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The persistence of failure in water, sanitation and hygiene programming: a qualitative study

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ABSTRACT

Introduction Unsafe water, sanitation and hygiene (WASH) causes millions of deaths and disability-adjusted life-years annually. Despite global progress towards universal WASH, much of WASH programming continues to fail to improve health outcomes or be sustainable in the longer term, consistently falling short of internal performance indicators and sometimes negatively impacting the well-being of local stakeholders. Although sector experts in high-income countries have often provided explanations for such failures, the opinions of those implementing WASH programming at the ground level are rarely published.

Methods In 2020, we purposively recruited 108 front-line WASH professionals in Malawi, South Africa, Tanzania and Zimbabwe to participate in 96 in-depth interviews, explaining why they believe WASH failure persists. Through participatory analysis, including framework analysis with additional axial coding and member-checking of our findings, we determined the core reasons for WASH failure as perceived by participants.

Results Interviewees reported poor engagement and commitment of intended users, unrealistic and idealistic expectations held by funders and implementers, and a general lack of workforce and financial capacity as significant contributors to WASH failure. Our analysis shows that these issues stem from WASH programming being implemented as time and budget-constrained projects. This projectisation has led to reduced accountability of funders and implementers to intended users and a focus on measuring inputs and outputs rather than outcomes and impacts. It has also placed high expectations on intended users to sustain WASH services and behaviour change after projects officially end.

Conclusions Our findings imply that WASH programming needs to move away from projectisation towards long-term investments with associated accountability to local governments and longitudinal measurements of WASH access, as well as realistic considerations of the needs, abilities and priorities of intended users. Funders need to reconsider the status quo and how adjusting their systems could support sustainable WASH services.

WHAT IS ALREADY KNOWN ON THIS TOPIC

⇒ Water, sanitation and hygiene (WASH) programming is failing to be sustainable and thus improve health outcomes. Due to the sensitivity of the topic, the reality of why failure occurs at the implementation level has been largely unexplored.

WHAT THIS STUDY ADDS

⇒ This study used participatory analysis of interviews with 108 front-line WASH professionals to determine that WASH programming fails largely due to its delivery as discrete time- and budget-constrained projects.

HOW THIS STUDY MIGHT AFFECT RESEARCH, PRACTICE OR POLICY

⇒ The findings of this study emphasise the need for the WASH sector to critically examine the practice of funding and implementing discrete, time-bound projects rather than longer-term embedded programming.

INTRODUCTION

The water, sanitation and hygiene imperative

1.4 million people die each year from diarrhoea, acute respiratory infections, undernutrition and soil-transmitted helminthiases attributed to unsafe water, sanitation and hygiene (WASH), mostly in low-income and middle-income countries (LMICs).[1] A further 74 million disability-adjusted life-years are lost due to WASH-attributed morbidity of these diseases, and there is emerging evidence that poor WASH, particularly water insecurity, has detrimental impacts on mental health.[2]

The importance of coordinated global action to improve WASH has been recognised for several decades. Brought into focus by the United Nations (UN) Water Conference and associated Mar del Plata Action Plan in 1977,[3] there have subsequently been multiple

international efforts to achieve universal WASH. In 2015, the UN Human Rights Council deemed water and sanitation standalone human rights,[4] and the UN General Assembly endorsed the Sustainable Development Goals (SDGs); within these, Goal 6, to 'Ensure availability and sustainable management of water and sanitation for all' (by 2030).[5] The SDGs apply to all countries, but although there are subpopulations within high-income countries (HICs) experiencing very poor WASH conditions,[6] most international efforts to improve WASH have continued to be directed towards LMICs, and we focus our study in such regions.

Since 2000, an extra 2.3 billion people have gained access to at least basic household water (including within a 30 min round trip), and 3.0 billion to at least basic household sanitation.[7] While progress has been made, much WASH programming has failed to achieve its goals. It is estimated that in order to achieve universal WASH by 2030, there will need to be a sixfold increase in current rates of progress for safely managed drinking water, a fivefold increase for safely managed sanitation and a threefold increase for basic hygiene services.[7] In order to achieve such an acceleration, the UN Human Rights Council recently adopted a Resolution calling on member states:

> To identify patterns of failure to respect, protect or fulfil the human rights to safe drinking water and sanitation for all persons without discrimination and to address their structural causes in policymaking and budgeting, while undertaking comprehensive planning aimed at achieving sustainable universal access to safe drinking water and sanitation, including in instances where the private sector, donors and non-governmental organizations are involved in service provision. (8, p. 6)

This article is an attempt to identify such patterns of failure in the context of sub-Saharan Africa (SSA).

Failure in WASH programming

The primary goal of all international development and humanitarian programming is ostensibly to improve or protect the health (physical, mental and social well-being) outcomes of 'beneficiaries' (9, p. 73). In WASH, this is through achieving sustainable access for the intended users of services (certain stakeholders may have secondary goals, for example, profit or political capital, but arguably these need to be accompanied by access). Programming which does not contribute to achieving sustained access can be considered to have failed. This may be a waste of resources (natural, human and financial), but WASH programming can also fail by having negative impacts on individuals. Although data on the scale of WASH programming which has failed to improve access are limited (because WASH programming that is not delivered by formal utilities does not tend to be monitored in the long term), there are many examples of WASH programming that has clearly not met its intended technical and/or social goals or has resulted in unintended negative consequences.

Many programmes have been deemed successful when they have been completed but have failed to be sustainable in the longer term, for example, the ongoing sectoral issue of water handpumps, where it is estimated that, despite 'working' at installation, one-quarter in SSA (~175 000) are non-functional at any given time.[10] Other programming has been deemed successful by implementers, but denounced by users, for example, the urine-diversion dry toilets installed in e-Thekwini, South Africa,[11] and the local government managed sanitation services in Goiás state, Brazil[12] (undoubtedly there are many other examples of user discontent, but we note that published evidence on cases of users denouncing WASH programming is difficult to come by, as they are rarely asked to formally evaluate programming). Multiple studies have identified the negative impacts of WASH programming that invokes social stigma or conspicuous consumption (eg, community-led total sanitation and sanitation marketing) on well-being, leading to outcomes such as gendered violence[13] and reduced community social cohesion.[14] In extreme cases, staff maintaining WASH infrastructure have died or been injured. For example, sanitation workers (those who unclog sewers or empty latrine pits) die regularly when undertaking their job in India, with some estimates as high as three deaths every 5 days.[15] Finally, implementers in LMICs (rarely in HICs) often encourage, sometimes require, intended users or local entrepreneurs to invest time and/or money in WASH programming. Although rarely discussed, when this programming does not succeed in improving WASH, there are lost opportunities and actual sunk costs that have been invested by local stakeholders (particularly women intended users).[16 17] These examples demonstrate how WASH programming—even that which may have achieved progress towards universal access—may be considered to have failed by at least some stakeholders.

