

## 41<sup>st</sup> WEDC International Conference, Egerton University, Nakuru, Kenya, 2018

### TRANSFORMATION TOWARDS SUSTAINABLE AND RESILIENT WASH SERVICES

#### **When faecal sludge reuse doesn't work: a look at access for the poorest and people with disabilities in urban Malawi**

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PAPER 2915

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*Reusing faecal sludge to generate value has the potential to contribute towards solving the issue of long term sanitation solutions in cities across Sub-Saharan Africa. This research was conducted to evaluate the potential for faecal sludge reuse in Malawi, and the difficulties and challenges to existing attempts at reuse in a city. We conducted 65 semi-structured interviews in a city of Malawi. The results show that two main approaches exist currently: The implementation of Skyloos as above ground household toilets which provide compost; and a central disposal site from which compost is illegally harvested. Both existing approaches to faecal sludge management and reuse were found to be inaccessible and not working when implemented for the poorest and people with disabilities.*

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#### **Introduction**

Access to sanitation in Sub-Saharan Africa has been shown to be an issue for people with disabilities (White, et al., 2016; Biran et al., 2018), with accessible design often failing and being cited as a large barrier by users. Treatment of faecal sludge in developing countries also often fails following construction due to low operational capacity and lack of finance for maintenance (Strande, et al., 2014). Malawi, a low-income country in Sub-Saharan Africa, has challenges in terms of providing safe sanitation and faecal sludge treatment in cities. Nationwide, 33% of the population relies on either unimproved sanitation facilities or practices open defecation (UNICEF and WHO, 2017).

One potential solution to limited treatment and improved household sanitation has been the building of ecological sanitation (Ecosan) facilities (Langergraber and Muelleger, 2005). Development projects in Malawi have used Skyloo toilets to solve the problem of treatment and reuse of faecal sludge in agriculture, high groundwater and lack of space for facilities. They are an adaptation of the Fossa Alterna, using two dry pits above ground surface that can be alternated whilst allowing the other pit to produce compost (Eawag, 2014). The raised pits prevents flooding and pit collapse that can be common in areas of high groundwater.

The economic potential for resource recovery from faecal sludge to provide a financial driver for improved sanitation has been shown Africa (Diener, et al., 2014; Murray, et al., 2011; Mallory et al, 2016). Suitability of faecal sludge recycling to generate economic value as a profitable operation depends on the context in terms of local culture and infrastructure, perceptions of waste-based products and availability of competing products. In Malawi, illegal disposal and reuse in agriculture by people in surrounding urban areas are practiced (Chiposa, et al., 2017). Increasing urbanisation and limited property space in Malawi makes the emptying of pit latrines, the most common form of sanitation facility, an increasing difficulty for households (Chunga, et al., 2016; Chirwa, et al., 2017).

This research, which is part of a wider study of urban reuse of faecal sludge, investigates the issues of equitable access to sanitation and faecal sludge reuse in a city of Malawi, by looking at the implementation of Skyloo facilities and direct reuse of sludge in agriculture, and how well suited they are to people with disabilities and the poorest members of society.

## Method

### Data collection

Our case study was conducted in a city in Malawi in 2016 and 2017. The exact location has been withheld from publication since many of the activities reported are illegal. In the study city, there is a central site for disposing faecal sludge managed by the local government that mostly receives waste from formal settlement areas and institutions with septic tanks, carried to the site with a vacuum tanker, however it was closed for rehabilitation during the time of this study. There have also been initiatives from several NGOs to implement composting toilets. Our study was limited to assessing the Skyloo latrine (ecological sanitation) design. In the study area, Skyloos have been introduced to improve household sanitation and provide compost for households that had previously relied on unimproved pit latrines, shared latrines or open defecation (Table 1).

Semi-structured interviews were conducted in three purposely selected urban neighbourhoods of high density population within the city. Interviewees were asked about their sanitation services, awareness and perceptions of services and potential for reuse of faecal sludge in energy or agriculture. Interviews were conducted to look at the existing forms of faecal sludge reuse, including household composting toilets and application of sludge from the central treatment site. Interviews were conducted with users who had composting toilets ( $n=47$ ) and farmers who applied faecal sludge ( $n=11$ ) either directly collected or diverted from the disposal site to understand the issues surrounding reuse in urban Malawi. A purposive selection of Skyloo interviewees were chosen from all known projects with a sample of between five and 15 interviewees from each, depending on the number of people each project served and ability to find interviewees by snowball sampling. Skyloo users were asked about how they had been introduced to the technology, how they had financed the purchase of the toilet, and how they found the use of the toilet and compost. Farmers residing adjacent the central treatment site and using untreated sludge in agriculture were selected until the snowball sampling led back to the people who had already either participated or not consented to the research. Farmers who used faecal sludge from the disposal site were asked about how they used it, difficulties with access and how it compared to normal fertiliser.

### Data analysis

Interviews were conducted in the preferred language of the interviewee and transcribed within 24 hours. Photographs were also used to capture individual cases representative of result themes. The interview transcripts were coded thematically using Nvivo 11 according to guidelines set out by Robson and McCartan (2016). One of the major themes that emerged from the data analysis was that of equitable access to both sanitation services and reuse of faecal sludge being insufficient. This aspect of when faecal sludge reuse does not work is explored in the results.

