

Search appropriate latrine solution for flood prone areas of Bangladesh

Case Study Summary

Government of Bangladesh (GoB) has set a goal for 100% sanitation by 2013. But, recurrent floods, cyclone and prolonged water logging make it harder to adapt appropriate sanitation for the displaced and those who are living with flood and water logging conditions. Every year on an average 20% area of Bangladesh are inundated due to annual flood and this is common and normal phenomenon. In Bangladesh, every year, a huge number of sanitation facilities are damaged or destroyed due to natural disaster like flood and cyclone. There is a huge demand for flood resistant, appropriate, socially and culturally accepted technological options for safe disposal of human excreta in the flood prone areas. However, there are limited technological options for sanitation for flood prone areas.



The overall objective of these projects is to do field trial of the recommended sanitation and desludging technologies adapt and replicate them in Bangladesh context in targeted flood zones to contribute to reduce health risk.

Available documents and draft guidelines by WASH cluster have been used as the bases for technological options and starting field-test of the technologies. For proper implementation of the projects a close partnership was maintained with DPHE and local government at central as well as at field level. Community participation was ensured in each and every step of design, implementation and monitoring. After installation of the sanitation technologies, close monitoring of the operation, maintenance and appropriateness has been ensured. We emphasized on social and cultural acceptance of the technologies. It also focused on integrated approach combining sanitation, desludging technology, hand washing facilities and hygiene promotion.

Taken all necessary primary activities for field implementation, literature review, technical committee, DPHE involvement, community participation, joint field visit etc all are part of implementation. Beneficiary selected through baseline data and according to community consultation. Latrine technologies were also finalized through participatory way in consultation with targeted beneficiary households. The functionality of latrine was closely monitored during normal period and during and post flood. To implement the project effectively, coordination was always maintained among central and local DPHE, community and other stakeholders. To ensure the community involvement, a village committee has been formed and oriented in every village.

Total nine types of latrine technologies were field-tested. With this latrine technology we also field-tested the low cost desludging of pits.

1. Eco-San Latrine
2. Urine Diversion Latrine
3. Combined Pit Latrine (Direct and Off-set Pit)
4. Earthen raised single pit latrine
5. Single pit latrine with cement and sand/ mud coated plinth
6. Cluster Latrine – 2 latrine chambers with one roof (Off-set single pit with 9 rings for each latrine chamber)
7. Drum Latrine
8. Clay pot or Kolsi Latrine
9. Floating Toilet

From these nine technological options, the community accepted seven options. Drum latrine and Clay pot latrines were not found appropriate and community is fairly positive for these two latrines. Combined Pit Latrine (Direct and Off-set Pit) was highly accepted by the community. This option also shows the flood resistance. Single pit latrine with cement and sand/ mud coated plinth has moderately been accepted but technically not sustainable in long run. Eco-san latrine also found satisfactory but need more motivational activities.

In addition, manual desludging of pits are creating health risk. Under this piloting, a safe desludging technology was also piloted to reduce the health risk. Oxfam imported 2 (two) diaphragm desludging pumps and manufactured four more pumps locally. The field-testing also has been completed successfully and the community appreciates the technology highly as it is safe to both environment and health.

Background Information and Rationale for Innovation

Government of Bangladesh (GoB) has set a goal for 100% sanitation by 2013. But, recurrent floods, cyclone and prolonged water logging make it harder to adapt appropriate sanitation for the displaced and those who are living with flood and water logging conditions. Every year on an average 20% area of Bangladesh are inundated due to annual flood and this is common and normal phenomenon. In Bangladesh, every year, a huge number of sanitation facilities are damaged or destroyed due to natural disaster like flood and cyclone. Often post-disaster epidemics of diarrheal diseases cause more short- and long-term health problems than injuries and other diseases. During flood and waterlog, people especially the women and adolescent girls are bound to go to bush or on the floodwater due to lack of appropriate sanitation facilities. The women and adolescent girls are even forced to control defecation and urination until dark. As a result of this unusual situation, they get victims of high health risk. And, in such situation, there is no scope of maintaining personal hygiene particularly menstrual hygiene management. On the other hand, they also lose privacy and dignity. Therefore, there is a huge demand for flood resistant, appropriate, socially and culturally accepted technological options for safe disposal of human excreta in the flood prone areas. However, there are limited technological options for sanitation for flood prone areas.

pit latrine¹ is the most common and low-cost technological option for sanitation. In rural Bangladesh more than 90% of the latrines are pit latrines. Culturally, people of Bangladesh use water to clean themselves after defecation. Therefore, urine, cleaning water and excreta are being accumulated in the single pit, which causes rapid fill up of the pit and subsequent return to open defecation due to lack of replacement space. In flood prone areas, overflowing pit latrines during flooding pose a high health risk. The major problems of sanitation in flood-prone areas are surface water contamination and loss of accessibility to the latrine during flood. The significant lack of technological options particularly in difficult and flood areas means the government target of 100% sanitation by 2013 is likely not to be reached and/ or not sustainable.