Understanding causes of WASH failure

Development scholars have always critiqued the ways in which aid is delivered, with some going so far as to state that spending has 'proceeded with rather little effort to understand the challenges entailed in inducing participation or to understand why earlier programmes failed. The process has been driven more by belief or ideology and optimism than by systematic analysis, either theoretical or empirical' (18, p. 256), with a review of humanitarian programming stating that there is an 'inability to learn lessons or follow recommendations from previous crises' (19, p. 1). However, in 2008, Engineers Without Borders Canada became the first international non-governmental organisation (NGO) to publicly publish a 'failure report',[20] and in the years since, rhetoric around 'admitting' to failure has increased, with many informal attempts to encourage sharing of failure in conference settings and blogs, including in WASH.[21–24] However, this has not translated into the widespread publication of programming failure, which would allow development professionals to learn from one another.

Although the failures of specific WASH programmes are often not publicly discussed,[25] WASH professionals who are not implementers or funders have been highlighting risks to programming for decades. For example, in 1983, as part of the International Drinking Water Supply and Sanitation Decade (The Decade), the WHO conducted a global survey to understand the constraints the sector faced in achieving universal water and sanitation by 1990. These included funding limitations, lack of operation and maintenance, inappropriate institutional frameworks, lack of (sub) professional staff, import restrictions, logistics, insufficient efforts towards health education, intermittent water services, non-involvement of communities in programming, lack of government policy, lack of planning and design criteria, inappropriate technology, inadequate or outmoded legal frameworks, insufficient knowledge of water resources and inadequate water resources.[26] Many of these risks had already been alluded to in the 1970s, particularly the need to move away from capital to operational expenditure and to develop long-term management plans in collaboration with intended users.[27]

Despite these causes of WASH failure being clearly identified in the 1970s and 1980s, WASH programming continues to fail. Recent publications indicate that WASH sector experts perceive causes of continued failure to be very similar to those identified as hindering the universal achievement of WASH in The Decade: priorities of intended users are not met; operation and management are not adequately budgeted for, and/or the processes for them are inadequate; lack of consideration of local social, cultural and physical contexts and their complexity; systems are not designed to be affordable to intended users; donors prefer to fund capital expenditure and infrastructure rather than operational costs; government support is inadequate; institutional weaknesses and bureaucratic processes inhibit success; guidelines from donors are too rigid; staff capacity and capabilities are insufficient; organisations and departments do not adequately communicate and coordinate; WASH is a low political priority; and there is limited local engagement.[28–42]

This study

Most of the opinions being publicly shared on why WASH programming keeps failing in LMICs are those of sector experts based in HICs (eg, staff at multilateral organisations such as UN agencies, development banks, consultant evaluators and senior academics). Thus, we envisioned a study where those closest to programming—the WASH professionals who directly implement it—could share their views on why so many WASH initiatives fail.

Our team of researchers had a current and historical focus in SSA, particularly Malawi, South Africa, Tanzania and Zimbabwe, and thus we endeavoured to hear from front-line WASH staff in this region. We anticipated that there may be local knowledge that had thus far been overlooked but which could—and should—be considered when attempting to prevent future WASH failure. We also wanted to understand whether the perceived causes of WASH failure in SSA were similar to those identified by sector experts based in HICs as global concerns.

MATERIALS AND METHODS

This article is reported according to the Consolidated criteria for Reporting Qualitative research guidance (checklist included as online supplemental material 1).[43] The research proposal itself, research tools (ie, interview guide and instrument development and contextualisation workshop template), ethical paperwork (ie, participant consent form and participant information sheet) and deidentified interview transcripts are available online via the Open Science Framework (data set).[44]

Patient and public involvement

Three of the authors (DJB, RCS and ES) have been facilitating sector-wide discussions on where things go wrong in WASH since 2018. This has included running gameshows and seminars at international conferences, facilitating and taking part in online discussions, webinars and panels, and codeveloping a manifesto for change with interested colleagues.[45] Through these avenues, it became clear that WASH professionals globally would like to prevent further failure through better understanding the mechanisms at implementation stage, and thus they convened a larger group of academics and practitioners to develop this study.

Study design

The principal (DJB), co-principal (RCS) and coinvestigators (AC, TM, MNS, JB, TK, SK, KL, RDM, OM, ACO, KTR, JR, ES and EW) developed an initial interview guide, which included a set of suggested prompts that would encourage participants to share their perceptions and experiences of WASH programming failure. An instrument development workshop template, designed to contextualise the interview guide and train interviewers in each of the four countries, was also developed. The instrument development workshops were led by RCS and ACO in South Africa; TM, KL and RDM in Malawi; AC and TK in Zimbabwe; and MNS and OM in Tanzania. The workshops had two aims: (1) contextualise the data collection instrument so that it would be appropriate in the local setting, including putting participants at ease when discussing sensitive topics and (2) making data collectors familiar with the project and research tools and incorporating their feedback. Due to COVID-19 restrictions, in some locations the data collection instrument and delivery method were adapted for remote interviewing (ie, via the phone or online).

The final data collection instrument in each country was an open-ended in-depth interview, where interviewers were specifically asked not to define WASH failure on behalf of participants. Participants were asked to discuss what they considered to have been failures in WASH programming that they had observed, including

those which they believed had been 'fixed'. Interviewers probed participants to explain what had happened, why they think it happened, and how they think it might have been avoided, or how it was later addressed.

Sampling

Due to the exploratory nature of this project and the sensitive nature of the topic, sampling and recruitment were conducted via purposive (to ensure a mix of private, public, non-governmental and academic participants) and snowball (to identify further participants) sampling. Appropriate participants were identified by the research leads in each country (RCS in South Africa, TM in Malawi, AC in Zimbabwe and OM in Tanzania) from existing relationships and knowledge of the local WASH sector. The data collection teams approached potential participants in person, through email or by phone. Recruitment continued until all avenues were exhausted and the research team believed they had extended invitations to front-line WASH professionals from all relevant organisations within their networks (rather than through saturation). Records were not kept of how many potential participants declined to be interviewed.

Data collection

Local researchers collected data in each location in 2020; see online supplemental table S1 for a description of their backgrounds and relationships to participants. Although participants were invited to be interviewed individually, they could opt to be interviewed in a group if they wished. Interviews were undertaken in person (privately, in a location preferred by the participant/s) or over the phone/online, depending on the preferences of participants and COVID-19 restrictions. All interviews were audio recorded.

Analysis

Audio recordings of the interviews were transcribed verbatim and translated into English where necessary. Analysis was then conducted through a participatory method:

1. Members of the author team (DJB, JB, AC, TK, SK, KL, RDM, OM, TM, ACO, KTR, JR, ES, RCS, MS and EW) were assigned a random subset of transcripts (five or six each) and prepared research memos[46] for all 96 transcripts. For each interview, authors noted what participants perceived to be the main causes of WASH failure (themes).
2. DJB convened an online workshop to present and discuss the emerging themes. This allowed us to discuss our own biases and reality-check that we were interpreting the data itself rather than imposing our own views.
3. DJB and JB took notes and later reviewed all of the memos, identifying reasons participants provided for WASH failure. They developed and shared a coding framework with the rest of the author team (by email), which all agreed represented the overarching findings.
4. A research brief was prepared and a workshop convened in each location, where country teams shared a draft with participants to determine whether they agreed with the overarching findings, and to identify those findings which were specifically important in the local context. This was in lieu of member checking interview transcripts.
5. After some small alterations, the overall research brief[47] and briefs for Malawi, Zimbabwe and South Africa[48–50] were published online and shared widely within the WASH sector. A separate brief was not published for Tanzania as there was no content specific to the country that needed highlighting.
6. To enable a more in-depth analysis, DJB coded each of the transcripts using NVivo[51] through a process of both framework analysis (using the framework codeveloped by the author team and approved by participants) and further axial coding[46]; assigning new codes as they arose across multiple transcripts. DJB coded all the data and considered a theme saturated if it was present in at least 25% of the transcripts. A few minor themes arose in a handful of transcripts (<15%) and are not discussed in this manuscript.
7. DJB shared the project file (codebook and coded extracts) and her interpretation of each perceived cause of failure with RCS to confirm the validity of the findings. The final codebook as relevant to this manuscript is included as online supplemental table S1.
8. The coded content and interpretation of each perceived cause of failure were then provided to, and discussed with, the other coauthors to confirm that all agreed with the conclusions based on their experiences as interviewers and/or analysts.

