Review Paper

WASH and Gender: a critical review of the literature and implications for gender-transformative WASH research

Jess MacArthur, Naomi Carrard and Juliet Willetts

ABSTRACT

The connections between gender and water, sanitation, and hygiene (WASH) are profound, and the sector is beginning to explore the integration of gender-transformative principles into WASH programming and research. Gender-transformative approaches challenge inequalities and move beyond an instrumentalist approach to gender in development interventions. Through a critical review of academic empirical studies, this paper explores the last decade of WASH-gender literature (2008–2018). Trends were visualised using an alluvial diagram. The reviewed literature was underpinned by a diversity of disciplines, yet was dominated by women-focused, water-focused studies. Although the studies addressed many important gender considerations, few studies engaged with transformational aspects of gender equality. The majority of the studies were based in rural sub-Saharan Africa and South Asia, indicating opportunity to explore contextual dynamics in other areas of the global south. Lastly, the studies primarily focus on women of productive age; only a few studies touched on gender dynamics relevant for a diversity of women, and men and boys were mostly absent. Insights from this analysis can inform future studies at the intersection of WASH and gender. Researchers and practitioners are encouraged to include a diversity of voices, reflect on the strengths and limitations of research disciplines, and incorporate gender-transformative concepts.

Key words | gender equality, gender-transformative, sanitation, transformative research, WASH, water

HIGHLIGHTS

- Innovative analysis methods explore the last decade of academic literature in the WASH-gender nexus (n = 155).
- Literature is water-focused in rural sub-Saharan Africa and South Asia.
- Men and boys feature in just 3% of studies.
- Literature is from 92 journals and 22 disciplines, highlighting the need for interconnections to avoid instrumentalism.
- Future studies can strengthen transformative research through participatory and mixed approaches.
INTRODUCTION

This paper explores how empirical studies on water, sanitation, and hygiene (WASH) over the last decade have engaged with gender equality. Although many aspects of WASH have long been acknowledged to be gendered, such as water collection, cooking, cleaning, and childcare (White et al. 1972), the historical focus on engineered solutions in WASH has limited the sector’s attention to gender (Willetts et al. 2013). More recently, there is emerging recognition in the sector that bridging practical gender needs (e.g. access to water) with strategic gender interests (e.g. changes in power and roles) is critical to achieving transformational changes in gender equality (Carrard et al. 2013). We adopt a phrasing of ‘gender equality’ to reflect the Sustainable Development Goals (Stephens et al. 2018) and conceptualise equity and empowerment as pathways to equality. With growing awareness of the centrality of gender equality in WASH, it is timely for the sector to reflect on the extent and scope of empirical research. In particular, there is opportunity to explore how the sector engages with emerging concepts of gender transformation, which are characterised by themes such as power, roles, and responsibilities in the context of inclusion, accountability, and non-discrimination (Cornwall & Rivas 2015).

Improvements in WASH have important consequences for all individuals but are perhaps even more significant for women and girls (Fisher et al. 2017). Aspects such as well-being, status in society, health, education, and safety remain critical to WASH-gender research (Fisher 2006). Literature speaks to four reasons for engaging with gender in WASH research and programming: the inherent challenges faced by women and girls; the integral role of women and girls in WASH; instrumental objectives; and ideological foundations. Firstly, women and girls have inherent biological challenges when it comes to water and sanitation including the physical acts of urination and defaecation, as well as complexities related to menstruation and pregnancy (Caruso et al. 2017; Fisher et al. 2017; Hennegan et al. 2019). Secondly, the integral social and structural responsibilities for household WASH are closely related to the traditional roles of women and girls including water collection, cooking, cleaning, and childcare (White et al. 1972; Fisher et al. 2017). Thirdly, gender-focused WASH programming can be seen as helpful for achieving programme sustainability, economic gains, improved health, and improved economic livelihoods (Fisher et al. 2017). In such programmes, a focus on women is seen as a means to an end. Lastly, there is a moral imperative to address gender equality in development programming as an objective in itself, which has emerged from feminist, social, and religious philosophies about the significance of gender equality (Kabeer 1994; Willetts et al. 2010; Carrard et al. 2013).

