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Publisher: Taylor & Francis

ISSN: 2374-8834

Subject area: [Social Sciences: Urban Studies](#) [Medicine: Public Health, Environmental and Occupational Health](#)

Source type: Journal

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To cite this article: Vasudha A. Gokhale, Deepa Joshi & Anjali Acharya (2023) Women's contested mobility and equity in Indian urban environment: case of public toilets in Pune, Maharashtra, *Cities & Health*, 7:6, 1072-1087, DOI: [10.1080/23748834.2023.2242091](https://doi.org/10.1080/23748834.2023.2242091)

To link to this article: <https://doi.org/10.1080/23748834.2023.2242091>



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Women's contested mobility and equity in Indian urban environment: case of public toilets in Pune, Maharashtra

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ABSTRACT

Public toilet facilities in an urban setting are an essential infrastructure that guarantees every citizen's right to sanitation in the public realm. This paper contends on the fragility of urban infrastructure in addressing women's needs focusing on public toilet facilities in Indian cities. We argue that the deficit and inequitable provision of urban public toilets in Indian cities restricts women's participation in the public realm and perpetuates social inequality, with Pune, India, as the case. The spatial features of 124 public toilet facilities in 15 wards were examined in light of gender-responsive guidelines under the Swachha Bharat Mission. Various contextual, psychosocial, and technological factors influencing toilet use behavior were identified with semi-structured in-depth interviews with 45 women in three different life stages using the Integrated Behavioural Model for Water, Sanitation, and Hygiene. The analysis provided a nuanced understanding of various spatial and psychosocial aspects governing women's public toilet use in Pune. Analysis showed that various initiatives for improving sanitation adopted an androcentric vision in designing public toilets discounting women's equitable participation in the public realm. The finding delineates a spatial paradigm on providing inclusive public toilets contributing to women's mobility and equity in the Indian urban environment.

ARTICLE HISTORY

Received 5 March 2023
Accepted 25 July 2023

KEYWORDS

Sanitation; menstrual; adolescents; safety; incontinence

Introduction

Urban growth is invariably associated with sanitation and waste management (Bichard and Knight 2011), where lack of basic sanitation creates unhygienic conditions leading to unhealthy living environments and increased illnesses (United Nations 2007). More than 2.4 billion people lack access to health infrastructure and basic sanitation globally. The role of well-designed and maintained sanitation facilities in improving social, economic, and environmental conditions in a place and enhancing public health is well recognized (Roma and Pugh 2012). Public health infrastructure includes adequate public toilet facilities contributing to the inhabitants' social life, helping them maintain health, well-being, and dignified life. Public toilet facilities reflect a city's socio-cultural and economic character and are often referred to as the essential barometer of civilization where people live or gather (Evans 2019). Besides, satisfactory operation and maintenance of public toilets improve sanitation and hygiene, providing an inclusive, safe urban environment and contributing to sustainable development (Ssekamatte *et al.* 2019). The provision of public toilets is a public health, humanitarian, educational, architecture, urban

planning, and business concern where the toilet facility's serviceability and adequate spatial distribution suitable for the intended population is a prerequisite (Thieme and Koszmovszky 2020, Fu *et al.* 2022). However, the toilet facility is often designed to ignore the socioeconomic and cultural factors that affect the usage patterns of women, hampering their equitable mobility in the urban sphere (Heijnen *et al.* 2015). Previous studies established that women avoid places of business, entertainment, and leisure devoid of adequately designed and located toilets to address their peculiar needs (Greed 2004, Hanson 2010, Bichard and Knight 2012). This aspect is significant for women living in Indian cities where inadequate sanitation facilities are a persistent problem (Banana *et al.* 2015, Wankhade 2015, Vedachalam and Riha 2015). In addition, public toilet facilities need to cater to adolescent girls and women who face additional challenges with menstrual hygiene and need access to menstrual products, facilities for disposing of used materials, and a supportive environment to manage menstruation without embarrassment or stigma (Sommer *et al.* 2016, Maroko *et al.* 2021). Although it is a normal and healthy part of life for most women, it has always been linked with taboos

and myths in India excluding women from many aspects of socio-cultural life (Garg 2015).

Research scholarship addressed the issue of women's access to sanitation from different perspectives focusing on rural areas of India. However, research on public toilet facilities in Indian cities for women is scarcely explored. The problem addressed in this research is women's equitable access and use of public toilet facilities, with Pune, India, as a case. It argues that Indian cities lack gender-sensitive public toilet facilities that are a significant aspect of guaranteeing women's equitable mobility in the urban realm. The insights obtained from a survey of existing public toilets and interviews with women living in Pune, India, can serve as a guideline for proposing future equity-based policies.

Public toilets as a gendered space

Past research illustrates historical and cultural meanings and perceptions of public toilets as a gendered space, where the conventional approaches and assumptions concerning the human body, sexuality, privacy, social practices, and technological advances manifested in their design and construction across cultures (Walker *et al.* 2013, Njeru 2014). The public toilets for women are often called the 'World of Unmentionable Suffering' (Penner 2005). Such toilet facilities were developed considering class, race, and gender, representing the middle-class moralism of the nineteenth century that stressed various forms of bodily restraints to attain respectability representing pure womanhood, catering to their unique needs. In the early twentieth century, consideration for women's bodily and spatial characteristics was stressed for providing users privacy (Cooper *et al.* 2000, Isunju *et al.* 2011). Many initiatives have been taken in advanced countries to address women's equitable access to the public toilet, such as the restroom equity act enforced in 1989 in California to address less number of public toilets for women resulting in delays in using such facilities (Banks 2013). 'Potty Parity' was the phrase coined to represent equitable provision and access of all users to public restrooms, including advocacy efforts and legislation to address the issue of long queues in women's restrooms. The first Restroom Equity Bill passed by the Virginia Legislature, in which the equal size and number of restrooms for men and women were considered unfair due to more space and time requirements for women users (Banzhaf 2002, Anthony and Dufresne 2007, Levy 2010, Banks 2013). The absence of women's toilets in the chambers of the supreme court, USA until 1981 and in the USA senate until 1992 are glaring examples of gender inequality in political

and legal spheres (Plaskow 2008, Rushin and Carroll 2017, Shannon and Hunter 2020). The International Plumbing Code (IPC) assigned a quota for the minimum number of gender-segregated toilet facilities in public spaces with required space in 2004 (Huh *et al.* 2019, Hochbaum 2019, Farajollahzadeh and Hu 2021).