Authors' positionality

We are a group of researchers from a variety of research disciplines and a mixture of HICs and LMICs, with experience working on WASH in a variety of contexts (online supplemental table S2). Although each of our individual backgrounds could have introduced bias into our project design, analysis and reporting, we trust that our participatory method of analysis and member-checking, as well as our attempt to employ self-critical epistemological awareness,[52] have allowed us to foreground the perceptions of our participants in our findings.

We are also cognisant of the positionality of the research participants (front-line WASH professionals) with regard to intended users. Although the participants were in most instances citizens or residents of the country where they implement programming, this does not erase the power differential between them and the intended users of WASH services. Not only is there an inherent hierarchy of them being the 'providers' of services, but it is also in the career interests of front-line WASH professionals to be 'foot soldiers', internalising the views of international development agencies (53, p. 43). Agreeing to take part in this project indicated a willingness to challenge this hierarchy to some extent by speaking about issues with

the status quo. However, we do note in our Results that there were many instances where participants placed blame for failed WASH programming on intended users, reinforcing international development narratives of ungrateful 'beneficiaries'.

Further information on the reflexivity of the authors is available in online supplemental information 3.

Ethical considerations

Workplace failures are a sensitive topic to discuss, and disclosure could have personal and professional ramifications for participants. We were thus cognisant from the outset that the utmost care would need to be taken to confirm that invited participants understood the voluntary nature and risks of the study, especially if they were invited by a colleague or recommended by their superior.

Because the voices of front-line WASH professionals are rarely heard, we decided that transcripts would be shared open access (so they could be read by fellow researchers and practitioners interested in this topic) provided they could be both sufficiently deidentified (from the participant, their organisation and any colleagues or intended users discussed) and did not contain sensitive information which the team deemed could cause harm when shared. To do so, two members of the author team reviewed each transcript (different paired members for each transcript) to remove identifying information and determine whether it was too sensitive to be shared open access. 94 (of 96) transcripts which could be successfully deidentified and were not deemed sensitive are available online via the Open Science Framework (dataset).[44] Two transcripts have not been shared publicly as they contain sensitive information which could not be sufficiently deidentified.

RESULTS

93 individual interviews and three group interviews were conducted with a total of 108 front-line WASH professionals (table 1). Interviews were normally 30–60 min long. Participants identified a variety of definitions and examples of WASH failure: challenges within programming (which may or may not have been rectified later) and/or programming that did not meet predefined end goals on time and within budget, was not sustainable in the longer term and/or did not meet the priorities of intended users. Although participants were able to discuss any WASH programming they deemed important, most examples provided were regarding time-bound projects funded by international donors.

Participants described WASH failure occurring due to eight perceived core causes (table 2), almost all of which they believed could have been foreseen. This section provides an explanation of each cause and some illustrative quotes; additional illustrative quotes for each perceived cause of failure are provided in online supplemental table S3.

Low levels of commitment from intended users

The most cited reason for failure was that participants did not consider the intended users adequately committed to WASH programming. While, in some cases, intended users were clearly being blamed for WASH failure, other participants explained that programmes were not designed to meet the needs or priorities of intended users, so it was unsurprising when users did not participate as fully as programme designers and implementers may have wanted.

It was common for participants to attribute failure to poverty, where even if intended users were interested in improving their WASH situation, this was not their highest priority, so programming failed; "*There is an issue of disasters such as floods, they bring back people to zero. They constructed a latrine, they had a borehole, and floods come and wash those away and with poverty people can't do anything… Their priority becomes food and for them to start thinking of sanitation is a challenge… sometimes issues of poverty can turn priorities upside down and you can't blame them*" (Malawi, Government Participant 7).

Participants also often mentioned small scale crime, such as theft and vandalism of WASH goods, although this was sometimes not blamed on intended users themselves because "*there's theft, it's because people need money. They need access to things. They need to send their child to school, they*

Table 1 Interviews facilitated in each country

	Individual interviews					Group interviews		
	Government	NGO or CSO	Academic institution	Private sector	Community leader	Government	NGO or CSO	Total transcripts
Malawi	7	27						34
South Africa	3	3	2	5	2		1 FGD (2 individuals)	16
Tanzania	10	11		3		2 FGDs (13 individuals)		26
Zimbabwe	9	10	1					20
Total	96 transcripts, 108 individuals							

CSO, Civil Service Organisation; FGD, Focus Group Discussion; NGO, non-governmental organisation.

Table 2 Themes and codes given by interviewees based on their perceptions of why WASH programmes fail

Theme+child codes	Failure caused by…	# Transcripts				
		M (34)	S (16)	T (26)	Z (20)	All (96)
Low levels of commitment from intended users	**Low levels of commitment of intended users regarding their roles in WASH programming**	**30**	**9**	**21**	**17**	**77**
Crime	Small scale crime (eg, vandalism, theft of WASH materials)	6	3	5	1	15
General	Uncommitted intended users not coded elsewhere	16	2	11	10	39
Historical and/or cultural beliefs	Historical and/or cultural beliefs around WASH practices	7	1	6	1	15
Ineffective local leadership	Ineffective leadership at the very local level (eg, committees, chiefs)	7	1	3	4	15
Insufficient knowledge	Intended users not having adequate WASH knowledge	8	2	9	3	22
Remuneration expectations	Intended users expecting payment for time and/or for WASH services to be provided for free	17	5	8	8	38
Poverty	Poverty of end users, particularly where WASH is not their highest spending priority	16	2	11	5	34
Inadequate engagement	**Implementers not adequately determining and/or considering the self-identified needs of intended users in planning and design or not providing sufficient education and training on the intended programming**	**22**	**8**	**22**	**14**	**66**
General	Inadequate engagement not coded elsewhere	8	3	3	4	18
Needs assessment, planning, design	Lack of engagement with intended users during needs assessments, planning and design	19	5	10	10	44
Programming education/ training	Lack of education and/or training regarding the programme being implemented	6	3	16	6	31
WASH education	Lack of WASH education (particularly around the impacts of poor WASH) being embedded within programming	0	0	11	3	14
Idealistic planning	**Idealistic planning which assumes programme theories of change are correct from the outset, budgets and time frames will not change, and programmes will be sustainable for a long period after implementation**.	**30**	**5**	**18**	**12**	**65**
General	Idealistic planning not coded elsewhere	4	0	1	2	7
Inappropriate budgeting	Implementers budgeting inappropriately	15	0	11	4	30
Postproject monitoring	Inability to assess sustainability as no monitoring is done following implementation	2	0	6	0	8
Project length	Projects being too short to achieve their goals	5	1	1	5	12
Sustainability assumptions	Assumptions that altered WASH behaviours will continue and users (or some other third party) will do or fund operation and maintenance after implementation	21	5	7	6	39
Politics and bureaucracy	**Political motivations and slow or overly complicated bureaucracy**	**21**	**9**	**14**	**7**	**51**
Bureaucracy	Lengthy and complicated bureaucracy	6	4	7	0	17
General	Politics and bureaucracy not coded elsewhere	4	4	3	4	15
Individuals' priorities	The priorities of individuals (politicians, staff within government departments and community leaders) being considered above those of institutions/ communities.	9	7	8	4	28
Political will	WASH not being considered a priority of the government	9	2	7	1	19

