



# Citywide Sanitation Planning Insights from India, Bangladesh

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# Contents

- Background
- Challenges for citywide sanitation planning
  - Unmanaged urban growth
  - Unrealistic approach of decision makers
  - Capacity limitations of urban local bodies
- A viable approach
  - Correlating sanitation approach to urban development process
  - Developing an ecosystem of sanitation services
  - Program approach rather than project approach



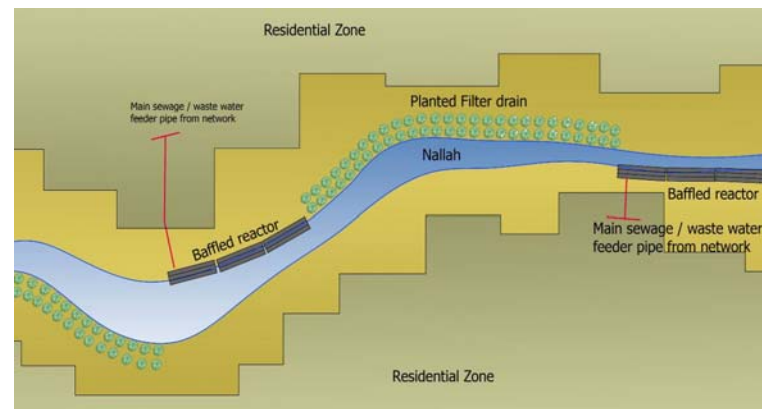
# Background

- CDD Society, Bangalore – created to promote sustainable approaches to sanitation and wastewater management
- DEWATS – streamlining and mainstreaming of decentralized wastewater treatment
- Experiments in scaling up of the DEWATS approach to area-wide and citywide solutions
- Focus on fecal sludge management
- Bangladesh project



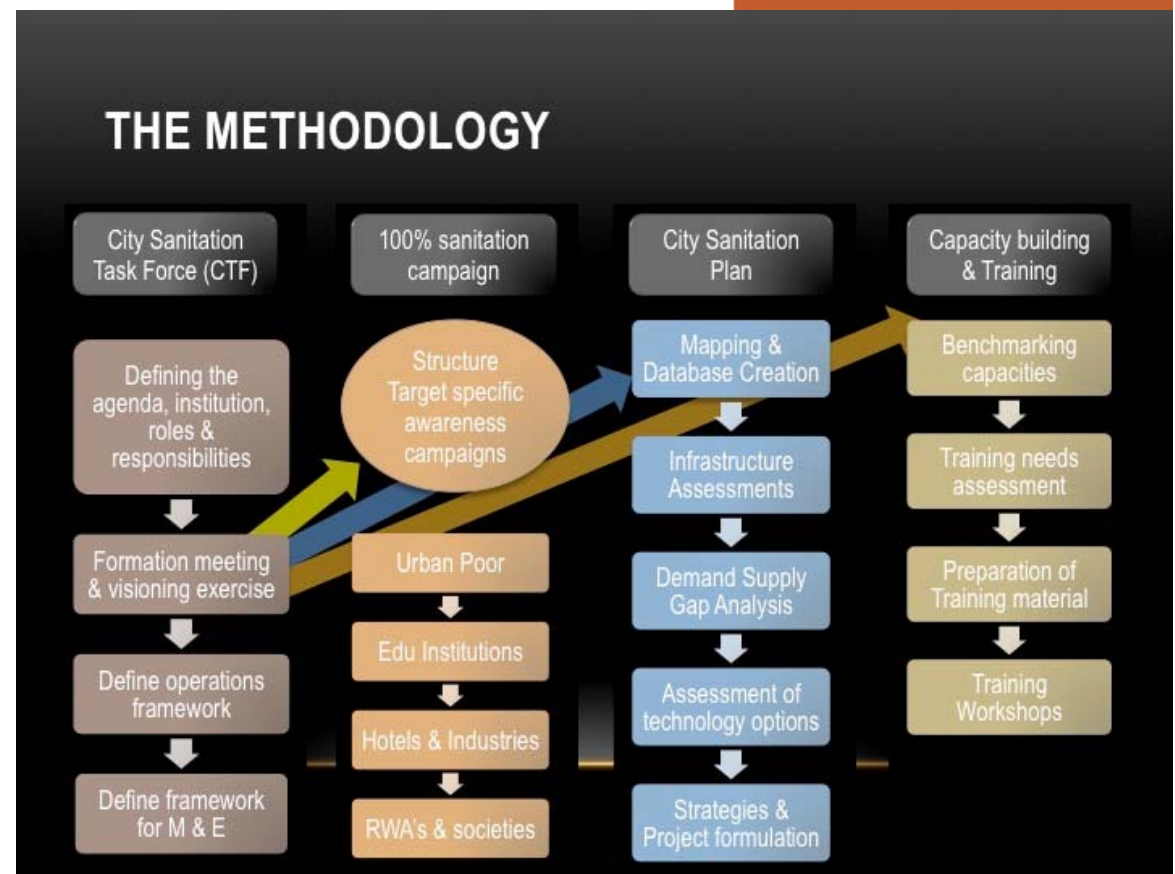
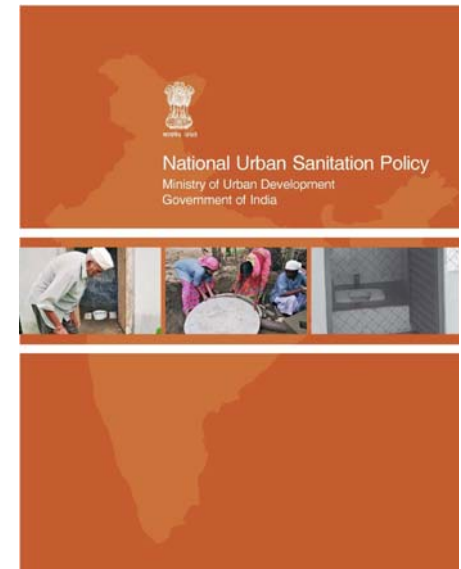
# Experiments in scaling up

- Pune – DEWATS based solution for treating wastewater along the catchment of a stream
- Kolhapur – citywide Master Plan for decentralized wastewater management



# Mainstreaming of citywide sanitation planning

- National Urban Sanitation Policy 2008
- City Sanitation Plan as the preeminent planning tool
- CDD-Alchemy-CEPT undertake City Sanitation Plans for Raipur, Simla, Varanasi funded by GIZ

