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**ASIA REGIONAL SANITATION AND HYGIENE
PRACTITIONERS WORKSHOP**

**Eco-toilet- An Ecological Sanitation Option for Difficult
Areas of Bangladesh (Practice)**

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Abstract

Bangladesh has made significant progress in sanitation under the programme Sanitation for All by 2013. Coverage and sustainability, however, still remain major challenges. The problems related to sanitation vary between urban and rural areas and among different geographical regions of Bangladesh.

Considering the drawbacks of current sanitation technologies (with respect to varying local conditions), Practical Action Bangladesh has started working on eco-toilet and piloting since 2006. With financial support from UNICEF and DPHE, Practical Action Bangladesh and its PNGOs implemented an Action Research Project on Ecological sanitation in difficult areas (urban slums, Hoar, Hilly, Barind track and flood prone) of Bangladesh.

Costing of the technology is another challenge for scaling-up. The average cost of conventional eco-san option is relatively expensive for the poorer section of the population. In this regard the current action research adopted a variety of options to bring down the cost. A number of design problems of the traditional eco-toilet and several modifications in the design of the have been made in order to improve the quality of compost and end uses. The research has also attempted to address another challenge, which of bringing about behaviour changes with respect to the use of eco- toilet.

Because of the short duration of the project, it was not possible to demonstrate all the design options in particular for urban slums and areas with a high water table. The project attracted considerable attention to sanitation practitioners in order to address the ecological sanitation solutions for the difficult areas of Bangladesh.

1. Introduction:

The Sanitation, Hygiene Education and Water Supply in Bangladesh (SHEWAB), a GoB-UNICEF Project, Dept. Of Public health Engineering (DPHE) undertook a 16 months action research “Ecological Alternatives in Sanitation in Difficult Areas of Bangladesh”. Practical Action Bangladesh and its PNGOs were engaged as technical agency for implementation of the project. The major objective of the action research is to try out run innovative eco-toilet options appropriate for difficult geo-hydrological, physical and socio-economic and cultural context of Bangladesh. The project implemented in 16 clusters of four geo-hydrological difficult areas (re: urban slums, Hoar, Hilly, Barind track and flood prone) in seven districts namely Rangpur, Gaibandha, CNganj, Bandarban, Sunamganj, Moulavibazar and Narsinghdi.

2. Activities and outcomes

The action research was comprised of five stages: (1) Inception, (2) Planning and Design (3) Implementation /Construction of toilets (4) Post -construction stage and (5) Documentation and knowledge dissemination.

i. Inception stage:

- a) Cluster Selection: The 16 clusters under the GoB-UNICEF project areas were selected through series of field visit and meeting with local communities, UP/PS/DPHE considering the various socio-economic and geo-hydrological contexts.

- b) Baseline survey: A details baseline survey was conducted regarding the present sanitation situation and to know the community people knowledge & attitude about the eco toilet and their interest and willingness to pay for eco-toilet construction; and
- c) Stakeholder’s feedback (Local & national): Several meetings were held with relevant stakeholders and individuals (DPHE, UNICEF, WSP-WB, UPPR project, NGO-Forum, DSK, DISHARI project, Plan Bangladesh, ITN etc.) with the objective is to inform them about the project, and to seek their suggestions & cooperation for strengthening expected and effective implementation of the project.

ii. Planning and Designing stage

The approach to developing eco-toilets designs have been Participatory Technology Development (PTD). The project developed the following eleven (11) proto type engineering designs through reviewing the existing design available in home and abroad, physical investigation to other Ecosan project areas in Bangladesh, and consultation meeting with the beneficiaries and stakeholders to improve the understanding of local conditions and preferences of the potential users.

