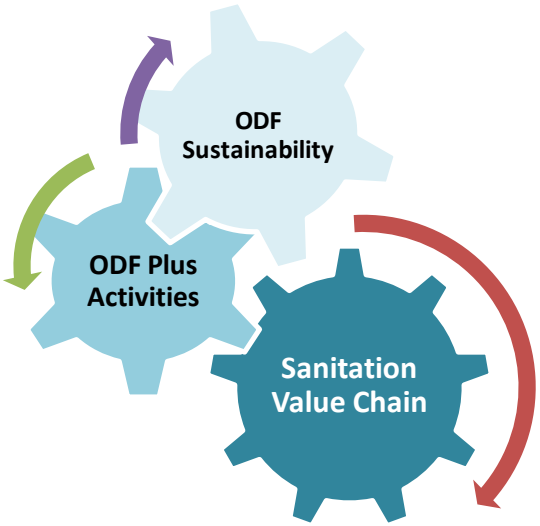
FSM and Decentralized Wastewater Treatment Systems – Case Studies form Asia

Sustainable Development Goal

TARGET 6.2 - ACCESS to SANITATION

By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations

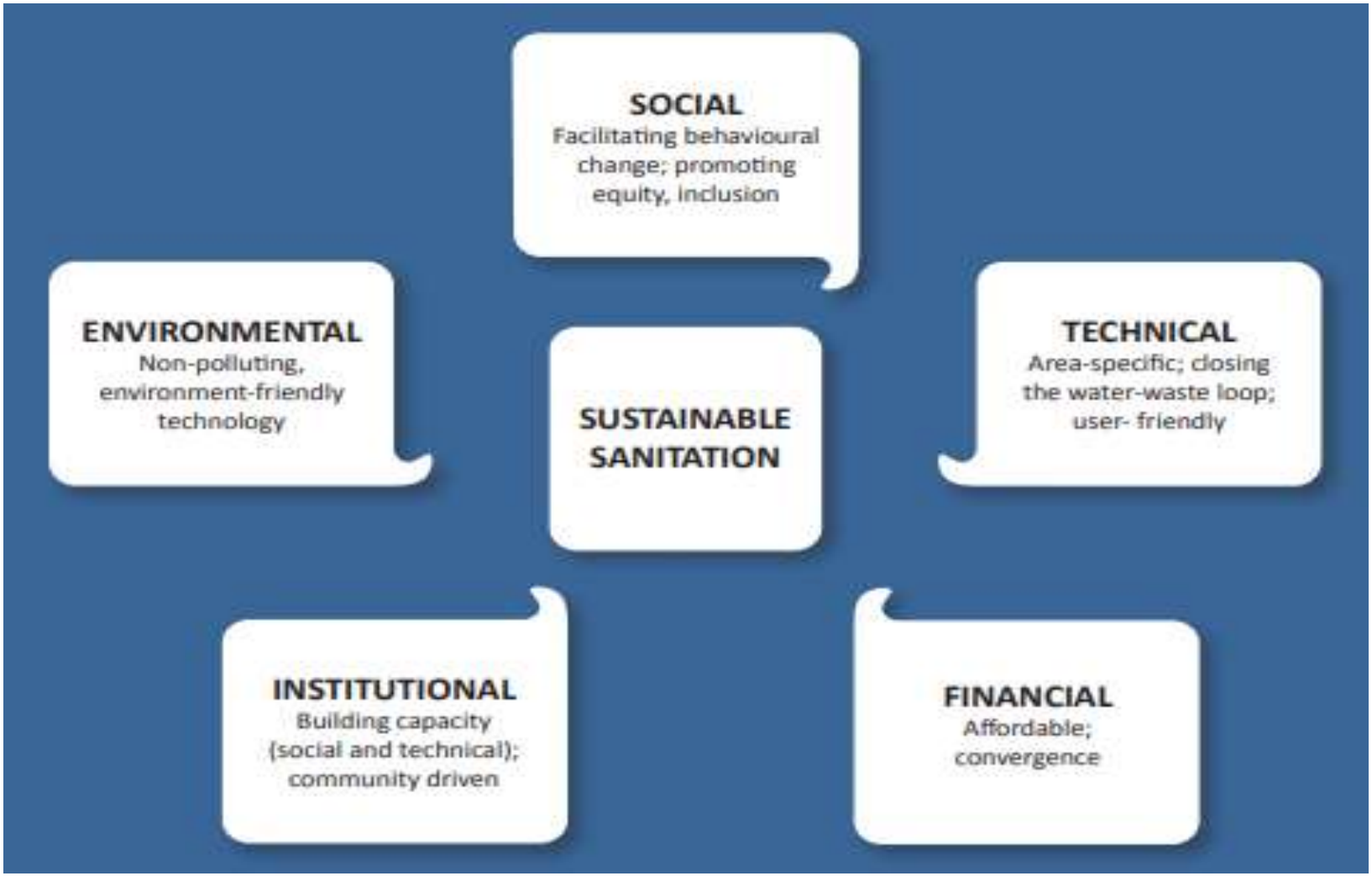


MEANS OF IMPLEMENTATION

6.A
International cooperation and capacity development

6.B
Local participation

CSE


SOCIAL
Facilitating behavioural change; promoting equity, inclusion
ENVIRONMENTAL
Non-polluting, environment-friendly technology
SUSTAINABLE SANITATION
TECHNICAL
Area-specific; closing the water-waste loop; user- friendly
INSTITUTIONAL
Building capacity (social and technical); community driven
FINANCIAL
Affordable; convergence

What is the cause of concern?

