

Dry Ecological Sanitation Alternative in Tanzania

By:

Alfred J. Shayo
Environmental Engineering and Pollution Control Organization (EEPCO)
P.O. Box 7018
Dar Es Salaam
Tanzania
Tel: +255222866221
Fax: +255222866221
Mobile: +255754316328
E-mail: shayoalf@gmail.com

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Abstract

Implementation of Ecological Sanitation (EcoSan) is a fast track in developing countries. Tanzania is on board. Dry EcoSan toilets were introduced in the country in 2000 by EEPCO as new paradigm in sanitation alternatives. Currently, local and international agencies are implementing or supporting EcoSan projects in Tanzania.

This paper explored four cases in the country where dry EcoSan toilets has been promoted including household cases in Pemba, Hai District - Kilimanjaro region, school cases in Kisarawe district and Bomango'mbe primary school in Hai.

The paper will enlighten successes of the cases, but exploring in detail, challenges facing EcoSan approach countrywide, that if not properly addressed, will make present non-ecological systems to remain preferred options beside that they have no ecological benefits. People's perspectives regarding urine separation, anal cleansing, bathing/washing and use of urine and sanitized feces as soil conditioner toward the use of EcoSan toilets are discussed and recommendations outlined.

Background

Ecological Sanitation (EcoSan) has been introduced in the country by EEPCO in 2000. 95 double vaults urine-diversion EcoSan toilets were constructed in the piloting project at Majumbasita area Dar es Salaam city. Over this period, EcoSan gained tremendous credibility countrywide.

Urine-diverting double vault EcoSan toilets are now widely promoted in Tanzania for use in households and schools with arguments like useful in areas of: high water table, flooding, water scarcity, lack of sewerage, rocky or mountainous terrain, river and lakesides. Moreover, EcoSan is an approach to sanitation that: prevents pollution, minimizes water use, sanitizes and recycles excreta as a valuable resource.

Structures of the toilets for households and schools are identical in multiples for the later, while, other components remain the same¹

¹ built above ground, have two impervious chambers for fecal matter, have cement finish; slab and squatting or seating pan (one above each chamber) with a drop-hole in the middle, a urine bowl in the front, and a wash bowl in between the chambers. A vent pipe fixed in the two chambers; one of the walls of the chambers has opening fixed with wooden cover painted black to remove sanitized fecal matter. A pipe from urine bowl takes urine into a collection tank outside or directs it to the ground outside to percolate and a pipe from the wash bowl takes out anal cleansing water to a filter bed with plants.

CASE STUDIES

Household EcoSan toilets in Pemba Island

Sanitation coverage in Pemba Island is below 36% (Ministry of Health 2006). The communities in the island were lacking technical knowledge on sanitary latrines construction. As way forward, Water Department Pemba with financial support from UNICEF Dar-es Salaam organized sanitary latrine trainings to four districts in Pemba in December, 2006. To implement the activity EEPCO was consulted and indenture to facilitate sanitation options training, aimed to provide the communities with suitable different sanitation options based on their local conditions hence increase latrines coverage. During the training, participants had opportunity to learn and build different sanitation options including EcoSan- urine diverting toilet (figure 1).

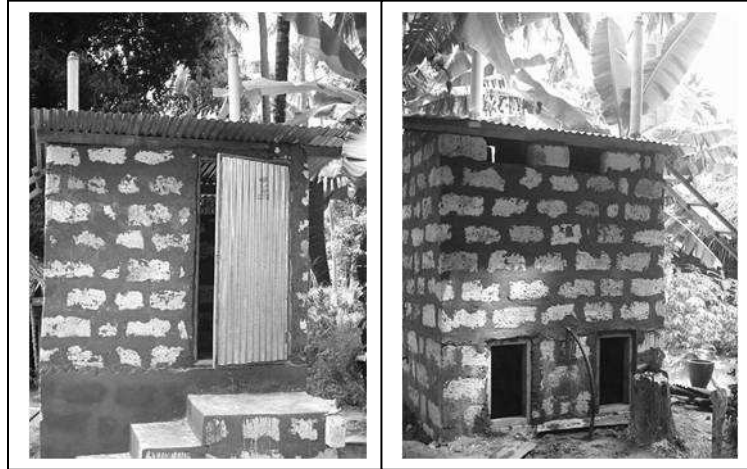


Figure 1: Dry EcoSan toilet under construction for household in Pemba Island. Photos by EEPCO 2006

EcoSan toilet in this area was a new technology but the option was cherished by many when noticed demonstration units. However, the following challenges (box 1) were early noticed.

Box 1: Noticed Challenges on EcoSan toilets in Pemba Island

Cultural belief regarding handling of urine

Majority of the inhabitants of the Island are Muslims and believes if a person by any way contact urine will not only be hygienically unsafe but will be spiritually unclean. For that reason, it was impossible to convince the toilet users to collect and reuse urine. Alternative of percolating urine to the soil was accepted.

