

Review Paper

Community engagement in water, sanitation and hygiene in sub-Saharan Africa:
does it WASH?

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ABSTRACT

This transdisciplinary literature review paper aims at addressing the literature lacuna in community engagement and water, sanitation and hygiene (WASH) in sub-Saharan countries. By responding to a set of identified WASH-related questions to community engagement, it explores through different disciplinary lenses the challenges and opportunities in this significant area that impacts human health. This transdisciplinary review brought together the disciplines of water engineering, environmental microbiology, public health and infectious disease, design research, women and gender studies, and developmental studies. It examined over 430 papers with 29 papers included in the final review. The main findings suggest integrating women into leadership roles in community water management and water and sanitation programmes can lead to more sustainability and can make water projects more effective. Second, cultural preferences should be a key factor when planning and implementing WASH technologies and interventions. Third, for community engagement to be effective, it should be done with intentionality and over a longer period; and employ existing culturally embedded leadership structures, such as schoolteachers, religious leaders and train change agents.

Key words: community engagement, gender, health, participatory approaches, transdisciplinary review, WASH

HIGHLIGHTS

- Successful community engagement in WASH requires intentionality and activation over a longer period of time.
- There are benefits in working with community leaders to establish peer education programmes on WASH.
- Engaging communities through co-design and co-production provides a powerful tool for wider community acceptance and ownership of WASH interventions.
- It is critical to involve women in community WASH.

INTRODUCTION

The sub-Saharan African (SSA) region is the worst affected worldwide in terms of water, sanitation and hygiene (WASH) service access (WHO 2019). Particularly, people in Lusophone and Francophone African countries, where under-5 mortality rates are high including Angola (1,141 under-5 deaths per 100,000) and Cameroon (1,522 under-5 deaths per 10,000; IHME 2021). Despite different levels of development, all SAA countries face very similar challenges in relation to drinking WASH, with large parts of urban and rural populations not having access to clean water and having rudimentary or non-existent sanitation facilities (Armah *et al.* 2018; WHO/UNICEF 2020).

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However, solutions to these challenges vary significantly between these countries due to their highly heterogeneous ethnic, social, cultural and linguistic diversity (Fearon 2003). The weight of powerful religious and cultural factors in spreading diseases, such as that of HIV/AIDS (Velayati *et al.* 2007) and Ebola (Manguvo & Mafuvadze 2015), has demonstrated the significant role of understanding the wider contextual factors. Furthermore, issues related to WASH are not gender-neutral. Evidence suggests that women, along with children, have the principal responsibility for the management of household water supply, water budget, sanitation and hygiene (Fonjong & Fokum 2015), but they are often the group suffering the most from lack of water and sanitation (Bisung *et al.* 2015; Tantoh & Simatele 2017; Silvestri *et al.* 2018). Historically, however, practitioners and policymakers have overlooked gender issues in the area of WASH (Wodon & Blackden 2006).

The UN Sustainable Development Goals (SDGs) recognise the need for participation of local communities with Target 6.b to 'support and strengthen the participation of local communities in improving water and sanitation management'. However, existing SDG indicators 'promote a top-down approach to community participation, and a common definition, framework and principles for community participation in WASH are required if robust qualitative and quantitative indicators are to be established' (Bowling & Hall 2019: 203). There is, therefore, a need to better understand how participatory approaches and community engagement methods can help address development challenges in the areas of clean WASH.

The WASHable project¹ is a collaboration between Lancaster University (UK) and the University of Buea (Cameroon) and the Catholic University of Angola. The project is underpinned by a research network that provides knowledge exchange and capacity building, addressing the need for African academic organisations to open their doors and work with, in and for their communities. It aims to develop a sustained transdisciplinary collaboration through an equitable partnership with SSA countries and to enhance the contribution that community engagement and participatory approaches make to WASH research. This is the first community-based research network on WASH in SSA countries, especially Francophone and Lusophone Africa, and is a stepping stone for the development of meaningful research collaborations that will be strengthened and sustained beyond the end of the project.

To address the literature lacuna in community engagement and WASH, the WASHable project team has developed this transdisciplinary literature review. By responding to a set of identified WASH-related questions to community engagement, it explores through different disciplinary lenses the challenges and opportunities in this significant area.

METHODS

A transdisciplinary literature review was conducted in order to map the community engagement and participatory approaches in low- and middle-income countries reported in the literature across different disciplines as well as all WASH-relevant projects.

Transdisciplinarity has recently emerged in research within different fields, with a growing body of academic publications (Klein 2008; Bibri 2019). Within the context of this paper, influenced by Klein's definition, we define the transdisciplinary literature as 'a process in which members of different fields work together over extended periods to develop novel insights that transcend separate disciplinary perspectives, exemplified by the overarching syntheses of general systems and ecology' (Klein 2008: 117). The field of WASH is very much transdisciplinary in nature, so too is research within, and thus the literature on, it. Transdisciplinary literature reviews are inquiry-based rather than discipline-based (Montuori 2013), as they combine concepts from across and beyond academic disciplines (Oliver *et al.* 2017). They integrate a way of thinking that is different from reductive disciplinary thought: one that contextualises a challenge/topic by placing it and attempting to understand it in terms of its larger environment, relationships and concepts (Montuori 2013). By drawing together information from diverse disciplines, it 'exposes differences between the world of research, and the wider world that research is meant to serve' (Oliver *et al.* 2017).

This transdisciplinary literature review brought together the distinct disciplines of water engineering, environmental microbiology, public health and infectious disease, design research, women and gender studies, and developmental studies, as represented by the research project core and advisory board team. In a series of three workshops conducted online between March and April 2020, the team explored the WASH theme from different disciplinary perspectives mapping several of the key questions the literature review needs to address. A total of 25 WASH-related questions were presented and discussed. These were the most important questions from the experts' perspective, based on the local and regional challenges and

¹ See <https://wash-able.org/>.

needs related to WASH. From this set of questions, the team identified eight that would be addressed in this transdisciplinary literature review and mapped them into four categories (Figure 1). They represented gaps in the literature and contextual factors that we considered are often overlooked. The questions were then grouped into three broader WASH-relevant categories.

