

Ensuring Hygiene for All: Evaluating SDG 6.2 through the Sustainability of Public Sanitation

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ABSTRACT:

Under Sustainable Development Goal (SDG) 6, specifically Target 6.2, the international community committed to ensuring access to adequate and equitable sanitation and hygiene for all, with particular attention to the needs of women, girls, and individuals in vulnerable situations. Despite this commitment, public sanitation continues to be treated as a discretionary amenity rather than a core public service essential for dignity, mobility, and social participation.

This paper examines the gap between the normative framework of SDG 6.2 and the lived realities of sanitation use through an integrated analytical approach that combines international comparative data with an exploratory empirical study conducted in Hungary. Moving beyond conventional metrics of access such as facility counts or service levels, the research highlights how formal equality in provision may translate into substantive inequalities in use. It demonstrates how capacity constraints, maintenance failures, and the lack of care-integrated and inclusive design generate disproportionate burdens for women, while drawing on selected international literature to reflect on broader exclusion and safety concerns in gender-segregated sanitation systems.

The findings suggest that current monitoring frameworks, including indicator 6.2.1a, inadequately capture the qualitative dimensions of sanitation access, particularly those related to usability, safety, and dignity in public space. In response, the paper argues for a conceptual shift from infrastructure-based metrics toward a more comprehensive understanding of sanitation as a component of gendered and inclusive urban citizenship. The paper briefly reflects on implications for urban planning and governance, highlighting the relevance of institutional accountability and more inclusive, user-sensitive sanitation design within the broader human rights framework of the United Nations.

Keywords: public sanitation, gendered citizenship, gender equality, right to sanitation

1. Introduction

SDG 6.2 is: “By 2030, achieve access to adequate and equitable sanitation and hygiene for all and end open defecation, paying special attention to the needs of women and girls and those in vulnerable situations.” Yet a considerable gap remains between the normative ambitions of SDG 6.2 and the everyday realities of sanitation access and use. Andersson et al. (2016) state that significant inequalities in toilet use persist in urban sanitation systems, despite apparent improvements in access. In the following discussion, I use their classification of inequalities, supported by research from different geographical contexts. First, we can see a socio-economic divide: low-income populations, especially those living in informal settlements often rely on inadequate or shared sanitation facilities, while wealthier groups have access to private, safely managed toilets. These disparities are

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reinforced by limited financial capacity, insecure land tenure, and weak institutional support (Cumming & Cairncross, 2016; Heijnen et al., 2014; World Bank, 2017). Second, inequalities in the quality and safety of sanitation. Even when toilets are available, many are connected to systems that discharge untreated wastewater, meaning that improved sanitation does not necessarily equate to safe or sustainable use. This disproportionately affects vulnerable populations, especially women, who are more exposed to environmental contamination and health risks (Kayser et al., 2019). Regarding the safety dimension of this problem: several studies show that for women privacy breaches, inadequate enclosure, and hygiene breakdowns are experienced as threats to bodily integrity, particularly in menstruation-related contexts (Caruso et al., 2017; Sclar et al., 2018). Third, there are spatial inequalities within cities. Residents of rapidly growing or under-served urban areas often depend on on-site sanitation (e.g., pit latrines or septic tanks), which require maintenance and waste removal services that are frequently inaccessible or unaffordable. As a result, these users face greater burdens and risks compared to those connected to well-functioning sewer systems (Dodane et al., 2012; United Nations Human Settlements Programme, 2020). Finally, the institutional and systemic inequalities, where governance failures, insufficient infrastructure, and fragmented service provision lead to unequal sanitation outcomes. These systemic issues mean that marginalized groups not only have less access to toilets but also less access to the full sanitation chain (collection, treatment, disposal) (Andersson et al., 2016).

Gendered inequalities in sanitation extend beyond access to include safety, usability, and dignity: women and girls often face heightened risks of harassment and violence when accessing sanitation facilities, while transgender and non-binary individuals frequently experience exclusion, denial of access, and psychological distress in binary, gender-segregated systems (Burt et al., 2016; Qiu, 2024; Sharma & Biswas, 2026). When public sanitation systems fail to reflect diverse user needs, they generate spatial disparities that ultimately manifest as health inequalities. This perspective is reinforced by the United Nations General Assembly, which, in its report on the human rights to water and sanitation beyond the household (A/HRC/42/47), emphasizes that access to sanitation in public spaces is an essential component of these rights and must be ensured for all without discrimination. The UN report highlights that neglecting sanitation provision in public spaces disproportionately affects vulnerable populations and may result in broader human rights violations (United Nations Human Rights Council, 2019).

