# Decentralised urban sanitation infrastructure

## Planning and Implementing sanitation

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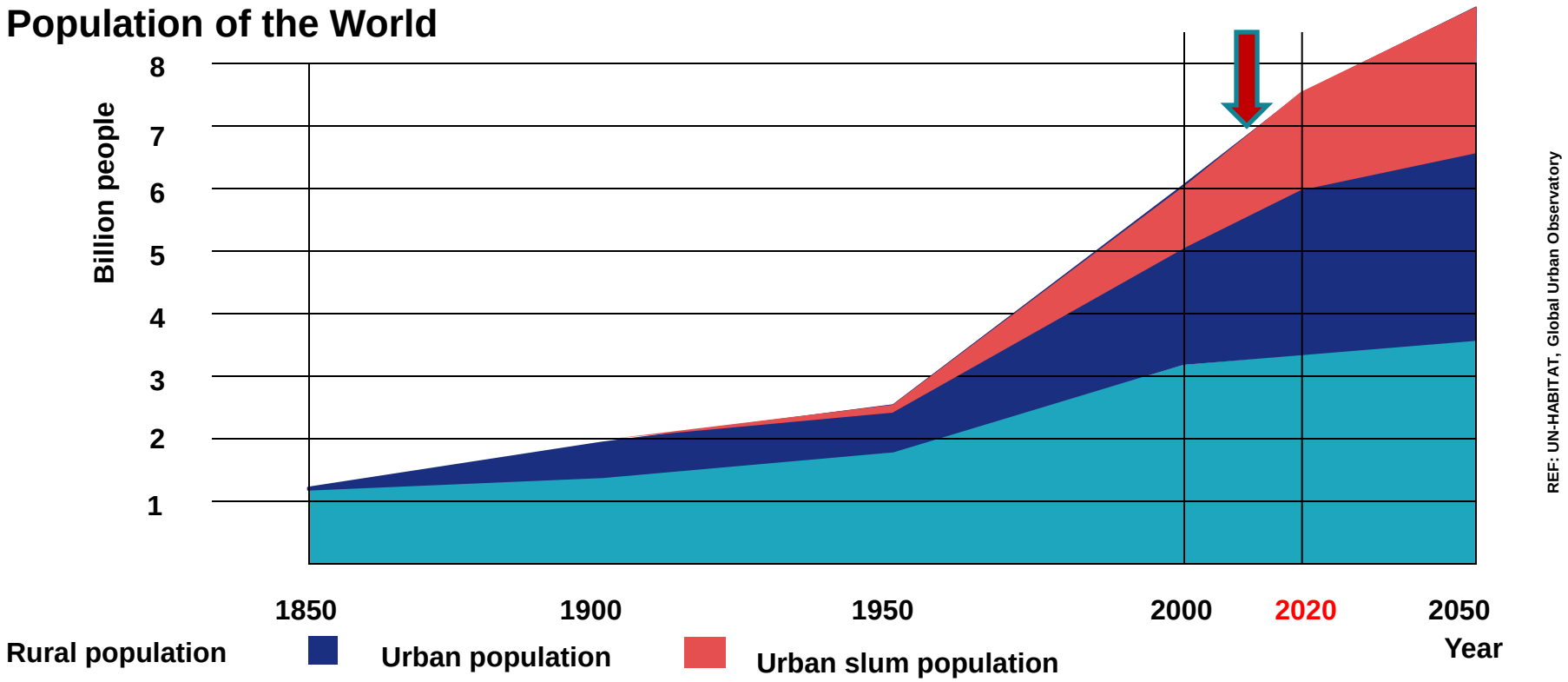
https://srasiaconference2015.wordpress.com/2015/09/30/sustainable-development-goals-sdgs/

**Goal 6: Clean Water and Sanitation**

"Ensure availability and sustainable management of water and sanitation for all."

