



Research Paper

The public perceptions of urban sanitation infrastructure: a cross-sectional study in Kegalle township in Sri Lanka

B.K.A. Bellanthudawa ^{a,c,*}, Samitha Udayanga ^b, Poornima Rajapaksha^c, Nawala Mudiyanseleya Semini Kushara Nawalage^c, Rajitha Senanayake^c, Senani Meegalla^c, Jayasuriya Mudiyanseleya Saumya Niroshani Jayasuriya^c and K.D.K.S. Kumara^c

^a Department of Agricultural Engineering, Faculty of Agriculture, University of Ruhuna, Matara, Sri Lanka 81100

^b Department of Sociology, Faculty of Humanities and Social Science, University of Ruhuna, Matara, Sri Lanka 81100

^c Water Supply and Sanitation Improvement Project, Kegalle District Unit, Sri Lanka 71350

*Corresponding author. E-mail: aravindabellanthudawa@gmail.com

 BKAB, 0000-0002-1830-8949; SU, 0000-0002-9826-691X

ABSTRACT

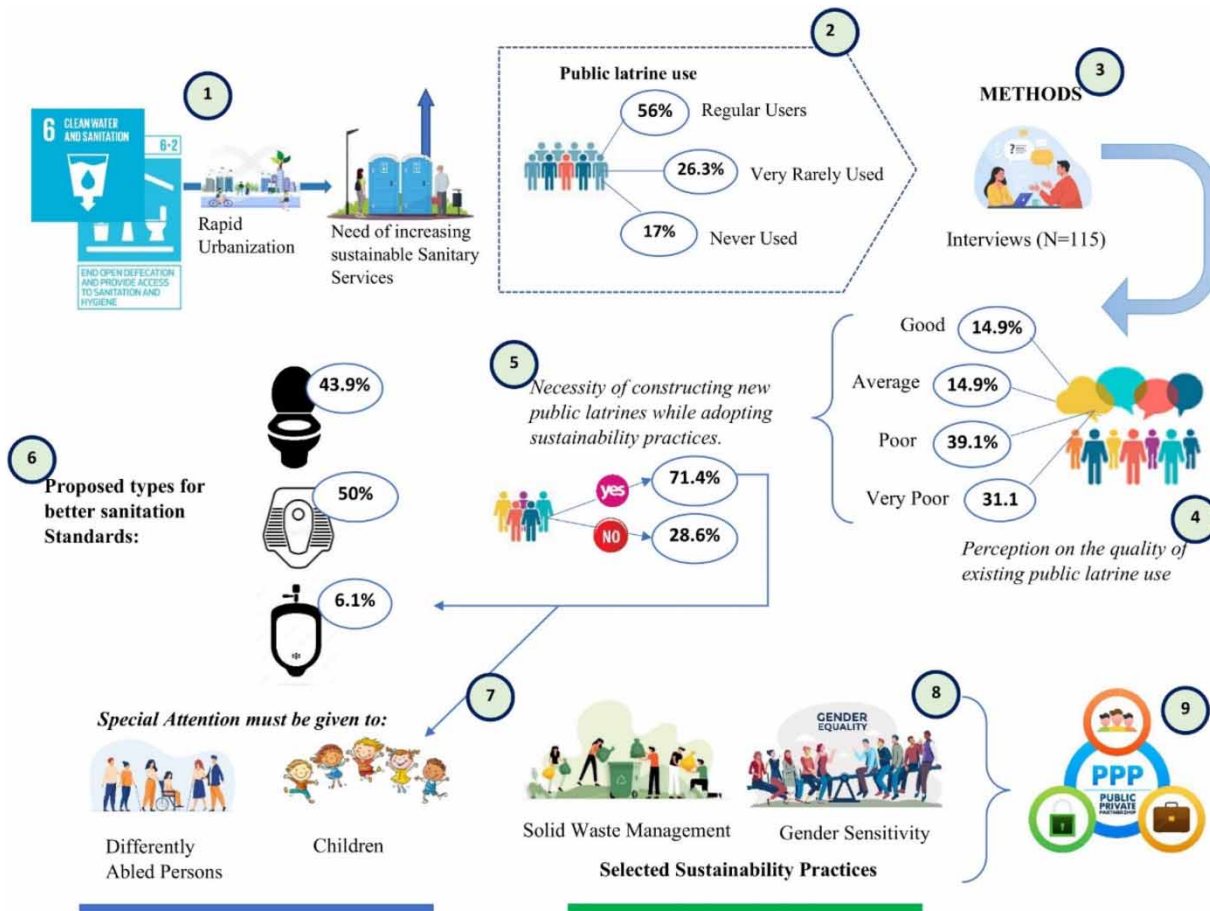
Improving public restroom facilities in urban areas can contribute to ensuring the overall living standards of the urban populace. Access to improved sanitation and hygiene is also considered a fundamental human right. Therefore, the present study aims to understand public perceptions of urban public restroom use based on a case study conducted in the municipality of Kegalle township in Sri Lanka. This included a questionnaire survey ($N = 115$) and in-depth interviews ($N = 5$). The analysis indicates the urgent need for adequate, accessible, and good-quality sanitary services, particularly in densely populated urban areas of the country. More than 70% of people (from $N = 115$) indicate that public restrooms are not of good quality due to certain reasons such as poor maintenance and uncleanliness. Despite the insalubrity of public restrooms, many respondents have used them, indicating an urgent policy intervention in operating, and properly maintaining public restrooms in densely populated urban areas of the country. A significant number of respondents indicated that the quality of public restrooms is extremely poor (39%) or poor (31.1%). Around 86.9% of respondents are not satisfied with existing public restrooms, thus, 71.4% believe in reconstructing new public restrooms that pave the way for ensuring access, affordability, quality, and safety.