### Ethical statement

This research had ethical approval from The University of Edinburgh and the Republic of Malawi National Commission for Science and Technology.

**Table 1. Skyloo Projects**

<b>Project</b>	<b>Financing Approach</b>	<b>Material Contributions by User</b>	<b>Sensitisation Approach</b>	<b>Target User</b>	<b>Year of Project Implementation</b>
1	100% subsidised by donors	No	Presented different options then built technology	Urban families of orphaned children through faith based organisation	2014-15
2	Loan for house and Skyloo combined	No	Provided standard house and sanitation design	Urban poor	2010
3	Loans to households from donor fund for urban development	No	Marketed technology in urban areas and provided loan for construction	Urban residents	2010-2016
4	Loans to households with donor collateral	Bricks and sand and optional further contribution	Marketed technology in urban areas and provided loan for construction	Urban residents	2012
5	Loan for house and Skyloo combined	Mudbrick contributions	Provided standard house and sanitation design	Urban poor without housing	2007-2010

## Results

It was clear from the fact that 20 interviewees out of 59 interviewees using Skyloos or applying faecal sludge mentioned issues of limited access to sanitation that current forms of reuse being practiced are not inclusive designs that achieve equitable access to sanitation. This was especially true for donor driven projects aiming to target vulnerable children or people with disabilities. The reuse of faecal sludge from the disposal ponds is physically demanding in terms of transport (walking with a heavy load of sludge carried on the head), making it difficult for people with certain disabilities to be able to access manure for organic fertiliser, with 11/12 farmers interviewed having to transport large weights (50kg+) of sludge manually for use in agriculture:

*“There are accessibility problems especially in rainy season because it’s very heavy to carry while in dry season it is easy to access but now more difficult”*  
 (Farmer Using Sludge)

*“Since I started using I’ve had high yields for consumption and for sale. I have a 1 acre and a 2 acre farm. Transport is the main issue as I have to carry but if I could transport to here I could maybe use the sludge here also”*  
 (Farmer Using Sludge)

Skyloo toilets also have issues with being an accessible design for physically vulnerable or disabled people and children. 10/48 Skyloo users cited issues of children using the Skyloo correctly, with them often forgetting to add ash or divert urine correctly, and seven users let the children use a pit latrine instead:

*“It’s ok but somehow it is difficult to use as with the children they get confused. To me I would prefer a pit latrine.”*  
 (Skyloo User, Project 2, Female, 57)

The issue of physical strength affecting the tools and knowledge to maintain and use Skyloos was particularly prominent in project 1, where the Skyloos were being built for families that often supported many orphaned children and would be considered ultra-poor. Some of the recipients and family members were also suffering from HIV and too poor to afford basic tools for accessing the back of the Skyloo:

*“For small children and old people though, it (the Skyloo design) is not best. For my mother she fell from the steps once and is still having problems with her knee. But for me there’s no problem..... If I see benefits of it I’ll use. For now I’ll use a pit latrine.”*

(Skyloo User, Project 2, Female, 31, Skyloo shown in photograph 1)

*“So the concrete in the steps is starting to crack and the stairs are failing so I have had to remove the tree nearby as the roots are causing issues..... The other issue with harvest is that I am too weak to do it as I have HIV and am elderly so can’t open and do it.”*

(Skyloo User, Project 1, Female, 59, Skyloo shown in Photograph 2)



**Photograph 1. Abandoned Skyloo and latrine used instead (right)**

Source: Authors



**Photograph 2. Skyloo with tree removed and stairs**

Source: Authors

## Discussion

Much data was collected during the course of this study; only some of this had bearing on accessibility issues. However, it was clear from all the relevant data that both the domestic composting and the direct application of sludge in agriculture were approaches to reuse that currently fail to serve the most vulnerable members of the population. This suggests that in order to ensure that basic levels of sanitation are achieved among the poorest, the emphasis should be on ease of access rather than reuse due to the physical requirements. The physical demands of maintenance for faecal sludge reuse mean that the methods designed to promote it are currently not working as NGO solutions for the most vulnerable people. For implementing projects targeting people with disability and the poorest populations, the physical and time demands of technological options need to be considered. A handrail option for the Skyloo stairs was observed at one house, which may help to assist some people on a limited basis. While other ecological sanitation designs (non-elevated) could perhaps also be more accessible for users with special needs, below ground surface pits could still be prone to flooding and be labour intensive to empty for reuse.

## Conclusion

The potential for improved sanitation and faecal sludge reuse in agriculture either through Ecosan facilities such as Skyloos or direct reuse in agriculture could provide improved livelihoods in urban areas of Malawi when properly designed. Our research found both approaches are currently not suitable for the poorest members of society who are unable to afford basic tools or have time available for maintenance and operation tasks. They are also unsuitable for those with physical disabilities, with Skyloos use of stairs in design leading to difficulties of access and the transport of compost or faecal sludge being too physically intensive. To ensure equitable access to sanitation in urban areas for vulnerable people the design of household sanitation for beneficial reuse has to focus on ease of access and maintenance tasks as a priority. In terms of reuse in agriculture any designs intended to target vulnerable groups in society need to account for transport distances and intense physical requirements.

## Acknowledgements

The authors would like to extend thanks to The Bomford Trust and ESPRC for funding this research.

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