

# Child-centred methods for school-based WASH interventions: co-creating sanitation research and interventions for and with children

*Rowan Ellis and Anu Karippal*

In 2020, the Joint Monitoring Programme of the WHO and UNICEF reported that, although 69 per cent of educational settings had basic improved drinking water, sanitation and hygiene provision lagged behind this figure (UNICEF/WHO, 2020). This shortcoming is pronounced in rural settings, where only 44 per cent of schools have basic sanitation services (improved single-sex operational facilities), and 34 per cent have basic hygiene services (handwashing facilities with soap and water). The picture in South Asia is more encouraging, but subnational data reveals a gap in provision between rural and urban settings, with just over 50 per cent of schools in rural India enjoying basic hygiene facilities, and 62 per cent with basic sanitation provision (ibid: 49).

There is growing recognition of the importance of securing access to water, sanitation, and hygiene (WASH) services in schools for educational attainment, children's health and wellbeing, and as an important intervention to reduce gender disparities in education and health outcomes (Jasper et al., 2012; Joshi and Amadi, 2013; Deroo et al., 2015; Sahin, 2015). Because of this, the expansion of WASH in schools (WinS) provision is enshrined in UN Sustainable Development Goal 4 (indicator 4.a.1), and there are a growing number of countries with WinS programmes (see, for example, WaterAid's multi-country WASH in Schools programme; Hinds and Keatman, 2017; UNICEF/WHO, 2020).

Beneficiary participation in WinS is seen as important for stimulating demand for sanitation improvements, ensuring the sustainability of school-based sanitation interventions, and securing sanitation behaviour change beyond just the school setting (Kere et al., 2016; McGinnis et al., 2017). While emphasis on participation in sanitation interventions is not new (UNICEF, 2012; Sultana, 2015), the shift in focus to children's participation is relatively recent. Numerous evaluation reports, academic review papers, and project briefs now mention the importance of gathering greater input from children themselves (Hinds and Keatman, 2017; Nyambe et al., 2018), and often describe children as 'change agents' for more widespread sanitation behaviour change (Dooley and Sahin, 2014; Bresee et al., 2014; see also Joshi et al., 2016). Evidently there is an ambition to centre children and their experiences in the design and delivery of WinS interventions. But we assert that achieving this

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ambition requires moving from an operational mode, which is focused on delivering WASH messages to children, to a more collaborative research-orientated approach that recognizes the contribution children can make to defining problems and solutions to WASH challenges.

Although there is some evidence of school-based WASH interventions that adopt a 'participatory approach' (Lupele et al., 2017; Redman-Maclaren, et al., 2018), there is very little detail or discussion on the methods or mechanisms by and through which children participate in sanitation interventions. There is even less reflection on the experience, challenges, or effectiveness of this participation. As a result, numerous questions remain unanswered: when and how should children participate in sanitation interventions? What are the limitations and challenges of children's participation? Does children's participation provide new evidence or insight about how to improve sanitation services for children?

In this paper, we share our experience of conducting sanitation research and developing recommendations *with* and *for* children. This approach was devised to enable children to contribute to the design and implementation of a single school-based sanitation facility in rural India. To do so, we developed a child-centred methodology that enabled us to learn from children about the sanitation challenges they face in school and, more broadly, to consider practical solutions to these challenges together, enabling critical reflection on the value and limitation of children's participation in school-based sanitation interventions.

The paper is structured as follows: first, we examine the rationale that underpins the emergence of school-based WASH programmes before we turn to the methodological insights that emerge from childhood studies and consider their applicability to school-based sanitation interventions. We then detail our child-centred methods and ethical considerations. The subsequent section describes how these methods support children's participation at various stages in the research process and presents the findings generated from this. Finally, we reflect on some of the new insights that emerge from research with and for children, potential areas for further exploration, as well as the limitations and challenges of this approach.

## **Background and rationale**

### ***WASH in schools***

The focus on schools as a priority destination for sanitation investments is rooted in evidence about the way poor WASH services impact children in specific ways. Research has highlighted children's amplified vulnerability to the consequences of poor sanitation deriving from their exposure to contamination and the resulting health impacts (Bartlett, 2003: 60) as well as the developmental and non-health impacts (Pearson and McPhedran, 2008). The costs of poor access to water and sanitation facilities is often borne disproportionately by children who may lose out on education and play time when they are required to contribute to household water and waste management practices (ibid; Robson et al., 2013). Research also shows that children also seem to benefit less when there are sanitation investments

because material interventions are often not designed with children in mind (Bartlett, 1999). These last two issues point to the importance of children's lived experiences in the context of inadequate sanitation.

Research into children's vulnerability provides valuable substance to the argument for improving children's access to sanitation in schools. However, barring some notable exceptions (Robson et al., 2013; Hetherington et al., 2017), much of this focus on children's experiences of poor sanitation derives from research methodologies that rely on data generated from adults who have contact with children (as caregivers, teachers, or service providers), or on health-related data that is collected from children with the consent of adults. For example, McMichael (2019) reviewed 38 sources that reported on WinS programmes across both academic and grey literatures. Of these, only one source is characterized as adopting a participatory design, one other source utilized self-reported data from children, and just five sources overall collected data on children's perceptions (McMichael, 2019: 8–15). Most of the sources in McMichael's review drew their evidence from school records, parent reports, clinical observations, health data, and/or researcher observations (ibid). Essentially, these findings derive from research *on* children to characterize the impacts of poor sanitation and hygiene, and to evidence the effectiveness of interventions in schools.

When children play a more central role in research to inform WinS programming, it usually takes two forms. The first is through large-scale data-collection tools such as knowledge, attitude, perceptions (KAP) surveys. In these examples, data provided by children is analysed and presented as evidence in support of the need for sanitation behaviour-change interventions (Vivas et al., 2010), for measuring and demonstrating the impacts of such interventions (Von Medeazza et al., 2019), or has been analysed to highlight disparities in types of sanitation knowledge and practices (Sibiya and Gumbo, 2013). In essence, this type of approach treats children as objects of current research and potentially subjects of future interventions.

The second way in which children participate in applied sanitation research is as targets of behaviour-change interventions, the impacts of which are the subject of research (Hinds and Keatman, 2017). These interventions are often structured through predetermined formats such as school-based hygiene or water clubs (O'Reilly et al., 2008; Trinies et al., 2016). What these two forms have in common is that children have very little say in what the research should focus on, how (and if) they participate, and in devising any outcomes from the research.