Many Asian countries also took proactive steps to improve sanitation to provide citizens with a better quality of life. Since 2015 under China's toilet revolution, 68000 public toilets have been built in urban areas in Mainland China to promote sanitation coverage and people's well-being (Cheng *et al.* 2018, Yan *et al.* 2021). Bangladesh witnessed large-scale rural and urban sanitation promotion programs to spread public toilet use and related hygiene practices in 1991 and 2014 (Hasan and Rahman 2021). The Total Sanitation and Sanitation Marketing (TSSM) program launched in East Java, Indonesia, and the Philippine Approach to Total Sanitation (PhATS), are some of the government-level initiatives to promote hygienic sanitary practices (Borja-Vega 2014, Nelson *et al.* 2014, Robinson and Gnilo 2016). Historically in the wake of India's non-violent independence movement, a well-equipped and maintained toilet symbolized dignity under the great visionary leader Mahatma Gandhi (Reddy *et al.* 2009). The Indian government made efforts to achieve equitable sanitation, including the 'National Urban Sanitation Policy' in 2008 and a people-centered sanitation program, the 'Total Sanitation Campaign', initiated in 1999. A Social Service Organization, 'The Sulabh International', provides toilet facilities all over India as one of the initiatives promoting sanitation and public health. Starting in Bihar, the organization has constructed about 3154 public toilets serving 10 million people nationwide (Pathak *et al.* 2022).

Swachha Bharat Mission (SBM), or Clean India Mission in 2014, aimed to eliminate open defecation and improve solid waste management. It is an attempt to generate awareness to bring about a behavioral change in the Indian population regarding healthy sanitation practices (Chaudhary 2017). This mission is one of the largest step towards achieving universal sanitation coverage and improving cleanliness operating in two domains, the Swachh Bharat Mission - Gramin and the Swachh Bharat Mission -Urban (Bharat and Sarkar 2016). Research indicated that more than 95 million toilets have been built across rural and urban India since the launch of this mission (Dandabathula *et al.* 2019).

The 'Swachh Bharat Mission-Urban (SBM-U)' aims to develop inclusive sanitation facilities to achieve desired cleanliness and services standards for public and community toilets in urban areas to cater to the need of women, physically challenged people,

children, and transgender population and strengthening of urban local bodies to design, execute and operate systems (Suthar *et al.* 2019).

Accessibility and safety

Public toilets are an example of a public space not accessible on equal terms and a testimony to the inability to achieve equal cities (Banks 2013). In the lack of accessible toilets in the urban spheres, women often experience bladder leashes, where less toilet provision demonstrates the male domination seeking to preserve the patriarchal tradition of segregated private and public spheres limiting women's access to public spaces (Flanagan 2014, Ellisa and Luana 2022). Women's toilet inequality includes less than men, inadequate design and facilities, absence of separate toilets, and no such facility (Moore 2001). Moreover, women standing with their legs crossed in long queues in female toilets are egregious and apparent results of the discrepancy between female and male toilet provisions (Plaskow 2016). Accessibility aspects of public toilets are associated with individual behavior, choice, status, and community behavior. Accessible toilets are recognized as a crucial public amenity, the lack of which represents embodied and gendered insecurity leaving women and the elderly vulnerable (Thieme and Koszmovszky 2020). Generally, such spaces need gender-wise separation to prevent either sex from viewing the exposed private body parts of the other (Greed 2004, Gershenson 2010). Sex-segregated toilets are preferred as they address women's inherent biological differences and different functional needs. However, they intensify the segregation of men and women in the public realm (Greed 2004, Kogan 2007, Doan 2010, Jones and Slater 2020, Machunda *et al.* 2020).

People civilize following social constructs and societal obligations in the public sphere, where an individual's cultural perception governs safety, shame, and discomfort. Public toilet provision and design shape how people perceive bodily image and privacy within the enclosed toilet space (Duong 2021). Safety is a subjective psychological aspect that differs for each person, depending on their past experiences and social expectations (Molotch 2010). The toilet as a space is referred to as an uncomfortable liminal zone to test and prove gender differences. They provide a space for trading cultural capital and reflect womanhood. However, the lack of safety from a male-bodied person is a significant concern who may intrude in sex-segregated toilets rendering the space dangerous (Skeggs 2001, Jeffreys 2014, Skoglund and Holt 2021). To address women's safety and privacy concerns in avoiding sexual violence, the 'Bathroom Bill' passed in 2016 in North Carolina, USA, mandated using sex-segregated toilets in public places and schools, considering that the absence of such

provisions would render the female population more vulnerable to sexual assault (Davis 2018). Feelings of safety and worry are associated with the urban environment characteristics of public toilets, and they are often considered potential spots of vandalism, anti-social behavior, and crime (Eck and Weisburd 2015, Hartigan *et al.* 2020). As per Routine Activities Theory, crime occurs without physical surveillance and the provision of security guards that reduce the opportunity for criminal activity (Hollis *et al.* 2013, Belur *et al.* 2017). The public toilet design relates to land-use patterns, architectural design, and urban planning, where many urban planning features as a designed road-network, often facilitating gender-related crimes. The research established that poorly lit areas create an uncertain environment, while the lack of surveillance, guards, broken doors, and missing locks render toilets unsafe (Afacan and Gurel 2015, Belur *et al.* 2017).

Health concerns

Toilet use has numerous health implications as research established that about 20% of women suffer from urinary infections, inflammation of the bladder wall referred to as interstitial cystitis resulting in increased urinary frequency and feeling of urgency. Pregnant women need to use toilets frequently, as in early pregnancy, urination increases due to hormonal changes. Furthermore, in late pregnancy, the bladder's capacity is reduced due to the pressure the uterus applies (Sahoo *et al.* 2015, Plaskow 2016). Poor menstrual hygiene management often affects women's risk of reproductive tract infections and urinary tract infections (Sommer *et al.* 2016). Women often hold onto urine as toilets are not readily available, where the urine retention and distension of the bladder increase the susceptibility to continence issues and may lead to renal damage (Banzhaf 2002, Teunissen *et al.* 2006). To avoid toilet use, women tend to limit water or fluid consumption, which causes dehydration, constipation, headache, and increased risk of kidney stone creation (Popkin *et al.* 2010). They have more significant contact with toilet fixtures such as toilet seats and cabinets, increasing vulnerability to health hazards than men. Moreover, unhygienic toilet facilities cause the spread of many skin infections, such as Methicillin-Resistant Staphylococcus Aureus (MRSA).

