सत्यमेव जयते

Nature-based Solution and Circular Economy

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- “Nature-based Solutions are actions to protect, sustainably manage and restore natural and modified ecosystems, which in ways that address societal challenges effectively and adaptively, to provide both human well-being and biodiversity benefits” (IUCN, 2016)

- Circularity, or the circular economy, is an economic model designed to minimize waste and make the most of available resources by promoting continuous reuse, recycling, and regeneration

- Integrated strategies for promoting sustainability, reducing environmental impacts, and building a more resilient, regenerative future

Vision of SBM(G)

By 2019-20

Creation of an Open Defecation Free (ODF) India

By 2025-26

Achieve ODF Plus(Model) India

ODF → ODF Plus

"ODF is the termination of faecal-oral transmission, defined by

a) no visible faeces found in the environment/village; and

b) every household as well as public/community institutions using safe. technology option for disposal of faeces."

An ODF Plus village is defined as

"a village which

sustains its Open Defecation Free (ODF) status,

& has arrangements for solid and liquid waste management and is visually clean"

SBM(G) Ph II - ODF Plus Components

For ODF Sustainability (ODF-S)

Sustained behaviour change for safe sanitation

Addressing gaps and leaving no one behind

Community toilets for floating population

Refresher trainings for all grassroots functionaries

For Solid and Liquid Waste Management (SLWM)

Biodegradable Waste Management

- Composting: Vermi/Pit/Nadep
- GOBARdhan at district level

Plastic Waste Management

- Storage Facility at Village level
- Material Recovery Facility at District/Block level

Greywater Management

- Soak Pits
- Ponds: WSP
- Drainage Channel

Faecal Sludge Management

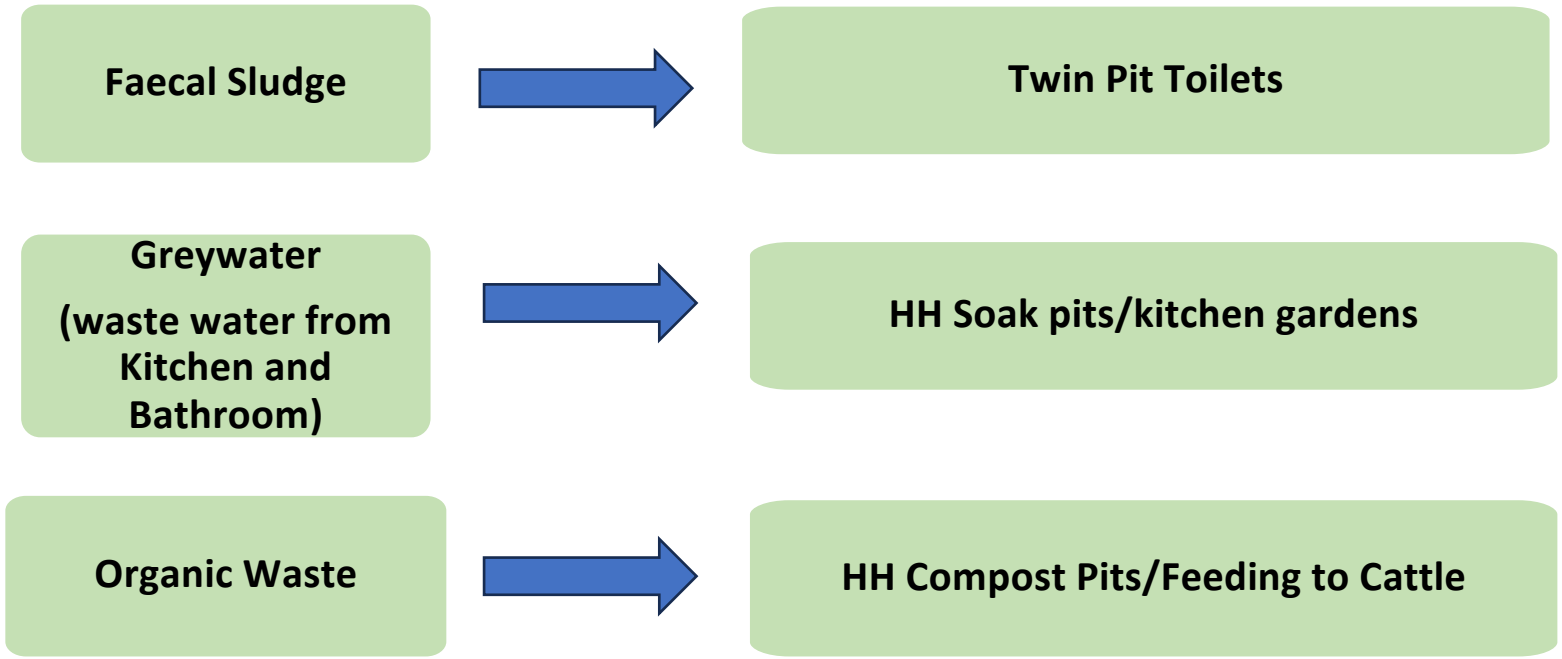
- Co-Treatment
- Trenching
- FSM Plant

NBS, Circular Economy and SBM(G)

- To strengthen sustainable waste management practices and promote a circular economy in rural areas, SBM(G) focuses on the adoption of the 3Rs (Reduce, Reuse, Recycle) and circular economy principles.
- The mission aims to minimize waste generation at the source, enhance resource efficiency, and ensure effective waste processing
- Promotion technological solutions that are easy to operate and maintain at low O&M cost and best suited to climatic conditions, hydrogeology and topography of an area
- Involvement of Rural Local Bodies(RLBs) in planning and implementation
- Community awareness programs, and capacity-building of local villagers

