

A group of seven children are sitting on the ground in a slum, playing with colorful plastic toys. The background shows a makeshift building made of corrugated metal and wood. The children are dressed in simple, colorful clothing. The scene is dimly lit, suggesting an indoor or shaded outdoor setting.

Alternative Sanitation Approaches

Case Studies : **Bangladesh**

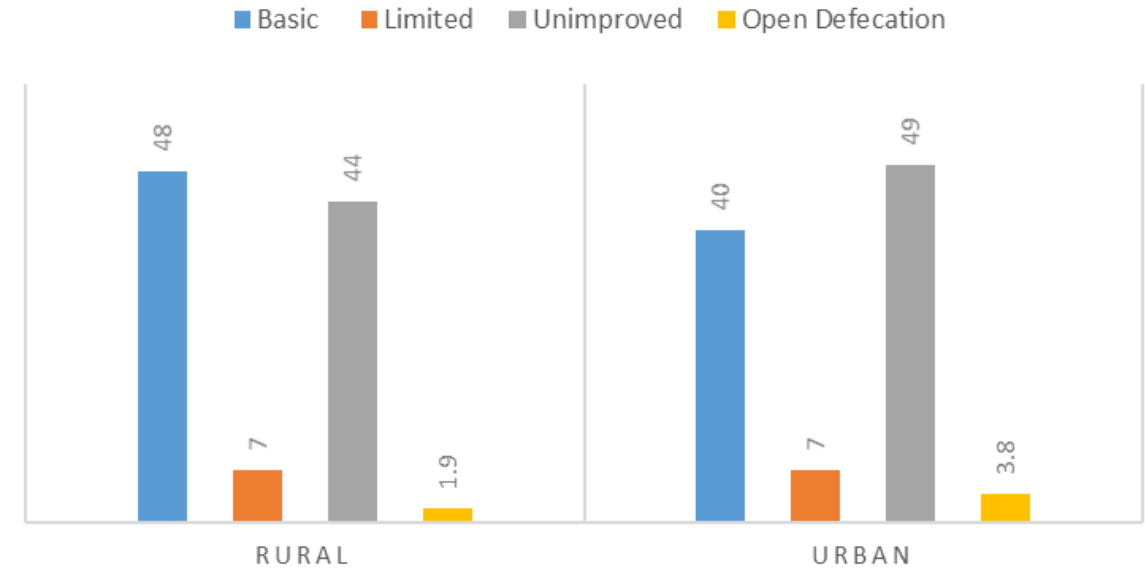
18.10.2024

Sanitation Status in Bangladesh

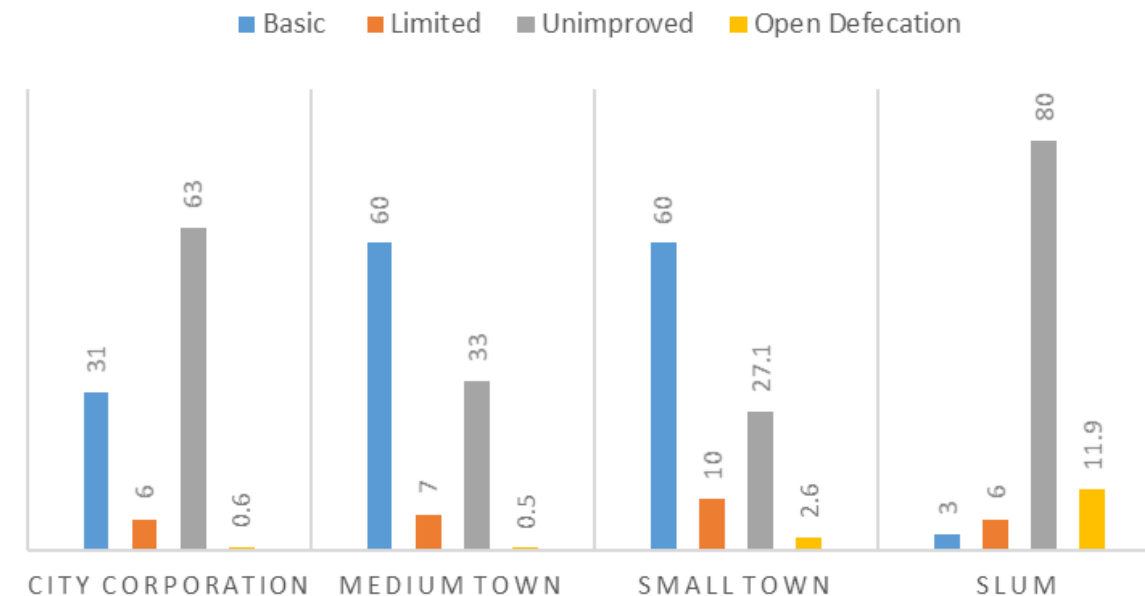
Three Key Issues to ensure Safely Managed Sanitation and Environmental Protection