# Global Urbanization Trend



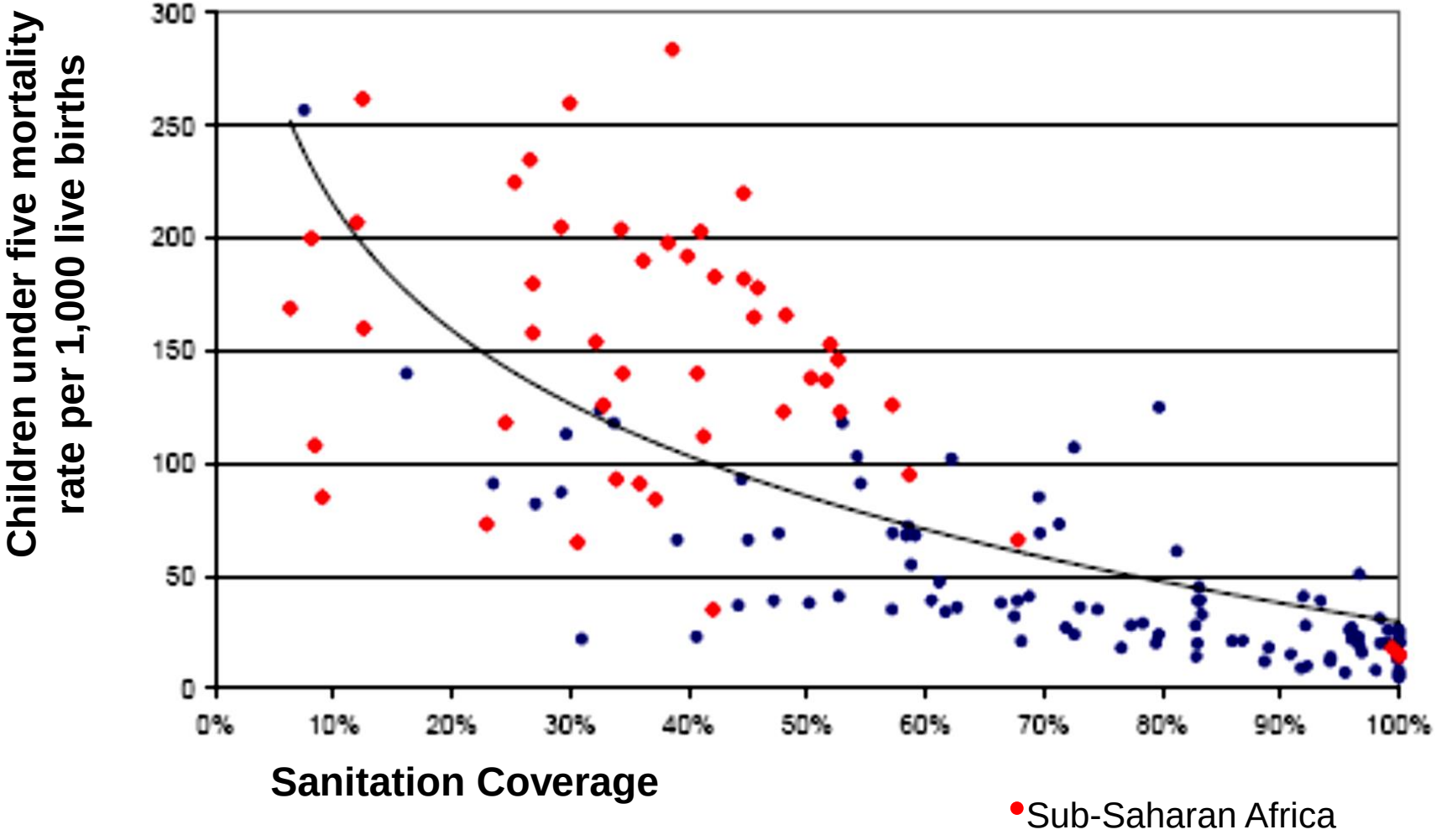

**Between 2010 and 2020, 95% of the global population growth (766 million) will be urban residents (690 million) and of these 92% (632 million) will be added to urban population in developing countries.**

