should have an integrated approach covering all these aspects and a strong monitoring system in all these phases has to be set up to ensure sustainability of the project

Generation of waste

The critical factor in any waste management system is the amount or volume of waste that is generated. The processing capacity and technology depends on this factor. On the flip side, it is also equally important to ensure that the people are made aware of their responsibility towards the environment. The most basic being their understanding of the term garbage and their role in ensuring that they reduce the waste that is generated by them. This has to be the core message that should be delivered to the people in the area no matter how sophisticated the system of processing is. Minimal usage of plastics, no usage of non-recyclable plastics and segregation are key messages that should be passed on to the residents in the area.

Responsible disposal of waste

Disposal of waste is the one factor that contributes to the unhygienic conditions prevalent in our country. The habit of disposing of waste in a hygienic manner is very poor in our country. This is partly due to the mindset of the people and partly due to unavailability of uniform and easy to access disposal facilities. This is addressed in the proposed integrated system by way of providing disposal utilities in the form of dustbins to each household as well as on the streets. The residents will be motivated as they can now feel the intensity in the program and a complete cooperation can be demanded once utilities are provided to them. This will obviously boost the desired source segregation of waste which is extremely crucial in the processing of waste irrespective of technology.

Timely Collection of Waste

Waste is not waste if it is collected within 12 hours of generation. It is termed as a resource. After 12 hours, the microorganisms start settling in the garbage and produce foul smell which will be very difficult to handle. Hence, systematic and timely collection of waste is extremely essential for successful processing and conversion into resource. The workers will have scheduled timings for

collection of waste in a decentralized manner with proper documentation. This ensures that the households are also catered positively and there is scope of grievance redressal also. The workers should have a time schedule with dedicated area which will be reviewed by the supervisors on a weekly basis.

Segregated Transportation of Waste

Decentralized collection is a very crucial aspect and similarly decentralized segregated transportation is also important. The effort put in by the people has to be complimented with systematic and timely transportation of the waste collected in the same segregated manner. This can be ensured by having segregated compartments in the collection vehicles and by having enough number of vehicles plying regularly on scheduled timings ensuring the waste is transported to the processing area immediately after collection.

Processing of Waste

This is the final phase of the waste management where waste is converted in to some form of a resource. This could be using composters to convert the waste collected in to compost or generating bio-gas from the waste or even conversion in to electricity. All this depends on the volume and the characteristics of waste collected. The better the segregation is at source, the better chances of sophisticated processing. This is the golden rule of Integrated Solid and Liquid Resource Management.

The key components of the proposed SWM system are shown in Exhibit-4 below:

Exhibit 4: Proposed Solid Waste Management system for KheriKarmu 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

The exhibit above covers all the stages in Solid waste management in accordance with the situation at the Gram Panchayat. Generation, collection and transportation, processing is shown pictorially in the exhibit above.

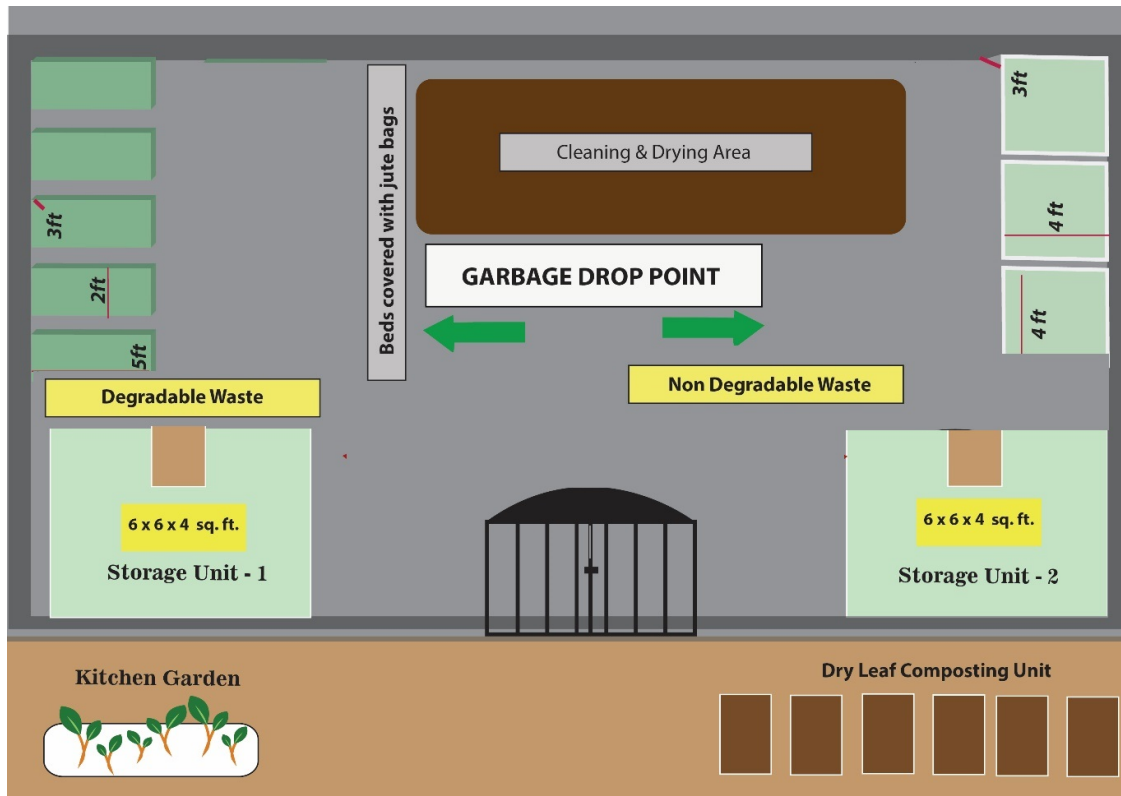
In order, to bring the dustbin culture in the village it is suggested to give one dustbin (Red or Blue) for depositing only the non-degradable waste from the houses. Common dustbins will also be placed to ensure that the household deposits their waste if the dustbins get filled up before the collection time. Door to door collection as well as emptying of common dustbins will be carried out using push cart

cycles on a daily basis. These will be taken to the Resource Recovery Centre (RRC) for immediate segregation based on value and packed for selling.