River basin context

In most emergencies, sanitation is facing major challenges in providing basic latrine coverage where spaces are limited to replace rapidly filled up pits. In Bangladesh where traditional pit latrine becomes unsuitable for high water table areas and contaminates shallow ground water that uses for drinking and domestic purpose. Apart from latrines, excreta needs to be desludged safely from latrines' pits and disposed of properly/hygienically. Safe desludging and disposing techniques are not being adapted/ promoted by neither the Government nor NGOs.



Water logged context

During last two years, Oxfam has done four pilot projects to do field trial of the recommended sanitation and desludging technologies adapt and replicate them in Bangladesh context in targeted flood zones to contribute to reduce health risk. These pilot projects are giving us the scope to reach 100% sanitation coverage even in the difficult context through piloting and promoting appropriate, socially and culturally accepted technologies. These are not only inventing new sanitation and desludging technologies, it is also taking recommended technologies given by WASH cluster and to do practical field trial, obtain users feedback and comments, share its findings & learning and finally do some fine tuning if necessary.



Haor context

The latrine technologies are field tested in different emergency context –

- Flood prone/Char (river basin) area
- Water logged area
- Haor (low lying water body) area
- Cyclone affected coastal area

The aim of these projects are to –

- ✓ Identify geographic and context specific appropriate, socially, culturally, cost effective and sustainable sanitation technologies for flood prone areas for women and men, child and disable user friendly.
- ✓ Identify sanitation facilities, which can resist to flood and high water table areas allowing people to have continuous access to the facilities during and after floods.
- ✓ Identify latrine technologies, which can increase pit life



Cyclone context

¹ The pit latrine is basically a toilet with a hole (pit) in the ground under it to receive the raw sewerage. Pit latrines are designed for the onsite disposal (but not treatment or reuse) of human excreta, with no or very little water use. In Bangladesh, it consists of concrete rings and slab, which are placed inside the pit (ring) and over the pit (slab).

- ✓ Identify sanitation technologies that have climate change adaptation capacity.
- ✓ Assess the social and cultural acceptance of those technologies for women and men.
- ✓ Assess the impact of inappropriate sanitation/ poor sanitation in flood prone areas particularly for women and adolescent girls.
- ✓ Identify appropriate, socially, culturally and cost effective desludging technology for emptying the latrines' pits and safe disposal of excreta.
- ✓ Replicate these technologies.

Description of the Innovation Process

Available documents and draft guideline by WASH cluster have been used as the basis for technological options and starting field-test of the technologies. A Technical Committee has been formed consisting representatives of DPHE (R&D division), Oxfam and other stakeholders to implement the projects. The committee has met regularly to review the progress and to provide technical suggestions accordingly. Partnership with DPHE and local government was ensured at central as well as local level. Community participated lively in design, implementation and monitoring etc. After implementation, close monitoring of the operation, maintenance and appropriateness of the technologies was ensured. Along with, social and cultural acceptance of the technologies was closely observed. Above all, integrated approach combining sanitation, desludging technology, hand washing facilities and hygiene promotion was promoted effectively.

Technical Committee (TC) formation

Technical Committee has been formed at the very outset. The representatives from Government, Oxfam and other stakeholders under WASH cluster were the members of the technical committee. An agreed ToR for TC has been drafted that will guide the committee to play their role effectively. TC has met regularly and taken necessary decisions about the pilot study. Through the meeting it has followed up the progress and revised the actions accordingly, if necessary. Findings and feedbacks were highly analyzed and considered for any decision making during TC meeting.

Literature review, technology selection, and field implementation

The TC has reviewed available literatures from different sources such as WASH cluster, GOB documents etc. Accordingly, the summary of findings has been discussed during TC meeting for adopting appropriate sanitation technologies for the targeted areas. Finally, the committee selected the technologies for field test.

