

# CASE STUDIES IN GENDER INTEGRATION:

Gender in Product Design: Three examples from the Reinvent the Toilet program

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Cover photo: A group of children use a Samagra-operated toilet block in a slum in Pune, India. © Bill & Melinda Gates Foundation / Paul O'Driscoll

## **INTRODUCTION**

Gender matters for access to safely managed sanitation and service delivery. Gender influences the behavior of all stakeholders, including users, policy makers, service designers and providers, and product developers, designers, manufacturers, and distributors. Gender also influences the level of participation and performance of these stakeholders in the sanitation sector, and gendered barriers affect the uptake of sanitation products. Awareness of gendered barriers and gaps should—but does not always—play a significant role in product development and service design and delivery as governments and implementers look to fill the gap of sanitation coverage in emerging markets. To fully understand the role gender plays in sanitation, it is important to look beyond just biological (i.e., sex) differences and consider how cultural practices, beliefs, and norms related to gender and sanitation affect everyone.

Lack of awareness about gender differences and inequalities can lead to the development of products that miss the mark or create barriers to effective sanitation programming. And too often, men with little awareness of the specific needs and interests of women, girls, and boys are the planners and the engineers setting out toilet locations, cubicle designs, and features. Effectively integrating a gender lens in sanitation programming, on the other hand, can reveal important differences and inequalities. It can also support more tailored approaches to ensuring sanitation outcomes are achieved for all, and that gender inequalities are not perpetuated. Understanding and accounting for the needs of women and girls is particularly important. Women and girls are disproportionately impacted by the lack of safe sanitation coverage as it affects their daily activities and can lead to unsafe hygiene and illness and physical, mental, and sexual health risks, as well as contribute to absences from work and school, especially for women and girls.

The interplay of gender and sanitation is bidirectional: sanitation programs can be leveraged to improve gender equality and promote women's empowerment, and gender inequality can be addressed as a way of improving sanitation outcomes. These do not need to be in conflict with one another and can in fact lead to improved outcomes in both dimensions. However, gender integration must be deliberate and intentional in order for this synergic effect to occur.

This case study in gender and sanitation is part of the Bill & Melinda Gates Foundation's Gender Equality Toolbox, which includes a series of case studies and other resources that support investment makers in applying a gender lens to their work. Note that not all of these case studies are foundationfunded programs, and a program's inclusion in this series does not indicate an endorsement by the foundation.

#### Box 1:

#### What does it mean to apply a gender lens?

The foundation defines a gender lens as a perspective that pays particular attention to how gender differences and relations are relevant for investments. Applying a gender lens to investments is a component of gender analysis. Using a gender lens to analyze power structures and roles within a specific context can provide important insights into whether an investment supports solutions to or whether it exacerbates imbalances in gender-related power. Understanding a context through a gender lens can lead to better development interventions by revealing opportunities and helping to mitigate risks.

The case studies are intended to offer readers an opportunity to unpack and understand the role of gender differences in driving sanitation outcomes, how programs identify and seek to address these differences, and whether they also promote gender equality and women's empowerment. The case studies are not meant to be perfect examples of how gender differences are identified and managed, but are meant as learning tools intended to:

- 1. Provide insight into specific areas where gender differences exist along the sanitation value chain.
- 2. Showcase real programs that have intentionally worked to integrate a gender lens into their design and delivery, whether from the outset or as a course correction.
- 3. Examine challenges and emerging lessons about integrating gender.

This particular case focuses on the efforts by design teams of three product development investments of the Reinvent the Toilet (RTT) program to take into account the gender dimensions of sanitation. Thus, the case showcases real R&D initiatives and examines challenges and lessons specific to integrating gender in engineered products, in order to support designers in accelerating gender-integrated innovations by planning for the gender dimensions of the problems they are addressing and the solutions they design.