Exhibit 5: Key specifications of the Resource Recovery Centre (RRC)

Description	Volume
Total Building Area	300 sq feet (Side walls made of Iron rods and mesh) (G.I. Sheet for roof)
Height Of The Building	12 Ft
Waste Handling Capacity	750 kgs /day

Exhibit 6: Layout Plan of Resource Recovery Centre for SWM for Kheri Karmu Gram Panchayat



3.3 Proposed Animal Waste management System

In addition to the household solid waste, the animal waste (mostly cow dung) is present in large amount, however, it is considered as a resource by the rural community and hence reluctance on part of the community to share and/or dispose along with the proposed solid waste system. Hence, it is proposed to undertake structured awareness campaigns to suggest proper and effective handling and process of composting of cow dung, as described in Exhibit-7 below, with an objective to have reduced odour and increased effective composting to produce rich manure.

Exhibit 7: Handling and management of Animal Waste

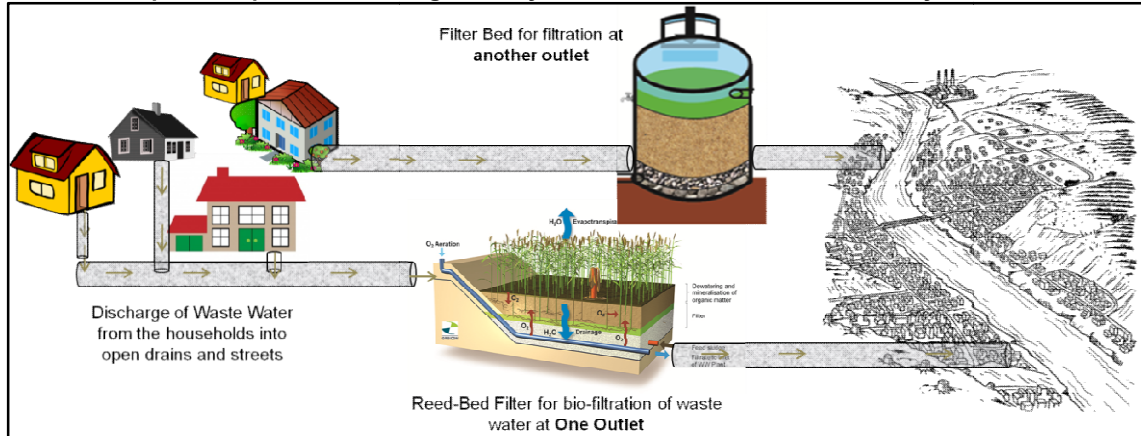
1. Identify and select location, preferably within HHS, where 3-4 feet square pile can be built
2. Spread 3-inch dry organic material layer on the area, then spread 2 inch of manure on top
3. Continue layering till 4 feet tall pile, and ensure watering as it is built to keep it slight damp
4. Finally cover it with a layer of soil
5. Turn the pile every 4 days, while keeping the pile moist but not soggy

6. Use the compost when it is dark brown, crumbly, and has an earthy smell

3.4 Proposed Liquid Waste Management System using Constructed Wetlands

The proposed liquid waste management system is outlined in Exhibit-8 below:

Exhibit 8: Proposed Liquid Waste Management system for Kheri Karmu Gram Panchayat



*Note: Detailed structure of Reed Bed Filter is presented in **Annex-3**.*

Key considerations while proposing the new liquid waste management system in Kheri Karmu GP:

- Individual soak pits in each HH is not feasible due to space constraints. HHs having no access to drainage system will have soak pits as an alternative, wherever possible.
- The entire system of routing the waste water to one common point is already present and hence continuing the same will be a cost-effective solution. However, the existing drainages need to be deepened and improved to increase their carrying capacity.
- A pre-filter chamber will be constructed to address the shock loads of water, before the water enters the filtration chamber.
- Reed-bed filter will be implemented for bio-filtration of waste water, before the water enters the stream. **Annex-3** explains the Reed bed filter and advantages of bio-filtration.
- The waste water collected and filtered can also be used as a water source for the agriculture purposes. This practice can be promoted in the Gram Panchayat through different awareness activities.

Exhibit 9: Area Map (not to scale)–KheriKarmu Village

3.5 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-10 outlines the proposed institutional structure for sustainability of the proposed SLWM system:

Exhibit 10: Proposed Institutional Structure for proposed SLWM system

Gram Panchayat	All Members of the Gram panchayat The overall responsibility to oversee the service and assets
Village Water and sanitation Committee	Already existing members The existing committee will provide the guidance to the SLWM committee and will act as the liason between the panchayat and the district.
Solid and Liquid Resource Management Committee	Sarpanch, Gram Sevak and few ward members or representatives (natural leaders), members from the NIGRANI committee, one member from service delivery team. It will monitor the service delivery team on a daily basis and provide support and guidance on day to day operations
Service Delivery Team	1 Supervisor and 3 Safai-Karamcharis They will collect, transport, dispose of solid waste daily Maintenance of drains &periodical clean of filter bed/ chamber

The Nigrani committee that has been set up in the GP to oversee the ODF activities and sustain those activities will be integrated in to the SLWM committee. 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 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 non-degradable items
- Maintenance of the drains and periodical cleaning of filter bed and chamber
- Maintenance of all accountability registers & 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.

3.6 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. which will be supported by the consultant team.

The awareness campaign will focus on the following aspects:

- Personal hygiene and sanitation
- Cleanliness of house and food habits
- Safeguarding water source
- Solid waste disposal – Household level segregation
- Maintenance of drains
- Importance of participation in the entire process
- Cleanliness of the streets/ open spaces etc.

The following methods of awareness campaigns will be conducted to cover the entire Gram Panchayats:

- Door to door awareness campaign and distribution of stickers
- Stage plays at common areas of the panchayat
- Street theatre, Gram Sabhas
- Puppet shows in street and schools/anganwadis
- Folk songs
- Rallies and wall paintings
- Faith Leader rallies

4 Investment Requirements and Phasing

Exhibit-12 below outlines the capital expenditure for entire SLWM in KheriKarmu Gram Panchayat.