Continued

Table 2 Continued

Theme+child codes	Failure caused by…	# Transcripts				
		M (34)	S (16)	T (26)	Z (20)	All (96)
Poor coordination and communication	**Poor coordination and communication between WASH sector actors and intended users**	**26**	**6**	**10**	**7**	**49**
General	Poor communication and coordination not categorised elsewhere	7	2	4	0	13
Poor communication between WASH sector professional actors	Poor communication and coordination between WASH sector professional actors (ie, not including intended users)	24	5	7	6	42
Withholding of information	Implementers purposefully withholding information from other stakeholders	4	1	1	1	7
Insufficient capacity	**Insufficient human resource capacity**	**15**	**4**	**15**	**6**	**40**
Staff capabilities	Insufficiently trained implementation staff	14	3	15	5	37
Staff turnover	Constant turnover of implementation staff	4	2	0	1	7
Unrealistic funder expectations	**Unrealistic funder expectations which, combined with a competitive funding environment means that organisations find themselves overpromising in terms of activity and timelines, and reluctant to report problems as they arise**	**21**	**1**	**8**	**7**	**37**
'Funder knows best'	Funders imposing their own ideas about programming, rather than listening to implementers/intended users	14	0	1	1	16
General	Unrealistic funder expectations not categorised elsewhere	7	0	4	1	12
Inadequate funding	Implementers having inadequate funds to achieve their goals	8	0	4	5	17
Limited flexibility	Lack of flexibility in timelines and budgets	7	1	2	2	12
Measurement priority	Funders prioritising outcomes that can be easily achieved and counted over those which require longer term behaviour change or qualitative measurement	5	0	1	1	7
Inappropriate technology	**Implementing WASH technologies which are inappropriate to the physical environment**	**16**	**0**	**7**	**1**	**24**
Climate	Implementing WASH technologies that are inappropriate due to the current and/or changing climate	12	0	6	1	19
Soil and/or topography	Implementing WASH technologies that are inappropriate due to soil and/or topography	4	0	1	0	5
Water table	Implementing WASH technologies that are inappropriate for the depth of the water table	5	0	0	0	5

Some transcripts discussed multiple child-codes, and thus the 'overall' numbers shaded grey are not a sum of the numbers directly below them. Overarching themes are listed in order from most to least prevalent in transcripts.
Numbers in brackets indicate the total number of transcripts for that country.
M, Malawi; S, South Africa; T, Tanzania; WASH, water, sanitation and hygiene; Z, Zimbabwe.

need to buy food, they need to do these things" (South Africa, Government Participant 1).

Sometimes participants believed that intended users lacked sufficient knowledge to know the harms associated with poor WASH, and thus were not committed to WASH programming; "*it's largely because people may not know the implications of not washing your hands properly, not throwing or disposing your rubbish properly.*" (Zimbabwe, NGO Participant 9). This lack of knowledge was sometimes linked to historical and/or cultural beliefs and behaviours around WASH; "[the intended users] *just did not seem too concerned about not having latrines—citing that their parents and grandparents did not have latrines and survived for generations"* (Zimbabwe, NGO Participant 1).

Another reason given was ineffective local leadership, where chiefs and councillors do not command the respect required to facilitate WASH improvements; "*power in the chiefs is not that much hence people don't really respect them. In some areas chiefs would hold those without a toilet accountable and even make them pay and people would fear such, while in other areas people don't fear or respect their chiefs and hence people don't follow through*" (Malawi, Government Participant 3).

Finally, many participants attributed a lack of commitment by intended users to their expectation of payment for their time and/or that WASH services should be provided for free. Although this was sometimes attributed to historical expectations (where free services and allowances have been provided by other organisations or governments) or political motivations, some participants did place negative judgements on intended users due to this expectation; "*I've noticed it now that that mentality of free basic service which people expect to see from the municipality "you guys do everything, provide me with the service because I vote*"" (South Africa, Private Sector Participant 1).

Inadequate engagement of intended users

Many participants identified the inadequate engagement of intended users throughout the WASH programming lifecycle as a cause of failure. Often this was because intended users were not adequately consulted during needs assessments, planning and design; "*Most of the times we just go with our activities outlined and it becomes difficult for the people in the community to adopt because they are not involved in the development process of the project… Most of the time as organisations we ambush the people with interventions*" (Malawi, NGO Participant 12). Participants also identified that programmes often lacked adequate communication, such that intended users did not know why the programme was being implemented, that it was for their benefit, and/or how to maintain the infrastructure/behaviour change in the longer term; "*The budgets may not be targeting capacity building of communities which is key when communities will be expected to manage the WASH facilities once implemented*" (Zimbabwe, NGO Participant 1).

In Tanzania and Zimbabwe, participants also identified that a lack of WASH education within programming was contributing to failure; "*I think we provide to the community education but it's not adequate*" (Tanzania, Government Participant 4).

Idealistic planning

Participants often identified idealistic planning by implementers as a cause of failure. This included a tendency for implementers to budget inadequately, or not consider where resources may be impacted by factors external to the project, "*so the problem is vehicles are available but there* [are] *just too many projects, instead of assigning one for each project, you would find that they've assigned one vehicle to many projects*" (Malawi, Government Participant 3).

Inadequate time frames which did not account for delays, and funding that did not allow for extension, were also often blamed; "*researchers work on best case scenarios and researchers are people writing all the proposals. I think it is very important to take into account that things move slowly socially and politically in Africa*" (South Africa, NGO Participant 1). Many participants also noted that programming assumed that intended users (or another agency) would carry out and pay for operation and maintenance of infrastructure and users would also continue with 'changed' WASH behaviours after funding ended, despite evidence that this assumption was flawed; "*When you do that awareness, people comply just to allow the borehole to be drilled. When the borehole is drilled and when we finish the awareness the community also stop practicing hygiene*" (Malawi, NGO Participant 17). This was compounded by a lack of monitoring after programmes had ended, which could provide evidence of the longer-term success or failure of different approaches.