## **OVERVIEW**

Unsafe sanitation is a massive problem that is becoming more urgent as our global population increases and trends like water scarcity and urbanization intensify. About 4.5 billion people—more than half the world's population—either practice open defecation or use unsafe sanitation facilities and services.<sup>1</sup> To be effective, sanitation must be carefully managed at all stages, from the point that waste is collected and contained to how it is transported and treated. Creating sanitation infrastructure and public services that work for everyone and keep human waste out of the environment is difficult—and it isn't a one-size-fits-all proposition.

This case presents three examples of how three teams in the RTT program worked to address gender considerations in the design of sanitation products to ensure that the needs and preferences of male and female users were considered and addressed in design. The teams were exemplary in their work to be inclusive. The teams evaluated users' practices and preferences, worked to develop prototype systems that were safe and effective, and tested prototypes to understand if any barriers to men's, boys', women's and girls' usage were inadvertently perpetuated. The first team worked to design on-site treatment and a toilet block lighting solution; the second team worked on cabin design for public toilets; and the third team worked to develop on-site waste treatment and attention to menstrual health and hygiene in shared family toilets. The examples highlight how applying a gender lens brings out innovative perspectives that would not otherwise have emerged for more typical design teams that pursue a less inclusive path for facility design and product testing.

# **PROGRAM OVERVIEW**

Since 2011, the Gates Foundation's RTT program has worked with leading engineers and scientists to design toilets and sanitation treatment systems. The Reinvent the Toilet Challenge (RTTC) has funded the development of sanitation systems that target the removal of all pathogens using on-site waste treatment waste processes - or systems that treat waste as close to the source of collection as possible. The initiative also prioritizes the recovery of resources from the human waste streams and pushes innovators to develop systems that are able to process waste "off-grid." The ultimate goal of these off-grid systems is to be unconnected to sewers, electrical grids, and external water systems. These innovative treatment systems foremost are targeting low-income populations that are currently underserved by improved, hygienic sanitation systems. Typically, these populations are in communities that lack land and capital resources for traditional sewer sanitation systems. A key premise in the RTT program is that new and better systems for managing waste will meet the needs of the underserved, and that reinvented treatment systems will work smarter by improving environmental health while reducing operational costs and transport and energy demand, as well as pioneer the development of valuable outputs from the waste treatment processes.

<sup>1.</sup> See: WHO/UNICEF Joint Monitoring Report on Water and Sanitation.

The RTT program is now working to improve technical performance of these new innovations, and through prototyping and field testing works to incorporate recommendations drawn from user-focused research. Many RTT systems aim to identify user preferences and incorporate meaningful findings into the systems' design and user interface. The value of integrating user insights into new technology R&D is recognized, though this has not always been the case in water and sanitation.<sup>2,3</sup>

In this case study, three examples of RTT teams illustrate how they were able to improve their product designs by adopting a gender lens. Each of the three teams was a grantee of the RTT program funded to conduct novel research and development on new waste treatment systems, to undertake user studies in target markets, and to complete prototype field testing as part of new product testing with target user communities. In each case, the team learned new insights in their prototype testing that would not have been realized if not for their inclusive approach to product development.

Each of the three teams for this case study is labeled rather than named. This practice is in keeping with research ethics approvals for this evaluation work, ensuring anonymity is preserved and the organizational names of the RTT grantee teams are not provided.

The **Lighting Design** team developed a novel on-site treatment technology interface to divert urine, and treat it with a microbial fuel cell that is able to generate energy. This waste-to-energy product could then be used to power the processing system or amenities such as lighting fixtures for a toilet block. Because the design required urine diversion, a task most easily achieved via a urinal, the product had been initially designed and trialed for male users and had been proven to work with men in initial field trials in the researcher's Global North home country. With initial prototypes tested, the team took to emerging markets to look for additional applications of their technology. The applied technology has the potential to generate lighting from the waste stream and put this new light source to use in and around the facility.

