



FEATURE  
TECHNICAL  
INNOVATIONS

2022

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## Spotlight: Technical innovations

One of the main reasons for lack of sanitation coverage is unaffordability (especially for peri-urban and rural populations in low- and middle-income countries). Lack of innovation on reducing the cost of sanitation is an issue FINISH programme founder, WASTE, has been working on for decades.

Why? We strive to make sanitation facilities (toilets) available and affordable to millions of people. Our FINISH Mondial programme's Technical Working Group, prioritises innovation

and (incrementally) lowering the cost of existing sanitation technologies by reducing the construction time and materials. These innovations contribute to our goal of being able to reach scale, making safely managed sanitation for an increasingly wider pool of people possible.

The Technical Working Group also hosts an engineering (technical) hackathon (the SanTech Hackathon) annually. Here, innovators around the world are challenged to come up with novel designs and/or demonstrate a novel choice of materials used and/or a new process that will help to reduce the cost of sanitation systems. In 2021, the winner of the 1st SanTech Hackathon was piloted, in Homa Bay, Kenya. The winning technology is featured in this collection, a vertiver grass toilet technology—a low-cost, nature-based solution.

Programme partners have worked together to design, pilot, and implement, new methodologies of sanitation system construction across all 6 programme countries. This collection showcases seven examples of those pilots.

## About the FINISH Mondial programme

Financial inclusion improves sanitation and health (FINISH) Mondial is a public-private partnership addressing both supply and demand sides of the sanitation challenge, contributing to healthier & socio-economically empowered communities.

The programme is facilitated by a global consortium WASTE, Amref Flying Doctors, and Aqua for All, and led in each programme country by local partners. FINISH Mondial is active in 6 countries across South Asia and East Africa, including: Bangladesh, Ethiopia, India, Kenya, Tanzania, and Uganda.



## Learn more

For more information on these and WASTE's work on other technical innovations, contact WASTE and FINISH Mondial programme Technical Lead, Henock Belete Asfaw, [hbafaw@waste.nl](mailto:hbafaw@waste.nl) or [visit our website here](#).





# Low-cost sanitation technology options

In many of the countries FINISH Mondial works, material prices, specially, cement, has increased significantly. Some countries have seen up to 200% price increases. To reduce our dependency on cement, maintain and reduce toilet costs, the Technical Working Group in Ethiopia is working on smart way of using locally available materials.

Note: The standard cost of a sanitation system using concrete materials (excluding sub-structure) is 14040 ETB (265 EUR).

## 1 Type 1: Interlocking bricks from local clay material

Cost: 9430 ETB (175 EUR) | 30% reduction



Development of electric operated machine



Prototype of interlocking bricks



Demonstration of a sanitation system

## 2 Type 2: Made from bamboo

Cost: 6580 ETB (122 EUR) | 53% reduction



Acquiring bamboo



Treatment of bamboo



Demonstration of a sanitation system

## 3 Type 3: Made from wood

Cost: 7030 ETB (130 EUR) | 50% reduction



Acquiring wood



Making components



Demonstration of a sanitation system





# Artisan capacity building

## Construction of double leach pit sanitation systems in space-constrained situations

In March 2022, the FINISH Mondial technical working group organized a master artisan training in Uganda. A total of 12 master artisans were trained on the construction of the double leach pit sanitation systems, particularly in space-constrained areas. The training was given by 2 master artisans from FINISH Mondial Ethiopia with virtual supervision from the technical working group members.

### Objective

Develop the capacity of our artisans to build a double leach pit sanitation system when there is a limitation of space. The master artisan, in turn, will train other artisans in their respective countries/areas.



Layout and excavation



Construction of sub-structure



Construction of meso-structure



Construction of super-structure



Achievements to date (2022):

**210 artisans**

- 115 artisans in 5 districts in Kenya (Kutui 30, Embu 15, Meru 15, Nakuru 30, Homa Bay 25)
- 12 artisans in Kamwenge district, Uganda
- 83 artisans in 2 districts in Tanzania (Rorya 45, Tarime 38)





# Toilet construction

The FINISH Mondial Uganda team showcases the steps to complete a standard toilet.











# Flood-proof sanitation systems

## Supaul, Bihar



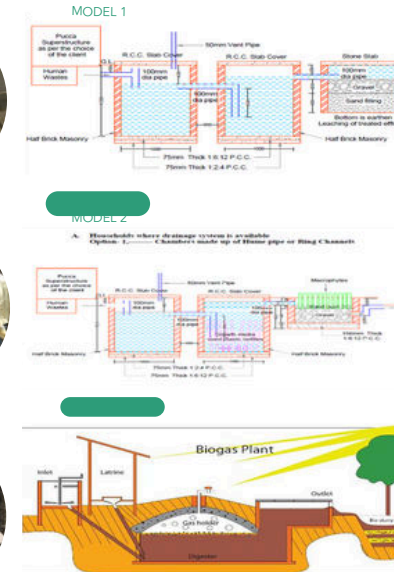
200-225



225-250



475-500



Shankar Bafam

Shankar Bafam

Toilet-linked biogas



### Benefits

- No smell
- No breeding of flies and mosquitoes
- No chance of contamination - ground at surface water - surface soil
- Human waste - not exposed and viable