- 71% HHs toilets directly/indirectly (90% in Slums) discharges to open drains/water bodies.
- Existing sanitation system is not being able to cope up with increased population density, occupancy (vertical extension, design and construction inadequacy, limited alternative sanitation service provision)
- Septic tanks-soakaways mostly do not work in big cities because of compact soil with low infiltration capacity

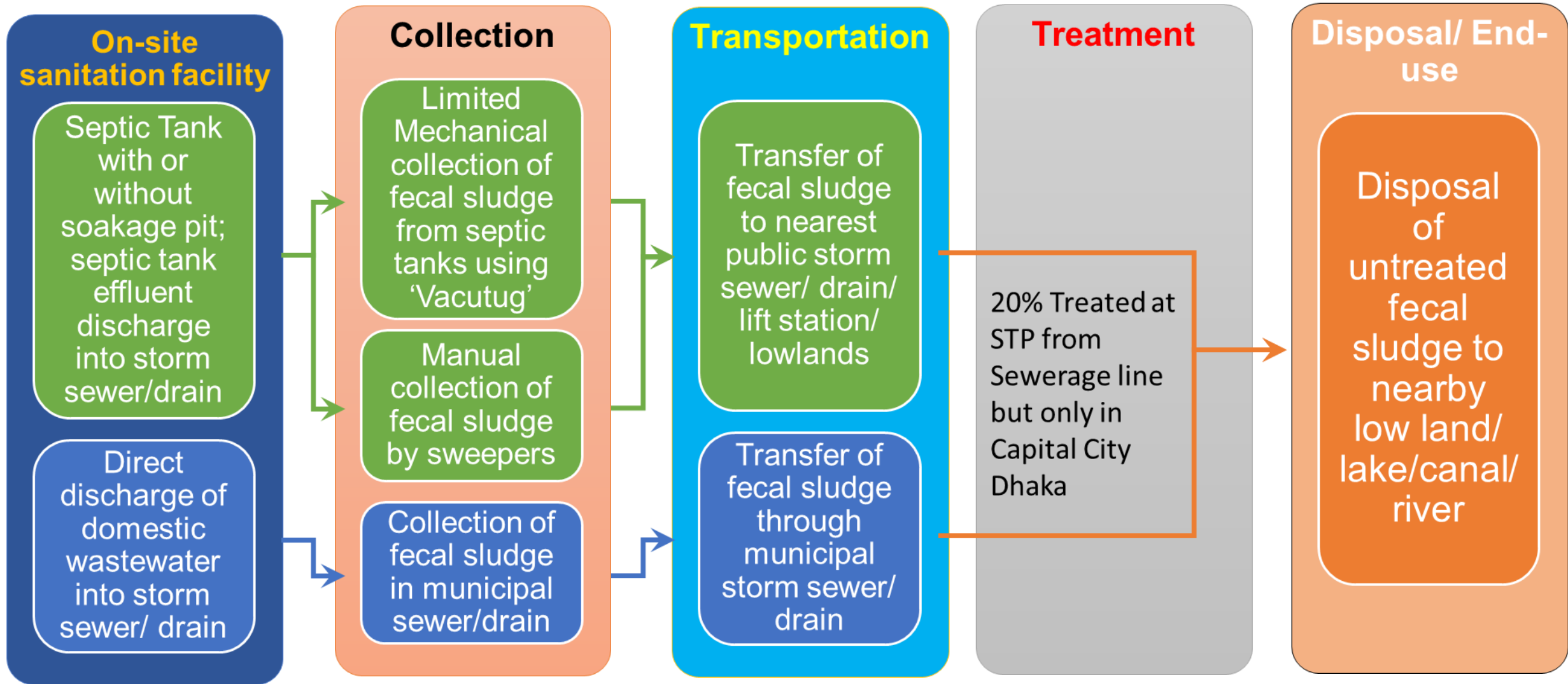
SANITATION ACCESS



SANITATION ACCESS TO URBAN SEGMENT