Washing/Bathing/Urine Place

Normally, households have a place to urinate and do self washing/bathing. The place is sheltered mostly by thatch to provide privacy. Household with latrine other than EcoSan do not require this place but the latrine is used instead, which is contrary in EcoSan toilet. People therefore, have indicated to prefer options that will serve the purpose.

School EcoSan toilets – Kisarawe District Coast Region

In 2003 EEPCO implemented school sanitation project “**Ecological Sanitation in schools**” financed by Finland Embassy Dar es Salaam, in ten schools for ten village in Kisarawe district coast region.

Training was organized in ten villages on construction, operation and maintenance of EcoSan toilets². After training, the trained masons were engaged in building of school EcoSan toilets (3 toilet stances for girls and 3 for boys in each school - figure 3).



Figure 3: EcoSan School Toilet at Titu Primary school – Kisarawe District Coast region (photo by EEPKO 20006)

Household and School EcoSan toilets - Hai District, Kilimanjaro region

EcoSan toilets were successfully promoted in Hai district by EEPKO in 2002 under the project “**Promotion of Ecological Sanitation in Hai District**” financed by UNICEF.

Initial meeting between project team, school staff (teachers), some district officials and local masons/artisans were organized, where EcoSan technology was explained with intention to gain acceptance of the proposed technology. Much curiosity was shown, and some uncertainties with questions concerning operation and maintenance of the toilets.

Intensive training on construction, operation & maintenance of the toilets were conducted³. The training aimed to transfer knowledge to local artisans to become community resource persons (CORPs) in building EcoSan toilets; for teachers to teach the pupils on use and maintenance of the toilets and district officials to facilitate planning and implementation of EcoSan programs⁴. There was wide discussion on the aspect, of re-use of human excreta as was found unfamiliar concept. The trained masons/artisans then built school EcoSan toilet – figure 2 household EcoSan toilets. Replication differs with geographical location within the district (table 1)



Figure 2: EcoSan School Toilet at Bomango'mbe – Hai District Kilimanjaro (photo by EEPKO 20002)

² Training participants were:- Two school teachers from each village's primary school, two leaders from each village, and ten local masons/artisans from each village participated

³ Training participants were: - Two school teachers from Bomang'ombe primary school, two DWST members, and ten local masons/artisans from five villages.

⁴ The training included discussing various aspects of sanitation including basic hygiene awareness, disease transmission routes associated with poor sanitary practices, operation and maintenance of EcoSan toilets, including excreta re-use.

Field Survey

A survey of 31 households with EcoSan toilets was conducted in peri-urban and rural communities in Hai district (Headquarter, and Northern & Southern parts respectively). The toilets had been in operation for 1 to 5 years. Representative of households were interviewed to collect information on use, maintenance behaviors, household knowledge and attitudes regarding the toilets. In addition, sanitary inspection of the toilets was conducted to collect information about use, maintenance, cleanliness, and presence of additives. Furthermore, focus group discussion (FDG) between district officials and trained masons were administered to look on hindrances and ways forward in increasing the number of EcoSan toilets.

Table 1: Household EcoSan toilets in Hai District

Location	Soil condition	No. of Demonstration EcoSan toilets - baseline 2002	Total No. household with EcoSan toilet 2007	General Observations/Remarks
Southern Part	Hard rock	2	21	<ul style="list-style-type: none"> EcoSan is easy to construct Urine is collected and used in agriculture
Central part (District Headquarter)	Hard rock	1	2	<ul style="list-style-type: none"> Urine is percolated Other options (e.g. Pour flush offset pit and septic tank system) more preferred
Northern Part	Clay Stable soil	2	8	<ul style="list-style-type: none"> Urine is percolated There are other options (e.g. pit latrine) more preferred
Total		5	31	

Parallel survey was conducted in schools with EcoSan urine diverting toilets in Hai district (Bomang'ombe primary school) and Chole district (10 primary schools). Some students and teachers were interviewed.

General issues for both household and school EcoSan toilets

In discussing with the users and stakeholders (interview & FDG) there were some common issues and questions in regard with use of the toilets and people's perspectives about the technology. Major issues lies on EcoSan pans, washing/bathing place, pharmaceuticals and pathogen residues in urine and sanitized feces, Cultural considerations and market for EcoSan toilet byproducts. This section will look on all issues arise and the ways forward as given by the users.

EcoSan pans including Place for anal cleansing

The pans (squatting or seating) have cement finish (figure 4). Users declare some problems in the urine bowl and anal cleaning bowl including blockage of pipes and difficulty to wash. Some nitpicked materials used to make the pans; they do not appeal to eye to look modern/urban (may suit only rural areas). Generally, people cherished the initiatives made to introduce the technology, recommending other materials (e.g. ceramic) in making the pans more ideal and user friendly.



EcoSan squatting pan – Innovated & Promoted by EEPKO.



EcoSan seating pan – Innovated & Promoted by EEPKO. Approximate cost



EcoSan squatting pan – Promoted by Water and Environmental Project Management organization (WEPKO). Photo by EEPKO 2007.

The pans are well designed for urine diversion. Material used (concrete) may be unpleasant to some people (especially in urban/peri-urban). People want to see and use modern goods. Taking an example of water closets (WC – figure 5) everybody likes to have it even in water scarce areas where pour flush option is to be used.