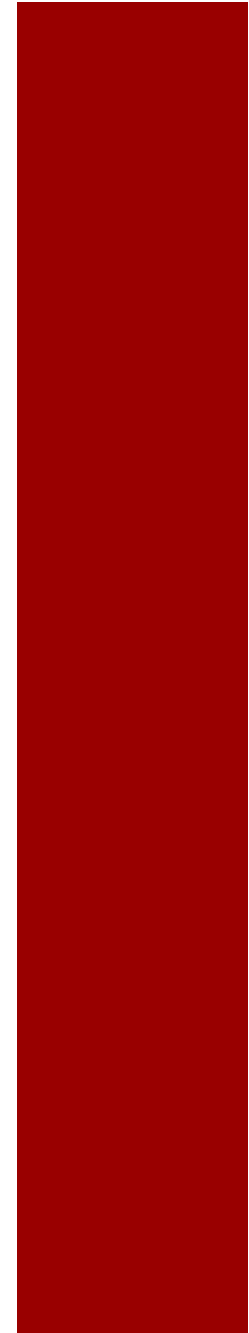


# Grand plans, but...

- Consultant driven planning
- Decision makers continue to favor big ticket sewerage projects
- No significant change on the ground
- Realization of the need to focus on incremental improvement

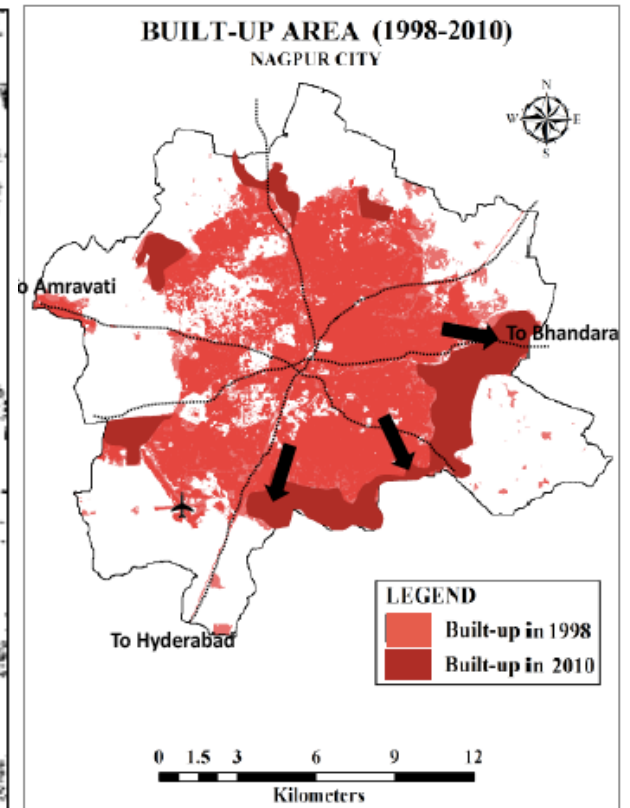


# Challenges for citywide sanitation planning



# Unmanaged urban growth

- Cities expanding rapidly
- With few exceptions, almost all urban expansion is unplanned
- 50 – 80% of housing – especially for low income groups – is informal/ unauthorized/ illegal
- Sanitation is low on the priority list – and usually ends with toilets