Reflections of the instrumental, integral, inherent, and ideological motivations within the WASH and gender discourse reveals evolution in thinking. There is a growing appeal to move beyond instrumental motives, towards a practice that supports inherent needs, while aiming to
transform the integral roles of women and girls by embracing a transformative ideological imperative (Willets et al. 2010; Fisher et al. 2017; Sweetman & Medland 2017). Research-based on an ideological imperative is more likely to be gender-transformative, seeking to bridge practical gender needs – such as access to water or sanitation – with strategic gender interests – including changes in power, status, and societal structures (Moser 1989; Kabeer 1994). Leveraging examples from the agriculture and health sectors, gender-transformative thinking asserts that research and practice can and should contribute to change in gender relations in wider society (Sweetman & Medland 2017, p. 159). Such research explores transformative concepts such as structures, agency and relations; values and voices; and utilises cross-disciplinary, participatory, and change-oriented approaches (Mertens 2009; Hillenbrand et al. 2015; Mullinax et al. 2018).

The International Decade for Women (1976–1985) and the International Decade for Water and Sanitation (1981–1990) overlapped from 1981 to 1985, catalysing the first WASH-gender research nexus – a body of work exploring the interconnections between WASH research and studies in gender equality. Early WASH-gender studies focused on women’s roles as users, managers, and change agents within water collection, utilisation, and management (White et al. 1972; Elmendorf & Isely 1981). Re-engaging with this historical interest and focused on gender-WASH dynamics, Fisher et al. (2017) analysed conference proceedings, observing the evolution of the WASH sector with regard to women, gender, and equity, ultimately concluding that the WASH sector has embraced women’s interests. Recently, Dery et al. (2019) also explored empowerment within WASH from global health literature, identifying five WASH-relevant elements of empowerment: participation, decision-making, information, capacity building, and leadership.

This study builds on and extends these analyses by investigating trends over the last decade of published WASH-gender empirical studies, providing an opportunity to review and reflect on the WASH-gender nexus. We present findings from a literature review utilising methods from the digital humanities, namely distant reading and visualisation techniques, to identify trends and themes in the literature. First, we describe the approach and introduce nine analysis fields used to categorise the reviewed literature. We then present findings in a visual form with interpretive text. Finally, we identify and discuss six insights arising from the analysis that can support future research into, and implementation of, gender-transformative WASH.

**METHODS**

To examine trends in current gender-related empirical research in the WASH sector, this study mapped and thematically analysed WASH and gender academic articles. Literature from 2008 to 2018 was identified through the Scopus database with a focus on international development contexts (164 low- and middle-income countries), gender (gender OR women OR girls OR men OR boys), and WASH (water OR sanitation OR hygiene OR wash). The database search identified 527 unique articles, of which 155 were selected after removing irrelevant and non-empirical studies.

Drawing from the digital humanities, the study utilised distant reading analysis, a technique for aggregating and analysing a large set of texts by coding titles and abstracts to identify themes and gaps. The digital humanities leverage digital technologies and data visualisation to study literature and culture (Kirschenbaum 2010). Conventionally, distant reading analysis utilises computer processes, including text and topical analysis to help explore patterns of information that are difficult for traditional analysis (Kirschenbaum 2010). It is often used in literature and the arts to study a large corpus of literature. The approach is also useful in exploring a body of academic literature, enabling observation of trends and patterns across a broader set of texts than would be feasible with a closer-reading approach.

We coded trends and themes for nine analysis fields: year of publication; journal discipline; data type; geographic region; study context; primary focus on water, sanitation or hygiene; aspect of WASH investigated; aspect of gender investigated by the study; and terminology used to describe the individuals being considered. These terms are defined in Table 1. The full codebook can be found in the Supplementary Material.

Results from coding were visualised in an alluvial diagram to display a series of relative proportions. Trends
identified in the alluvial diagram were then considered with reference to wider gender and development literature, drawing from a parallel review of assessments of a gendered change in international development interventions to identify insights and implications relevant for the WASH sector.