Key words: gender sensitivity, partnership interventions, public perceptions, public restrooms, sanitation, sustainability measures

HIGHLIGHTS

- In total, 70% of respondents indicated that the quality of public restrooms is poor due to poor maintenance.
- In total, 86.9% of respondents were dissatisfied with the current state of public restrooms.
- In total, 71.4% were in favor of constructing new public restrooms that ensure accessibility, affordability, quality, and safety.
- The study demonstrated the demand and need for high-quality sanitation services in densely populated urban areas.

GRAPHICAL ABSTRACT



INTRODUCTION

Rapid urbanization, accompanied by expanding industry and service-based urban occupations, draws many people to urban areas, where they are likely to spend the majority of their time away from home. Guaranteeing adequate, equitable, and high-quality sanitation for all, with special attention to the needs of girls, women, and those requiring special care, has been recognized as essential to remove a significant barrier to wider participation in public life (Weststrate et al. 2019). Public restrooms (commonly known as toilets or lavatories) are a mandatory component of urban public life, which reinforces human rights to sanitation. However, poor sanitation has been recognized as a significant determinant of the existing disease burden in the world (Prüss-Ustün et al. 2009). The inadequate water, sanitation, and hygiene (WASH) coverage and practices, particularly in densely populated urban areas in developing countries, have significant negative implications for overall human well-being (van Minh & Hung 2011).

In particular, people who use public restrooms are the most vulnerable to certain infectious diseases. The World Health Organization (WHO) (2022) reports that approximately 1.7 billion people do not have proper access to improved sanitary facilities, two-thirds of whom are from Asia and sub-Saharan Africa. Only 53% of residents in developing countries have access to better sanitation, compared to 99% of those living in affluent nations. In developing nations, 71% of urban areas have access to sanitation, compared to 39% of rural areas. Improving the WASH coverage, including ensuring quality and safe access to public restrooms, can significantly improve the living standards of those who constantly engage in urban public life (Poirier 2019). Furthermore, designing and developing an urban space publicly convenient for people where they can fully engage in public life beyond their household can be guaranteed by incorporating effective and sustainable WASH practices. Ensuring equitable and quality public restroom facilities is a vital strategy for sustainable, accessible, and inclusive cities in which the living standards of those who regularly visit urban centers can be nurtured (Kanuti et al. 2019).

United Nations International Children's Emergency Fund (UNICEF) reports that 93% of urban people in Sri Lanka have access to at least basic sanitary facilities (Fan 2015). This indicates the sanitation sector in Sri Lanka has achieved considerable development over the past decade, with significant assistance being provided by national and international organizations. However, certain important challenges remain due to several reasons, such as the ineffective implementation of policies at local levels, lack of awareness, and untightened corporations among the public, private, and community sectors (World Bank 2006; Mcloughlin & Harris 2013). Moreover, the inadequacy of data on WASH coverage in the country prevents understanding the demands, needs, and expectations of people who use public restrooms in urban areas. Change in people's attitudes and behavior has been well understood as another important factor behind improving WASH coverage in the urban public sphere in Sri Lanka (World Bank 2006).

In light of this, the present study aimed at exploring the particular case of the Kegalle township, a main tourist public place in Sri Lanka with regard to the perceptions of safely managed urban public restroom use. Furthermore, this paper strives to identify public perspectives on incorporating sustainability practices for public restroom maintenance.

METHODS

The research design utilized in this study was a mixed-method approach, which involved gathering data through both a questionnaire survey and in-depth interviews. The study units were framed using an embedded (multiple units of analysis) single case study design (Yin 2003; Landman 2014; Krehl & Weck 2020). An embedded single-case design was appropriate for this study to understand public perceptions of latrine use in an urban environment (Context). An embedded single case study design includes a selected social context in which several study units are included. Drawing on these principles, Kegalle Urban Council (a township) was selected as the social context, in which five public latrines (units of study) are included. Data were collected from individuals who access these five public latrines.

Study area

The present study was carried out in the premises of Kegalle Urban Council (Kegalle township), covering urban public restrooms in the city area. Kegalle, a densely populated township in the Sabaragamuwa province of the country, was chosen as the case of this study as it is a space for tourism and a public convenience center. The Kegalle Urban Council administers the township. The survey was conducted with participants who used five main urban public restrooms available (locations: inside the public market, close to the clock tower, Aside Nidahas Mawatha, Aside Nidahas Mawatha (near the wine store), and near the hospital junction) as indicated in Figure 1. There are only five public latrines in the Kegalle township and people who use those latrines were selected as participants of this study. All the public toilets have been established and managed by the Urban Council of Kegalle township with the same standards. Therefore, the flow plans of all latrines are the same (Supplementary material, Annex 1). Since the structure and flow plans of these five latrines are identical, they are comparable. However, the overall objective of this study was to determine the current state of five public restrooms as perceived by those who use them. Special consideration was given to individuals with disabilities.

The operational and maintenance responsibilities of the five public latrines fall under the jurisdiction of the Kegalle Urban Council. The Kegalle Urban Council designates a laborer, who is a Work Aid Member, to oversee the operation of each public latrine. The work aid member, appointed by the Urban Council, is responsible for collecting a fee of LKR 20.00 from every individual utilizing the facility. Periodically, sanitary workers appointed by the urban council perform cleaning duties on the toilets as needed. These activities lack regulation and are conducted without adherence to proper procedures. The operational hours of these facilities are from 5:00 a.m. to 10:00 p.m. every day. The income received from users is transferred to the Kegalle Urban Council, which is utilized for procuring cleaning chemicals, conducting maintenance, and disbursing salaries to the Work Aid Members responsible for overseeing the upkeep of these communal lavatories. Annually, the budget of the urban council includes provisions for the operation and management of these latrines. Nonetheless, there is a lack of proper documentation with regard to the management and operation of the latrines. For example, a fee of LKR 20.00 is collected from users but not documented.