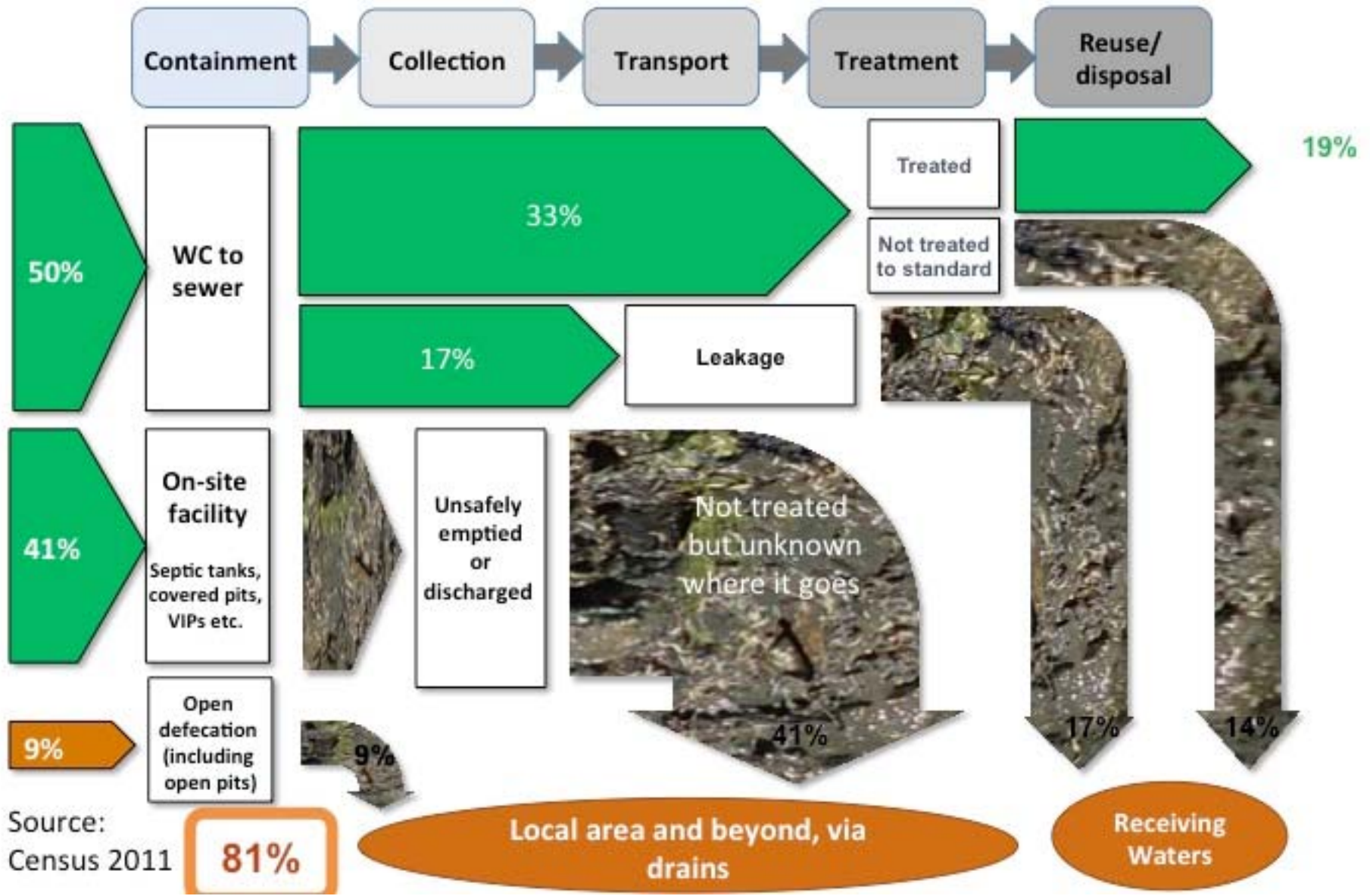
# Unrealistic approaches

- Decision makers prefer proposals for citywide sewer networks and centralised sewage treatment plants
- However, often, the necessary preconditions don't exist
  - no street network
  - no willingness to pay
  - no resources to run the treatment plants
- Many cities claim high sewerage "coverage" (even 90%)
  - In reality half the sewage may be going untreated into natural water bodies.
  - Often, streets have sewer lines, but people may not connect
  - Lots of houses are not built on such streets



# Urban India

Sewer coverage	No of Cities	% of population
<10 %	191	16.45%
10 - 30%	158	20.10%
30 - 60%	75	24.22%
>60%	78	39.23%

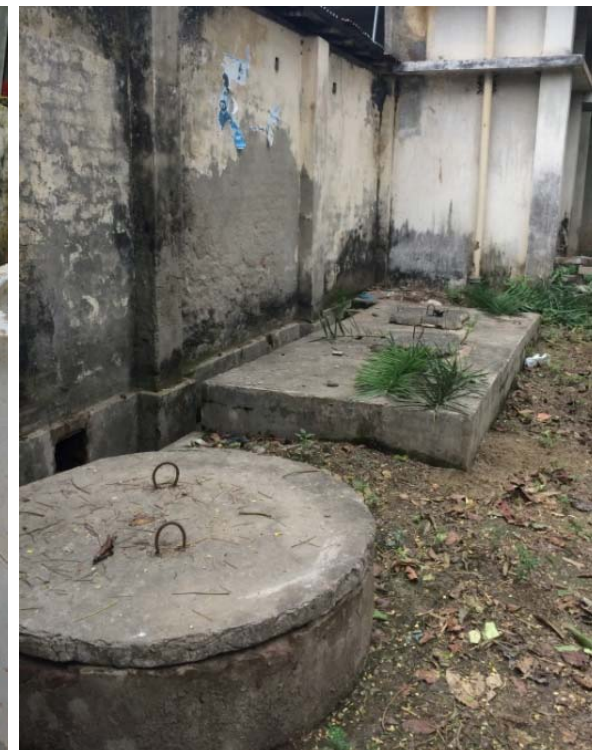


Source: Census 2011

**81%**

# Onsite, out of sight, out of mind

- Pits and septic tanks – predominant means of fecal containment
- Not acknowledged as a reality that will continue for years to come.
- No focus on services such as regular desludging.
  - Pits and septic tanks don't function well
  - Also makes it difficult to propagate the next level of improved sanitation (such as DEWATS).



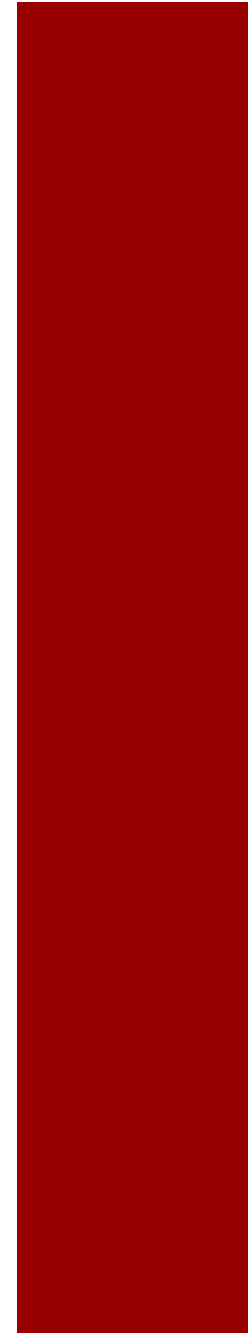
# Capacity limitations of urban bodies



- Donors, lenders, etc. promote ownership of projects by the city
  - Limited success – most municipal bodies still work on government grants and are controlled by higher levels of government.
- Citywide sanitation planning presumes that cities have a culture of "planning and implementation".
  - Unfortunately most don't. They are used to implementing 'programs' of higher levels of government.

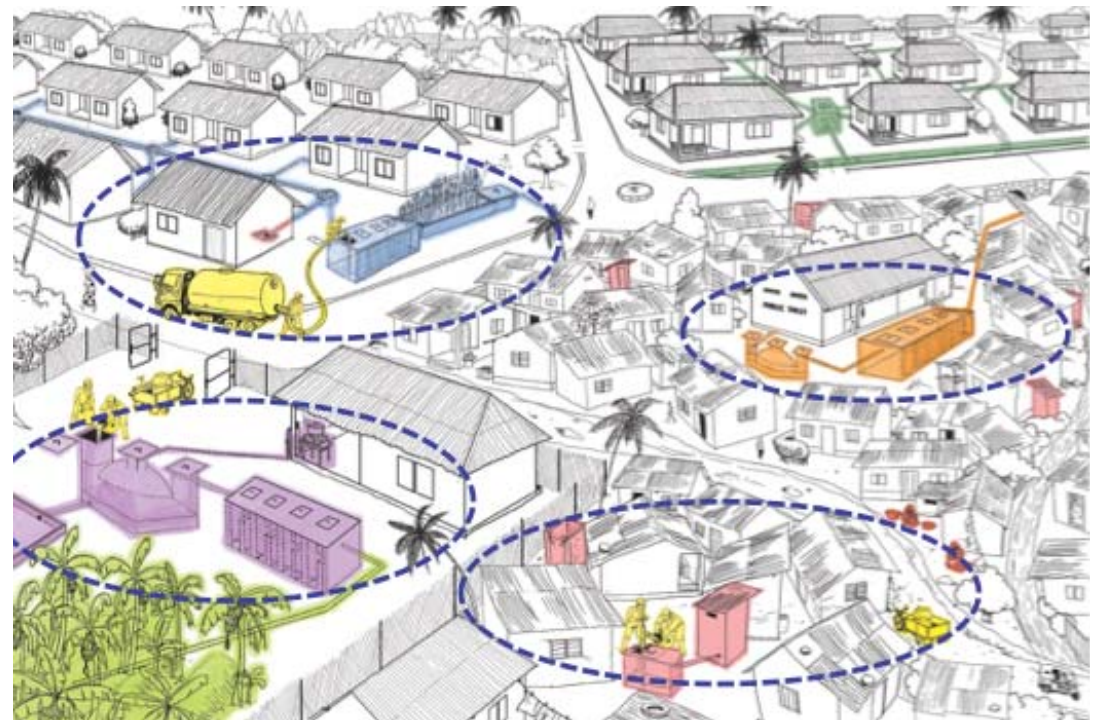


# Viabile approaches for citywide sanitation planning



# Correlate sanitation approach to urban development process

- Two pronged strategy:
  - Urban expansion with sanitation systems
  - Cover backlog in developed areas
- Urban expansion:
  - Contiguous expansion – extend existing system
  - Scattered peripheral growth – decentralized approach
- Backlog:
  - Site specific solutions