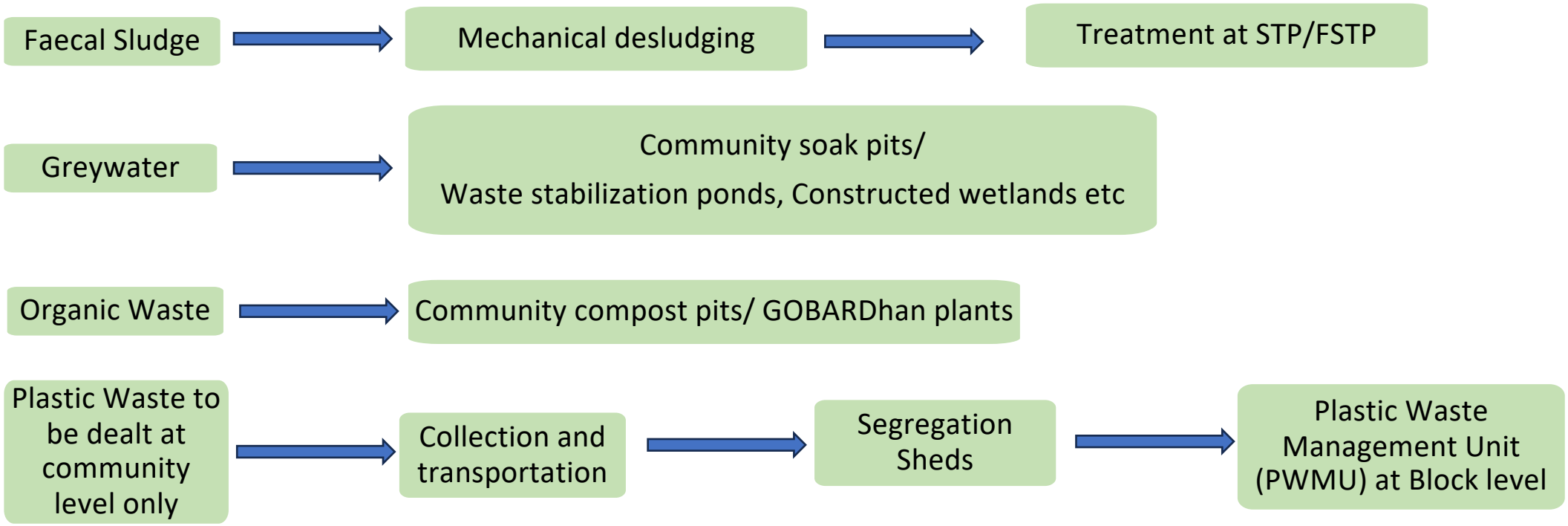
Waste Management in Rural Areas

Preferred option – Household level treatment



Waste Management in Rural Areas

If household treatment is not feasible, community solutions to be adopted

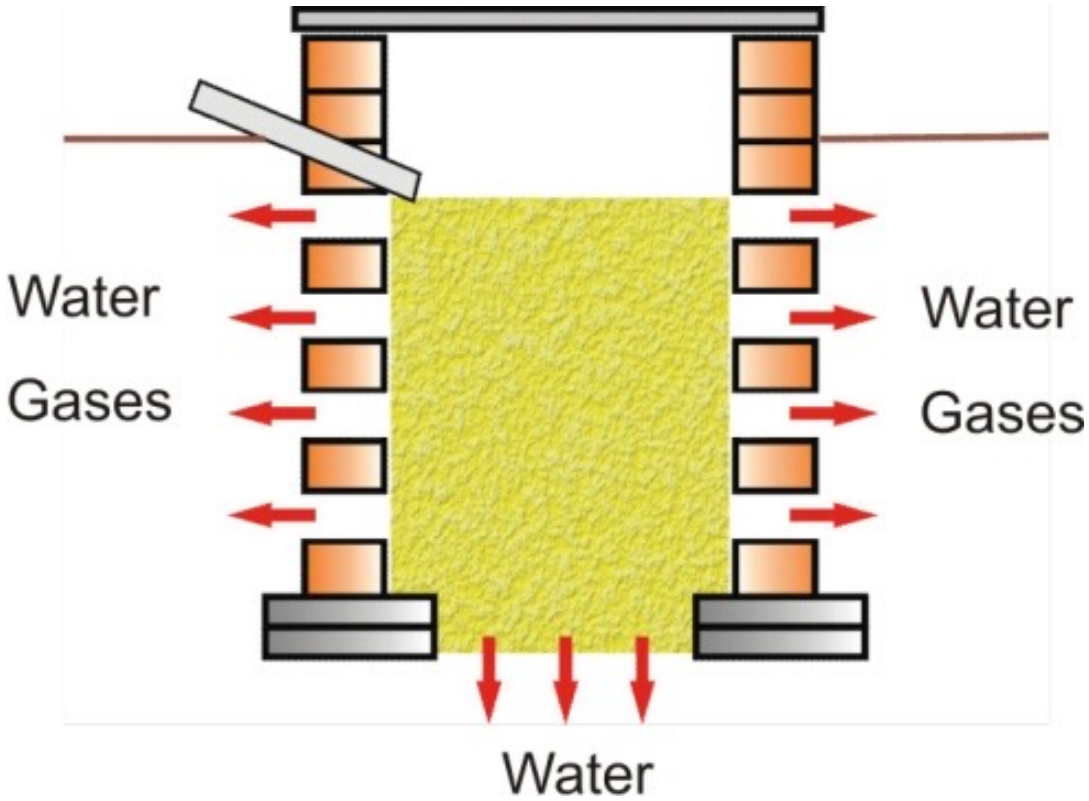


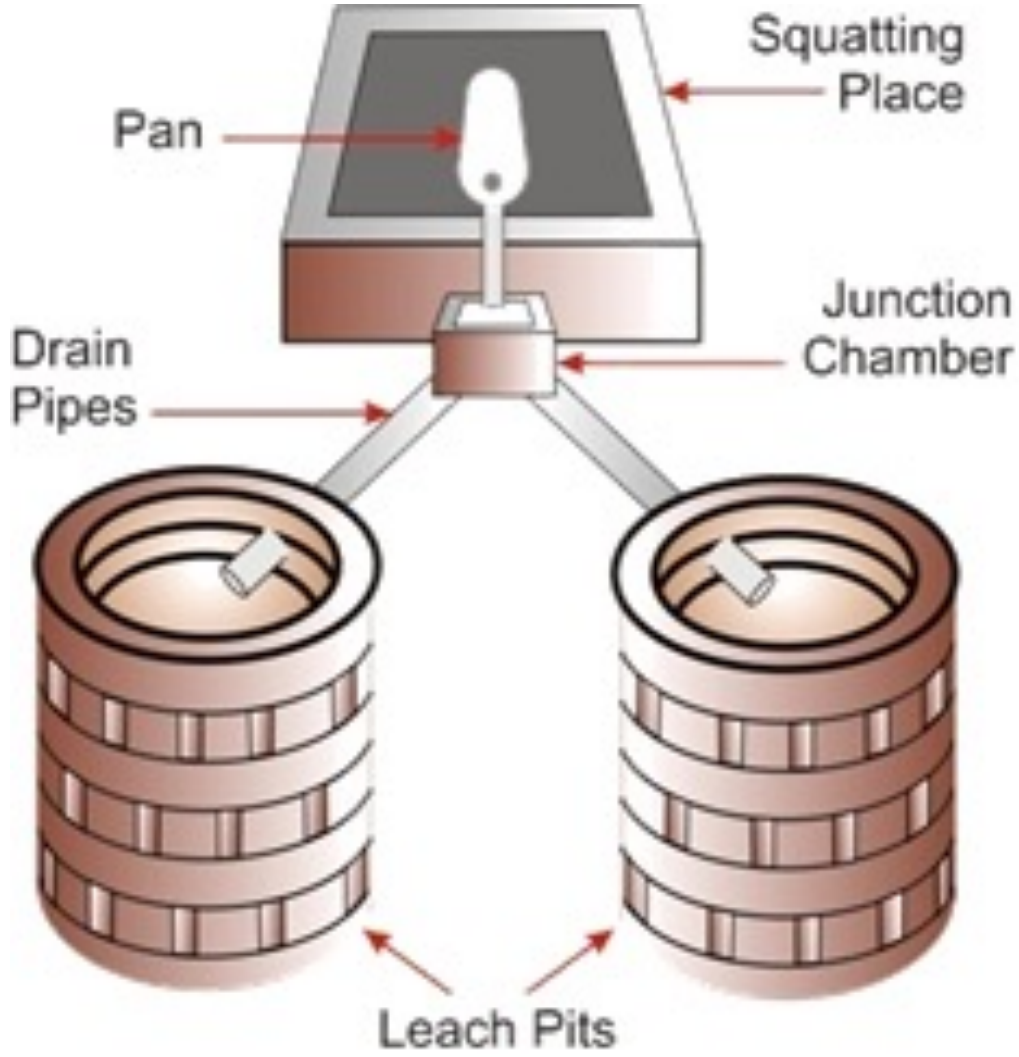
Nature-based Solutions and Circularity
- Faecal Sludge Management

What is Twin leach pit

Twin leach pit toilets are WHO approved on-site sanitation measure that cuts across sociocultural aspects, health and economy, technical function and environment - all factors that determine a sustainable sanitation technology.