The **On-Site Waste Treatment** team set out to design a better public or community toilet, one that ensured guality on-site treatment, delivered water reuse, and included a user cabin built to fully respond to male and female user needs. The toilet used back-end technology to capture and separate the liquids and the solids. The liquid is treated for non-potable reuse as flush water and the solids are dried into pellets for use as fuel for combustion or as a soil amendment. The toilet also sought to incorporate the handling of menstrual hygiene product waste streams as part of the product offering. The on-site treatment unit included a disposal chute for menstrual waste. and explored the application mechanisms for the shredding of menstrual solid waste and its potential combustion along with the human solid waste. Testing also included evaluating the treatment of waste streams that could include menstrual blood, and the safety and efficacy of using recycled liquid waste for flush water. In the prototype test scenario, the team focused on a shared toilet model. The one-stall toilet was designed to be shared by men, women, and children from four or five families. The shared toilet is a sanitation service type often found in many low-income communities in India, where families join together to build a shared toilet for their primary use, and work together in its basic maintenance and upkeep.

Research has shown that users are particularly underserved by public toilets and the lack of well-functioning or clean toilets. Poor toilet infrastructure or operation and maintenance is a particular deterrent for use, especially for women and girls.<sup>4</sup> The **Cabin Design** team set out to design a better public toilet interface to address many of the shortfalls of public and community toilets, which often are not functioning because of poor design or are not being cleaned or maintained, and lack amenities to address the genderand age-specific needs of users. The team worked on a new pay-per-use product innovation that used a prefabricated toilet block, which could be guickly installed using a guality modular set-up. Essential attributes included separate stalls for men and women, locking doors, on-site washing facilities, and safe siting of the toilet location. The cabins were equipped with self-cleaning features, automated controls to monitor usage, and sensors to trigger toilet bowl and floor cleaning to provide better hygiene consistently after a toilet cabin visit. Two additional design features included providing privacy while delivering natural lighting to promote safety and allowing for good ventilation in the toilet cabin using louvred windows in the top portion of the cabin.

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<sup>3.</sup> Pattanayak SK, Pfaff A. Behavior, environment, and health in developing countries: evaluation and valuation. Annu Rev Resour Econ 2009;1(1):183–217. https://doi.org/10.1146/annurev.resource.050708.144053

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### GENDER-RELATED BARRIERS AND OPPORTUNITIES

The three teams undertook field testing and market research as part of their feasibility assessment and prototype development, although in different ways. The **Lighting** Design team undertook market research in Uganda and visited a number of different school sites, gathered feedback through focus groups and guestionnaires, and considered different ways they could broaden the application of their technology. Their visits included varied settings, both day schools and boarding schools. Ultimately, the team decided to focus their efforts on applying their technology to an allgirls boarding school after learning about the challenges that girls face in the school and dormitory facilities. Based on these different forms of field testing, the teams asked user-centered questions that took gender into account, and gathered important insights about gender-related barriers and opportunities.

The **Cabin Design** team undertook product field testing in India, to evaluate design measures to provide natural light and ventilation through the installation of louvred windows. Public toilet design and safe and hygienic operations in India are often problematic, especially for women, and the team's product development and testing were focused on allowing them to reach targeted users. The team sought to address this public toilet demand and differentiate the needs and preferences of both men and women in the model units. The team surveyed adult male and female users through multiple product testing rounds to gather feedback on the prototype models. The team collected user perspectives about location siting to maximize privacy and visibility, model unit amenities, and explore variations that would best meet user preferences.