# Develop an ecosystem of sanitation services



- Sanitation service ecosystem:
  - Production of prefab units, components, etc.
  - Services for sludge evacuation and transportation
  - Faecal sludge treatment plants and their O&M
  - Marketing network for reuse
- Service providers
  - Municipal
  - Private
- Soft components
  - Awareness campaign
  - Capacity building

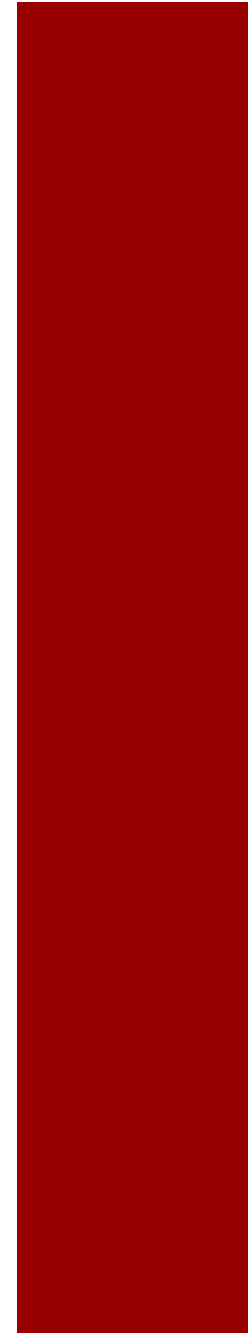
# Program approach rather than project approach



- Awareness campaigns to build a critical mass of public opinion in favor of good sanitation practices
- Program for capacity building in municipalities
- Program for private sector vendor development
  - manufacture of prefab components
  - design and construction
  - sanitation service providers
- Program for building and operating faecal sludge treatment plants
- Program for reuse of treated sludge and effluent

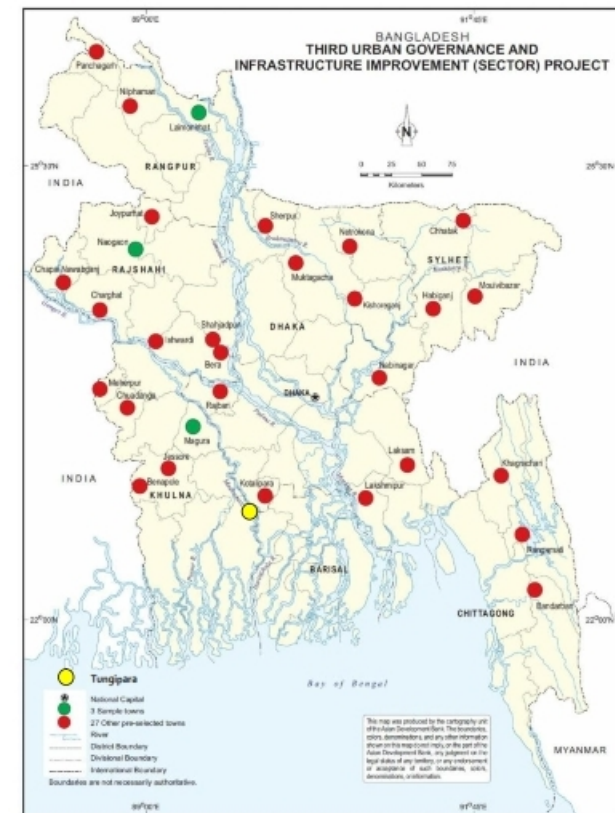


# Sanitation Action Plan for 31 towns in Bangladesh



# Introduction

- Preparing Sanitation Action Plans for 31 Pourashavas
- Funded through UGIIIP-3 Program by the Asian Development Bank
- Duration: 10 Months
- Purpose: Preparation of Sustainable sanitation action plans using an incremental approach with preference for decentralized solutions