4.1 Capital Expenditure

Exhibit 11: Capital Expenditure for the entire SLWM for Kheri Karmu Gram Panchayat

S. No.	Particulars	Quantity	Unit Price (Rs.)	Total Cost (in Rs.)	Funding Source
Solid Waste Management					
1.	Construction of Waste Collection Centre (RRC)	300 Square Feet	800	2,40,000	SBM
2.	Number of dustbins installed				
2.1	Common dustbins of 100 kg capacity (including school, anganwadi and panchayat building) ¹ (It is a big and dense village, 1 common dustbin will be placed after every 20 HHs)	82	2,000	1,64,000	SBM
2.2	Dustbins for households *	1631	140	2,28,340	SBM
3.	System for collection, segregation and disposal of household garbage				
3.1	Waste Collection vehicles (Push cart Vehicles)	3	50,000	1,50,000	SBM
3.2	Workers Uniforms, safety equipment; hand gloves, canvas shoes, first aid kits etc.	3	2,000	6,000	SBM
3.3	Packing materials for a year **	LS		10,000	SBM
3.4	Tools required (Shovels, Brooms etc.)	LS		15,000	SBM
4.	Number of compost pits constructed and installed	0	0	0	-
5.	Number of biogas plants installed	0	0	0	-
6.	Plastic Shredding Units	0	0	0	-
7.	Plastic Recycling Units	0	0	0	-
8.	Modular Septage Treatment Units	0	0	0	-
9.	Menstrual Hygiene Management Activities	0	0	0	-
10.	Other SWM Activities (Operations and Maintenance)	LS		150000	SBM
Sub Total for Solid Waste Management				9,63,340	
Liquid Waste Management					
1.	Construction of Soak Pits	0	0	0	-
2.	Construction of Leach Pits	0	0	0	-
3.	Construction of Drainage Facility	0	0	0	-
4.	Stabilization Pond- Construction and Maintenance				
4.1	Construction of Reed-bed Filter in Kheri Karmu village <i>The detailed cost breakup is presented in Annex-4.</i>	1	8,36,502	8,36,502	SBM
4.2	Filter Bed in Kheri Karmu village	1	139732	139732	SBM

¹ Either Community or Households dustbins will be distributed.

S. No.	Particulars	Quantity	Unit Price (Rs.)	Total Cost (in Rs.)	Funding Source
4.3	Plantation Cost	1	60,000	60,000	SBM
5.	Other LWM Activities (Landscaping of the GP)	LS	0	0	-
	Sub Total for Liquid Waste Management			10,26,234	
	Grand Total			19,99,574	

Note: * It was unanimously agreed by the Gram Sabha that if the dustbins are broken or lost, it will be the responsibility of the individuals to replace them.

4.2 Investment of SLWM system in KheriKarmu GP

SBM will be the only source of funding for the implementation of SLWM system in Kheri Karmu GP and will be completed in one go. Other source of funding can also be explored such as TFC/FFC (Thirteen Finance Commission and Fifteen Finance Commission) and CSR.

4.3 Operation & Management (O&M) Costs

Operation and Maintenance Cost mainly includes the monthly salary of the workers, expenses on time to time awareness campaign and IEC activities, and other Administrative Expenses.

Exhibit 12: Operation and Maintenance Cost

S. No	Particulars	Quantity	Cost per month (in Rs.)	CostPer annum (in Rs.)
1	Monthly salary for field workers @ rupees 4000/-	3	12,000	1,44,000
2	Monthly salary for Field Supervisors @ rupees /- 5000	1	5,000	60,000
3	Vehicle maintenance expenses		1,000	12,000
4	Awareness Campaigns/ IEC Activities	3	1,000	12,000
5	Miscellaneous administrative expenses		1,000	12,000
6	O&M cost for Reed bed		6,000	72,000
7	Electricity		2,000	24,000
	Total		28,000	336,000

5 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 behavioural modifications and new practices established are also sustained.

In order to sensitize the people to encourage using the Solid Resource Management services a series of awareness campaigns has to be conducted covering; personal hygiene and sanitation, safeguarding water source, HH level segregation, cleanliness and maintenance of drains, open spaces etc. which will be supported by the consultant team.

Methodology:

Step 1: Door to door awareness program can be conducted to cover all the houses with source segregation and disposal of garbage in the common dustbins as the main points. The information given in the table below can be used as the main message for the village population.

Biodegradable	Non-Degradable
<p><i>Vegetables and fruit waste, banana leaves, coconut shell, egg shells, dry flowers garden leaves and small twigs non-vegetarian waste (animal bones, , chicken waste) leftover food, kitchen waste dead lizards and cockroaches ash, charcoal coir broom tea, coffee, floor dust house sweepings, soiled paper, finger nails and hair</i></p>	<p><i>Paper: notebooks, books, magazines, newspapers, cardboard Plastic: broken articles, water covers, milk covers, oil covers, carry bags, mineral water bottles, chocolate wrappers, paste tubes Metal: aluminum foils, iron pieces, copper, steel, tablet covers</i></p> <p><i>Glass: bottles, broken pieces Wood, Cloth Leather: tom slippers and bags, Rubber: slippers Electric wires, powerless batteries, fused bulbs and tube lights, electronic waste.</i></p>

Step 2: Mass level community awareness programs

These programs can be organized in the evenings or timings convenient to the locals and can be done in the form of talks, video shows and discussions. This can be done separately for men and women and discussions can be held according to the target audience. This will also be a good opportunity to get a commitment from the natives about the sustainability of the project. These programs can be organized with the help of the district SwatchBharat Mission team which has resources for these kind communication events.

Step 3: School Awareness Programs

These can be planned as a combination of fun and learning for the children in the form of interactive sessions, quiz and painting competitions etc., this has to be done as per the age groups.

5.1 Physical Sustainability

- A set of rules and regulations with respect to disposal of garbage inside the village will be 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 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.

The Following are the registers that the service delivery team need to maintain on a daily basis. A few of these registers are maintained by the workers and a few are maintained by the supervisor. These are just samples and the service delivery team can add columns to this but the core data should remain the same.