- Option 1: Fixed Chamber System using Plastic Fiber Pan
- Option 2: Movable Drum System using Plastic Fibre Pan (Single Pan)
- Option 3: Movable Drum System using High Commode
- Option 4: Fixed Chamber System using Modified Traditional Eco Pan
- Option 5: Fixed Chamber System using Traditional Eco Pan
- Option 6: Movable Drum System using Traditional Eco Pan
- Option 7: Elevated Movable Drum System with RCC Column
- Option 8: Single Pit Urine Diversion Toilet
- Option 9: Twin Pit Urine Diversion Toilet using Urine Diversion Pan
- Option 10: Waste Concern Model using Urine Diversion Pan
- Option 11: Community Based Urine Diversion



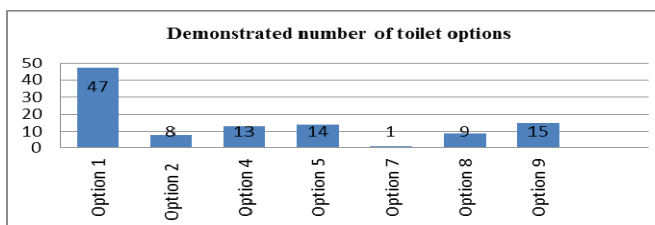
The major innovations of the options design are:

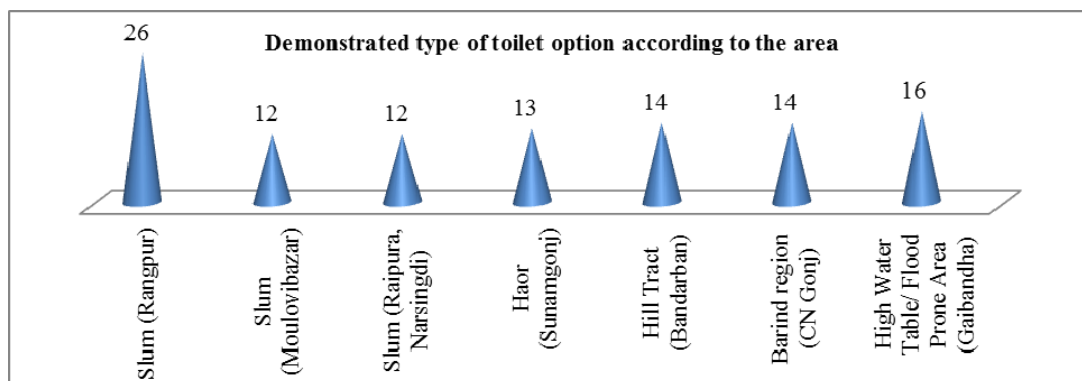
- Adaptation of anal cleansing provision using water in the same pan has been adjusted, to avoid pan switching for anal cleansing in the conventional eco-san options;
- Due to cultural and religious stigma, engineering solution made in the eco-san pan to divert urine into the evaporation bed during menstruation period;
- Address the especial needs of women (pregnant), children, elderly and differently abled people by providing handle and railing inside & outside of the toilet;
- Provision of two windows for better ventilation & sunlight and ventilation pipe $\phi 3$ inches and 3 ft. higher from the roof is kept to reduce bad smell as well as expedite the drying process.;
- Provide pictorial O & M guideline on the wall to guide the proper use;
- Provision of hand-washing facility with low cost hand washing device and soap stand;
- Design faces hole cover to avoid fingers in direct contact with the pan cover;
- Design faces chambers based on the size of the family members, in order to reduce the construction cost;
- A light bulb (use toilet at night) or using lighter colour roof helped to improve the situation without lighting
- Provision of a bucket to store ash along with a scoop to use hand to spread the ash on faeces.
- Reduce of construction cost using different construction materials (low cost to conventional brick/RCC) for each options ranging from Tk. 17,000 (\$ 243)—UDD model to Tk. 5000 (\$ 70)—Urine diversion model.



iii. Implementation/construction stage:

Developed 11 designs have been endorsed by the DPHE and constructed 107 no. of Eco-toilet of seven different designs as mentioned in the graph.