2. Methodology

This study applies an integrated analytical approach combining secondary data analysis with primary empirical insights. In this context, a distinction must be made between formal and substantive equality: while formal equality refers to the uniform provision of sanitation infrastructure, substantive equality concerns the extent to which different users are able to access and use these services under equitable conditions. This analytical distinction is the core motivation of the study by linking standardized indicators of access to the differentiated, context-dependent experiences of sanitation use observed in the empirical analysis. The analysis is further guided by the concept of care-integrated sanitation systems as a policy recommendation. This refers to a model of public sanitation that explicitly

incorporates the diverse bodily, caregiving, and hygiene-related needs of users into both design and operation. This approach includes the provision of facilities and services that support activities such as menstruation management, childcare, and assisted use, while ensuring privacy, safety, and continuous maintenance (Caruso et al., 2017; Koshimura, 2022; United Nations Human Rights Council, 2019). Such systems move beyond purely technical provision and recognize sanitation as part of care and social reproduction.

First, international sanitation inequalities are examined through a structured review of the WHO/UNICEF Joint Monitoring Programme (JMP) database, with particular attention to the methodological implications and limitations of indicator 6.2.1a in capturing qualitative dimensions of sanitation access. This macro-level analysis is complemented by a focused empirical component based on an exploratory online survey conducted in Hungary in October 2025. Participants were recruited through non-probability convenience sampling among university students and through social media, resulting in 97 valid responses. The questionnaire was pretested with 20 adults, and no changes were required. Given the sampling method and demographic imbalance, the findings are not representative of the Hungarian adult population. Participation was voluntary, anonymous, and restricted to adults. Respondents received information about the study and provided electronic informed consent before completing the questionnaire. The Science Ethics Committee of the Scientific Advisory Board of Széchenyi István University determined that formal ethical review was not required (Decision No. SZE/ETT-29/2026 [II. 25.]). Closed-ended responses were analyzed using descriptive statistics. The limited number of open-ended responses was examined by the author through exploratory qualitative content analysis. Categories were developed partly from the existing literature and partly from recurring themes in the responses. As individual responses could describe several distinct problems, a response could be assigned to more than one category. Coding was conducted by one author without a formal codebook or an inter-coder reliability assessment; these limitations are acknowledged when interpreting the qualitative findings. The Hungarian survey data are used here only as contextual evidence illustrating dimensions of public sanitation—such as availability, maintenance, safety, accessibility, and user experience—that are not fully captured by aggregate sanitation coverage indicators. Detailed gender-based analyses of the dataset have been reported elsewhere (Glavanits & Fényes, 2026) and are therefore not repeated in the present study.

The combination of global comparative data and localized empirical evidence enables a multi-scalar interpretation of sanitation inequalities, linking institutional monitoring frameworks with lived user experiences. At the same time, the study acknowledges its limitations, including the non-representative sample and the demographic imbalance of respondents, and therefore positions its empirical findings as exploratory rather than generalizable.

3. SDG 6.2.1a in worldwide practice

As discussed previously, SDG 6.2 in general aims to ensure access to adequate and equitable sanitation and hygiene for all and to end open defecation. Progress toward this target is monitored through indicator 6.2.1a, which measures the proportion of the

population using safely managed sanitation services. The methodological framework of this indicator is defined by the WHO/UNICEF Joint Monitoring Programme (JMP) and formally codified in the United Nations SDG metadata. A core methodological principle of indicator 6.2.1a is that countries are not classified into a single sanitation category. Instead, the entire population of each country is distributed across a set of mutually exclusive service-level categories, expressed as percentages that sum to 100%. These categories are organized along a hierarchical sanitation service ladder, reflecting increasing levels of service quality and safety. The basic unit of analysis is the individual or household, depending on the data source. National-level percentages are calculated by aggregating individual or household-level classifications across the total population. This approach allows within-country inequalities to be captured and compared across time and between countries.