1. Wastewater/Fecal sludge quality

	Wastewater	Fecal Sludge
BOD_5 [in mg/L]	100 -300	3000 -25000
Faecal coliform (MPN/100 mL)	$1X10^4 - 1X10^6$	$1X10^6 - 7X10^8$

2. Environmental Pollution

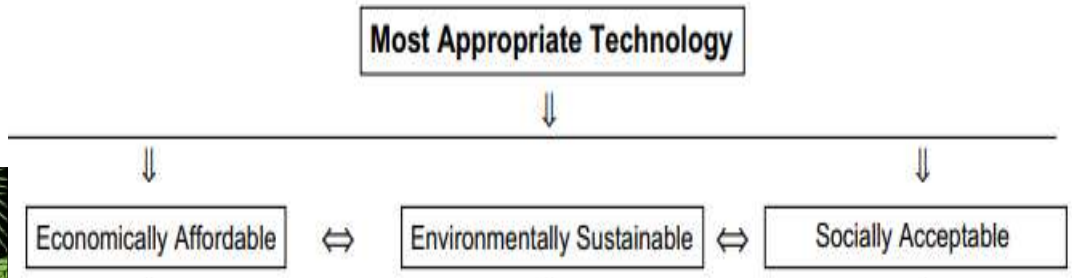
3. Impact on human health

Transmission of diseases such as cholera, diarrhoea, dysentery, hepatitis A, typhoid and polio and exacerbates stunting

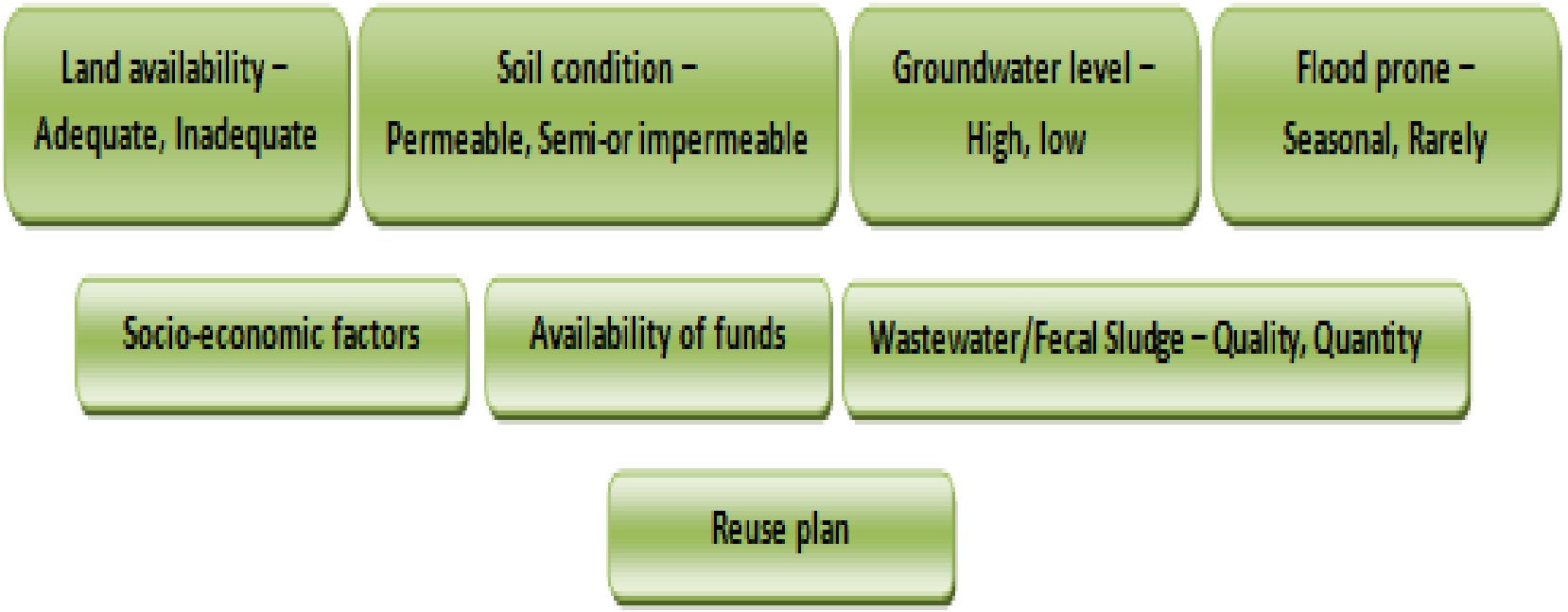
Policy Goal of Fecal Sludge/Wastewater Management

Criteria –

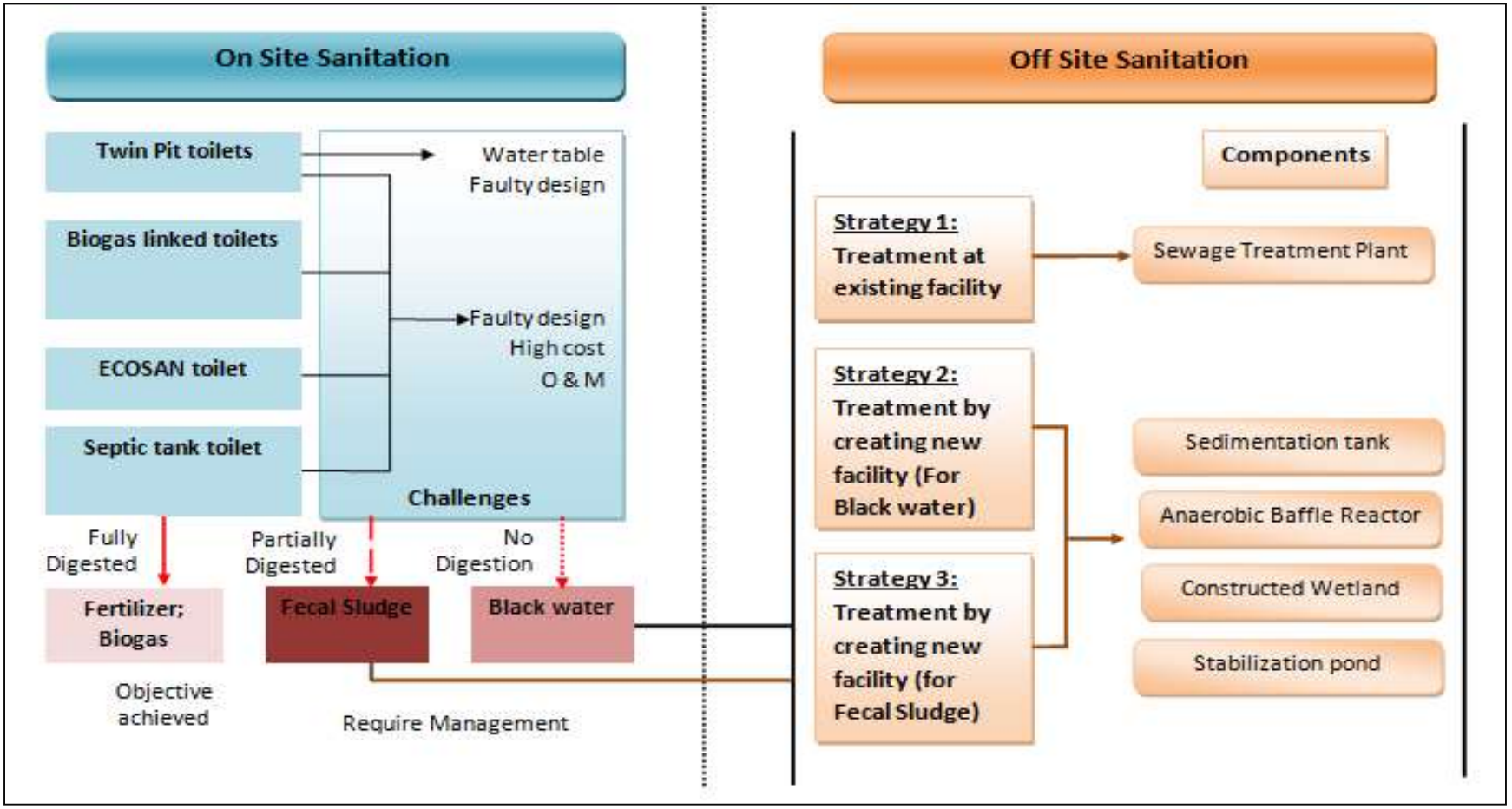
- Economically viable
- Protect environment and the natural resources
- Socially acceptable (*Convenience, perceptions, gender issues, religious or cultural issues*)
- Technically and institutionally appropriate (*Flexible and adaptable*)