# Goal

- Public health
- Environmental sanitation

  → Coverage is more important for impact

# Sanitation and Health

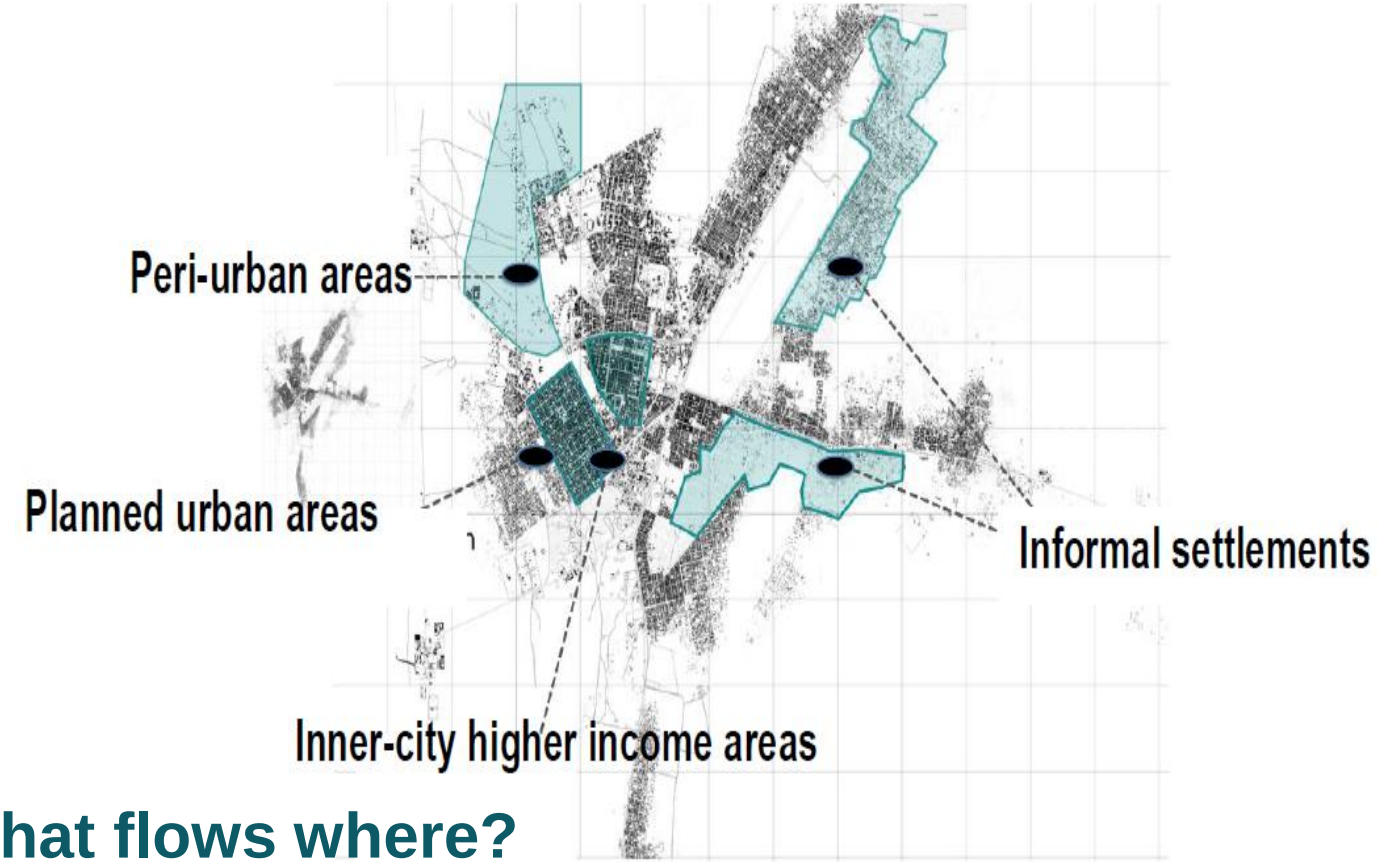



*Source: WHO/UNICEF, 2008*

# Approach

- Identify source of pollution, categorise it and then choose appropriate infrastructure interventions
- Interventions that are - Integrated and progressive – context specific

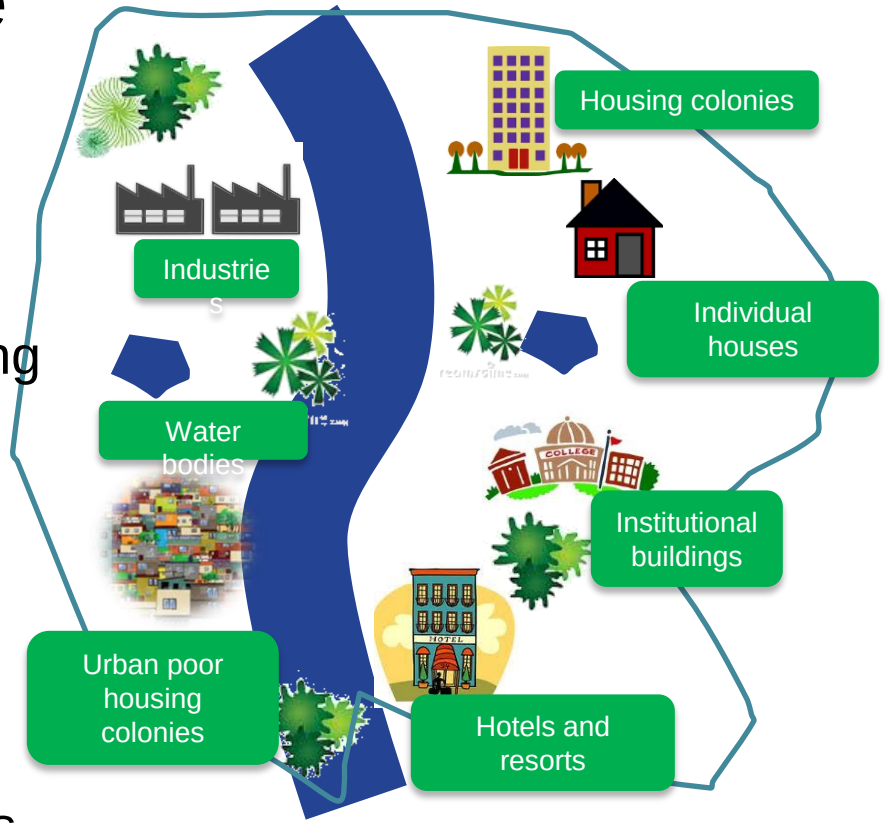
# Methodology



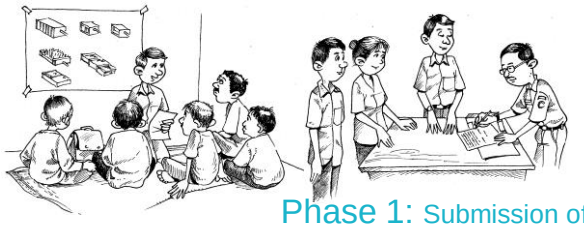

- What flows where?
- How to convert linear flows into circular systems

# Decentralised Sanitation

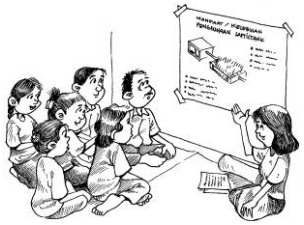
- From communities to the city level
  - Integration of decentralised sanitation approaches complimenting centralised conventional systems ensuring entire population to have adequate access to basic sanitation services
- Sectors
  - Access/on-site solutions
  - Wastewater management
  - Storm water/polluted waterways management
  - Solid waste management