Field Activities

Beneficiary households were selected following the selection criteria as mentioned below –

- Disaster affected households
- Vulnerable poor families
- Socially excluded families
- Women headed families
- Families with disable members
- Families not having latrine and unable to install latrine due to poverty

The beneficiary households have been selected in consultation with the community. At the beginning of the projects baseline data has been collected. The objective of the baseline is to assess the sanitation situation of the targeted areas. The beneficiary has selected the latrine technology and site for the latrine. During site and technology selection, gender and disability issues have been considered strongly. The female members of the user household were the main decision makers in site as well as technology selection. A village committee consisting 5-11 members has been formed at each village to ensure the community participation, community monitoring, site selection, operation and maintenance etc. The female represented the most in most of the committees. This committee has had monthly meeting with project staffs to discuss the project activities, future plan and monitoring. The committee has played a vital role in implementing the projects and now is performing the role of community monitor. Project Engineers have provided support to the community in selecting the option that will consider the climate change adaptation. Project staff and village committees have monitored the progress and success in regular basis. Objective of the monitoring is to determine the appropriate sanitation technology for flood prone areas in terms of technical appropriateness, cost effectiveness, feasibility and social acceptance. Thus, it requires a regular and effective follow-up. From the first day field staffs are maintaining a close coordination with local DPHE, Union Parishad Chairman village committees. The major outcomes of this coordination are site selection, beneficiary selection, discussion on technological options, monitoring procedure and ensuring quality etc. Manual desludging of pits is a risk to health. In addition, it makes environment pollution. Safe desludging technology was also piloted to reduce health risk. Oxfam imported 2 diaphragm

desludging pumps and successfully make replica locally. Monitoring were conducted with the view to assess community feedback on the technology, its use, operation and maintenance etc. The community was highly encouraged to share their acceptance of and access to the sanitation technologies considering the aspects both socially and technologically.

Learning and Sharing

Learning and Sharing workshop was organized by Oxfam GB in collaboration with DPHE with the view to share the learning and experiences of the projects to the sector stakeholders. The representatives from GO-NGO joined the program and provided their necessary recommendations on the sanitation technology piloted.

The latrines and technological options

All latrines are constructed with raised plinth considering the highest flood level. It was emphasized on substructure than superstructure. For substructure, the drawings and designs in every area were followed properly. Superstructure has been developed as per user demand and availability of local materials.

1. Eco-San Latrine:

Special Features:

- Two separate chambers for accumulation of feces
- Chamber allowing feces to convert into compost- Separate pan for urine and anal cleaning water
- In-built system ensuring separate storage of feces, urine and anal cleaning water
- Functional all time (before, during and after flood)
- Long term use
- Urine for plant nutrients and compost as fertilizer
- Desludging is not required



Ecosan

Field findings:

- All latrines functioning smoothly
- Higher cost than normal pit latrine
- New technology for users
- Moving for anal cleaning after defecation is a bit hassle
- Primarily reluctant to use urine and compost
- Accepted by community
- Well maintained
- Recommended for further scale up reducing the cost by using local materials

Recommendation:

Further scale up is recommended but reducing the cost by using local materials. It is to be noted that the study needs more time to assess proper utilization of compost fertilizer.

2. Urine Diversion Latrine:

Special Features:

- Single Pit- In-built system which ensures separate storage of feces, urine and cleaning water
- Appropriate for flood, water logged context
- Urine as plant nutrient- Easy maintenance
- Desludging required but frequency less
- Can be used first phase of emergency
- Low cost compare to eco-san

Field findings:

- Latrines are functioning
- Comparatively higher cost than pit latrine
- New technology to the user
- A bit hassle to move for anal cleaning after defecation
- Urine use to plant as nutrient
- Well maintained
- Community fairly positive for its replication
- Less probability to underground and surface water contamination



Urine diversion latrine

Recommendation:

Community is fairly positive for its replication, as there is no visible and instant output. The latrine needs more time and more number to assess pit life and community acceptance.

3. Combined Pit latrine (Direct and Off-set):

Special Features:

- Two Pit (Direct – 3 rings, Off-set – 4 rings)
- Pit connected by PVC pipe
- Volume increased without increasing depth
- Can be used all year round even during flood- Long term use
- User friendly
- Easy maintenance
- Suitable for shallow water table areas
- Ease to de-sludge



Combined pit latrine

Field findings:

- Users appreciated the technology
- Used & maintained by community
- Cost is reasonable for its life-time
- Replication demanded but at lower cost
- Less probability to underground water contamination

Recommendation:

Community accepts the technology as this latrine is like regular latrine. Replication is highly demanded but at a lower cost.

4. Cluster latrine – 2 chambers (Off-set single pit for each chamber):

Special Features:

- Two chambers with different pits constructed in same compound
- Shared among 3-4 families
- Twin pits with 9 rings
- Connected off-set two pits, easy for desludging
- Easy maintenance
- Minimize the space requirement



Cluster latrine

Field findings:

- Functioning smoothly
- Relatively moderate cost
- Well maintenance by users
- Use and cleanliness is sometimes challenge due to shared
- Maximum user in minimum space– further scale up is highly recommended
- Suitable for limited space areas

Recommendation:

Further scale up is highly recommended, as this latrine is quite appropriate for Haor area. Community accepts the latrine for its use by maximum users in minimum space. Software activity is recommended as mandatory as the user households are more than one.