Factor affecting Technology Selection



Sanitation – Management Strategies



Case Studies

1. Twin Pit Toilets constructed under Swachh Bharat Mission

Location: All over the country
Project Year: 2014
Area selected: Rural
Challenges and Issues:
Residents are not willing to built toilets because of behavior and financial status
Output:
Manure generated from the toilets will be used as manure
Usage reported - 90 per cent

1. Superstructure of ECOSAN

Twin Pit Toilets constructed under Swachh Bharat Mission

Cost: 180 - 200 USD

Economic sustainability:

- Government give an incentive of 170 USD
- Beneficiary contribute in terms of labor or add money
- Little water is used for flushing and washing purposes.

Key Features:

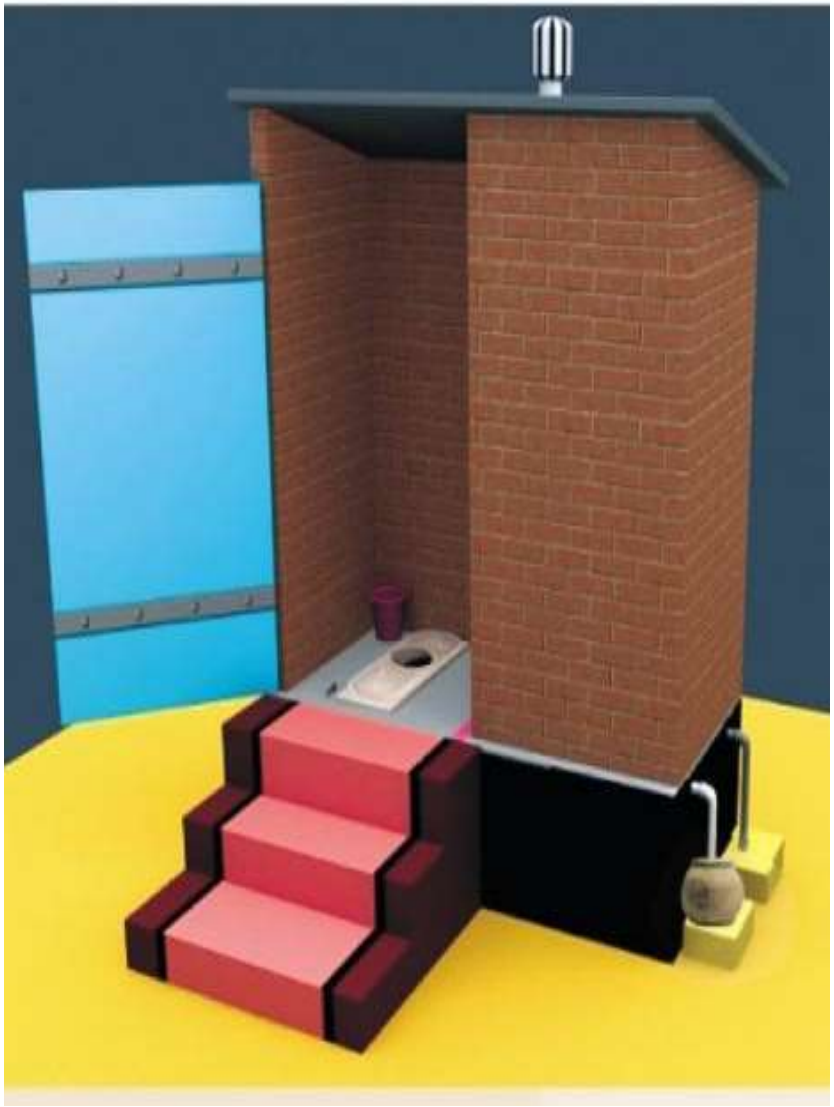
- Affordable toilet system
- Completely closed system with no sewage piping or treatment systems required
- No effluent seepage into underground water system