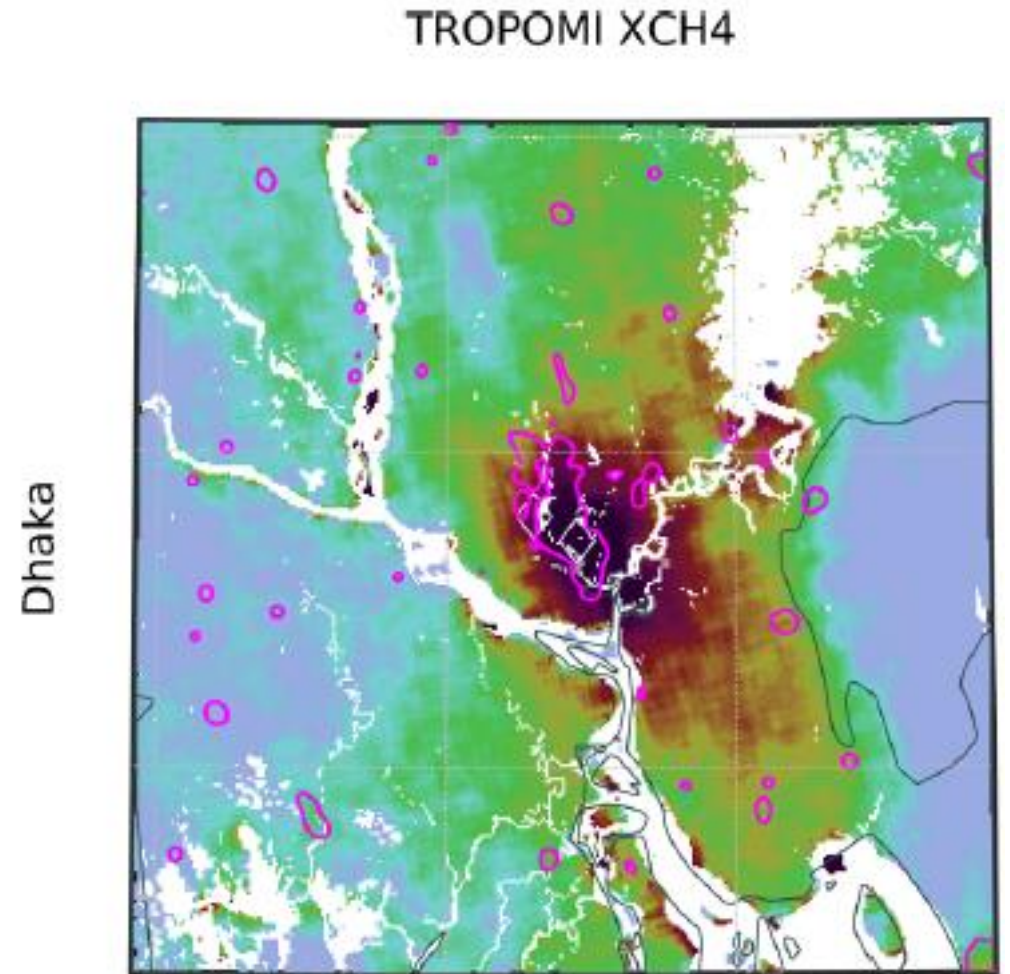
Summary of Sanitation Service Chain Situation in Bangladesh



Unsafe sanitation impact on Climate *(Beside of Public Health)*

- Over Dhaka, there is **methane formation** in the environment that is much larger than the estimates in current inventories.
- A result of releases of **untreated wastewater**
- Wastewater treatment could lead to a **significant reduction in greenhouse gas emissions** from urban areas

Source: Benjamin de Foy et al 2023 Environ. Res. Lett.