The sanitation service ladder comprises six categories. *Open defecation* represents the lowest service level: individuals in this category do not use any sanitation facility and instead dispose of human excreta in open spaces such as fields, forests, bodies of water, or other open environments. *Unimproved services* include sanitation facilities that do not ensure hygienic separation of human excreta from human contact. Typical examples are pit latrines without a slab or platform and bucket latrines. Although a facility exists, it does not meet the minimum standards required for improved sanitation. *Limited services* refer to the use of an improved sanitation facility that is shared between two or more households. While the facility type itself meets technical criteria for improvement, shared use is considered a limiting factor due to increased health risks and reduced accessibility. Methodologically, shared use automatically excludes households from being classified as having basic or safely managed services. *Basic services* are defined as the use of an improved sanitation facility that is not shared with other households. *Improved facilities* include flush or pour-flush toilets connected to sewer systems, septic tanks or pit latrines, ventilated improved pit latrines, and composting toilets. At this level, no requirement is imposed regarding the downstream management of excreta; information on safe treatment or disposal may be unavailable or insufficient. *Safely managed sanitation* services constitute the highest service level and are the primary focus of indicator 6.2.1a. To be classified as safely managed, three conditions must be met simultaneously (1) The sanitation facility must be improved; (2) It must not be shared with other households; (3) The excreta must be safely disposed of in situ or transported and treated off-site in accordance with accepted safety standards. The category “*at least basic services*” is not a distinct rung on the sanitation ladder but an aggregate indicator. Methodologically, it is calculated as the sum of the population using basic services and those using safely managed services. This measure is frequently used in comparative analyses because it captures access to improved, non-shared sanitation regardless of whether full safe management is achieved. The cases in Table 1 were selected purposively to include comparatively high-performing countries, major tourism destinations, contexts identified as problematic in the literature, and countries discussed later as examples of good practice. The comparison is illustrative rather than representative and is intended to show that sanitation deficiencies may persist even where overall performance is generally assumed to be high. All values and reporting periods are reproduced from the official JMP SDG 6.2 database; missing values were not estimated, and differences in reporting years limit direct comparison.

Table 1.*SDG 6.2.1a – Challenges in Achieving Goals in Developed and Developing Countries*

Country	Year	6.2.1a Proportion of population using safely managed sanitation services					
		Safely managed services	At least basic service	Basic service	Limited service	Unimproved	Open defecation
United States of America	2022-2024	97.01	N/A	100	0	0.37	0
American Samoa	2021-2024	42.93	N/A	62	44.32	1.53	0.79
Great Britain	2022-2024	97.84	N/A	99	0.72	0.17	0
Australia	2022-2024	95.77	N/A	100	0	0.03	0
Croatia	2021	74.73	N/A	96	2.86	0.97	0.23
Hungary	2022-2024	91.71	N/A	98	2.02	0	0
France	2022-2024	89.99	N/A	99	1.35	0	0
Germany	2022-2024	96.77	N/A	99	0.77	0	0
Canada	2022-2024	81.3	N/A	99	0	1.41	0
Ireland	2022-2024	81.26	N/A	90	6.8	3.95	0
Italy	2022-2024	78.21	N/A	100	0.1	0.01	0
Chad	2022-2024	11.09	N/A	13	5.46	19	62.22
Ethiopia	2022-2024	8.05	N/A	10	8.49	64.54	16.23
French Polynesia	2022-2024	N/A	97	98	0	3	0
Maldives	2022-2024	N/A	99.7	100	0.3	0	0
Bahamas	2019	N/A	95.93	94	3.32	1.53	0.13
Japan	2022-2024	99.19	N/A	100	0	0.06	0
Singapore	2022-2024	100	N/A	100	0	0	0
Note: Data from the WHO database: https://www.sdg6data.org/en/indicator/6.2.1a (on 3rd April 2026) Data and reporting periods are reproduced from the official SDG 6.2 database. N/A indicates that no value was reported. Missing values were not estimated. The selected cases are illustrative and are not representative of their respective regions.							