Participants' recruitment

The current study was designed to investigate the perceptions of the general public regarding latrine use in an urban setting, utilizing a questionnaire guided by an interviewer and in-person in-depth interviews. In-person in-depth interviews were carried out only with differently abled people, so that they were allowed to answer freely. The main purpose of these in-depth

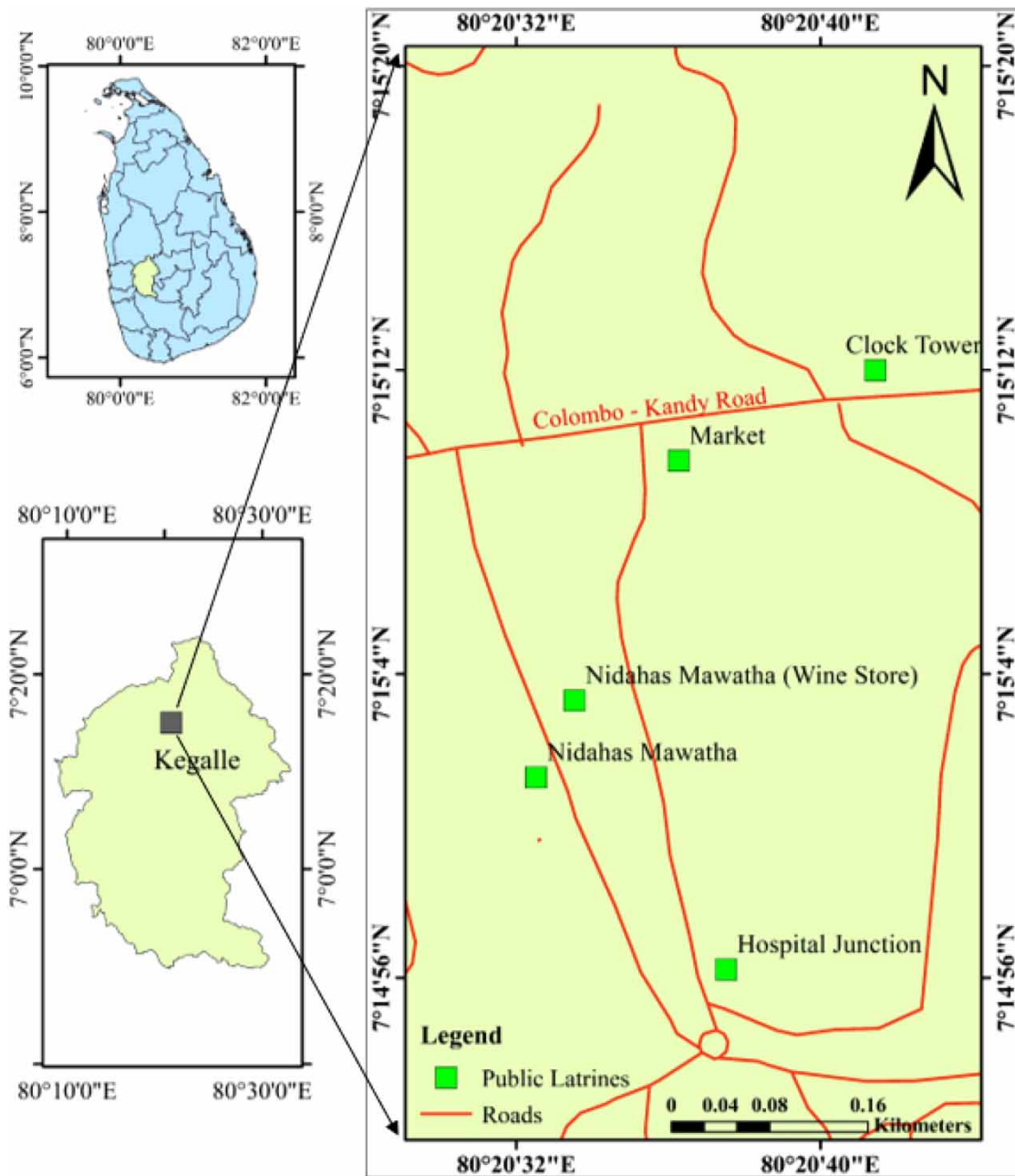


Figure 1 | Locations of urban public restrooms in Kegalle township.

interviews was to understand difficulties encountered by differently abled people when accessing public latrines and possible suggestions to improve future public latrine constructions. The simple random sampling technique was employed. Those who use five public latrines in the Kegalle township were randomly selected with the support of field assistants. Those who use public latrines from 8.00 a.m. to 7.00 p.m. were selected. Overall, 115 participants were recruited with different demographic characteristics as indicated in the demographic profile of participants. The participants interviewed for the present study were individuals above 18 years of age ($N = 115$). Five differently abled people who used public latrines during the research period were interviewed and included both men and women in varying age categories (Table 1). The sampling criteria for differently abled people included blindness and inability to walk, as these are major factors affecting access to public toilets.

Table 1 | Demographic information of participants in the in-depth interviews

No	Age, years	Gender	Disability	Education
R1	55	Male	Blind	Secondary 1
R2	25	Female	Inability to walk (wheelchair is used)	Tertiary
R3	24	Male	Inability to walk (wheelchair is used)	Tertiary
R4	50	Female	Blind	Primary
R5	30	Male	Inability to walk (wheelchair is used)	Secondary 1

Data collection

The primary data for the study were collected through a face-to-face questionnaire survey from the general public and in-depth interviews with differently abled people. In addition, five ($N = 5$) in-depth interviews were conducted with differently abled people to understand the unique issues they encounter when accessing public latrines. An interactive session was carried out before the interviews. Also, consent for participation was obtained before filling out the questionnaire. A verbal session was conducted, and written consent was obtained before presenting the questionnaire.