The search strategy was developed in stages. An initial text search of Scopus and PubMed was carried out using relevant terms in order to find exemplar articles from which to harvest indexing terms. Following this, the categories and keywords were fine-tuned to ensure that at least all exemplar articles were returned in the final database search. An extensive literature search was conducted using four electronic research databases. These databases were selected because they are amongst the most commonly used ones in the field of technology and health: Scopus, Web of Science, PubMed and African Journals OnLine. The search was performed using the following keywords: 'water' OR 'sanitation' OR 'hygiene' AND 'community engagement' OR 'participatory' AND 'sub-Saharan Africa'. Combinations and alternatives of these keywords were also used. For example, these included 'WASH', 'community participation' and 'Africa'. All searches were conducted in September 2021 and each of the aforementioned search terms was entered in each of the selected databases.

Inclusion and exclusion criteria

A number of inclusion and exclusion criteria were employed to refine the search results. First, the search was limited to English text papers published in peer-reviewed journals, conferences, books, book chapters and review papers from January 2010 to August 2021. Editorials, letters, technical reports and book reviews were excluded. In addition to this, articles that did not address the research question were excluded from the study.

Data analysis

After the literary search was completed and the papers selected based on the aforementioned criteria, the data analysis commenced based on the eight questions set prior to the literature search. A table summarising key findings in relation to the areas of exploration was developed and used as a guide for the team (see Supplementary Material, Table 1 in Appendix 1). Each of the pre-identified three WASH categories (see Figure 2) was assigned to different members of the team to lead the research and write-up. Each lead was supported by another member from a different discipline. Once a draft response was written for a set of questions, these were swapped between teams to be further developed. Then they were circulated amongst the wider team member pool for further feedback.

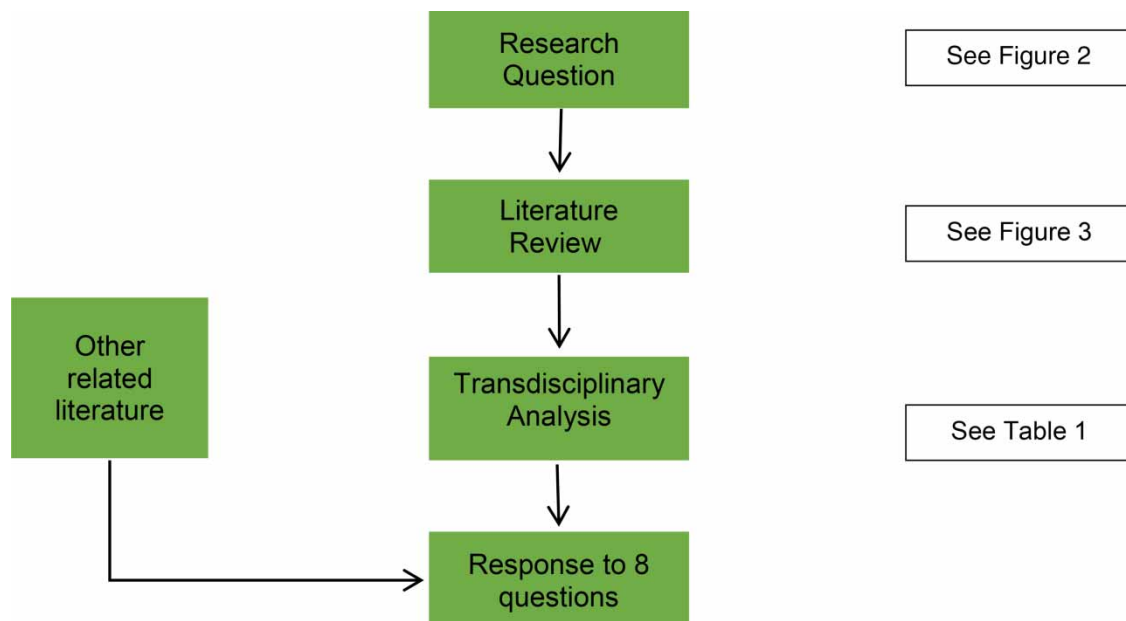


Figure 1 | Literature review methodology diagram.