Findings of the study should be interpreted with reference to limitations associated with the distant reading approach and the scope of literature reviewed. First, the analysis explored the English academic literature, excluding grey literature, literature in other languages, and conference proceedings. The decision to focus on the academic literature was justified to ensure a manageable scope, enable the use of databases with known inclusion criteria, and in the knowledge that academic research plays an important role informing both research and practice. Second, reflecting dominant discourse in the existing literature, the review adopts a binary and heteronormative conception of gender, which we hope will be complemented by more inclusive analyses as the body of literature grows. Third, the distant reading technique is focused on main messages rather than details, which means nuance can be missed. Nonetheless, content highlighted in titles and abstracts reflects dominant themes and drives discourse, justifying a focus on breadth as a complement to in-depth analyses.

### RESULTS

The 155 reviewed articles captured the breadth and diversity of the last decade of empirical WASH-gender research as visualised in Figure 1 and described below. The relative proportions of studies within each of the nine analysis fields allow visual identification of the predominant foci of the literature. The analysis fields are grouped into four broad sets of study characteristics, as identified at the top of the figure (reading from left to right): study aspects, contextual aspects, WASH conceptual aspects, and gender conceptual aspects.

Study aspects show publication year, publication journal, and type of data. Within the sample, 72% of the studies were from the second half of the decade, indicating increasing interest in the WASH-gender nexus. Journals were aligned with 22 discrete disciplines. Public Health (15% of total), Development (14%), and Gender Studies (12%) were the most common disciplines represented, with Medicine (9%), WASH Technology (8%), and Geography (8%) also represented. The public health discipline saw a seven-fold increase in studies from 2008 to 2018. Analysis of cross-referencing between journals and authors indicated that 13% of studies had no interconnection within and across the sample. Interest in quantitative studies increased throughout the decade, matched by a decrease in qualitative and mixed-methods studies.

Contextual aspects visualise the geographic region and the type of geography with regard to population density. Studies focused on South Asia (37%) and sub-Saharan Africa (37%), with India (27% of the total sample) and

| Analysis terms      | Definition                                                                 |
|---------------------|-----------------------------------------------------------------------------|
| Publication Year    | Year in which the study was published in an academic journal.               |
| Journal Discipline  | The discipline of the journal in which the study was published as per the CiteScore 2017 academic journal metrics. If the journal crossed multiple disciplines, the most relevant discipline was selected. |
| Data Type           | The primary type of data used in the study. For example, qualitative, quantitative, or mixed-methods. |
| Geographic Region   | The global region in which the study is located.                            |
| Study Context       | The geographic context in which the study takes place. For example, urban or rural. |
| WASH Focus          | The primary focus of the study across water, sanitation, hygiene, and menstrual hygiene management (MHM). |
| WASH Inquiry        | The central aspect of WASH provision or management investigated by the study, for example behaviour, access, and supply. |
| Gender Terminology  | The terminology used by researchers to describe the individuals or groups being studied. For example, men or women. The category of ‘gender’ is applied when ‘gender’ is used in the abstract or title, and there is no specific discussion of a particular gender type. In this article, a heteronormative and binary framing of gender is dominant, reflecting terminology used in the 155 articles surveyed. |
| Gender Inquiry      | How gender intersects or impacts WASH. For example, women’s health outcomes, participation in committees, experiences of menstruation, or handwashing practices. |
Kenya (8%) remaining most common study countries. Studies focused primarily on rural contexts (58%). Mixed and urban settings each had 18% of the sample. A small number of studies were explicitly focused on small towns or urban slums and were coded separately.

WASH aspect fields categorise studies based on what type of WASH and what specific aspect of WASH programming they focused on. Within the sample, 60% focused on water, 16% on menstrual hygiene management (MHM), and 15% on sanitation. The remainder of the studies addressed handwashing (3%) or multiple aspects of WASH together (7%). Of the MHM and handwashing studies, the majority explored the behavioural practices of individuals: 84 and 100%, respectively. Within mixed WASH studies, 60% investigated access and 30% focused on behaviour. Within sanitation studies, 39% investigated access and 56% behaviour. Water-focused studies were distributed in emphasis across access (14%); management and governance (24%); quality and treatment (14%); and supply (24%).