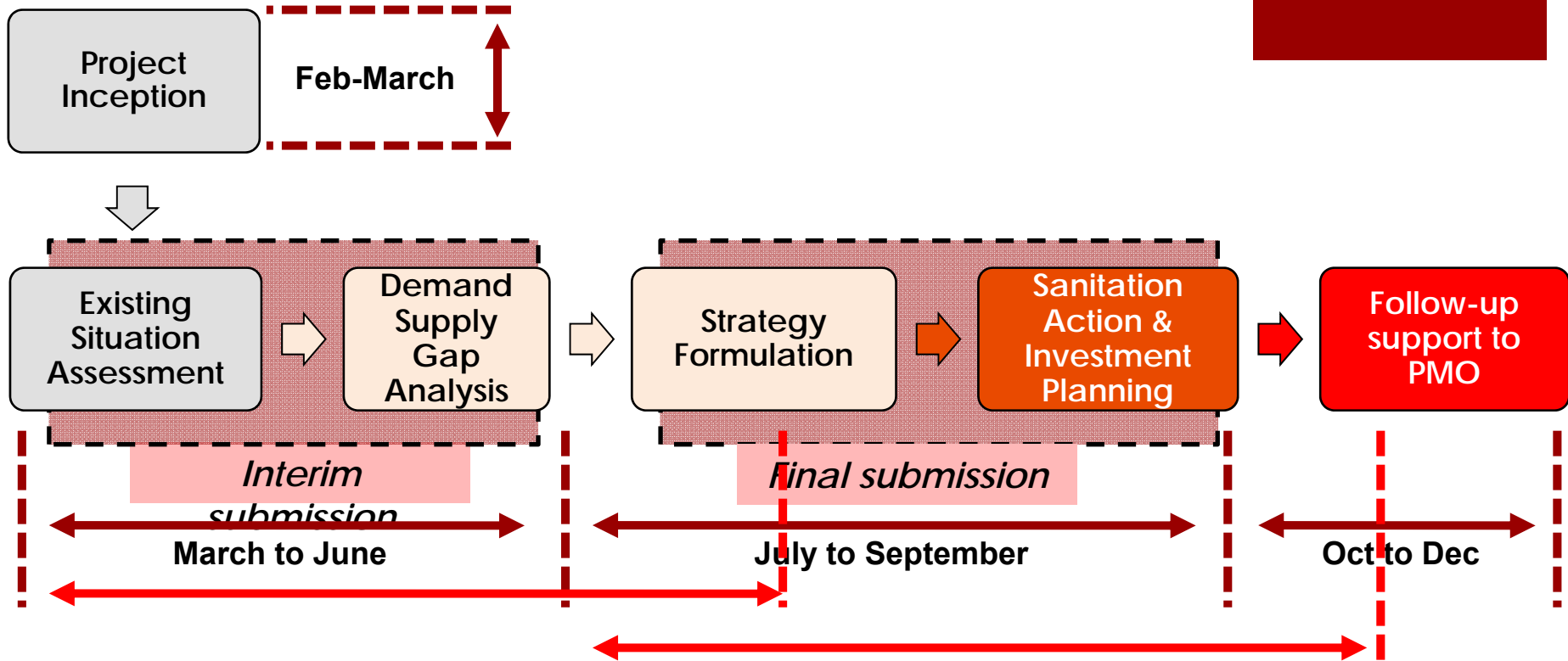





# Scope

1. Analyze existing sanitation situation in the Pourashava
  - Demand for Sanitation Solutions
  - Gap between Demand and Supply (level of service existing)
2. Propose sanitation solutions to facilitate improved access to safe sanitation
  - Safe disposal of fecal sludge and wastewater
  - Possible reuse
3. Prepare Sanitation Action & Investment Plans

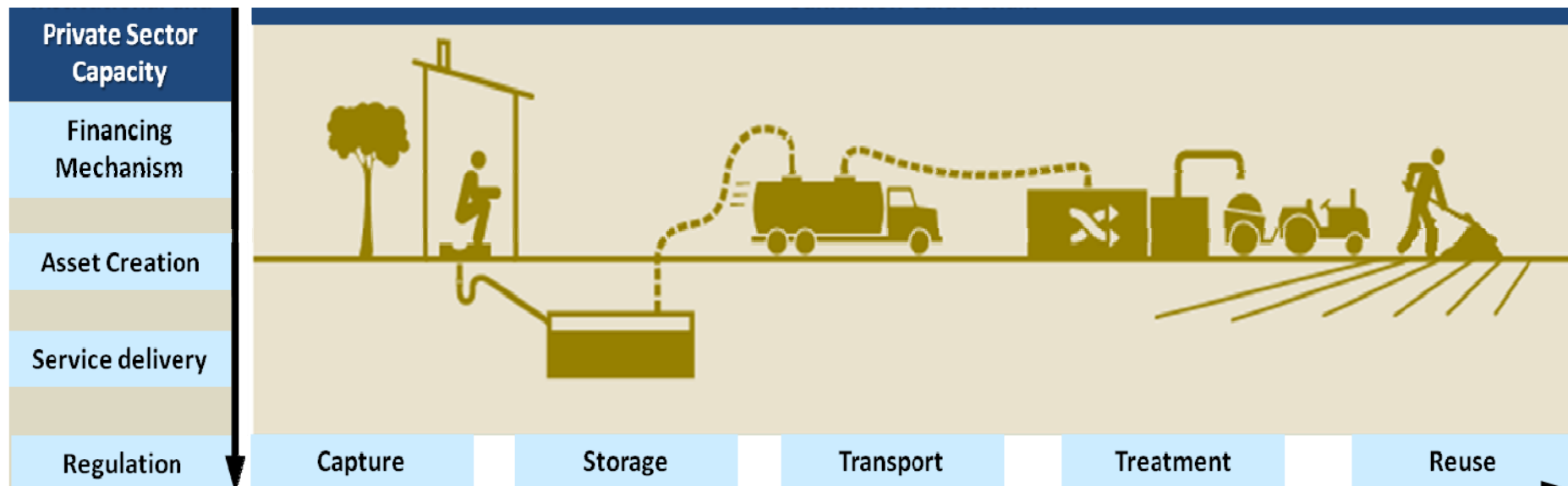


# Timeline



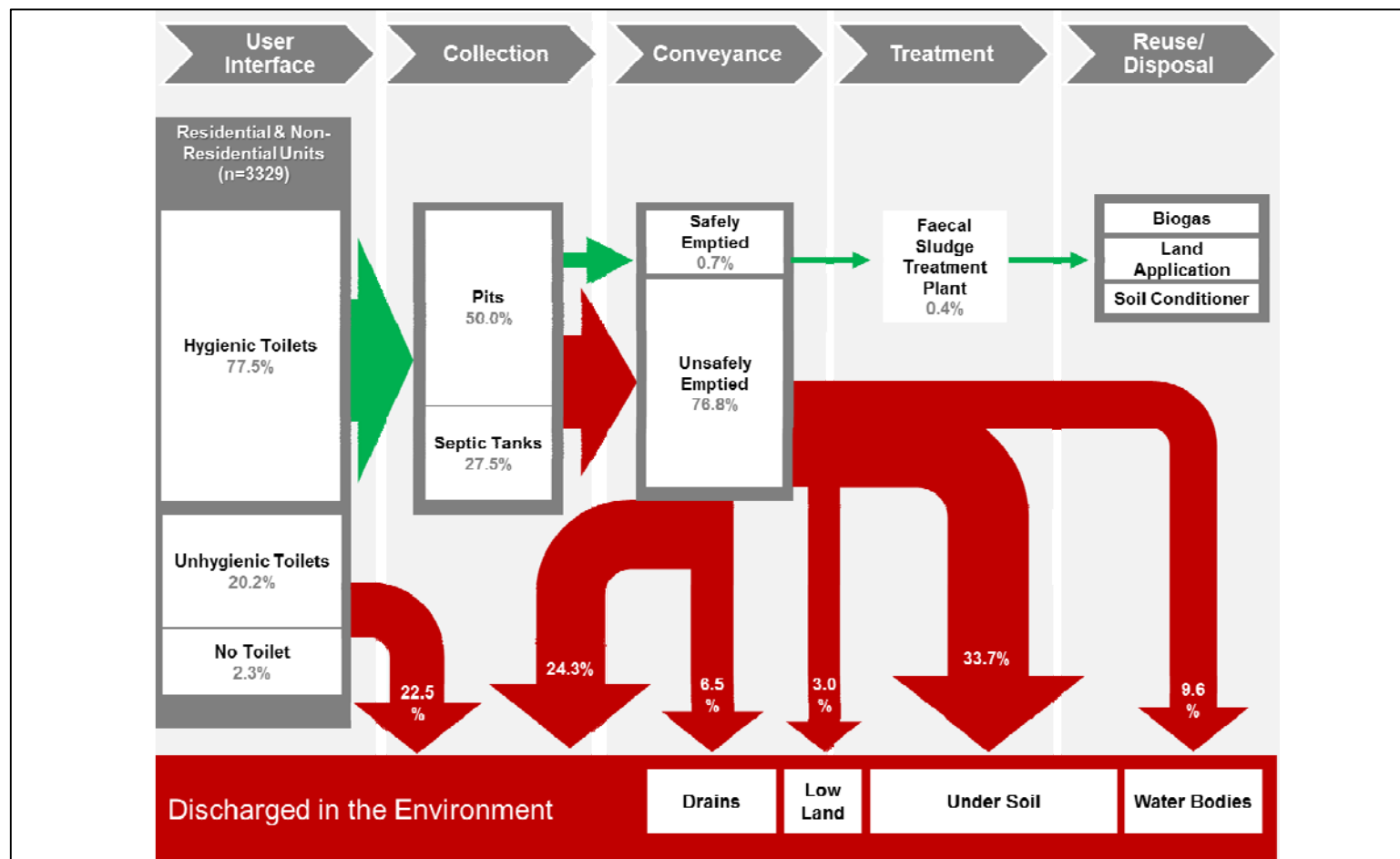
-  Completed stages of project
-  Ongoing stage of Project
-  Next stages of Project