On one hand it fulfills all sanitary requirements of a toilet and on the other, provides continuous use with minimal maintenance and decomposed waste may be valuable as a fertilizer


Water
Gases
Water
Gases
Water


Squatting Place
Pan
Junction Chamber
Drain Pipes
Leach Pits

Why Twin Pit Toilet

- Promotes sustainable sanitation practices in rural areas.
- In situ solution for FSM-Manages human waste in an environmentally friendly manner.
- Reduces contamination of soil and water through safe waste treatment.
- Supporting the Circular Economy
- Converts waste into valuable resources like compost –we call it **“Sona Khad”.**
- Encourages resource recovery and waste minimization.
- Creates livelihood opportunities through waste-to-resource initiatives.

Former Secretary, DDWS cleaned twin pit

Rajasthan SBM-G officials emptying twin pit toilet

Nature-based Solutions and Circularity
-Organic Waste Management

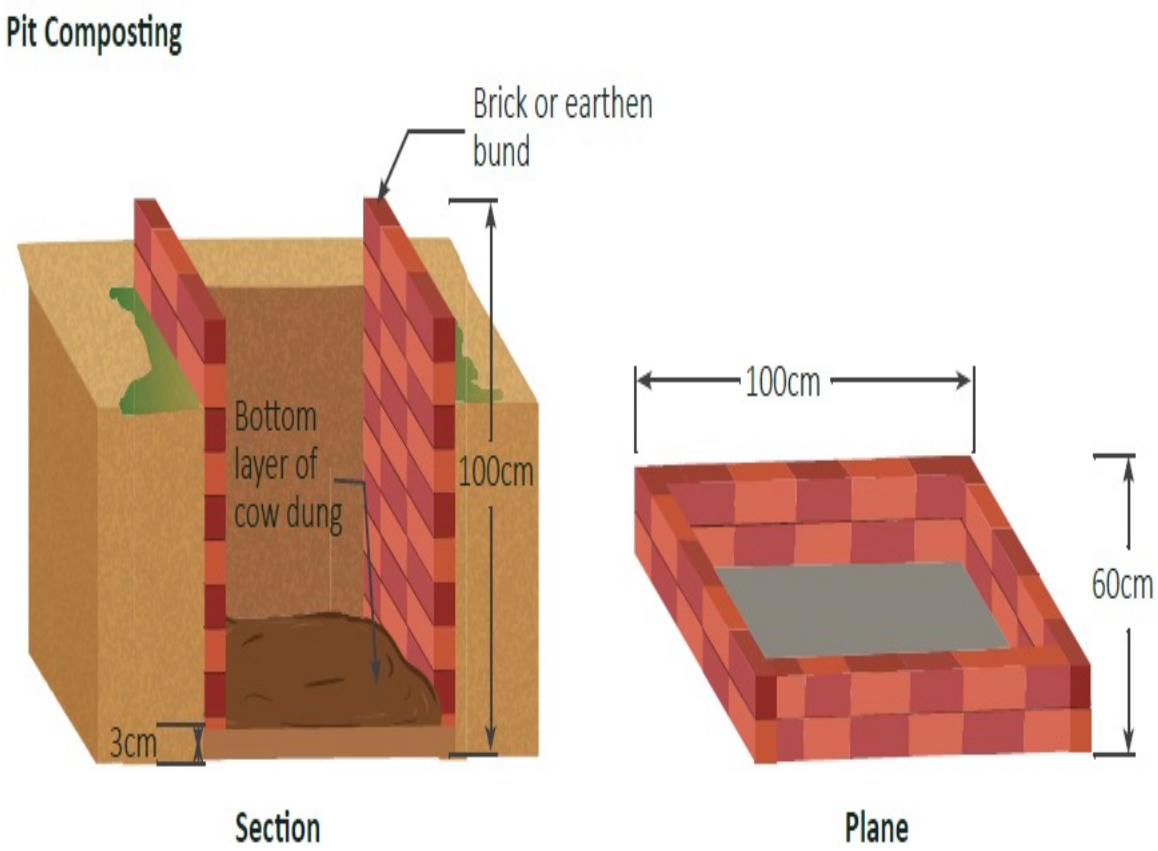
Organic Waste Management - Composting

- ✓ Composting of the wet waste at HH or community level is promoted under the Mission
- ✓ Biodegradable waste converted into manure through natural biological process and utilized locally as soil nutrient enhancer
- ✓ More than 33 lakh HHs have individual HH compost pits
- ✓ More than 11 lakh community compost pits
- ✓ Nearly 132 lakh MT of wet waste is managed annually through community composting facilities

HH Composting methods

Pit composting

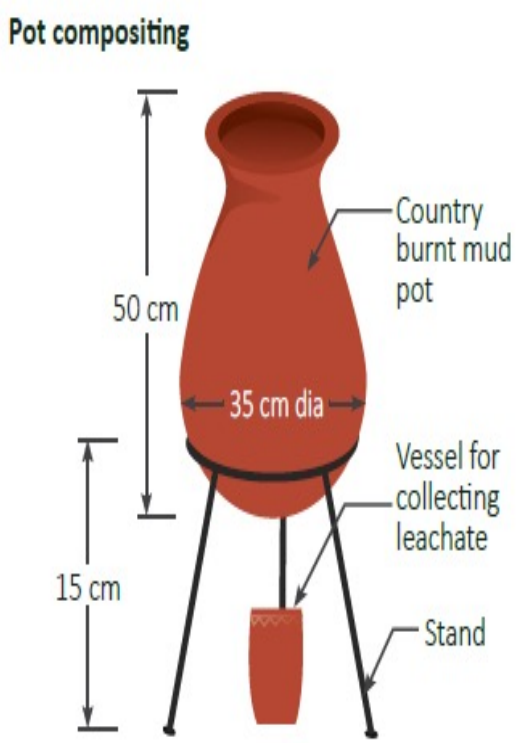
- Compost pits:
  - ✓ Each pit to be developed to bury the biodegradable waste of nearly 6 months.
  - ✓ Pit size - 1 m x 60 cm x 1 m (LBH) for a family of five or six members.
  - ✓ Bigger size pits for bigger families according to requirements.
  - ✓ 2-3 pits of adequate size to be dug for family of 4-5 people



HH Composting methods

Pot composting

- Pot composting:
  - ✓ Mud pots about 50 cm height and about 35 cm diameter at the center with lid covers – 2 nos.
  - ✓ Tripod stand 50 cm high of appropriate design made of steel, wood, plastic- steel or brick pedestals for keeping the pots—2 nos..
  - ✓ 2 pots of mentioned size is adequate for a family of 4-5 people