1. Attendance Register (maintained by supervisor)
2. Daily collection timing register (supervisor)
3. Source segregation register (Workers)
4. Daily volume book (workers and supervisor)
5. Accounts book (Supervisor)

Attendance Register (Example)

S.No.	Name of the worker	(Date) – In time & out time	(Date) – In time & out time	(Date) – In time & out time
1.	Xxx	16/10/2016 9:45AM/4:00PM	– 17/10/2016 9:30AM/4:30PM	– 18/10/2016 9:30AM/4:30 PM
2.	YYY	16/10/2016 9:00AM/4:00PM	– 17/10/2016 9:00AM/4:00PM	– 18/10/2016 9:30AM/4:30PM

Daily Collection Timing Register

DATE	ROUTE 1 – START AND END TIME	ROUTE 2 – START AND END TIME	ROUTE 3 – START AND END TIME
16/10/2016	10:00AM/11:45 AM	10:00AM/12:00PM	10:00AM/11:15AM
17/10/16	Xxx	Yyy	Zzz

Source Segregation Register

Format 1:

(Every Route should have a different register)

(Put a tick mark in the corresponding column)

Route No: 1 (example)

DATE:

House Number (and address if possible)	Segregated	Partially segregated	Unsegregated

Similar register should be present for each route. This register should be maintained till the time when the residents of that particular route start source segregation in a proper manner.

Format 2:

Date:

Route number	Un-segregated waste given (during collection)
1 – Inder (team incharge)	House No: 13, 1st street; No. 19, 1st street
2	

Daily Volume book

Date: 17/10/16

Organic waste

S.No	Item description	Quantity (gm)
1	Vegetable/fruit waste	110gm
2	Food waste (cooked)	100gm
3	Xxx	yyy

Non-degradable or Inorganic waste

S.No	Item description	Quantity
1	White water bottles	1kg
2	Coke/pepsi bottles	500gm
3	Polythene bags	1.5kg
4	News paper	200gm
	Xxx	yyy

Accounts Book

S.No	Item Description	Quantity sold (gm/kg)	Amount sold (Rs)	Supervisor signature
1	Plastics	5kg	60/-	xxxx

5.2 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 financial sustainability is possible from 3 different sources as presented below:

Exhibit 13: Revenue Generation methods

S.No	Particulars	Rs/ month	Rs /annum
1	User Fee collection at Rs. 20/ month/ HH	32,620	3,91,440
2	Sale of recyclable items/ resources from RRC	1,000	24,000
3	Other services by the service delivery team	Varies every month as per the work done	
4	Philanthropic donation/CSR activities, wherever possible	Depending upon the interest	
	Total	33,620	4,15,440

To maintain accounts and expenses for SLWM system, separate bank account named "SLWMKosh" would be opened which would be operated by 3 people (Sarpanch, secretary of VWSC, and supervisor of service delivery team).

Though the Gram Sabha has endorsed the proposal to collect Rs 20 per household per month, the user fee collection may not be 100% successful in the beginning and would require a structured awareness campaigns. Thus, it is important to support the GP for maintenance of the systems for a period of initial 12 months. For this purpose, it is necessary to contribute some amount to the SLWMKosh, which can take care of the costs of the system if the revenue is not generated as per the estimations. To develop the system in the GP, handhold support would be provided by the consultant team.

5.3 Implementation Plan

During implementation phase, the key responsibilities of the consortium 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. Exhibit-14 outlines the key activities to be undertaken to successfully implement the proposed SLWM DPR at KheriKarmu Gram Panchayat.

Exhibit 14: Steps to be followed to implement the Plan

	Component	Responsibility	Remarks
1	Submission of DPR	Gram Panchayat (facilitated by Consultant)	The consultant will support to prepare the DPR in consultation with GP and submit it for approval
2	Approvals at the District level	District administration and GP	Follow up

	Component	Responsibility	Remarks
3	Approval from the state level	GP and District administration	The GP will have to follow up with the district to get the approvals
4	Awareness Programs	District SBM team, VWSC and SLWM committee	This will be an ongoing activity which will start before the approval process.
5	Bank accounts for transparency	GP, SLWM committee	A separate bank account called SLWM account will be opened by the GP. This will be operated by Sarpanch, VWSC head, supervisor of service delivery
6	Contracts and selection of vendors	GP, SLWM committee	This activity will be completed before the approval process
7	Release of funds – 1 st installment	GP, SLWM committee	Amount released to common account
8	Creation of assets	GP, SLWM committee	RRC, Filter beds and chambers constructed
9	Release of funds – 2 nd installment	GP, SLWM Committee	Amount released to common account
10	Creation of assets	GP, SLWM Committee	Drainage network constructed, dustbins procured and distributed
11	Recruitment and training - service delivery team	GP	Service delivery team in place
12	Initiation of the Solid and Liquid resource management program	GP, District and state representatives	This will be the first day of both solid and liquid waste management program

Annexure

Annexure 1: Letter from Panchayati Raj Department, GoUP

GP KHERI KARMU

TECHNICAL SUPPORT FOR PREPARATION OF SLWM DPR SHAMLI, UTTAR PRADESH

To:

Executive Secretary-cum-Country Coordinator,
India Water Partnership (IWP) & Top Level Expert, WAPCOS Ltd.
Secretariat WAPCOS, 76-C Institutional Area, Sector 18
Gurgaon, Haryana- 122015

Respected Sir/Madam,

Re: Providing technical consultancy for preparation of SLWM DPR for GP Kheri Karmu, Block Shamli of District Shamli, Uttar Pradesh

As you must be aware that Government of India is exerting great emphasize on Swachh Bharat Mission and the honourable Chief Minister of Uttar Pradesh has given a mandate to declare Uttar Pradesh as ODF state by 2nd October 2018. Simultaneously, we also have been mandated to carry out total sanitation activities especially Solid and Liquid Waste Management (SLWM) services at the Gram Panchayat.

The Gram Panchayat will be supported through funding from appropriate schemes for the SLWM initiative. As your organization is already facilitating stakeholders of Shamli district for Nirmal Krishi and Nirmal Hindon initiatives as per mandate of District Magistrate, in this regard, we would like to request for providing your expertise and guidance to prepare Detailed Project Reports (DPR) for the Gram Panchayat Kheri Karmu, Block Shamli on SLWM in Shamli district. We would like to engage India Water Partnership for developing the DPRs for the GP for which the details are as under:

TERMS OF REFERENCE OF THE CONSULTANCY:

IWP will provide a consultant with experience of preparing SLWM DPR at the Gram panchayat level to support the process. The consultant will have the following responsibilities:

1. Initial scoping visit to the Gram Panchayat .
2. Training and guiding the field team to conduct a baseline waste audit in all selected GP (at random sampling basis)
3. Orient the GP as well as the block and district officials on the process of SLWM and related structures needed for sustainability
4. Support the process of data analysis and subsequent report preparations
5. Guide the GP in preparation of documents needed for approvals at various levels
6. Preparing the final DPR with budget guidelines (as per GCM guidelines) and support with answering queries if any from the district or state officials.