Politics and bureaucracy

Just over half of the participants indicated that political motivations and bureaucracy contributed to failure. This was often attributed to politicians, government staff or local leaders directing funds to groups or individuals to win favour or elevate their own priorities; "[when] *seeking votes from the people … some standards such as borehole depth are compromised*" (Malawi, NGO Participant 17). Sometimes failure was deemed to be due to a lack of political will; "*There is an issue that government do not pump in enough money to support that… they would rather use the money to buy drugs to treat diarrhoea rather than to implement activities that would help someone to prevent all diarrhoea infections*" (Malawi, Government Participant 7). Lengthy or complicated bureaucracy was also often cited as a cause of failure, particularly delays in being able to release funds; "*You spend another two, two weeks with a sign on the toilet that says: "Out of Order!" and people are coming every day, they want to use it, but there is a sign saying: "Out of Order!". Why don't you get a plumber there and then to come and fix that? But, because of bureaucracy, we still have to go to tender … we will stay a month with a toilet or an ablution block that is not working*" (South Africa, CSO Participant 2).

Poor coordination and communication

Around half of the participants indicated that poor coordination within the sector, and poor communication between stakeholders, led to failure. This was mostly due to professional WASH actors failing to communicate and coordinate with one another, because *"departments work in silos, Department of Housing is sitting somewhere planning their own thing. Whereas the Department of Water and Sanitation is sitting somewhere planning their own thing"* (South Africa, CSO Participant 2) and *"Any WASH NGO does what they think is best for them… So for instance, the* [name withheld] *project was huge, we discussed with the government to bring standards, because as we were conducting the project, we were about six NGOs, during that project … every NGO operated in their own unique way"* (Malawi, NGO Participant 21).

Sometimes failure was perceived to have been caused by implementers purposely withholding information from other stakeholders; "*Initially local authorities started with hiding information from each other, thus the project was built using a baseline with false information*" (Zimbabwe, Government Participant 1). This was sometimes attributed to stakeholders not wanting to disclose budget amounts to one another; "*I believe they didn't want us to peep into their pocket… Many* [organisations] *do not want to indicate how*

much money they have" (Malawi, Government Participant 4).

Insufficient human resource capacity

Several participants identified a lack of human resource capacity as contributing to failure. Often, this was related to implementation staff who did not have sufficient training in necessary skills; "*There are engineers or WASH professionals, but they don't know how to prepare the community to receive a project*" (Tanzania, NGO Participant 5) and "*If you don't recruit technical experts in WASH, don't expect results… we need to recruit the right people to do the right job*" (Malawi, NGO Participant 5). In a handful of cases the sustained turnover of implementation staff was mentioned as contributing to failure; "*Unfortunately, with the nature of our job, you'd find that the person we coordinate with leaves the job and another one comes in, so it leads us to start all over*" (Malawi, Government Participant 4).

Unrealistic funder expectations

The unrealistic expectations of funders were commonly cited as a reason that WASH programmes failed, particularly in Malawi. It was generally expressed that in preparing proposals for funders, implementers promised unrealistic results to appear competitive, and then were unable to deliver what was expected of them. Some participants in Malawi, Tanzania and Zimbabwe believed that implementers received inadequate funding (overall, or they were not allowed to spend on specific items, such as vehicles and staff/community allowances) to be able to achieve their goals; "*WASH failures… they occur, because of the inadequacy of resources to carry out these programs, sometimes the materials that are provided can only sustain the programs halfway*" (Zimbabwe, Government Participant 5). They also shared that once funded, there was very limited flexibility with regard to changing timelines or budgets (including moving funding between budget lines); *"It was challenging during the rainy season… we have a specific time frame so you can imagine spending all this time without going to the field which means that this time has been spilt over out of the time frame of the project. And the donor starts to question that we agreed that by this date we need a report on the progress and if you have finished; we cannot give donor an excuse that we had rains*" (Malawi NGO Participant 2). Several participants spoke about issues of funders dismissing the expertise of implementers or intended users, deciding that they 'knew best' what was needed, rather than what implementers and intended users deemed important; "*I think there is a problem with NGOs that the donors usually when they come, they dictate what they want to do… There was a requirement for financial contribution, and they* [NGOs] *were like "our donor said we should do this". So, some decisions are done from far places like overseas*" (Malawi, Government Participant 7).

A few participants also indicated that "*The main problem is that we are more focused on figures than the sustainability of the project. An example would be when they give us a target of 10,000 people to be reached… our focus will be on the figure given. Our main focus should be the quality of work and not just quantity. These two must be differentiated… when the donors see the large numbers being reported they get excited. So, the donors have to change their mindset… We need to start reporting on quality and not quantity*" (Malawi, NGO Participant 15). They indicated that outcomes that can be easily achieved and counted over those which require longer-term behaviour change or qualitative measurement are prioritised, limiting the transformative and sustainability potential of WASH programming.

Inappropriate technology

The selection and attempted installation of WASH technologies that were inappropriate to the environment within which they were being implemented was sometimes mentioned as a cause of failure. Often, this was related to technologies that could not withstand changing climatic conditions and associated extreme weather events such as flooding; "*they* [intended users] *would construct a pit latrine which is substandard since as an organisation we fail to support them with materials. So, you would find out that when floods come, they would wipe away those latrines*" (Malawi, NGO Participant 24). In a smaller number of cases this was attributed to technologies unsuited to the area's geology and topography; "*due to climate change the water tables, water levels are changing, they are going down so sometimes to drill a borehole is a challenge and cases of boreholes that work just for few years are rising yet you have spent a lot of millions*" (Malawi, NGO Participant 1).

DISCUSSION

Front-line WASH professionals in SSA described narratives of staff trying to achieve sustainable WASH in complex contexts with limited resources and under extreme time and budgetary pressure. It is important to recognise that the results presented are the *perceptions* of the participants (and thus failure cannot be directly attributed to them without further empirical evidence). However, they identified many of the same causes of failure that have been suggested by senior WASH professionals in HICs to have been occurring throughout LMICs since at least the 1970s and 1980s. Considering these perceptions of front-line WASH professionals alongside the critical development literature, when taken as a whole it seems that a major, overarching cause of WASH failure in LMICs is the disbursement of WASH aid (and indeed, most global health and international development aid generally) as commodified projects.[54]

The projectisation of WASH in LMICs

In most cities with functioning water and sanitation networks (the majority of which are within HICs), regardless of whether they are managed by private or publicly owned utilities, governments hold implementers accountable via regulations and are nominally held accountable themselves by the general population, through democratic processes, to ensure these services continue to be delivered.[55] Very rarely are users expected to participate in service delivery. By contrast, WASH programming in

LMICs tends to be delivered as discrete time-constrained and budget-constrained projects funded by external donors, often through NGOs, with increasing expectations of participation and long-term maintenance from intended users, often without their initial engagement in design, development and planning for the service.[56]

We do not believe that the issues of projectisation are new knowledge to the WASH sector, but rather that they are 'uncomfortable knowledge'[57]—that the sector has known the limitations of WASH projectisation for decades, but has continued to implement WASH in this way because it considers there to be limited options when navigating the complexity of international development; "[funded] project proposals are those that define upfront the specific protocols, targets, and modes of operation that will guide the work…. the attention is focussed on internal legitimacy and control rather than shifting external challenges" (58, p. 85).