HH Composting methods

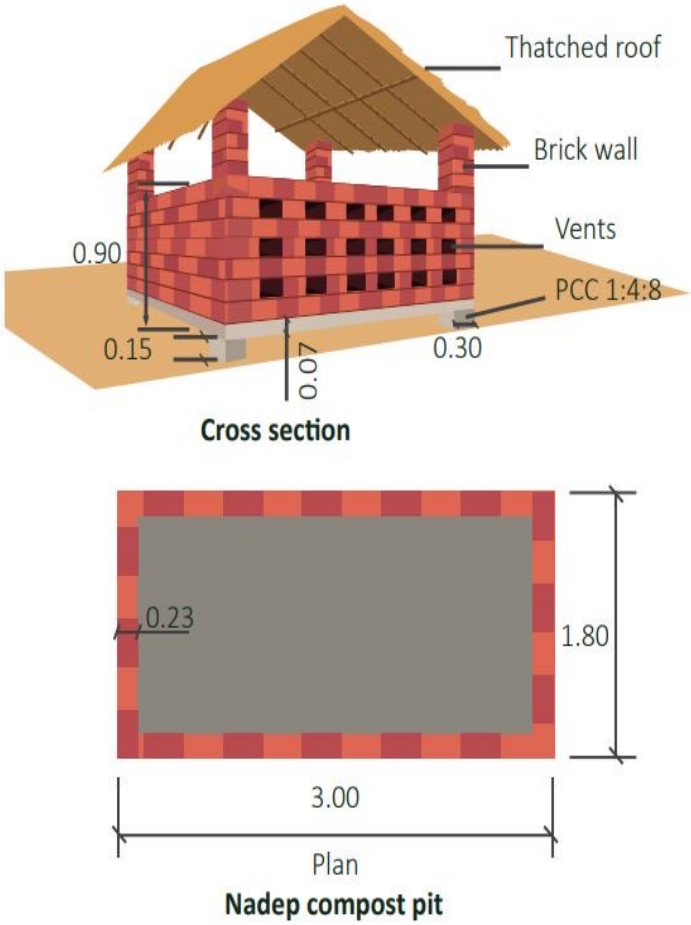
Pipe composting

- Pipe composting:
  - ✓ Two or more PVC pipes of 200 mm diameter and 1 m long placed vertically, buried 30cm in the earth.
  - ✓ kitchen waste and other biodegradable waste can be added to the pipes and mixed with water and cow dung
  - ✓ Pipe composting being practiced in schools in Assam for mid-day meal waste disposal

Community Composting methods

NADEP pits

- NADEP compost pits:
  - ✓ Community level compost pits
  - ✓ Suitability developed at place located away from drinking water source.
  - ✓ General size of each compost pit - 4.5 cum
  - ✓ Two pits can cater to population of nearly 100-150 HHs.
  - ✓ Limitations-not suitable for areas with a high-water table.

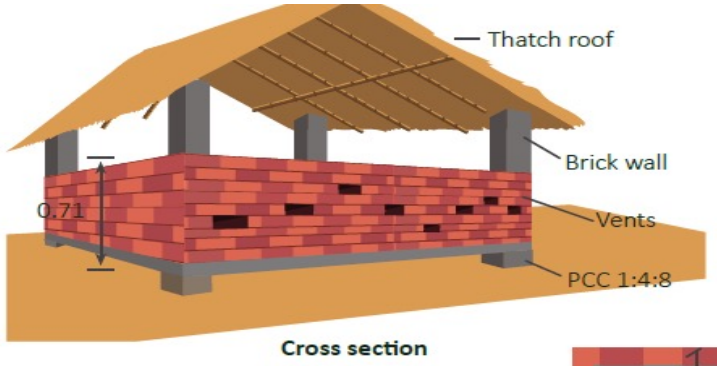


Nadep compost pit

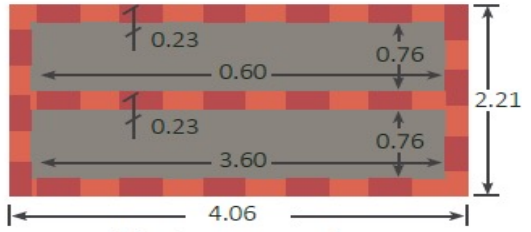
Community Composting methods

Vermi Composting

- Vermi composting:
  - ✓ Vermicomposting is the result of the combined activity of microorganisms and earthworms
  - ✓ Any type of biodegradable waste is suitable for vermicompost.
  - ✓ Kitchen wastes, animal/cow dung, and leafy biomass are more suitable for vermicompost.
  - ✓ Rich in all essential plant nutrients
  - ✓ The estimated cost for a vermicomposting unit ranges from Rs. 25,000 to Rs. 30,000



Cross section



Vermi compost tank

Community Composting methods

Windrow composting

- Windrow composting:
  - ✓ The windrow composting process consists of placing the segregated biodegradable waste in long narrow piles called ‘windrows’ that are turned on a regular basis for boosting passive aeration.
  - ✓ Can be adopted at places where adequate space is available.
  - ✓ The estimated cost of windrow composting depends upon the available quantity of biodegradable waste

Best Practices

Solid Waste Management

Andhra Pradesh

G.Ragampeta GP – Kakinada District

- A Solid Waste Processing Centre (SWPC) is setting an example of sustainable waste management.
- The SWPC Shed efficiently processes wet waste to generate valuable resources.
- **Achievements:**
  - **Compost Production:** The SWPC produces high-quality compost, which is a valuable resource for local farmers.
  - **Clean Environment:** The project has significantly reduced waste accumulation, promoting hygiene and cleanliness in the village.
  - **Sustainability:** The Panchayat receives financial support from the revenue generated by selling compost and recycled materials, ensuring the project's sustainability.

Bihar

- Organic waste is converted into nutrient-rich fertilizer at Waste Processing Units (WPUs)
- So far, 366 tons of organic fertilizer have been produced at WPUs in the state
- Offering farmers an affordable and eco-friendly solution for enriching their fields
- Districts are garnering certificates through quality testing in state government laboratories.
- Quality Testing Authorities, issuing certificates affirming the manure's standard and utility for farming.

Karnataka

Gauribidanur Taluk, Chikkaballapur district

- **Coverage**: In order to manage the waste generated in a scientific manner, the Gauribidanur Taluk constructed a waste management facility which is serving 24 villages under Hosur, Mudugere, and Sonaganahalli Gram Panchayats
- **Processing Capacity**: Handles 45–50 tons of waste per month
- **Organic Waste**: Converted into high-quality manure, improving agricultural productivity and farmers' incomes
- **Community Impact**: Educates the public on cleanliness and sustainability, setting an example of a successful, technology-driven waste management model.

Steps taken under waste management

Before

Facilitated structure

Waste D2D collection

Process

Beautification by Manure

Rajasthan
Village and GP-Jadawata, Sawai Madhopur

- Compost pits/NADEP constructed near farms, and farm owners were entrusted with the responsibility of using only these pits for disposing of household wet waste and agricultural waste
- Agriculture Department's supervisors provided training and continuous monitoring to ensure the correct composting process
- Trained farmers now use compost, also known as "Super Compost," as a natural fertilizer for their fields, improving soil health and crop productivity
- Reduced Chemical Dependency
- This convergence has empowered farmers with the knowledge to produce high-quality compost while simultaneously contributing to better waste management and environmental sustainability

Filling Organic waste in NADEP

Farmer using compost

GOBARdhan Initiative

Current Scenario of under GOBARdhan Initiative – SBM(G):

- ✓ Anaerobic Digestion of the cattle dung, agri waste and food waste through GOBARdhan Initiative is promoted under SBM(G)
- ✓ Biodegradable waste is converted into Biogas and Bio slurry which is used as soil nutrient
- ✓ 50 lac per district is provided for setting up of GOBARdhan community biogas Plants
- ✓ More than 850 community biogas are functioning across the country producing nearly 1400 KLD of bio slurry

Success Story GOBARdhan – Begusarai,Bihar

Key Highlights of the Biogas Unit

- Farmers and the goshala receive Rs 500 per metric ton of cow dung.
- Processes 2 metric tons of cow dung daily, generating 100 cubic meters of biogas per day.
- Supplies biogas to 14 households, 5 shops, and the Jeevika Training and Learning Center.
- Produces 150 metric tons of compost annually, sold at Rs 600 per ton.