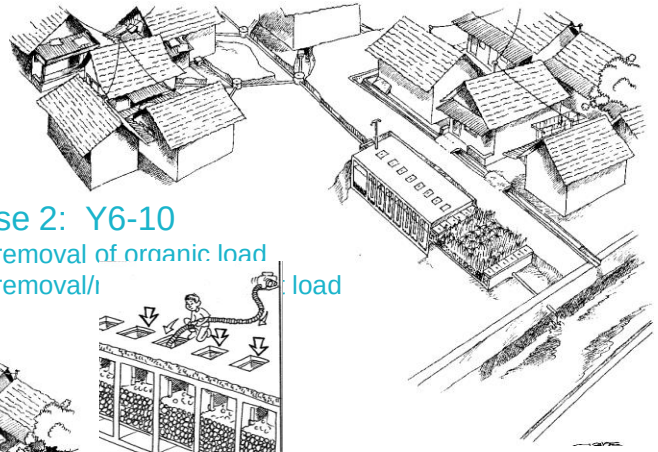


# Progressive implementation

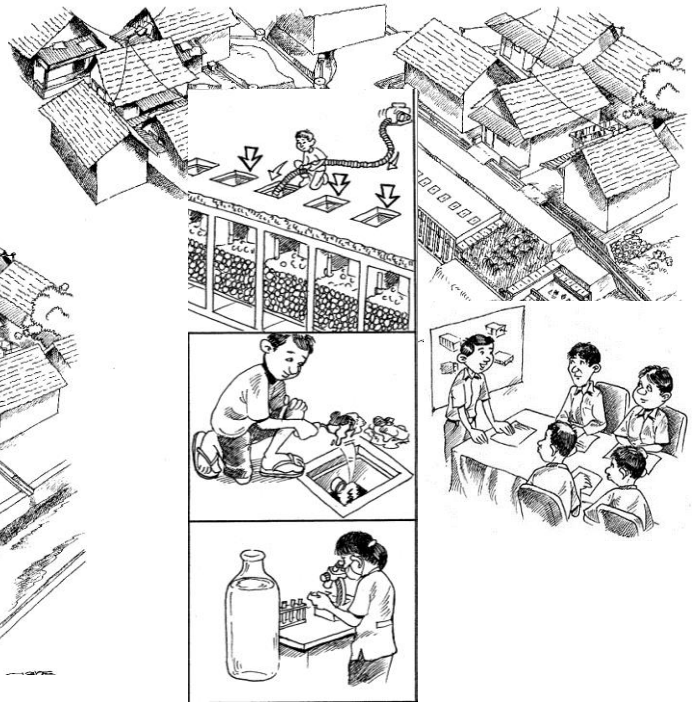


Phase 1: Submission of full design

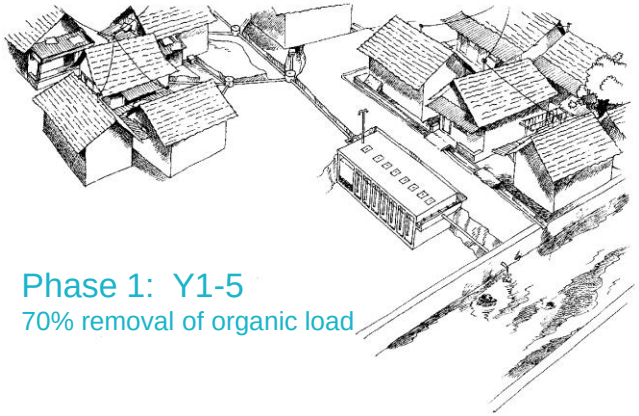


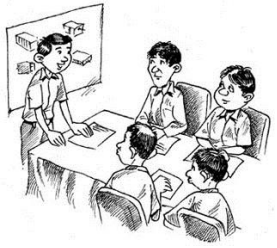


Phase 2: Y6-10
90% removal of organic load
50% removal/ load



Phase 3: Y 11+
100% removal of organic load
100% removal/reuse of nutrient load





Phase 1: Y1-5
70% removal of organic load

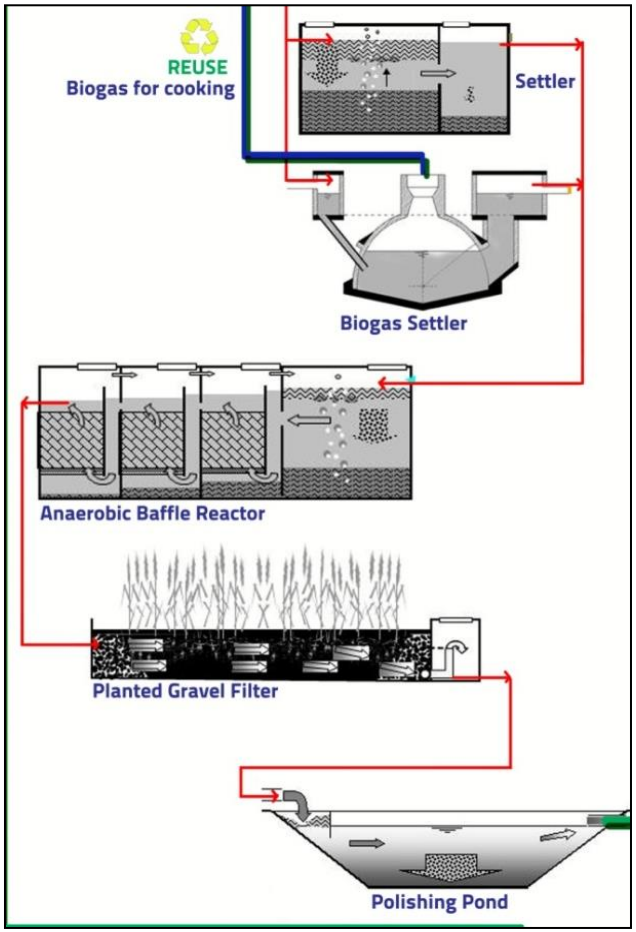
# DEWATS

## Technical Specification/features

**Operating principle** –DEWATS applications are based on the principle of low-maintenance without technical energy inputs for treatment of organic wastewater from different sources

