

# A Biotoilet for the Future?

Mwangi Mwaura and Mary Lawhon

What can a toilet tell us about people's understanding of ecology, their relationship to their surroundings, their aspirations for urban life? Toilets are mundane objects, a place where people go to do private business, a task we often prefer to think and talk about as little as possible. Yet toilets are also a key site where bodies and ecosystems connect and a useful space from which to rethink what infrastructure is, or ought to be.

Modern toilets that flush and are connected through a sewer to a water treatment facility have long been imagined as the pinnacle of sanitation, part of the modern infrastructure ideal of a uniform, universal infrastructure network (Graham and Marvin 2001). Yet there is an equally longstanding – and, in the context of ongoing environmental crises, a growing – sense that there is something flawed, something 'unnatural' about the modern imaginary. There might be a need to imagine, and act, differently (Lawhon and McCreary 2023; Lawhon et al. 2023).

This essay draws on participant observation and interviews at a biotoilet that has been in operation for ten years in Mathare, an informalized settlement in Nairobi. Mwangi conducted interviews for seven months in 2023 with members of Twaweza (Swahili for ‘together we can’) youth group who manage the toilet. Here, we explore tensions between a hope-filled new narrative in which bioinfrastructure enables more sustainable urban lives and resources remain under local control, and actual experiences of bioinfrastructure that require unreliable resources and relationships.

In Mathare, we can already find the coexistence of diverse off-grid sanitation models (Thieme 2017). While some still consider these to be placeholders as people wait for modern flushing toilets, others articulate a different pathway, one rooted in no longer waiting for modernity. Such toilets are infrastructures “of the now and the future” as one of our interlocutors stated in a focus group discussion in April 2023.

The sanitation configuration we focus on here includes an ablution block intended to produce two key benefits: green energy from the waste would fuel a cooker, and a biodigester would make faecal sludge that is no longer a health risk and can be used as nutrient-heavy compost. To most of those we spoke with, the necessity of toilets was evident: they would reduce open-air defecation and the flying toilet menace that had been prevalent in the area. What kind of toilet should be constructed, however, was less clear. There are, undoubtedly, politics to these decisions: who is to build what, how should a toilet be owned and maintained, and what happens to the resulting sewage are all questions with political and economic implications. They are underpinned by power-laden assumptions about what sort of infrastructure is ‘appropriate,’ plausible, affordable and deemed to be green (see Morales et al. 2014; Jackson and Robins 2018). Who gets to decide what sanitation arrives is often not entirely straightforward, but our respondents note that this particular toilet is related to their support for a local politician as well as European development funding. We are therefore mindful that the arrival of the toilet involved a complicated interplay of agents and agency. Further, we are cognizant of the limits of data and aware of the interests of our interlocutors: these are not neutral actors, but entrepreneurs with vested interests in the success of the toilet. Our entry-point to the site was long after the toilet’s arrival, and thus what follows reports and reflects on how those managing the toilet have come to narrate it.

At the beginning of the project, our respondents noted that most of the members were optimistic and curious about the possibility of a biotoilet. However, it was the idea of “turning your waste into a resource” – as the project was pitched to them – that was most appealing. One member, who has since been nicknamed Fundi (literally ‘knower’ or ‘technician’) by the group for his knowledge of how the toilet functions, expressed that he was fascinated with the building design and its underground biodigester.

To build the requisite infrastructure, members volunteered their services under the guidance of engineers and technicians from the funding NGO and received training on operation, management and maintenance. The biotoilet has changed the surrounding area, reducing open defecation and flying toilets. It is generally seen as affordable: families and two churches near the toilet pay a monthly fee and children access it for free. The space outside has been turned into a garden and the hall on the upper floor provides a social space for local residents.