Beyond biogas production, the plant ensures zero waste by **repurposing the emitted slurry into valuable by-products:**

- Liquid Fertilizer: The separated water is reused for cow dung slurry preparation and as a natural fertilizer.
- Soil Conditioner: The fiber-rich residue is used to enhance soil moisture retention and quality.
- Organic Compost: The dried slurry is processed into fertilizer, sold to local farmers at Rs 600 per ton.

Success Story GOBARdhan – Gaushala Village Khokhar Kalan , Mansa, Punjab

Problem

- Large accumulation of cow dung (25-30 quintals daily) causing hygiene and sanitation issues
- High electricity and fuel costs for Gaushala operations
- Lack of proper disposal mechanism for cattle waste.
- Dependency on conventional fuels for cooking

Solution

- Installation of a **100 cubic meter biogas plant** Utilization of **cattle dung for biogas production**, reducing dependency on conventional fuels
- Utilization of biogas for electricity generation and cooking at Gaushala
- Processing of slurry into organic manure and vermi-compost for agricultural use.

Project Details

Executed by: Punjab Energy Development Agency

Total Project Cost: ₹47.37 lacs

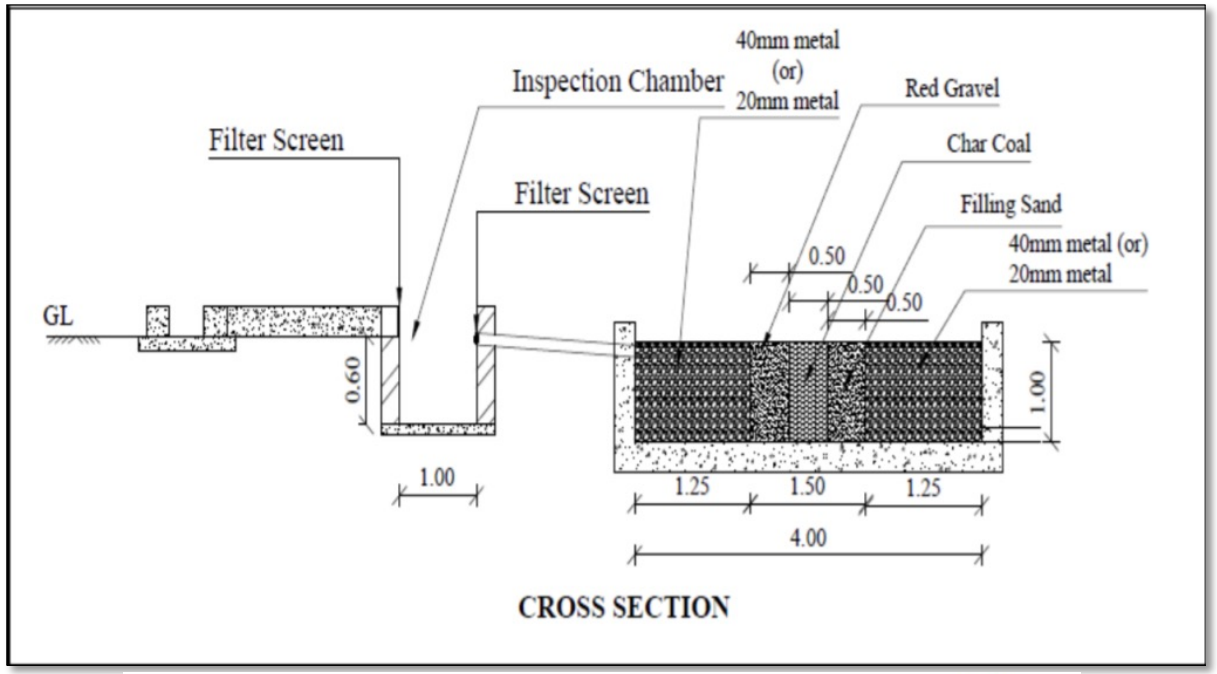
- **Utilization:** Powers Gaushala generator for 7-8 hours and also provides cooking gas for gaushala kitchen

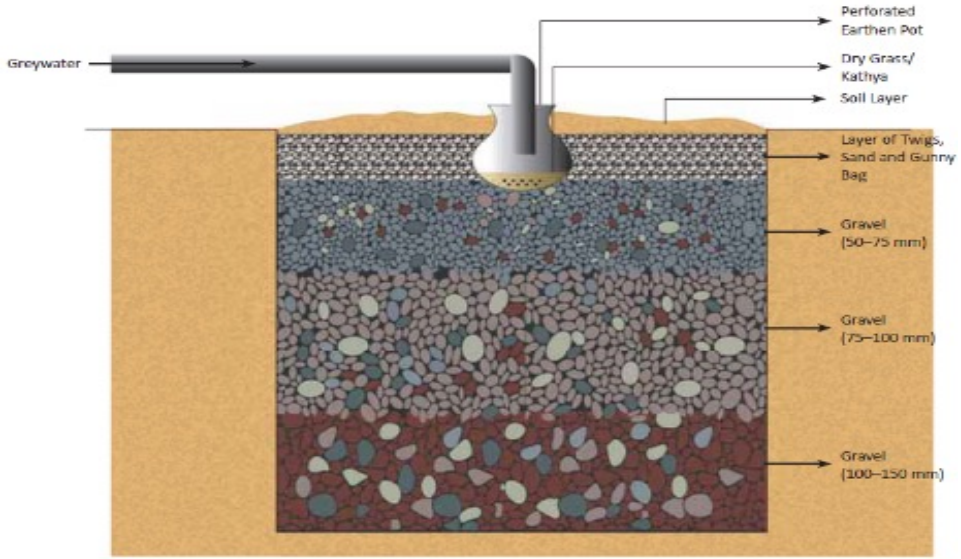
Impact:

- Reduced foul odors and waste accumulation
- Reduction in electricity charges and provided alternate fuel to LPG for cooking purposes
- Sale of vemri-compost - ₹10 per kg
- High-quality vermi-compost benefiting local agriculture