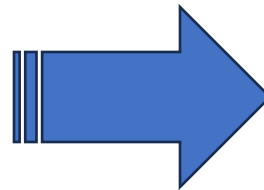
Country Response



Change for Inclusivity and Sustainability

TRADITIONAL APPROACH

1. Master planning/ investment only for **centralized sewer systems**
2. **On-site not considered**
3. Financed by central Govt/loans
4. **Wealthy/business districts prioritized**
5. Limited coverage
6. O&M challenges
7. **Resource recovery not considered**
8. No performance management



SAFE, SUSTAINABLE INCLUSIVE SANITATION SERVICES

1. **Equitable sanitation services benefit everyone**
2. Fecal waste is safely managed along the **entire sanitation service chain**
3. Systems enable **resource recovery** and re-use
4. **Diverse and innovative technologies**-sewered and/or non-sewered-are deployed
5. Comprehensive long-term planning fosters innovation, pro-poor financing, improved performance
6. Demonstration of **strong political will**, accountability and technical and managerial **leadership** in the sector

INTRODUCE MULTIPLE SANITATION SCHEMES

1	Scheme	Centralize Sewerage Treatment System Connected with Pipe Network
2	Scheme	Centralize Sewerage Treatment System Connected with Decentralized Treatment Units
3	Scheme	Centralize Sewerage Treatment System with Schedule Deluging Scheme

TODAY'S DISCUSSION FOCUS on 4 & 5

4	Scheme	At source sanitation transformative technology
5	Scheme	Special arrangement for Low Income Community



Demonstration of Sanitation Transformative Technology :

(1) Community based wastewater treatment and reuse for Household toilet flushing – *Asrayan slum Rajshahi city*

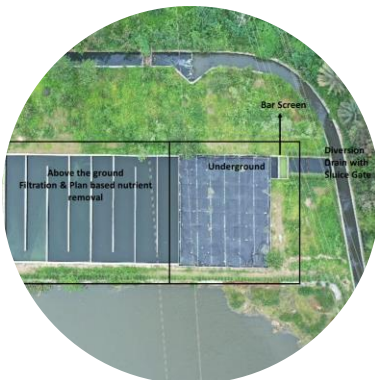
(2) Nature Based Solution – Protect city waterbody from fecal contamination from low-income communities – *Karail slum Dhaka*

(3) Wastewater treatment and Reuse for City Greening Zones – *Dhaka Gulshan Lake*