# Structured approach



- The approach adopted is pragmatic, demand responsive and inclusive rather than need or supply driven.

# Sanitation situation



# Risk to health & environment

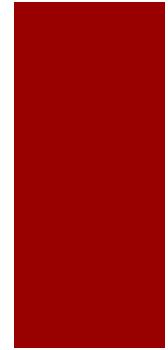


- Many of the toilets are unhygienic
- Almost all the waste from the toilet goes untreated into natural water bodies
- High risk to health and environment





# Program approach



## Catalogue of Solutions

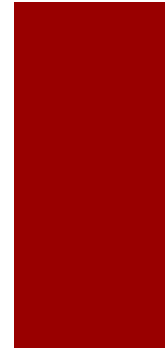
- Solutions for each segment of the value chain
- Technical briefs for each solution
- Recommended solutions for each town in its action plan
- Action plans as working documents

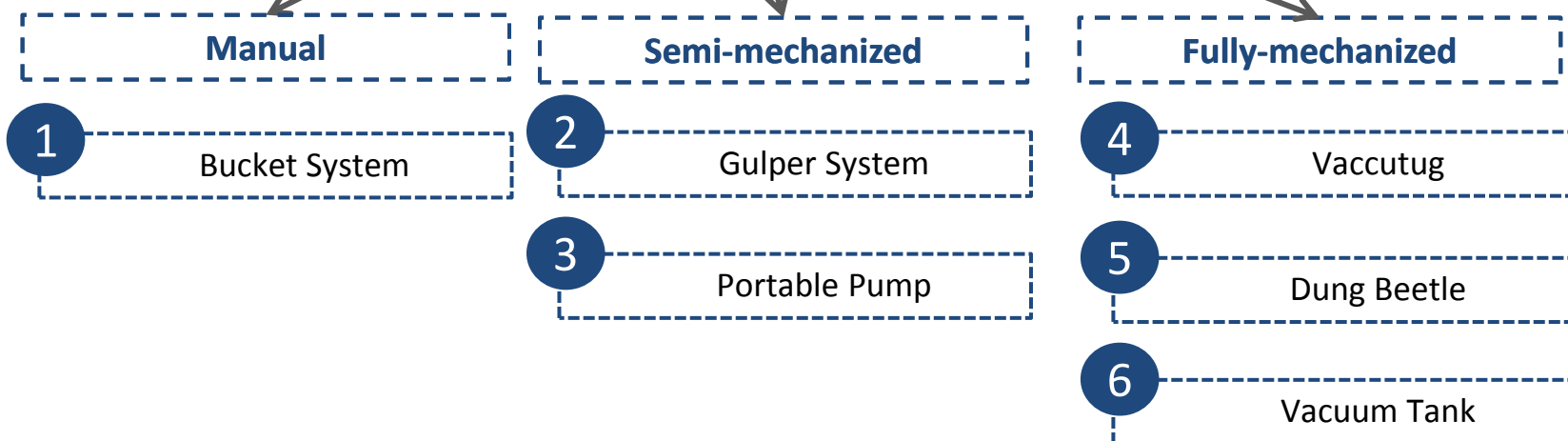
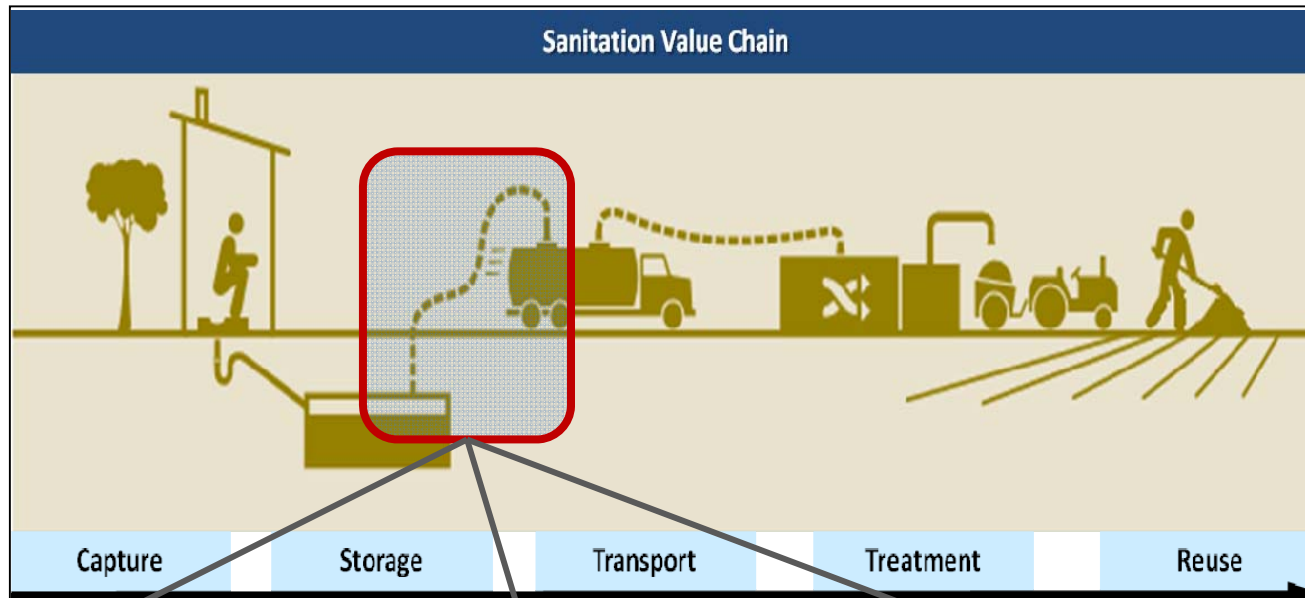
## Program Design