The **On-Site Waste Treatment** team, from the very beginning of its R&D processes, focused on the needs of men and women users. Menstrual hygiene waste streams (menstrual blood and menstrual absorbents that often end up in the waste stream, such as pads and tampons) were recognized from the beginning as another type of waste to account for, along with the work to develop a treatment system for urine and feces. As the first prototypes were developed, the team undertook two rounds of field assessment in India to understand men's and women's different needs and perspectives in the application of on-site reuse of treated liquid for flush water. This shared toilet stall also included menstrual hygiene amenities such as on-site pad supply and extra space for changing clothes, and added a discrete menstrual waste disposal chute, along with a bin underneath for on-site collection, and potential for thermal on-site treatment of this waste stream. The team set out to evaluate how Menstrual Health and Hygiene (MHH) amenities worked for women, and whether men supported having these amenities in a shared family toilet model. The team recognized that men and women may not feel comfortable speaking about their sanitation needs and preferences in each other's presence, and so they sought user insights on the design features through individual interviews and focus groups exclusively with men, exclusively with women, and then with men and women together. A core focus was also to assess how local stigmas and taboos around menstrual health and hygiene might play out in terms of age and gender, so they also consulted with different adult male and female age cohorts.

All teams were able to generate insights on gender related to barriers and opportunities, as summarized below:

Adequate lighting is a key design feature. Quality lighting is universally welcomed, which is acknowledged in many sanitation studies as an important design factor for toilet facilities. Lighting and safety concerns are especially noted barriers for women and girls in many shared sanitation facilities<sup>i,ii</sup> Girls and women can be anxious about safety and may be at risk going to and from the toilet, or making use of stalls in a public space, particularly with lack of adequate outdoor and indoor lighting. The **Cabin Design** team learned that lighting is a common complaint about public toilets, particularly with dark or unlit cabins making one feel at risk, claustrophobic, or unable to effectively use the space. Similarly, the **Lighting Design** team learned how frequently the absence of adequate lighting in toilet facilities was a major concern for girls. Without toilet block lighting, they felt unsafe using the toilet at night. The girls expressed anxiety about being harassed by boys and men who might be hiding in the unlit stalls and were also afraid of encountering snakes and spiders that they could not see in the dark. Girls did not have flashlights and would tend to go to the toilet as a group for their safety. Although the research team was generally aware of the importance of lighting, the magnitude of the girls' need was particularly acute. These findings challenged the team to adapt a user interface that would also work with female users. It is widely documented in many countries and different community toilet settings that dark and isolated public toilet facilities contribute to the occurrence of on-site gender-based violence.<sup>5</sup>

Light and ventilation features must ensure privacy. The Cabin Design team used louvred windows that were thought to be a smart technique for providing light and airflow to better manage odor and temperature while also providing a shield for privacy. However, feedback with potential women users revealed their concerns that a small camera device could still be used to see through the louvred window and that men might be able to peek in. These findings challenged the team to come up with a different solution to the need to provide light and ventilation to the stalls. Where and how a public toilet is placed is key to ensure that women will use it. The Cabin Design team learned that a key design component is cabin location and siting. Through exploration with women, the team learned that privacy, discretion, and visibility were important to the cabin placement. Women favored having the entrance door to the cabin shielded by a screen to ensure some level of anonymity on entering and exiting. At the same time, the toilet placement is best positioned in a trafficked area. Isolated sites, hidden away from view, also could present safety concerns for women and girls.

Women's preferences around flush water quality can be

different from men's. When it comes to treatment processes and byproducts, men and women may have different perspectives, and so their perspectives cannot be assumed to be the same. The **On-Site Waste Treatment** team assessed the use of on-site treated liquid for flush water, particularly in regard to the odor and color of treated recycled water for flush. In the initial field testing with only men, the team had not registered any complaints on flush water quality. In contrast, women users who were later interviewed noted the discolored liquid and the odor of the flush water.

#### Addressing MHH well can be a driver of sustained toilet

**use.** Research has shown MHH is often a barrier to toilet use. For women and girls, the lack of access to menstrual pads, space for changing clothes or pads, water for washing, and safe disposal facilities in toilet cabins are all frequent weak points in public toilets. The **On-Site Waste Treatment** team thought that including menstrual management amenities in a toilet used by both men and women might be considered a deterrent for male toilet use. In contrast, the team found that men in the focus groups were very engaged when talking through MHH considerations and, similar to the women users interviewed, accepted the inclusion of MHH amenities in a shared family toilet. A number of married and unmarried men in the focus groups went beyond expressing just acceptance of these MHH amenities, and emphasized they actually preferred their inclusion.