(4) Cluster Sewer with Wastewater treatment - *Khulna City Slum City*



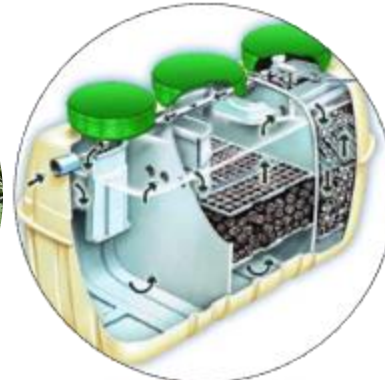
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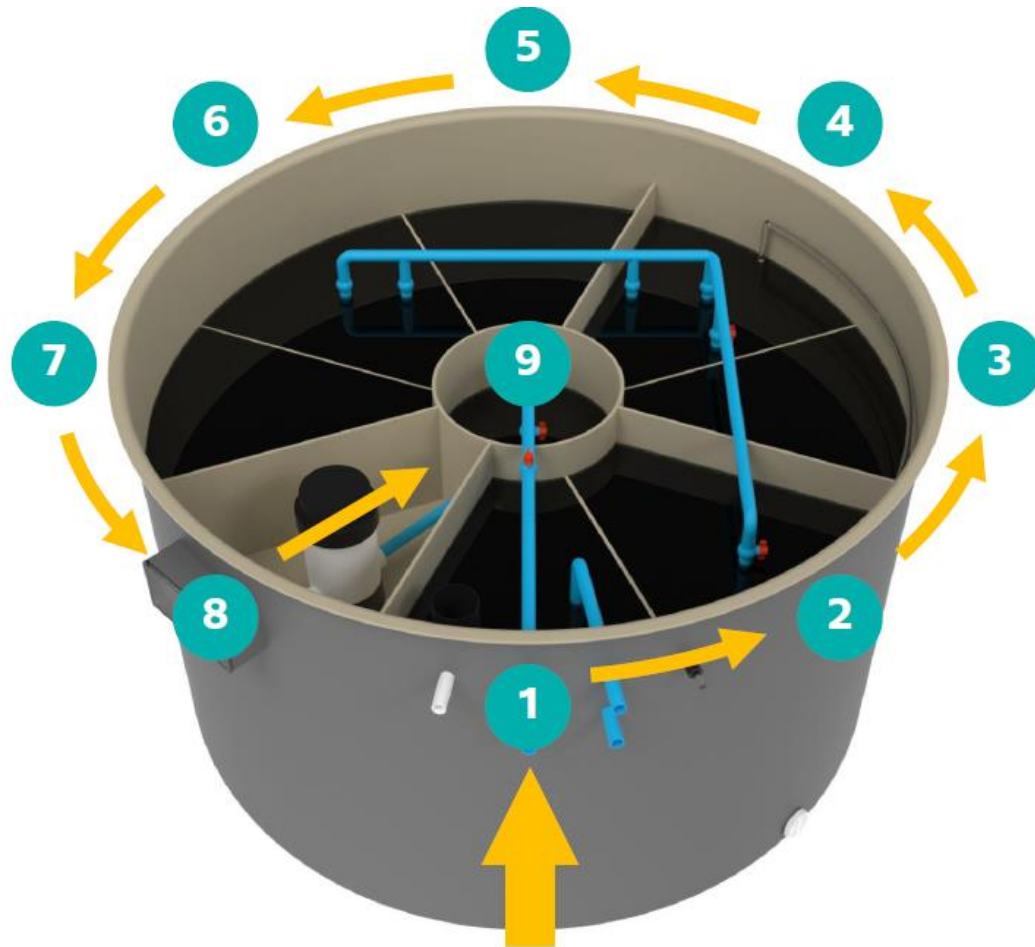


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4

(1) Community based wastewater treatment and reuse for Household toilet flushing – Asrayan slum Rajshahi city



Aquonic Treatment : 9 Different Chambers

1. Up-flow filter chamber
2. 1st Sedimentation chamber
3. Anaerobic chamber
4. Aerobic chamber
5. Anoxic chamber
6. Recirculation chamber
7. 2nd Sedimentation chamber
8. Chlorine dosing
9. Treated water chamber

(1) 200 LIC Household Toilet
Connected with Treatment Unit

(2) Treat 4000 Liter Blackwater Per Day
and Supply to 200 Household Toilet for
Toilet use