- Awareness campaign
- Capacity building
- Sustainable operating models
- Investment planning
- Handholding
- Development of sanitation services ecosystem



# Excerpts from Catalogue of Solutions





# Desludging/Emptying System – Semi Mechanized

## Gulper System

### Technical Specification/features

**Operating principle** – gulper works on the same concept as water hand pump. Bottom of the pipe is lowered into the pit /tank. The sludge is pumped up and discharged through the discharge spout

### Technical and general description

- Specially designed for removal of sludge from pits
- Operating depth = 2-3 meters
- Weight = 8 to 10 kgs, Size = Length: 2 meters; Dia: 15 to 20 cm
- Pumping rate = 30 litres per minute
- No. of persons required for operations = min. 2 persons

**Minimum Area Requirement for operation (in sqmt) = 1 to 2 sqmt**

### Applicability

- Applicable for settlement area with no accessibility for fully mechanized system
- Suitable for emptying small pits



**Capital and O&M Cost (in BDT)**

**Capital Cost = 30000-35000 BDT**

# Desludging/Emptying System – Fully Mechanized

## Dung beetle

### Technical Specification/features

**Operating principle** – works on the concept of compression of air to create vacuum in the tank. Vacuum system with smaller quantity of sludge collection and storage

### Technical and general description

- Operating depth = 2-3 meters
- Weight = 1100 kgs      Size = 3.9m x 1.4m x 2.1m (approx)
- Tank capacity = 1000 litres    Vacuum pump capacity = 2700 litres/minute
- Type of energy = fuel (diesel)
- Persons required for operations = min. 2 persons

**Minimum width Requirement for operation (in sqmt): 10 to 15 sqmt (Approximately)**

### Applicability

- Applicable for settlement area with limited access (road width in the range of 2-3 meters)
- Suitable for flat terrain
- Suitable for desludging volume of 0.5-2.0 cu.m per pit/trip



### Capital Cost (in BDT)

**Capital Cost = 7,00,000 BDT**

# Desludging/Emptying System – Fully Mechanized

## Vacuum Tank

### Technical Specification/features

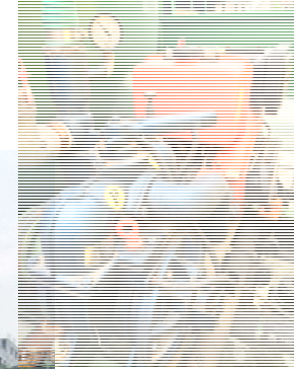
**Operating principle** – works on the concept of compression of air to create vacuum in the tank. Vacuum system with medium to larger quantity of collection and storage of sludge.

### Technical and general description

- Operating depth = upto 5 meters
- Weight = 900 kgs, Size = Length 20 ft; Width 7.4 ft
- Vacuum pump capacity = 4000 litres per minute
- Type of energy = fuel/electricity
- Persons required for operations = min. 2 persons

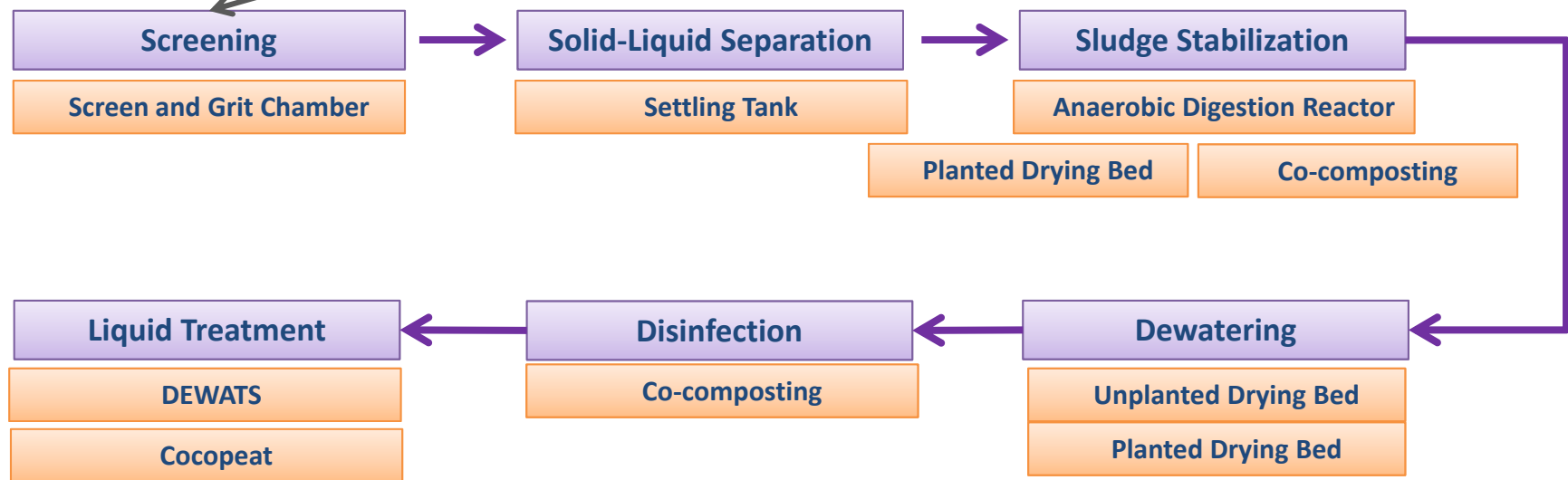
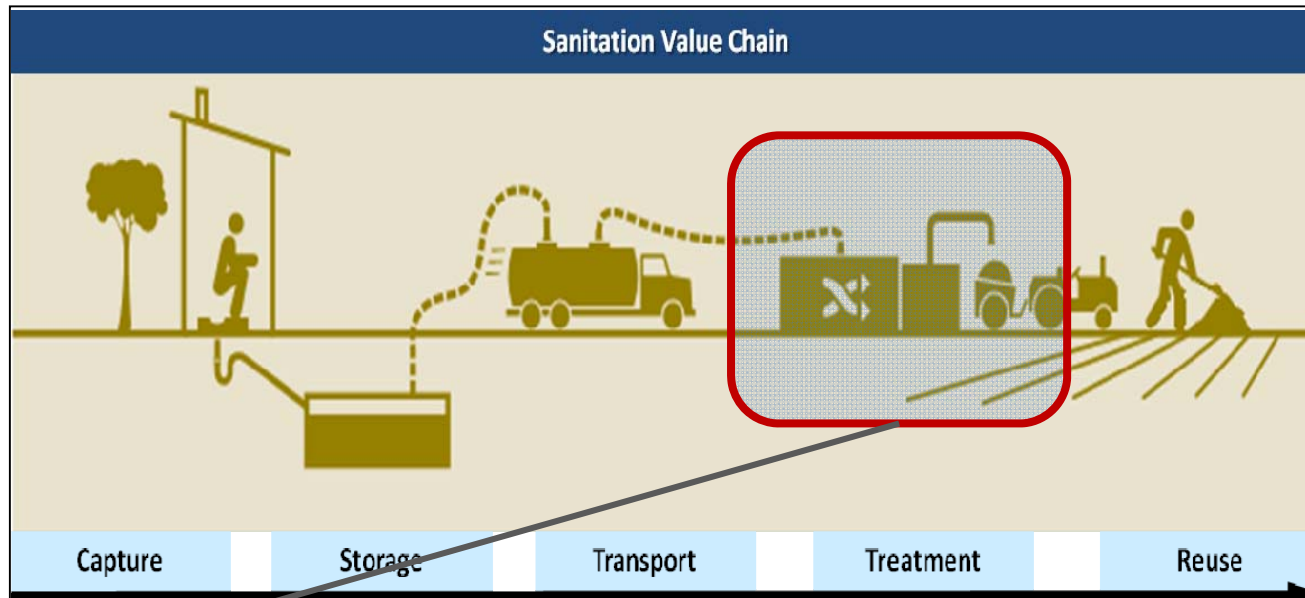
### Applicability