The public life of people with health issues often becomes challenging due to the limited availability of accessible public toilets (White 2021). Inaccessibility and ill maintenance of public toilets deter people from using them, and they often modify their routines and habits outside the home environment. Due lack of adequate toilet facilities within walking distance, older adults often face embarrassment as they may have incontinence problems commonly known as the loss

of bladder control which keeps them home-bound, increasing isolation and causing poor mental health (Kitchin and Law 2001, Bichard *et al.* 2006, Hanson *et al.* 2007, Satterthwaite *et al.* 2015, Lowe 2018).

Architectural design and planning concerns

Public toilets are part of an individual's social life and are designed to satisfy architectural norms, rituals, and identity, symbolizing the culture and social milieu of the host community. Dara Blumenthal (2014) examined identity and embodiment using post-humanism and feminist theory, referring to the emotional response experienced in using a toilet. It included fear, anxiety, shame, and embarrassment (FASE) that maintains a homo clausus order, representing emotional, rational, and physical self-control (Blumenthal 2014). The design of public toilets needs to cater to women who use toilets more frequently than men due to many physical and health-related issues; besides, many women are likely to assist children or use them for breastfeeding; hence, they need more time to perform the required activity (Roma and Pugh 2012, Singh *et al.* 2018, Fileborn and Marshall 2020). A women-friendly toilet facility needs a separate entrance, good lighting, adequate doors, windows, and locks to assure privacy, culturally appropriate menstrual material availability, and a waste disposal option for equitable use. Besides, they should be affordable with a safe and convenient location (Corradi *et al.* 2020, Machunda *et al.* 2020). A public toilet has a direct user interface; hence it must be designed to satisfy users' needs and aspirations (Moreira *et al.* 2022).

Public toilets: the Indian scenario

India suffers from an alarming shortage of toilets as only 11.9% of the population has adequate sanitation, and 3.2% use public toilets (Wankhade 2015, Frøystad 2020). Insanitary conditions due to inadequate public toilet facilities are a significant concern in Indian cities suffering from poor maintenance, vandalism, and ignorance from the service providers and local government (Khosla and Dhar 2013, Kulkarni *et al.* 2017, Koonan 2019). Significant evidence showcases the vulnerability of Indian women to sexual violence where poor design and inadequate location of public toilets supported eave teasing, assault, and even rape as extreme events in both rural and urban settings (Viswanath and Mehrotra 2007, Molotch 2010, Gershenson 2010, Tacoli and Satterthwaite 2013, Srinivasan 2015, Sahoo *et al.* 2015, Shiras *et al.* 2018, Nunbogu and Elliott 2022). Providing adequate sanitation facilities for women considering their peculiar needs, is a neglected issue in the Indian context despite recognizing the adverse impact on their health and well-being (Reddy *et al.* 2009). The research established that various cultural, behavioral, and religious reasons

govern sanitation and toilet use practices, as many women face the problem of using conventional Western-style public toilets, and the low partition walls between two stalls create privacy issues (Warner 1998, Jain and Subramanian 2018). A Plethora of research discussed flaws in public toilet provisions affecting women's safety, health, and well-being, focusing on rural women (Patel 2003, Datta and Ahmed 2020). However, women's concerns regarding access to healthy sanitation are still a neglected area of concern.

Study setting and context

The study was conducted in Pune, a major metropolis in the western province of Maharashtra with an urban/metropolitan population of 5,057,709, of which 2,656,240 are males and 2,401,469 are females. The city earned the nickname a pensioner's paradise and Oxford of the East; however, the information technology industry has witnessed unprecedented growth in the last few decades. Besides, the city is a popular choice for women to study and work to nurture a conducive ecosystem for women's education and employment (Nalavade 2000, Srinivasan and Kulkarni 2019). In Pune, many initiatives were taken with joint efforts by the municipal government, social organizations, and NGOs providing good sanitation facilities to more than half a million people (Burra *et al.* 2003). Pune Municipal Corporation (PMC) has constructed 797 community and 395 public toilet blocks, each with separate units for men and women. Community toilets are located near slums to cater to the slum population; however, public toilets are placed on streets, transport hubs, parks, and marketplaces (PMC, Hobson 2000). Pune Municipal Corporation presented a policy document with a vision of improving public health and safety, particularly of the marginalized population, including women, the elderly, and the physically challenged cohort. The intent is to provide a cohesive, well-maintained, universally accessible network of public toilets in all the city neighborhoods. The design principles include equitable use, allowing flexibility to accommodate individual preferences and abilities. Despite various initiatives the local government takes, public toilet facilities in the city remain gender-blind and do not satisfy the Gender Responsive Guideline under the Swachh Bharat Mission – Urban (SBM-U) (niua.org). This research examined the current status of public toilets in Pune and aimed to identify various social and spatial aspects that have a bearing on their equitable use.

Methodology

The primary database was collected through semi-structured interviews and observations at the 15 wards in Pune between August 2021 and February 2022. The

Table 1. Pune City Zones

S.N.	ZONE	WARD
1	ZONE I	Dhole Patil Yerwada Nagar Road
2	ZONE II	Aundh Ghole Road Kothrud
3	ZONE III	Dhakawadi Sahkar Nagar Warje Karve Nagar
4	ZONE IV	Kondhwa Tilak Road Hadapsar
5	ZONE V	Kasba Bhawani Peth Bibvewadi

Source: Pune Municipal Corporation (PMC 2023).

city is divided into five zones and 15 ward offices (each consisting of three), as shown in Table 1 and Figure 1.

A windshield survey was performed to identify the toilets located in each ward for detailed survey and analysis. Driving through the locality, researchers identified male and female toilets, noted the relevant characteristics, and marked their location on the area map. The toilet location and the number of male and female toilets are shown in Figure 2.