Nature-based Solutions and Circularity
- Greywater Management

Soak Pit

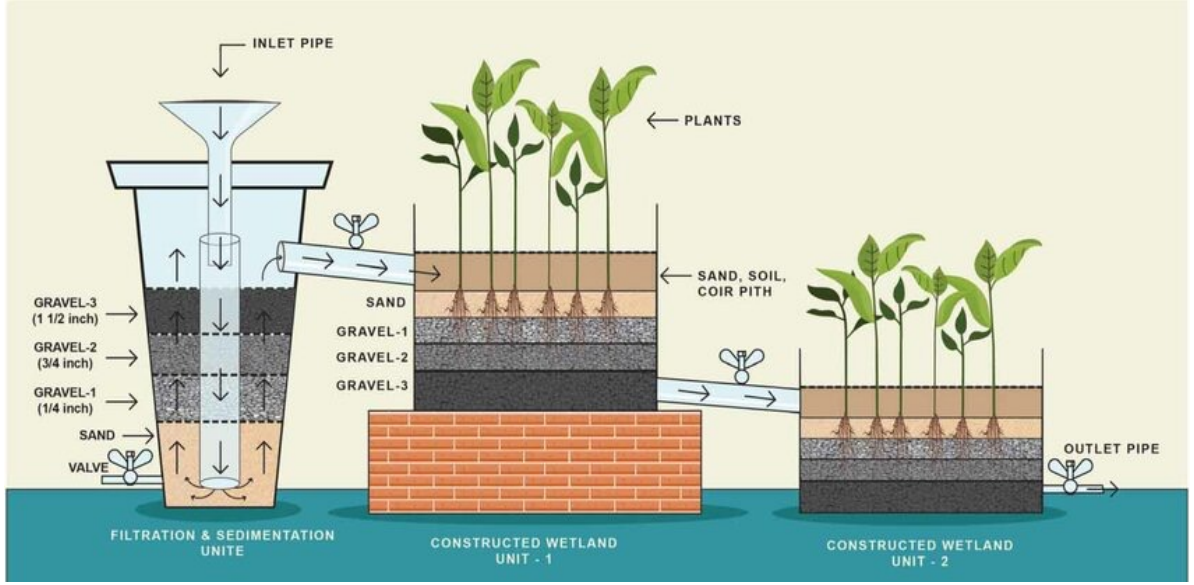




- A dug-out pit that is filled with graded stones and gravels. The stones increase the surface area over which biological and chemical action takes place.
- Also known as a leach pit, it is a covered, porous-walled chamber that allows water to slowly soak into the ground and helps recharge the groundwater table.
- The treated greywater can thereafter be used for agriculture purposes.
- **Efficacy:** Constructed at disposal point of drainage systems, soak pits are suitable for clusters with high ground water table areas.
- **Cost:** Construction cost of 1 unit would be around Rs.1300/-

In-line Constructed Wetland

- A vibrant tapestry of canna indica, napier grass, and raw banana are used for greywater treatment
- It is efficient in significant pollutant reduction; i.e., BOD by 80%, COD 90%, turbidity 92% and increase in DO by 90%
- **Efficacy:** Provides treated enriched water that helps in irrigation activities
- In NTR District (AP), Jupudi village, ivy gourd plantations using the treated water has enriched the landscape and become a financial boon for the SHGs



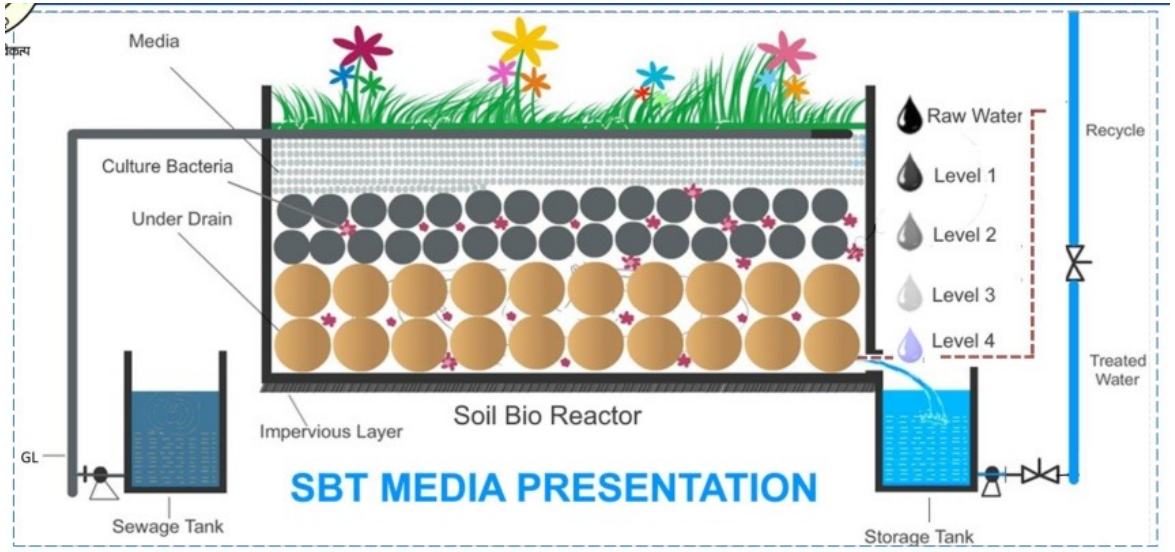

Before


After


Before


After

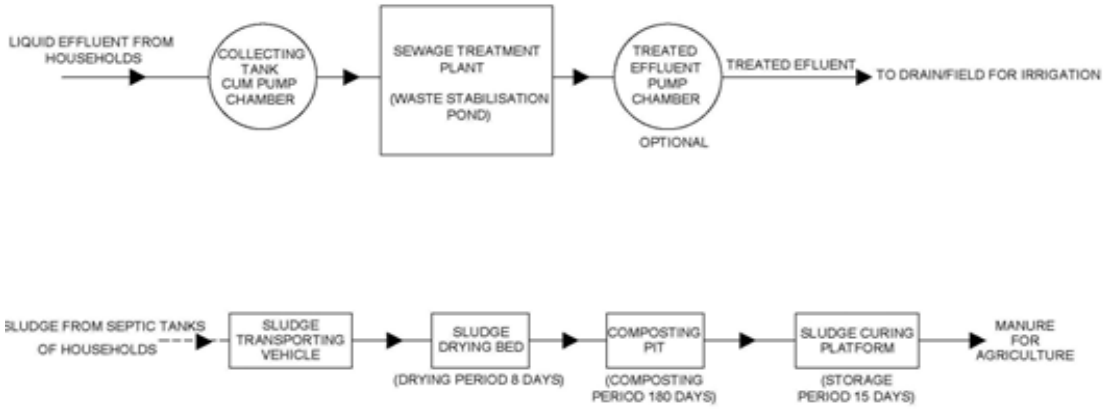
Soil Biotechnology



- Soil Bio- technology is a terrestrial system for wastewater treatment which is based on the principle of trickling filter.
- Suitable mineral constitution, culture containing native micro-flora and bio- indicator plants are the key components of the system.
- It is a technology that uses little energy and integrates with the natural cycles of the environment.
- Efficient in treating the grey water to produce clean water for construction and agriculture purposes.
- It serves a dual purpose addressing the concern of water scarcity and contributing to sustainable agricultural practices.