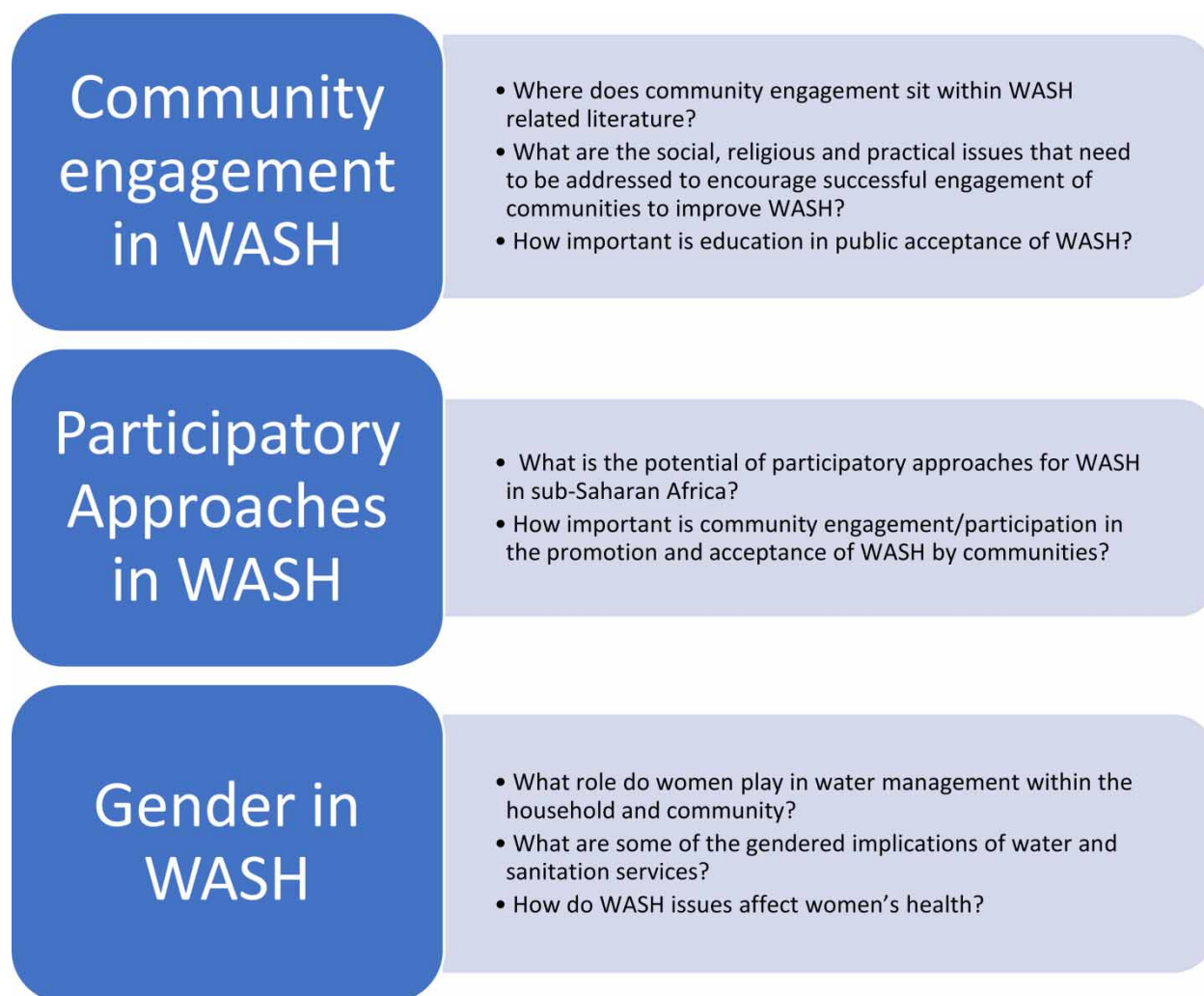


Figure 2 | The set of eight questions this transdisciplinary review explores.

FINDINGS

Our initial search of the four selected databases generated a total of 435 articles (see [Figure 3](#)). After applying the inclusion criteria, presented above, 372 papers were excluded leaving 63 articles for further scrutiny. Of the 63 papers fully screened, 26 addressed directly the research questions and were selected to be included in the review. Looking at the other related literature (e.g. *Journal of Water, Sanitation and Hygiene for Development*) revealed another three papers which were also included, raising the total number of fully reviewed and included articles to 29.

Furthermore, looking at the 63 fully screened articles, only 10 of these discussed/considered WASH together; while 35 focused on water, 10 on sanitation and 7 on hygiene. This was representative of the total articles reviewed, suggesting that there is clearly much more research prioritisation on water, with sanitation and hygiene following well behind.

Looking at the total of 29 articles included in this review, there are a number of noteworthy observations. First, similar to the aforementioned observation, almost half of the papers (13) focused on community engagement within the context of water, 6 focused on WASH, 6 in sanitation, 3 in sanitation and hygiene, and only 1 in hygiene. Second, of those articles, the vast majority (22 out of 29) were published in the last 5 years (2017–2021) with most in the last 3 years (14) and the fewer being published in 2012 (only 2); indicating that there is an increasing research interest in WASH and community engagement. Third, looking at the country focus of the reviewed articles and visualising this (as seen in [Figure 4](#)), it becomes clear that most papers focus on community engagement in WASH in Eastern Africa, with over half of these (17) looking at

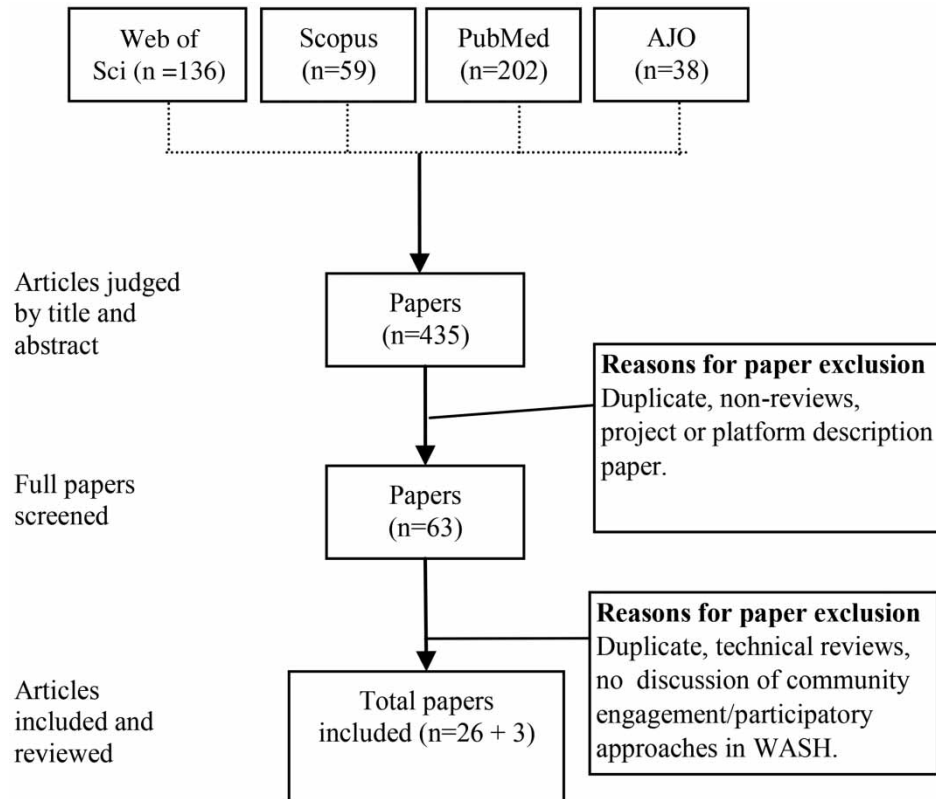


Figure 3 | Literature search strategy.