(3) OPEX = 200 USD/Month

(4) CAPX = 50,000 USD

(5) Every Household pay 2 USD/Month
to get Treated Water for Toilet Use

Triggering Points for Reuseable
Water

(1) No Running Water Available

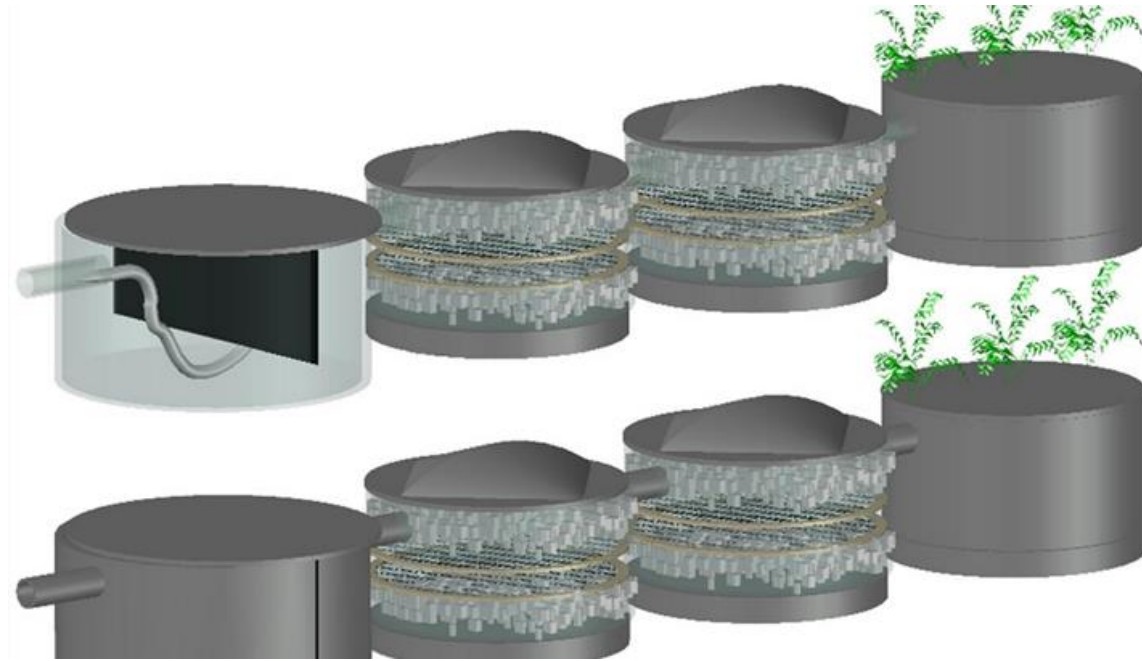
(2) Drought Prone Area

(3) Permanent Slum Dwellers

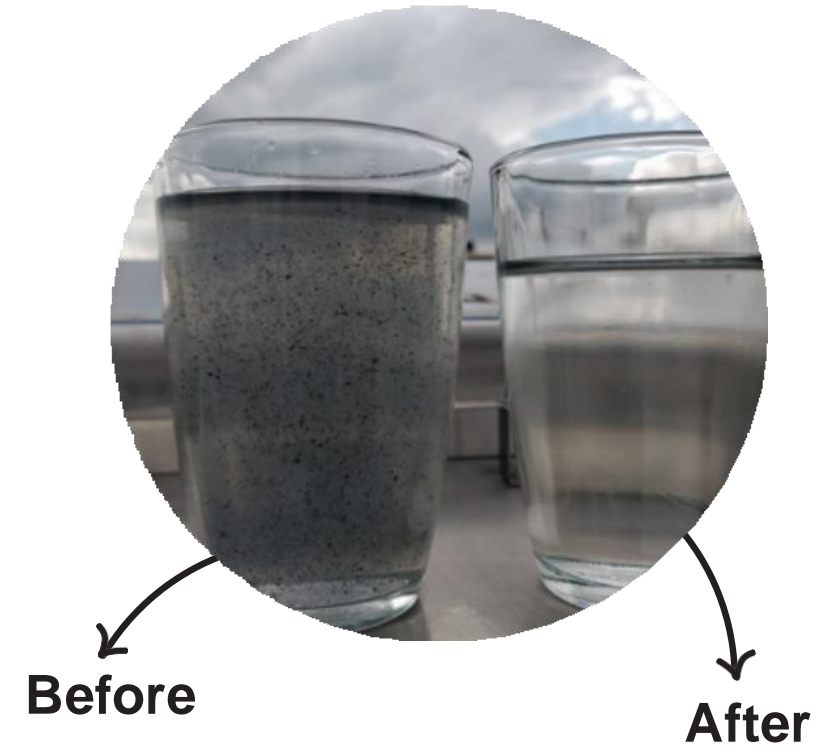


(2) Nature Based Solution – Protect city waterbody from fecal contamination from low-income communities – Karail slum Dhaka

Derived from Nature Based Solutions (NBS) principles, **Neervana** is a low-cost passive water treatment system for existing water body restoration like Lakes, Ponds, and Storm water drains and VILLAGES



- Solar energy and wastewater are the raw materials for Neervana systems
- System has Zero/Minimal electricity requirement and few mechanical components. Combination of anaerobic baffled reactor and algal bioremediation followed by wetland. Maintenance requirement only once in 5 years
- Resource recovery can be planned in form of protein rich algae and fish