According to recent data provided by the WHO/UNICEF Joint Monitoring Programme (JMP) for the period of 2000–2024, the global landscape remains fragmented, with significant disparities persisting not only in developing regions but also within highly developed Western nations (World Health Organization [WHO] & United Nations

Children's Fund [UNICEF], 2025). While the global average for the population using safely managed sanitation services stands at 58.5%, a granular analysis reveals that the *safely managed* benchmark (the highest tier of the sanitation ladder) remains an unfulfilled objective for many high-income countries. A critical observation from the data is that *at least basic service* coverage (often reaching 99–100%) frequently masks deficiencies in safely managed services in the West (Bain et al., 2014). Even in regions categorized under Europe and Northern America, where the safely managed service average is relatively high at 85.45%, the remaining 14.55% represents a significant population lacking optimal sanitation infrastructure. The data suggests that economic prosperity does not inherently equate to infrastructure completion. For instance, despite being the world's leading economy, the United States of America maintains a safely managed service rate of 97.01%, leaving approximately 3% of the population reliant on lower-tier solutions, including 0.37% utilizing *unimproved* facilities. Similarly, European nations like Italy (78.21%) and Ireland (81.26%) exhibit significant gaps in safely managed infrastructure, with Ireland reporting a surprisingly high 3.95% of its population utilizing *unimproved* sanitation.

A critical examination of tourism-dependent island nations and territories unveils a precarious sanitation paradigm where the *safely managed* benchmark, which is essential for protecting fragile marine ecosystems frequently remains unfulfilled (Gheuens et al., 2019). American Samoa presents a particularly stark case, as safely managed services reach only 42.93% of the population, while a staggering 44.32% remains restricted to *limited* services. In the Caribbean context (see also: Cashman, 2012), the Bahamas reports that 1.53% of its population continues to utilize unimproved facilities, despite achieving a 94.93% rate for *at least basic* services. Similarly, French Polynesia maintains a 97% rate for basic services, yet 3% of the population remains marginalized within the *unimproved* category, notably with no recorded data provided for safely managed integration. While the Maldives demonstrates a robust 99.7% access to at least basic services, the broader regional data from Oceania (excluding Australia and New Zealand) highlights a systemic crisis, with safely managed services plummeting to 21.32% and 15.13% of the population still practicing open defecation.

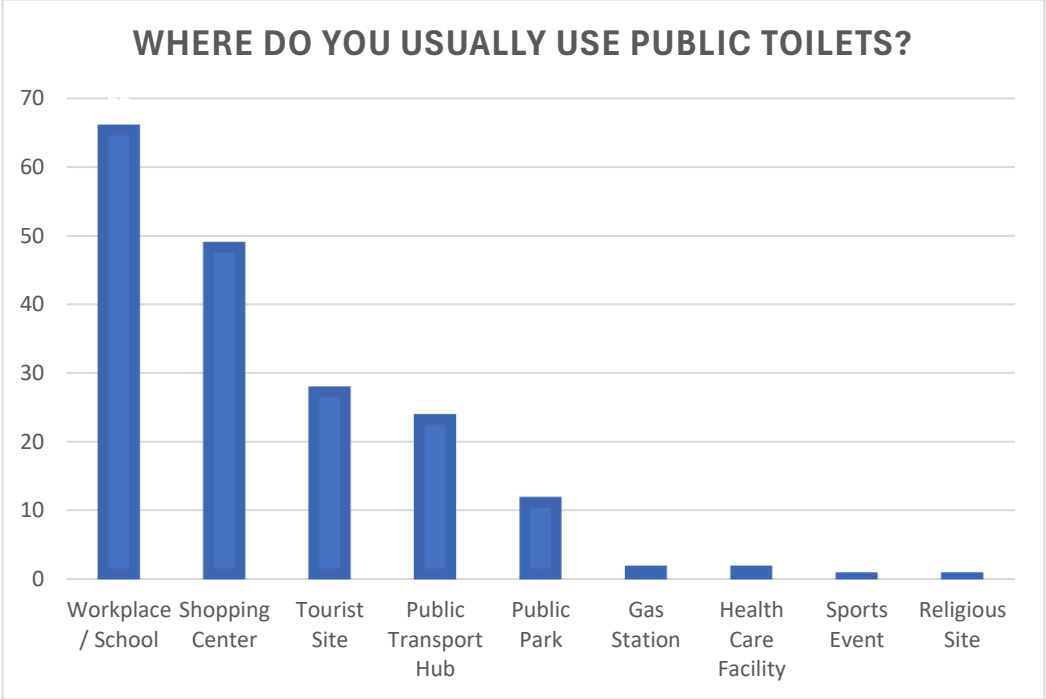
The data further underscores the catastrophic infrastructure deficits in the Global South, where sanitation serves as a primary driver of public health crises (Fuller et al., 2016; Prüss-Ustün et al., 2019; Wolf et al., 2022). In Chad, the prevalence of open defecation remains an alarming 62.22%, while safely managed services are accessible to only 11.09% of the population. Ethiopia exhibits a similarly dire trajectory, with a safely managed service rate of a mere 8.05% and over 64% of the population utilizing unimproved facilities (Roche et al., 2017). These figures stand in total opposition to hyper-developed urban states such as Singapore, which has successfully achieved a 100% saturation rate across both basic and safely managed service tiers.