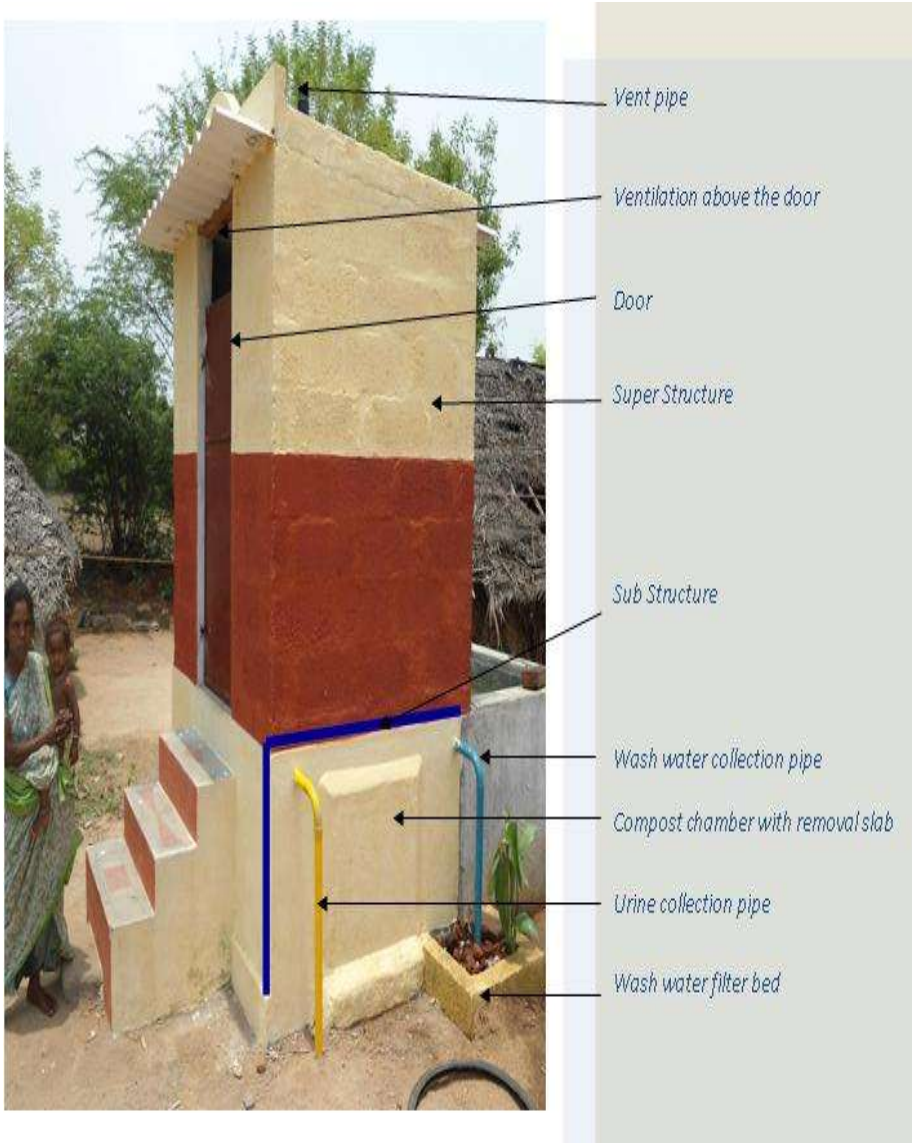
2. ECOSAN Toilets in Rajasthan, India

Location: Udaipur district, Rajasthan
Project Year: 2015
Area selected: Rural
Challenges and Issues:
Residents are do not like dry toilets and prefer water supply inside
Output:
Manure generated from the toilets have helped increase the wheat yield by 30 per cent
Usage reported - 100 per cent

1. Superstructure of ECOSAN

ECOSAN Toilets in Rajasthan, India





ECOSAN Toilets in Rajasthan, India

Cost: Average cost of installing a functional unit of ECOSAN toilet is 300 USD

Economic sustainability:

- Daily maintenance is cost free, as the design has no plumbing.
- Little water is used for washing purposes.
- Urine storage cans are reused
- No revenue or income is generated from this toilet for the household

Key Features:

- Affordable waterless toilet system
- Completely closed system with no sewage piping or treatment systems required
- No effluent seepage into underground water system

