FINISH MONDIAL

2nd Annual SanTech Hackathon

Application & supporting documents

Table of contents

Questions?

Contact the organising team at finishmondialtechnical@waste.nl.

WASTE amref flying doctors Aqua for All Ministry of Foreign Affairs of the Netherlands

Annex 1. Application form

1. What is the specific problem you are addressing?

In 300-500 words, please detail the specific problem in regard to the flood-proof toilet you are aiming to address.

2. Please briefly explain how your solution solves the problem

In 300-500 words, please explain how your solution will solve this problem.

3. Any other details you think the panel needs to know in evaluating your submission.

4. Please include the following attachments:

a. Relevant technical drawings

b. Total cost (use attached BoQ template)

c. Supporting media

i. 2 videos (landscape format) of:
   - 60 seconds footage of your innovation in action
   - 60 seconds interview style explaining how the innovation works

ii. 3 photos

Link to submit

Annex 2. Piloting Sanitation Models for Flood Prone Zone in Supaul, Bihar (India)

Introduction

Many different toilet technologies can be found in rural households in India and most common being twin leach pit toilets, single leach pit toilets and septic tanks. India being extremely diverse in geographical and climatic conditions, needs terrain appropriate and climate resilient WASH solutions. Despite a humungous success of Swachh Bharat Mission, gaps have been observed in availability of safely managed toilets. Studies also indicate that households are not clearly aware about suitable technology options for their areas and rely on masons and local contractors. Masons also present mixed levels of knowledge of toilet technologies and as per a research by WaterAid, 40% of the 52 masons interviewed, reported including vent pipes when building leach pits, and 42% are unaware of technologies suitable for high water table areas.

Promoting terrain appropriate sanitation technologies is an effective Disaster Risk Reduction strategy with well thought-out and suitably constructed facilities can make them more resilient in the face of disasters and climate change such as floods. However, in order to promote technologically safe and climate resilient WASH technologies, hardware and software components must be equally integrated in an intervention. Supaul district in Bihar has high ground water level and is also flood prone and therefore the pilot focuses on promoting toilets suitable for this terrain with creating awareness and providing technological support.

With an objective to promote need-based improved sanitation systems appropriate for high water table/flood prone zones, a pilot is underway in selected catchment of Supaul district in Bihar under FINISH Mondial. The project aims to provide safe onsite containment systems for 55 families. Cost of the sub-structure is being covered under Mondial and the super-structure is constructed by the households. The project is implemented in partnership with GSBS who is responsible for the ground implementation with technical support and monitoring from FINISH.

Technical options for Toilets for high water table and flood affected areas

Criteria for selecting safely managed toilet model:

i. No smell
ii. No breeding of flies and mosquitoes
iii. Human wastes- not exposed and visible
iv. No chance of contamination of
    - Ground water/ Drinking water
    - Surface water
    - Surface soil

Guidelines for pit designs in high water table area[1] or water-logged areas:

- In high subsoil water level, where the subsoil water level rises to less than 300 mm below ground level, the top of the pits should be raised by 300 mm above the likely subsoil water level and earth should be filled all-round the pits and latrine floor raised as stated above.
- In water logged area the pit top should be raised by 300 mm above the likely level of water over ground level if there is water logging. Earth should then be filled well- compacted around the pits up to 1.0 m distance from the pit and up to its top. The raising of the pit will necessitate raising of latrine floor also.
- The project is piloting 3 models/technologies that are appropriate in flood or high-water table zones:

[1] Source: https://jalshakti Handbook on Technological Options for On-site Sanitation in Rural Areas.

Model 1: Shankar Balram Model

The Shankar Balram Model is suitable for normal soil, high ground water table areas and rocky areas. It can be implemented even in water logged areas with some modification. Such modification can be made by raising the lengths of both the Hume pipes suitably above the maximum water-logged point. Accordingly, toilet seat should be raised. (Source: shankerseptictanks.com, CPHEEO 2003).

In case of water-logged area or flood affected area, 0.90 meter of the tank (i.e.,3 channels) is kept below the ground level and rest 0.60 m (2 channels) above the ground. It makes suitable to work even in water logged condition of up to 0.60 m water level, without any problem. Height of the tank above the ground can be increased suitably taking into account the maximum water level in case of flood and accordingly toilet seat should be raised.

- The latrine consists of WC seat with water-seal trap.
- The toilet consists of two Hume pipes of different diameter and length connected at upper half through a PVC pipe.
- Bottom of the hume pipe / chambers are sealed with PCC
- Effluent quality from last hume pipe is much better than septic tank
- Generation rate of septage is also very low in comparison to septic tank
- Effluent can be reused in agriculture / horticulture or discharge in soak pit
- It is suitable also for water logged areas
- Problem of septage remains, however cleaning interval of tank is longer due to high retention time of tanks

As the village does not have sewerage or drainage facility, modified Shankar Balram Model is being used. Below is the schematic for modified Shankar Balram model.