technology

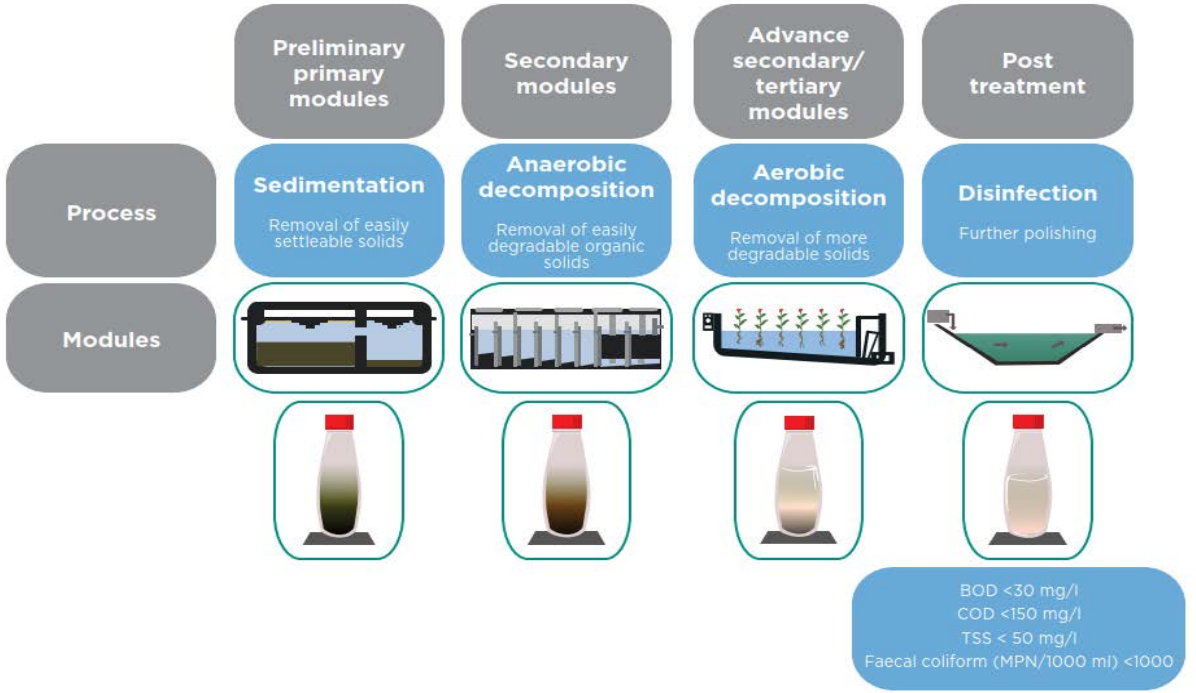
- Typha plantation carried out on a floating platform is used to augment existing facultative pond of Waste stabilization pond.
- The root system of Typha carries out the most active and important process, induced by the interaction of plants, microorganisms, the soil, and pollutants.
- It is efficient in significant pollutant reduction; i.e., the effluent BOD levels of the maturation pond have decreased by 70-80%.
- **Efficacy:** An innovative system for treatment of both grey and black water.
- The treated water and compost generated through the process is used for irrigation and agriculture.

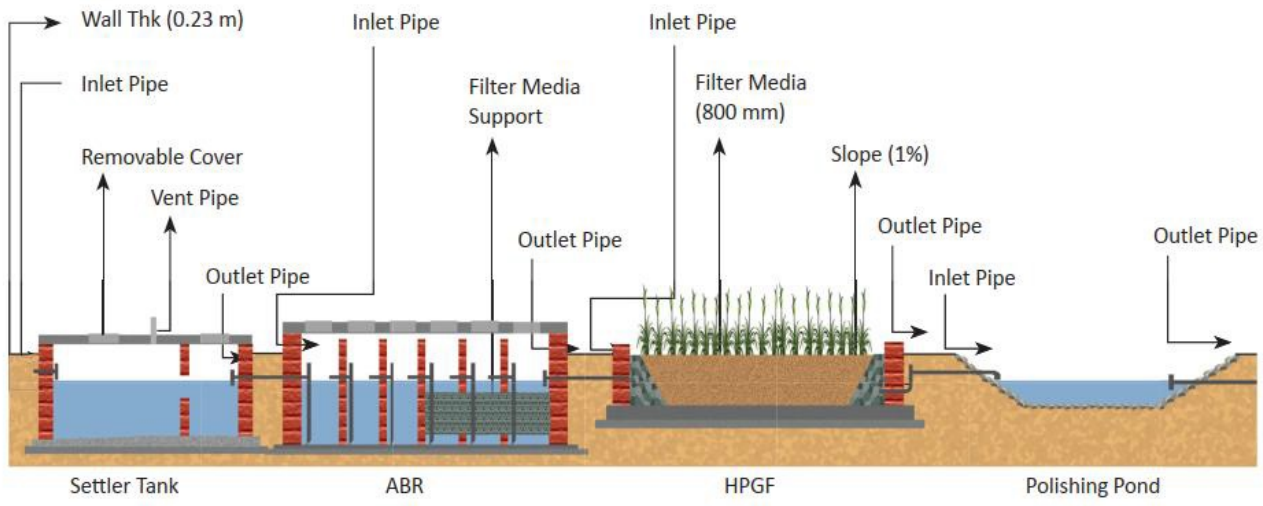


SCHEMATIC FLOW DIAGRAM AT S T P

DEWATS wastewater treatment technology

- The system includes primary, secondary and tertiary treatment processes, where natural bacteria and plants are used for wastewater treatment.
- The decentralized system is suitable for the cases of high organic loading, particularly when treating the waste from small bore sewer systems or wastewater mixed with the supernatant from septic tanks.
- The system is consisting of Settler, Anaerobic baffled reactor, Anaerobic Filter, Planted Gravel Filter and Polishing Ponds.
- **Efficacy:** The technology is effective, efficient and affordable as a wastewater treatment solution for a small and medium-sized enterprises.
- **Cost:** Rs. 25-30,000 Per KLD





Best Practices

Liquid Waste Management

In -Line Treatment of Greywater : Jupudi Village (A.P.)

Key Components:

- Canna indica
- Napier grass
- Raw banana plants

Mechanism:
Natural treatment of greywater through plant filtration.

Circularity :

•Napier Grass: Greywater treatment *and* valuable fodder for local cattle.

•Ivy Gourd Plantations: Environmental enrichment *and* financial benefit for Self-Help Groups (SHGs).

•Reduced water pollution and conservation of freshwater resources.

•SHGs are responsible for nurturing and sustaining the green infrastructure.

Pradesh

- Principal: Water conveyed through Common drain, screened and passes through horizontal layers of gravel and the surrounding soil with extended roots of **cana indica plants** , removes suspended solids, organic matter, and pollutants

- Scale-up: Villages having natural slopes and moderate permeability to prevent rapid infiltration

- Cost: Rs. 1.5 Lakhs for 100-150 HHs or Rs. 350 Per Capita

- Efficacy: Requires 2-3 SQM per person land and provide water with reuse potential

Plastic Tanks & soak Pit-Palghar, Maharashtra

- Best example of creativity and innovation by using plastic drums to make soak pits to effectively manage greywater generated in households.
- The soak pits consisted of pits measuring 5X5X5 feet into which a 100-litre strong plastic tank was placed in the center and covered with cement bags and soil.
- When a soak pit is filled, the soil and dirt can be removed, allowing for the soak pit to be used again.
- The system prevents wastewater from overflowing onto the village paths and stagnation in the low-lying areas, thus curbing vector-borne diseases.
- It also recharges the groundwater table, thereby increasing water availability in the area.

ECO-FRIENDLY TRANSFORMATION
GELLA TG VILLAGE, RANGALI RANGLIOT BLOCK, DARGEELING

Amidst the lush tea gardens of Darjeeling, Gella TG village turned a wastewater challenge into an eco-friendly success.

- **HHs in village- 125**
- **Problem- Direct discharge of wastewater to tea gardens**
- **Solution- Horizontal Filter Chamber**
- **Investment- Rs 2,50,000 (SBM-G)**
- **Nos of Structure- 2 (**Two structured pipelines connected 40-50 households at key discharge points**)**
- **Reuse-** Irrigation of tea gardens, flower beds, and vegetable patches

Gujarat

- Filter Tank developed to provide a simple low-cost and more sustainable solution for managing greywater in resource-limited of Jafaripura Village, Sidhpur Block in Patan District

1. Socio-Economic Impact:

- Households save on water costs by reusing greywater for daily activities.
- Local economies benefit from the use of locally sourced materials, creating jobs and opportunities for local technicians.