The windshield survey provided helpful information about toilet facilities distribution and location,

based on which 124 toilets catering to women users were selected for analysis; the breakup is shown in Figure 3.

The method adopted was the naturalistic observation of sampled cases performed by trained women research assistants. They are supposed to enter the facility and observe the physical condition three times daily to ensure the broadest range of observational consistency. Five study parameters, each represented with specific attributes, adopted from “Gender Responsive Guidelines under Swachha Bharat Mission-Urban (niua.org) as presented in Table 2.

The adequacy of the parameters was rated as good, satisfactory, and unsatisfactory; in addition, notes were taken to serve as descriptive observational variables for each attribute to elaborate and justify the rating assigned to each toilet. The findings from the survey are presented in Figure 4 and elaborated in the next section.

Availability

Availability is represented by 800 m distance between two toilets along a road or 400 meters (5-minute walk) distance from a significant node distance from a significant node which is considered a comfortable



Figure 1: Pune city Wards Map

Source: Pune Municipal Corporation (PMC)

Figure 1. Pune city ward map. Source: Pune Municipal Corporation (PMC 2023)

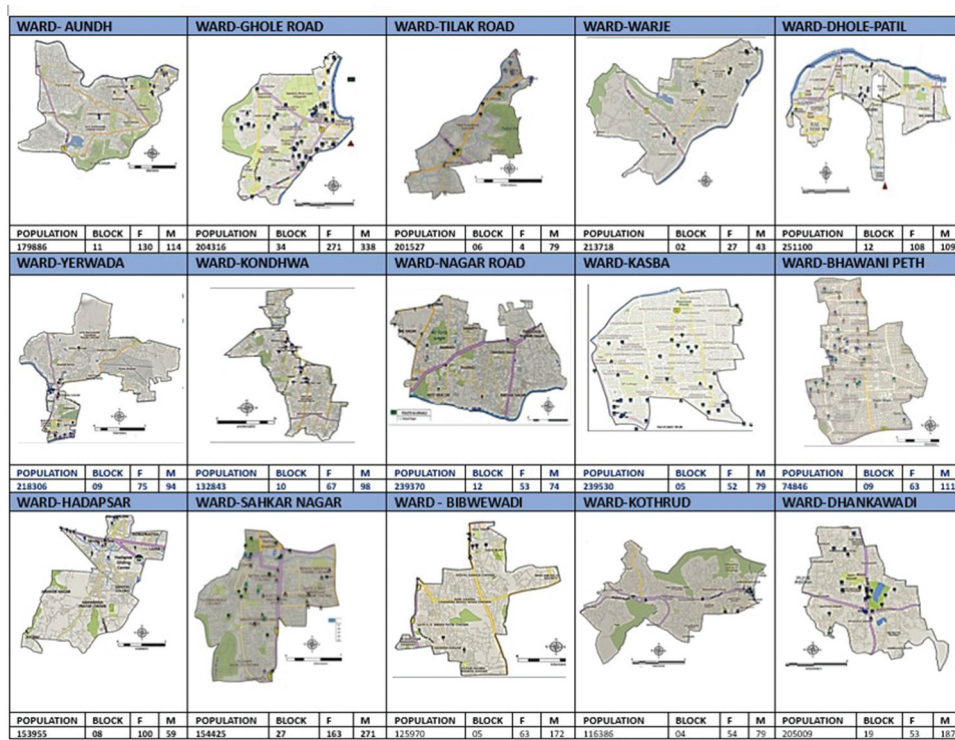


Figure 2. Location of public toilets.

walking distance to access a toilet facility and safety. Disproportionally located toilets where the concentration of toilets was observed at particular places in Aundh, Kothrud, Dhole-Patil, Yerwada, Kondhwa, Bibviewadi, and Hadapsar wards. At the same time, the rest part was devoid of toilet facilities. Just 22% of toilets satisfied the requirement, 30% were at a fair distance, and the location of 46% of toilets was rated 'unsatisfactory'. More than 50% of the toilet locations were rated unsafe due to various reasons, such as; being located in remote or rundown locations, concealed by dense trees, walls, and buildings resulting in the lack of passive surveillance, and being located close to places deemed unsafe for women, such as liquor shops.

Toilet design

Gender-friendly toilet design criteria included the availability of a separate unit for women, the entry reasonably away or facing a different direction from the male toilet unit, and visual intrusion. Another aspect is the provision of adequate signage for male and female toilets graphically and in the local language Marathi, and Hindi or English, to make them accessible for local people and the migrant population. The presence of adequately designed units for males and females providing privacy to use toilets in a dignified way was found in 10% of toilets; 41% were designed satisfactorily, and 49% of toilets' design was not rated as gender friendly. Adequacy of signage was noticed to a certain extent where

signage in 28% and 38% of toilets were rated 'good' and satisfactory respectively while the rest, 33%, were not up to the mark.

Cubicle design

Cubicle design adequacy was examined considering the size of the cubicle and accessibility of toilets for the physically challenged population. The provision of a minimum of one cubicle accessible for physically challenged people meeting national accessibility guidelines, is a mandatory requirement under Gender Responsive Guidelines under Swachha Bharat Mission-Urban. However, no sampled cases satisfied this requirement. Most cubicles satisfy the size (1.1 square meters) requirement prescribed by Pune Municipal Corporation (PMC).

