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SUSTAINABLE DEVELOPMENT OF WATER RESOURCES, WATER SUPPLY AND ENVIRONMENTAL SANITATION

Provision of sustainable sanitation in emergency situations: role of ecosan

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This paper describes the potential of ecological sanitation (ecosan), and in particular of urine-diversion dehydrating (UDD) toilets, to provide sustainable excreta disposal in emergency situations in low-income countries. Three case studies of emergency sanitation were analysed: El Salvador (hurricane), Afghanistan (civil war) and Pakistan (earthquake). The analysis of these case studies has shown that the systems implemented in the long-term phase of the emergency were sometimes more sustainable than what was in place before the emergency occurred. For UDD toilets to be viable during emergency situations, specific criteria have to be in place. The essential criteria include awareness and expertise among aid agencies, ease of transportation and quick installation of standardised UDD units, stage and duration of emergency and the role of government in sanitation provision. For emergency situations in low-income countries, we propose the use of UDD toilets (e.g. with pre-fabricated urine-diversion squatting pans) as a suitable excreta management option, particularly in those instances where pit latrines are not sustainable in the longer term.

Introduction

Natural or man-made disasters cause emergency situations, which affect people's lives, the infrastructure that supports them and their natural environment. In low-income countries, the existing infrastructure is often weak and insufficient to start with, which makes the impact of the emergency even more severe. One of the major causes of diseases during emergency situations is lack of proper sanitation facilities. The stages of an emergency situation range from "immediate term" (1-2 months) to "short term" (2-6 months) to "long term" (6 months to several years, e.g. for internally displaced people camps).

Aid agencies tend to implement sanitation systems that are well known to them even if they may not be sustainable in the long term, since they are not normally meant to be long-term solutions. Currently the excreta disposal practices used in emergency situations in low-income countries include open field defecation, shallow and deep trench latrines, pit latrines and pour flush latrines (Harvey et al., 2002). The most common method of excreta disposal implemented by aid agencies during emergency situations is currently the simple pit latrine. The problem is that when the emergency has passed and the aid agencies have left, people in low-income countries will often continue to use these pit latrines, which can become unsustainable in the longer term if:

- The groundwater table is high;
- Karst geology or ground that is underlain by pervious rock leading to a rapid rate of groundwater movement and potential for groundwater contamination (in combination with shallow wells being used as a water supply

source);

- Area has a potential for flooding;
- Soil type is rocky (hard to excavate);
- No space to dig new pits or no means to empty full pits and to treat faecal sludge;
- Population density is high; or
- Situation has lack of security (since pit latrines have to be built in some distance from the settlements).

It would therefore be useful to have an alternative sanitation option which is more sustainable. Ecological sanitation (ecosan) is an alternative approach to sanitation provision that strives to be sustainable in all aspects. The nutrients that can be recovered from human excreta can be used in agriculture, hence preserving soil fertility and ensuring food security, which is particularly important for the nutrient-depleted soils in Africa. The main difference between ecosan and conventional pit-based on-site sanitation systems is that the former does not necessarily rely on the soil for infiltration of liquids. Another feature is that ecosan aims to enable safe, hygienic reuse of nutrients in agriculture. An ecosan approach will be particularly beneficial in those cases where traditional excreta disposal practices fail.

A concern with ecosan concepts, which is sometimes raised in discussions, is the issue of reuse of the sanitised excreta in agriculture. But this consideration should not be regarded as a limiting factor because reuse can still be implemented at a later stage after the affected population has been informed about the benefits of this practice. Reuse of excreta should be the final aim of any ecosan approach, but we postulate that it is not essential in the beginning of a project, particularly in emergency situations.

Table 1. Analysis of emergency sanitation case studies (“UDD toilet” stands for urine-diversion dehydrating toilet)