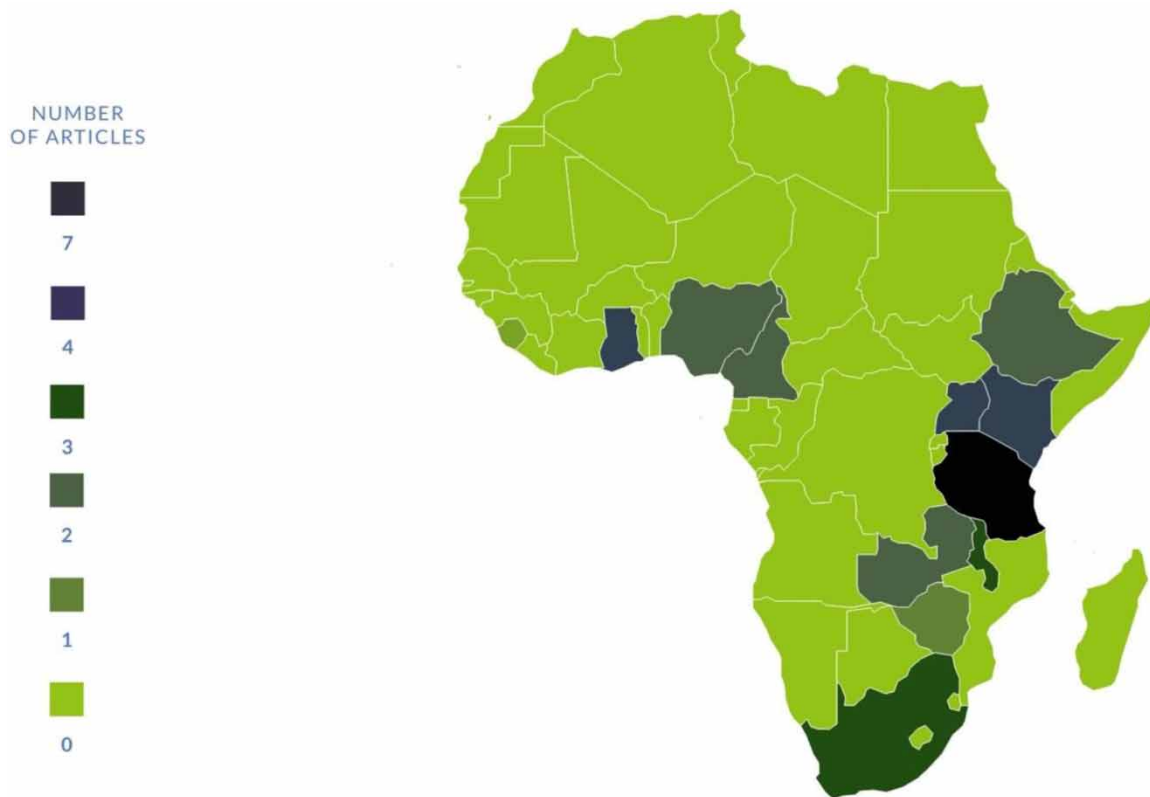


Figure 4 | Distribution of papers included in the review in sub-Saharan Africa.

Tanzania, Kenya and Uganda. There is also a pocket of papers in mid-west Africa mostly targeting Ghana, Nigeria and Cameroon. Fourth, looking at the gender dimension in WASH, only half of theme (14 out of 29 reviewed papers) provide discussion into the challenges and impact of WASH on women. Fifth, there is a diversity of research methods employed in relation to participatory approaches. The most common are focus group discussions, followed by community meetings. Co-creation, co-production and co-design are also being employed across various settings.

REVIEW QUESTIONS AND ANSWERS

Community engagement in WASH

Where does community engagement sit within the WASH-related literature?

The literature reveals that it is mainly water being prioritised in WASH contexts, with sanitation and hygiene often receiving less focus, impacting negatively on water quality and environmental sustainability. The de-prioritisation of sanitation and hygiene is also found beyond emergency and crisis situations, as typically water, food and shelter tend to occupy more immediate attention (Sandison 2018). This is also the case when we look at community engagement within WASH, with most of the articles focusing on water, then sanitation and finally hygiene (as outlined under the findings above).

Within sub-Saharan Africa, where the paper focuses, the literature advocates community participation in water access (Kamara *et al.* 2017; Adams & Boateng 2018; Nastar *et al.* 2018; Hovden *et al.* 2020), water management (Tantoh & Simatele 2017; Kelly *et al.* 2018; Tantoh *et al.* 2021; Arimoro & Musa 2020; Hassenforder *et al.* 2020; Nyam *et al.* 2020; Zambrano *et al.* 2020; Shields *et al.* 2021), sanitation promotion (Crocker *et al.* 2016), sanitation at school (Person *et al.* 2016; Hetherington *et al.* 2017), sanitation for community health (Kariuki *et al.* 2012; Kema *et al.* 2012; Banana *et al.* 2015; Kefeni & Yallew 2018), waste management (Holm *et al.* 2021), hand hygiene (Crosby *et al.* 2020) and menstrual hygiene (Scorgie *et al.* 2016). This indicates that when it comes to community engagement in WASH, hygiene is identified as a key area with more gaps and therefore potential for innovation. Sanitation is identified as the second key gap.

What are the social, religious and practical issues that need to be addressed to encourage successful engagement of communities to improve WASH?

The literature survey reveals that tradition and culture, cultural practices, social norms, formal and informal rules, routines and habits affect the disproportionately successful engagement of communities in projects and programmes aimed at improving WASH (Nastar *et al.* 2018; Silvestri *et al.* 2018; Arimoro & Musa 2020; Hassenforder *et al.* 2020).

Regarding water, it is clear that the cultural context, local context (i.e. resources; geographic considerations, including seasonality) along with the prevalence of poverty can lead to passive involvement of community members affecting water interventions (Hovden *et al.* 2020; Tantoh *et al.* 2021). For instance, many people in the community have the perception of clear water as constituting safe water (Hovden *et al.* 2020), which in turn leads to resistance to improving water facilities that are perceived by the community as good. Ignoring local and indigenous knowledge may also hinder community engagement, as it forms a key part of the local culture and community collective. In fact, local water users often possess detailed indigenous knowledge related to water resources, water needs and historical changes that have occurred related to water use (Arimoro & Musa 2020).

Another challenge is the structure and hierarchy within a given community. It is essential to be aware of the different levels of leadership within the community and the hierarchy, both from a grassroots and a stakeholder's perspective for the project to be sustainable (Hovden *et al.* 2020). Here lies a further challenge of addressing hegemonic cultures and practices to provide more equal access to resources (Silvestri *et al.* 2018) for all community members. Thus, considering the local context in which the water intervention unfolds requires acknowledging the issues around existing community hierarchies and broader community access to water resources.

