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SCHOOL OF WATER AND WASTE AAETI NAMAMI GANGE

MAKING WATER SENSITIVE CITIES IN GANGA BASIN AIMED AT IMPROVING RIVER HEALTH/FLOWS

Decentralized Wastewater Management – A Paradigm Shift

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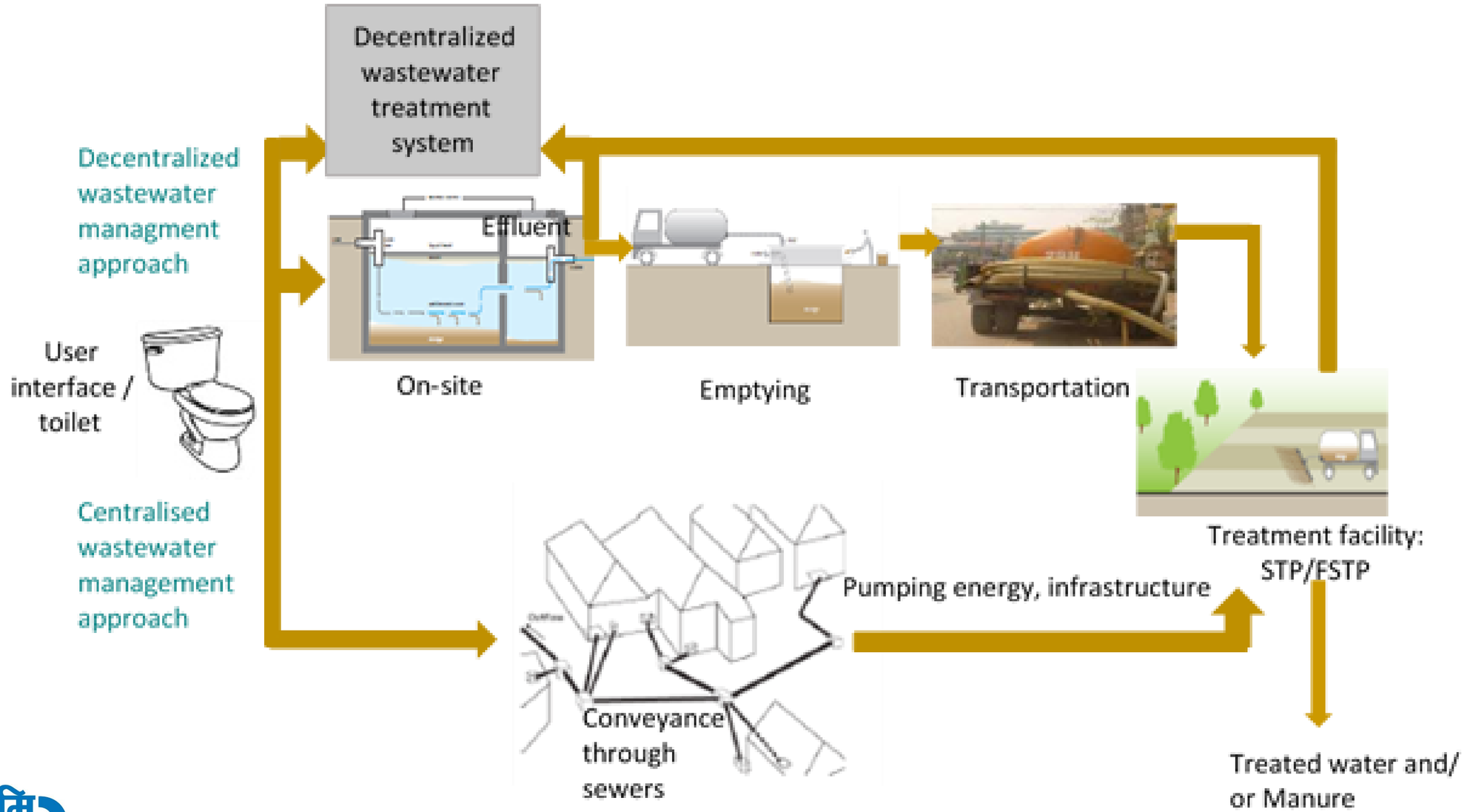
Presentation Structure

- Wastewater Management Approaches – Challenges & Opportunities
- Centralised V/s Decentralised Approach
- Concept, Principle and Scale of Intervention of DWWM
- Integration of DWWM in WSUDP and Citywide Sanitation
- DWWM - A Practitioner's Guide (Its need and content review)

Wastewater Management Approaches



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Challenges with Conventional Wastewater Management

Centralized Approach
Too much focus on Infrastructure

Poor O&M
Insufficient attention to operation and maintenance

Conventional gravity sewers **deeply placed** with manholes & pumping stations

Inequality
Neglect the needs and priorities **of low income communities**

Overall managed by **ULBs**

Suitable for large city areas with **dense population** and **adequate water supply**

Insufficient Infrastructure
Cities are not fully covered with sewer due to expansion, accessibility and funding

Energy Intensive
It requires huge piped network and pumps to collect, treat and supply water

Pollution of Water bodies
Discharge of untreated / partially treated wastewater in water bodies causes pollution

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Conventional Way

Bring water into the city – storage, diversion, pipe, pump, treat **– from further and further away**

Flush and carry the waste out of the city – pipe, pump, divert, treat – **further and further away**

The Current Paradigm

More water supplied = More waste water generated = more costs for treatment

=

Unsustainable

What could be an alternative approach which is cost-effective and sustainable in nature? A recovery-based closed loop system.