Muddled accountability and measurement

Most of the WASH programming discussed by our participants was projects funded by international donors, and many participants spoke about pressure to satisfy their funders. Often this funding originated from governments in HICs and was provided via granting bodies (eg, multilateral agencies or international NGOs) who in turn funded implementers (mostly NGOs). Intended users cannot hold anyone accountable under this model.[53]

Due to short election cycles in most democratic countries, it is difficult for HIC governments to commit to the longer-term provision of WASH services in LMICs, and thus periodic funding of projects is the norm. In addition, to placate tax-payers, when such projects are evaluated there is often an 'excessive focus on what can be counted as opposed to what counts',[58] further evidenced in this study. What tends to be measured is how many of a particular WASH infrastructure have been built at project completion (eg, number of toilets), how many intended users 'should' be served by a service in the longer term (eg, households estimated to be served by a wastewater treatment plant), or how many users demonstrate (or verbally confirm) some prescribed behaviour at project end (eg, handwashing), but these do not account for the long-term uptake of provided services, user experiences or health outcomes. Just because something can be counted does not mean it has significance to intended users (Natsios, 2010, p. 9). This focus on the outcomes of short-term projects has contributed to WASH programming which, even if deemed successful at project 'end', is proving to be unsustainable in the longer term and unlikely to improve health outcomes. This also links to project evaluation processes, including what is important to measure, and who deems whether a project has been a success—our participants indicated that too often evaluations are conducted rapidly and superficially, with little consideration of what intended users may think about a project or what they believe is important to share (see a discussion on the 'white gaze' and evaluation in 53).

Participation as panacea?

For decades, WASH scholars and practitioners have spoken of the importance of participatory development, including the meaningful involvement of intended users (and other local stakeholders) in project design, implementation and management (eg, see work of Robert Chambers and Deepa Narayan). Notionally, this advice has been heeded, with many funders requiring programming which prioritises 'participation', including much of the programming discussed by our participants. Yet some of the most cited causes for WASH failure from our study suggest that even if participation is included in WASH projects, it does not always lead to sustainable programming. Sometimes this is because those interviewed believe participation of intended users is being inadequately incorporated and sometimes because they blame intended users for not being 'committed enough' to improving WASH in the ways the implementer and funder have envisioned. The point at which participation is incorporated into the programme was also raised as an issue, where the decisions around implementation may already be made, and therefore, to the intended users can seem tokenistic and one way, exacerbating the power imbalances between them and WASH professionals. Overall, there is a fundamental tension between being able to engage intended users in WASH projects because users themselves believe they are necessary and a personal/community priority versus expecting users to participate in WASH projects because the implementers and funders believe they should be a personal/community priority. This has been critiqued in the international development literature for decades (eg, see several chapters of ref. 59), including in WASH specifically,[60] but still persists, and in our work appears to be perpetuated by many front-line WASH staff trained, mentored and/or employed by organisations and experts based in HICs (as discussed in ref. 61).

In addition to the general rhetoric of the WASH sector that participatory development, and 'ownership' by intended users are important,[62] our results suggest that generally unrealistic expectations by funders, insufficient funding and inappropriately trained staff are also contributing to projects placing the burden of implementation, operation and maintenance onto intended users. As Ramalingam writes, "… participatory development can simply end up reinforcing the status quo by defining upfront the kind of participation the aid agency wants, rather than thinking about the kind of participation that might be needed and appropriate to the context".[58] What appears to have been overlooked in many of the projects discussed by our participants is that 'ownership' of WASH services cannot be engineered if intended users do not value, or prioritise, those services which are being proposed. This is not novel to WASH, "NGOs [in global health and international development generally] have not been able to solve these problems because their efforts are not adequately tied to the aspirations and struggles of grassroots communities".[63] It

is thus no surprise when intended users choose not to engage in WASH programming. Similarly, where users do choose to engage, but projects fail because inappropriate WASH technologies have been implemented due to a lack of technical specialists (in favour of using the human resources of intended users), this is unsurprising, as intended users, although experts in their own context, are not experts in WASH.

The myth of project handover

WASH services require ongoing investments of time and money. International funders and implementers are not ignorant to this; even in the 1970s and 1980s it was known that implementing discrete projects was not leading to sustainable WASH. To address this, two types of 'handover' at project completion have become commonplace (and sometimes hybridised): to intended users and their communities, and to local governments.

As discussed in the previous section, there is no guarantee that intended users have the ongoing capacity to operate, manage and/or financially contribute to an ongoing WASH service. Even if they have engaged in the short-term project, there is limited evidence that 'handing over' WASH services to intended users has resulted in sustainability, let alone health outcomes—for example, fast 'slippage' from improved sanitation back to open defecation is commonly reported (where an evaluation is actually completed) following many community-led sanitation programmes.[64] The theories of change implementers design projects based on, which suggest communities will sustainably manage a 'handed over' WASH project or continue a desired hygiene behaviour, appear to be based on assumptions derived from rare examples of positive deviants or wishful thinking on the behalf of project funders. Our participants gave a myriad of examples where intended users have been unable to sustain a WASH service following project 'completion'.

Another way in which WASH projects are 'handed over' at completion is to local government implementers, for example, health departments and water utilities. But as with intended users, our evidence indicates that local government implementers are improperly engaged by project implementers (mostly NGOs) and unable to provide their own opinions on what WASH services are needed in their local area. Government implementers generally have their own plans for managing WASH, but these are often not considered by externally funded implementers, who instead design projects with unrealistic expectations of what services they believe local government implementers can, or should, sustain in the longer term (a persistent issue in global health and development more broadly[65]). Our study included interviews with several local utilities who had been the recipients of 'handed over' projects from NGOs and lamented that they could not sustain the associated WASH services due to a lack of consultation throughout the project 'life', nor funding to continue provision.

A lack of flexibility and complicated bureaucracy

Throughout our study, even where longer-term WASH services (ie, not short-term projects) were discussed (eg, service delivery in South Africa), failure was identified due to systems with limited flexibility, onerous bureaucratic requirements and complicated politics. Participants identified pressures to abide by the advice of international (generally white) experts over local staff and intended users and to implement solutions which were preferred by local politicians or agencies rather than intended users, both of which are observed time and again in global health and international development programming.[66–68] In addition, due to contracting with international funders, participants generally could not move budget between line items/categories, alter timelines which became infeasible, or adapt technical approaches as the cracks in earlier assumptions arose, also not novel to our study.[69]

Challenging the status quo

We agree with Gordon *et al* that "delivering safely managed water and sanitation services requires significant strengthening of government systems, professionalization of service delivery and major increases in investment".[70] Ideally, this will include a shift from projectised WASH programming to longer-term investments in services with associated accountability to LMIC governments, and longitudinal measurements of WASH access to determine sustainability. Such a shift from projectised work will require a massive structural change to the way WASH, and global health and international development more generally, is funded and implemented. However, even with such a shift, implementers must accept—and perhaps expect—that for many intended users, WASH is not the highest priority on which to invest their time and money. They may choose not to engage not because they do not want WASH services—but because the participatory ask is too much, for example, they may not have the time or desire to clean and maintain public ablution blocks,[71] or the lost opportunity cost of attending group planning/management events may be too great.[72] Similarly, local government implementers may choose not to engage, or only engage tokenistically, because the agenda of the implementer does not align with their own district plans and existing budgets.[65] If the primary goal of WASH programming is to achieve health outcomes via universal access, then this apparent lack of local engagement must not be seen as a reason to blame intended users or cease efforts to improve WASH—but to consider other ways in which it can be achieved.