In terms of sanitation, several studies (Person *et al.* 2016; Scorgie *et al.* 2016; Kamara *et al.* 2017; Kefeni & Yallew 2018) have shown that many issues of sanitation access are related to cultural values, religious practices and traditions. For instance, menstrual hygiene remains immersed in cultural norms of shame in many parts of the world (Scorgie *et al.* 2016; Kefeni & Yallew 2018). In another example, older men avoid being seen going to the latrines, because their culture considers older men going to a latrine as shameful (Kamara *et al.* 2017). Sanitation projects involving communities with strong religious practices need to appreciate these in the design of any intervention, such as the example of the project in Tanzania where urinals were modified to adhere to Muslim culture practices (Person *et al.* 2016). For sanitation research to be successful, community

norms and perceptions around sanitation and gender, age and the body, in general, should be considered when developing community-based interventions (Hyun *et al.* 2019).

With regard to accepting and maintaining sanitation practice, the literature demonstrates that factors in each sanitation stage (from acceptance to safe disposal), such as the perceived risk, perceived barriers, priorities and perceived role, are influenced by cultural perspectives and values, although each individual is influenced to a different extent (Scorgie *et al.* 2016; Kamara *et al.* 2017). A study by Kefeni & Yallew (2018) showed that the cleaning frequency of latrine was shown to have a significant effect on latrine use and adoption.

In terms of existing leadership structures, established religious groups and leaders have a great influence on the communities and form key social structures for community engagement. For example, a study by Manjang *et al.* (2021) found that involving religious institutions such as madrassas in their sanitation programmes was most effective in getting to buy-in from the community. Having gained the leaders' support was important, as communities who receive assurance from the religious leaders are very likely to accept and adopt new WASH interventions.

How important is education in public acceptance of WASH?

Education plays a critical role, as knowledge sharing involving community members is the key to addressing WASH and related challenges (Kema *et al.* 2012; Hetherington *et al.* 2017; Adams & Boateng 2018; Silvestri *et al.* 2018; Aduro & Ebenso 2019; Appiah *et al.* 2020; Hovden *et al.* 2020). However, infrastructures that enable people to act upon these challenges are crucial to managing, sustaining and upscaling new practices (Kariuki *et al.* 2012; Banana *et al.* 2015; Intriago Zambrano *et al.* 2020). Hence, ideally, a WASH approach should adopt a holistic view from promoting community awareness and education to enabling management, scalability and sustainability of WASH locally.

The lack of adequate education and training is identified as a concern in terms of water management (Hovden *et al.* 2020). Also, communities need to be sensitised about the need to preserve water resources and to avoid wasting water (Arimoro & Musa 2020). In terms of sanitation and hygiene, education is equally critical for the promotion and acceptance of WASH, as many community members are not aware of the causes of water contamination, the health effects of using contaminated water or the effects of open defaecation or littering (Silvestri *et al.* 2018). Several studies have underscored the importance of health education and promotion in the improvement of hygiene practice (Kariuki *et al.* 2012; Aduro & Ebenso 2019; Crosby *et al.* 2020). Community members have the potential to solve their health problems, but lack awareness of their potentials (Kema *et al.* 2012). Studies have highlighted that changing mindset and generating a genuine demand for better WASH are the key to sustained change (Kema *et al.* 2012; Hetherington *et al.* 2017; Adams & Boateng 2018).

However, knowledge without activation and training is not enough to lead to better WASH behaviour. For instance, Aduro & Ebenso (2019) found that even in situations, where communities were more knowledgeable about the link between unsafe water and diarrhoea, they did not mention the specific WASH-related factors contributing to it. Within this context, capacity building is the key in community acceptance of WASH, recognised for its potential to bring about change, but requires strengthening of the community structures (Kema *et al.* 2012; Silvestri *et al.* 2018). Furthermore, innovative capacity building as an engagement and empowerment strategy for youth and communities can help develop locally sustainable strategies to improve sanitation and hygiene (Hetherington *et al.* 2017); lack of capacity building threatens the long-term sustainability of the co-production model in WASH (Adams & Boateng 2018).

A range of tools and methods, which have been shown to raise greater awareness of sanitation and hygiene issues, are being proposed in the literature, including media, planning workshops, training sessions and house-to-house visits by village authorities and health officials, and co-created learning processes with engaged stakeholders (Kariuki *et al.* 2012; Kema *et al.* 2012; Bisung *et al.* 2015; Hetherington *et al.* 2017; Silvestri *et al.* 2018). The key in all these approaches is, on one hand, the simplification of the scientific language used and, on the other hand, using human-centred storytelling approaches that can increase public engagement on environmental health and WASH issues (Appiah *et al.* 2020). Also, integrating tools such as 'photo voice', community theatre, can enable the expression of issues difficult to express with words (Silvestri *et al.* 2018).

Involving schoolteachers in sanitation- and hygiene-related programmes has shown to increase promotion at the community level (Crocker *et al.* 2016; Manjang *et al.* 2021) often leading to the implementation of novel school-based education and training (Person *et al.* 2016). Working with community leaders and volunteers and establishing a peer education programme for societal gatekeepers have shown that it can enable them to, on one hand, become advocates for young people and other community members (Kema *et al.* 2012) and, on the other hand, provide more regular and sustained health information that will ensure more accurate information is accessible to people (Aduro & Ebenso 2019). The key to community engagement

and continued participation, especially once the project has ended, is the establishment of change agents, people who have ongoing responsibility for the delivery of WASH services in communities.

Participatory approaches in WASH

What is the potential of participatory approaches for WASH in sub-Saharan Africa?

Community-based and participatory approaches have been proven effective in tackling WASH issues in sub-Saharan countries (Kariuki *et al.* 2012; Bisung *et al.* 2015; Crosby *et al.* 2020; Nyam *et al.* 2020). More precisely, they have led to increased water accessibility in Malawi (Adams & Boateng 2018); helped improve the effectiveness of multi-level participatory water governance in Uganda (Hassenforder *et al.* 2020) and to identify solutions to WASH issues affecting rural communities in resource-poor settings in Uganda (O'Donovan *et al.* 2020); helped solve problems related to water management and agricultural development in South Africa (Nyam *et al.* 2020) and the development of more sustainable and effective interventions for the control of schistosomiasis in Tanzania (Person *et al.* 2016).