Current models of water and wastewater management are not effective and creates more nuisance to the river flow – A sustainable, nature friendly and easy to use approach is needed.

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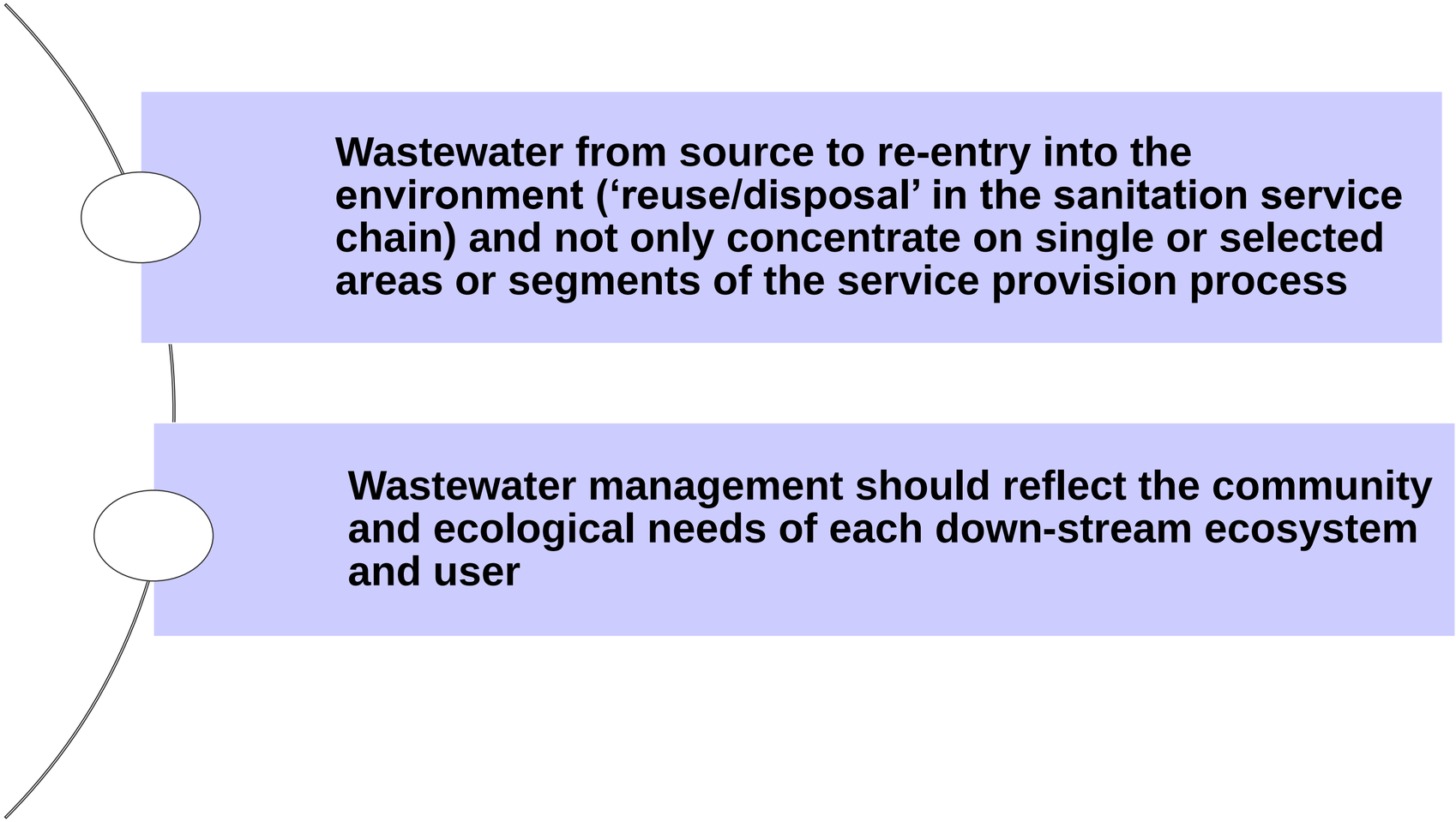
Need for a Paradigm Shift

(Towards Sustainable Wastewater Management Approach)