Safety

Good lighting conditions represented safety for women's toilets during day and night and surveillance. Adequacy of light during the day is based on adequate illumination for required visibility through fenestration design facilitating daylight penetration inside and artificial lighting. Inadequacy of lighting in toilets during day and night is found in 52% and 76% of toilets, respectively, appearing as a significant technological dimension that is likely to affect toilet use during day and night. The reason was the limited

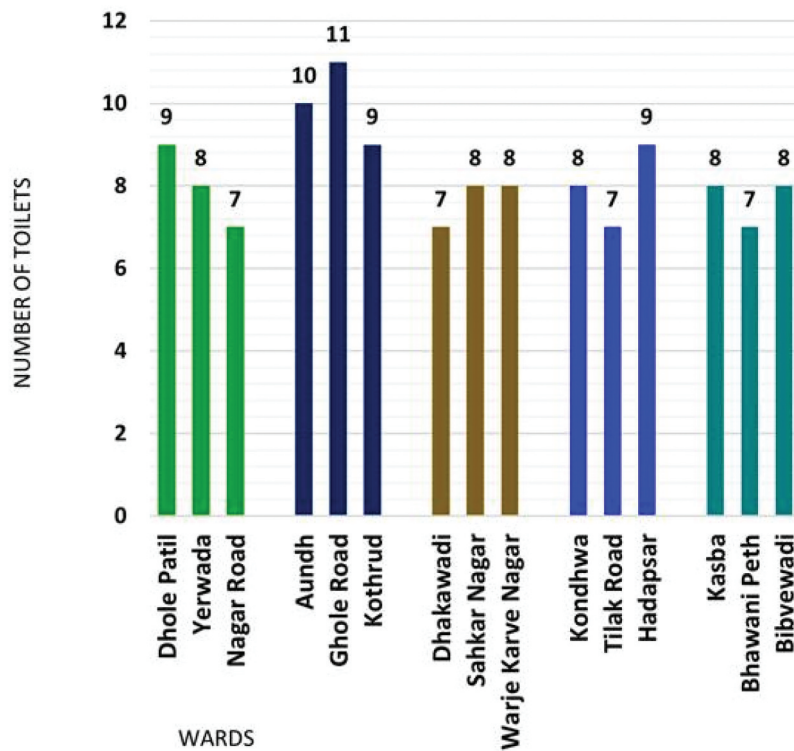


Figure 3. Sampled toilets.

Table 2. Parameters for gender responsive toilet.

Parameters	Attributes	Criteria
1	Availability	Reasonable distance: 800 m Interval along a major road. Distance from a major node (400 m) Safe Location: Reasonably visible from approach road Remote/Run-down locations
2	Toilet Design	Privacy: Separate toilet/part in same toilet for male and female units Toilet entrance at a sufficient distance from each other Face different directions or have separating walls. Signage: Adequate Graphical Signage Signage in local language/English/Hindi.
3	Cubicle design	Size of Cubicle: Minimum 1.1 Sq.m. area Accessibility: Toilet cubicle accessible for people with disabilities
4	Safety	Lighting: Outside Lighting for Entrances, exits, walkways, paths- Inside Lighting in cubicles, wash areas Presence of a security guard/caretaker
5	Quality	Surveillance facilities: Wash Basin, Water, Soap. Hooks and ledges for hanging clothes for keeping belongings off the floor. Menstruation management: Access to products for menstruation Waste disposal: Availability of regularly cleaned and covered litter bins, Hygiene: Cleanliness, Use of disinfection liquid Physical condition: Floor, walls, doors windows, hardware, sanitary fittings

Source: Adopted from niua.org, 2018.

entry of daylight attributed to the use of concrete grills with fewer perforations and small ventilators. Besides, ill maintenance of fenestration and consequent accumulated dust on glazed surfaces added to the gloomy and dingy interiors. Another reason was the Inefficiency of artificial lighting due to the use of luminaries with less wattage and non-working light fittings that did not add to the illumination level during the day and made toilets inaccessible after dark. The absence of female caretakers or guards in 70% of toilets is alarming as most toilet facilities were unpaid and operated with minimal cost.

Quality

Quality is represented by the attributes, including available facilities, menstruation management, waste disposal, hygiene, and the physical condition of the toilets. Availability of various facilities such as basins, water, soap, hooks, and ledges for hanging clothes for keeping belongings off the floor was rated good and satisfactory for 24% and 59% of toilets, respectively. The rest, 21%, were rated as 'unsatisfactory' in providing facilities to satisfy users' needs. Highly deficient menstruation management due to a total lack of access to products

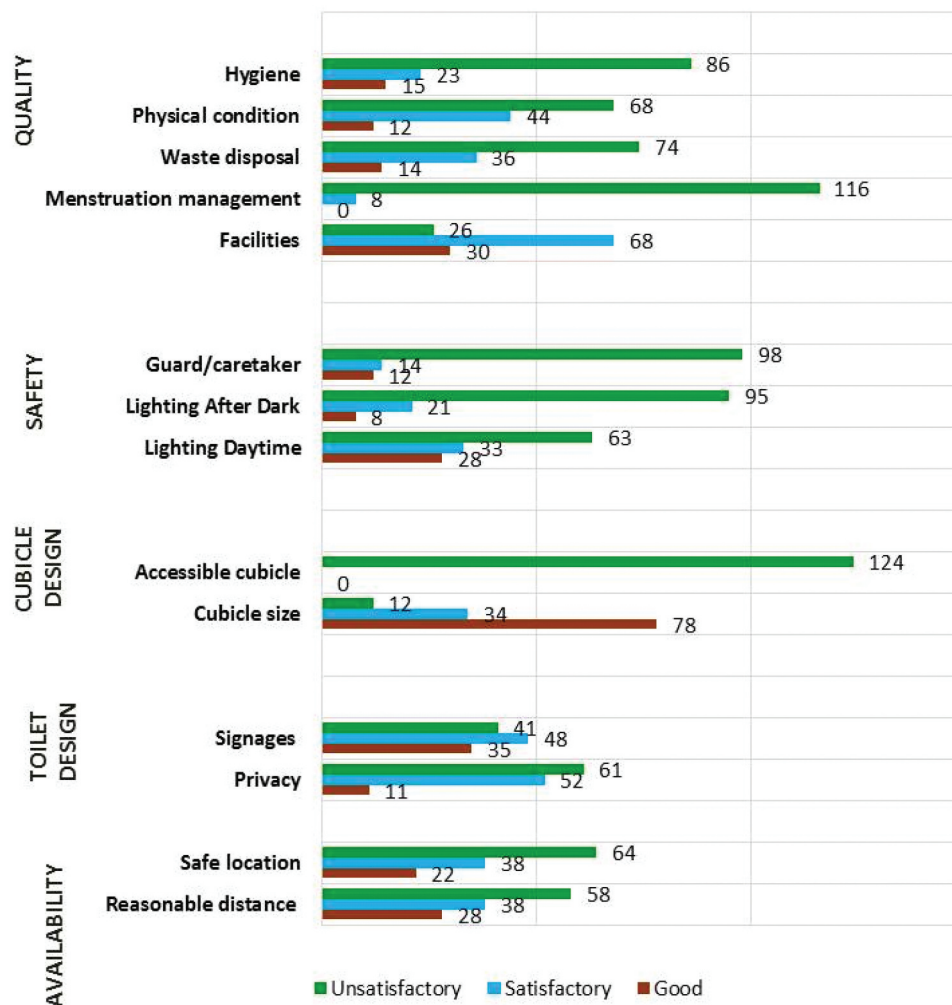


Figure 4. Survey responses.