Participatory approaches can help address contextual barriers which are often overlooked by understanding those through the 'eyes' of people who experience WASH issues, including their potential, views and needs in the problem-solving process (Bisung *et al.* 2015; Arimoro & Musa 2020). This is likely to lead to sustainable solutions since people tend to be committed to implementing solutions that they participate in the decision-making process, encouraging acceptance (Crosby *et al.* 2020; O'Donovan *et al.* 2020). Additionally, addressing local barriers to WASH earlier avoids investment in non-feasible solutions considering the practice, culture and livelihood diversity of communities on the ground. By enabling active participation of community members in problem-solving, community capabilities are harnessed so the benefits go beyond the physical outcomes of initiatives, being critical to cultivating problem-solving skills, creative and innovation capabilities in communities (Banana *et al.* 2015; Hetherington *et al.* 2017).

How important is community engagement/participation in the promotion and acceptance of WASH by communities?

Our review of the literature shows that community engagement and community participation are keys in the development as well as promotion and acceptance of WASH-related interventions and practices.

In terms of water, community engagement is considered important for water management, water access and supply, as well as for agricultural development. More precisely, influenced by their project, Arimoro & Musa (2020) argue that effective water management requires community engagement and participation. In another project, in Mali, community engagement increased water accessibility, reduced the cost of water and resulted in more effective financial management and accountability (Adams & Boateng 2018). In a project in Cameroon, it was observed that rural water supply was successful in communities, where the population actively participated in the different phases of the water system development (Tantoh *et al.* 2021). Similarly, in Uganda, community-based participation helped solve problems related to water management and agricultural development in the catchment (O'Donovan *et al.* 2020).

Regarding sanitation and hygiene, community engagement and participation were associated with higher uptake of co-developed interventions. In particular, community engagement in sanitation in Tanzania showed that the proportion of households, involved in the project, using pit latrines increased from 33% at baseline to 81% (Kema *et al.* 2012). In another hygiene-related project in Sierra Leone, community engagement led to shared ownership, improved outcomes and more meaningful insights alongside the mitigation of risks and short-circuiting of problems (Crosby *et al.* 2020). In a randomised trial in Mali, the community-led sanitation approach used increased positive sanitation behaviours and reduced under-5 mortality, by which focusing on social motivation and peer pressure rather than financial support (Hyun *et al.* 2019).

Full commitment to a bottom-up community-based, participatory approach, especially one that promotes community ownership, has shown benefits. Communities are more likely to participate in a project that they themselves have helped to initiate and develop (Kema *et al.* 2012; Bisung *et al.* 2015; Appiah *et al.* 2020; Crosby *et al.* 2020; Shields *et al.* 2021). For instance, community engagement in Kenya enhanced trust between the researchers and the community, as well as a sense of ownership over the research process, outcomes and collective actions (Bisung *et al.* 2015), shared ownership and improved outcomes in Sierra Leone (Crosby *et al.* 2020). In relation to this, it has been demonstrated that water management committees were more effective when the community determined their structures rather than them being imposed, when they have strong links to existing leadership structures and when they have the necessary skills (Kelly *et al.* 2018; Nastar *et al.* 2018; Arimoro & Musa 2020; Hassenforder *et al.* 2020; Shields *et al.* 2021). Especially as bringing the administration closer to the people, is making them more active contributors to the development process (Tantoh & Simatele 2017).

Furthermore, community engagement has shown to generate trust, which in turn provides researchers with a better understanding of local vulnerabilities and increases the usefulness of projects to communities (Bisung *et al.* 2015; Silvestri *et al.* 2018; Hassenforder *et al.* 2020; Tantoh *et al.* 2021). In contrast, projects that do not consider local stakeholders, fail to deliver the promised benefits or mitigate the anticipated risks, attract resistance from community members (Holm *et al.* 2021).

Gender in WASH

The neglect and exclusion of women in project cycles is one of the major causes of the high rates of failure of water projects in both rural and urban areas (Tantoh *et al.* 2021). Cultural factors such as the gender roles of women in the community (that hinder their participation in community activities) and traditional beliefs are also recognised as barriers to participatory development and implementation of solutions (Kariuki *et al.* 2012; Banana *et al.* 2015; Silvestri *et al.* 2018). Although women do not participate in decision-making processes, they are usually in charge of the water supply and management of the household (Silvestri *et al.* 2018). Moreover, equity and ethical issues arise when providing cheaper and incomplete solutions for informal settlements. Problems include, for instance, accessibility of the elderly, children and disabled people (Pan *et al.* 2015). Hence, understanding these determinants that define WASH decisions within a community is necessary for developing solutions that are desired, affordable, feasible and sustainable to SSA communities, particularly to the most fragile ones.

What role do women play in water management within the household and community?

Women are typically responsible for collecting, storing and using water (drinking, preparing food, cleaning, bathing, and washing clothes and dishes, brushing, watering the yard and garden) and therefore play a significant role with vital contributions to the sanitation, hygiene, health and household well-being through their domestic role of fetching water (Adams & Boateng 2018; Tantoh *et al.* 2021; Parikh *et al.* 2020; Shields *et al.* 2021). They are, by and large, responsible for domestic water management and the irrigation of subsistence and are likely to bear the principal responsibility for the management of household water supply, water budget, sanitation and health.

Women's groups regard water as the top infrastructure priority issue amongst the household (Parikh *et al.* 2020). This is reflected in their primary household role responsibility in collecting water for performing their household chores, including cooking, cleaning and childcare services. They concurrently play a vital role in ensuring the healthy maintenance of their families. Despite being very instrumental in community development ventures, women are never or rarely given the opportunity to express their views (Tantoh *et al.* 2021). In situations when this happens, such as in the case of a project in Ghana, as reported by Silvestri *et al.* (2018), women are not allowed to participate in meetings organised by researchers without their husbands' consent.

Notwithstanding the centrality of women in water management at household levels, they are side-lined and ignored from any discussions and decision-making concerning water management in their communities (Kamara *et al.* 2017; Kelly *et al.* 2018). In the very few examples from the literature, where women were represented in water committees, their participation in the decisions regarding the water source governance is either restricted (Kamara *et al.* 2017) or limited to cleaning the area around the borehole (Shields *et al.* 2021).