5. Earthen raised single pit latrine:

Special Features:

- Single Pit- Plinth raised by earth used turfing to prevent erosion
- Functions at all times (before, during and after flood)
- Low cost- Easy O&M- Desludging required



Earthen raised pit latrine

Field findings:

- Smooth function
- Relatively low cost
- Well operation and maintenance by users

- Proper use and cleanliness
- Appropriate for water log area Scale up is highly recommended in flood and cyclone prone areas.
- Plinth is not vulnerable to heavy rain

Recommendation:

Community accepts the technology as this latrine is like regular latrine. Replication is highly demanded.

6. Single pit latrine with cement and sand/ mud coated plinth:

Special Features:

- Single Pit- Plinth coated by cement and mud/ sand to prevent erosion
- Functions at all times (before, during and after flood)
- Low cost- Easy O&M- Desludging required

Field findings:

- Smooth function
- Relatively low cost
- Well operation and maintenance by users
- Proper use and cleanliness
- Appropriate for water log area– Scale up of cement and sand coating is recommended
- Cement and mud coated is vulnerable to heavy rain

Recommendation:

Community is not interested in promoting the cement and mud coated single pit latrine, as it is vulnerable to intensive rain. But, they recommend for scaling up of cement and sand coated one.

7. Drum Latrine:

Special feature:

- Single Pit
- Drum, open at both end
- Readily available materials
- Instantly useable
- Applicable only in first days of emergency
- Need desludging often

Field findings:

- Relatively low cost
- Easily O&M
- Appropriate only in emergency situation
- A temporary solution
- Material carrying is challenging
- Replication as regular option is not recommended
- Promotion of concept is recommended with high raised plinth

Recommendation:

Recommended only for emergency situation but not as regular option. The promotion of the concept is demanded, as it will ensure the development of high raised plinth before flood as disaster preparedness.

8. Clay pot or Kolsi Latrine:

Special Features:

- Applicable for emergency response
- Very temporary
- Need desludging every two to three weeks

Field findings:

- Easy O&M
- Temporary solution only for emergency situation
- Material carrying is risky (fragile)
- Scale up is not recommended

Recommendation:

Though this type of latrine is a temporary solution during emergency situation but it is not recommended due to its short life span.

9. Floating Toilet

Special Features:

- It is UDL latrine (separate container for solid, urine and cleansing water)
- A replaceable container to accumulate excreta
- Two containers with filter media to treat cleansing water
- Separate jerrycane to store urine
- empty containers act as buoyant
- In-built system ensuring separate storage of feces, urine and anal cleaning water
- Functional all the time on the water (before, during and after flood)
- Appropriate for water logged, flood prone areas
- Long-term use
- Urine for plant nutrients
- Excreta disposal is required



Floating toilet

Field findings:

- All latrines functioning smoothly
- Higher cost than normal latrine
- New technology for users
- Moving for anal cleaning after defecation is a bit hassle
- Relevant stakeholders at national level so excited to replicate even in urban slum
- Accepted by community

Recommendation:

Recommended only for emergency situation in water body area. The promotion of the concept is demanded. Community highly accepted.

Desludging Technology - Diaphragm Hand Pumps:

Special Features:

1. Simultaneous sucking and disposal of sludge at certain distance without contacting sludge
2. Manually operated
3. Desludging of a latrine waste (5 rings) within 15-20 minutes
4. Pump body and all other accessories locally assembled and produced

Advantages:

1. Removes waste safely
2. Low operation and maintenance cost
3. Easy transport and operation
4. Less environmental pollution
5. Reduce labour and health hazard
6. Suitable for emergency, camp and slum situation

Disadvantages:

1. Unable to deal with dry sludge and other solid objects
2. Requires disposal site
3. High cost of equipment (Tk. 20,000) - primarily
4. Cleaning of the equipment
5. Requirement for secure storage



Desludging pump

Recommendation:

Desludging technology is highly recommended by the community but disposal site is a problem during flood. The sweeper also highly appreciates the technology as will simultaneously increase their income and reduce health hazards.