4. Towards substantive equality: rethinking public facilities

According to the SDG 6 Data Portal, Hungary demonstrates comparatively high sanitation coverage, with 91.71% of the population using safely managed sanitation services and approximately 98% using at least basic services during the latest reported period. While the nation maintains a robust position relative to global averages, the data

underscores a persistent urban-rural divide (Hegedüs & Székely, 2022), particularly concerning the secondary treatment of wastewater in smaller municipalities (Buzás, 2024). In October 2025 a questionnaire-based survey was conducted among Hungarian respondents, primarily university students supplemented by additional participants recruited via social media, resulting in a total sample of N = 97. The sample exhibited a gender imbalance, with 27.8% male (n = 27) and 72.2% female (n = 70) respondents, and was dominated by younger participants, as 63.9% (n = 62) belonged to the 18–29 age group. The survey was designed not for statistical generalization but to capture context-sensitive patterns in how public sanitation is experienced and evaluated, with particular attention to the difference between formal sanitation coverage and effective, safe, and dignified access. Given the exploratory and non-representative nature of the survey, the following findings are presented descriptively and solely to illustrate how formal availability may differ from effective, safe, and dignified access.

Figure 1.
Usage of Public Toilets (empirical study, 2025)



As shown in Figure 1, the distribution of public toilet use across locations reveals a clear concentration in spaces associated with everyday mobility and routine activities. Most respondents reported using public toilets primarily in workplaces or educational institutions, followed by shopping centers, while a second tier of usage is observable in tourist sites and public transport hubs. In contrast, usage in locations such as parks, healthcare facilities, gas stations, and sports or religious venues remains marginal.

This pattern reinforces the argument developed in earlier sections of the paper that public sanitation should not be understood as an occasional or auxiliary service, but rather as a core component of urban infrastructure supporting daily mobility. The high frequency of use in workplaces and transit-related environments highlights that access to sanitation is closely tied to participation in public and economic life, aligning with the human rights perspective outlined by the United Nations Human Rights Council (2019), which emphasizes sanitation beyond the household as essential to full societal inclusion.

Table 2.

Qualitative Dimensions of Effective Public Sanitation Access

What type of negative experience do you have in connection with public toilets?		
Category	Specific Examples from the Data (Translated from Hungarian)	Number of Mentions
Supply shortage	Lack of toilet paper, soap, or hand towels; dispensers not refilled.	21
Hygiene and maintenance	General filth, foul odors, lack of cleaning.	14
Capacity and queuing	Extremely long wait times (up to 1 hour), insufficient stalls for women.	11
Spatial inaccessibility	None nearby, required long detours, had to search for a facility.	9
Structural/Safety Issues	Doors that do not lock, broken toilet seats, poor lighting.	6
Caregiving/Family issues	Entering with opposite-gender children, lack of child-friendly facilities.	4
Forced alternatives	Forced to enter a café/restaurant, use a plastic bag, or a bush.	3
Menstrual challenges	Lack of privacy/intimacy during menstruation, audible stalls.	3
Substandard facilities	"Toy-Toy" style portable toilets with no running water for handwashing.	2
Note: A total of 29 respondents provided analysable open-ended responses. As a single response could refer to several distinct problems and could therefore be assigned to more than one category, the total number of category mentions exceeds the number of respondents.		

