



Scaling-up urban wastewater treatment through nature-based principles

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Innovative nature-based solutions are transforming wastewater treatment in informal settlements – improving the health of children, their communities and their environment.

Worldwide, more than one billion people live in informal settlements with poor sanitation and an unhygienic or polluted environment.¹ This puts the health of children and families at risk of life-threatening diseases through contamination of drinking water, with long term consequences for their health, education and well-being.

Informal settlements are home to almost 25 per cent of the urban population globally.² All have the potential to benefit from innovative Nature-based Solutions (NbS) for managing wastewater.

SUPPORTING RAPID SCALE-UP

To rapidly accelerate the scale of access to sanitation, the UNICEF Sustainable WASH Innovation Hub is exploring the treatment of wastewater using powerful but low-cost natural processes including innovative filtration, solar power and constructed wetlands to help remove solids and pollutants.

NbS in informal settlements can be a cost-effective, sustainable, climate resilient way to treat urban wastewater in densely populated settings like Dhaka, Bangladesh. This approach holds immense potential for adaptation and scale-up in urban areas across the globe. Once expanded, it could benefit tens of millions of children and families worldwide by improving access to safe water and sanitation, enhancing environmental resilience, and supporting children and their communities to thrive and live healthier lives.

UNICEF is working with governments and partners to accelerate scale-up across multiple countries and contexts through technical assistance, stakeholder collaboration and knowledge sharing. This could offer decision makers an alternative to centralized sewer systems, making sanitation more affordable and accessible. In contrast to traditional urban sanitation interventions that rely on the expansion of centralized sewer infrastructure, NbS is suitable for dense unplanned settlements and can reach low-income communities through localized treatment options.

NBS PILOT IN BANGLADESH

In Bangladesh, UNICEF, in collaboration with the government and the Bill & Melinda Gates Foundation, has developed and implemented a NbS treatment package to address urban wastewater and human waste flowing into Gulshan Lake in the capital Dhaka.

The innovative solution aims to transform lives by turning wastewater into safer water, protecting children and families who live, play and learn near the lake. The process has four key steps:

1. Solid waste from 1,000 households living in informal settlements is filtered.
2. Wastewater is broken down using an anaerobic-anoxic biological system using coconut fibers, cow dung and bacteria.
3. The water is filtered through gravel and activated carbon, while green plants further purify the water and release oxygen.
4. Treated water is stored for additional solar disinfection before being reused or safely discharged.

The scaled use of this NbS approach can significantly improve the quality of the water going into the lake.

1 UN Habitat - World Cities Report 2022 https://unhabitat.org/sites/default/files/2022/06/wcr_2022.pdf

2 <https://unstats.un.org/sdgs/report/2024/Goal-11/>

Raw wastewater collection

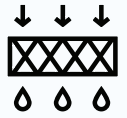
Collection tank with solid separator/bar screen

**TANK ONE****Advanced dual biofilter technology**

Novel anaerobic-anoxic biological system, to treat higher recalcitrant biochemical oxygen demand

**TANK TWO****Filtration**

A designed bed of gravel and activated carbon is employed to reduce particulate matter and colour in the water

**TANK THREE****Storage and re-use or discharge****TANK FOUR****Plant Bed**

A designed bed to harness solar energy and remove nutrients from the water. In addition, released oxygen further helps treat the water.

**TANK THREE****RESULTS SO FAR**

The UNICEF-supported pilot project in Bangladesh:

- provides over 1,000 households with wastewater services.
- demonstrates a cost-effective and sustainable approach to wastewater treatment and urban lake rehabilitation.
- supports advocacy for climate resilient sanitation approaches and influences policy makers in government.
- raises awareness of how low-cost, modular systems can be adapted and maintained across different urban and rural contexts.
- builds confidence in the scalability of NbS approaches and attracts investment for future expansion.

“My children and I now live in a cleaner and safer environment.”

Selina, a 43-year-old mother of four and Korail resident

NEXT STEPS IN SCALING FOR IMPACT

Scaling up the NbS approach to urban wastewater treatment has significant potential benefits for developing urban areas, enabling tens of millions of children and their communities to thrive and live healthier lives. Lessons learned from the pilot project indicate that the technology can be adapted for other contexts. UNICEF plans to scale up, firstly in Dhaka through strategic partnerships with actors like the Asian Development Bank (ADB), followed by expansion to other cities and towns across Bangladesh. Once scaled, the approach could benefit more than 100 million people in Bangladesh who lack access to adequate sanitation, as well as the 1.8 million living in densely populated informal settlements.

Preparation for scale up will begin with refining the model in Dhaka and then identifying areas in Bangladesh with similar water pollution challenges where the NbS approach can be effectively applied. In collaboration with UNICEF offices in Africa and Asia, work is underway to better understand the challenges faced by governments and the private sector in rapidly scaling up urban wastewater treatment and identify areas where NbS can have the greatest impact.

Next steps include:

- exploring opportunities for scale up with government partners who have identified a need for innovative urban wastewater treatment solutions.
- defining opportunities and challenges for scaling up
- providing technology transfer and design support.
- developing business cases, resources and guidance for investment and scale-up.
- ensuring adaptability by identifying water pollution and carbon emission issues for which NbS is relevant.

ABOUT THE UNICEF SUSTAINABLE WASH INNOVATION HUB

With the support of the Government of Denmark, the UNICEF Sustainable WASH Innovation Hub helps accelerate the scaling of proven, climate resilient innovations to transform access to safe and sustainable water, sanitation and hygiene for children and their families globally.