Analysis of gender conceptual aspects found that studies primarily focused on women (47%) and gender (31%). Of the women-focused studies, 21% explored experiences of WASH and 19% addressed personal health. Gender-focused studies explored themes of individual experiences (25%) and roles/relationships (27%). Adolescent girls (12%) were the focus of the next largest group of studies, which addressed awareness (33%) and experiences (27%). Men and boys only appeared in 5% of article titles and abstracts.

**DISCUSSION: SIX INSIGHTS FOR STRENGTHENING WASH-GENDER STUDIES**

Situating this analysis with reference to wider gender and development literature, including the emerging body of work on gender transformation, we present six insights and implications for strengthening the gender-transformative potential of future WASH-gender studies.

1. With increasing interest and disciplinary diversity in WASH-gender studies, researchers should actively build interconnections and seek multidisciplinary research teams to avoid siloed thinking.
Interest in the WASH-gender nexus continues to grow. Studies were published in 92 unique journals across 22 identified disciplines. Historically, the WASH literature has been located in technical fields such as engineering, which have viewed gender narrowly and instrumentally in relation to efficiency and effectiveness of WASH interventions and outcomes (Willetts et al. 2010). The increase in disciplinary diversity over the last decade has significant potential to enrich the sector’s understanding. However, it comes with challenges of divergent syntax and conceptual simplification, a particular risk where there are low levels of interconnection between some authors and journals. For example, researchers from technical disciplines (e.g. engineering or medicine) exploring the functionality of water filters may inadvertently adopt instrumental approaches to engaging women if social science perspectives are not considered (e.g. Sheth et al. 2010; Freeman et al. 2012). This highlights the importance of multidisciplinary (Mertens 2010) or transdisciplinary (Fam et al. 2017) collaborations, which are common in transformative research. By prioritising collaboration, the risks of inadvertent siloed thinking can be reduced, leading to richer investigations and findings.

2. Limited use of participatory and mixed-methods reveals an opportunity to foster more transformative research approaches.

Of the selected studies, 43% used quantitative data, 35% used qualitative data, and only 21% explicitly engaged with mixed-methods. The use of qualitative and mixed-methods also declined throughout the decade, while quantitative studies increased. Furthermore, only 6% of the studies actively highlighted a participatory component. Given that any inquiry has the capacity to instigate a positive change (and the risk of catalysing negative change) in gender equality (Willetts et al. 2013), there is opportunity to move away from assigning research participant roles as ‘research subjects’, so that participants can have an active part in shaping the studies and their own futures (Mertens 2010; Mullinax et al. 2018). Studies that leverage both technical and social data through participatory data collection can capture valuable insights into the social relations within a technical sector. For example, the use of participatory methods to explore microbial contamination (Khatibi & Yamakanamardi 2010), system functionality (Sterling et al. 2014), and supply (Shonsey & Gierke 2013) shaped the research to be contextually relevant and empowering for participants. Additional examples of transformative engagement of WASH programme staff are explored in Cavill et al. (in press). As journals endorse and researchers expand the application of participatory and mixed-method approaches, there is an opportunity for engaging in social transformation through the process of research itself – a fundamental principle of gender-transformative research (Mertens 2009).

3. The number of studies focused on menstruation, sanitation, and hygiene have increased in recent years and lay the foundations for further investigations on intersections with gender equality.

Reviewed articles focused much more on water than sanitation and hygiene, reflecting a historical dominance of water over sanitation and hygiene more generally in the sector (Cairncross & Valdmanis 2006). Recent attention on MHM (Budhathoki et al. 2018; Hennegan et al. 2018) is a welcome trend. However, MHM-focused research was primarily from medicine and public health journals; was 72% quantitative in approach; and was almost solely focused on sub-Saharan Africa and South Asia. There is scope for growth in mixed-methods and qualitative research on MHM and for social science inquiries into how MHM links to wider aspects of gender equality. The review also found an emerging body of work focused on psychosocial stress, violence, and trauma, which offer an important lens into the psychological impacts of inadequate sanitation across life stages (e.g. Hulland et al. 2015; Sahoo et al. 2015). There is still much to be explored regarding the intersection of gender with sanitation and hygiene, including consideration of roles, practices, experiences, and social norms.