### ***Children's participation***

Within both academic and grey literature that reports on WinS interventions and outcomes, there appears to have been little engagement with or assimilation of the considerations that arise in wider discussions about children's participation in research. This lack of engagement is surprising given how vibrant these debates have become within academic research and on the part of various civil society and NGO actors that work directly with children.

The growing interest in children's participation in research has come through recognition of children's right to participate, as enshrined in the UN Convention on the Rights of the Child (United Nations, 2009), the expansion of children's participation within a diversity of international development programmes, and methodological debates and innovations surrounding research with children (Tisdall, 2013; Cuevas-Parra and Tisdall, 2019). Although there are differing views about the validity or robustness of findings generated through child-centred or even child-led research methods (see Hammersley, 2017; Spyrou, 2018), there is a growing consensus about the value of children's participation to meet a diversity of research and applied or programmatic aims.

James and colleagues (1998) identified the key features of a new paradigm in social studies of childhood built on an understanding 1) of childhood as a socially constructed concept; 2) that children and their social relationships are worthy of study; and 3) that children must be seen as active agents in both the construction of their own lives and the societies in which they live. This paradigm has inspired a whole host of theoretical and methodological reflection, marking a shift in the study of children and childhood towards something now called 'childhood studies' (Holloway and Valentine, 2000). One of the key ideas from childhood studies that has led to methodological reorientations has been to critique the notion of children as passive victims or incomplete subjects not yet fully capable of acting upon the world (Morrow and Mayall, 2010; Sime et al., 2017). Instead, those working within this new paradigm argue that children are 'experts' in their own lives (Langhout and Thomas, 2010) as well as social actors with agency to interact, (re)produce as well as transform social structures (Morrow and Mayall, 2010). This belief underpins an active and ongoing methodological debate about children's different competencies and the research methods most suited to these (James et al., 1998; Punch, 2002).

This has led to methodological innovation within childhood studies. For example, researchers have adapted tools from participatory action research for use with children and young people (Langhout and Thomas, 2010; Porter et al., 2010; Ozer, 2016). Gallacher and Gallagher (2008) suggest combining work and play in child-centred research, arguing that children learn and communicate through play and that participation in research should be fun. Others have explored child-directed methodologies that allow children to guide the focus of the research (Porter and Abane, 2008). Still others have shown how visual and creative methods (such as drawing, participatory video, or storytelling) can overcome literacy and language barriers (D'Amico et al., 2016; Eastwood et al., 2021). Due and colleagues (2014) advocate for a 'toolkit' approach for research with children, which builds in the flexibility as well as the opportunity for research to adapt and respond to the interests, capabilities, and diversity of child participants.

There are also some widely recognized challenges to doing child-centred research associated with children's positions of relative disempowerment, marginality, as well as protective structures. Accessing children through adult 'gatekeepers' in education or care settings has long been acknowledged as a challenge to participatory approaches in children's research (Masson, 2004; Pyer and Campbell, 2013).

In her research with migrant children, Sime et al., (2017) observes that, when children are approached through schools, teachers, and other adults, gatekeepers often play a role in selecting which children participate in the process. Children's ability to provide informed consent is further complicated by this issue of mediated access, in particular their ability to decline to participate in settings where adherence to adult authority is normalized (Morrow, 2008). Although schools have often been the preferred location for accessing and conducting research with children, there is scope and value in considering how children's participation might take different forms outside of school, and yield different research insights as a result.

The insights that emerge from childhood studies have a significant bearing on research that seeks to understand and improve children's experiences of sanitation in educational settings. First, it highlights the need for a methodology that takes account of unequal access to power and representation on the part of child participants (both relative to adults, as well as each other). Recognizing the way in which children's participation in school settings might be constrained or influenced, and carving out alternative spaces or opportunities for children to participate, is one example of how WinS research might address this. Second, childhood studies highlight the value in approaches that create opportunities for children to author their own experiences of sanitation and be active in the construction and assessment of outcomes. Methodologies that centre children's voices, enable and embrace a diversity of communication styles, and include children at various stages of the research process allow children to exercise agency in how they participate and enable reflection on the effect of that participation. In the best cases, better participation through child-centred methodologies provides children with a say in the decisions that affect their life, and can lead to better outcomes for children, particularly in contexts where these decisions influence services for children.

## Methodology

The child-centred methods presented here were developed in the context of a larger project focused on sustainable solutions for on-site sanitation and wastewater treatment infrastructure for rural educational settings (Ganesh Subramanian et al., 2020; Koseoglu et al., 2021). The project was executed at a government primary school in a village in the south Indian state of Karnataka. The school served a village with a population of approximately 2,982 (according to the 2011 census), and at the time of conducting this research (2017–19), there were approximately 180 students aged 5–12 who attended the school. All research was conducted with ethical approval from the Research Ethics Committee of the James Hutton Institute (approval ID 106/2017). In the following section, we reflect on the additional ethical considerations when conducting research with children.

### *WinS research toolkit*

The sustainability of sanitation and wastewater treatment infrastructure was conceived of across multiple social and environmental dimensions. Understanding

of the factors that shaped the social sustainability was derived from scoping activities within the village and preliminary discussions with school staff and local authorities, which revealed issues with vandalism of school facilities alongside wider issues of toilet abandonment and open defecation, an issue that has been documented elsewhere in rural India (Hueso and Bell, 2013; Orgill-Meyer et al., 2019).

Child-centred methodologies were developed around the following applied research aims: 1) to gather children's own accounts of barriers to accessing improved sanitation; 2) to document children's sanitation practices, and monitor change in these practices over time; 3) to enable children's preferences to inform the design of school-based sanitation facilities; and 4) to evaluate these facilities as well as children's experiences of participation.

Research with children was conducted between October 2017 and December 2019 over the course of 25 field visits. Four researchers were involved in data collection with children. One researcher was a native Kannada speaker and also functioned as a translator and interpreter during data-collection activities. Research with children entails special ethical considerations, particularly those associated with the challenges of ensuring informed consent. In this research, parental consent was obtained via school staff for children participating in research activities, and children were never forced to participate in activities. Researchers also remained attuned to context-dependent cues about children's comfort or willingness to participate and made methodological decisions in response to this. One member of the research team also spent significant time in the field to build rapport with the children through play and other non-research-focused interactions. This rapport was important for developing trust between researchers and children, mediating some of the hierarchical dynamics between adults and children that prevail in a school setting.