The process of completing the questionnaire and in-depth interviews has ensured that it enabled the participants to respond to the questionnaire within a short time. A survey was carried out using a semi-structured questionnaire (Supplementary material, Annex 2). The questionnaire survey identified and evaluated aspects such as the demography of respondents, the status of existing facilities, demand for another new restroom complex, proposing facilities, and sustainability and maintenance of urban public restrooms. The in-depth interview guideline was designed to understand how differently abled people perceive using public latrines and to find out their experiences and suggestions for improving them. In-depth interviews lasted 35–40 min. [Table 1](#) gives demographic information of participants in the in-depth interviews.

Data analysis

The survey data were transferred into the SPSS software package and analyzed while ensuring quality control measures. The percentages of the respondents were illustrated graphically and strived to understand the existing facilities of the urban public latrines in the Kegalle township of Kegalle Urban Council. Qualitative data obtained from in-depth interviews were given to MAXQDA (2020 version) and employed content analysis to support the findings obtained through quantitative data analysis. The interviews were conducted in the local language and subsequently transcribed and translated into English prior to analysis. The data were subjected to analysis using [Bengtsson \(2016\)](#) content analysis protocol. The process comprised four distinct stages, namely identification of primary meaning units, linking all meaning units to the research objective, classification of meaning units, and presentation of thematic categories.

Ethical considerations

In accordance with ethical principles articulated in the Helsinki Declaration, participation in the study was considered voluntary, and participants were therefore permitted to withdraw their responses at any time. The confidentiality of the participants was protected.

RESULTS

Socio-demographic profile

The demographic observation of participants covering gender, age, and education level of the study is demonstrated in [Table 2](#). In addition, two differently abled women and three differently abled men participated in the research, and they provided rich qualitative data on public latrine use.

Public restrooms use in Kegalle township and peoples' perceptions

[Figure 2\(a\)](#) represents the frequency percentages of respondents visiting the Kegalle area. Around 43% of the respondents visit the Kegalle area daily, whereas only 5% visit occasionally. A significant percentage of the respondents (27.20%) visit the Kegalle area weekly. When it comes to the frequency with which respondents use public restrooms, 56.6% use them on a regular basis, while 17.1% never use them ([Figure 2\(b\)](#)). Those who do not use public latrines reported using latrines

Table 2 | Socio-demographic profile

Gender	Percentage (%)
Male	59.3
Female	40.7
Age, years	Percentage (%)
18–30	36.5
31–45	24.3
46–60	28.7
60 +	10.40
Level of education	Percentage (%)
Primary	6.1
Secondary I	21.7
Secondary II	54.8
Tertiary	17.3

in small-scale restaurants within the township. Some participants stated they do not use public or other latrines because they do not reside in the township for an extended period of time. The perception of the quality of existing urban public restrooms was assessed using four categories ranging from good to very poor (Figure 2(c)). Around 39.1% of participants rated the quality of public restrooms as poor, while 14.9% of respondents rated the quality of existing urban public restrooms as good and average. Around 31.1% of respondents responded that this was very poor. Figure 2(d) illustrates the reasons for the instant reluctance to access public restrooms. Among the multiple issues, uncleanliness was recorded as the major issue with 44.5%, bad odor (30.2%), and less protection (19.3%). Charges were the least recorded reason for the instant reluctance to use public restrooms.

The qualitative content analysis revealed the perspectives of differently abled individuals on public latrine use. Generally, they described avoiding public restrooms because they were unsuitable for people with disabilities. Accessibility of public restrooms for people with disabilities was not a matter of concern in the latrine structure. People who are blind or unable to walk are unable to access and use public latrines in the Kegalle township. In addition to access barriers, safety concerns have been identified as a major barrier to the use of public latrines, as illustrated in the following narrative.

'Public toilets are often built in remote or hard-to-reach places where we can't go. And it is hard for blind people to use a toilet where there are no signs for them. Also, we need help from someone else to keep our personal things safe. All of these things make it hard for us to use public toilets. We do not use them often, therefore.' (R1)

Perception of participants on safely managed public restrooms in Kegalle township

A higher percentage of the respondents (86.9%) are unsatisfied with the existing urban public restrooms, while only 13.1% of the respondents are satisfied. Only 28.6% of the respondents are in the opinion of not constructing new public restrooms, but 71.4% of respondents highlight the need to construct (or renovate) new public restrooms. The main reasons for this suggestion were (i) uncleanliness of existing latrines, (ii) structural defects of some existing latrines so that they cannot be further used without renovation, (iii) lack of proper waste management and menstrual hygiene management facilities, (iv) lack of security, and (v) lack of facilities for differently abled persons which is a need. Figure 3(a) demonstrates the types proposed for better sanitation standards in public restrooms. Most of the respondents (50%) suggest installing squatting pans, while 43.90% recommend installing commodes. Only 6.10% suggest urinals for new public restrooms. Considering the specially targeted groups for the new public restroom complex in Kegalle town, 34.8% of respondents suggest having special care for children and differently abled persons, while 30.4% stress having concerns for clergy (Figure 3(b)).

Differently abled individuals advocate for primary infrastructure facilities over improved sanitation conditions. They are more concerned with ensuring access to public restrooms. In addition, hangers and accessible pathways for wheelchairs,