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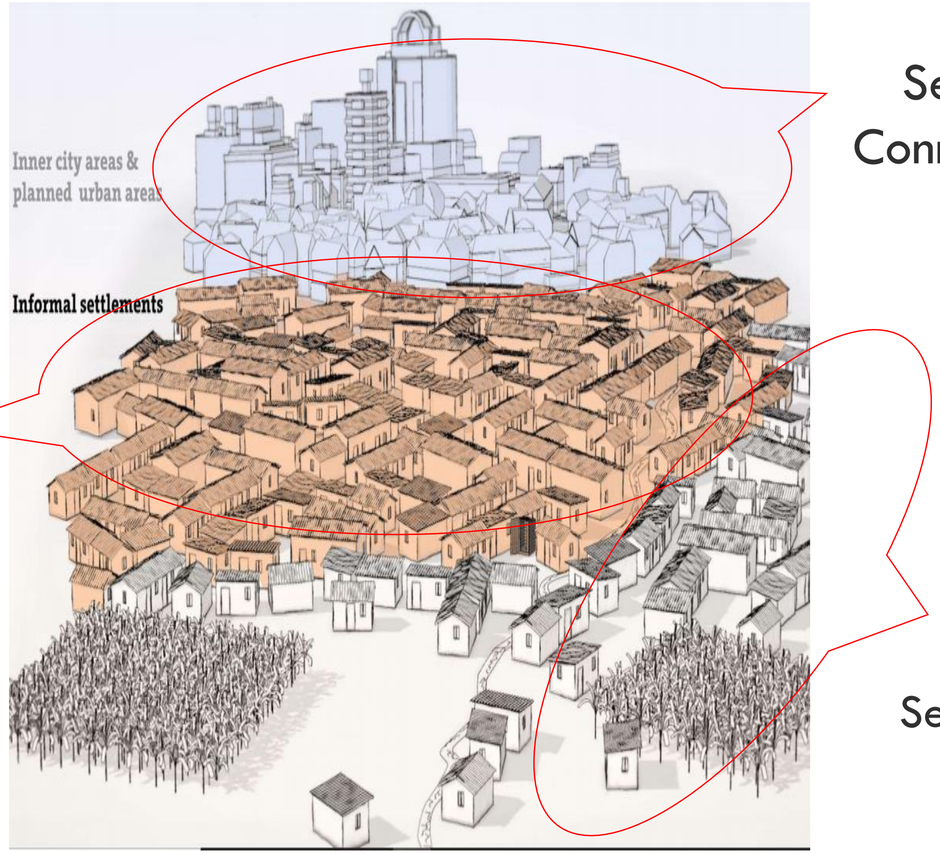
Decentralized Wastewater Management



Sewer Connection

Onsite Sanitation

New Settlements

WHAT ?

"Decentralised wastewater management (DWWM) is defined as the **collection, treatment and disposal / reuse of wastewater at or near the point of waste generation**."

It includes systems that treat wastewater from individual homes, cluster of homes, isolated communities, industries or institutional facilities as well as portion of existing communities

PRINCIPLE

Decentralised wastewater treatment (DWWT) is based on the important principle **– devolving level of the application** so that wastewater can be treated at **affordable costs, cutting the cost of pumping long distances and promoting local reuse of treated wastewater**.

Most of the popular technologies used in conventional treatment could be implemented at small scale ranging from community to zonal level.

-Guidelines for Decentralised wastewater management (CPHEEO) for MOHUA

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DWWTs Characteristics and Advantages

Cut / Reduce the length of pipeline
Wastewater can be **treated on site**, no need of conveying to far distances. **Sewer networks are shorter in length and smaller in diameter** since there are several disposal points

Required basic skills to operate and maintain
Semi skilled/ unskilled labour required for operation and maintenance.

Reduces carbon footprint
Generally **less or no energy required**. Also no addition of expensive chemicals or additives

Safe reuse of treated wastewater
Especially for non potable end uses

Cost efficient
Doesn't require **sophisticated or costly maintenance**

Promotes a kind of 'public-private partnership'
ULBs / local authorities have to provide lesser capital outlay including low O&M that is taken care by public

Adaptability in nature
Adaptable to **varying organic load and climatic condition**

Suitable for Organic wastewater flow
1-1,000 m3 per day

Meets the wastewater standards
Treated wastewater **meets the discharge standards** and environmental laws

Follows circular economy
Treat and reuse of **wastewater locally and promotes resource recovery**

Doesn't cause any nuisance
Such as **noise pollution, bad odour to the surrounding, problems of mosquito** breeding etc.