**Technical and general description**
DEWATS applications are based on four basic technical treatment modules which are combined according to demand:
- Primary treatment: sedimentation and floatation
- Secondary anaerobic treatment in fixed-bed reactors: baffled upstream reactors or anaerobic filters
- Tertiary aerobic treatment in sub-surface flow filters
- Tertiary aerobic treatment in polishing pond

**Area Requirement (in sqmt): 5 to 8 sq.m per Cum**




## Advantages

- Gravity based system. Electrical input is not required for treatment
- Treatment efficiency is in the range of 80-95%
- Significant reduction in

## Disadvantages

- The cost for construction may be high depending on ground condition

## Applicability

- The treatment modules are very effective for treatment of wastewater with high organic concentration

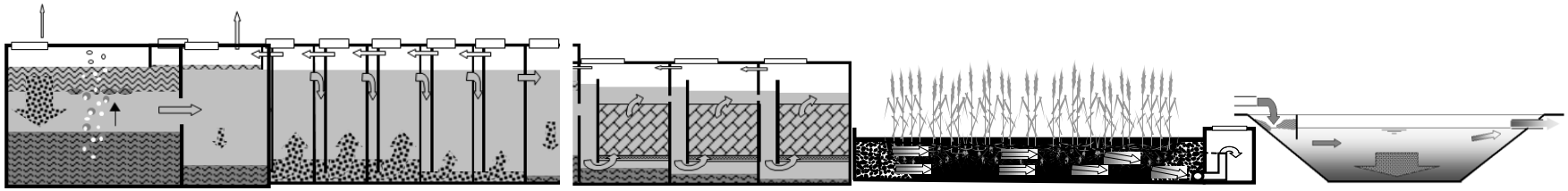
## Capital and O&M Cost

- **Capital Cost = 40000 to 60000 per Cum**
- **O&M Cost = 3 to 5% of CAPEX**

# DEWATS

- Treated wastewater reused for growing vegetables

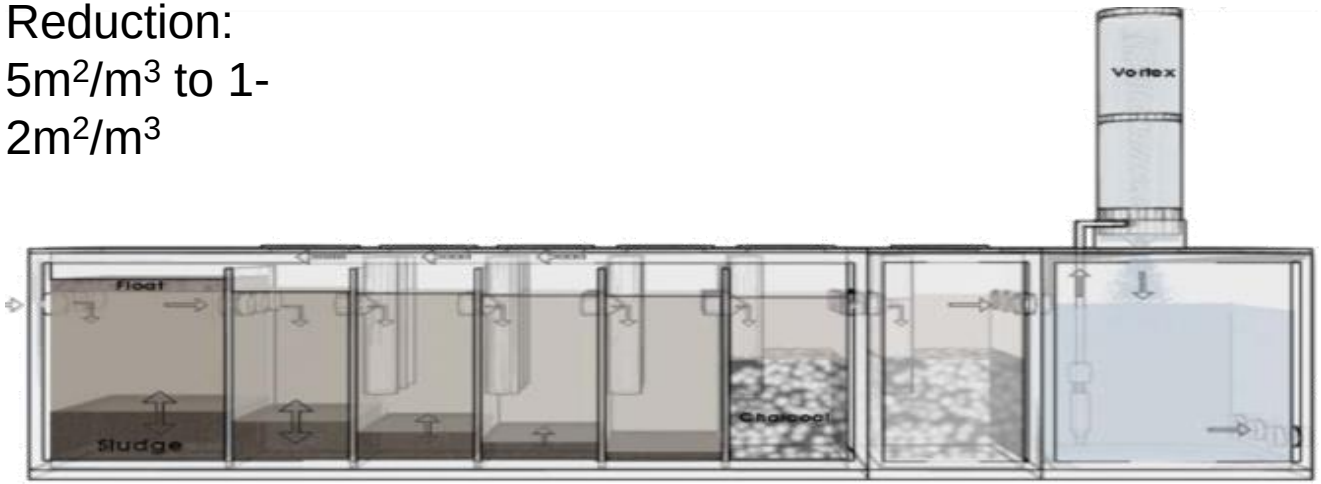
# DEWATS with VORTEX



Settler ABR AF PGF Polishing Pond

**INNOVATION**

Foot Print Reduction: 5$m^2/m^3$ to 1-2$m^2/m^3$




Settler ABR AF VORTEX

# DEWATS with VORTEX

## General Description

- The Vortex is a highly efficient means of aerating water
- The process is similar to the way whirlpools formed in rivers are known to suck air into the water. In Vortex, air is brought in it via a pump - thus achieving oxygenation of the water.
- The device consists of a cylinder, preferably transparent, resting in a funnel shaped base.
- Water is pumped in tangential to the cylinder's surface at a speed sufficient to create the whirlpool. The treated WW is falling continuously through the outlet at the centre of the bottom funnel.
- 'Vortex' reduces the space required by 70%.