The consultant has to ensure that the DPR thus prepared adheres to the guidelines issued by the GOI for SLWM. The DPR has to be consolidative with all the required information for implementation as well as sustainability.

RESPONSIBILITIES OF THE INVITING AGENCY (GP)

1. All the travel and accommodation arrangements for the consultant (mutually agreed duration) is the responsibility of the inviting agency.
2. Making available a team of 15 field workers for the waste audit process .
3. Organising the scoping visit (local travel) in GP.
4. Providing data as required by the consultant from the block and district
5. Providing a single point of contact at the GP as well as the district level for coordination of visits and meetings.

Duration for preparing DPR:

DPRs on SLWM will be prepared and submitted for approval within 26 days from the date of the initial scoping visit.

Remunerations:

A consolidated payment of Rs. 7,500/- per DPR in words Seven Thousands Five Hundreds only will have to be paid to IWP for the assignment. All travel (as per policy) and local accommodation will have to be arranged by the inviting agency (GP).

Terms and conditions of payment:

60% of the total amount to be paid of the offer of contract.

40% of the total amount to be paid on submission of the DPR.

This contract is applicable only for the current assignment and should not be extended or duplicated for any other assignment.

Thank you

विमला
प्रधान
ग्राम पंचायत- खेरी कर्मु
शमली-राज्य

Sign Of Pradhan/Sachiv

Gram Panchayat

वेणुकांडु
सचिव
ग्राम पंचायत खेरी कर्मु
शमली-राज्य

Sign *(Veenukhandu)*
IWP



21-11-17

Annexure 2: Methodologies followed for preparing the DPR

To understand the existing condition of the village and to assess the solid and liquid waste systems and further to provide recommendations the following activities were carried out:

- Initial Orientation Workshop
- Transact Walk/ reconnaissance Survey
- Discussions with Key Stakeholders/ Gram panchayat officials
- Participatory Rural Appraisal (PRA) and Village Mapping
- DPR Discussion with the Key Stakeholders for their Comments and Suggestions
- Final Discussion of DPR in Gram Sabha

Orientation Workshop

The team visited Shamli Block in Muzzaffarnagar district. The workshop was kicked-off by Block Development Officer (BDO) in presence of Pradhan, PanchayatSamiti. The BDO introduced the consultant team to various stakeholders; comprising Sarpanches, Ex-Sarpanches, Anganwadi workers, and local NGO, and villagers. The future plans and objectives related to Solid Liquid Waste Management (SLWM) were discussed during the workshop. The officials and other participants showed keenness to provide timely and active support in developing and executing SLWM activities in their respective GPs.



Orientation Workshop

The representatives from various GPs highlighted problems and challenges which are faced at the grass root level in sanitation sector. These are:

- Garbage pits are not present in the villages due to which is thrown along the roads, in the drains or at vacant place
- There are no permanent safai-karamcharis due to which streets and drains are not cleaned regularly. Presently, to clean the drains and villages, Gram Panchayat hires few workers three to four times in a year.
- Animal waste and vegetable waste is either dumped within the house premises or just outside the house which is alter on used as manure for the fields, but other waste such as plastic, paper, cloth etc. is either thrown at open areas or burnt.
- Waste water is not a big problem for villages at foothill, as water drains out of the village due to the slope. But, in plain areas either waste water gets accumulated on streets, open land or local pond.
- Blockage of drains also leads to overflowing of waste water onto streets.

After understanding the issues from the stakeholders, Pradhan and BDO suggested that behavioural change is needed for successful implementation of the project which can be brought in by spreading awareness amongst all the villagers by informing the benefits of SLWM. The workshop was closed with the selection of potential Gram Panchayats for pilot cases based on the discussions with officials and the selection criteria such as ODF/ NGP Status, willingness to support, cluster approach/ individual approach etc. identified by the consultants.

Reconnaissance Survey

Initially, a complete round of the village was undertaken to understand the overall systems, to visit the main thrust areas, and to identify the problem areas.



Open Drains and Waste Disposed



Waste Water on the Roads



Stream Flowing nearby

Discussions with Key Stakeholders/ Gram panchayat officials

After transact walk, continuous discussions were held with the key stakeholder and Sarpanch, ward members, Gram Sevak etc. of Kheri Karmu GP. The officials and other participants showed keenness to provide timely and active support in developing and executing SLWM activities in their respective GPs.



Discussions with the PRI and community members

Participatory Rural Appraisal (PRA) and Village Mapping

The PRA along with the FGDs were conducted at the temple of the Gram panchayats where many stakeholders had gathered to participate in the exercise of village/ resource mapping.



Focused Group Discussions and Resource Mapping in Kheri Karmu Gram Panchayat

DPR Discussion with the Key Stakeholders for their Comments and Suggestions

A workshop was conducted at the Village. Representatives from all the three Gram Panchayats were present in this workshop. The consultant team along with field team shared all the proposals which have been identified in the plan to get suggestions and comments from the local people. Various technical and feasible inputs were received from the local people as well as the funding of the asset creation and its operation and maintenance was discussed. The brief of the discussion and comments and suggestions provided by the villagers has been shown below:

First round of Suggestions and Comments

Sector/ Category	Proposal	Suggestion/ Comment from locals
Solid Waste		
Household segregation level	One dustbin at household level (dry waste)	Villagers agreed on the same
House to House Collection	Team suggested to appoint Safai-Karamcharis for collecting waste from the individual households	The villagers suggested that, it would be difficult to follow door-to-door collection as farmers/ workers leave early morning from their homes. So they suggested to keep dustbin (1 – dry waste) for every 10-20 HHs, from where safai-karamcharis can collect and transport the waste
Transportation of waste	Tricycle/ Pick-up with compartments to collect waste from Mohalla level dustbins	Villagers agreed on the same
Cleaning of roads/ drains	Appointment of Safai-Karamcharis for regular cleaning	Villagers agreed on the same

Sector/ Category	Proposal	Suggestion/ Comment from locals
Processing at Dumping of Waste at GP level	A campus is suggested at the specified location which will include a platform for segregation if required, a recovery centre for recyclables, grinder/ crusher for plastics, a hygiene shop etc.	Villagers agreed on the same and suggested few possible sites for the proposed campus
Liquid Waste		
Treatment of waste water	Filtration plant at the one outlet of drain and Reed Bed Technology at another outlet.	Villagers agreed on the same
Institutional Set-up		
Service Delivery Team	Consultants suggested the formation of a team, wherein a committee would be formed at village level and 4 to 5 safai-karamcharis with a supervisor	Villagers suggested having Ward-wise committee as well under the Gram Panchayat level committee to have proper and regular monitoring. Also villagers suggested that the Gram Panchayats do not have safai-karamcharis, so they will have to be brought from near-by villages/ Gram Panchayats
Funding		
Funds for Asset Creation	Consultants suggested the funds to be procured under SBA funds	Villagers agreed on the same
Funds for Operation and Maintenance	Consultants suggested collection of user fees for day to day operation and salary of the Safai-Karamcharis	Villagers agreed on the same and suggested that extra cost can be shared by Gram Panchayat through SFC/ TFC, untied funds etc.