Our child-centred methodology was devised around a participatory 'toolkit' approach (Due et al., 2014). This approach combined qualitative and quantitative data-collection tools with the goal of creating a variety of avenues for children to participate in the research, generating multiple types of data for triangulation and comparison purposes, and to allow for a methodology which could evolve and adapt in response to children's interests and issues that arose (see Table 1). Our sample size ranged from as few as 12 children to as many as 106. Most activities were organized during school hours and on school premises and, as such, the selection of child participants was often practically constrained by the availability of children in school that day. We worked with school staff to try and balance student participation to capture a diversity of student experience, but some activities were deemed (by teachers) as more suitable for older students (see Figure 1). We utilized a range of more 'conventional' data-collection tools (interviews, focus groups, surveys), as well as more creative, visual, and non-language-based methods that allowed for collaborative interpretation of insights. The toolkit approach not only utilized a range of methods, but also enabled children to engage with the research process at different stages. Children's participation in the research process can be distinguished by their role as data contributors, in interpretation and co-creation of recommendations, and as evaluators of project outcomes and experiences.

**Table 1** Methods toolkit

<i>Method</i>	<i>Participants<sup>1</sup></i>	<i>Type of participation</i>	<i>Focus</i>
Street interviews	29 children (13 male, 16 female), 6–13 years	Data contributor	Existing/baseline sanitation experiences
Self-reporting ‘chit’ survey <sup>2</sup>	106 students, 8–10 years	Data contributor	Baseline school toilet usage
Self-reporting ‘chit’ survey	65 students, 8–10 years	Data contributor	Post-intervention school toilet usage
Focus group discussions	41 students (23 male, 18 female), 10–13 years	Data interpretation and recommendations	School toilet issues and experiences and improvements
Problem-tree activity	12 students (6 male, 6 female), 10–12 years	Data interpretation and recommendations	Problem, barriers, and solutions to improved sanitation in school
Focus group discussions	37 students (19 male, 18 female) 8–13 years	Evaluation	Post-intervention reflections, experiences of participation

Notes: <sup>1</sup> We use ‘male’ and ‘female’ to describe the gendered identities that were presented to us by either teachers or students themselves. We recognize that this language does not adequately account for those students who may be transgender or gender diverse. The issues surrounding transgender inclusion in sanitation programming are only recently drawing sustained academic attention and are the subject of a recent review paper by Boyce et al. (2018).

<sup>2</sup>The ‘chit’ is a traditional form of rural recording associated with historically specific forms of credit and lending known as ‘chit funds’. In common parlance, the notion of a chit sheet implies a form of accounting that has cultural legibility for participants in the study site.

### **Data contributors**

A central tenet of child-centred methodologies is that children are valid sources of information, or ‘data’, about their own lives. As primary users of the planned school-based sanitation facility, it was important to understand how children viewed existing sanitation provision, to explore and capture their daily sanitation-related practices, at school and more widely, and to explore the various drivers and barriers associated with existing sanitation practices. We utilized three distinct methods to allow children to provide data to this effect.

First, we conducted short ‘street interviews’ with children who attended the primary school. These interviews took place, as the name suggests, in the streets and lanes of the village, out of school hours, and over the course of several days. Street interviews were adopted as an early method to mitigate some of the affirmation bias that can be a factor in hierarchical educational settings, as well as to aid in building rapport and trust with child participants. Although the researchers sought and received consent from parents/guardians, children’s participation was entirely voluntary and it was not uncommon for children to conclude the interview early, by either running off to play or changing the subject. Twenty-nine children were interviewed, and we utilized a purposive sampling strategy to capture responses



**Urination -Defecation Record Chit**  
**DWWT Project, Beramabadi (6<sup>th</sup>-8<sup>th</sup> Dec 2017)**

Doit/Gender-

13/12/2017 15:20

dir/ Class-

 <b>ಮೂತ್ರ ವಿಸರ್ಜನೆ</b>	 <b>ಮಲವಿಸರ್ಜನೆ</b>
○	○
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**Figure 1** Sample of a ‘chit’ sheet

from boys and girls who attended the local government school, as well as a range of ages and stages of children (see Table 1). The interviews followed a semi-structured format and asked children about their access to improved sanitation facilities outside of school (i.e. private or shared latrines), how frequently they used improved sanitation facilities outside of school, what factors shaped this use, and how frequently they used the existing sanitation facilities at the school.

We also designed a non-language-based self-reporting survey, described here as a ‘chit’ survey, to allow children to confidentially contribute quantitative data about sanitation practices. This survey asked children to report the frequency of toilet use, and the nature of that use (urination or defecation), by placing a mark on a graphical sheet that was distributed at the start of the school day over three days



(see Figure 1). The chit survey was conducted before the installation of the new sanitation facility to provide baseline usage figures. For the baseline survey, toilet usage data was collected over three days from 35 students on each day, with a total of 106 students completing the survey. This method was then repeated three times over the 2.5-year duration of the project, allowing researchers to capture change in school toilet use over time and in relation to the installation of new sanitation facilities at the school. In subsequent iterations of the survey, a total of 65 students were surveyed.

### *Interpretation and co-creating recommendations*

Children were asked to contribute to decisions about the design of their new school-based sanitation facilities. The initial method for encouraging this contribution was through conventional focus group discussions (FGDs). Two FGDs were organized, one among boys and one among girls. Twenty-three boys and 18 girls aged approximately 10–13 years took part in the FGDs, which were roughly 30 minutes in duration. These discussions took place inside a school classroom and teachers were present. Students were asked to reflect on the results of the chit survey, the issues that shaped their toilet-use decisions, and were asked to consider what sorts of improvements could be made to the existing school sanitation facilities. One outcome was a ‘wish list’ of various design elements that students wanted to be incorporated in the new facility.