## Technical Specification/features

**Technical and general description**

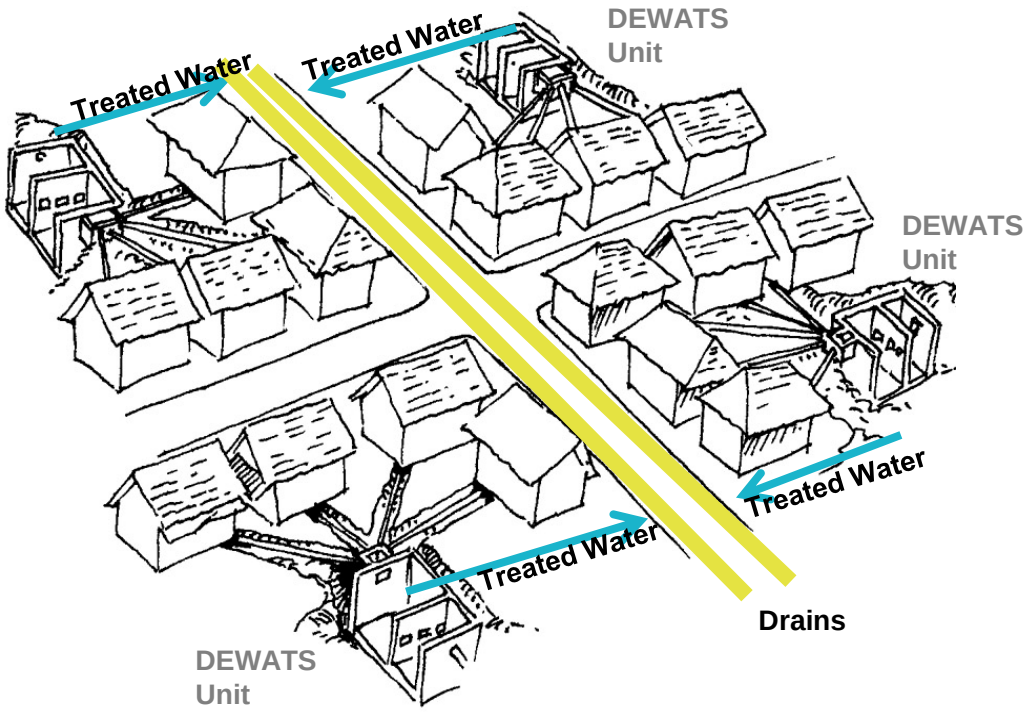
- 3.5 Cycles are required to reach the optimum oxygenation
- There are currently three models available in the market
  - **35 KLD: Pump required – 0.5 HP**
  - **250 KLD: Pump required – 1 HP**
  - **400 KLD: Pump required – 3 HP**
- **O&M Requirements:** Regular cleaning of cylinder is required to reduce the algae formation
- **Area Requirement (in sqmt): 1 -2 $m^2/m^3$**

# VORTEX Case Study – VBHC, Bengaluru

**Key Facts:**

- Type of establishment: Apartments
- Year of establishment: 2009
- Capacity of treatment plant (DEWATS-Vortex): **730 KLD**
- Daily power consumption at full load (20 hrs): **350 kwh**
- 13 sqm required for Vortex against 2500 sqm **required for PGF**
- **Vortex Cost: 16 Lacs** (Equivalent PGF Cost: 50-80 Lacs)
- **O&M Cost (Vortex):** 14000/month

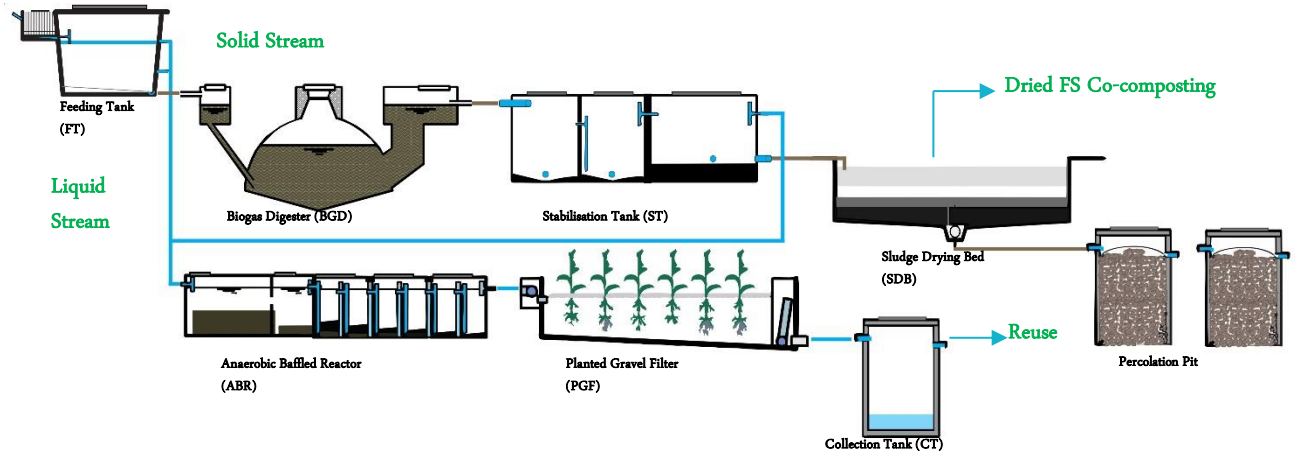
# Community Based Sanitation




- Integrating technology in a community life context
  - For small clusters
  - Local transport and treatment
  - Treated ww safe for reuse/disposal

# Faecal Sludge Treatment Plant

- Combination of anaerobic and aerobic modules
- Solid-Liquid separation followed by stabilization and drying
- Dried sludge co-composted with municipal solid waste
- Liquid stream treated in baffle chambers, followed by anaerobic filter and planted gravel filter