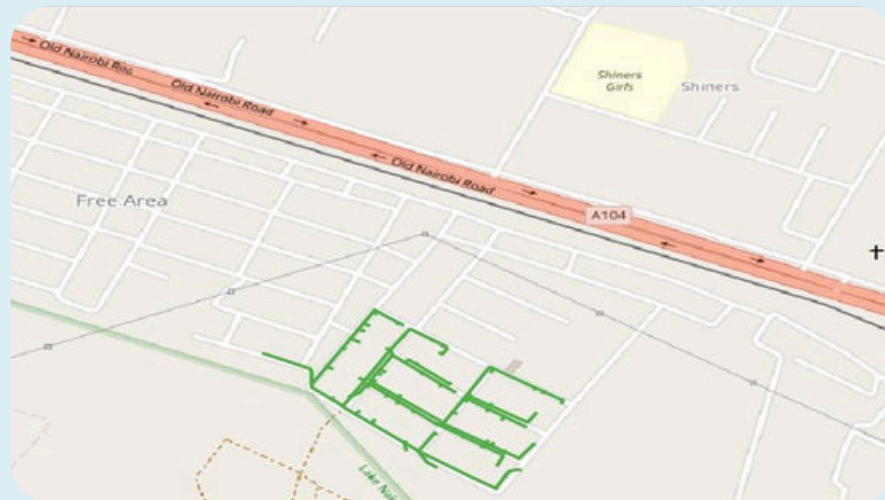
# Condominium sewer pilot at free area location

## Case study: Murogi Cluster

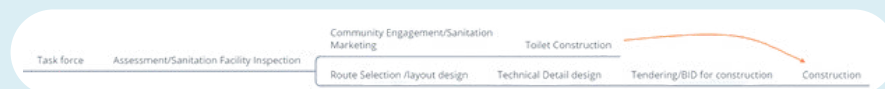
### Introduction

The following case study shares understandings from the implementation of a condominium sewer pilot from technical, financial, social/marketing and partnership perspectives. This pilot has provided the foundation for developing strategies and approaches for future expansion.

### Pilot area



### Approach



### Findings

#### Technical: Scenarios of sanitation systems to connect them to sewers



- 83 connections in total
  - 40 New
    - Scenario 1 - traditional pits without permanent structure
      - Pour flush (seat/squat)
  - 40 Rehabilitated
    - 24 dry toilets
      - Scenario 2 - VIP & shower (9) convert shower facilities to pour flush
      - Scenario 3 - VIP (11) convert some of VIP rooms to pour flush
      - Scenario 4 - VIP & store (1) convert store to pour flush
      - Scenario 5 - Traditional pits (3) convert them to pour flush
    - 19 wet system
      - Scenario 6 - Pour flush to septic - pour flush to sewer

#### Social: Factors for decision making



- Toilet collapse during rainy season and during emptying
- Obligatory connection by the Municipality bylaws for sewer line less than 300m distance
- Opportunity for title deed for informal settlements with permanent structures
- Priority Water Connection with less bureaucracy
- Opportunity for free sewer connection unlike the private sewer lines
- Increase in availability of water from 2 days to 4 days per week and
- Health benefits with water-based sanitation systems

### Financial

No	DESCRIPTION	Condominium Approach			Conventional Approach (Average cost NAWASSCO)		
		QTY	RATE	AMOUNT	QTY	RATE	AMOUNT
1	PRELIMINARY AND GENERAL ITEMS	1S		260,000.00	1S		260,000.00
2	SETTING OUT AND EARTH WORKS	3300 m	1,018.82	3,362,103.00	3300 m	2,273.85	7,813,699.99
3	MANHOLE TB CONSTRUCTION	33 Nr	24,305.03	802,000.00	119 Nr	85,000.00	10,115,000.00
4	PIPELAYING	3300 m	779.14	2,571,149.92	3300 m	1,500.00	4,950,000.00
	Sub Total			6,995,252.92			23,158,699.99
5	VAT			1,119,240.47			3,705,392.00
	GRAND-TOTAL			8,114,493.39			26,864,091.99
	Cost Reduction			70%			





# Vertiver grass sanitation system

## Nature-based solution

The vertiver grass-based sanitation system was the winning technology from the FINISH Mondial programme's 1st annual SanTech Hackathon (2020) submitted by Opero Services.

### About vertiver grass:

- It is referred to as the "wonder grass"
- Due to its extraordinary characteristics, it is now being used as a bioengineering technique for steep slope stabilization, wastewater disposal, and other environmental protection purposes
- In waste water treatment, Vertiver grass is used for effluent polishing. Its usefulness in treating polluted water lies in its capacity to quickly absorb nutrients and heavy metals, and its tolerance to elevated levels of these elements.



Features of a vertiver bed sanitation system:



The toilet/  
superstructure



Barrel septic  
system



The vertiver  
grass bed





# 'Toilet-in-a-box' innovation

## Mwanza, Tanzania

Objective: Adopt low-cost technology and improve quality control for household sanitation

Actors involved:

- FINISH Mondial Tanzania: Sharing design of innovation, financing the fabrication, developing business model, disseminating technology to sanitation entrepreneurs,
- VETA Mwanza (Vocational education and training center): Customization/localization of technology, fabrication of machine, testing with vocational trainees, training machine users to sanitation entrepreneurs

1 Fabrication of mold/machinery



2 Production of prototypes



3 Assembly of components