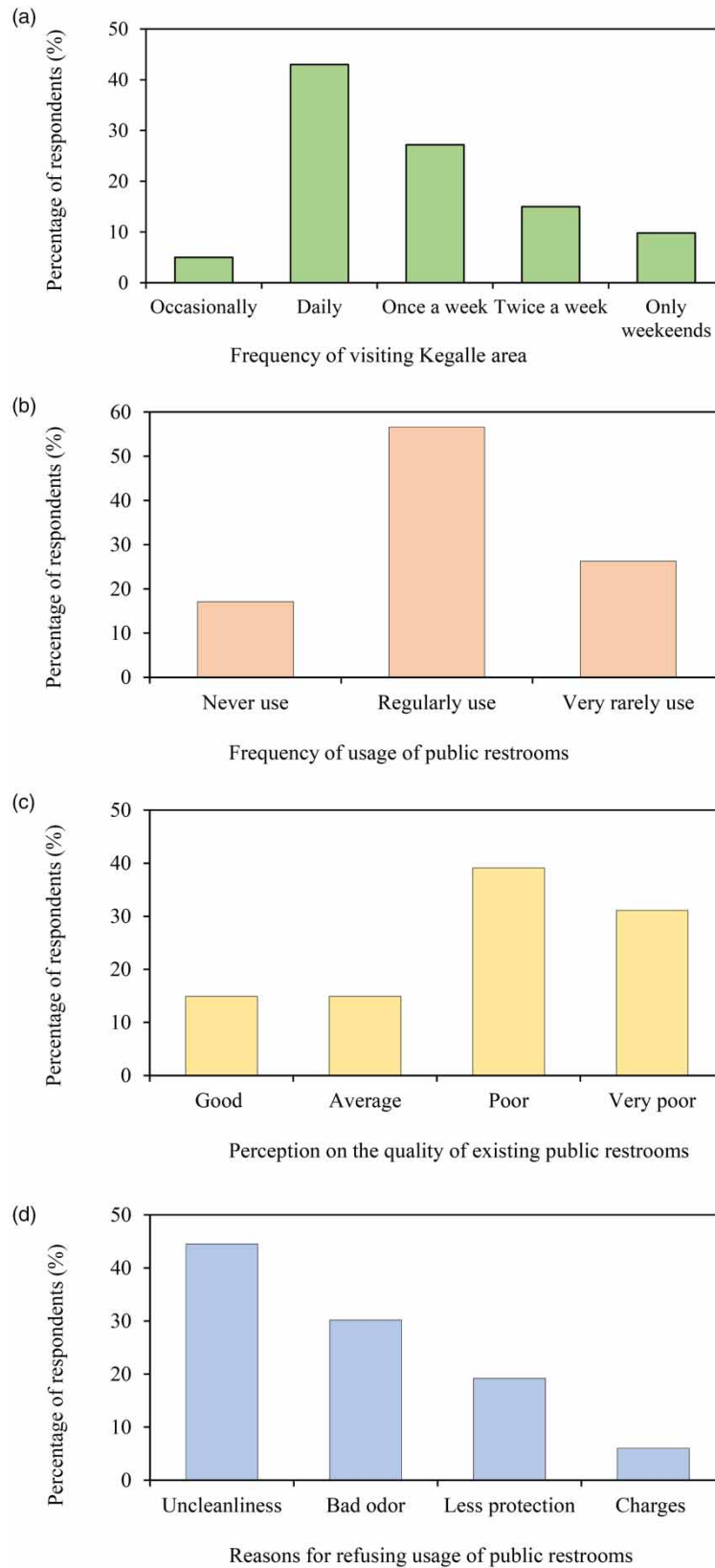


Figure 2 | (a) The frequency of visiting, (b) the frequency of public restroom usage by respondents, (c) perception of the quality of existing urban public restrooms, and (d) reasons for refusing public restroom use.

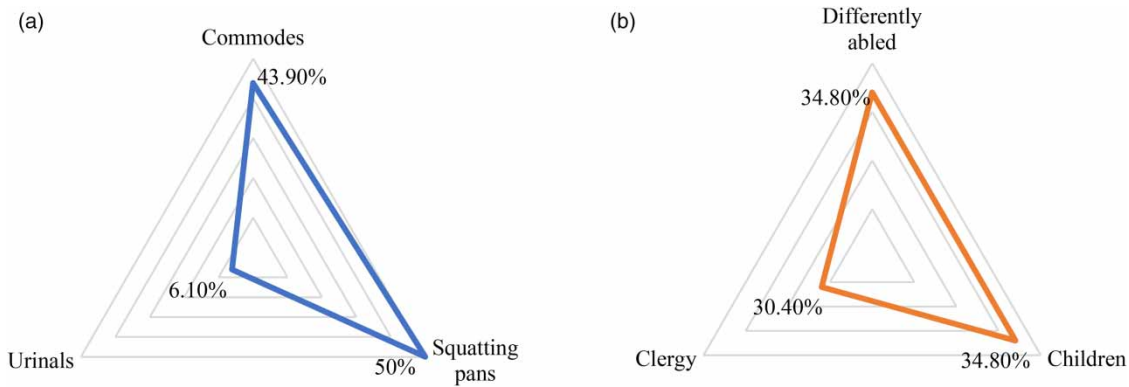


Figure 3 | (a) Overall types proposed for standard sanitation facilities for public restrooms and (b) the specially targeted groups for the new public restroom complex in Kegalle town by respondents.

as well as the installation of commodes and pathway tiles for the blind, are recognized as essential infrastructure facilities for people with disabilities.

‘Unlike people who are unable to walk, we can independently use public restrooms. However, we need signs to identify their locations. It is extremely important to have floor tiles for blind individuals, so that we can independently walk to a public toilet.’ (R5)

Differently abled women show that their needs differ from those of men, specifically in terms of requiring certain infrastructure facilities. Women seek safety and better sanitation conditions, which is why differently abled women avoid using public restrooms as much as possible. In certain circumstances, including menstruation, differently abled women seek assistance from a caretaker, without which they would encounter significant difficulties using public toilets.

‘When attempting to use a public restroom, I was once involved in a mishap. There are certain perilous drains that we cannot always avoid. Once during my period, I had to use the restroom immediately, but I was unable to seek assistance from a caretaker. I encountered a number of obstacles during that time.’ (R4)

Figure 4 shows the mean responses rating (1–5) of the main concerns of public restroom facilities in the Kegalle township. Among the multiple concerns related to the public restrooms, accessibility was rated as a significant concern with a 4/5 rating, and water supply (3/5).