for menstruation and unique arrangement for their disposal was found in 94% of toilets, indicating ignorance of this aspect in the provision of public toilets. Unsatisfactory hygienic conditions in 69% of toilets attributed to dirty surfaces, foul odors, less or no use of toilet cleaners, and disinfection liquid resulted from less frequent cleaning operations, in addition to the unsanitary behavior of users. Lack of adequate number, size, and type of litter bins, and irregular cleaning operations showcased inefficient waste management in 59% of toilets is likely to affect the quality of the facility, demotivating women to use them frequently. Broken tiles, water-flooded floors, damaged and low-performing hardware, and dull and worn-out interiors indicated the physical condition of 55% of toilets needed to be improved, out of which 35% were in bad shape and 7% were unusable.

The next step included structured interviews conducted by trained research assistants to capture women's experiences and perceptions regarding public toilet facilities. The respondents ($n = 45$) were recruited across the 15 wards of Pune, including three life stages young, middle aged and elderly. Three women from the

middle age group were pregnant and 4 from elderly group were using a walker. The composition of the sample is presented in the Table 3.

Respondents were randomly selected who travel for 30 minutes to 2 hours every day using public transport, walking, two-wheeler for work, errands, and leisure activities identified from bus stops, offices, temples, and public toilets. The identified women were contacted to know their willingness to participate in the study, explaining its purpose. Verbal consent was obtained, and the interview time and venue were selected at the respondent's convenience. Interviews were conducted in English and the local language, Marathi, lasting 15-30 minutes. Data gathered from the individual interviews were collated and constructed into narratives based on the users' experiences and perceptions concerning public toilets. Data were audio recorded and

Table 3. Composition of the sample.

	STATUS	AGE	NUMBER
1	Young : Adolescent and Early working age	15-24 years	16
2	Middle Aged : Prime working age	25-54 years	21
3	Elderly : Mature working age and elderly	55 onwards	8

transcribed verbatim; however, the interview data in Marathi was translated into English for analysis. A grounded theory approach using NVIVO Software was adopted. The emerged themes included Availability, Safety & Privacy, Health & Hygiene, Cleanliness, Accessibility, and Design concerns. The verbatim quotes under each theme are

presented in Tables 4–6, which are further analyzed in light of dimensions of the Integrated Behavioural Model for Water, Sanitation, and Hygiene (IBM-WASH) framework comprised of three intersecting dimensions that influence behaviors (Contextual, Psychosocial, and Technology dimensions) (Dreibelbis *et al.* 2013).

Table 4. Availability, safety & privacy.

Availability	<p><i>The toilet is located in remote area with dense vegetation around its scary and un-safe. "There is no toilet along the route when I go for walk"</i></p> <p><i>"It is too far from the road. Many times it is hard to control the pressure".</i></p> <p><i>"I avoid to go out for long period as there is no women toilet available in the temple"</i></p> <p><i>"I haven't seen any women's toilet along the road I daily use.</i></p> <p><i>"I prefer to go to toilet in a coffee shop or mall as no clean public toilets nearby".</i></p> <p><i>"I use two-wheeler for commuting to workplace. In peak hour it take longer to reach due to heavy traffic. I use toilets located in coffee shop often and never even thought of going to a public toilet".</i></p>
Safety and Privacy	<p><i>"There always the threat of gender-based violence to send my young daughter in public places".</i></p> <p><i>"I feel scared in accessing public toilet when there is no one present".</i></p> <p><i>"Many men are sitting in front of toilet it is embarrassing to enter public toilet".</i></p> <p><i>"There is less light inside I cannot see properly and feel risk of falling down"</i></p> <p><i>"We avoid using public toilets due to safety and privacy concerns".</i></p> <p><i>"In night it is scary as most of the area is dark. I had an injury because I hit my head".</i></p> <p><i>I do not feel un-safe as I can handle the situation, however I do not use due to un-hygienic condition.</i></p> <p><i>It is visible from the road no privacy at all.</i></p> <p><i>"The window was broken anyone can see me using".</i></p> <p><i>I prefer toilets in restaurants, malls as there is much privacy.</i></p> <p><i>There is no facility to make-up my appearance, I do not go only to urinate.</i></p> <p><i>It won't give me a feeling of relaxation at all.</i></p>

Table 5. Health, hygiene and cleanliness.

Health and Hygiene	<p><i>"There is foul smell always, I have to hold my breath".</i></p> <p><i>"The toilet floor was flooded with water and there were many flies".</i></p> <p><i>"I feel it risky to sit on the seat as I may be infected".</i></p> <p><i>"I have to touch many dirty surfaces"</i></p> <p><i>"Many users are coughing, I may catch it"</i></p> <p><i>"I always try to delay urination and limit liquid intake".</i></p> <p><i>"I am always worried about getting infection".</i></p> <p><i>"I never used a public toilet I feel they are not safe"</i></p> <p><i>I use public toilet only in extreme emergencies.</i></p>
Cleanliness	<p><i>"I need to hold wall and door, there is no soap available to wash my hands making my health at risk"</i></p> <p><i>The toilet was so dirty"</i></p> <p><i>"Early morning toilets are comparatively clean however, later they became highly dirty".</i></p> <p><i>"The foul smell and dirty surroundings made me to decide not to use it as far as possible".</i></p> <p><i>"Toilet was clean but foul smell made it uncomfortable and leave the space early".</i></p> <p><i>"The garbage piled up make me irritated"</i></p> <p><i>"Never thought of getting some mensural supplies in public toilets".</i></p> <p><i>"Why they do not use phenyl, I have to hold breath due to foul smell".</i></p> <p><i>The male members sitting at male toilet can see who using toilet. I am not comfortable</i></p> <p><i>We have to stand outside in an exposed place in case toilets are occupied.</i></p> <p><i>"People watching you entering the toilet, opening the door its ridiculous"</i></p> <p><i>I need to access toilet but it is very stressful as there are no ramps to access the toilet as I used to walk with walker".</i></p> <p><i>"Public toilets look so shabby I cannot stand".</i></p> <p><i>"The toilet walls are not well painted every thing is ugly and dull".</i></p>

Table 6. Accessibility and design aspects.