Table 2 illustrates the dimensions of public sanitation that remain largely invisible in aggregate coverage indicators. The responses refer not only to the physical availability of facilities but also to maintenance, basic hygiene supplies, waiting time, spatial accessibility, safety, privacy, and care-related usability. These findings are presented as contextual evidence rather than as a separate qualitative analysis; a detailed examination of the dataset is available in Glavanits and Fényes (2026). In the present study, they support the distinction between formal sanitation coverage and effective, safe, and dignified access.

The small convenience sample, dominated by women and respondents aged 18–29, limits the generalizability of the findings and may reflect recruitment bias arising from distribution among university students and through social media. Age, location, education, disability, and socioeconomic status may also shape sanitation access and experiences but were not systematically controlled for; consequently, the observed differences should be interpreted as exploratory rather than as conclusive evidence of broader gender patterns. These observations call for closer examination of regulatory and design approaches capable of addressing both formal availability and effective access, as discussed in the following section.

Within the Hungarian context examined here, the concentration of toilet use in workplaces, educational institutions, and shopping centers, together with reported detours and reliance on cafés or other commercial facilities, suggests that effective access is often dependent on semi-public or privately operated spaces. These observations should not be interpreted as uniquely Hungarian or nationally representative. The reported shortages of basic supplies, hygiene and privacy failures, queuing, and care-related barriers instead correspond to the broader concept of sanitation insecurity, in which access is shaped not only by the presence of infrastructure but also by its reliability, safety, acceptability, and usability (Caruso et al., 2017; Sclar et al., 2018). Where these conditions restrict mobility or participation in public life, sanitation also becomes an issue of dignity and urban citizenship, consistent with the human rights framework for sanitation beyond the household (United Nations Human Rights Council, 2019).

5. Best practices in public sanitation: institutional standards and gender-sensitive design

Against the backdrop of the shortcomings identified above both in the international literature and in the empirical research, international best practices suggest that effective public sanitation is not primarily the product of higher toilet counts alone, but of a more integrated regulatory model combining maintenance obligations, minimum hygiene standards, accessibility requirements, and gender-sensitive design. In this respect, the most instructive examples are not necessarily those countries that are merely reputed to have clean toilets, but those in which public or quasi-public sanitation is embedded in enforceable legal or administrative frameworks.

Singapore represents one of the most comprehensive and institutionally embedded models of public sanitation governance, where hygiene standards, maintenance obligations, and user-oriented design are regulated through a combination of legal requirements and administrative guidelines. Central to this system is the Code of Practice on Environmental Health (COPEH), issued by the National Environment Agency, which establishes minimum design, hygiene, and operational standards for public toilets. A defining feature of the Singaporean model is the mandatory provision of basic hygiene amenities. Public toilets are legally required to provide an adequate and continuous supply of toilet paper, liquid soap, hand-drying facilities (either paper towels or hand dryers), and litter bins. In addition, each female cubicle must be equipped with a sanitary disposal bin, explicitly recognizing menstrual hygiene as a core component of sanitation provision. Beyond mere provision, the system emphasizes continuous availability and functionality: facilities must

be maintained in always working condition, and consumables such as soap and paper must be regularly replenished. The regulatory framework also requires that toilets be well-ventilated, clean, and dry, with mechanical systems subject to regular servicing. According to the Code, public toilets must be constructed with durable, easy-to-clean materials, adequate ventilation, and layouts that facilitate cleaning and withstand heavy usage. Singapore complements regulatory enforcement with incentive-based mechanisms such as the “Happy Toilet Programme”, which rates facilities based on cleanliness, maintenance, and user-friendliness, thereby encouraging operators to exceed minimum standards (Restroom Association [Singapore], 2022).