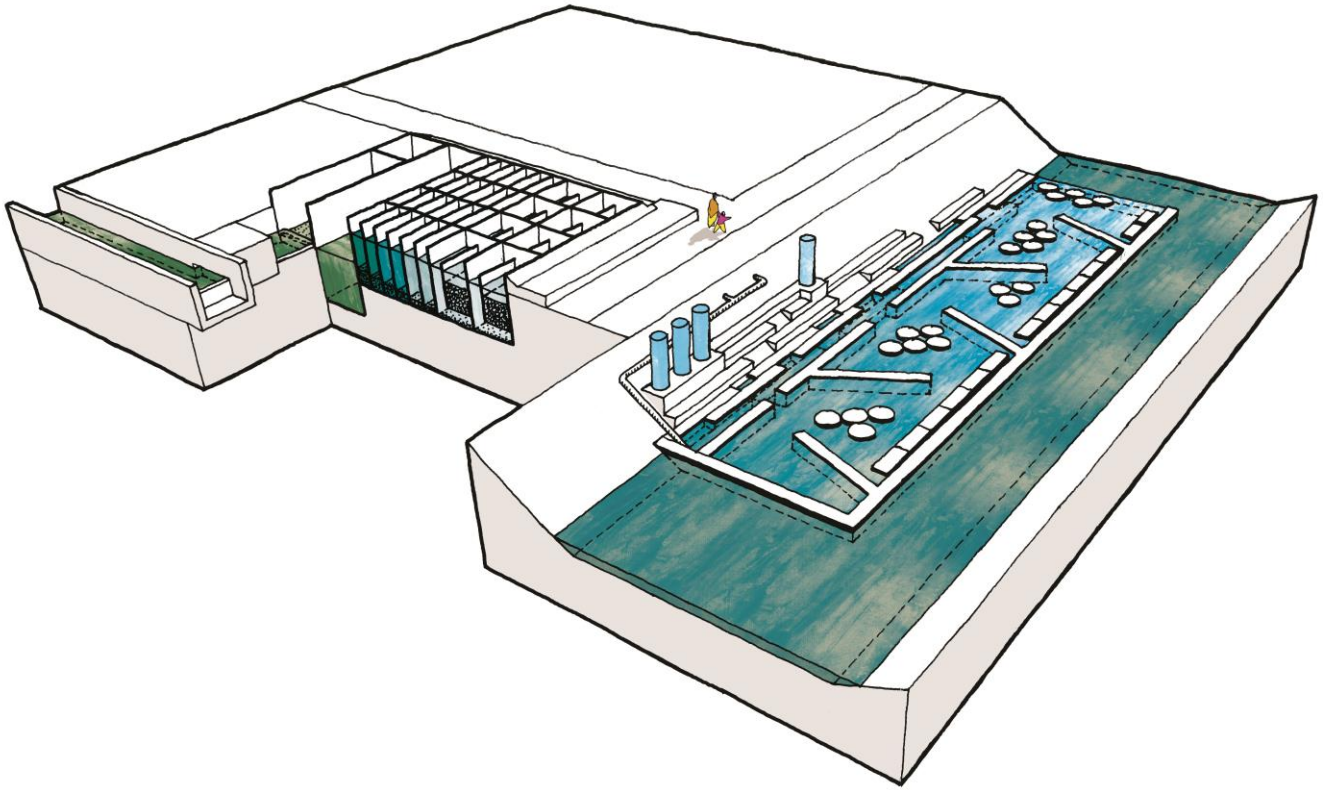

## Capital and O&M Cost

- **Capital Cost = Approx. 1 Cr for town of 20,000 population**
- **O&M Cost = Rs. 300 per HH/year**

# Treatment of Waterways

- Primary treatment – upstream, at source
- Secondary treatment – cluster level
- Tertiary – banks of waterway, in the stream

# Treatment of Waterways



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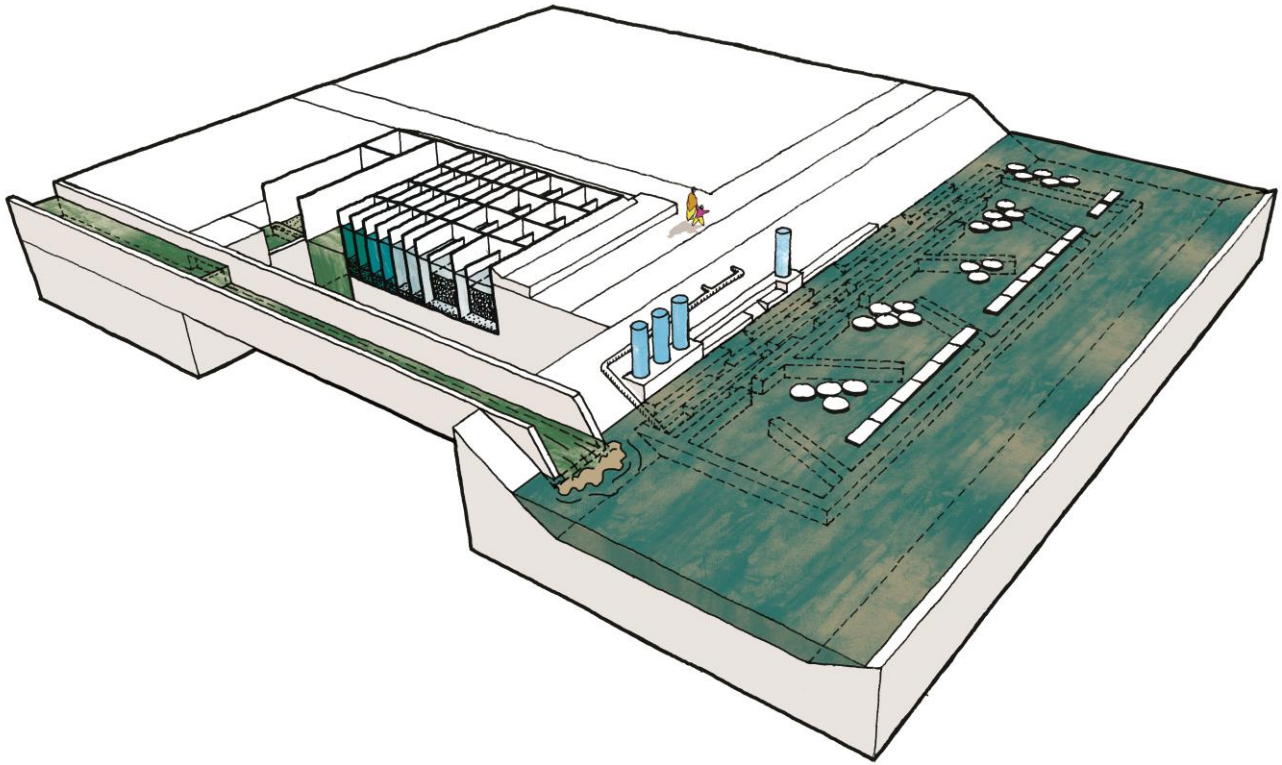