Pit holes connected to underground collection tanks

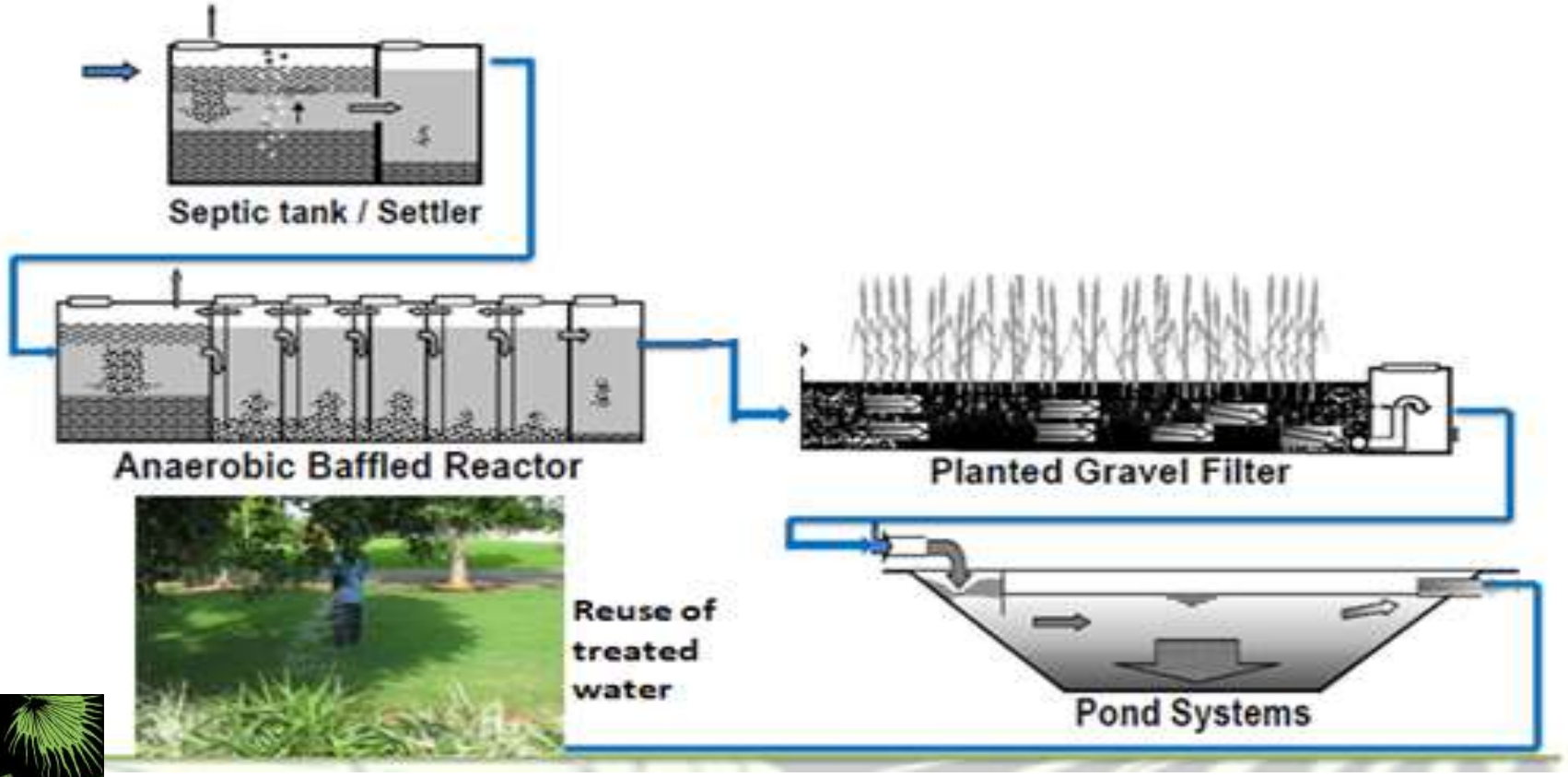

Connection of digested bio-solid from collection tanks

3. Decentralised Wastewater Treatment System at Delhi Jal Board, India

Location: Varunalaya, DJB's Head Office, Jhandewalan, New Delhi
Scale: Institution
Implementing organization: Delhi Jal Board with technical advisory from CSE
Designed Capacity: 8 KLD **Capital cost:** 6000 USD
Area : 110 sq. m
Operational since : 2015

DWWTs combine following technical treatment steps:

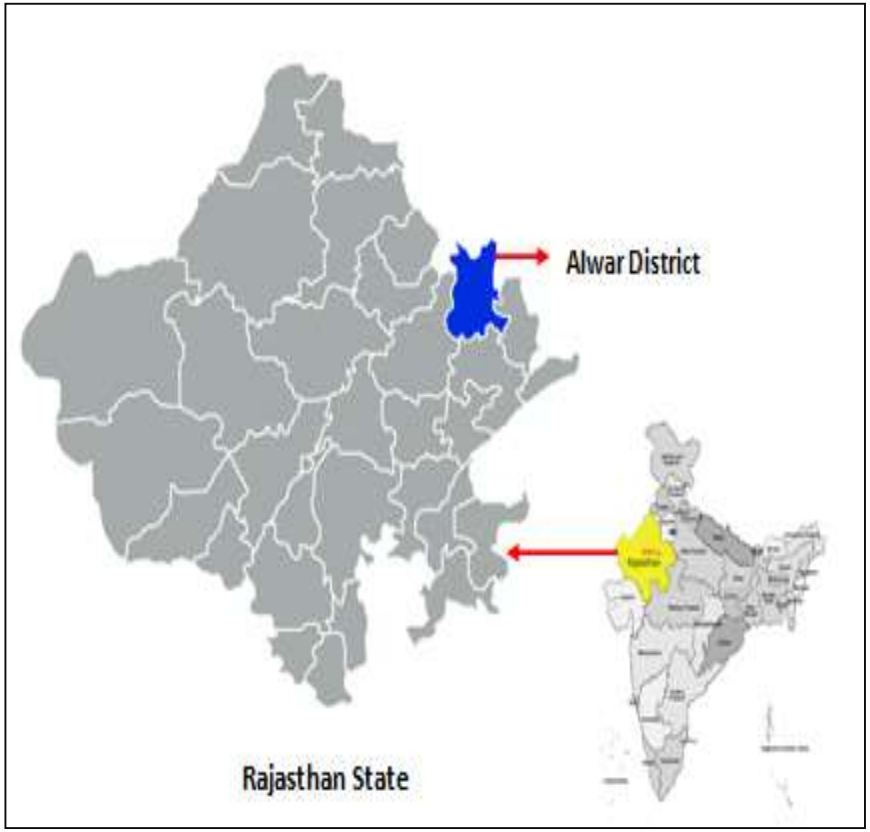
- Primary treatment – Settler – Organic load (30 %)
- Secondary treatment – Anaerobic baffled reactors – Organic load (90 %)
- Tertiary treatment - Planted gravel filters – Nutrient load (90 %)
- Post-treatment – Polishing pond – Pathogen load (90 %)



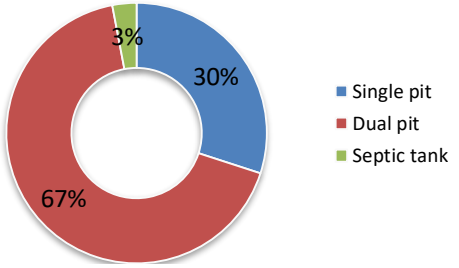
4. Pilot Decentralized Wastewater Treatment System at Manka Village, Rajasthan, India

Project location: Manka village, Rajasthan
Project duration: 1 Year
Geographical area of village: 11 sq km
Total Population: 2800

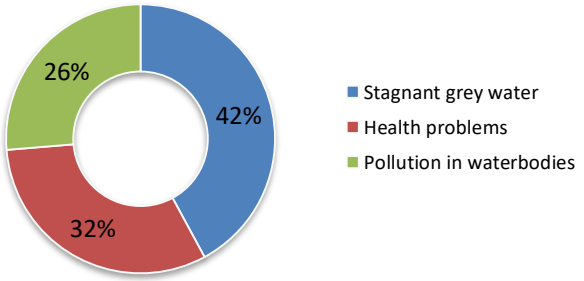
Water Source: Groundwater
Toilet Coverage: 100 %



Type of toilet techology



Major issue



Major Issue - Greywater management

- Grey water (from kitchen and bathrooms) not managed
- Only 50 % village covered under drainage system (open drains)
- Greywater generated in the village gets accumulated in three open ponds
- 70 % of the greywater flows into one pond and 20 % per cent to the other pond and rest flow to a third pond

Demonstration of sustainable sanitation service delivery by DWWTs

Planning

Institutional arrangement

- Block Development Officer and Engineer work with Panchayat Representatives
- Technical capacity building and hand holding – NGO (Centre for Science and Environment)

Financial arrangement

- CAPEX - Convergence of different government schemes – Swachh Bharat Mission, MNERGA, Finance Commission etc
- OPEX - Financially viability through introduction of household cess and leasing-out the pond for pisciculture and treated water for agriculture