	Case 1 El Salvador, hurricane	Case 2 Afghanistan, civil war	Case 3 Pakistan, earthquake
Type, date and location of disaster (reference)	Hurricane in 1998, Ahuachapan, Sonsonate, La Paz and San Vicente (MSFH, 2000)	Civil war during 1992 – 1995, Kabul (Reed and Khan, 2003)	Earthquake in Oct 2005, Muzafarabad, Hattian, Lamnian (MSFH 2005a, 2005b)
Stage of emergency covered in report	Long term 1998-2001	Long term 1996-2003	Immediate to short term 2005
Water supply situation before disaster	Wells	Thousands of hand-dug wells due to shallow aquifer	Town water supply from protected and unprotected springs (water treatment plant to concrete reservoir)
Sanitation systems before the disaster	Traditional pit latrines	Poorly maintained vault latrines with unsanitised excreta being reused by farmers	Pour flush latrines, septic tanks and conventional sewer system discharging into a river without treatment
Sanitation systems after the disaster	LASF latrines (La Letrina Abonera Seca Familiar – also known as UDD toilets); urine is not reused but infiltrated into the ground (2,430 LASF latrines built)	Better managed, improved vault latrines with urine diversion, i.e. UDD toilets (urine is not reused but infiltrated into the ground); sanitised excreta being reused by farmers (47,000 latrines built)	Pit latrines (shallow or deep); 500 pit latrines built in Muzafarabad, 250 pit latrines in Hattian, number for Lamnian not known but fewer in number
Reasons for using this new type of sanitation system after the disaster	LASF system in use in country already and the area is prone to flooding	Existing practice of excreta reuse and use of raised vault latrines with tank for containment	Dry system required due to breakdown of the water supply system
People’s perception of new infrastructure	Approx. 90% of the affected population were satisfied with it, according to survey results	Very much appreciated because it was similar to what was in existence before	The affected population accepted this system even though they were used to water borne sanitation (pour flush toilets)
What could have been done better in connection with the new sanitation system?	More awareness raising; analyse possible groundwater contamination by urine infiltration; consider options for reuse of urine	More awareness raising since farmers still use fresh excreta on their farms; building of double vault latrines to allow enough time for sanitising the excreta; analyse possible groundwater contamination due to urine infiltration.	Introduction of UDD toilets; since people are new to the pit latrines (dry sanitation), this could have served as a chance to introduce ecosan. Note: third hole would be required for “washers”; anal wash water would require separate treatment

Analysis of emergency sanitation case studies

We analysed three representative case studies for sanitation provision during/after emergency situations in low-income countries, and this analysis is summarised in Table 1. Further details are provided in Mwase (2006). It was difficult to obtain detailed reports on sanitation provision in emergency situations because of lack of donor emphasis on sanitation let alone its documentation. The three case studies analysed have shown that ecosan-compatible technologies can be successfully implemented in the long-term phase of the emergency, e.g. the LASF latrines (La Letrina Abonera Seca Familiar) and the vault latrines (both are UDD toilets without reuse of urine) used in El Salvador and Afghanistan, respectively. We also found that at least for the El Salvador and Afghanistan case, the systems implemented in the long-term phase of the emergency were more sustainable than what was in place

before the emergency occurred.

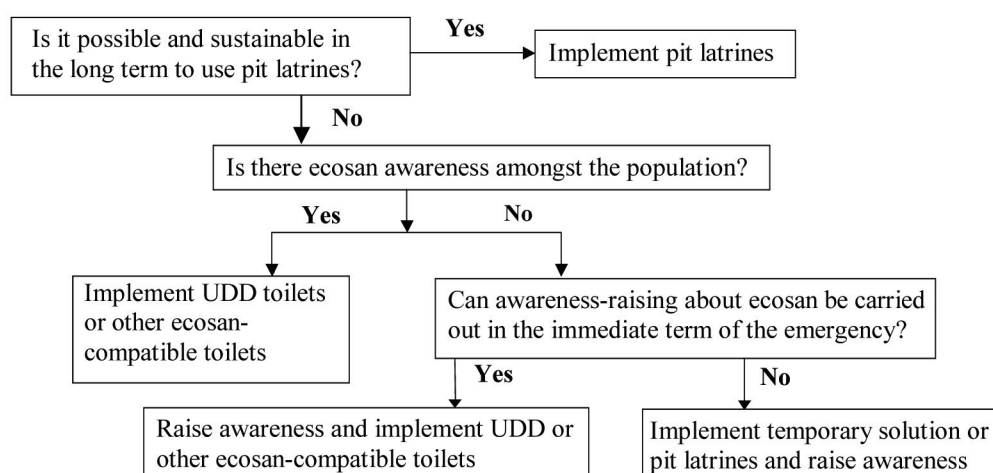
Criteria for applicability of ecosan

Ecosan “hardware” options include toilets with or without urine diverting (UD) squatting pans or pedestals, which use water for flushing or use no water. In emergency situations, urine-diversion dehydrating (UDD) toilets are generally preferable to other ecosan options because of the general lack of water during emergencies, and also because of the simplicity to manage UDD toilets compared to composting toilets.