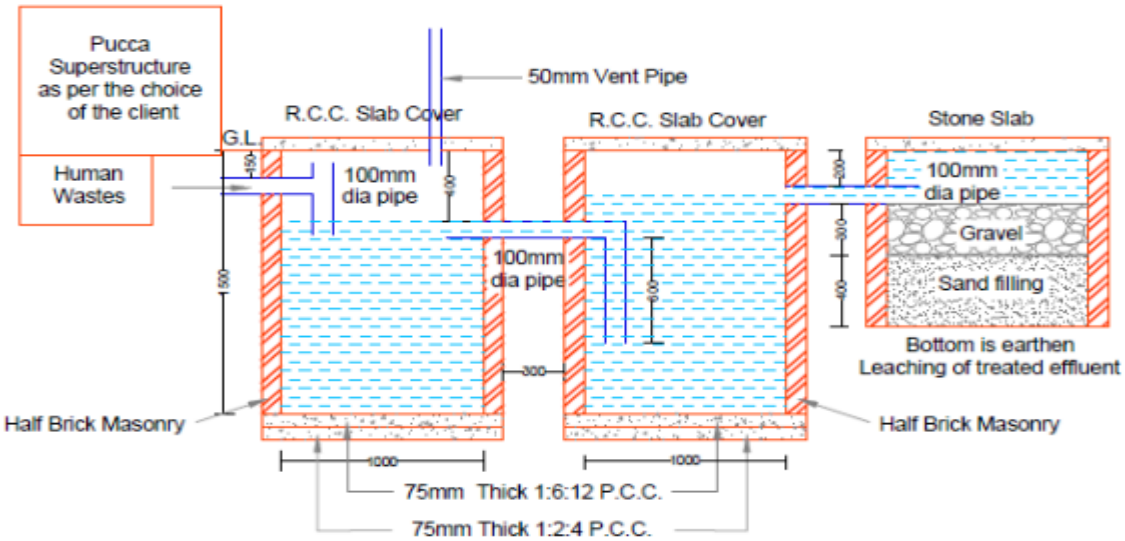

Figure 1: Model 1- Design of modified Shankar Balram (Drainage not available)

Figure 2: Photos from the field (Model 1: Shankar Balram)

Model 2: Modified Shankar Balram Model

The 2nd model is modified version of Shankar Balram Toilet with an outlet to discharge effluent from 3rd tank. This model is built for households that have a nearby drain or some discharge route available.

In this model five ring channels each of 0.90 m dia and 0.30 m height can be used for one tank by putting one ring above the other and joining with cement. Two such tanks can be prepared and connected in above the middle by a 100 mm pipe. Bottom of both the tanks are sealed with PCC. Human wastes from toilet seat enters into 1st chamber. From 150 mm of top level of 2nd tank a 100 mm pipe is connected to the covered drain for flow of treated effluent. Human waste settles and degrades in the 1st tank, liquid part flows in the 2nd tank where it is further degraded and finally through outlet pipe from this tank liquid passes out in a drain. Such treated effluent can be used for agriculture purpose.

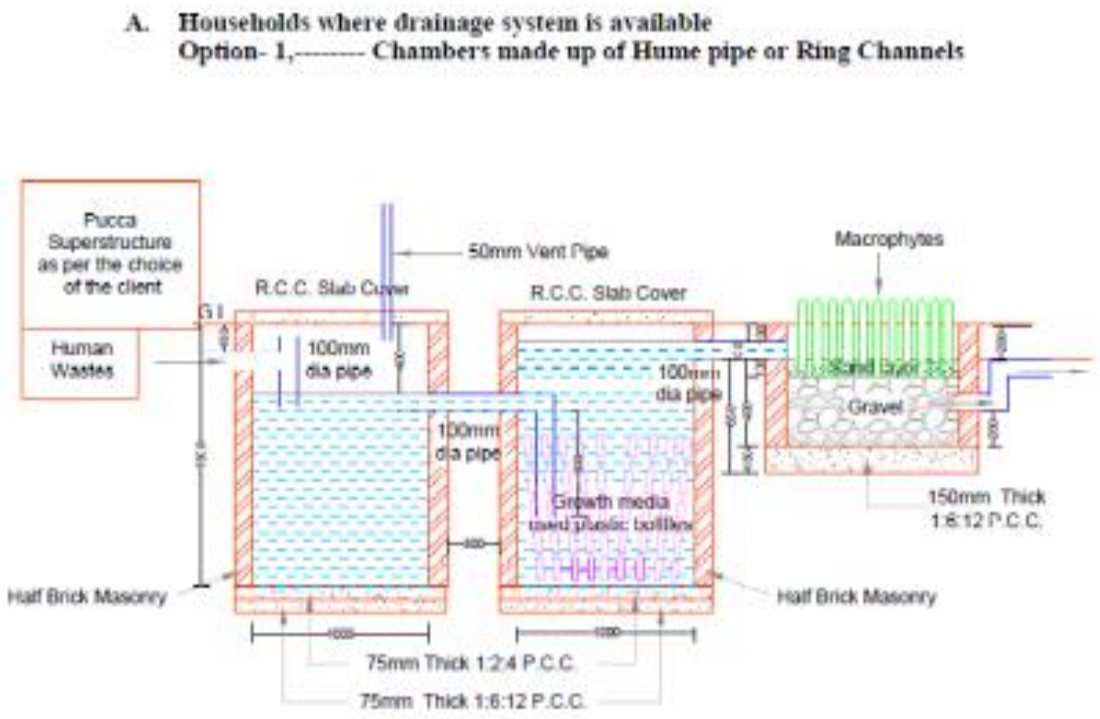

Figure 3: Model 2 Design of Modified Shankar Balram with Outlet in 3rd Tank

Figure 4: Model 2-Shankar Balram (Modified) with Effluent Discharge from the 3rd tank