Capacity Building

- Relevance of technology, planning, designing and operation and maintenance

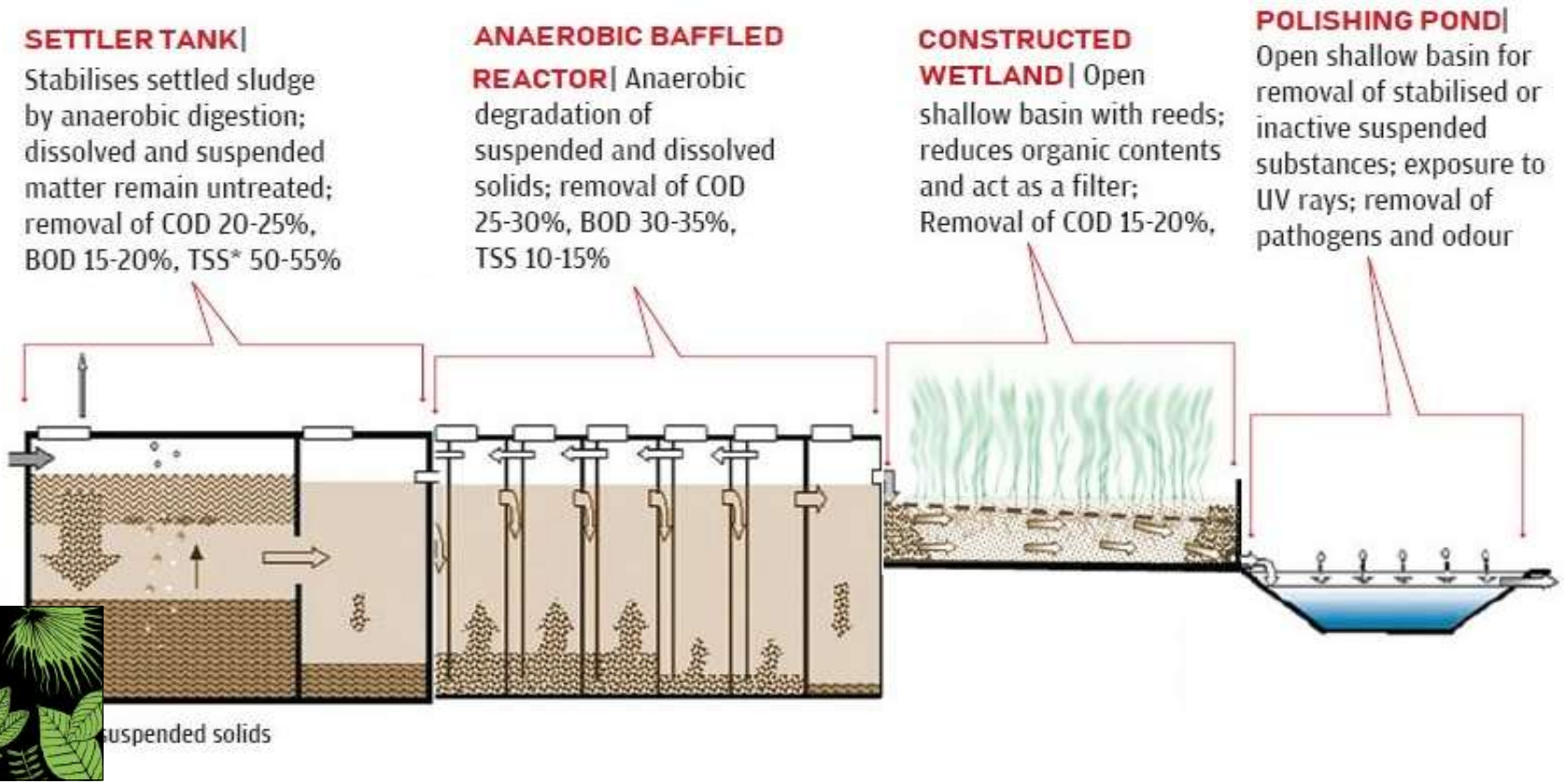
Social aspects: Public awareness, women's involvement

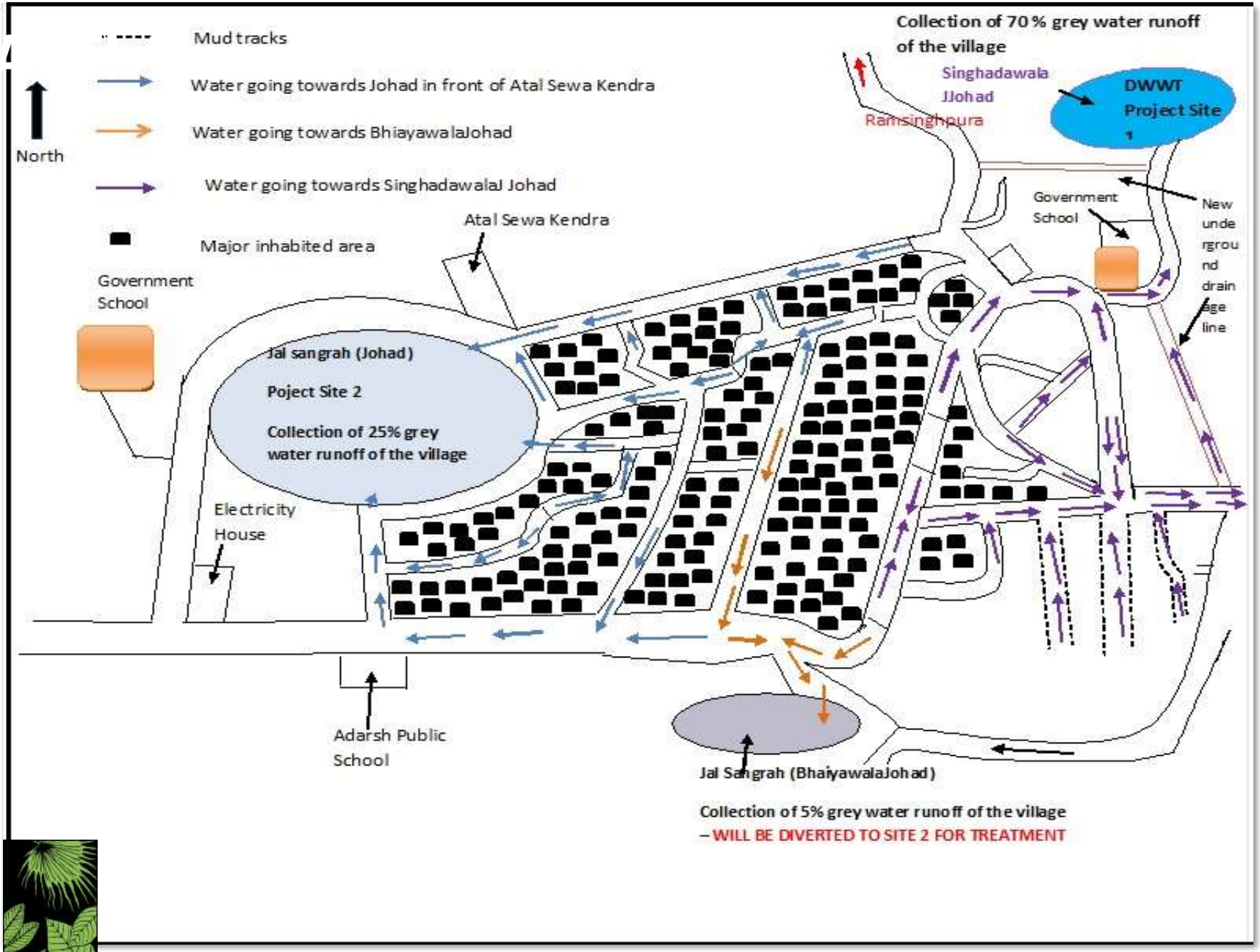
- Active involvement of Panchayat representative
- Public meeting to help them understand the benefits
- Welcoming response and high women participation