- **800,000** people live at Karail Slum
- **23,000** kg fecal matter/per day discharged into lakes/khals (water bodies)/low-lying areas

- Implemented NBS connected **1000** Households with **50,000** Litres/day treatment capacity
- CAPX Around : **25,000** USD
- OPEX Around : **50** USD/Month



(3) Wastewater treatment and Reuse for City Greening Zones – Dhaka Gulshan Lake

Current challenges situation of Gulshan Lake

- Daily **untreated domestic wastewater** come from the military area and residence area near the lake approximately 4,000 m³/day discharged to the lake.
- Directly discharged **blackwater (Feces)** to the lake.

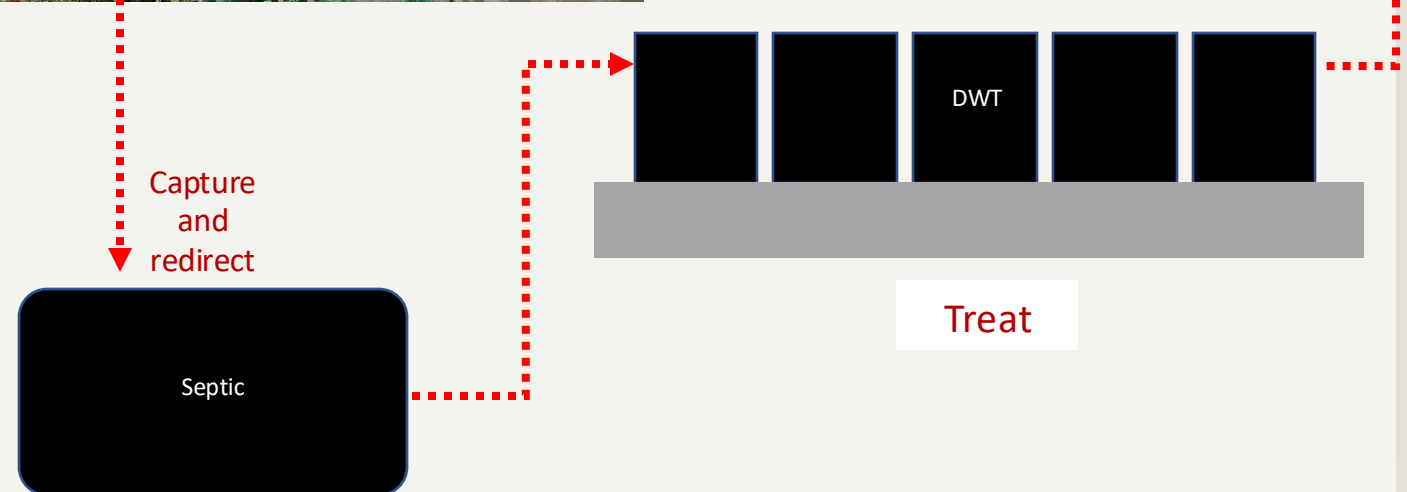
99% of Household directly discharge blackwater to lake



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Effect on lake

Degradation of water quality in the lake

Dissolved oxygen (DO) depletion (DO = 0 mg/L)

Odor problems

Reduction in depth of lake

The Lake became a big septic tank

Contaminated with pathogen in the lake (*E. coli*, *Feecal coliform*, *Total coliform*).

Nutrients accumulation (Nitrogen and Phosphorus)



DWT (Aquonic) System



(1) The estimated capital cost for this intervention is around USD 130,000, with a monthly operation and maintenance (O&M) cost of USD 200, it is estimated to cost 3.89USD per cubic meter of treated water.