Site specific and flexible in nature
To be designed **according to the characteristics of wastewater**

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Comparison b/w Centralized and Decentralized Wastewater Treatment System

Parameter	Centralized System	Decentralized System
Capital cost for conveyance systems	High	Low
Treatment technologies	Electromechanical and chemical based	Flexibility to use nature based systems that consume less energy
Level of skill required for operation and maintenance	High	Medium to Low
Timeline for project implementation	4-6 years	9 months to 1 year
Reuse	Needs infrastructure	Local reuse possible
Financial sustainability	Unsustainable , depends on funding ,grants and subsidies for O&M, recovery of cost and even O&M is difficult	Less capital intensive as compared to the establishment centralized systems; hence, makes it financially sustainable
Affordability	Installation cost , building networks and O&M cost is high which makes it unaffordable	Affordable in in terms of low cost as compared to centralized system

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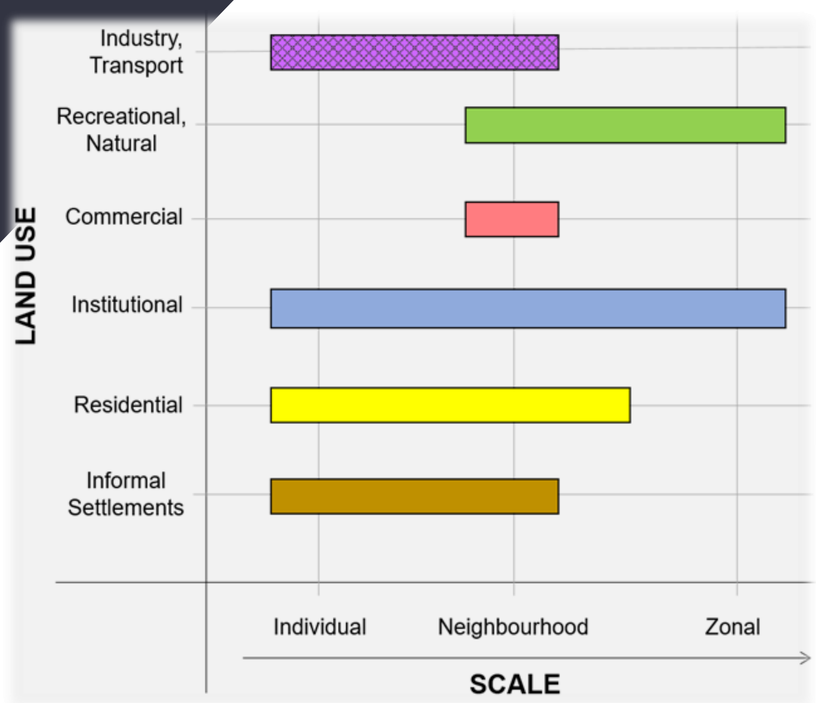
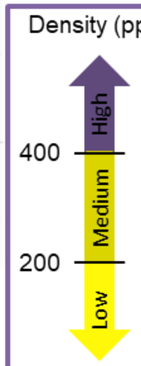
Scales of Decentralized Wastewater Management



- Residential and institutional land uses have high potential at all the scales.
- Informal settlements have a high potential of simplified sewerage networks and decentralized projects at lower scales.
- Commercial areas, industrial estates and transportation hubs have potential at lower scales.
- Recreation areas and natural areas have high potential for projects of higher scales.

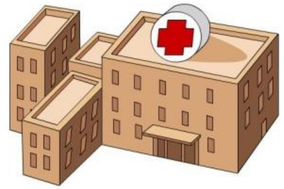
Informal settlements include peri-urban areas, urban villages and unauthorized colonies.

NOTE: Scales of decentralisation are explained in section 3.1



- Centralized sewerage systems are not recommended for low density areas as they are expensive.
- Decentralized solutions can be done for low as well as high density, but in case of high density some additional measures to be adopted in favour of local context.

Public toilets



Hospitals

Single house

Markets/Offices

Residential areas

Schools/colleges

Suitable situations for DWWM project -

1. Where the operation and maintenance of existing on-site systems needs to be improved.
2. Where the community or facility is remote from existing sewers.
3. Where freshwater for domestic supply is in short supply.
4. Where, for environmental reasons, the quantity of effluent discharged to the environment must be limited.
5. Where the site or environmental conditions that require further sewage treatment or exportation of sewage are isolated to certain areas.
6. Where individual on-site systems are failing and the community cannot afford the cost of a conventional sewage management system.
7. Where localized water reuse opportunities are available.
8. Where existing STP capacity is limited and financing is not available for expansion.
9. Where the expansion of the existing sewage collection and treatment facilities would involve unnecessary disruption of the community.
10. Where residential density is sparse.
11. Where specific sewage constituents are treated or altered more appropriately at the point of generation.