Final DPR Discussion in Gram Sabha

The Gram Sabha meeting was held to discuss about the plan for Solid and Liquid Resource management and get the views of the villagers.

Highlights from the Gram Sabha

- Issues regarding non treatment of Solid and Liquid waste were discussed in detail.
- The present issues were highlighted with respect to solid and liquid waste and more inputs were taken from the villagers.
- The participants were given an opportunity to suggest ideas to handle the situation which then can be incorporated in the DPR.
- Every aspect of the methodology was explained and consent from the villagers were taken in the form of minutes of the meeting
- Rules and regulations with respect to SLWM to be implemented in the villages were discussed in detail

Final round of Suggestions and Comments

S.No	Discussion points	Decisions taken	Remarks
Solid Resource Management			
1.	Source Segregation of garbage – Every household must segregate the garbage in to two categories	1 dustbin will be distributed to each of the households ONLY ONCE at the start of the project. It is the responsibility of the individuals to ensure that it is maintained. Panchayat will pass a resolution that	The service delivery team will report to the SLWM committee about the segregation in the common dustbin. Each dustbin will be numbered and the team will report to the SLWM committee if they find un-

S.No	Discussion points	Decisions taken	Remarks
		each house hold will segregate the waste in the household and deposit the dry waste in the common dustbin and wet waste will be composted.	segregated garbage in the dustbins.
2	Placement of Common Dustbins	1 dustbin will be kept at the corner of each street. On an average each street has about 20 houses. In streets where there are less number of houses they will have to deposit in the dustbin in the adjacent street Movable type of dustbins is preferred.	The safety of the dustbins will be the responsibility of the households in that particular street. The panchayat will question those households if the dustbins are damaged.
3	Collection vehicle	It has been decided to use manual cycles for collection of garbage as they are cost effective and easy to maintain/repair or even replace if needed. Tractors cannot get in to each of the streets and it is also time consuming.	The rickshaws will be made of good quality locally. 3 rickshaws will be purchased.
4	Service delivery team	A 4 member team will be constituted as the service delivery team. If needed more can be added at a later stage. The Panchayat will take that decision	The 3 member team will be selected by the gram panchayat and their performance will be monitored by the SLWM committee
5	Resource Recovery centre	This will be located in KhariKarmu village and will be built in 300 sq.ft area.	The maintenance of this centre will be the responsibility of the service delivery team.
Liquid Waste Structures and decisions			
3	Water Treatment	1 filter beds and 1 reed bed system will be constructed at the two main outlets where 70% of the water gets accumulated.	
5	Maintenance of the structures	The maintenance of the filter beds and the safety of the equipment will be ensured by the SLWM committee	The committee will provide responsibility of maintenance on turn-key basis to the members of the SLWM committee

The gram sabha unanimously decided that the project will be implemented in a swift manner and it will be the responsibility of every individual to ensure that the systems are sustained.

Annexure3: Reed-Bed Technology or Root Zone Technology

Reed bed is natural purifying decentralized waste water treatment. The process was developed in 1970s by Professor Dr. Reinhold Kickuth of Kassel University, Germany.

Reed beds are constructed wetlands (CWs) that are used successfully around the world in thousands of water and wastewater treatment applications. Reed beds can be treated as a natural and inexpensive treatment for domestic, agriculture, industrial, etc. wastes. This effective and sustainable water treatment technology permits the successful management of domestic wastewater, potable treatment sludges, leachate and contaminated groundwater, mining and industrial process water, and winery and agricultural wastewater.

Reed bed technology designs and constructs highly effective and simple to operate systems for treating a wide range of contaminant chemicals including ammonia, BOD, COD, suspended solids, organic chemicals, chlorinated organic chemicals, industrial solvents, and hydrocarbons.

A reed bed is essentially a basin that is lined with sand, gravel and planted with macrophytes such as reeds. Reed bed waste water treatment systems are biological treatment that works by combined action of bacteria and plants. Reed beds rely on biological processing of contaminants to treat water to a quality suitable for environmental disposal or reuse. But unlike activated waste, reed beds consume no energy, require no chemicals, have no moving parts, and are carbon neutral. Reed beds have been operating across Europe and the US for over 20 years to manage and treat domestic wastewater, water treatment waste, leachate and contaminated groundwater, and mining and industrial process water. These systems are still in operation today and continue to function with very little maintenance.