The implementation modality of the action research:

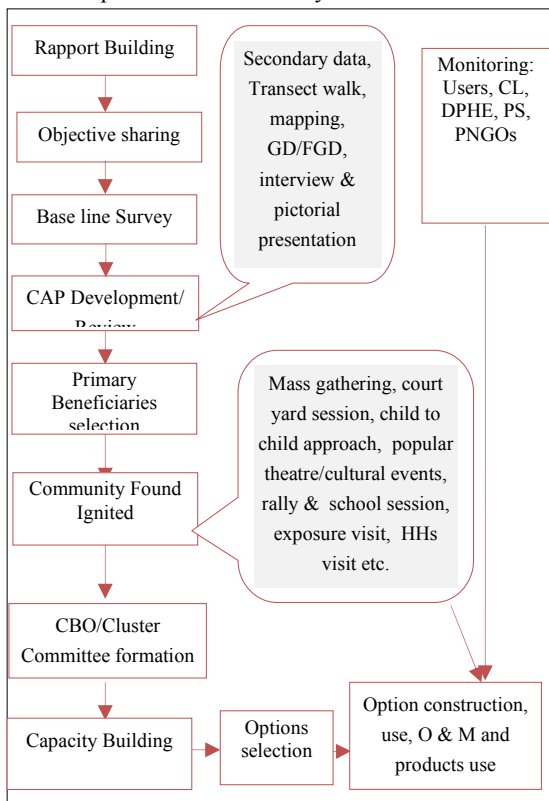


Fig 1: Social mobilization process

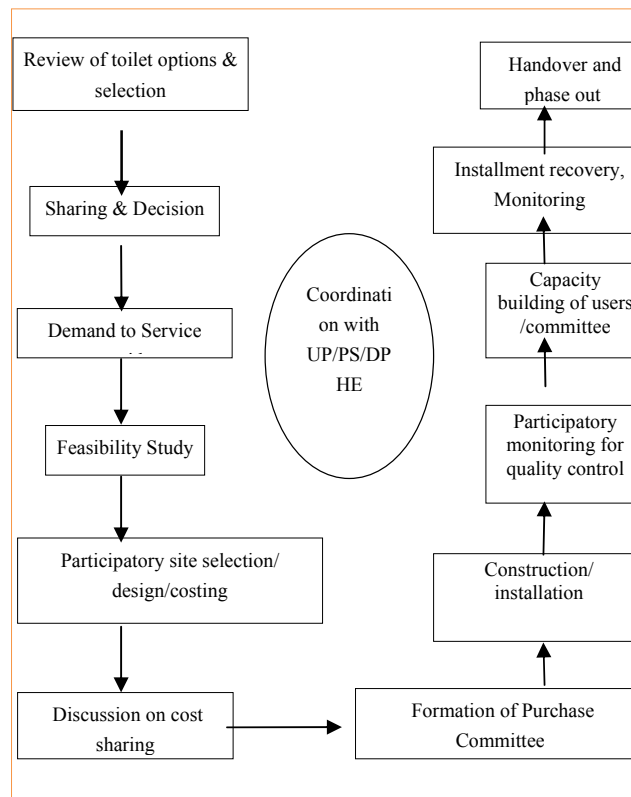


Fig 2: Hardware implementation process

Besides, more emphasis was given to:

- Capacity building*: The users, local masons, community leaders (PS & DPHE) were trained on construction, use, and O & M.
- Choice of technology/materials*: Users had freedom to choose toilet option considering their affordability. A technology matrix of toilet options with pictorial view and detail costing was made available to the community to make their choice.
- Quality of Workmanship*: First, one toilet option was built in each cluster to create demonstration effect and to provide hands on training to the local mason and community people. Project Engineer and Engineers (DPHE/PS) ensured quality of construction works and its workmanship.



- d. *Cost sharing*: The cost sharing verified from 15% to 40% depending on income level.
- e. *O&M of facilities*: A pictorial chart on toilet use and maintenance is set in front of the toilet wall. A participatory monitoring system has been established to ensure proper use and cleanness.
- f. *Use of Ecosan products in agriculture*: User's started using the urine for the fruit trees i.e. coconut, jackfruit, mango and banana. Main problem in urban slums, therefore project tried to establish a link between users in urban slums and neighboring farmers for using of their Ecosan products.



iv. Post implementation/construction stage:

At this stage the project performed two major activities:

a) Collected community feedback (acceptability & sustainability)

After six month of toilet use, a feedback survey conducted through questionnaire and FGD among users and local stakeholders. It is found that people have accepted this technology and they are already habituated with the eco-toilet. Major feedbacks were:

- 73.59% family members use eco-toilet, whilst 89.03 users are satisfied with using and 85% owners is already using the urine as fertilizer.
- Toilet structure is good, durable and climate resilient. Whilst, beneficiaries found difficulties in anal washing at the beginning of use; children need more time to habituate with the use of eco-toilet.
- 19.4% users identified high construction cost and 6.9% users who are mainly from urban low income settlement identified land scarcity as challenges.
- 92% masons and Sub-Assistant Engineers thought that Eco-toilet might sustainable than traditional toilets and would support to promotion of eco-toilets;
- 94.2% Community Leaders found no problem with using and promoting eco-toilet. Moreover, they will assist for promotion of eco toilet and use of urine and composted faeces.

b) Conducted pathogen test of composted faces and nutrient analysis of urine.

The recommendations from IEDCR for Faces are:

- The colour and odour of the compost are more or less acceptable;
- To ensure of ash after each defecation for attaining al alkaline pH
- The compost has to be dried
- Storage of the compost for at least one month in airtight container may reduce the pathogenic load f parasite.

The recommendations from Department of Soil, Water and Environment of Dhaka University for urine are:

- Urine is sterilized and contains N (0.733%), P (89.3%) and K (0.39%) in sufficient amount and it could be used in agriculture land whilst do not have arsenic in harmful level.
- Arsenic and cadmium in composted excreta are not at a harmful level and lead content was found below the detection level (re: Organic Carbon 6.47%, N 0.80%, P 0.563%, K 1.227%, Ca 262.5 mg/kg, and Mg 10.89 g/kg) and could use in farming to increase the soil fertility.

v. Documentation, knowledge dissemination & networking

It has also developed user manual, construction manual for Mason and Engineers in both languages (Bengali & English), eco-toilet catalogue and a brochure highlighting the project implementation approach and its outcomes. Through implementation of this project Practical Action has extended its network with all relevant stakeholders working in WASH sectors, donors and also the organic fertilizer sellers and disseminates the experiences through a national workshop at DPHE bhaban in Dhaka.

3. Major Challenges

- Selection of beneficiaries (frequently mind changed);
- High construction cost/cost sharing/contribution collection (Re: urban slums);
- Heavy rainfall and flood;
- Land scarcity/ tenure ship at urban slums;

- Negative attitude towards eco-toilet, as this technology was not familiar in these areas;
- Promote local available materials;
- Ensure optimum use of urine in agriculture;
- Market of urine and eco-compost
- Ensure menstrual hygiene to 100% as women feel shy sharing the problem(s);
- At the end of the project, meet the increasing demands of Eco toilet.

4. Lessons Learnt

- Beneficiaries' freedom for choosing toilet option made them proactive and created ownership as well;
- Critical awareness is important to mobilize all stakeholders towards eco-toilets;
- People are interested to have a good looking & long-lasting toilet and also willing to invest for the same; Particularly the people in remote areas are more interested to construct brick made toilet ;
- More time required to change people attitude and behaviour towards eco-toilet. But they are reluctant to go back to traditional toilet, once they are habituated;
- Sanitation link with income generating activities (re: vermi composting) could more sustainable.

5. Scaling-up of eco-san initiative:

- The 11 Ecosan options got provisional approval from the Design division of DPHE. It was mentioned in the provisional approval that successful piloting would be essential for formal approval. A formal approval by GOB would be critical for scaling up the technology. Then it can be persuaded at the Ministry of Local Government, Rural Development and Cooperative level for incorporating ecological sanitation options as a part of GOB ongoing sanitation promotion campaign strategy. However, LGRD&C Ministry already interested about Ecosan initiatives as they have tried out earlier in each Union.
- Costing of the technology is another barrier for scaling up. The traditional hard-core engineering solutions do not allow low cost options. As a result the eco toilet cannot compete with mass sanitation options. However, this project first time tried out low cost option at \$70.
- Numbers of knowledge products (toilet catalogues/manuals) distributed to all local DPHE offices and PS at SHEWA-B project areas so that it can be used for future promotional activities and SHEWA-B project could be a platform for scaling up. The current 7 piloting areas could be used as demonstration centre and knowledge hub for replication of Ecosan initiatives.

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Note/s

Practical Action Bangladesh's partner NGOs are SPACE, BASA and Commitment Consultant

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