According to Allen *et al.* (2018), women and girls bear the brunt of collecting water and are, by and large, affected by limited access to safe WASH, hence, the need to involve them in all policies and programmes involving water management. While socio-cultural norms and practices on water intensify gender hierarchies, it is also reflective of gender inequality (Kema *et al.* 2012; Kelly *et al.* 2018). Therefore, integrating women into leadership roles in community water management and water and sanitation programmes is more likely to address women's needs of water, can lead to more sustainability in general and can make water projects more effective.

What are some of the gendered implications of water and sanitation services?

Women and girls disproportionately bear the brunt of limited access to water and sanitation and are more vulnerable to water stress due in part to degradable water sources (Bisung *et al.* 2015; Tantoh & Simatele 2017; Adams & Boateng 2018; Silvestri *et al.* 2018; Shields *et al.* 2021). This usually entails several trips for women and children to water-collection points, sometimes involving several hours especially in rural environments (Adams & Boateng 2018). Water burden on women and girls (especially related to water collection) includes risks associated with personal health and safety (i.e. heavy loads, falling into wells and encounters with wild animals) and time taken from education and family (Hovden *et al.* 2020; Parikh *et al.*

2020). In light of this, it is also worth noting that WASH innovation and research projects that place demands for unpaid community contributions may place a disproportionate burden on women (Shields *et al.* 2021).

The fact that women and girls are exclusively responsible for collecting water exacerbates gender inequality, especially given that time for other activities such as schooling, leisure and business is often spent travelling long distances to fetch water (Kema *et al.* 2012; Bisung *et al.* 2015; Silvestri *et al.* 2018). Also, lack of water and poor WASH facilities in schools, workplaces and markets for instance are more likely to affect women and girls than boys and men. Also, short supply and poor quality of WASH services, especially menstrual hygiene (Scorgie *et al.* 2016), in schools are likely to result in absenteeism and may negatively affect attendance and dropout rates for girls. They are also faced with challenges in relation to private and clean spaces to change their sanitary pads during school hours (Tantoh & Simatele 2017; Allen *et al.* 2018). Meanwhile, girls and women are also more likely to encounter similar challenges in the markets and their workplaces where WASH facilities including washrooms are either absent or inadequate. Furthermore, they are expected to offer unpaid labour, particularly around the daily cleaning of water systems (Shields *et al.* 2021).

How do WASH issues affect women's health?

Our literature survey outlines that there are gendered health impacts associated with WASH, especially water collection and lack of water access, sanitation and poor hygiene, that affect women disproportionately (Bisung *et al.* 2015; Adams & Boateng 2018; Kayser *et al.* 2019; Parikh *et al.* 2020; Shields *et al.* 2021). In terms of the specific health conditions that affect women, this tends to refer, with a few exceptions, such as that of reproductive tract infections, to the same range of infections that affect men too. It should be noted that this could probably be the fact that the search terms did not directly explore WASH in healthcare facilities.

Given that in most urban and rural areas where potable water is scarce, women walk long distances to fetch water, the burden of the time used and the water-fetching responsibility, in general, has severe implications for women's health and economic well-being (Kayser *et al.* 2019; Parikh *et al.* 2020). Although women and girls have more responsibility and play a greater role relative to men in WASH activities, in agriculture and domestic labour, they are more vulnerable to infection and suffer disproportionately from lack of access to basic WASH facilities. For instance, women's water-fetching responsibility and the fact that they walk long distances to find water may give rise to neck pain and some spinal injury (Pouramin *et al.* 2020).

Inadequate sanitation infrastructure and limited access to water create and/or reinforce diverse health challenges to women and girls reflected in poor sexual and reproductive health outcomes (Kayser *et al.* 2019; Goddard & Mia 2020). Limited access to water severely affects women's and girls' menstruation experiences in terms of lack of safe and clean water for changing, washing and bathing and the cleaning of reusable sanitary towels, pads and cloths (Tantoh & Simatele 2017; Allen *et al.* 2018). This in part underscores the significance of WASH initiatives and services to women's menstruation and reproduction-related health.

We found that diarrhoea, skin and respiratory infections (Kariuki *et al.* 2012; Kamara *et al.* 2017; Silvestri *et al.* 2018; Crosby *et al.* 2020), reproductive tract infections (i.e. vaginal infections) and maternal health (Kema *et al.* 2012; Scorgie *et al.* 2016; O'Donovan *et al.* 2020), waterborne disease (Crosby *et al.* 2020; Hovden *et al.* 2020), such as schistosomiasis (Bisung *et al.* 2015; Person *et al.* 2016; Manjang *et al.* 2021), and other parasitic infections (Hetherington *et al.* 2017) were the most prominent. We should however note, that there were limited data on quantifying the effect of these on women's health, other than they have a higher risk due to lack of gender-specific hygiene and sanitation facilities. This demonstrates that there is merit for additional more in-depth research on how WASH issues affect women's health.

FURTHER DISCUSSION ON COMMUNITY ENGAGEMENT AND PARTICIPATORY APPROACHES AND GENDER IN WASH

Community engagement and participatory approaches

Further examination of the literature reveals that community management does not inherently lead to broader community participation, but rather that fostering community participation requires intentionality (Shields *et al.* 2021). Unless community engagement and participation are done with intention and via well-established participatory processes, it is doomed to fail. This is well-exemplified by a project on waste management in Malawi, in which sites where community engagement had not been conducted effectively the project did not succeed in contrast to other sites where this was done well, increasing its adoption and use (Holm *et al.* 2021).

In successfully engaging communities, it is crucial to understand existing local beliefs and priorities before implementing a WASH programme in order to identify appropriate facilitating values and approaches for effective participation. Moreover, community characteristics (e.g. complexity of social structure, existing values, social and economic goals, degree of internal control and existing involvement in community) also affect the style and level of participation in community actions (Scorgie *et al.* 2016; Kamara *et al.* 2017). For instance, the least resourceful actors need to have a space created specifically for them in order to be able to form a shared agenda based on their needs and concerns and to make their claims visible prior to their engagement with WASH interventions (Nastar *et al.* 2018). Furthermore, it is important that community engagement takes place over a long period of time so that seasonal patterns in water access management can be understood and better incorporated into WASH training (Kelly *et al.* 2018). Ignoring these characteristics will hinder successful participation and/or the implementation of aspects of WASH programmes.