4. There is opportunity to move from ‘participation’ to ‘power’ in exploration of gender equality concepts in WASH.

Gendered concepts such as roles, relationships, participation, and experiences were commonly mentioned within the studies. However, the inclusion of such concepts was not always reflected in the way studies were framed. The lines of inquiry were typically framed in an instrumental
(17%) or neutral (59%) manner. Examples can be drawn from studies focused on water access. Neutral studies, for example, reported on who in a family collects water (e.g. Graham et al. 2016; Emenike et al. 2017), without discussing implications for gender equality. Instrumental studies framed findings in terms of how they might make a supply system more efficient (e.g. Mommen et al. 2017; Gross et al. 2018). These contrast with transformative studies, which explored water collection roles in the context of gendered power dynamics (e.g. Hawkins & Seager 2010; Van Houweling 2016). Instrumental or neutral framings can be avoided by investigating both the connections between practical aspects of health, sustainability, and efficiency as well as strategic interests such as power, respect, confidence, and gender norms (Moser 1989).

5. A strong regional focus on sub-Saharan Africa and South Asia leaves room for future research in other less studied regions.

Geographies such as sub-Saharan Africa and South Asia are important for the WASH sector due to high rates of open defaecation, low water access, and challenging WASH-related gender norms. However, while studies often find similar strategic gender interests across geographic contexts (Cairns et al. 2017; Schmitt et al. 2017), there is cultural nuance in how gender roles, dynamic and power relations function (as explored by Carrard et al. (2013) and Leahy et al. (2017)). Sultana (2009) reiterates this notion in her descriptions of how gender dynamics are inextricably linked to culture and space in Bangladesh, and Winter et al. (2018) argue that ‘context matters’ in their exploration of women’s sanitation use across 14 sub-Saharan countries using Demographic and Health Survey data. Studies which explore multiple geographical contexts also offer an opportunity to compare and contrast contextual factors (e.g. Carrard et al. 2013; Graham et al. 2016; Cairns et al. 2017; Schmitt et al. 2017). Given a current lack of evidence from some regions, a broadening of geographic focus as well as cross country comparisons is much needed.

6. Current literature dominantly focuses on women of productive age, indicating a need for studies considering women’s different life stages, men and boys, and sexual and gender minorities.

Reviewed literature dominantly focused on women, which aligns with trends in wider gender research (Cornwall 2000), with particular representation of women at productive age, as young mothers. Although 30% of articles used ‘gender’ terminology, 47% of the articles focused solely on women rather than gender equality per se. Only four articles (3%) focused explicitly on the experiences of men or boys, exploring: increased workload for men after piped water installations in Kenya (Crow et al. 2012); the role of men and boys in menstruation programming (Mahon et al. 2015); and masculine identities in water management in Peru (Rap & Oré 2017). While women are integral within WASH, a narrow view of gender continues to place the burden of overcoming WASH and gender challenges on women. Studies which engage women from a lifecycle perspective (e.g. Hulland et al. 2015; Sahoo et al. 2015; Baker et al. 2017); engage men and boys (e.g. above examples and Cavill et al. 2018), and engage with sexual and gender minorities (e.g. Boyce et al. 2018) offer valuable opportunities to explore people in all their diversity. Gender-transformational research creates opportunities to engage a diversity of people across age, gender, ethnicity, and status for a more systemic approach (Stephens et al. 2018).

