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SUSTAINABLE DEVELOPMENT OF WATER RESOURCES, WATER SUPPLY AND ENVIRONMENTAL SANITATION

Towards a sanitation selection algorithm for enhancing decentralized service delivery

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In Uganda, sanitation coverage is estimated at 53% and 39% for urban and rural areas respectively. The national coverage is 41%. Lack of proper sanitation potentially leads to environmental health problems, which in many cases cost lives and impact on health of a community and family income as more money is spent on medication. This leads to a vicious circle of poverty. The objective of this study was to collect information on the current practices in selection of sanitation arrangements and use it to develop a simple algorithm for use by decision makers and district staff to advise households on selection of appropriate sanitation systems. Currently, there is no streamlined criterion used. People select systems based on what they are used to. Consequently, traditional pit latrines are the commonest sanitation system used. These toilet systems however, are disadvantageous due to: difficult soils (rocky, collapsing formations and areas with high water table); when full, require that new pits are dug, which is expensive and in the dense settlements this is inhibited by lack of space for new pits. As a starting point, we have proposed a simple algorithm that can be used by decentralized districts to give guidance to households in the selection of sanitation systems. The principle of the sanitation ladder, where people choose from the whole range of options, and select systems based on site conditions, affordability as well as user acceptance and perceptions applies. At the next phase, we intend to carry out detailed consultations to get specific information on user preferences, develop costs for all categories and package the information in an easy to use document for awareness creation, advocacy and promotion of sanitation

Introduction

According to WHO/UNICEF (2005), Uganda's sanitation coverage is at 53% and 39% for urban and rural areas respectively. The national coverage is approximately 41%. Globally, the Millennium Development Goals (MDGs) on sanitation require that 2.4 billion additional people have adequate sanitation by the end of 2015. For this target to be met, approximately 440,000 people need to be served every day (Drangert, 2005). In Uganda, lack of adequate sanitation potentially exposes people to a risk of contracting infectious diseases such as cholera, dysentery, diarrhoea and others (NWSC/World Bank, 2002; KCC, 1999, 1998).

Possible reasons why sanitation coverage is low are that most sanitation initiatives are funded alongside water projects, but the bulk of the funding and activities concentrate on water supply. This is usually the case as sanitation in Uganda is considered a private issue (Nakiboneka, 1998). Additionally, the responsibility of sanitation in Uganda is spread over three different sectors, viz: Health, Education and Water. All these sectors have given sanitation a very low priority. Inter-sectoral collaboration has formally been almost non-existent (MFPED, 2003). Further, Uganda is characterised by high illiteracy rates. This may impact on the choice of sanitation systems in view of the fact that there is no documented selection criteria. It is important that such information is developed but equally important, also is that the information should be packaged in an easy to understand manner, probably demonstrated pictorially.

To improve sanitation, there is no single technology option that should be universally favoured. Indeed, a wider choice of sanitation options exists (flush toilet systems connected to a wastewater treatment plant, various types of pit latrines, septic tank systems, composting toilets and various types of dry urine diverting ecosan toilets). It is important that sanitation systems fit to a wide array of local physical (sloping to flat, rocky to sandy, inundated to dry, water rich to water scarce, high-density to low-density settlements etc), cultural and economic conditions. In the decentralised governance structures, resources are usually stretched making it difficult to manage public utilities. Further, decentralised sanitation systems may require less managerial inputs probably suiting them for application in most situations in Uganda.

Objectives

The objective of this research was to collect information on current practices for selecting sanitation arrangements and to use it to construct a simple algorithm for use by decision makers and district staff to choose appropriate sanitation systems for urban, peri-urban and rural areas taking into account users' social economic status, perceptions as well as technical site considerations.

The specific objectives were to:

- Conduct a situation analysis (through interviews, field visits and observations) on the current sanitation systems used in selected districts and their suitability with respect to local site conditions;
- Conduct a social inquiry into the acceptance, perceptions and/or cultural taboos on use of the different sanitation systems;
- Obtain information on performance of sanitation systems and related incidences such as pit collapse, difficult areas of pit latrine construction and other information that may be limiting or beneficial to different sanitation systems;
- Carry out focus group discussions on a wide range of sanitation systems, their advantages and limitations and, establish selection criteria with grassroots communities and district staff;
- Analyse the data collected in the above and based on this, compile a report with a proposed simple selection algorithm for enabling households choose appropriate sanitation arrangements.