Implementation

Technology

- **DWWTs -** Settler, Anaerobic Baffle Reactors, Planted bed, Polishing Pond
- **Merits -** Low O&M, simple operation, minimal skills, no electricity. But, land availability is a prerequisite




Mud tracks
Water going towards Johad in front of Atal Sewa Kendra
Water going towards BhiayawalaJohad
Water going towards SinghadawalaJ Johad
Major inhabited area
North
Collection of 70 % grey water runoff of the village
Singhadawala JJohad
Ramsinghpura
DWWT Project Site 1
Government School
New underground drainage line
Atal Sewa Kendra
Government School
Jal sangrah (Johad)
Poject Site 2
Collection of 25% grey water runoff of the village
Electricity House
Adarsh Public School
Jal Sangrah (BhaiyawalaJohad)
Collection of 5% grey water runoff of the village
– WILL BE DIVERTED TO SITE 2 FOR TREATMENT

Implementation

- Total cost of the Treatment Systems 1 and 2 - USD 30000
- Land was allocated at the periphery of the two existing ponds
- Treatment Systems 1 = 551 sqm – Capacity = 80 KLD
- Treatment System 2 = 175 sqm – Capacity = 20 KLD
- Treated water will be reused for irrigation
- Pond used for pisciculture

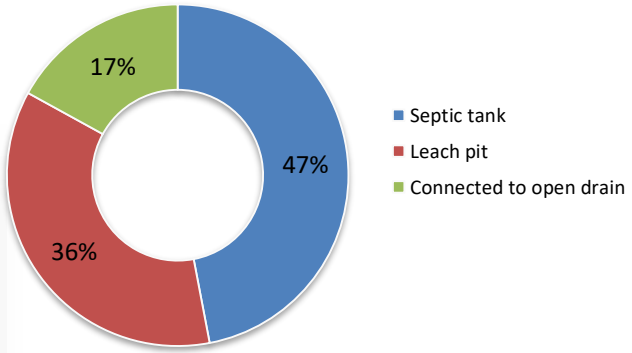
Challenges

- Irregular cleaning of drain because of limited manpower
- Change in bureaucracy/transfer of Government officials

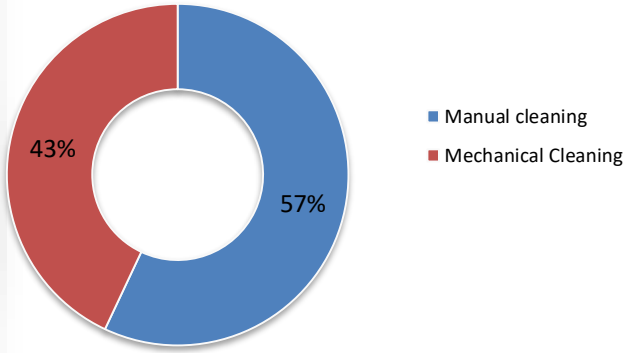
5. Demonstration of Fecal Sludge Treatment Plant at Dhenkanal Town, Odisha, India

Location: Dhenkanal, Odisha
Project duration: 3 Year
Geographical area : 31 sq km
Total Population: 67414