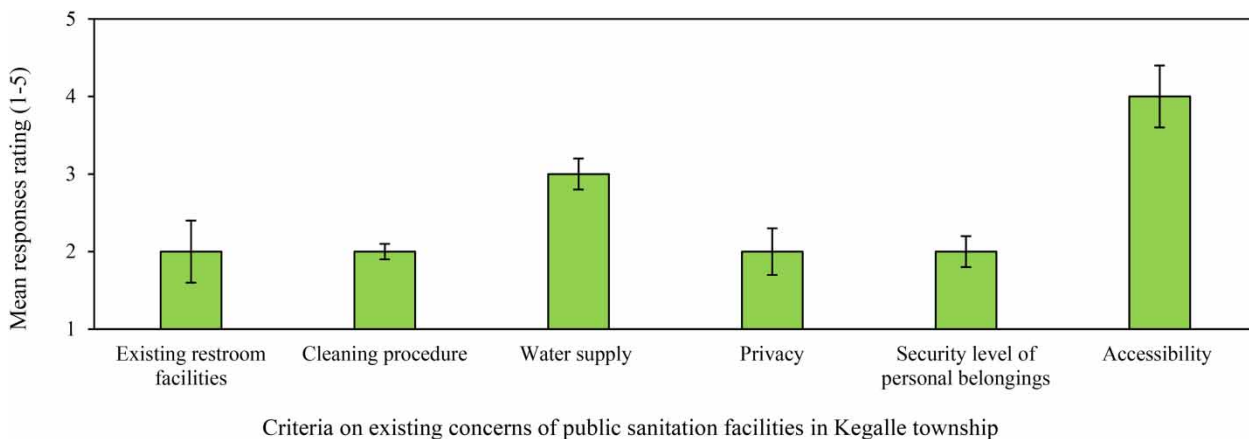


Figure 4 | Main concerns of public restrooms facilities in the Kegalle township.

Incorporating sustainability practices for operating and maintaining public restrooms

The percentages of frequency of the respondents' perceptions of incorporating certain sustainability practices (Patterson *et al.* 2018; Restroom Association 2018) for public restroom facilities (Figure 5(a)) and perception of granting the responsibility of future maintenance of public restrooms (Figure 5(b)) are presented accordingly. Commonly reported suggestions for improvement of public restroom facilities were proper solid waste management including napkins removal, removal of food covers, cigarettes, or any other waste gathered inside latrines (91%), intense cleaning at peak hours (84%), establishing separate restrooms for males and females (80%), proper monitoring of maintenance (78%) and displaying awareness sign boards on proper sanitary and hygiene practices (75%). Around 44% of the respondents are interested in granting the responsibility of future maintenance by the private sector, and 31% said giving the responsibility to the municipal council, and 25% support partnership operation and maintenance.

In-depth interviews with disabled individuals also revealed a unique set of recommendations for improving sustainability practices in accordance with social justice. Social justice is fundamental to guaranteeing equal and high-quality access to WASH services (Corburn 2022). Installing safety tactile tiles for the blind for visual impairments, constructing separate areas for differently abled people, installing blind signs, and employing a care worker to assist differently abled people are some of the quality standards identified by people with disabilities. In addition, they agreed to the factors listed in Figure 5(a) to varying extents.

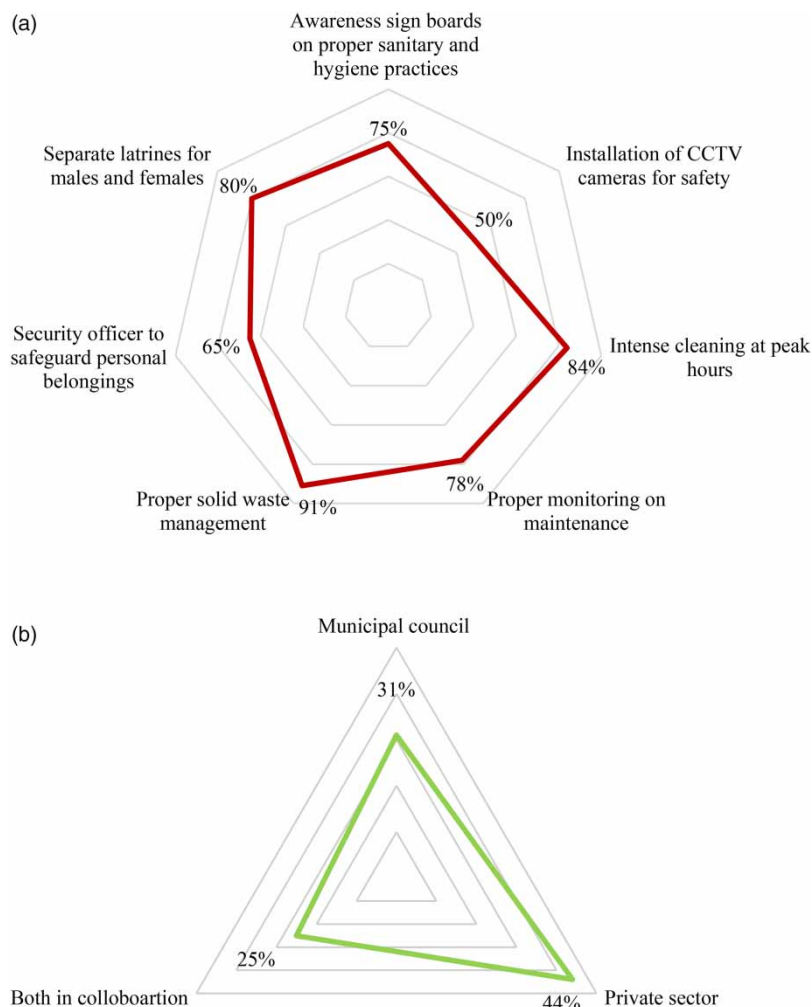


Figure 5 | (a) Respondents' perceptions of improvement options of public restroom facilities in Kegalle township and (b) respondents' perceptions on vesting the responsibility of future maintenance of public restrooms.