- Applicable for settlement area with access (road width more than 3 meters)
- Suitable for desludging pits and septic tanks
- Access to remote areas through long hose pipes possible



### Capital and O&M Cost (in BDT)

**Capital Cost = 15,00,000 to 20,00,000 BDT**





## Settling tank

### Technical Specification/features

**Operating principle** – Settling tank is a pre-treatment device which ensures maximum settling (gravity settling or forced settling through addition of lime) of solid particles present in the faecal sludge waste for fixed duration of time.

### Technical and general description

- The retention time proposed in the settling tank for 2 to 3 hours
- The solids collected at the bottom is discharged into the sludge treatment and dewatering unit where as the liquid (free water) is discharged in the wastewater treatment facility
- It can also act like equalisation tank to ensure uniform discharge of sludge into the subsequent module

**Area Requirement : 3 sqmt**

### Capital Cost (in BDT)

**Capital Cost = 10000 to 15000 per Cum**



## Anaerobic Digestion Reactor

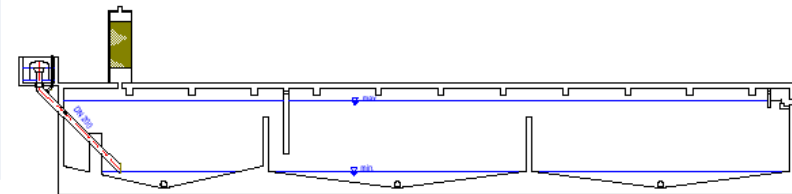
### Technical Specification/features

**Operating principle** – This treatment unit works on the principle of anaerobic digestion where the organic matter is converted more stable organic components.

### Technical and general description

- This process ensure effective sludge digestion and stabilization ((in sewage disposal)
- The solid constituents present in the sludge that precipitate during treatment and are removed for subsequent purification or dewatering (filtration)
- The SRT is maintained for 12-15 days

**Area Requirement (in sqmt): 12-15 sqmt/cu.m**



### Capital Cost (in BDT)

- **Capital Cost = 15000 to 25000 per Cum**



## Planted Drying Beds

### Technical Specification/features

**Operating principle** – PDBs are loaded with layers of sludge that are subsequently dewatered and stabilized through multiple physical and biological mechanisms

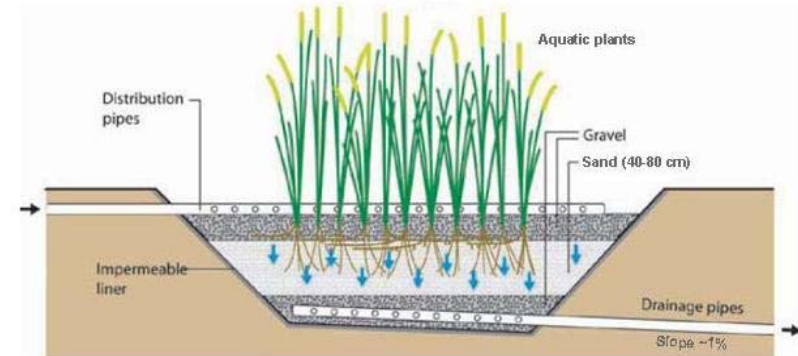
### Technical and general description

- The PDB is loaded with sludge of not more than 20cm per loading with maximum sludge depth of 1.5mtr before desludging. Sludge retention time – 2-3 years depending on sludge loading rate TS
- The filtrate is estimated in the range of 50-70% and evapo-transpiration 30-50% of the total volume
- Emergent microphytes – Reeds and Cattails mostly used
- Permeable bed with graded filter media is used for a depth of 60-75cm with sand layer on top

**Area Requirement (in sqmt): 10 to 70 m<sup>2</sup>/m<sup>3</sup>/day**

### • Applicability

- Applicable where the ULB can allocate large area for construction



### Capital Cost (in BDT)

**Capital Cost = 800 to 2000 BDT per sq. ft**

# Conclusion

- Correlate sanitation approach to urban development process
- Plan for incremental improvement
- Facilitate the creation of an ecosystem of sanitation services



Thank You