Materials and methods

The study was carried out in four districts of Kisoro, Kanungu, Mbarara and Rakai. The criteria for selection in relation to sanitation/decentralisation challenges often experienced was: Kisoro – Most areas are characterised by rocky ground, Kanungu – a relatively new/upcoming district facing many decentralisation challenges; Mbarara – the town area is characterised by high population density; Rakai – many areas are characterised by loose soils and pit latrine collapse is often experienced. In all of these districts, except Rakai ecosan toilets are being piloted.

Development of field data collection instruments

The research team designed individual interview questions for the key informants (KI) and a questionnaire guide for Focus Group Discussions (FGDs). Individual interview questions were pre-tested on a random sample of 5 staff from the Department of Civil Engineering and then the final questions for key informants were modified accordingly. The FGD guide was not pre-tested due to lack of resources and time.

Literature review

A literature review was conducted on sanitation technologies used in the study areas and internationally. Information was obtained on the siting of the sanitation facilities, design, functionality, operation and maintenance, user perceptions and attitudes as well as previously documented sanitation system selection algorithms.

Field visits, interview and FGDs

The research team liaised with Chief Administrative Officers (CAOs) to get to the districts. In total, seven FGDs were conducted; one in Mbarara and two 2 FGDS in each of the remaining three districts. Face to face interviews were held with 10 key informants using guided questionnaire. Key informants that were interviewed included District Water Officer (DWO) and Assistants, District Health Inspector (DHI) and Health Inspectors (His). The KIs were interviewed during work hours. Therefore, the number of KIs interviewed depended on the availability of persons at their place of work during the field visit to each of the districts. Other tasks involved inspection of sanitation facilities and taking field notes.

Data analysis and report writing

The data was analysed using M/S excel. Basing on the data, a preliminary simple sanitation system selection algorithm was proposed. A report of the findings was compiled using M/S word.

Results and Discussion

Situation analysis

It was reported by eight out of the ten KIs, and during all of the FGDS that there was lack of guidance in the planning, siting and design of any sanitation system.

The sanitation systems currently used in the field were traditional pit latrine and improved types, the dry urine diverting ecosan toilet, flush toilets connected to a sewage treatment plant as well as those connected to a septic tank.

The cost of sanitation facilities was a major limiting factor to ownership and probably affected choice, where more than one sanitation system was known. Table 1 presents some of the costs of the sanitation facilities that were reported during the interviews.

In all of the areas visited, at least some ecosan toilets had

Table 1. Costs of sanitation systems

Type of sanitation system	Costs (thousands of Ug.Shs.)[1]	Frequency
Flush toilet connected to a sewage treatment plant	1,300	1
Traditional pit latrines	106-200	5
Ventilated improved Pit latrines • 1 stance • 5 stance • 5 stance	 250 – 500 3,000-3,500 5,000	4 2 2
Urine diverting ecosan toilets • Household, Local materials • Household, brick (1 stance, 2 chambers) • Communal (2 stance, 4 vaults) • Communal (5 stances, 10 vaults)	 280 700 – 1,100 1,800 9,500	 1 4 1 1

[1] 1 USD is approximately Ug.Shs. 1800/=

Table 2. Problems linked with current sanitation systems

Problems	Reference sanitation system	Frequency
Poor operation and maintenance	Flush toilets	3
Collapsing soils	Pit latrines	2
Poor siting of wastewater treatment plant	Flush toilets	2
Rocky soils	Pit latrines	3
Inadequate funding	ALL	1
Cultural stigma	Ecosan toilets	1
High cost of installation	Flush toilets, ecosan, VIP	2
High water table	Pit latrines, unlined VIP	1
Poor hygiene	Pit latrines	1
High maintenance cost	Flush toilets	1

been constructed and were in use. Household ecosan units were properly used and the users did not have complaints. However, public and institutional ecosan toilets were associated with problems such as, scarcity of ash and the need for continual education of new users, who otherwise misused the toilets. Ownership of ecosan toilets was low due to their high cost of construction as reported by all of the ten KIs and during all the seven FGDS. It was pointed out that since the ecosan technology is new, not every one is aware of these systems and how they work.

Problems experienced with sanitation systems

Table 2 lists the range of problems reported by key informants with regard to the various sanitation systems used. The major problems were poor operation and maintenance and rocky soils. Other problems were collapsing soils, poor siting and high initial cost.

Proper siting, system improvement, use of alternative sustainable and cost effective sanitation options can solve the problems presented in Table 2. In particular, use of systems that promote recycling of human excreta may be additional advantageous.