Type of toilet techology

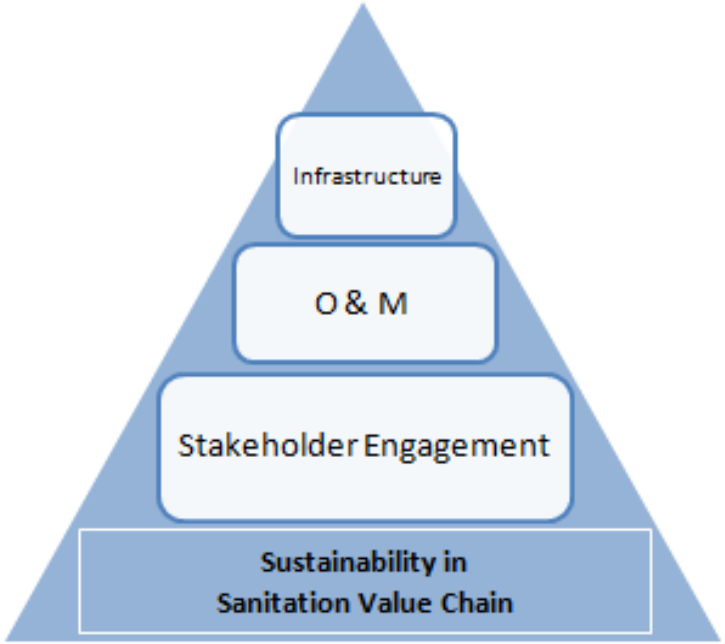


Cleaning of pits



Adopted Intervention Strategy

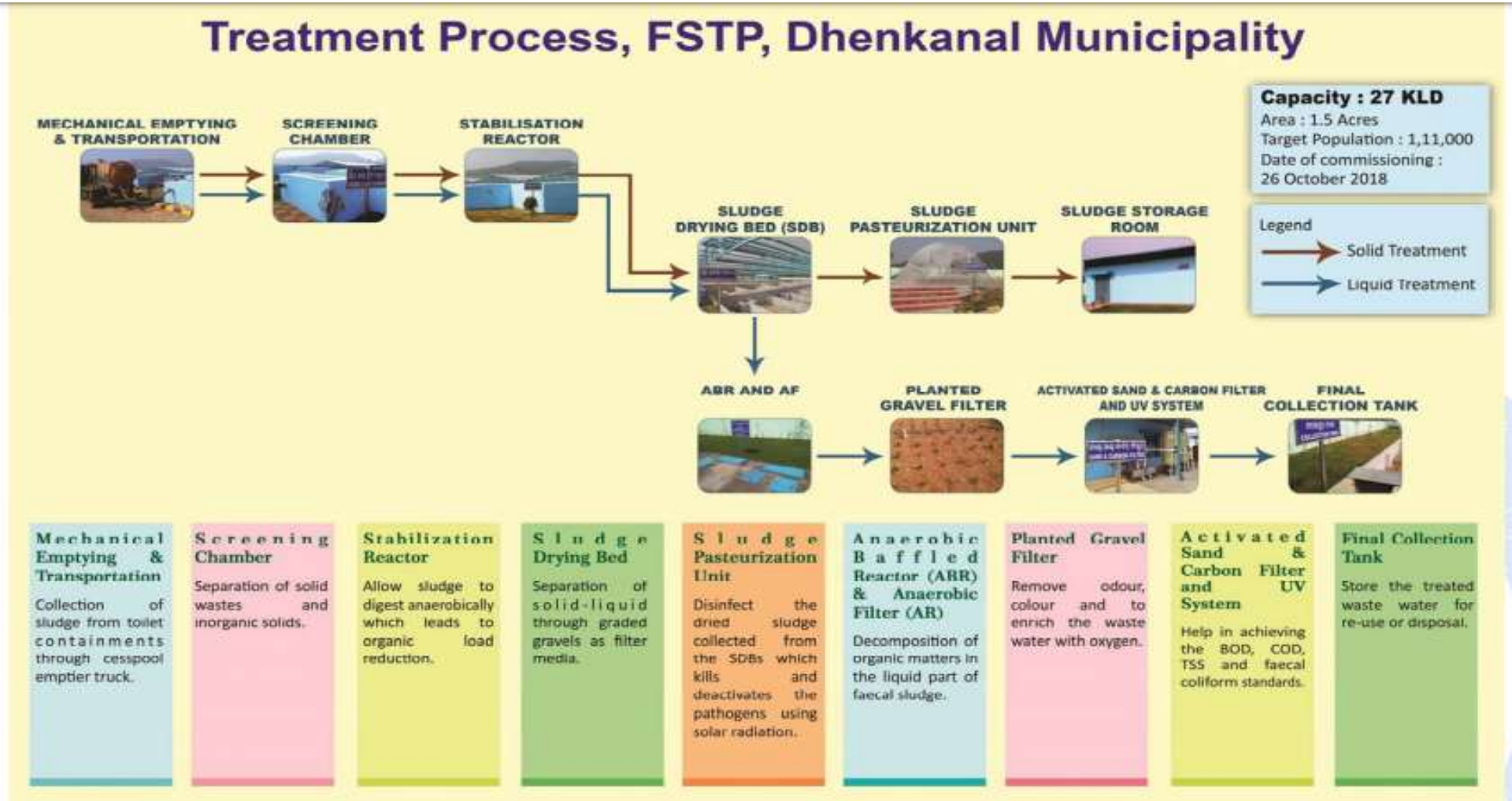
- Partnership with state government, district and Local Bodies
- Demonstration of FSM Technologies
- Engagement of stakeholders
- Capacity Building of key stakeholders
- FSM Campaign
- Integrated FSTP operation and Desludging Service



Infrastructure

Technology

- Screens, Drying Beds, Anaerobic Baffle Reactors, Planted Drying Beds
- Merits - Low O&M, simple operation, minimal skills, no electricity. But, land availability is a prerequisite



Pre-Treatment of Fecal Sludge

1. Screening Chamber

2. Sludge Drying Bed

3. ABR

4. Planted Drying Bed

Post-Treatment of Fecal Sludge

5. Activated Carbon Filter

6. Sludge Pasteurization Unit

Operation and Maintenance

Operation

- Call centre for desludging service requests
- Digitized revenue system and GPS tracking of the desludging trucks
- Checking the water quality standards
- Ensuring the reuse of by-products
- Establishment central monitoring system

Key Processes:

- Participatory Market System Development
- Formation and Strengthening the Structures at various Formation and Strengthening the Structures at various level
- Capacity building
- Policy Change: FSM Regulations, specific budget head for FSM Engagement of Private Operator for O & M
- Clearances form various agencies for the construction of the FSTP : Pollution
- Control Board, Planning Dept. the FSTP : Pollution Control Board, Planning Dept.

Key Challenges

- Political dynamics at the city level
- Change in bureaucracy
- Land allotment for FSTP Land allotment for FSTP
- Local Resistance

Key Outcomes of Effective Engagement of Stakeholders

Before	Now
42% Open deffecation	ODF city
Manual Emptying	Mechanical Emptying
Sludge disposed in open	100% treatment (FSTP)
Absence of Regulations /Policies	FSM regulations
Less involvement t of stakeholders	Effective involvement/ FSM campaign
Focus on toilet constructions	FSM (entire sanitation value chain)/Modules
Absence of Monitoring system	Call Centre, GPS, IVRS, FSM fund
Worst (liquid)	Wealth (Business Model)/engagement of private service provider
Casual service delivery	Demand generation

6. Demonstration of Fecal Sludge Treatment Plant at Devanahalli, Karnataka, India


CSE
Open for questions