Recent scholarship has begun to reconceptualize public toilets not merely as functional infrastructure but as integral components of urban public space. Lim (2020) argues that public toilets represent hybrid spatial forms that simultaneously embody privacy and public accessibility, thereby contributing to what the author terms *spatial publicness*. Through a historical and spatial analysis of public toilets in Japan, the study demonstrates that their evolution reflects broader transformations in urban public life, while also actively shaping everyday spatial practices. Importantly, the research highlights that the value of public sanitation cannot be reduced to mere physical access; rather, it depends on qualitative dimensions such as spatial integration, atmosphere, and user experience. By identifying different typologies of toilet spaces the study shows that these facilities can support a wide range of urban functions, including rest, retreat, and social interaction. As Japan is one of the top-achievers in public sanitation, there is a lot to learn from their perspective. As Cho and Kim (2025) point out, cleanliness and hygiene are Japanese cultural values, where public toilets are not merely functional spaces but embodiments of societal norms around order, respect, and public health. This is reflected in consistently high maintenance standards and the transformation of public toilets from previously stigmatized spaces into environments associated with cleanliness, safety, and comfort. Koshimura (2022) goes further, highlighting that the Tokyo Toilet Project explicitly addresses the needs of women and other vulnerable user groups through a comprehensive universal design approach. Facilities are equipped with features supporting caregiving activities—such as baby-changing stations, child-friendly fixtures, and care beds—as well as accessibility elements for elderly and disabled users, including grab bars and wheelchair access. These design interventions reflect a broader recognition that public sanitation must accommodate diverse bodily needs and social roles, particularly those disproportionately affecting women as primary caregivers. By moving beyond binary gender assumptions and incorporating multiple user-specific functions, the project operationalizes an inclusive model of sanitation that links accessibility, dignity, and social participation. On the other hand, Çamaş (2024) adds a critical perspective on transferability, arguing that while certain elements—such as inclusive design and stigma reduction—are widely applicable, the broader model remains context-dependent, relying heavily on Japan’s cultural norms of cleanliness and strong maintenance regimes.

6. Conclusions – linking global indicators and lived experiences

The findings confirm that while international indicators such as 6.2.1a provide a valuable overview of infrastructure coverage, they remain limited in capturing the

qualitative dimensions of sanitation, particularly those related to usability, safety, and dignity. As a result, countries that appear to perform well in terms of formal access may still reproduce significant inequalities in everyday use (Andersson et al., 2016; Bain et al., 2014). The main contribution of this study lies in empirically linking global sanitation indicators with user-level experiences, thereby operationalizing the distinction between formal and substantive equality in the context of public sanitation.

The empirical findings reinforce these limitations by demonstrating that users experience public sanitation primarily through deficiencies in maintenance, capacity, and accessibility, rather than through the absence of infrastructure per se. These patterns are consistent with prior studies emphasizing that sanitation inequalities are closely linked to service quality, safety, and maintenance conditions (Caruso et al., 2017; Sclar et al., 2018; Kayser et al., 2019). At the same time, the results illustrate how these shortcomings translate into time-related, spatial, and embodied burdens, thereby substantiating the distinction between formal and substantive equality introduced in the methodological framework. The qualitative evidence further supports the argument that sanitation use is embedded in everyday practices of care and social reproduction, as highlighted in recent literature on sanitation insecurity and inclusive design (Caruso et al., 2017; Koshimura, 2022).

By integrating global data with localized user experiences, the study contributes to a more nuanced understanding of sanitation as a component of urban public infrastructure and social inclusion. This perspective aligns with the human rights-based approach articulated by the United Nations Human Rights Council (2019), which emphasizes sanitation beyond the household as a prerequisite for full participation in public life. In this sense, public sanitation should not be interpreted merely as a technical service, but as part of a broader framework of urban citizenship, where access is defined not only by availability but by the conditions of use.

While the exploratory nature of the empirical research and its limited sample size constrain the generalizability of the findings, the results nonetheless highlight the need for further research that systematically incorporates qualitative and user-centered dimensions into sanitation assessment. Future research should use larger and, where feasible, representative samples, cross-city comparisons, and intersectional analyses examining how gender interacts with age, disability, socioeconomic position, and caregiving responsibilities. The effectiveness of care-integrated designs should also be evaluated through comparative or pre- and post-implementation studies. In policy practice, SDG 6.2.1a monitoring could be supplemented by measurable indicators of effective public sanitation access, including distance to the nearest facility, opening hours and operational availability, waiting time, cleanliness, availability of water, soap and menstrual hygiene facilities, privacy and perceived safety, accessibility for older persons and persons with disabilities, and the availability of baby-changing and assisted-use facilities. These indicators could be collected through facility audits and disaggregated user-experience surveys.

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