Model 3: Toilet Linked Biogas Model

It is complete underground structure, made up with brick, cement or RCC. Inlet chamber is brick work with a PVC pipe for inlet and outlet chamber is brick work. Gas dome is also made of RCC. Even in winter gas production remains more or less same. Toilet linked bio gas treats with faecal waste with animal waste and converts into methane gas that can be used for cooking. The slurry also has high nutritional value and can be used in agriculture.

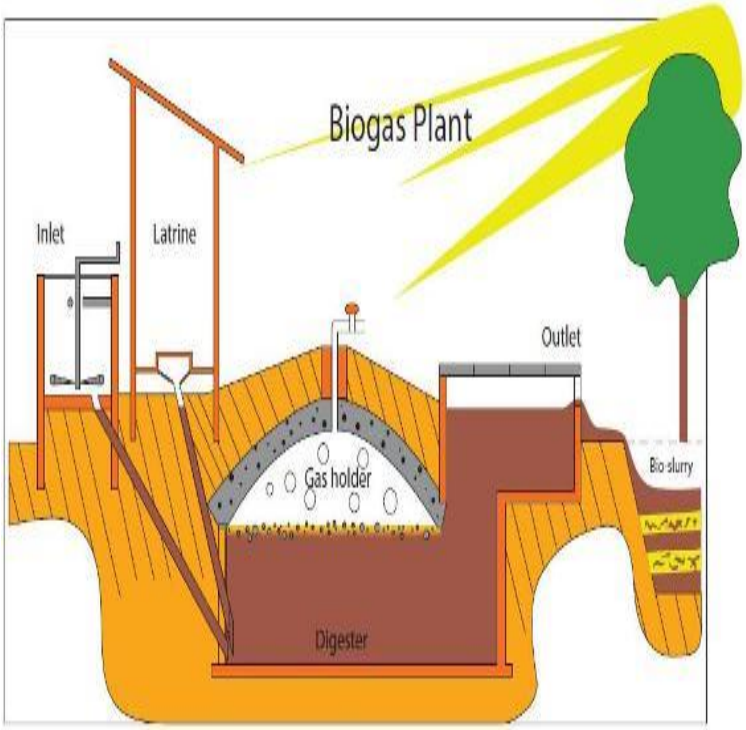

Figure 5: Design of a Toilet Linked Biogas Plant

Figure 6: Toilet Linked with Bio-digester

Summary of specs and costing for all three models are presented in a table below:

Model	Type of OSS	Design Features	Cost of Sub-structure	Cost of Super-structure[2]	Estd Total Cost of Toilet
1	Shankar Balram Model	3 chambers: 2 chambers 6*6 ft and 1 chamber 3*3 ft	14,580	7,000-25,000	22,000-40,000
2	Shankar Balram Model	3 chambers: 2 chambers 6*6 ft and 1 chamber 3*3 ft	17,950	7,000-25,000	24,950-42,950
3	Toilet linked Bio-gas Model		38,200	7,000-25,000	45,200-63,200

Progress

Below table presents the number of different toilet models completed under the project

MODELS	UNIT COST	CONSTRUCTION DONE	TOTAL COST
1	14580	47	6,85,260
2	17950	5	89,750
3	38200	3	1,14,600
TOTAL		**35**	**8,89,610**

Challenges:

- While the sub-structure is financed by the project, households are delaying construction of super structure hence slowing down the progress of the project. One of the strategies adopted is now to promote low-cost super structure so that households can start using the toilet facilities.
- As of now 3 bio toilets have been constructed but they are not being used regularly due to concerns in using the bio gas for cooking. Awareness of the beneficiaries is continuously being done but needs more efforts. As these toilets are in small number, these households want to shift to another model.
- Work was affected during Covid-19 which also contributed in slow progress.

[2] Lower end of the costing range 7,000 is for low-cost super structure made from bamboo and 25,000 is brick (pakka) super-structure

Additional photos

Figure 8: Low-cost bamboo super structure

Figure 8: Pakka Super structure made the beneficiary

Figure 9: District collector visiting model no. 2 in the field

Annex 3. References, useful links

1. Winners & event recording from 1st FINISH Mondial Technical Sanitation Contest (2020)
2. Top 8 Finalists from 1st FINISH Mondial Technical Sanitation Contest (2020).
3. Sante Brac Project