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# GENDER INTENTIONAL DESIGN

The three RTT teams made efforts to adapt their design to address gender concerns and improve usability of the innovations. The original Reinvent the Toilet Challenge call asked teams to address gender dimensions in their R&D and product development. Many of the grantees interpreted sanitation treatment technology not to have gender implications because the focus was on the waste streams. Many teams viewed their work to be gender-neutral because they were dealing with the outputs of going to the bathroom, urination and defecation—often referred to as the back-end treatment processes among the product developers. This case study shows how these three teams pushed harder and further and applied a gender lens. These are unique examples of RTT grantees wrestling with being gender-intentional in their R&D processes, and integrating a gender lens into their prototype and field-testing work, which has implications for technology as well as sanitation infrastructure developers.

Urine diversion is possible for toilets used by girls and **women.** The treatment system initially designed by the Lighting Design team had conducted testing with male toilet stall applications in their Global North home country. The team then began testing in Uganda, which opened their eyes to how women and girls are underserved by safe sanitation. In the field work at the girls' school, the team worked to re-design the treatment and user interface to facilitate urine diversion through a new user interface for girls. This change turned out to be a challenge. The team faced many design challenges in adapting the user interface proven effective with men and boys to meet the user preferences and biological requirements for girls. The team needed to isolate urine while limiting paper, menstrual products, or feces from getting into the treatment system. The team needed to move out of their comfort zone in designing for male users and innovate. Urine diversion was a critical element of technology as the diverted urine feeds the energy fuel cell. With a redesign, the team selected new user<sup>6</sup> interface plates as a urine-diverting mechanism that was applicable and comfortable for female users in order to collect only the urine, treat it, and generate power that could be stored in a battery and provide lighting for the inside or outside of the toilet block.

## Windows can ensure privacy without compromising ventilation or lighting requirements. Poor toilet

infrastructure or operation can be a deterrent for use, especially for women and girls.<sup>7</sup> Ventilation is important for managing odor, and consistent air flow helps moderate temperature inside the cabin, and in general helps make the space more comfortable for the user. The **Cabin Design**  team re-designed the louvred windows that were an original part of their design to use an exhaust fan inserted in the window along with LED bulbs installed within the cabin to provide artificial lighting, thus still achieving the lighting and ventilation goals but ensuring women feel secure and private when using toilets.

Reuse products can be perceived differently by men and women. The RTT program had as one of its goals to derive potential products of value from new sanitation treatment approaches. As R&D teams develop treatment solutions and early product concepts, the valued byproducts also require the application of a gender lens. In this example, insights into women's thoughts on water reuse pushed the **On-Site Waste Treatment** team to apply new strategies in the on-site treatment processes. This field testing finding came early enough in their product development process to push the team to expand and refine its treatment processes as a result of having sex-disaggregated data. The team was able to augment "polishing" steps using simple, durable, and low-cost activated carbon filters on the back-end of their complete liquid processing system to further enhance the clarity and odor of the safe recycled liquid. Technology adoption depends on user acceptance,<sup>8</sup> and so differences in perception and stated preference, if not addressed, can turn into barriers to use. If one target user group does not like the product or feels the processes are not reliable, the product will not be accepted into the community.

**Cabin placement can strike a balance to ensure safety.** One of the big gaps in the sanitation field in many countries has been gender-integrated designs for public facilities. Too often, men are the planners and the engineers setting out toilet locations, cubicle designs, and features. The **Cabin Design** team was pushed by user feedback to find a good balance between an entrance that was screened from view, but at a location that was not set out of the way to the point that safety risks from isolation would become a point of anxiety.