CONCLUSIONS

Drawing from the last decade of WASH-gender literature, this review critically examined sectoral trends and opportunities. Using a process of distant reading, we visualised bibliographic, contextual, and conceptual aspects to identify areas of convergence and divergence within the literature. An increasing interest in quantitative research was matched by a focus in sub-Saharan Africa and South Asia, and a focus on women. Building on these trends, we identify insights for WASH researchers seeking to embed gender-transformative approaches, concepts, and voices in their work. Transformative approaches often engage across disciplines and methodologies to explore and transform the lived experiences of participants through participatory or mixed-methods (Mertens 2010) [Insights 1 and 2]. Transformative studies engage with feminist concepts such as agency, relations, and structures that speak to power dynamics in the home, community, and broader public sphere (Kabeer...
1994) [Insights 3 and 4]. Finally, gender-transformative research promotes a diversity of voices by recognising different groups related to age, class, gender, and economic status (Stephens et al. 2018) [Insights 5 and 6].

By exploring the last decade of WASH-gender literature, we have reflected on the growing interest in gender-transformative approaches in research, evaluation, and interventions. Although gender-transformative approaches may not be appropriate for all WASH-gender research, the Sustainable Development Goals highlight the profound interconnections between gender equality and global WASH targets. Gender-transformative WASH programming requires evidence beyond technical and health impacts – evidence that critically examines gender dynamics inherent in WASH and the contexts in which WASH services are delivered and experienced.

**DATA AVAILABILITY STATEMENT**

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

**REFERENCES**

Baker, K. K., Padhi, B., Torondel, B., Das, P., Dutta, A., Sahoo, K. C., Das, B., Dreibelbis, R., Caruso, B., Freeman, M. C., Sager, L. & Panigrahi, P. 2017 *From menarche to menopause: a population-based assessment of water, sanitation, and hygiene risk factors for reproductive tract infection symptoms over life stages in rural girls and women in India*. *PLoS ONE* 12 (12). https://doi.org/10.1371/journal.pone.0188234.

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. & Thapa, K. 2018 *Transgender-inclusive sanitation: insights from South Asia*. *Waterlines* 37 (2), 102–117. https://doi.org/10.3362/1756-3488.18-00004.

Budhathoki, S. S., Bhattachan, M., Castro-Sánchez, E., Sagtani, R. A., Rayamajhi, R. B., Rai, P. & Sharma, G. 2018 *Menstrual hygiene management among women and adolescent girls in the aftermath of the earthquake in Nepal*. *BMC Women’s Health* 18 (1). https://doi.org/10.1186/s12905-018-0527-y.

Cairncross, S. & Valdmanis, V. 2006 *Water supply, sanitation, and hygiene promotion*. In: *Disease Control Priorities in Developing Countries*. Retrieved from: http://www.cabdirect.org/abstracts/20063039214.html.

Cairns, M. R., Workman, C. L. & Tandon, I. 2017 *Gender mainstreaming and water development projects: analyzing unexpected enviro-social impacts in Bolivia, India, and Lesotho*. *Gender, Place and Culture* 24 (5), 325–342. https://doi.org/10.1080/0966369X.2017.1314945.

Carrard, N., Crawford, J., Halcrow, G., Rowland, C. & Willetts, J. 2015 *A framework for exploring gender equality outcomes from WASH programmes*. *Waterlines* 32 (4), 315–333. https://doi.org/10.3362/1756-3488.2013.033.

Caruso, B. A., Clasen, T. F., Hadley, C., Yount, K. M., Haardörfer, R., Rout, M., Dasmohapatra, M. & Cooper, H. L. F. 2017 *Understanding and defining sanitation insecurity: women’s gendered experiences of urination, defecation and menstruation in rural Odisha, India*. *BMJ Global Health* 2 (4). https://doi.org/10.1136/bmjgh-2017-000414.

Cavill, S., Francis, N., Grant, M., Huggett, C., Leahy, C., Leong, L., Mercer, E., Myers, J. & Singeling, R. T. 2020 *A call to action: organizational, professional, and personal change for gender transformative WASH programming*. *Waterlines* 39 (2) (in press).

Cavill, S., Mott, J., Tyndale-Biscoe, P., Bond, M., Huggett, C. & Wamera, E. 2018 *Engaging men and boys in sanitation and hygiene programmes*. *Frontiers of CLTS: Innovations and Insights* 11, IDS, Brighton. Available from https://www.susana.org/_resources/documents/default/3-3429-7-1539354187.pdf.