Community comments:

- 'It is a nice technology, as anyone can easily handle it'
- 'This is a good technology as it reduces bad smell and ensures less pollution of environment'
- 'Reduces health hazard and increase income'

Comparative Analysis of Latrines

Technological Option	Appropriate for Flood	Sustainability	Cost	O&M	Desludging	Extra Economic benefit	Community Acceptance	Remarks
Eco-San Latrine	Yes	Long term	Comparably too High	Not easy. Need special orientation and care	No need	Community get urine for as plant nutrient and compost fertilizer	Moderately accepted. Need more motivation.	Recommended with proper and long term promotional activities
Urine Diversion Latrine	Moderate	Short term (1–2 Years)	Comparably High	Easy	Pit can be filled up by faeces and need desludging	Community get urine for as plant nutrient	Fairly positive. Need more motivation.	Recommended with proper and long term promotional activities for O&M
Combined pit latrine (Direct and Off-set)	Yes	Long term	Moderate	Easy	Pit can be filled up by faeces and need desludging	No	Highly accepted	Highly Recommended but at lower cost
Earthen raised single pit latrine	Yes	Long Term	Low	Easy	Pit can be filled up by faeces and need desludging	No	Highly accepted	Highly recommended
Single pit latrine with cement and sand/ mud coated plinth	Yes	Short term	Low	Easy	Pit can be filled up by faeces and need desludging	No	Moderately accepted	Cement and sand is recommended but not cement and mud
Cluster Latrine – 2 chambers (Off-set single pit for each chamber)	Yes (Assumed as there is no flood this year)	Long term	Moderate	Easy	Pit can be filled up by faeces and need desludging	No	Highly Accepted	Highly Recommended with proper and O&M
Drum Latrine	No	10 – 15 days only	Low	Not easy	Pit filled up by 10-15 days and need desludging every week.	No	Rejected	Only for emergency
Clay pot or Kolsi Latrine	No	10 – 15 days only	Low	Not easy	Pit filled up by 10-15 days and need desludging every week.	No	Rejected	Not recommended for replicate
Floating Toilet	Yes	Long Term	Corporately High	Easy	Chember can be filled up. Need replacement.	Community get urine for as plant nutrient	Highly accepted	Highly recommended

Challenges and Risk

- Lack of availability of skill mason at local level for the construction of UDL and EcoSan toilet
- Lack of readymade or prescribed design as well as availability of materials. Due to this several design/ modification have been made during construction period
- As Ecosan and UDL is new for the community, it is therefore challenge for proper use, operation & maintenance
- Use of urine and excreta compost in agriculture field
- Transportation of latrine materials to remote areas
- Unexpected flood
- Unavailability of space for latrine installation

Partnerships and Collaborations

All this initiative is implemented in partnership with government, local NGOs and community. The concern government agency (DPHE) was closely involved in whole process. DPHE act as a specialist agency in all process. Oxfam maintained close relation and coordination with DPHE in regular basis.

Local NGOs also were in loop and they are act as field implementer. Oxfam local partner NGOs was the middleman and all field service providers. Their long field experience in the community helped to establish relationship with community and selection of technologies.

Main actor was community people. They were involved from the beginning to end. Their experience in coping with floods was main tools of technology selection and design.

Lessons Learned and Evaluation Findings

It is proved that all the technologies recommended by WASH cluster are not appropriate for the flood prone areas. This pilot study also explores that sustainability of flood resistance latrine depends on technology and cost. So, cost should not be barrier and even cost should be compromised considering the sustainability. It is also recommended that local DPHE and other stakeholders needs more skills on desludging and accordingly capacity should be developed on low cost desludging technologies.

- Need appropriate technology for flood prone areas, even at higher cost.
- Cost can be analyzing compare to sustainability.
- Community accepts new technologies if it has positive impact.
- Community is aware of the benefit of good sanitation. So, they are very positive to accept any new and appropriate technologies.
- Community willingly provides space for latrine
- Users are motivated to use & maintained latrine. Reduce spreading water born diseases.
- Community people are aware on positive impact of this latrine to protect contamination of ground water and as well as surface water
- Efficacy to use UDL at emergency period.
- UDL can be as mid-level sanitation ladder (after pit latrine) and final destination would be ecosan.
- Effective usage of urine and excreta compost in agriculture field that will save chemical fertilizer. Through using urine and compost, crop yield will be increased.

Wider Sectoral Implications

The overall success of this initiative offers an opportunity to other sector actors to replicate these technologies in flood and cyclone prone areas to minimize the health risk due to sanitation. The WASH cluster can play a lead role to dissemination the experience and for further improvement. Government agency will able to replicate in whole Bangladesh. The local NOGOs also can play a vital role for wider replication.

Key Contacts:

1. Abdus Sobhan – asobhan@oxfam.org.uk
2. Golam Morshed – gmorshed@oxfam.org.uk