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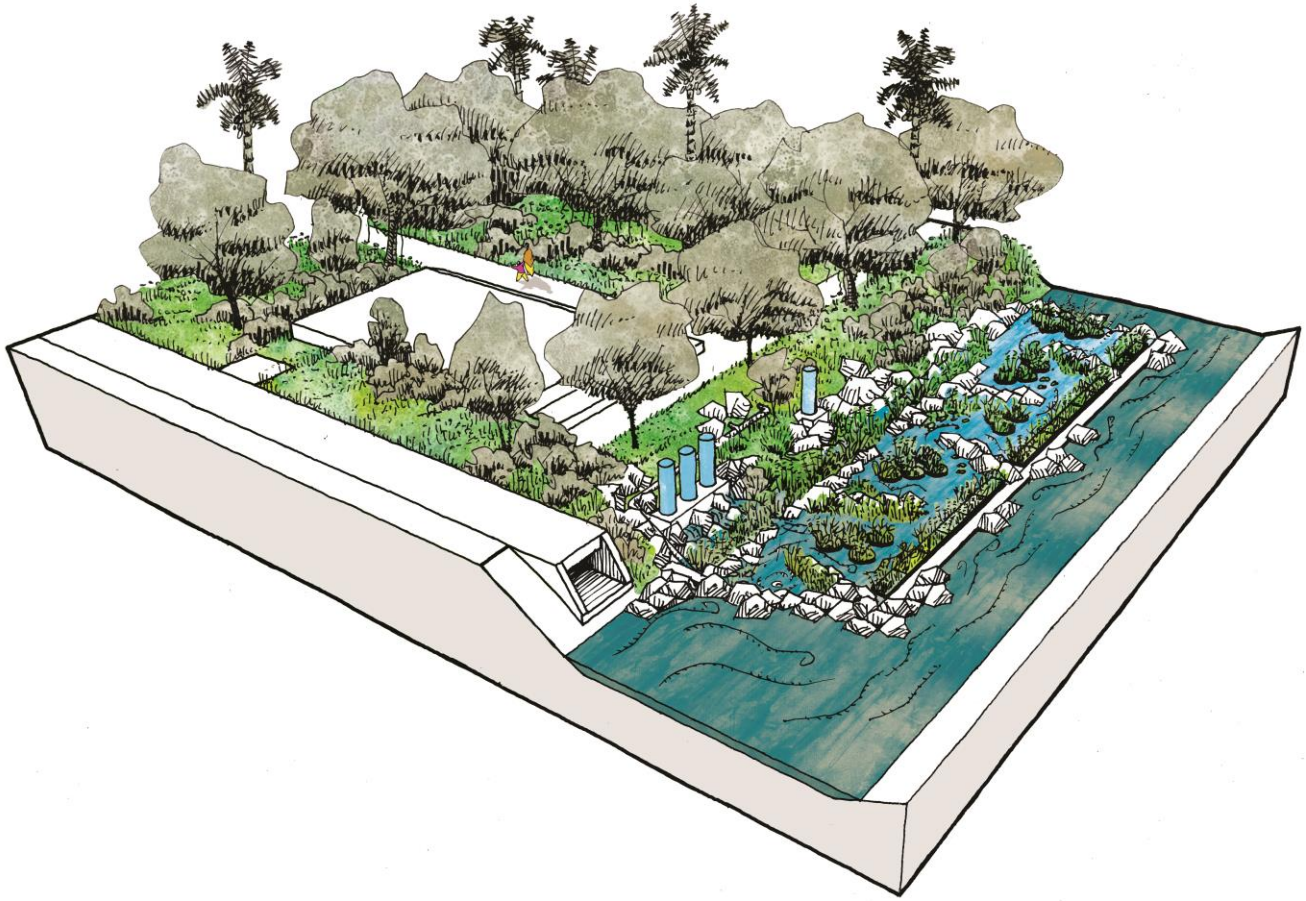


Key Plan


Key Plan

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# Thank you