The members of Twaweza youth group view the toilet as a resourceful infrastructure thanks to its double benefits. As the group's chairperson explained: "It is not only a toilet where you shit and forget about your waste; you are aware the waste is a resource that produces gas which you can cook with." Here, then, through its metabolic system, the toilet is described as valuable infrastructure for the community. During our interactions with members, they regularly stated they would highly recommend the installation of more biotoilets in Mathare. Some even took this point further, hoping that more green infrastructures – beyond just sanitation – can be set up in the settlement. One member in particular, who is also a community activist remarked: "It is time infrastructure works to harness the resources we have with us here instead of washing them away." In such comments, as well as our wider conversations, we find a hope-filled narrative that emphasizes placing agency in local hands, utilizing local labour and knowledge rather than relying on outside support. This is a narrative underpinned by a belief in progress and the idea that a better future is possible, but it fundamentally differs from the modern infrastructure ideal's assumptions of uniform, universal access to a single network managed by external experts.

Our story does not end here: despite this positive rhetoric, there are plenty of problems with the biotoilet. While this bioinfrastructure is admirable and has been beneficial, it is also considerably more demanding of labour. A lot of maintenance is required which, as one member complained, would not be necessary for a toilet connected to

*Biogas toilet tunnel cleaning at night.*  
Photo: Mwangi Mwaura,  
February 2023.



a sewer. The sludge tank has to be emptied every year, and in practice, this is done manually: members of the group use buckets to remove the waste. While the 'dry' sludge is supposed to be a resource in the form of manure, the group has never found a client for it. In the absence of someone else to help them close the loop, the sludge is put into the river.



**The new cooker being designed at the jua kali workshop.**

Photo: Kevin Ochieng (Twaweza Group), April 2023

Moreover, as is true for all infrastructure, some parts get broken and require repair, and this takes time and money. Unlike for more standardized infrastructure, however, the necessary parts sometimes take a long time to get hold of. For instance, for the last two years, the cooker has been missing. So, instead of using the gas as a resource, it has to be realized into the atmosphere periodically when it builds up. There is a sense of loss at the unavailability of this resource. The group is, however, in the process of acquiring a new cooker from a local *jua kali* ('technician workshop') who they have worked with in the design and making process.

Reflecting on the biotoilet and the associated labour leaves us with certain questions about nature, infrastructure and the future. From our conversations with those who work with and benefit from the toilet, we can find a hope-filled narrative of this infrastructure as being appropriate for the future, shifting agency and enabling more local access to resources. They see the metabolic labour of the toilet producing energy and bringing waste back into circuits of value as particularly beneficial aspects, in line with utilitarian green perspectives. The toilet is no longer new, but those working with it are also clear that it is a work still in formation: more is needed for this toilet to fulfil this potential. Knowledge and learning are crucial here, but what is sought and produced is not ivory tower theory; it is ways of innovating to make use of the knowledge, skills and materials already in the settlement. But connections are also essential: while there is a small garden associated with the toilet that acts as a social space (see Gonzalez 2021), there is a need for someone who wants the sludge, and a way to move it.

The biotoilet can be understood as part of ongoing shifts in thinking about what a good infrastructure configuration is, and can be, and the tensions involved in working towards infrastructures of the future. Good infrastructure, in this narrative, does not rely so much on elsewhere – neither the state to provide pipes nor hinterlands to manage the waste, even though there is an awareness that this might well be, on the whole, easier for those who work with the infrastructure. Yet good infrastructure cannot really be fully ‘localized’: in settlements of this density, sludge must go elsewhere; knowledge or parts from other places are needed to keep the cooker running. For now, those working with the infrastructure resourcefully make do while actively working to create a better infrastructure for the future.

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**Mwangi Mwaura** is a MSc student in the School of Geography and the Environment at the University of Oxford. His interests are on urban infrastructures, hustle economies and southern urbanism. He has published on various urban aspects including on the [Configuration of Mobile Telephony](#), [Survival as an Urban Way of Life](#) and [Demolition Colonialism in Nairobi](#).



**Mary Lawhon** is a Senior Lecturer in Human Geography at the University of Edinburgh. She is a political ecologist working on waste and sanitation infrastructure in African cities. She has published conceptual and empirical work on theorizing from the Global South, politicizing infrastructure and deepening understandings of contestations associated with sustainability transitions, including as two books: [Enough! A Modest Political Ecology for an Uncertain Future](#) and [Making Urban Theory: Learning and Unlearning through Southern Cities](#).

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