Following the FGDs, the research team considered approaches for further interpretation of the data that was being collected about the existing toilet practices, and the aspirations reflected in the wish list generated in the FGDs. Researchers adapted a tool from solution science studies called the ‘problem-tree method’, which is used in collaborative settings to identify a specific issue, its causes, impacts, and potential interventions. The method is built out of the analogy of a tree, which has roots (causes), a trunk (issues), and branches (impacts). Identifying the various elements of the ‘problem tree’ then initiates a discussion about interventions or solutions that can be targeted at different parts of the tree. In this case, 12 children took part in the activity (see Table 1). The results were recorded in photographs and researcher field notes (see Figure 2). The activity was repeated with a group of seven parents, and again with four teachers. Although we do not reflect in depth here on data-collection activities with adults, it is worth noting that the problem-tree activity revealed differences in how children and adults define the nature of the ‘problem’ of sanitation, which is noteworthy because it highlights the potential value of children’s autonomous participation, a point to which we will return.

Children’s interpretations of the ‘problem’ of school-based sanitation were analysed and coded thematically. These themes comprised key barriers to children’s access to school-based sanitation. These barriers were then compared with the wish list generated from the FGDs, as well as observational reflections from researchers, to support the development of recommendations that were reflective of children’s views of potential solutions to the identified barriers.



**Figure 2** Children participating in a problem-tree activity

### **Evaluators**

A final series of FGDs was conducted with students to discuss their views of the completed sanitation facilities, raise any concerns about the new facilities or the arrangements for managing these, and to reflect on their experience of participating in the project. The team conducted four FGDs, and a total of 37 children between 8–13 years participated in these.

### **Results**

Our child-centred methodology painted a rich picture of how children experienced and negotiated sanitation access in our study site. While some of these insights are consistent with existing evidence, our research sheds new light on the relationship between school, home, and village sanitation access.

Key findings:

- Children made choices about when and where to meet their sanitation needs, which were not exclusively structured by access.
- Barriers to improving children's sanitation practices at school must be contextualized within a wider landscape of sanitation provision.
- There are inequalities in terms of how children are impacted by poor sanitation facilities in school.
- Children were capable and willing evaluators of their school sanitation facilities, and articulated feelings of pride and status associated with improved school sanitation.

### *Sanitation practices and experiences*

Children described the ways they actively negotiated uneven access to sanitation. This negotiation takes place across a wider landscape that includes homes, school, and public spaces. Children described sanitation practices that relied on a mix of improved sanitation facilities and open defecation (OD). In some instances, children's choices about their sanitation practices were strategic and based on a judgement of the facilities available to them. In this way, our data uncovered a more nuanced experience of sanitation access than what may be indicated by national or even subnational statistics about WASH access.

Although all the children who participated in street interviews would be considered as having access to improved sanitation (because of their enrolment in a school with these facilities), discussion with children about their daily sanitation practices revealed that most children in the sample practised OD to some degree. However, the reasons for these practices varied across the responses and were mediated by their access to sanitation facilities in the home, school, or other spaces, such as the homes of relatives. Access was not uniform either between or among children, but also access could vary in response to, for example, illness in the family and adult decisions about prioritizing use of private sanitation facilities. Children also made choices about when and where to meet their sanitation needs, and although these were sometimes dictated by issues of access, other factors also shaped these decisions.

### *Home toilets on the rise*

During the time of this research, the national government of India was implementing a national toilet-building and sanitation campaign. The Swachh Bharat Abhiyan, or Clean India, campaign was initiated in 2014 with the aim to make India OD free by 2019 (Jain et al. 2020). Towards this end, the central government made funds available for the construction of household toilets. This resulted in a surge of new or planned toilet construction in the study village. At the time when the street interviews took place (October 2017), 10 children had access to a toilet in their home, two children lived in homes that were in the process of constructing toilets, and 17 had no toilet in the home. Of those children who had toilets in their home, all of them reported that they would only use the school toilet for urination. Not surprisingly, those without access to a home toilet reported higher rates of use of the school toilet for defecation and urination, although still only 8 of the 17 children (or 47 per cent) without toilet access at home used the school toilets in this way. In total, 34.5 per cent of children interviewed used the school toilet for urination and defecation. Over 65 per cent of all the children said they practised OD.

Focus group and street interview respondents described 'holding it' until they got home, or even leaving school at mealtimes to use their home toilet. Children described home toilets as more comfortable, private, and dignified, and therefore preferable to school toilets. However, home toilets were also seen as a resource to be conserved. Children described occasions where home toilets

were reserved for the elderly or infirm. Others said that, when a family member was ill, they would be forbidden from using the household toilet. Other children described household toilets that had become inoperable or were only used for special occasions and were more regularly used as storage spaces. It was clear that the mere existence of a toilet in the home did not guarantee children had regular and unfettered access to these. In such instances, children would meet their sanitation needs in other ways.

### ***Open defecation***

Even children who had toilets in their homes practised OD, but with varied frequency. Some children described their choice to defecate in the open as one of urgency or as the only choice in the absence of access to a toilet. Other children made this choice occasionally as a matter of convenience, and some described it as sociable and fun. Some children said they preferred OD to what they viewed as the unhygienic conditions in shared sanitation facilities (including the school).

For those who described OD as a matter of necessity, they also expressed some drawbacks to OD, such as the fear of wild animals after dark. Yet, taken together, children's reflections on practices of OD highlight the way it was viewed as just one option among several and they may choose to practise OD for a variety of rationales. Access to improved sanitation alone was not a determinant of these choices.

### ***School toilets: characterizing dissatisfaction and devising solutions***

The baseline data from the self-reporting survey supported students' more qualitative accounts of their school toilet use. As previously discussed, data collected from children through the street interviews revealed a range of feelings of dissatisfaction with the existing sanitation facilities in their school, which led to avoidance behaviours among some children. Subsequently, FGDs and interpretation facilitated by the problem-tree method allowed researchers and children to distil the key factors that underpinned this dissatisfaction. These factors, or 'barriers', to school sanitation access are as follows.

*Water availability.* Children described the difficulty of using the school toilets, especially for defecation, in the face of limited availability of water in the toilets themselves. The standard practice in rural India is to use water for washing after using the toilet (instead of toilet paper or other products). However, the toilets were served by a non-continuous piped public water supply and, with no adequate water storage capacity for the toilet blocks, the toilets did not always have running water (for hygiene or flushing purposes). The intermittent or non-availability of water in the school toilets meant that children often had to haul water to the toilets from the on-site sump. Children saw this as a time-consuming and physically strenuous burden, and instead of hauling water, many children would choose to not use the school toilet for defecation where water was more of a requirement.