DISCUSSION

The purpose of this study was to explore the status of available infrastructure and public perception of the use of urban public restrooms in the densely populated Kegalle township, Sri Lanka. Out of those interviewed, more than 66% are daily urban visitors who use public restrooms regularly. This demonstrates the urgent need for adequate, accessible, and good-quality sanitary services, particularly in densely populated urban areas of the country. In certain situations, the insalubrity of public restrooms prevents access for women and children (Figure 6). Access charges, however, have not been a major concern.

Compared to other countries in South Asia, Sri Lanka achieved tremendous progress during the past two decades in ensuring access to improved sanitation facilities covering 95% (World Bank 2006). However, a lack of data avoids capturing the real situation regarding sanitation, particularly in urban areas of the country. Even though more than 95% of Sri Lankans have been ensured access to at least basic sanitation, the growing urban population (due to gentrification and concentrating industries and service centers) brings about a challenge of ensuring safe access to sanitation facilities (Mawilmada *et al.* 2016). Sri Lanka has pledged to ensure safely managed sanitation services by 2030, in line with the sustainable development goal (SDG) plan. In addition, the present research shows that public interventions to public restroom operation and maintenance require considerable attention, including some unrecognized areas like ensuring access for people with disabilities, women, and children. According to Arvidsson & Pinto (2022), ensuring women's access to public restrooms is integral to protecting their rights in the city. In addition to the SDG 6 deliberations, the Delhi Declaration, an outcome of the third South Asian Conference on sanitation has recognized sanitation in urban areas as a national priority (International Environmental Law Research Centre 2008), but the present study found that adequate attention has not been given despite its essentiality in Sri Lanka. However, improving sanitation in urban areas has positive implications for developing city areas as public convenience centers and tourist-attractive hubs (Dwipayanti *et al.* 2022).

Even though certain studies indicate that people repudiate using public restrooms due to poor facilities, poor maintenance, and insecurity (Afacan & Gurel 2015), this study demonstrates that people generally use public restrooms despite poor quality and cleanliness. If not addressed effectively and immediately, this could lead to a public health emergency. One of the main concerns neglected in public restroom construction is the age and gender suitability alongside the needs of people with special care. Gender-sensitive public restroom planning and design has received considerable attention even in developed nations, as it encourages women to fully participate in public activities without facing any barriers (Anthony & Dufresne



Figure 6 | (a) Existing restrooms at Nidahas Mawatha, Kegalle, (b) improper solid waste management practices associated with public restrooms, (c) poorly maintained drainage near the restrooms, and (d) broken drainage pipelines around the restrooms.

2007). The analysis thus also highlights the urgent need to appropriate age and gender sensitivity standards. Without WASH services, women and girls are more susceptible to abuse, violence, and illness, which hinders their ability to study, work, and live with dignity. Improving access to WASH at home, in the workplace, and in public spaces promotes gender equality (Florence *et al.* 2019). Accessibility and water supply are interconnected standards, so the effectiveness of public restrooms is primarily determined by these two factors. Ssekamatte *et al.* (2019) also supported this criteria-driven idea. Similarly, when water supply and accessibility are compromised, effective WASH coverage cannot be ensured, particularly in urban public areas of the country. Moreover, gender mainstreaming in a WASH project should entail ensuring that the unique needs and realities of women, men, girls, and boys are reflected throughout the project (Fisher *et al.* 2017). For the Kegalle township, gender mainstreaming considerations should be given attention when constructing a new latrine complex or renovating existing latrines.

The perception of the general public regarding the implementation of certain sustainability practices (identified through the literature review) emphasizes the importance of proper solid waste management, intensive cleaning during peak hours, and gender-sensitive design of public restrooms. Also, a set of unique practices was recommended by people with different abilities. The principles of respect, tolerance, and confidentiality are outlined here to guarantee that the needs of all users are met (United Nations General Assembly (UNGA) 2019). The lack of a discrete location to dispose of used hygiene products and the lack of formal garbage collection and disposal options contributed to inappropriate waste management. Thus, an effective solid waste management system can be more easily implemented with the help of programs on behavior change communications. Even though issues of gender sensitivity and dignity were observed in the present study, they were not studied extensively.

As identified in this study, one of the crucial concerns was providing necessary facilities and guaranteeing access to children and differently abled persons, as existing public restrooms are not constructed to address their specific requirements. The human right to water and sanitation is the right of every person, including those physically challenged, without discrimination. Ensuring access to and consistent use of sanitary facilities by physically challenged individuals is crucial for minimizing their risk of getting diseases linked to poor sanitation as understood in the present study.

Studies show that sustainable maintenance of public restrooms to provide standard sanitary service should be a responsibility ensured through multisectoral coordination (Ssekamatte *et al.* 2019; Moreira *et al.* 2022). The present study found that the people's trust in public institutions has been declined, and they suggest having a maintenance system overseen by the private sector. Collaborative operation and maintenance were also not supported by the participants adequately so it is suggested to incorporate private sector operation and maintenance of public restrooms at least in city areas of the country, apart from the public sector interventions. Nonetheless, some studies identify collaborative operation and integrated maintenance of public restrooms as sustainable (Restroom Association 2018).

CONCLUSION

With rapid urbanization and a growing urban population, access to high-quality public restrooms has been identified as a top national priority. Effective and sustainable operation and maintenance of public restroom services can also aid in the development of city centers as public convenience centers and tourist attraction hubs. The present study indicates that despite the unhygienic conditions of public restrooms in certain Sri Lankan cities, they are frequently used; therefore, immediate attention must be paid to ensuring safe access to public restrooms. One of the critical concerns in developing new plans for public restrooms in urban areas is gender sensitivity and focusing on the needs of differently abled persons. Even though the public sector currently manages public restroom facilities, respondents strongly favor incorporating private sector maintenance and operation. In terms of incorporating sustainability measures, solid waste management has been considered an essential requirement in future developments of public restrooms in urban areas of the country.

DATA AVAILABILITY STATEMENT

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

CONFLICT OF INTEREST

The authors declare there is no conflict.