Accessibility	<p><i>"There are just two cubicles which are often occupied".</i></p> <p><i>I take longer time to un-dress and use toilets because of Indian outfit I used to wear.</i></p> <p><i>After dark it is impossible to access as the light is not working".</i></p> <p><i>There is always dark, I cannot see the things properly.</i></p> <p><i>"I try to avoid using toilet as I cannot use Indian type seat as it is difficult to sit down and get up due to knee pain".</i></p> <p><i>I need to use toilet but it take long time as there are no handrails for support".</i></p>
Design Aspects	<p><i>The entrance steps are difficult to climb with walker, even the small cubicle make me uncomfortable.</i></p> <p><i>"The Indian type toilet seat is just few inches from the door It is difficult to enter and shut the door".</i></p> <p><i>"Toilet was so tiny I could not move".</i></p> <p><i>"The steps are broken and floor is slippery".</i></p> <p><i>"Why they do not use some superior quality material in construction like it is used in malls and other places".</i></p> <p><i>"There is no openable window, its suffocating".</i></p> <p><i>"They could have provided exhaust fan".</i></p> <p><i>"No hanger to keep my belongings and dupatta".</i></p> <p><i>The floor is always wet, I need to take care of my saree.</i></p>

Based on the concerns noted, safety concerns included multiple dimensions ranging from possible sexual assault to physical harm. Responses regarding immediate surroundings that affect privacy were visibility and lack of acoustical privacy mentioned by five adolescents, and eight young respondents indicated their heightened sensitivity to the micro design features of the physical environment in addition to social and environmental cues, including perceptions about the disreputable and presence of men that affected their visit to public toilets. The responses of three adult working women indicate that they expect not only physical privacy in toilets but also mental privacy or solitude as they perceive toilets as more than just a facility with functions far beyond elimination, a place where they can mend their appearance, and get a retreat from the public sphere. The respondents had concerns regarding the threat of physical harm due to unfavorable environmental characteristics such as inadequate lighting and slippery floors. Five women (three elderly and two pregnant) had issues related to their physical issues or abilities, such as walking to distant locations of toilets, causing exhaustion from substantial physical exertion, and apprehension about falling, particularly in navigating through spaces devoid of supporting mechanism such as a railing or grab bars. The noteworthy observation was that safety from likely sexual assault was not a significant concern as 28 respondents (5 adolescents, 17 middle-aged, and six elderly) avoided the use of public toilets due to fear of getting an infection, less privacy, fear of falling, and having an unpleasant experience.

Twelve middle-aged women had issues with bad-smelling toilets. The extreme response of the two was that they were driven out of the space because of nasty odor, and they rejected staying there a moment longer than needed. Three professionals reject using public toilets due to cognition, which is the appraisal process that considers the current situation and the possibility that the toilets could be dirty and unhygienic. The avoidance behavior was noticed in more than fifty percent of respondents due to germ-specific phobia. Seven adolescents and five women respond that they are often acutely self-conscious when other people are near or in the toilets when it is being used. Besides, they have feelings of shame and embarrassment while entering or leaving a public toilet.

Limited availability of toilets reduced the frequency of outdoor visits of 8 elderly and three middle-aged respondents suffering incontinence. Lack of maintenance and ill-designed drainage resulted in dirty floors. It even flooded toilet floors, making their use difficult as they are primarily in traditional outfits like saree or salwar suites, as reported by six middle-aged respondents. Twelve women have problems with large amounts of water that gets splashed around in squat-style restrooms, keeping the floors always wet. This

aspect cause more discomfort in toilets with squatting seats, a much-needed facility in the Indian context. The lack of a ramp and small cubicle size was mentioned as highly stressful for elderly women ($N = 3$) who use a walker.

Discussion

The physical survey revealed that availability needs to be met in the public toilets by the number of toilets provided or by the distance from each other. The two major problems identified include toilets in secluded, unsafe spots and unhygienic conditions due to ill maintenance and management and a lack of regulatory mechanisms (Greed 2004, Vyas *et al.* 2015). Unattended toilets, full of garbage and dirt, were reported as frequent. The range of factors identified that are likely to affect the acceptability of public toilets for sustained use are further discussed in light of contextual, technological, and psychosocial dimensions.

Contextual dimensions

Several Contextual dimensions emerged, resulting in an unfavorable environment and barriers to public toilet access. Respondent's previous experience of public toilet use stigmatized public toilets as unclean, unhygienic places, which was perceived as a threat to their health and well-being (Geisler 2000, O'Reilly and Louis 2014, Sahoo *et al.* 2015, Bisung and Elliott 2016, Caruso *et al.* 2018, Sclar *et al.* 2018). The interview precepts showed that the emergence of 'germaphobia' from an unclean and cluttered environment amongst health-conscious respondents fueled the avoidance behavior. A problem confirmed by the respondents was the perceived likelihood of unwanted and anti-social behaviors in and around public toilets. Various contextual dimensions, such as lack of sound and visual privacy and absence of a female caretaker or guard one of the reasons that discouraged the respondents from accessing public toilets supporting the concept of informal social control, 'eyes on the street', and policing as an essential attribute to avoid the feeling of insecurity (Platt and Milam 2018, Hallberg 2021). Besides, the respondents were skeptical about accessing toilets located in remote or rundown locations or locations concealed by dense trees, walls, and buildings resulting in the lack of passive surveillance as such locations do not ensure the protection of them from sexual violence (Bell 1998, Pearce *et al.* 2020). Users opt to use public toilets in extreme emergencies and prefer toilets housed in commercial establishments like malls and restaurants because such facilities address their functional, aesthetics, health, and safety needs influencing value fulfillment (Griffin 2008, Musa *et al.* 2022). Responses indicated how the

physical environment could trigger intense fear and anxiety, particularly the adolescent's response expressed fear and perceived inability to use the facility when other persons are present or may enter the room. The hostile and scary indoor environment due to ill maintenance, the uncertainty of locks functions, etc., add to the insecurity in using the toilet.