*Comfort, safety, and privacy.* Children remarked on the issues of poor maintenance and vandalism, which undermined their comfort and privacy when using the toilet. Poor ventilation, poor lighting, and missing doors were the most frequently cited issues that impacted on children's feelings of comfort and privacy. The children also described the toilets as dirty and foul smelling. Taps were also broken and not repaired, further exacerbating the issue of water (un)availability.

The issue of water availability came up again as a privacy concern. Particularly female students remarked on feelings of embarrassment at carrying water across the school grounds, which revealed to other students their private activities in the toilet. Female students also expressed discomfort and embarrassment around the disposal of sanitary products. Existing facilities required that students either carried sanitary products to a disposal bin outside of the toilets or disposed of them in the toilet pan (which would lead to blockages). Female teachers echoed this concern about the discreet disposal of sanitary products.

*Availability of home toilets.* As previously discussed, there was a relationship between the availability of toilets in the home and students' patterns of use of the school toilet. Children expressed a preference for using the toilet at home, and many children chose to withhold defecation until they returned home or skipped classes to use home toilets if withholding was not possible. Although this barrier is one that is not directly related to the conditions of in-school sanitation, the regularity with which the availability of home toilets was raised suggests it is an important factor. The previously mentioned challenges associated with children's sanitation practices in school must be contextualized within a wider landscape of sanitation provision. It also highlights important inequalities in terms of how children are impacted by poor sanitation facilities in school – those who have access to better facilities at home can choose to 'opt out' of the poor service levels at school.

### ***Incorporating children's perspectives and evaluating outcomes***

One outcome that derived from the research activities and findings was the co-creation of a set of recommendations for designing context-appropriate, child-friendly sanitation facilities. Certain design elements of the wastewater treatment and sanitation infrastructure were predetermined by site conditions (topography, existing pipe locations) and the availability of materials. Other elements were incorporated as best practice for safety and inclusivity (handrails on toilet stairs, disabled access,<sup>1</sup> and fencing around treatment components). Despite this, there was an opportunity and enthusiasm for incorporating children's views into the design elements. A set of broad recommendations were derived out of analysis of data collected by and from children, as well as by triangulating this with observations from the research team and discussions with the school management committee. These recommendations were then used as the basis for exploring various design or technical solutions that could be implemented within the scope of the project

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<sup>1</sup> At the time of conducting this research, no children with physical disabilities were attending the school, but to ensure the future inclusivity of the toilet facilities, the design included a disabled toilet with ramp access and grip bars.

**Table 2** Sample of preliminary recommendations

<i>Problem</i>	<i>Recommendation</i>	<i>Response</i>
Unreliable water supply in toilet blocks	Explore options for enhancing the resilience of water supply in toilets	Water storage tanks added to the toilet blocks. Recycled greywater pumped to overhead tanks to provide water for flushing toilets. Harvested rainwater (which was already being stored on site) was connected by pipe to the toilet blocks as a back-up supply.
Dirty toilets, broken locks, vandalism	Explore maintenance and cleaning arrangements for toilet blocks	Economic costing models to explore options for sustainable funding for maintenance and cleaning with local authorities and school management committee. <sup>1</sup> The project also allocated funds for training in various elements of system maintenance, as well as for employing janitorial services.
Lack of privacy for female students	Consider ways to enhance girls' privacy and menstrual hygiene needs	An incinerator was installed in the girls' toilet for safe disposal of sanitary products. Girls and boys were provided with a separate toilet entrance.

Note: <sup>1</sup>The development of these models is explored in depth in Koseoglu et al. (2021).

activities and budgets. A sample of the recommendations and the design elements that resulted from these are captured in Table 2.

These recommendations also formed a useful framework for post-installation evaluation of the project. FGDs asked children to tell researchers what they liked best about the new toilets, report any elements that they did not like, and make suggestions for improvements. While it was perhaps not surprising that children reported the constant water supply and functional water taps as positive improvements, there was also praise for smaller elements that enhanced their comfort and convenience, including dustbins, mirrors, and the bright and airy feel of the new toilet block. Female students were explicit in the benefits that arose from having sanitary waste disposal in the toilet blocks and the convenience of handwash facilities in the toilets.

Some children reported that they were less inclined to return home to meet their sanitation needs, although this reflection was primarily offered by older female students in relation to the sanitary waste disposal. In an evaluative FGD with older boys, participants made special mention of the toilets being particularly appreciated when one was suffering with gastrointestinal upset.

Children remarked that improvements could be made in terms of ensuring the availability of hand soap in bathrooms and lowering the mirrors, since smaller children had to jump to see themselves. Children also highlighted areas where external taps leaked and expressed concern over foul water and mosquitos.

Perhaps more unexpected was the enthusiasm with which the children articulated feelings of pride associated with the new sanitation facilities. The project received modest attention in the local media; children were aware of this and felt like this attention showed that their school was now a 'good school'. Other children said that, when teachers visited from other villages, they would 'say good things' about their school. Overall, the children expressed a sense of accomplishment at having been part of the improvement of their school. While this particular finding is based on just one set of FGDs in a single school, it does highlight the potential of WASH in school improvements to generate wider benefits in terms of dignity and status for children, a potential that has been identified but for which there is little research and evidence. A valuable avenue for further research would be to explore the extent to which this benefit is amplified by children's participation in decisions about WinS.

## Conclusions

This paper opened with a series of unanswered questions about children's participation in school-based sanitation interventions. The first question related to the when and how of children's participation in sanitation interventions. We considered the diverse roles children can play in research-driven interventions. This consideration necessitated the development of a range of methods that could facilitate meaningful participation at various stages, but also accounted for children's different capacities to articulate these experiences. Our approach did not seek predefined behaviour-change outcomes, but, echoing the UNCRRC and the ethnical assertions of childhood studies, started from the premise that children's meaningful participation is valuable in and of itself.

We also asked what we could learn from this type of approach. In our experience, the diversity enabled by the methodological toolkit generated new and varied insights. Our street interviews highlighted the way children, often quite expertly, negotiated a host of considerations in accessing sanitation and in meeting their needs. These negotiations also shed light on the way access to improved sanitation cannot be directly inferred from infrastructure or service levels. This suggests that assessments of sanitation access in education settings can be augmented by more qualitative, child-focused research that explores the way school-based provision is positioned within a wider landscape of sanitation infrastructures, behaviours, and inequities.