The main reasons why ecosan options have not been used or even considered in emergency sanitation provision are likely to be the relative novelty of the technology and the lack of knowledge amongst aid agencies. To help aid agencies with making informed choices on the applicability of ecosan for a specific emergency situation, we developed a list of criteria (Table 2) and a simplified decision flow chart

Table 2. Criteria for applicability of urine-diversion dehydrating (UDD) toilets during emergencies (first 4 are essential, last 4 are desirable)

Criterion	When UDD toilets are very applicable	When UDD toilets are less applicable	Recommendations for increased sustainability
1.) Awareness and expertise on ecosan amongst aid agencies	Previous implementation of similar projects by same aid agency	Absence of expertise on ecosan in the agencies	Increase awareness of ecosan amongst aid agencies through education and training
2.) Availability of standardised and easy to assemble and transport UDD toilets	When standardised UD toilets/slabs are locally available or when they can be brought for quick installation	UD toilets/slabs (or equivalent) not available	Develop design standards for UDD toilets that are lightweight and quick to assemble and install
3.) Stage of emergency	Medium to long-term (2 months to years)	Immediate term (1-2 months) if no ecosan awareness exists	Raise awareness in country already before emergency; install demonstration facilities
4.) Role of government in sanitation provision	Present; active involvement of government at all levels and support for an ecosan approach	Absent	Increase advocacy within government departments to promote use of sustainable sanitation systems
5.) Awareness of ecosan amongst users	Pre-existing awareness (users understand sustainability issues)	Existing negative attitude about ecosan due to past failed projects	Increase awareness of ecosan amongst population through various campaigns
6.) Availability of land for reuse; current fertiliser practices	Land available; soil depleted of nutrients and soil conditioners	Excreta cannot be re-used and even no space for dumping	Set aside land for small-scale (urban) agriculture, e.g. in long-term camps
7.) Collaboration between the different aid agencies; coordination with other reconstruction projects	Collaboration is present	No collaboration	Influence donors to encourage aid agencies to consider the sustainability of implemented sanitation system
8.) Recognised need for alternative to pit latrine	For example high groundwater table, flooding, hard to excavate, karst geology, groundwater used for drinking water	Local ground conditions suitable for pit latrines	Thoroughly investigate local conditions considering possible <i>long-term</i> use and effects

**Figure 1. Simplified decision flow chart for assessing whether and how ecosan could be implemented as excreta management option in emergency situation**

(Figure 1).

This list was developed with input from experts who are active on the Ecosanres Discussion Forum (www.ecosanres.org – a closed discussion group with currently 191 members founded in 2002).

A very important criterion is the availability of standardised units ready to install. There is an urgent need for developing UD slabs equivalent to the currently used “Oxfam slabs” for pit latrines.

Since the sanitation infrastructure for a large part of the population in low-income countries is in a poor state, emergency situations can in fact be seen as an opportunity to introduce the affected communities to sustainable sanitation systems, which can improve people’s living conditions as well as ensuring environmental protection.

It is therefore crucial that aid agencies and governments invest in sanitation systems that are safe and sustainable in emergency situations and thereafter.

Conclusions and recommendations

Emergency situations can be seen as an opportunity to improve sanitation in low-income countries in a sustainable manner by rebuilding or replacing the existing sanitation systems with sustainable solutions. We propose that the use of UDD toilets (along the lines of an ecosan approach) should be given due consideration, especially (but not only) when conventional pit-based sanitation systems are not appropriate. We recommend that aid agencies should:

- Encourage capacity building in their organisations to broaden their expertise and awareness about new types of excreta disposal systems e.g. by enrolling in courses at relevant educational institutions;
- Ensure government in the affected countries is involved and takes ownership of sanitation related development projects;
- Collaborate with other aid agencies in promoting sanitation systems that are safe and sustainable;
- Incorporate sustainable sanitation technologies in their other development projects such as improving shelter and water supply.

Further research and development is required regarding the design details of standardised ecosan-compatible toilets that are appropriate for emergency situations in different low-income countries.

The main concern in poor excreta disposal is the presence of pathogens in human excreta that can lead to disease

transmission. However, the other emergency sanitation areas such as wastewater management, hygiene promotion, solid waste management and waste management at medical centres can also have the same disastrous effect. Therefore, research should be carried out to determine how existing approaches can be improved in the context of an overall ecosan approach. Also, the relationship between an ecosan approach and the emergency water supply approach needs to be considered.

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