Inclusive field testing can build a stronger consensus around the strategies to incorporate menstrual hygiene products and waste disposal mechanisms in toilet design. Pushing the boundaries of what is typically considered to be acceptable to males, the men consulted by the **On-Site** Waste Treatment team showed strong support for MHH amenities in the cabin, recognizing its value for their female community members. Male participants in the focus groups noted that they value MHH as important, and the women emphasized that they see it as essential. For women, it can be empowering to have access to menstrual absorbents and a safe and private disposal option, as well as facilities that are designed well: are easily cleaned; have water and soap, lights, space, mirrors, and access to absorbents; and include absorbent waste management strategies. These amenities drive user demand for toilet facilities.

<sup>6.</sup> Hartmann M, Krishnan S, Rowe B, Hossain A, Elledge M. Gender-responsive sanitation solutions in urban India. RTI Press Publication No. RB-0009-1502. Research Triangle Park, NC: RTI Press; 2015 Feb. <u>https://doi.org/10.3768/rtipress.2015.rb.0009.1502</u>

<sup>7.</sup> Morrison L, Hossain A, Elledge M, Stoner B, Piascik J (2018). User Centered Guidance for Engineering and Design of Decentralized Sanitation Technologies. Research Triangle Park, NC: RTI Press.

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### **CONCLUSION**

Gathering user-focused insights early in the product engineering and design process provides an important opportunity to identify and avoid potential downstream barriers to technology adoption. The three examples explored in this case study drive home the value of adopting a gender lens in product innovation and testing.

The **Lighting Design** team's market research work in Uganda revealed a use case for girls' toilet blocks that the team had not previously considered in their early product development. Subsequent field data from low-resource settings identified key barriers to toilet use and expanded the team's knowledge beyond the testing done in their home country. With this field insight from Uganda on the importance of lighting to girls, they adapted their approach to apply their treatment technology innovation to also address a common concern in public toilets in low-income areas.

Similarly, for the **Cabin Design** team, field testing with women users surfaced an important nuance that could negatively influence the product's acceptance and ultimately the desired sanitation outcomes. Through the collection of user insights from women users, the team adjusted their model with a revised approach that meets their original goals and importantly is more effective in ensuring safety and privacy for women and girls. This input also provided an important set of location or siting considerations that encouraged the team to define new guidelines to review with municipal partners when identifying and designing the placement of new public toilets.

The **On-Site Waste Treatment** example drives home the importance of early testing and product feedback loops that include active participation of diverse stakeholders. Potential barriers were tackled early on. The inclusion of men and women in the planning discussion built a consensus and raised awareness. The MHH field testing discussion findings were striking in that the findings challenged frequent gender stereotypes. The men recognized that it was often missing, and that this addition would help the women in their lives. The women highly valued the MHH considerations, noting many psycho-social, privacy, and health benefits.

Paying attention to their own gendered understanding of user preference expanded and revealed more than the team's initial design thinking. This finding in turn helped the teams ensure appropriate lighting for girls' toilets, appropriate lighting and ventilation in public toilets, appropriate placing and location of cabins, delivery of menstrual amenities, and better quality of re-use water in the shared toilet facility.

Use the discussion questions below to guide your analysis of this case study on gender and sanitation. Consider what seems to have been done well, and what might have been done differently to improve how gender was identified and addressed in product and service design and execution:

- 1. Which gender differences identified during user testing were most relevant to the success of the products? What additional information would help you better understand gender dynamics relevant to usage of these products?
- 2. What gender-based barriers do you think the program brought forward and addressed? Which ones were not addressed or might have seen more success if addressed differently? How could these factors inform the design and testing?
- 3. Did the design teams ask questions about gender and user needs and preferences early enough in the design process? What difference could it make to consider gender earlier in the product development process?

#### **END NOTES**

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