Our more targeted, school-based FGDs also highlighted the affective considerations that shaped how children experience sanitation facilities at school. While concerns over cleanliness, privacy, and smells are not new findings for sanitation research, FGDs with children allowed the research to capture the particularity of these experiences. Further opportunities for participation, such as the problem-tree activity, supported the co-creation of specific recommendations about how these issues could be addressed. This sort of tangible, co-created outcome would not derive as easily from a process that was built on standardized surveys and mediated by adults.



Additional new insights also emerged from our more evaluative activities, which highlighted some unanticipated benefits to improved sanitation in school, namely those associated with pride and enhanced social capital. While more research is required to establish the nature of these relationships, the evaluation outcomes suggest that there is scope for closer consideration of the link between positive feelings about school, improved sanitation, and children's participation.

As expected, there were also challenges and limitations to research with and for children. These challenges are most salient around issues of access and sampling, affirmation bias, and risks and safeguarding. Although we were able to ultimately include children from a range of age groups and achieve a moderate balance between male and female respondents, this diversity was inherently limited by the reliance on the school as the primary field site. Our ability to dictate which children were selected to participate on any given school day was limited and teachers had the ultimate say on which children were selected. We observed a tendency to select the same children, and would often gently request the inclusion of some new participants. Our street interviews were useful for facilitating participation that was not mediated by the school structure, but had its own limitations: most notably, we were only able to speak with children who were available and not otherwise occupied with caring, household, or other work-related activities. We do not have the necessary data to reflect on how this might have impacted the responses we received, but one could speculate that children and young people who engaged in various forms of work would identify unique sets of sanitation considerations and concerns.

We also acknowledge that our methodology was not able to fully account for the issues of affirmation bias – that is, the potential of child participants to provide the answers that they think are expected of them. While we took steps to mitigate the naturalized pupil-teacher dynamics in our various research activities, we must account for the positionality of external researchers, whose urban, educated, and mobile capabilities conferred a privileged status that cannot be easily undone by reassurances about voluntary participation and open discussions. Particularly in the evaluative phase, we must read the positive feedback about the school sanitation facilities against the wider context where school officials and teachers were celebrating the opening of new school toilets. Whether the feelings of pride articulated by children remain as salient over time would require a follow-up piece of research.

A final consideration that comes to light, particularly in the context of sanitation research, surrounds the limitations of child-centred research approaches. While the focus of this paper was the insights and findings from and with children, this work was interpreted alongside data generated from research with adults. This comparison highlighted some areas where children's perception of risk associated with certain activities or services did not align with the view of adults. For example, some of the design considerations, such as handrails and fences, were included as 'child-friendly' design, but these elements were not identified by children themselves as barriers to sanitation access. Although a banal issue, the example of handrails and fences for keeping children safe does remind us of the balance that must be struck

in child-centred approaches between the responsibility of adults to protect children, and the desire to listen to and validate children's views. We reiterate that mixed and participatory methods, which centre children's voices across the research process, can facilitate this balance.

In conclusion, we have set out to share our experience of utilizing the theoretical and methodological insights from childhood studies to support research for and with children to better understand how children experience and negotiate access to sanitation, with the aim to inform a WinS intervention. We believe this approach facilitated the development of new insights about children's experiences of sanitation, particularly in contexts where access is not universal and service levels are not always adequate to ensure the full benefits of improved sanitation. Our approach also illustrates how including children at various stages in an intervention enables the development of actionable recommendations that reflect the experiences and needs of children themselves.

## References

- Bartlett, S. (1999) 'Children's experience of the physical environment in poor urban settlements and the implications for policy, planning and practice', *Environment and Urbanization* 11(2): 63–74 <<https://doi.org/10.1177%2F095624789901100207>>.
- Bartlett, S. (2003) 'Water, sanitation and urban children: the need to go beyond "improved" provision', *Environment and Urbanization* 15(2): 57–70 <<https://doi.org/10.1177%2F095624780301500220>>.
- Boyce, P., Brown, S., Cavill, S., Chaukekar, S., Chisenga, B., Dash, M., Dasgupta, R.K., De La Brosse, N., Dhall, P., Fisher, J., Gutierrez-Patterson, M., Hemabati, O., Hueso, A., Khan, S., Khurai, S., Patkar, A., Nath, P., Snel, M. and Thapa, K. (2018) 'Transgender-inclusive sanitation: insights from South Asia', *Waterlines* 37(2): 102–17 <<http://dx.doi.org/10.3362/1756-3488.18-00004>>.
- Bresee, S., Lupele, J. and Freeman, M. (2014). *Children as Agents of Change for WASH in Rural Zambia*, Emory University, Atlanta, GA.
- Cuevas-Parra, P. and Tisdall, E.K.M. (2019) 'Child-led research: questioning knowledge', *Social Sciences* 8(2): 44 <<https://doi.org/10.3390/socsci8020044>>.
- D'Amico, M., Denov, M., Khan, F., Linds, W. and Akesson, B. (2016) 'Research as intervention? Exploring the health and well-being of children and youth facing global adversity through participatory visual methods', *Global Public Health* 11(5–6): 528–45 <<https://doi.org/10.1080/17441692.2016.1165719>>.
- Deroo, L., Walter, E. and Graham, J. (2015) 'Monitoring and evaluation of WASH in schools programs: lessons from implementing organizations', *Journal of Water, Sanitation and Hygiene for Development* 5(3): 512–20 <<https://doi.org/10.2166/washdev.2015.026>>.
- Dooley, T. and Sahin, M. (2014) 'Chapter 11: Advancing health, learning and participation through WASH in schools in Africa', in P. Cross and Y. Coombes (eds), *Sanitation and Hygiene in Africa: Where do We Stand?*, pp. 89–93, IWA Publishing, London.
- Due, C., Riggs, D.W. and Augoustinos, M. (2014). 'Research with children of migrant and refugee backgrounds: a review of child-centered research methods', *Child Indicators Research* 7(1): 209–27 <<https://doi.org/10.1007/s12187-013-9214-6>>.