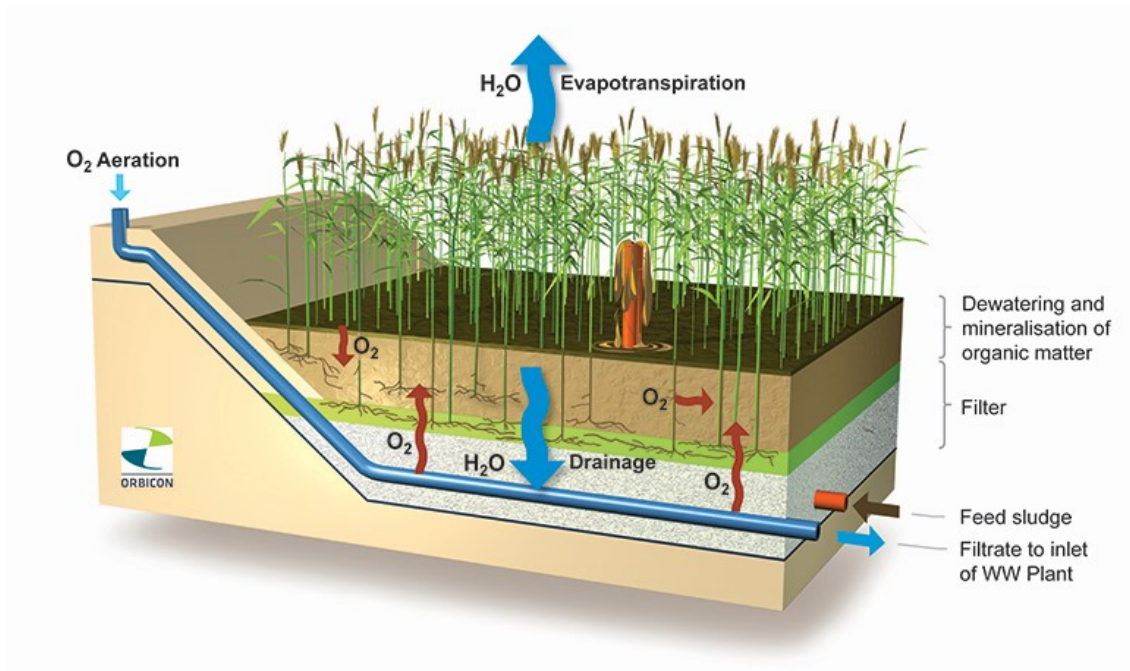
Reeds are rough grasses growing in wet places. **Aquatic plant species that can be used as reeds:**

- *Phragmitesaustralis*, *Phragmitescommunis*, *Phragmiteskarka* (Also effective in phenol removal)
- *Typha* spp.(*Cattail*)
- *Schoenoplectusvalidus* (Great Bulrush), *Schoenopletuslacustris* (bulrush)
- *Juncusinges* (Giant Rush)
- *Canna indica*
- *Stenotaphrumsecundatum*

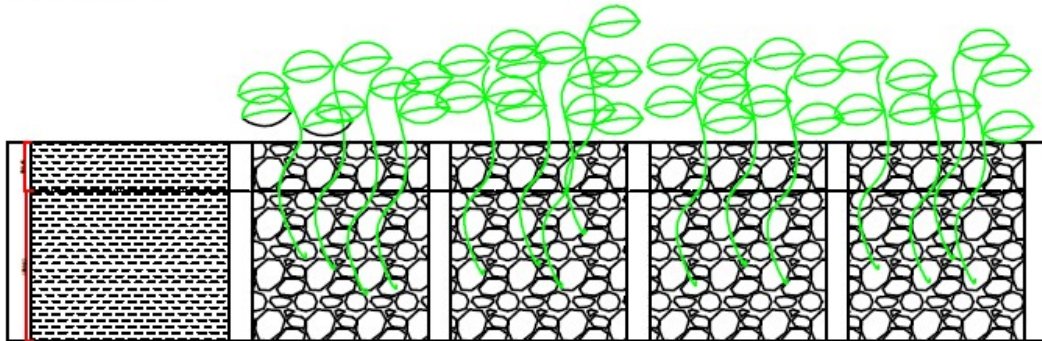
Advantages of Reed-bed Technology

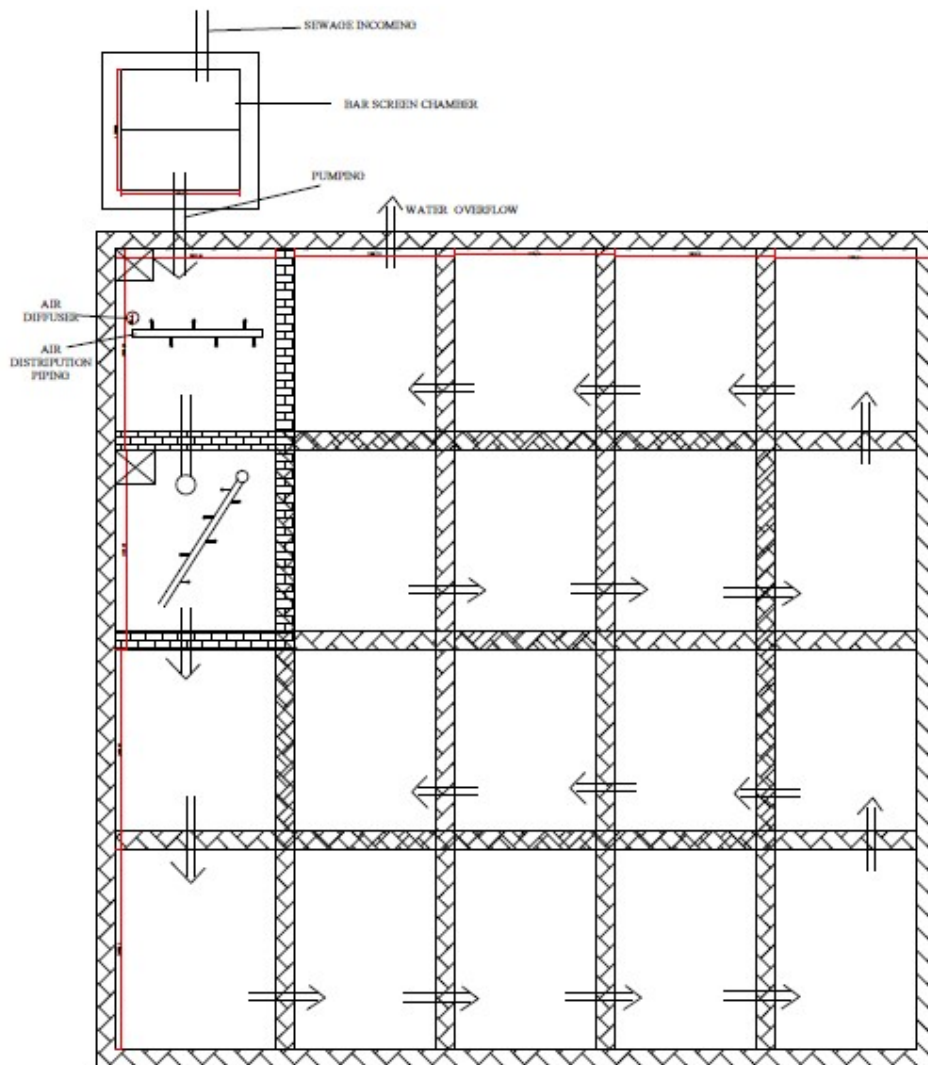
- **Zero energy, carbon neutral solutions:** Consumes no energy, resulting in reduced greenhouse gas emissions and consequently a reduced carbon footprint.
- **Low capital and operation cost:** Reedbed Technology also incurs low capital costs and lower operational costs compared to housed mechanical systems.
- No addition of chemicals
- No sludge production
- **Highly aesthetic, odourless living and growing systems:** Surface reed beds look like a lush garden bed with reeds swaying in the breeze, and they are completely odourless.
- **Remove a range of contaminants:** Reed beds remove a range of different contaminants including organic loads (BOD), petrochemicals and solvents, suspended solids and sediments, metals, and nutrients.
- **Little or no moving parts and on-site treatment of wastewater:** Being natural, environmentally sustainable systems, our reed beds have no moving parts and this equates to reduced noise and maintenance, as well as reduced pollution and greenhouse gas emissions compared to mechanical treatment systems.