Psychological dimensions

The psychosocial Dimension comprised the behavioral, social, or psychological determinants that governed respondents' toilet use. Due to poor sanitation, several stressors concerning the physical and social environment surfaced, rendering respondents physically vulnerable and psychologically distressed (Schouten and Mathenge 2010, O'Reilly and Louis 2014, Nelson *et al.* 2014, Biswas and Joshi 2021). In agreement with previous studies, the respondents had a mental map of public toilets; this perceived image governed their usage pattern in public toilets (Lowe 2018, Yan *et al.* 2021). Interview data unfolded many psychological aspects, such as anxiety, embarrassment that stimulated avoidance behaviors, and unwillingness to use public toilets. Quality of physical and social environments influencing personal safety contributed to the stress of using public toilet facilities, as per the responses of 12 out of 16 adolescents. Adolescents' heightened privacy issues due to inadequate physical separation between male and female toilets demonstrated the architectural implications of toilet design, indicating the need for a more inclusive environment in the public domain (Barcan 2005, Sanders and Stryker 2016). Besides, they associated public toilets with illicit activity. They felt shame and embarrassment due to the stigma they endured and felt ashamed even to be seen walking into a public toilet. The toilet use was contingent on the severity of urgency, particularly for the elderly and adolescents who need access to menstrual needs. However, adolescent respondents expressed using various behavioral strategies to manage or limit urgency in avoiding public toilet use. Participants, particularly women who used to be in Saree, expressed that they often use toilets to check their outfits and make-up; many used them to take a break, socialize, or find solitude. The pressing need for privacy to handle various practices, particularly for changing the menstrual material, was expressed when the PT environment was found un-supportive of upholding cultural practices and values (Nallari 2015, Sommer *et al.* 2015, Ramster *et al.* 2018, Maroko *et al.* 2021). The respondents, mainly working women, labeled public toilets unacceptable and tended to set up strategies to resist using them, such as ensure using the toilet before leaving home, taking less water intake, or seeking alternative locations like

shopping malls or restaurants. Such compelling compromises lead to melancholy (Plaskow 2008).

Technological dimensions

Technological Dimension emerged, including the specific attributes that influence the adoption and sustained use of public toilets, including cubicle design in terms of available space, light, and ventilation, number of cubicles, maintenance, and cost. Young women from socially liberal, middle-class families in Pune enjoy the right to participate in the public sphere for work, education, or leisure. They access urban public spaces associated with bodily exposure functions of varied degrees, such as gyms; clothing shops; swimming pools; however, they are supposed to follow specific parameters of time, space, and dress and follow culturally coded social norms where bodily exposure is often unacceptable (Mathur 2008, Ellis *et al.* 2014). Many respondents who used to wear 'Saree' or 'Salwar kameez' experienced toilet use stressful due to the space crunch, flooded floors, and lack of facilities to hang accessories. Besides, the need for more time, the strange gaze of others waiting made them uncomfortable (Greed 2004, Barcan 2005, Ellis *et al.* 2014, Ramster *et al.* 2018). Women from middle and upper-income families usually move in private vehicles, particularly two-wheelers. Use may afford to access toilets located in public consumption locations, such as coffee shops and malls. However, others who rely on public transportation do not have other options to use and use public toilets when required. Although public toilets are provided in Pune to promote social life and facilitate public festivals and events, the women population's lack of maintenance and appropriateness remains persistent (Joshi 2018).

Conclusions

The finding of this research revealed the strong relationship between architectural designs in performing intimate activities to the effect that ignorance towards female friendly features in public toilets is no longer acceptable. The public toilet is associated with multiple dimensions of safety, ranging from possible sexual assault to physical harm, where the perception of safety varies across various life stages. It is revealed how the physical environment can trigger intense fear and anxiety, particularly adolescents who expressed fear and perceived inability to use public toilets when other persons are in the vicinity or may enter the room. Altruistic fear as a maternal caretaker appeared in middle-aged women for the safety of their teenage daughters concerning a potential danger of imminent and distal threat while accessing a public toilet. It is established that avoiding public toilets has very little

to do with the actual risk of assault or getting an infection and more with how users' brains are conditioned. This aspect calls for social engineering to destigmatize public toilet facilities eliminating the associated negativity with gender-sensitive architectural and planning intervention. The strategy to take leave on certain days to avoid accessing public toilets for menstruation needs revealed that this aspect is ignored in public toilet provisions causing social isolation and inactivity, preventing women from participating fully in social life and consequently losing millions of work hours. Although the provision of private and hygienic management of menstruation is a part of the Swachh Bharat Mission – Urban, access to products for menstruation is still not in place. This is revealed that the decisions to use public toilets manifest in various contextual influences of physical environmental, socioeconomic, and cultural factors. To address this issue the design of toilets should consider the peculiar needs of Indian women who are often in traditional outfits (draping Saree or Salwar kameez) with adequate size of cubicles and required facilities. Providing accessible toilets near nodes like temples and parks will support the social life of the elderly. Locating toilets not more than 400 m from a vital node is desirable to save elderly and pregnant women from exhaustion due to substantial physical exertion. Adequate supporting mechanisms such as railing or grab bars can eliminate apprehension about falling, facilitating elderly and physically challenged women to come out of the home environment and participate in socio-cultural and religious events. It has been found that women are psychologically more affected by disorderly behavior and messy environments. They reacted strongly to seeing deserted, dirty, and dingy places and expressed unwillingness to use such spaces. It is established that urban women's aspirations about public toilet facilities have gone beyond functionality, and they need a cheerful, refreshing, and hygienic environment that could be achieved with good architectural design. This research established that planning and designing public toilets with a gender-sensitive approach could facilitate the mobility of the women population in Indian cities, achieving equity in the urban environment.

Disclosure statement

No potential conflict of interest was reported by the author(s).

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