CONCLUSIONS

Our research investigated WASH programming in four SSA countries, indicating that WASH failure is often tied to how such programming is projectised. This projectisation is common across LMICs, and thus likely contributes to failure around the globe. The systemic change which must happen

to improve WASH, and thus health outcomes, needs to occur at a much higher level than front-line professionals: those who control the funding and the ongoing projectisation of WASH must reevaluate how services are currently being delivered (or failing to be delivered).

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Contributors DJB led the project and is responsible for the overall content (as guarantor). DJB, RCS, AC, TM, MNS, JB, SK, KTR, JR, ES and EW developed the project concept and data collection tools. RCS, AC, TM and MNS led the data collection in South Africa, Zimbabwe, Malawi and Tanzania, respectively, with the assistance of TK, KL, RDM, OM, ACO and FC. DJB, RCS, AC, TM, MNS, JB, TK, SK, KL, RDM, OM, ACO, KTR, JR, ES, FC and EW analysed the data, and removed identifying information so that the transcripts could be shared open access. DJB and RCS conceived the paper. DJB wrote a first draft of the paper, which was then critically reviewed by RCS and BE. RCS, AC, TM, MNS, JB, TK, SK, KL, RDM, OM, ACO, KTR, JR, ES and BE reviewed the revised version of the paper. All authors approved its submission to BMJ Global Health.

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REFERENCES

1 World Health Organization. Burden of disease attributable to unsafe drinking-water, sanitation and hygiene, 2019 update. Geneva, Switzerland, 2023.
2 Wutich A, Brewis A, Tsai A. Water and mental health. *WIREs Water* 2020;7:e1461.
3 United Nations. Report of the united nations water conference. New York, USA, 1977.
4 United Nations. General assembly resolution 70/169: the human rights to safe drinking water and sanitation. 2015.
5 United Nations. General assembly resolution 70/1: transforming our world: the 2030 agenda for sustainable development. New York, N.Y., U.S.A, 2015.
6 Brown J, Acey CS, Anthonj C, *et al*. The effects of racism, social exclusion, and discrimination on achieving universal safe water and sanitation in high-income countries. *Lancet Glob Health* 2023;11:e606–14.
7 WHO/UNICEF. Progress on household drinking water, sanitation and hygiene 2000-2022: special focus on gender. Geneva, Switzerland Joint Monitoring Programme of the World Health Organization and UNICEF; 2023.
8 United Nations. Human rights council a/hrc/res/57/13: the human rights to safe drinking water and sanitation. 2024.
9 Gibson CC, Anderson K, Ostrom E, *et al*. The Samaritan's Dilemma: The Political Economy of Development Aid. Oxford, U.K: Oxford University Press, 2005.
10 Foster T, Furey S, Banks B, *et al*. Functionality of handpump water supplies: a review of data from sub-Saharan Africa and the Asia-Pacific region. *Int J Water Resour Dev* 2020;36:855–69.
11 Mkhize N, Taylor M, Udert KM, *et al*. Urine diversion dry toilets in eThekwini Municipality, South Africa: acceptance, use and maintenance through users' eyes. *J Water Sanit Hyg Dev* 2017;7:111–20.