Cornwall, A. 2000 *Missing men? Reflections on men, masculinities and gender in GAD*. *IDS Bulletin* 31 (2), 18–27. https://doi.org/10.1111/j.1759-5436.2000.mp31002003.x.

Cornwall, A. & Rivas, A. M. 2015 *From ‘gender equality and women’s empowerment’ to global justice: reclaiming a transformative agenda for gender and development*. *Third World Quarterly* 36 (2), 396–415. https://doi.org/10.1080/01436597.2015.1013341.

Crow, B., Swallow, B. & Asamba, I. 2012 *Community organized household water increases not only rural incomes, but also men’s work*. *World Development* 40 (3), 528–541. https://doi.org/10.1016/j.worlddev.2011.08.002.

Dery, F., Bisung, E., Dickin, S. & Dyer, M. 2019 *Understanding empowerment in water, sanitation, and hygiene (WASH): a scoping review*. *Journal of Water, Sanitation and Hygiene for Development* 10 (1), 5–15. https://doi.org/10.2166/washdev.2019.077.

Elmendorf, M. L. & Isey, R. B. 1981 *The Role of Women as Participants and Beneficiaries in Water Supply and Sanitation Programs* (No. WASH Technical Report No. 11). USAID, Office of Health.

Emenike, P. C., Tenebe, I. T., Ogbiye, A. S., Omole, D. O., Animasaint, K. O., Olumuyiwa, A. A., Ihuoma, O. B. & Kofoworola, D. T. 2017 *Women’s involvement in the evaluation of water-improvement variables towards the achievement of sustainable development goals: assessment of a Semi-Urban City in South-West Nigeria*. *WIT Transactions on Ecology and the Environment* 216 (9), 27–35. https://doi.org/10.2495/WSE170031.
Khatibi, F. S. & Yamakanamardi, S. M. 2017 Transdisciplinary Research and Practice for Sustainability Outcomes. Routledge, Abingdon, Oxon.

Fisher, J. 2006 For Her It's the big Issue: Putting Women at the Centre Of Water Supply, Sanitation and Hygiene. Retrieved from: https://www.wsscc.org/wp-content/uploads/2016/04/For-Her-Its-the-Big-Issue-Putting-Women-at-the-centre-of-Water-Supply-Sanitation-and-Hygiene-WASH-Evidence-Report.pdf.

Fisher, J., Cavill, S. & Reed, B. 2017 Mainstreaming gender in the WASH sector: dilution or distillation? Gender and Development 25 (2), 185–204. https://doi.org/10.1080/13552074.2017.1331541.

Freeman, M. C., Trinies, V., Boisson, S., Mak, G. & Clasen, T. 2012 Promoting household water treatment through women’s self-help groups in rural India: assessing impact on drinking water quality and equity. PLoS ONE 7 (9). https://doi.org/10.1371/journal.pone.0044068.

Graham, J. P., Hirai, M. & Kim, S. S. 2014 Quality examination by H2S strip in Mysore City and training development thought. Journal of Environmental Research and Public Health 11 (1), 2017.1342255. https://doi.org/10.3390/ijerph15050905.

Mahon, T., Tripathy, A. & Singh, N. 2015 Putting the men into menstruation: the role of men and boys in community menstrual hygiene management. Waterlines 34 (1), 7–14. https://doi.org/10.3362/1756-3488.2015.002.

Mertens, D. 2009 Transformative Research and Evaluation. Gilford, New York.

Mertens, D. M. 2010 Transformative mixed methods research. Qualitative Inquiry 16 (6), 469–474. https://doi.org/10.1177/1087800410364612.

Momin, M., Humphries-Waa, K. & Gwauvuya, S. 2017 Does women’s participation in water committees affect management and water system performance in rural Vanuatu? Waterlines 36 (3), 216–232. https://doi.org/10.3362/1756-3488.16-00026.

Moser, C. O. N. 1989 Gender planning in the third world: meeting practical and strategic gender needs. World Development 17 (11), 1799–1825. https://doi.org/10.1016/0305-750X(89)90201-5.