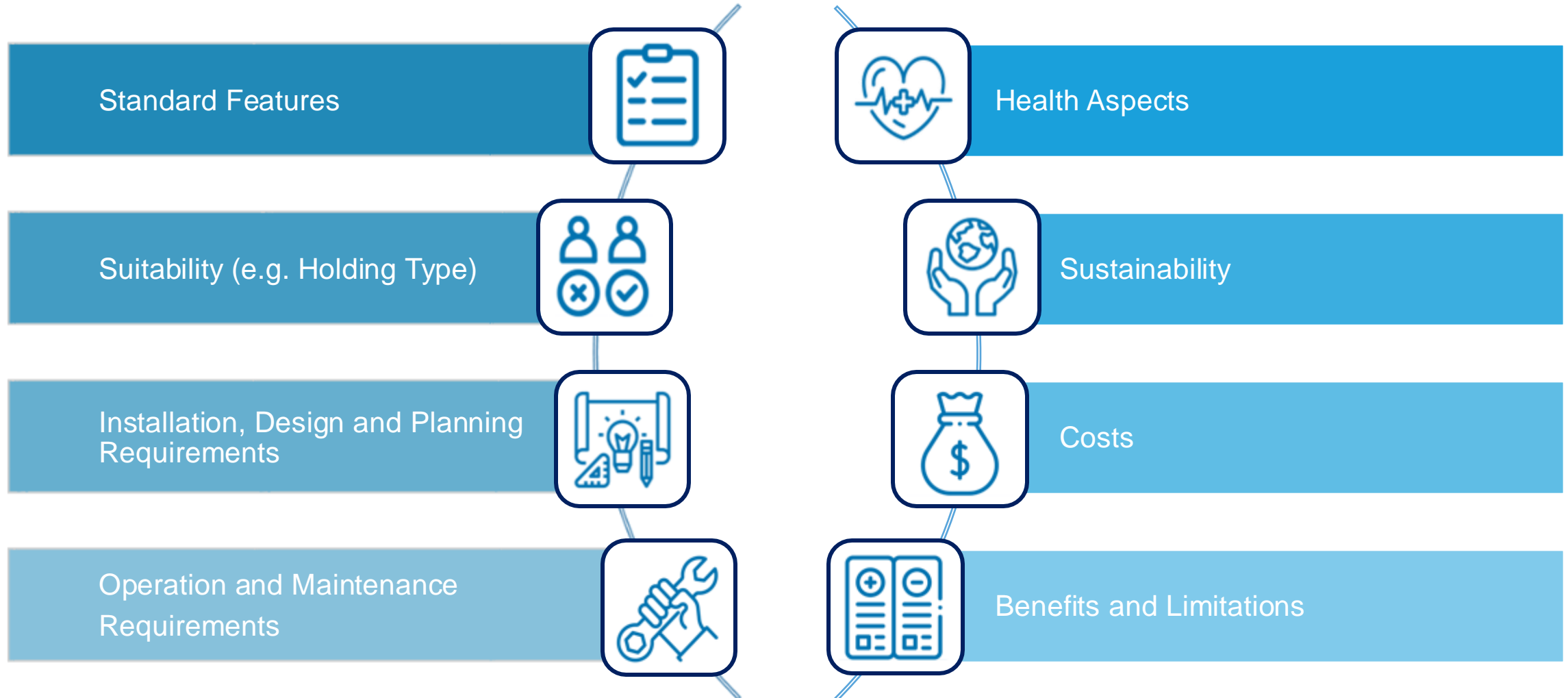
(2) Plant Capacity : 25 m³/day

(3) Treated Water Reuse – City Corporation Greening Zone and Road Cleaning



Sanitation Transformative Technology

Evaluation Criteria



Next steps for scaling

in Bangladesh:

- Leverage existing partnerships and seek new collaborations with funding bodies (ADB, EIB) to support scaling efforts with Bangladesh but outside of Dhaka.
- Map dumping points for pit emptiers around the lake, prioritize installation of new treatment sites in those locations
- Identify and target regions with similar water pollution challenges where the urban wastewater model can be effectively replicated.

in new countries:

- Understand how supportive local governments are of innovative wastewater treatment solutions
- Identification of the main water pollution issues in country/region that NBS solutions are relevant for - Technology transfer and design support for identified use cases
- Define opportunities and challenges foreseen in scaling NBS projects.

Thanks

*Contribute to ensure
healthy and clean-living
environment specially for
child and women*

Acknowledgment

*Gates Foundation and
UNICEF*