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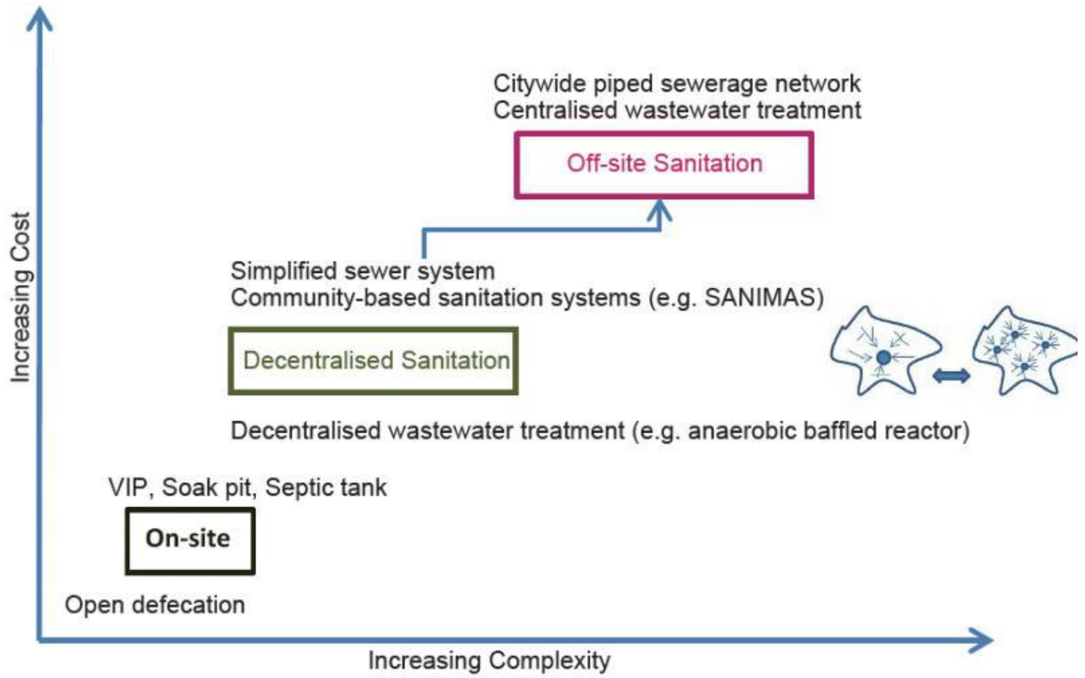
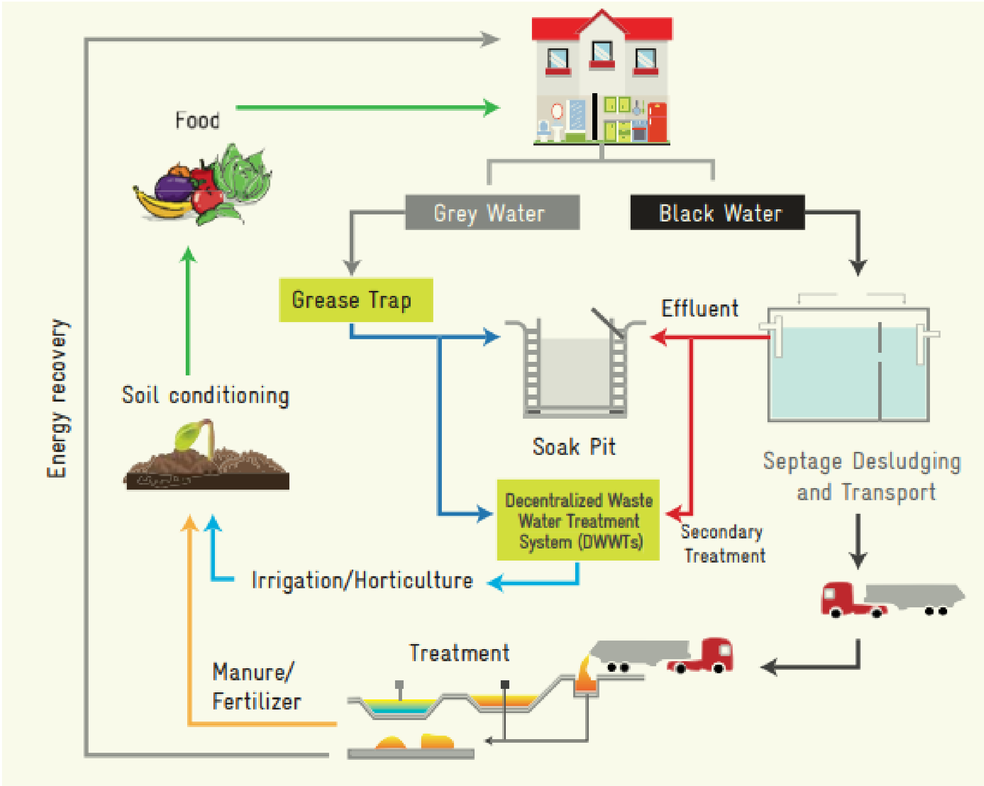
Missing Link: Decentralized Wastewater Treatment in Sanitation





Decentralized approach bridges the gap between OSS and conventional off-site sanitation approaches

- The decentralized approach is also applicable to address the **issue of environmental pollution** caused by **effluent from the on-site sanitation systems.**

- The concept of **septage management** that sets out interlinked steps that are vital to manage septage and effluent from **generation to disposal to end-use also recognize DWWM** as one of the solution for effluent management.