2. Environmental Impact:

- Reduces the strain on freshwater resources by encouraging the reuse of grey water.
- Decreases water pollution by treating grey water before it is discharged into the environment.

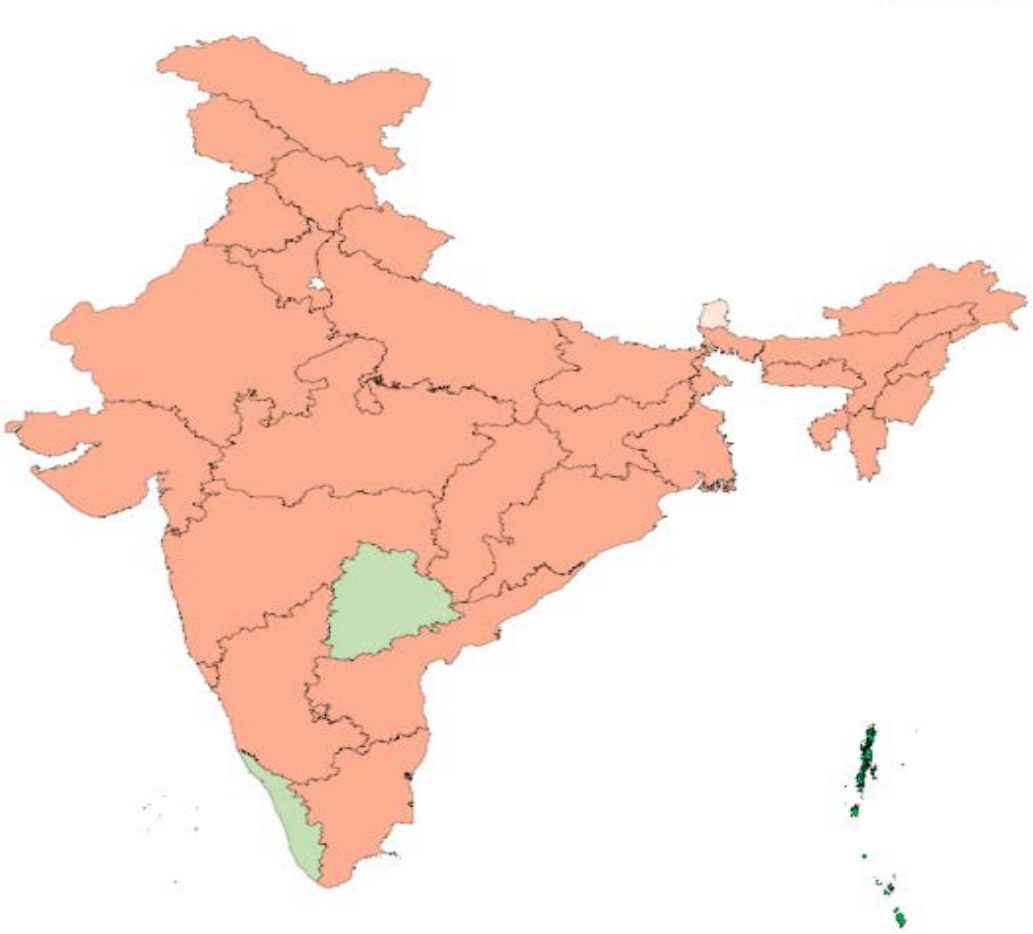
3. Policy Impact:

- The success of the Filter Tank has influenced water management policies, encouraging the adoption of eco-friendly technologies for sustainable water conservation.

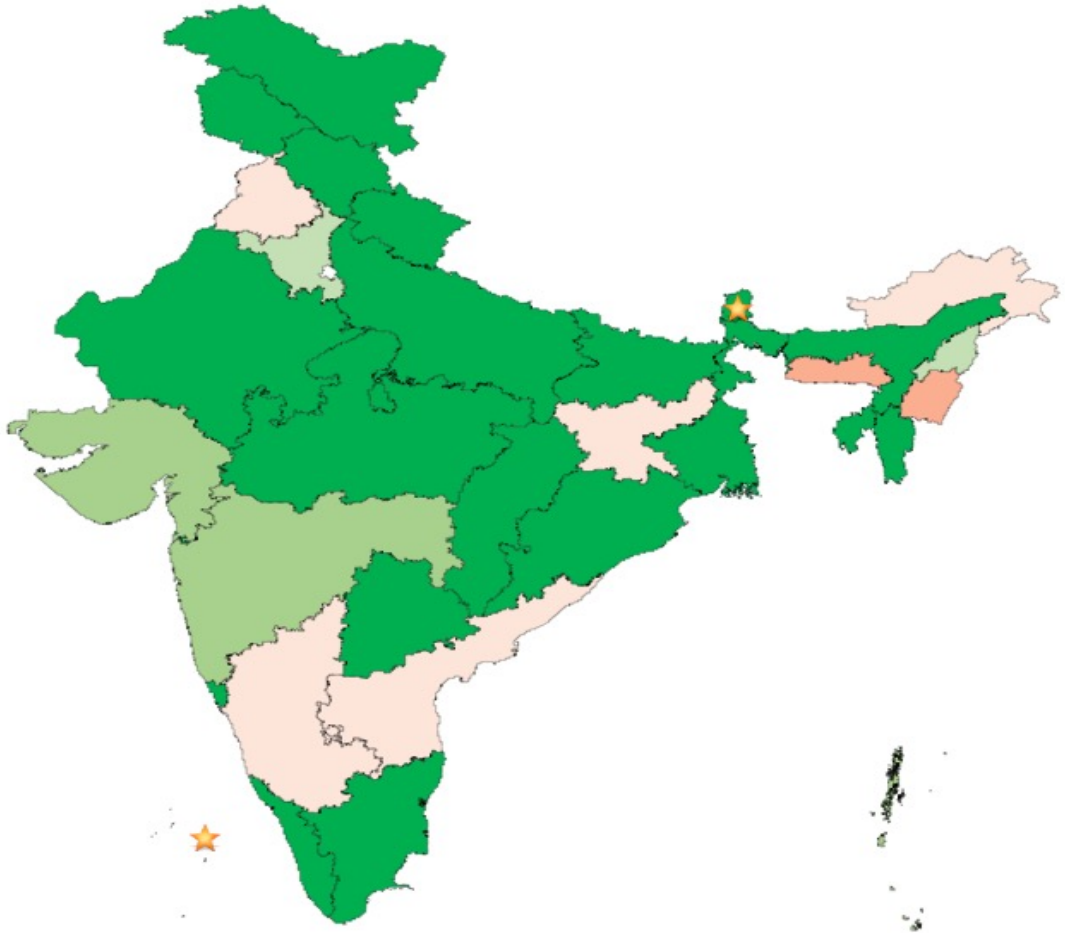
Achievements of SBM(G)

Over 4.37 lakh ODF Plus Model villages

As on **1st April 2022 : 2.4%** ODF Plus (Model) villages



2nd March 2025 : 75% ODF Plus (Model) villages



Brief Snapshot of the SBM-G in country

96%
of Villages are now ODF Plus &
>74 %
of villages are ODF Plus Model

>12 cr.
Toilets Constructed

>85%
Villages have arrangement of Solid Waste Management

>88% Villages
having arrangement of Liquid Waste Management

889
Functional biogas plants,
120 Functional CBG plants

>4600 blocks
have arrangements for Plastic Waste Management

आओ चलें....सम्पूर्ण स्वच्छता की ओर !

THANK YOU