- Eastwood, A., Juárez-Bourke, A., Herrett, S. and Hague, A. (2021) 'Connecting young people with greenspaces: the case for participatory video', *People and Nature* <<https://doi.org/10.1002/pan3.10236>>.
- Gallacher, L. and Gallagher, M. (2008) 'Methodological immaturity in childhood research? Thinking through participatory methods', *Childhood* 15(4): 499–516 <<https://doi.org/10.1177%2F0907568208091672>>.
- Ganesh Subramanian, P.S., Raj, A.V., Jamwal, P., Connelly, S., Yeluripati, J., Richards, S., Ellis, R. and Rao, L. (2020) 'Decentralized treatment and recycling of greywater from a school in rural India', *Journal of Water Process Engineering* 38: 101695 <<https://doi.org/10.1016/j.jwpe.2020.101695>>.
- Hammersley, M. (2017) 'Childhood studies: a sustainable paradigm?', *Childhood* 24(1): 113–27 <<https://doi.org/10.1177%2F0907568216631399>>.
- Hetherington, E., Eggers, M., Wamoyi, J., Hatfield, J., Manyama, M., Kutz, S. and Bastien, S. (2017) 'Participatory science and innovation for improved sanitation and hygiene: process and outcome evaluation of project SHINE, a school-based intervention in rural Tanzania', *BMC Public Health* 17(1): 1–15 <<https://doi.org/10.1186/s12889-017-4100-7>>.
- Hinds, R. and Keatman, T. (2017) 'Lessons from WaterAid's multi-country WASH in schools programme', *40th WEDC International Conference*, Loughborough, UK, 24-28 July, 2017 <<https://wedc-knowledge.lboro.ac.uk/resources/conference/40/Hinds-2739.pdf>> [accessed 14 December 2021].
- Holloway, S. and Valentine, G. (2000) 'Spatiality and the new social studies of childhood', *Sociology* 34(4): 763–83 <<https://doi.org/10.1177/S0038038500000468>>.
- Hueso, A. and Bell, B. (2013) 'An untold story of policy failure: the Total Sanitation Campaign in India', *Water Policy* 15(6): 1001–17 <<https://doi.org/10.2166/wp.2013.032>>.
- Jain, A., Wagner, A., Snell-Rood, C. and Ray, I. (2020) 'Understanding open defecation in the age of Swachh Bharat Abhiyan: agency, accountability, and anger in rural Bihar', *International Journal of Environmental Research and Public Health* 17(4): 1384 <<https://doi.org/10.3390/ijerph17041384>>.
- James, A., Jenks, C. and Prout, A. (1998) 'Theorizing childhood', pp. 81–104, Cambridge Polity Press, New York, NY.
- Jasper, C., Le, T.-T. and Jamie Bartram, J. (2012) 'Water and sanitation in schools: a systematic review of the health and educational outcomes', *International Journal of Environmental Research and Public Health* 9(8): 2772–87 <<https://doi.org/10.3390/ijerph9082772>>.
- Joshi, A. and Amadi, C. (2013) 'Impact of water, sanitation, and hygiene interventions on improving health outcomes among school children', *Journal of Environmental and Public Health* <<https://doi.org/10.1155/2013/984626>>.
- Joshi, D., Kooy, M. and van den Ouden, V. (2016) 'Development for children, or children for development? Examining children's participation in school-led total sanitation programmes', *Development and Change* 47(5): 1125–45 <<https://doi.org/10.1111/dech.12258>>.
- Kere, C., Nikiema, L. Z., Boutin, M. and Debus, J. P. (2016). Increasing local participation in monitoring and learning to improve WASH services in schools. Briefing paper presented to 39th WEDC International Conference, Kumasi, Ghana, 2016 <<https://core.ac.uk/download/pdf/288362854.pdf> >
- Koseoglu, N.M., Ellis, R. and Biswas, D. (2021) 'Scenario-based life-cycle cost assessment to support sustainable investment in rural communal sanitation facilities: the application to a

school-based sanitation facility', *Journal of Water, Sanitation and Hygiene for Development* 11(5): 771–84 <<https://doi.org/10.2166/washdev.2021.230>>.

Langhout, R.D. and Thomas, E. (2010) 'Imagining participatory action research in collaboration with children: An introduction', *American Journal of Community Psychology* 46(1): 60–6 <<https://doi.org/10.1007/s10464-010-9321-1>>.

Lupele, J., Kakuwa, B. and Banda, R. (2017) 'Improving the quality of education through partnerships, participation and whole-school development: a case of the WASH project in Zambia', in H. Lotz-Sisitka, O. Shumba, J. Lupele, D. Wilmot (eds.) *Schooling for Sustainable Development in Africa*, pp. 175–85, Springer, Cham <[https://doi.org/10.1007/978-3-319-45989-9\\_13](https://doi.org/10.1007/978-3-319-45989-9_13)>.

Masson, J. (2004) 'The legal context', in S. Fraser, V. Lewis, S. Ding, M. Kellett, C. Robinson (eds) *Doing Research with Children and Young People*, pp. 43–58. SAGE, London.

McGinnis, S.M., McKeon, T., Desai, R., Ejelonu, A., Laskowski, S. and Murphy, H.M. (2017) 'A systematic review: costing and financing of water, sanitation, and hygiene (WASH) in schools', *International Journal of Environmental Research and Public Health* 14(4): 442 <<https://doi.org/10.3390/ijerph14040442>>.

McMichael, C. (2019) 'Water, sanitation and hygiene (WASH) in schools in low-income countries: a review of evidence of impact', *International Journal of Environmental Research and Public Health* 16(3): 359 <<https://doi.org/10.3390/ijerph16030359>>.

Morrow, V. (2008) 'Ethical dilemmas in research with children and young people about their social environments', *Children's Geographies* 6(1): 49–61 <<https://doi.org/10.1080/14733280701791918>>.

Morrow, V. and Mayall, B. (2010) 'Measuring children's well-being: some problems and possibilities', in A. Morgan, M. Davies and E. Ziglio (eds), *Health Assets in a Global Context*, pp. 145–65, Springer, New York, NY <[https://link.springer.com/chapter/10.1007/978-1-4419-5921-8\\_8](https://link.springer.com/chapter/10.1007/978-1-4419-5921-8_8)>.

Nyambe, S., Hayashi, K., Zulu, J. and Yamauchi, T. (2018) 'Water, sanitation, hygiene, health and civic participation of children and youth in peri-urban communities', *Sanitation Value Chain* 2(1): 39–54 <<https://doi.org/10.34416/svc.00010>>.