https://www.susana.org/_resources/documents/default/3-2553-7-1462884043.pdf

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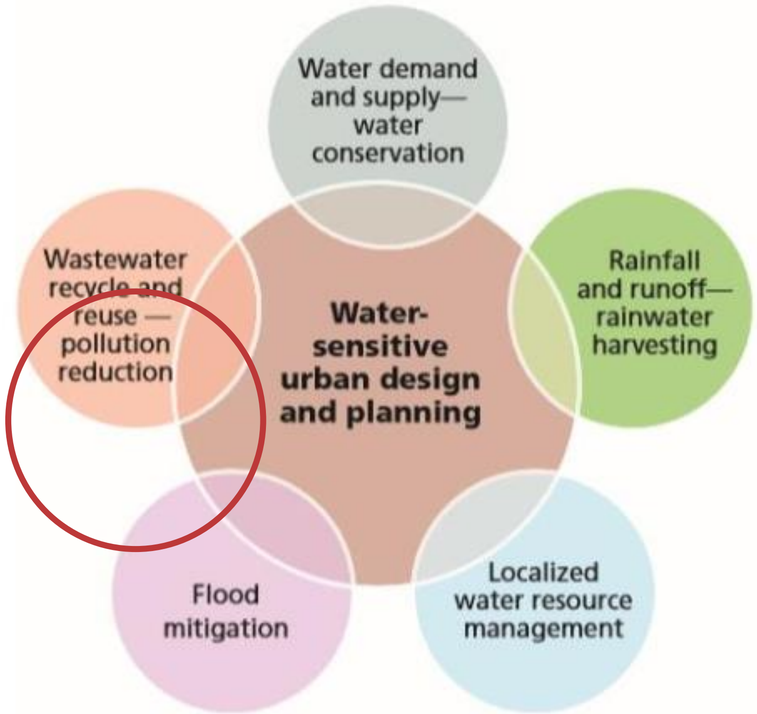
DWWM: An integral part of Water Sensitive Urban Design and Planning



Source: *Water-Sensitive Urban Design and Planning: A Practitioner's Guide, Centre for Science and Environment*, New Delhi

WSUDP, being the integrated design of the urban water cycle, incorporating **water supply, wastewater, storm-water and groundwater management**, urban design and environmental protection, can contribute towards sustainability and livability, particularly when considered as part of an overall urban strategy

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Why DWWM is Important? – SBM 2.0

Objective 1

- All used water is safely collected, treated and reused to feasible extent and no untreated used water is discharged into water bodies or the open environment

Objective 2

- All faecal matter and septage is properly collected, treated and by-products reused

- No funds earmarked for waste water management for towns under SBM Phase 1.

SBM 2.0 and AMRUT 2.0 has funds earmarked for used water treatment including Faecal Sludge management, for cities with less than 1 lakh population.

It will help to manage 13,000 MLD of sewage generated from the notified Class II - VI towns of the country.

SBM 2.0 - New green field developments in and around towns, provision of sewerage network along with decentralized sewage treatment facilities should be ensured.

Class of Cities based on Population		No. of Cities*	Total Population @ 2011 Census [in crore]	STP capacity reqd (in MLD) (after adjusting for 23% decadal growth of population)	Average capacity (in MLD)
Class II	**50,000-99,999**	535	3.65	4,498	5.5
Class III	**20,000-49,999**	1,439	4.46	5,494	3.5
Class IV	**10,000-19,999**	1,233	1.2	2,826	.70
Class V	**5,000-9,999**	541	.43		
Class VI	**<5,000**	153	.05		
Total		**3,901**	**10.42**	**12,818 (approx. 13,000)**	

***- For purpose of estimation, Census 2011 figures are considered with suitable population projections. However, all Statutory towns will get funding support from SBM (U).**