Mullinax, M., Hart, J. & Garcia, A. V. 2018 Using Research for Gender-Transformative Change: Principles and Practice. IDRC, Ottawa.

Rap, E. & Oré, M. T. 2017 Engineering masculinities: how higher education genders the water profession in Peru. Engineering Studies 9 (2), 95–119. https://doi.org/10.1080/19378629.2017.1342255.

Sahoo, K. C., Hulland, K. R. S., Caruso, B. A., Swain, R., Freeman, M. C., Panigrahi, P. & Dreibelbis, R. 2015 Sanitation-related psychosocial stress: a grounded theory study of women across the life-course in Odisha, India. Social Science and Medicine 139, 80–89. https://doi.org/10.1016/j.socscimed.2015.06.031.

Schmitt, M. L., Clatworthy, D., Ratnayake, R., Klaesener-Metzner, N., Roesch, E., Wheeler, E. & Sommer, M. 2017 Understanding the menstrual hygiene management challenges facing displaced girls and women: findings from qualitative assessments in Myanmar and Lebanon. Conflict and Health 11 (1). https://doi.org/10.1186/s13031-017-0121-1.

Sheth, A. N., Russo, E. T., Menon, M., Wannemuehler, K., Weinger, M., Kudzala, A. C., Tazwie, B., Masuku, H. D., Msowo, T. E. & Quick, R. 2010 Impact of the integration of water treatment and handwashing incentives with antenatal services on hygiene practices of pregnant women in Malawi. American Journal of Tropical Medicine and Hygiene 83 (6), 1315–1321. https://doi.org/10.4269/ajtmh.2010-0211.
Shonsey, C. & Gierke, J. 2013 Quantifying available water supply in rural Mali based on data collected by and from women. *Journal of Cleaner Production* **60**, 43–52. https://doi.org/10.1016/j.jclepro.2012.02.013.

Stephens, A., Lewis, E. D. & Reddy, S. 2018 Towards an inclusive systemic evaluation for the SDGs: gender equality, environments and marginalized voices (GEMs). *Evaluation* **24** (2), 220–236. https://doi.org/10.1177/1356389018766093.

Sterling, S. R., Dodson, L. & Al-Rabaan, H. 2014 The fog phone: water, women, and HCID. *Interactions* **21** (6), 42–45. https://doi.org/10.1145/2671210.

Sultana, F. 2009 Fluid lives: subjectivities, gender and water in rural Bangladesh. *Gender, Place and Culture* **16** (4), 427–444. https://doi.org/10.1080/09663690903003942.

Sweetman, C. & Medland, L. 2017 Introduction: gender and water, sanitation and hygiene. *Gender and Development* **25** (2), 153–166. https://doi.org/10.1080/13552074.2017.1349867.

Van Houweling, E. 2016 ‘A good wife brings her husband bath water’: gender roles and water practices in Nampula, Mozambique. *Society and Natural Resources* **29** (9), 1065–1078. https://doi.org/10.1080/08941920.2015.1095377.

White, A. U., Bradley, D. J. & White, G. F. 1972 *Drawers of Water: Domestic Water use in East Africa*. University of Chicago Press, Chicago.

Willetts, J., Halcrow, G., Carrard, N., Rowland, C. & Crawford, J. 2010 Addressing two critical MDGs together: gender in water, sanitation and hygiene initiatives. *Pacific Economic Bulletin* **25** (1), 211–221.

Willetts, J., Carrard, N., Crawford, J., Rowland, C. & Halcrow, G. 2015 Working from strengths to assess changes in gender equality. *Development in Practice* **25** (8), 991–1006. https://doi.org/10.1080/09614524.2013.840564.

Winter, S., Dreibelbis, R. & Barchi, F. 2018 Context matters: a multicountry analysis of individual- and neighbourhood-level factors associated with women’s sanitation use in sub-Saharan Africa. *Tropical Medicine and International Health* **23** (2), 173–192. https://doi.org/10.1111/tmi.13016.

First received 11 May 2020; accepted in revised form 31 July 2020. Available online 16 September 2020