Appropriateness of sanitation options

The appropriateness of the sanitation systems was ranked by FGDs as flush toilets>ecosan>ventilated improved pit latrines>traditional pit latrines (> is used to mean better than). This result was obtained at 6 of the 7 FGDs held. However, the reverse was reported when the costs were included in the ranking. It was strange that pit latrines were reported to be appropriate in Rakai district, an area otherwise known to have collapsing formations and where collapsed pit latrines were seen. This emphasized the need for guidance in selecting appropriate sanitation systems as we propose in the algorithm.

General

Selection of sanitation systems has been based on what the communities are used to. No guidance whatsoever has been given during the selection process.

Traditional pit latrines were the main sanitation systems used in all the four study districts. Although they are cheap, traditional pit latrines are inappropriate in areas with hard rock, high water table and collapsing formations as well as in the dense peri-urban settlements in the cities where plot sizes are small, making it hard to dig new pits wherever need arises.

Other sanitation systems such as ventilated improved pit latrines and flush toilets were used. However, their high costs of construction made them prohibitive and inappropriate for mostly low-income and some middle-income earners.

In general, KI respondents and members of the FGDs who had ecosan toilets considered them ideal especially at household level. However at public and institutional levels, the high initial cost, difficulty in getting additives (ash), blockage of urine pipes when ash is mistakenly put in the urine hole and generally a high operation and maintenance cost were mentioned as limiting factors in their use and operation.

A simple sanitation selection algorithm

A simple sanitation system selection algorithm is presented in Fig. 1. The algorithm is based on the concept of the sanitation ladder. The basic criteria of land availability, social and technical criteria are used to recommend the cheapest sanitation technologies, namely: the pit latrine followed by the Fossa Alterna and Double Vault Urine Diverting (DVUD) toilet. At the second level, a DVUD ecosan toilet is suggested not because it is cheap, but as a suitable onsite sustainable sanitation option. Sanitation technologies increase in cost as you go down the ladder. As you move down the ladder, even the most expensive and sophisticated i.e., flush toilet connected to a sewage treatment plant, considered the best by many (as they flush and forget) but a headache to wastewater treatment operators and down stream residents, may not be technically or economically feasible. At this stage, intensive education, sensitisation, awareness creation, social marketing (with or without some compromise to some environmental or socio-factors) should be done to convince the people to take up any of the sanitation systems proposed at the very end (bottom) and to the right of Fig. 1. User preference should prevail where more than one sanitation technology option seems technically, socially and economically feasible. Compared to the suggested and more complex sanitation system selection algorithms (Kalbermatten et al., 1982 Drangert, 2005), the suggested model is very simple to use, and useful for planning and implementation of sanitation systems. The algorithm is applicable to rural, peri-urban and urban areas. It can be used by anybody with basic understanding of sanitation systems and site conditions.

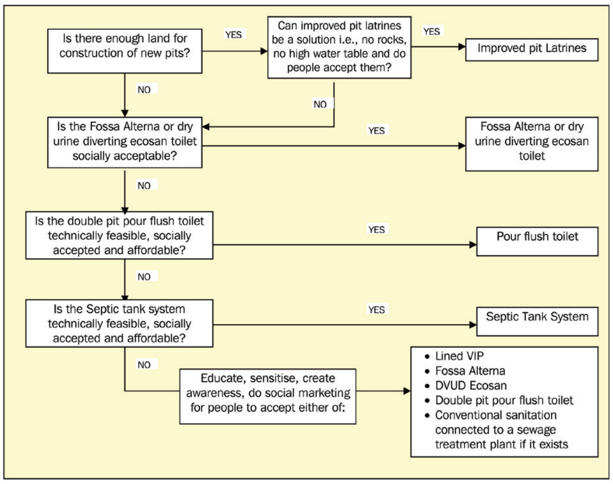

Figure 1. Flow chart showing the proposed sanitation system selection algorithm

Conclusions

No single technology option should be favoured as a means of sanitation improvement. System selection should consider physical (sloping to flat, rocky to sandy, inundated to dry, water rich to water scarce, high-density to low-density settlements etc), cultural and economic conditions. The menu of the different alternatives should be presented to people so that they can choose what fits them in view of the aforementioned.

There were no social or cultural taboos reported against the adoption of all sanitation systems included in the preliminary algorithm. However, new sanitation systems present challenges in construction, use, operation and maintenance. Therefore, people should be sensitised about important technical aspects of new systems.

The preliminary sanitation system selection algorithm that has been constructed needs to be updated with specific information on user preferences and tested as well. During the next phase, external factors such as gender issues, treatment of excreta to assure safe re-use (and/or disposal), other demand drivers and availability of supplementary but important operational requirements e.g., additives (for dry urine diverting ecosan toilets) and water (for water using systems) will be accounted for.

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