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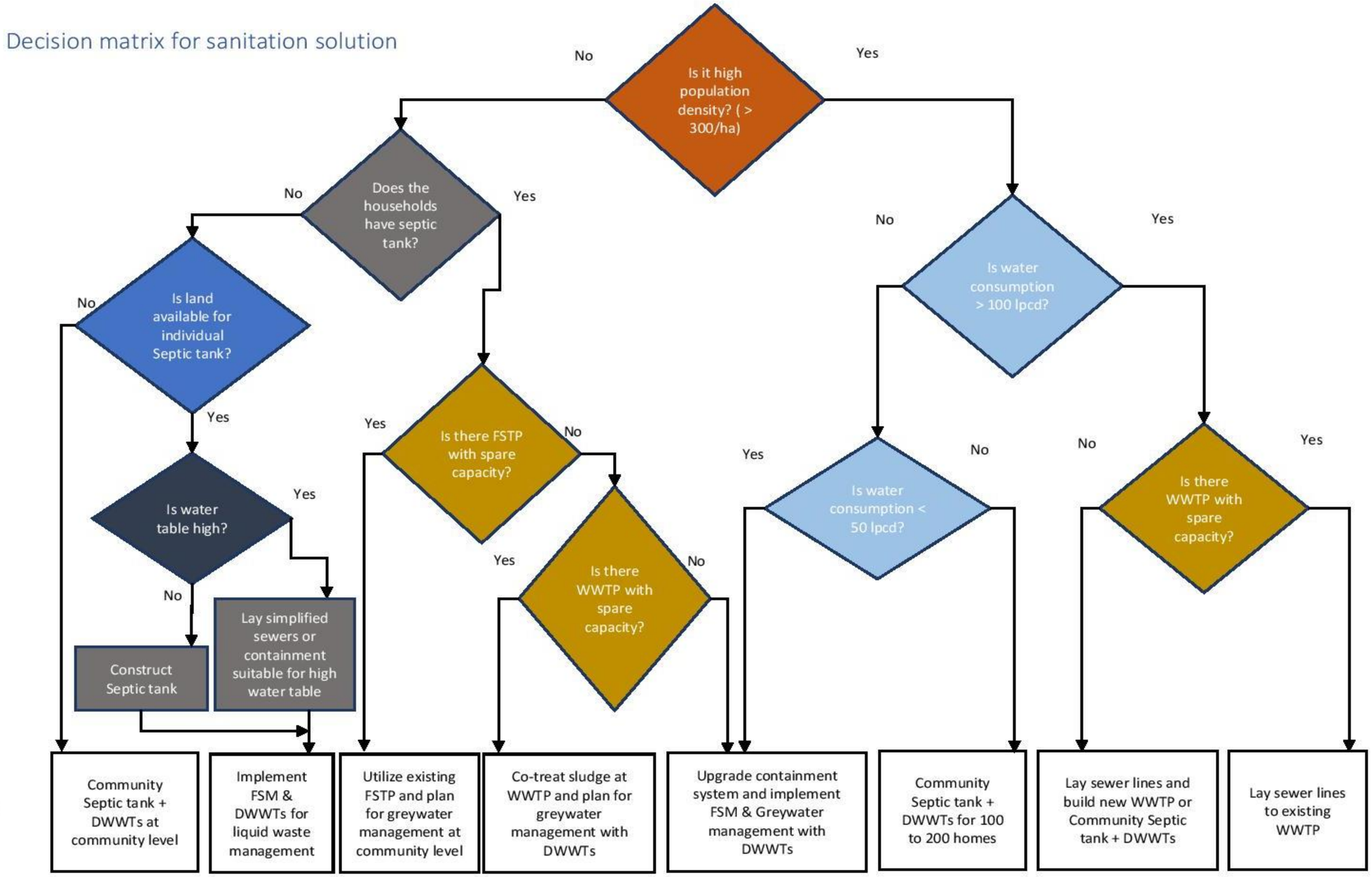
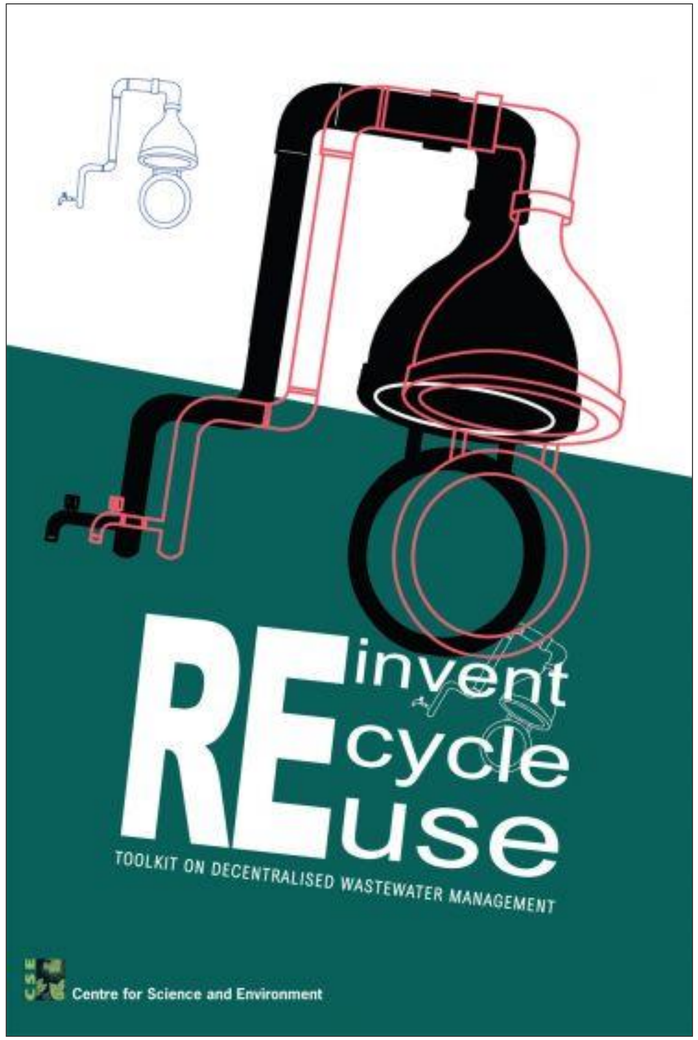
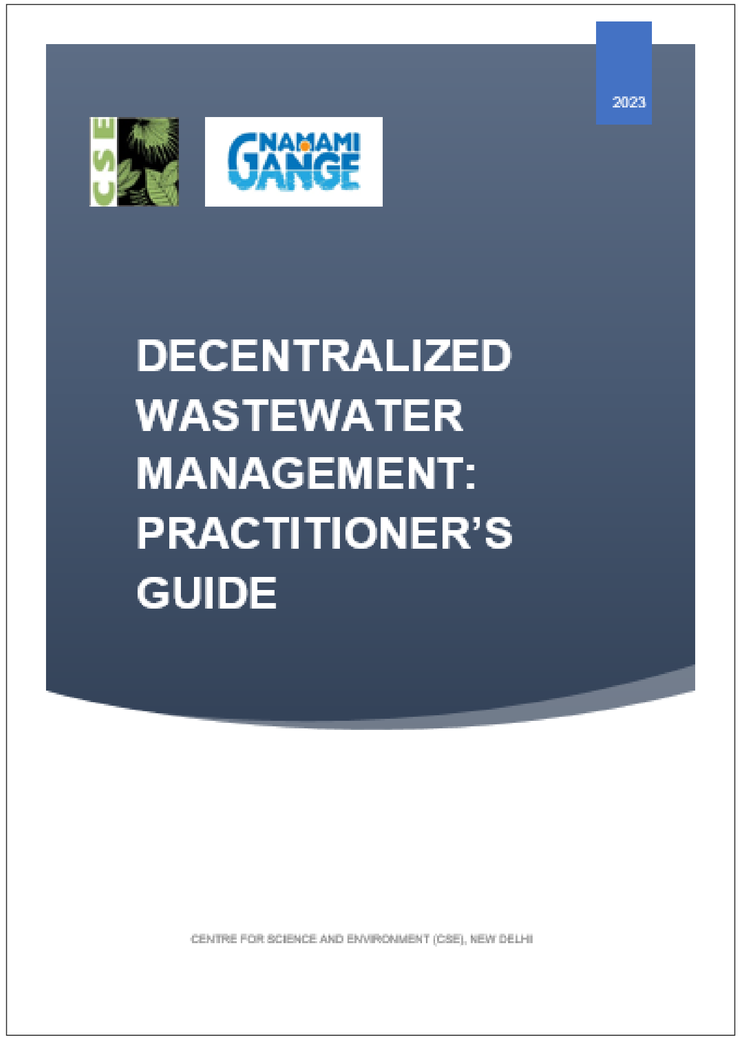
Decision Matrix for Sanitation Solution