O'Reilly, C.E., Freeman, M.C., Ravani, M., Migele, J., Mwaki, A., Ayalo, M., Ombeki, S., Hoekstra, R.M. and Quick, R. (2008) 'The impact of a school-based safe water and hygiene programme on knowledge and practices of students and their parents: Nyanza Province, western Kenya, 2006', *Epidemiology & Infection* 136(1): 80–91 <<https://doi.org/10.1017/S0950268807008060>>.

Orgill-Meyer, J., Pattanayak, S.K., Chindarkar, N., Dickinson, K.L., Panda, U., Rai, S., Sahoo, B., Singhae, A. and Jeuland, M. (2019) 'Long-term impact of a community-led sanitation campaign in India, 2005–2016', *Bulletin of the World Health Organization* 97(8): 523 <<https://doi.org/10.2471%2FBLT.18.221572>>.

Ozer, E.J. (2016) 'Youth-led participatory action research: developmental and equity perspectives', *Advances in Child Development and Behavior* 50: 189–07 <<https://doi.org/10.1016/bs.acdb.2015.11.006>>.

Pearson, J. and McPhedran, K. (2008) 'A literature review of the non-health impacts of sanitation', *Waterlines* 27(1): 48–61 <<https://www.jstor.org/stable/24684955>>.

Porter, G. and Abane, A. (2008) 'Increasing children's participation in African transport planning: reflections on methodological issues in a child-centred research project', *Children's Geographies* 6(2): 151–67 <<https://doi.org/10.1080/14733280801963086>>.

- Porter, G., Hampshire, K., Bourdillon, M., Robson, E., Munthali, A., Abane, A. and Mashiri, M. (2010) 'Children as research collaborators: issues and reflections from a mobility study in sub-Saharan Africa', *American Journal of Community Psychology* 46(1): 215–27 <<https://doi.org/10.1007/s10464-010-9317-x>>.
- Punch, S. (2002) 'Research with children: the same or different from research with adults?', *Childhood* 9(3): 321–41 <<https://doi.org/10.1177/2F0907568202009003005>>.
- Pyer, M. and Campbell, J. (2013) 'The other participant in the room: the effect of significant adults in research with children', *Research Ethics* 9(4): 153–65 <<https://doi.org/10.1177/2F1747016112464721>>.
- Redman-Maclaren, M., Barrington, D.J., MacLaren, D., Humpress Harrington, H., Cram, D. and Selep, J. (2018) 'Improving WASH in Pacific Island schools by embracing local epistemologies', *WASH Futures Conference, 5-9 March, 2018, Brisbane, Australia* <[https://washfutures.com/wp-content/uploads/2020/03/D4\\_Dani-Barrington\\_Humpress-Harrington.pdf](https://washfutures.com/wp-content/uploads/2020/03/D4_Dani-Barrington_Humpress-Harrington.pdf)> [accessed 9 June 2022].
- Robson, E., Porter, G., Hampshire, K. and Munthali, A. (2013) 'Heavy loads: children's burdens of water carrying in Malawi', *Waterlines* 32(1): 23–35 <<https://www.jstor.org/stable/24686870>>.
- Sahin, M. (2015) 'Guest editorial: tackling the stigma and gender marginalization related to menstruation via WASH in schools programmes', *Waterlines* 34(1): 3–6 <<https://www.jstor.org/stable/24688186>>.
- Sibiya, J.E., Gumbo, J.R. (2013) Knowledge, attitude and practices (KAP) survey on water, sanitation and hygiene in selected schools in Vhembe District, Limpopo, South Africa', *International Journal of Environmental Research and Public Health* 10: 22 82–95 <<https://doi.org/10.3390/ijerph10062282>>.
- Sime, D., Evans, R., Holt, L. and Skelton, T. (eds.) (2017) 'Challenging barriers to participation : doing research with migrant children and young people', In: *Methodological Approaches. Geographies of Children and Young People*, 2 (1). Springer, Singapore, pp. 135–57. ISBN 9789812870193
- Spyrou, S. (2018) 'Disclosing childhoods', in *Disclosing Childhoods*, pp. 1–14, Palgrave Macmillan, London <[https://link.springer.com/chapter/10.1057/978-1-137-47904-4\\_1](https://link.springer.com/chapter/10.1057/978-1-137-47904-4_1)>.
- Sultana, F. (2015). Rethinking community and participation in water governance. *The Routledge Handbook of Gender and Development*, pp. 261–72, Routledge, London.
- Tisdall, E.K.M. (2013) 'The transformation of participation? Exploring the potential of "transformative participation" for theory and practice around children and young people's participation', *Global Studies of Childhood* 3(2): 183–93 <<https://doi.org/10.2304/2Fgsch.2013.3.2.183>>.
- Trinies, V., Garn, J.V., Chang, H.H. and Freeman, M.C. (2016) 'The Impact of a school-based water, sanitation, and hygiene program on absenteeism, diarrhea, and respiratory infection: a matched-control trial in Mali', *The American Journal of Tropical Medicine and Hygiene* 94(6): 14–18 <<https://doi.org/10.4269/2Fajtmh.15-0757>>.
- UNICEF (2012) 'Water, sanitation and hygiene (WASH) in schools', in *Child-Friendly Schools Manual* <<https://phkh.nhsrsc.pk/sites/default/files/2020-10/Water%20Sanitation%20and%20Hygiene%20in%20Schools%20UNICEF%202012.pdf>> [accessed 14 December 2021].
- UNICEF/WHO (2020) State of the World's Sanitation: An urgent call to transform sanitation for better health, environments, economies and societies. New York: United Nations Children's

Fund (UNICEF) and the World Health Organization <<https://www.unicef.org/media/86836/file/State-of-the-world%E2%80%99s-sanitation-2020.pdf>>.

United Nations (2009) *Convention on Rights of the Child: General Comment Article 12* <<https://www2.ohchr.org/english/bodies/crc/docs/advanceversions/crc-c-gc-12.pdf>> [last accessed 01/12/2022].

Vivas, A., Gelaye, B., Aboset, N., Kumie, A., Berhane, Y. and Williams, M.A. (2010) 'Knowledge, attitudes, and practices (KAP) of hygiene among school children in Angolela, Ethiopia', *Journal of Preventive Medicine and Hygiene* 51(2): 73 <<https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3075961/>>.

Von Medeazza, G., Cavill, S. and Fisher, J. (2019) 'Assessing change in access to WASH in Palestinian schools', *Waterlines* 38(2): 123–34 <<http://doi.org/10.3362/1756-3488.18-00039>>.