12 Lima ASC, Scalize PS, Arruda PN, *et al*. Satisfaction and users perception regarding the sanitation systems of municipalities in the state of Goiás operated by the local governments. *Eng Sanit Ambient* 2017;22:415–28.
13 Nunbogu AM, Elliott SJ. Characterizing gender-based violence in the context of water, sanitation, and hygiene: A scoping review of evidence in low- and middle-income countries. *Water Security* 2022;15:100113.
14 Wicken J. Effectiveness of a sanitation marketing approach in rural papua new guinea: the atprojects round loo programme. Loughborough University; 2012. Available: https://wedc-knowledge.lboro.ac.uk/details.html?id=19321
15 Raghavendra RH, Kumar RA. Sanitation Workers: A Neglected Community of Indian Civilized Society. *Contemporary Voice of Dalit* 2022;0:2455328X211069683.
16 Cherukumilli K, Ray I, Pickering AJ. Evaluating the hidden costs of drinking water treatment technologies. *Nat Water* 2023;1:319–27.
17 Caruso BA, Ballard AM, Sobolik J, *et al*. Systematic re-review of WASH trials to assess women's engagement in intervention delivery and research activities. *Nat Water* 2024;2:827–36.
18 Mansuri G, Rao V. Localizing Development: Does Participation Work? Washington D.C, U.S.A, 2011.
19 Rose J, Adler CM. A Framework for Effective Collaboration with Crisis-Affected Communities. *Challenges* 2024;15:13.
20 Lentfer J. Complexity, contracting and courage: changes for usaid to embrace. 2014. Available: https://politicsofpoverty.oxfamamerica.org/complexity-contracting-courage-changes-usaid-embrace/ [Accessed 08 Oct 2024].
21 Jones S, Greene N, Hueso A, *et al*. Learning from failure: lessons for the sanitation sector. 2013. Available: https://sanitationlearninghub.org/resource/learning-from-failure-lessons-for-the-sanitation-sector/
22 Water.Women.World. WASH game shows. 2024. Available: https://www.waterwomenworld.com/wash-failures/wash-game-shows/ [Accessed 08 Oct 2024].
23 Paul A. WASHaholics anonymous. Available: https://washaholics.wordpress.com/ [Accessed 08 Oct 2024].
24 Peralta AYZ. Is failure a key step in mainstreaming technology innovation? 2024. Available: https://www.worldwaterweek.org/news/is-failure-a-key-step-in-mainstreaming-technology-innovation [Accessed 08 Oct 2024].
25 Sindall RC, Barrington Dani J, Shaylor E. Learning from and preventing failure in wash. In: *Frontiers of Sanitation: Innovations and Insights*. 2023.
26 World Health Organization. The international drinking water supply and sanitation decade: review of regional and global data (as at 31 december 1983). report no.: 9241700920. Geneva, Switzerland, 1986.
27 Bradley DJ. Engineering, health and policy in developing countries - some strategic issues. *Prog Water Technol* 1978;11:1–4.
28 European Court of Auditors. European union develpoment assistance for drinking water supply and basic sanitaiton in sub-saharan countries. Special report 13. Luxembourg, 2012.
29 Starkl M, Brunner N, Stenström T-A. Why do water and sanitation systems for the poor still fail? Policy analysis in economically advanced developing countries. *Environ Sci Technol* 2013;47:6102–10.
30 Starkl M, Brunner N, Flögl W, *et al*. Design of an institutional decision-making process: the case of urban water management. *J Environ Manage* 2009;90:1030–42.
31 WaterAid. Functionality of wastewater treatment plants in low- and middleincome countries. In: *Desk review*. London, U.K, 2019.
32 Katukiza AY, Ronteltap M, Oleja A, *et al*. Selection of sustainable sanitation technologies for urban slums--a case of Bwaise III in Kampala, Uganda. *Sci Total Environ* 2010;409:52–62.
33 Sujaritpong S, Nitivattananon V. Factors influencing wastewater management performance: case study of housing estates in suburban Bangkok, Thailand. *J Environ Manage* 2009;90:455–65.
34 Cronin AA, Ohikata M, Kumar M. Social and economic cost-benefit analysis of sanitation in Odisha State, India. *J Water Sanit Hyg Dev* 2014;4:521–31.
35 Eales K, Blackett I, Siregar R, *et al*. Review of Community-Managed Decentralized Wastewater Treatment Systems in Indonesia. Washington, D.C: World Bank, 2013.
36 Bao PN, Aramaki T, Hanaki K. Assessment of stakeholders' preferences towards sustainable sanitation scenarios. *Water & Environment J* 2013;27:58–70.
37 Kaminsky J, Javernick-Will A. Causes for sustainable maintenance and operation of on-site sanitation systems. Construction Research Congress 2012; West Lafayette, Indiana, United States, 2012:2270–9. 10.1061/9780784412329.228 Available: http://ascelibrary.org/doi/book/10.1061/9780784412329
38 Murphy HM, McBean EA, Farahbakhsh K. Appropriate technology – A comprehensive approach for water and sanitation in the developing world. *Technol Soc* 2009;31:158–67.
39 Muller M. Have Five Decades of Development Engineering Research Improved Sanitation in Southern Africa? *J of Intl Development* 2020;32:96–111.
40 Hueso A. Is 'access to adequate and equitable sanitation' for all by 2030 achievable? Perspectives from sector experts on what needs to change to realise the Sustainable Development Goal. *J Water Sanit Hyg Dev* 2016;6:650–7.
41 Rhodes-Dicker L, Brown NJ, Currell M. Unpacking intersecting complexities for WASH in challenging contexts: A review. *Water Res* 2022;209:117909.
42 Davis A, Javernick-Will A, Cook SM. The use of qualitative comparative analysis to identify pathways to successful and failed sanitation systems. *Sci Total Environ* 2019;663:507–17.
43 Tong A, Sainsbury P, Craig J. Consolidated criteria for reporting qualitative research (COREQ): a 32-item checklist for interviews and focus groups. *Int J Qual Health Care* 2007;19:349–57.
44 Barrington DJ. Data from: amplifying local voices to reduce failure in the water, sanitation and hygiene sector. Open Science Framework; 2022. Available: https://www.doi.org/10.17605/OSF.IO/VX84M
45 Water.Women.World. WASH failures. 2024. Available: https://www.waterwomenworld.com/wash-failures/ [Accessed 26 Nov 2024].
46 Corbin JM, Strauss AL. *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*. 4th edn. Los Angeles, U.S.A: SAGE Publications, 2014.
47 Barrington DJ, Sindall RC, Chinyama A, *et al*. Research Brief: Amplifying Local Voices to Reduce Failure in the Water, Sanitation and Hygiene Sector. 2021.
48 Luwe K, Malolo RD, Morse T, *et al*. Research Brief: How to Reduce Failure in the Malawian WASH Sector. 2021.
49 Chinyama A, Kativhu T, Sindall RC, *et al*. Research Brief: How to Reduce Failure in the Zimbabwean WASH Sector. 2021.
50 Sindall RC, Odili A, Barrington DJ. Research Brief: How to Reduce Failure in the South African WASH Sector. 2021.
51 NVivo. QSR International Pty Ltd. 2020.
52 Chambers R. Whose Reality Counts? Putting the First Last. London, U.K: ITDG Publishing, 1997.
53 Shallwani S, Dossa S. Evaluation and the white gaze in international development. In: Khan T, Dickson K, Sondarjee M, eds. *White Saviorism in International Development: Theories, practices and lived experiences*. Wakefield, Canada: Daraja Press, 2023.
54 Freeman S, Schuller M. Aid projects: The effects of commodification and exchange. *World Dev* 2020;126:104731.
55 EurEau. The Governance of Water Services in Europe. Brussels, Belgium: The European Federation of National Associations of Water Services (EurEau), 2018.
56 Tsekleves E, Fonseca Braga M, Abonge C, *et al*. Community engagement in water, sanitation and hygiene in sub-Saharan Africa: does it WASH? *J Water Sanit Hyg Dev* 2022;12:143–56.
57 Rayner S. Uncomfortable knowledge: the social construction of ignorance in science and environmental policy discourses. *Econ Soc* 2012;41:107–25.
58 Ramalingam B. Aid on the Edge of Chaos. Oxford, U.K: Oxford University Press, 2013.
59 Cooke B, Kothari U. Participation: The New Tyranny? London, UK: Zed books, 2001.
60 de Wit S, Luseka E, Bradley D, *et al*. Water, sanitation and hygiene (WASH): the evolution of a global health and development sector. *BMJ Glob Health* 2024;9:e015367.
61 Khan T. The matriarchy complex. In: Khan T, Dickson K, Sondarjee M, eds. *White Saviourism in International Development: White Feminist Disruption in Development*. Quebec, Canada: Daraja Press, 2023: 79–97.
62 Oxfam. An Introduction to Community Engagement in WASH. Oxford, U.K, 2019.
63 Mwangi N, Maghanga L. Introduction: silences in the ngo discourse. In: Mwangi N, Maghanga L, eds. *Breaking the Silence on NGOs in Africa*. Wakefield, Canada: Daraja Press, 2023: 1–3.
64 Kouassi HAA, Andrianisa HA, Traoré MB, *et al*. Review of the slippage factors from open defecation-free (ODF) status towards open defecation (OD) after the Community-Led Total Sanitation (CLTS) approach implementation. *Int J Hyg Environ Health* 2023;250:114160.
65 Makuwira J. Power and development in practice: NGOs and the development agenda setting. *Dev Pract* 2018;28:422–31.
66 Shields KF, Barrington Dani J, Meo S, *et al*. Achieving Development Outcomes by Building Practical Authority in WASH Participatory Collectives in Melanesia. *Water Alternatives* 2022;15. Available:

https://www.water-alternatives.org/index.php/alldoc/articles/vol15/v15issue2/660-a15-2-2/file
67 Niederberger E, Glanville-Wallis T. Community Engagement in WASH Emergencies: Understanding Barriers and Enablers Based on Action Research from Bangladesh and the Democratic Republic of Congo (DRC). *Water (Basel)* 2019;11:862.
68 Samoff J, Stromquist NP. Managing Knowledge and Storing Wisdom? New Forms of Foreign Aid? *Dev Change* 2001;32:631–56.
69 Anderson J-A. The "local" and white saviorism in the caribbean. In: Khan T, Dickson K, Sondarjee M, eds. *White Saviourism in International Development*. Quebec, Canada: Daraja Press, 2023: 198–208.
70 Gordon B, Boisson S, Johnston R, *et al*. Unsafe water, sanitation and hygiene: a persistent health burden. *Bull World Health Organ* 2023;101:551–551A.
71 Roma E, Buckley C, Jefferson B, *et al*. Assessing users' experience of shared sanitation facilities: A case study of community ablution blocks in Durban, South Africa. *WSA* 2010;36:589–94.
72 Barrington DJ, Shields KF, Saunders SG, *et al*. Some lessons learned from engaging in wash participatory action research in melanesian informal settlements. WEDC Knowledge Base; 2017. Available: https://hdl.handle.net/2134/31433