There is also the need to understand power relations, roles and responsibilities of the diverse actors and institutions in the WASH system from the outset. Considering these factors, Silvestri *et al.* (2018) highlight that a well-functioning democracy is critical to creating a 'protected space' in which community members, especially vulnerable ones, can participate in WASH solutions' development and decision-making. The need for an interdisciplinary bottom-up approach to WASH that considers the complexity involved between socio-cultural and technological elements in communities is widely recognised (Silvestri *et al.* 2018; Intriago Zambrano *et al.* 2020). It is, therefore, key to explicitly engage with intra-community diversity and inequalities in order to facilitate the opportunity for all community members to meaningfully participate in decision-making (Shields *et al.* 2021). Activities that are embedded in capacity building, co-creation of knowledge and participatory development can encourage the engagement of more vulnerable members and disadvantaged groups, leading to knowledge sharing across communities (Silvestri *et al.* 2018).

Unequal access to education forms another challenge in the WASH context (Silvestri *et al.* 2018). Building the capacity of potential change agents forms a key education practice that can address sustainability in WASH awareness and services within the community. In selecting research participants, projects in WASH should therefore also consider the potential of actors in engaging in future actions and experiments, and the process should provide them with opportunities to learn, build capacities and access resources (Silvestri *et al.* 2018). The model of change agents can also be applied in the school environment. Especially, in contexts where there are no effective government/state change agents, community-level change agents, such as community leaders and schoolteachers, are critical to sustainable WASH services in communities, and thus resources should be made available to support these change agents (Tyndale-Biscoe *et al.* 2020). A project by Person *et al.* (2016) has demonstrated that the training of a small group of schoolteachers enabled training a larger group of teachers in their school, leading to more children being engaged in WASH prevention and control activities. Parents were also encouraged to attend in order to learn about the impact of WASH practices on health and how to prevent this in their children (Person *et al.* 2016).

The sustainability of WASH services 'requires systemic ways to understand the complexity of the problems at hand and to propose innovative governance approaches' (Silvestri *et al.* 2018: 2). Community engagement and participatory approaches can be valuable methods to achieving this, as we have outlined in the sections above. However, it should be noted that a big challenge in this is upscaling in local communities and domesticating the tools to suit local conditions, especially in areas of resource constraints (Kariuki *et al.* 2012). To counterbalance this, the alignment of interventions with community priorities can help in ensuring uptake and sustenance of services in the long term (Parikh *et al.* 2020).

Gender

The absence and exclusion of women from the design and planning of community water supply and sanitation programmes and projects can be considered as a major impediment to development. Given the fundamental role of women as providers and users of water and therefore the duty and tasks in ensuring the availability and accessibility of water, the global community recommends the integration of women into all efforts geared towards improving the quality and accessibility of water (Kamara *et al.* 2017; Adams & Boateng 2018; Kelly *et al.* 2018; Parikh *et al.* 2020; Shields *et al.* 2021; Tantoh *et al.* 2021).

Considering the relationship between women and water created by their gender roles, women are expected to be more knowledgeable of water resources, quality, availability and accessibility (Kamara *et al.* 2017; Parikh *et al.* 2020). However, the gender roles of women in the community do not allow them to actively participate in community development activities (Kariuki *et al.* 2012). The feminisation of domestic water collection and management in many communities implies that women are to a great extent knowledgeable of water-related issues including the quality, availability and location of water

sources. Their participation in WASH interventions in areas of scarce water and hygiene commodities can bring distinct benefits to water sanitation and hygiene as a whole (Kariuki *et al.* 2012; Tantoh & Simatele 2017). Thus, for any effective use and functioning of water supply and sanitation facilities, the involvement of users who are mainly women is central as they play a very fundamental role in the management and use of water (Shields *et al.* 2021). *Thus, the active participation of women in WASH programmes is imperative.* Including women in training and capacity building will enhance women's understanding of water and sanitation issues and will lead to the identification of resolutions and recommendations to improve quality, access and sanitation facilities.

CONCLUSIONS

Our transdisciplinary review of the literature on community engagement, participatory approaches and gender in WASH enables us to draw the following main conclusions. *First*, community engagement should be done with intentionality and over a longer period of time for both community engagement and WASH programmes to be effective. *Second*, successful community engagement requires consideration and understanding of the cultural context and value, the community hierarchy, structure and power balance. *Third*, community engagement in WASH should employ existing culturally embedded leadership structures, such as schoolteachers, religious leaders and community leaders. *Fourth*, it should aim at creating a direct link between knowledge sharing and knowledge activation through capacity building and training programmes, which apply the new/shared knowledge in practice. *Fifth*, in doing so it should train change agents from the community, particularly young children to embed change and share knowledge across families and communities. *Sixth*, engaging communities through co-design and co-production of WASH interventions provides a great tool for wider community acceptance and ownership. *Seventh*, there is a clear gender inequality in WASH with women being disproportionately affected. *Eighth*, women's increased participation in WASH programmes and research has the potential to improve WASH acceptance and ownership by the community as well as improve the understanding, access and quality of WASH interventions. *Ninth*, although WASH issues impact women's health, it is not clear to what extent and why. Therefore, this area merits further research.

Sustainable and equitable WASH management needs research that goes beyond raising awareness to fully engage, at grass-roots level, with communities in order to (1) ensure that novel solutions are developed at the appropriate scale to meet specific needs and (2) offer opportunities for acquisition of knowledge and skills, personal experiences of efficacy, ability to identify and solve problems. Participatory design and co-design are promising ways of (1) understanding WASH challenges and issues from the perspectives of communities and (2) co-creating solutions that are locally meaningful, considering livelihood diversity, social, cultural and economic determinants. Moreover, considering the level of investment required and the high impact of WASH challenges on public health, good governance and public official commitment to enhance WASH conditions in sub-Saharan Africa are critical. Public empowerment and engagement without appropriate local support and accountability may neither empower nor be scalable or sustainable.

DATA AVAILABILITY STATEMENT

All relevant data are included in the paper or its Supplementary Information.

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