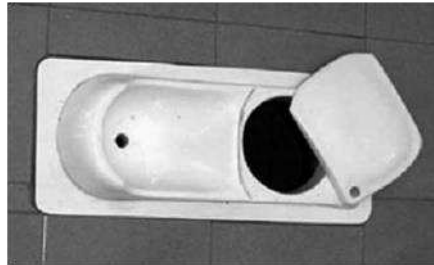
Figure 5: Squatting WC usually used in Tanzania (mostly imported from India and China). Photo by EEPKO 2006
Approximate costs of the WC/pan:
Chinese = US \$ 6.7,
Indian = US \$ 7.5



To make the EcoSan toilets more ideal and attract majority some improvements in the pans is inevitable. Affordable urine diverting ecosan pans (locally manufactured or imported) therefore may be required (noted examples in figure 6).



Composting toilet with urine separation (China) – Source: Christine Werner, Patrick Bracken, Florian Klingel



Urine diverting dry toilet in Guangxi-Province, China – Source: Christine Werner



Urine diversion and dry composting of fecal matter atTingvall conference center Sweden.
Source Prof Dr. Petter D. Jenssen

Figure 6: Examples of ideal urine diverting EcoSan Pans

Handling and reuse of Urine

No reservations were shown by the toilets users regarding reuse of sanitized fecal matter. Storage time (1 – 2 years) was said sufficient to sanitize the fecal mater. Community raised questions about handling and reuse of urine as fertilizer. They questioned on possibility of pathogens and pharmaceuticals residues in the urine, and risk that may occur during handling of the urine and bioaccumulation of pharmaceuticals in the plants (some quotes from respondents – box 2).

Box 2: Quotes from respondents regarding handling and reuse of urine.

- “There must be diseases causing microorganism in urine. Doctors frequently asked sick people to bring urine for diagnosis so I think urine is risky and needs special treatment rather than collecting, storing and reusing it”
- “When I took antibiotic pills its smell smells in my urine this means to me that some pills residues are excreted with my urine what will happen to the plants when I apply the urine as fertilizer?”
- “Sometimes plant dies when we urinate on them frequently, now we are told to apply urine in our crops we are afraid”.
- “Diluting urine before use is a problem. We do not know the dilution factor/ratio and how to avoid smell”.
- “I can not eat garden products knowing that urine was applied as fertilizer”

In fact, majority of the people using urine diverting toilets have apprehension in using the urine as fertilizer. In Majumbasita pilot area, only 46% of households using EcoSan toilets have started using urine as fertilizer in their gardens/plants (Shayo 2003). The remaining 54% are not reusing the urine due to some uncertainties.

No intensive research done in the country to substantiate absence or presence of pathogens, heavy metals or residue of pharmaceuticals in urine from the toilets. According to Caroline Schönning (2004), faecal contamination of the diverted urine is probably the higher risk and storage before fertilizing is recommended.

Market for byproducts from EcoSan Toilets

Under peri-urban conditions, not all households are engaged in agriculture and therefore do not need the byproducts as fertilizer. In addition, reuse of human excreta is still new concept and there are some reservations as described in the previous section. Currently there is no reliable market for the byproducts.

Washing/bathing place

In most circumstances, other options like pit latrines, pour flush, water closets, the toilets are also used as bathing rooms. No provision for bathing in the EcoSan toilet. People are complaining about the situation and some users are bathing on the top slab of the standby vault, as a result some water mixed with the faecal in the other vault hence become difficult to sanitize the faeces.

Conclusion

Dry urine diversion EcoSan toilets are accepted in the areas built. The community welcomed the EcoSan as a solution to latrines construction in their areas as they found it permanent, simple, durable, affordable, environmentally friendly and hygienically safe (Shayo 2003). However, people's reservations and attitudes should be addressed to make the toilets users friendly and attract more people.

Recommendations

- For Tanzanian context, research is required to examine potential harmful substances (pathogens, heavy metals, commonly used pharmaceuticals and hazardous organic substances) in urine and examine retention time for urine storage and dilution requirements.
- Alternatives of utilizing urine should be considered including; -
 - i. Use of urine as a catalyst to solid wastes composting. The use of urine as a starter for composting (household waste or agricultural residues) is an ideal approach in countries with water shortage and a promising alternative to the direct use of liquid urine (Kerstin Bark et al 2004).
 - ii. Subsurface infiltration. Cultivation of plant out of the toilet is recommended where subsurface infiltration in combination with wash water will nourish the plants.
- To promote use of byproducts from EcoSan toilets hence create its market/demand, a project of collection and reuse of the byproducts on a large scale in the country is recommended.
- EcoSan actors countrywide should find alternative of improving urine diversion EcoSan pans to make them more ideal, attractive and hence self incentive.
- Consideration for ideal Washing/bathing place as component for EcoSan toilet is recommended.
- Reflection of people's culture/customs on use of toilets is very important factor in planning, designing and implementing EcoSan projects.

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