REFERENCES

- Afacan, Y. & Gurel, M. O. 2015 Public toilets: an exploratory study on the demands, needs, and expectations in Turkey. *Environment and Planning B: Planning and Design* **42** (2), 242–262. doi: 10.1068/b130020p.
- Anthony, H. K. & Dufresne, M. 2007 Potty parity in perspective: gender and family issues in planning and designing public restrooms. *Journal of Planning Literature* **21** (3), 267–294. doi: 10.1177/0885412206295846.
- Arvidsson, M. & Pinto, A. B. 2022 Public toilets for women: how female municipal councillors expanded the right to the city in Sweden, c. 1910–1925. *Women's History Review* **31** (3), 476–495. doi: 10.1080/09612025.2021.1950335.
- Bengtsson, M. 2016 How to plan and perform a qualitative study using content analysis. *NursingPlus Open* **2**, 8–14. https://doi.org/10.1016/j.npls.2016.01.001.
- Corburn, J. 2022 Water and sanitation for all: citizen science, health equity, and urban climate justice. *Environment and Planning B: Urban Analytics and City Science* **49** (8), 2044–2053. https://doi.org/10.1177/23998083221094836.
- Dwipayanti, N. M. U., Nastiti, A., Johnson, H., Loehr, J., Kowara, M., de Rozari, P., Vada, S., Hadwen, W., Nugraha, M. A. T. & Powell, B. 2022 Inclusive WASH and sustainable tourism in Labuan Bajo, Indonesia: needs and opportunities. *Journal of Water, Sanitation and Hygiene for Development* **12** (5), 417–431. doi: 10.2166/washdev.2022.222.
- Fan, M. 2015 *Sri Lanka's Water Supply and Sanitation Sector: Achievements and A Way Forward*. Metro Manila.
- Fisher, J., Cavill, S. & Reed, B. 2017 Mainstreaming gender in the WASH sector: dilution or distillation? *Gender & Development* **25** (2), 185–204. doi:10.1080/13552074.2017.1331541.
- Florence, D., 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.
- International Environmental Law Research Centre 2008 *Delhi Declaration (2008)*. International Environmental Law Research Centre, Delhi.
- Kanuti, A. I., Monko, R. & Alananga, S. 2019 Urban public toilets management in Tanzania: understanding cost-effective approaches. *Macro Management & Public Policies* **1** (2). doi:10.30564/mmpp.v1i2.738.
- Krehl, A. & Weck, S. 2020 Doing comparative case study research in urban and regional studies: what can be learnt from practice? *European Planning Studies* **28** (9), 1858–1876. doi:10.1080/09654313.2019.1699909.
- Landman, K. 2014 Learning through real-life experience: using case studies for urban planning and design education. In: *Planning and the Case Study Method in Africa*. (Duminy, J., Andreasen, J., Lerase, F., Odendaal, N., Watson, V., eds.). Palgrave Macmillan, London.
- Mawilmada, N., Atapattu, S., Dela, J. & Gunawardene, N. 2016 *Urban Development, Human Settlements and Economic Infrastructure*. Climate Change Secretariat, Colombo.
- McLoughlin, C. & Harris, D. 2013 *The Politics of Progress on Water and Sanitation in Colombo, Sri Lanka*. Overseas Development Institute, London.
- Moreira, F. D., Rezende, S. & Passos, F. 2022 Public toilets from the perspective of users: a case study in a public place, Brazil. *Journal of Water and Health* **20** (1), 41–53. doi: 10.2166/WH.2021.127.
- Patterson, S., Looney, K. & Santen, Z. 2018 *Recommendations for Sustainable Restrooms in Future Development at Western Michigan University*. Western Michigan University, Kalamazoo.
- Poirier, P. 2019 *Global Framework for Urban Water, Sanitation and Hygiene*. United Nations Children's Fund, New York.
- Prüss-Ustün, A., Wolf, J., Bartram, J., Clasen, T., Cumming, O., Freeman, M. C., Gordon, B., Hunter, P. R., Medlicott, K. & Johnston, R. 2009 Burden of disease from inadequate water, sanitation and hygiene for selected adverse health outcomes: an updated analysis with a focus on low- and middle-income countries. *International Journal of Hygiene and Environmental Health* **222** (5), 765–777. https://doi.org/10.1016/j.ijheh.2019.05.004.
- Restroom Association 2018 *A Guide to Better Public Toilet Design and Maintenance*. Restroom Association, Singapore.
- Ssekamatte, T., Isunju, J. B., Balugaba, B. E., Nakiryia, D., Osuret, J., Mguni, P., Mugambe, R. & van Vliet, B. 2019 Opportunities and barriers to effective operation and maintenance of public toilets in informal settlements: perspectives from toilet operators in Kampala. *International Journal of Environmental Health Research* **29** (4), 359–370. doi: 10.1080/09603123.2018.1544610.
- United Nations General Assembly (UNGA) 2019 *Human Rights to Water and Sanitation in Spheres of Life Beyond the Household with an Emphasis on Public Spaces*. United Nations, Geneva.
- van Minh, H. & Hung, N. V. 2011 Economic aspects of sanitation in developing countries. *Environmental Health Insights* **5** (1), 63–10. doi: 10.4137/EHI.S8199.
- Weststrate, J., Dijkstra, G., Eshuis, J., Gianoli, A. & Rusca, M. 2019 The sustainable development goal on water and sanitation: learning from the millennium development goals. *Social Indicators Research* **143** (2), 795–810. doi:10.1007/s11205-018-1965-5.
- World Bank 2006 *Toward Sustainable Water and Sanitation Services in Sri Lanka*. The World Bank, Washington, DC.
- World Health Organization 2022 'Sanitation.' *Fact Sheet on World Sanitation*.
- Yin, R. K. 2003 *Case Study Research: Design and Methods*, Vol. 5. SAGE, London.

First received 10 October 2022; accepted in revised form 1 June 2023. Available online 12 June 2023