REINVENT, RECYCLE, REUSE - TOOLKIT ON DECENTRALISED WASTEWATER MANAGEMENT (2013)



DECENTRALISED WASTEWATER MANAGEMENT – A PRACTITIONER'S GUIDE (2023)

The previous guide published in 2013 includes, basic principles, key technical facts, case examples etc. This updated guide has been prepared in view of disseminating the latest knowledge/information to the users and enable practitioners to plan/design decentralized system by their own as “Do It Yourself” approach.

The updated Practitioner’s guide discusses:

- DWWM as an approach and its applicability in citywide sanitation.
- Enabling environment in terms of policies, plans and programmes in order to provide rationale on DWWM approach.
- Elaborates on the process of planning and designing of decentralized wastewater treatment projects that are context specific.
- Offers an updated repository of successfully implemented case studies of different decentralized wastewater technologies.
- Provides information on possible checklists, ‘Do’s and Don’ts’ for efficient stakeholder engagement, operations, maintenance and monitoring.
- Myths about DWWM and frequently asked questions (inserted as box in chapters) from relevant publications and research findings are also included in the guide.

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Practitioner's Guide - Content Outline

Chapter 1: **Introduction**	• Background: Global and national scenario of wastewater management • Introduction to the guide • Objectives and target groups • How to use the guide	Introduction; Setting the context
Chapter 2: **Understanding wastewater management**	• Understanding wastewater management • Why decentralisation? Scope of DWWM • Existing regulatory framework	Understanding wastewater management
	• Simplified sewerage networks	Implementing decentralised wastewater management systems
Chapter 3: **Decentralised wastewater management: How to start?**	• Scales of decentralisation • Stakeholder analysis • Economics of DWWM • Monitoring systems and redressal management	
Chapter 4: **Planning and Designing**	• Planning and designing for decentralised wastewater treatment • Identifying scale-specific opportunities • Designing a DWWTS • Implementation, O&M	
Chapter 5: **Resource recovery**	• Closing the loop: Circular economy • Fit-for-purpose treatment: Water reuse	
Chapter 6: **Case studies**	• Zonal / City Scale • Neighbourhood Scale • Individual Scale	Best management practices
Appendices	• Checklists, Format for DPRs • Compendium of technologies • Do's and Don'ts, O&M instructions, Myths	Tools to aid practitioners

SUMMARY

The process of decentralized wastewater management furnishes the recycle and reuse of wastewater — a process of treating **wastewater** as a **resource** rather than a **liability.**

THANK YOU

Jyoti Parsad Dadhich
Programme Officer, CSE
jyoti.parsad@cseindia.org