Reed Bed Filter System

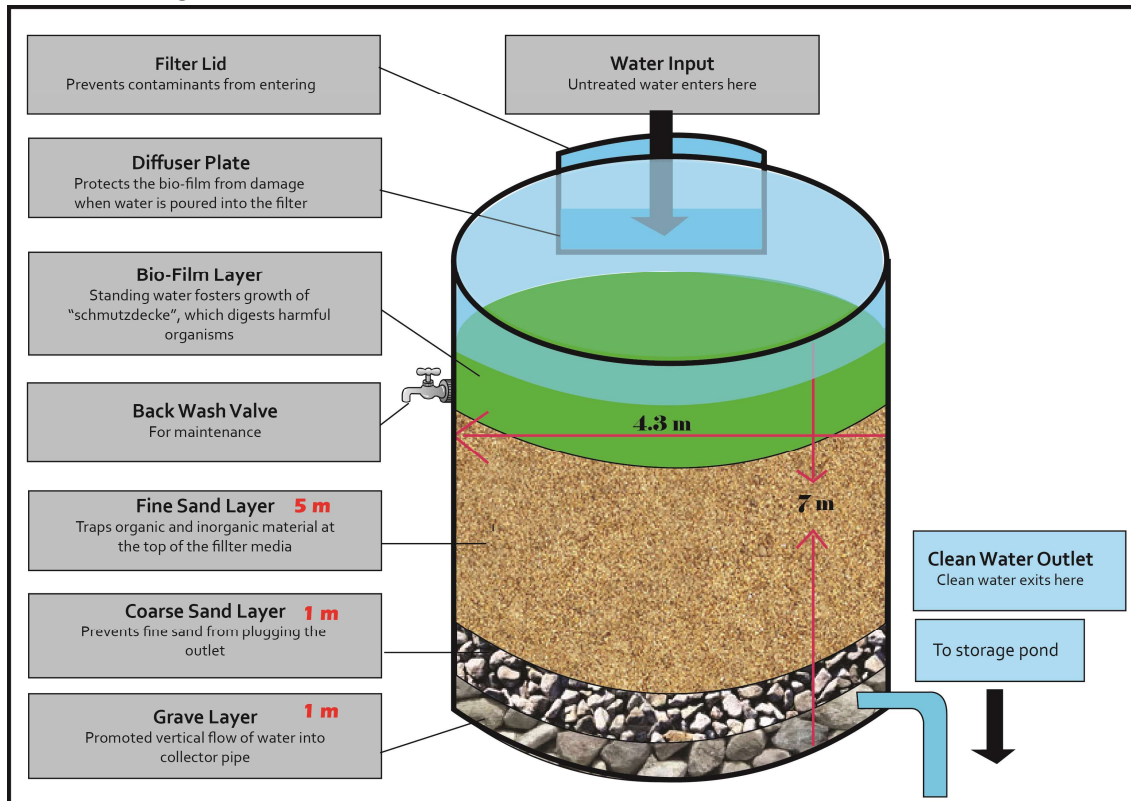


SECTIONAL VIEW AT AA'



CIVIL WORK FOR
SEWAGE TREATMENT PLANT WITH REED BED SYSTEM

Schematic Diagram of Filter Bed



Annexure 4: Financial Details of Reed-Bed Filter

QUOTATION FOR SEWAGE TREATMENT PLANT WITH REED BED SYSTEM 100 KLD (Expandable)

S.N O.	DESCRIPTION	SPECIFICATIONS	QTY.	UNIT	AMOUNT
	SEWAGE TREATMENT PLANT WITH REED BED FOR { 100KLD (Expandable) }				
A	<u>MECHANICAL WORK</u>				
1	REED BED FOR PLANTATION	Civil Work	1	No.	510000
	Designing & Making of Reed Bed	10Mtr X 10Mtr X 2Mtr Depth			
	Brick Wall				
	PCC				
	Plasting				
	Connecting Piping				
	Wall Painting				
	Filling of Reed Bed with Stone Pallets / Big Rori				
	Plantation				
2	HYPO DOSING SYSTEM	PVC Hypo Dosing Tank 200 ltrs. & Pump 0-6Ltrs.	1	SET	10000
3	G.I. / PVC PIPING & FITTING & BUTTER FLY BALL VALVES		1	LOT	30000
4	ELECTRICAL PENEL WITH ENERGY METER	Bentex / Siemens /Ventilair	1	NO.	35000
B	<u>ELECTRICAL WORK</u>				
1	SEWAGE TRANSFER PUMP SET- 1.5HP (1W +1S)	Crompton Greaves / Kirlosker	2	Nos.	30000
C	<u>CHEMICALS FOR STP</u>				
1	EM SOLUTION (BIO CULTURE)	Effective Micro Bio Organism	100	Ltrs.	20000
2	HYPO SOLUTIONS		100	Ltrs.	10000
D	INSTALLATION		1	NO.	50000
					695000

S.N O.	DESCRIPTION	SPECIFICATIONS	QTY.	UNIT	AMOUNT
	Packing & Forwarding @ 2%				13900
					708900
	GST @ 18% or as per applicable				127602
	TOTAL				836502
(RUPEES Eight Lakhs Thirty Six Thousand Five Hundred Two ONLY)					
(100KLD) AREA REQUIRED FOR REED BED = 100 squre mtrs					