

# The Psychology of Making Waste in Public Spaces of Dhaka, Bangladesh

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## Abstract

*In recent times, Dhaka's public spaces have been grappling with escalating waste issues, causing damage to the natural environment and reducing breathable areas. This paper examines the psychology of waste generation in public spaces using the Bronfenbrenner's bio-ecological model that focuses on the dynamic interplay between urban environments, human behaviour, and environmental sustainability. It explores the Suhrawardy Udyan, a major park in the Dhaka City, as a case study to investigate how architectural design and policies can enhance public green space maintenance and curb detrimental waste-making patterns. The findings emphasize the necessity of discreet architectural interventions to seamlessly integrate waste management into spatial policies in various scalar systems (i.e. micro, meso, macro). The paper argues that articulating concepts such as belongingness, territoriality, and co-creation through various spatial strategies, such as place-making, can prompt both reactive and proactive measures from the stakeholders, fostering a sense of ownership. This approach is pivotal in shifting the culture of waste-making in public spaces towards a more responsible one.*

**Keywords:** waste making, behaviour pattern, urban breathing space, bio-ecological model, public spaces

## 1.0 INTRODUCTION:

The global waste crisis is a pressing issue, with an average daily per-person waste generation of 0.74 kilograms, varying widely from 0.11 to 4.54 kilograms (World Bank, 2023). Dhaka, the capital of Bangladesh, is no exception to this challenge, facing an escalating waste crisis. In 2018, approximately 6,500 tons of waste were produced daily in Dhaka, projected to reach 8,500 tons by 2032 (Nahar, 2020). This excessive waste, coupled with inadequate green spaces in the city, not only leads to health risks and environmental pollution but also transforms important public spaces into non-breathable areas (Prodhan & Kaeser, 2020).

Dhaka's renowned parks, including the Ramna Park and the Suhrawardy Udyan, are vital green sanctuaries essential for the mental well-being and balance of urban life in the Dhaka City. However, these public spaces are currently facing a crisis due to

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irresponsible waste disposal, undermining their intended purpose and transforming them into dumping grounds rather than peaceful retreats. Scholars have emphasized the significance of urban green spaces for psychological development and well-being (Chiesura, 2004; Wan et al., 2020; Hartig et al., 2014). Research indicates that green spaces contribute not only to improved psychological health (Hartig et al., 2014; Wan et al., 2020) but also promote physical activity (Kaczynski et al., 2008) and alleviate the stress of urban living (Ulrich et al., 1991; Wan et al., 2020). Moreover, urban parks enhance social relationships by providing venues for recreational activities (Maas et al., 2009; Coley et al., 1997; Wan et al., 2020). The metaphorical comparison of park spaces to the 'lungs' of urban areas, providing oxygen for overcrowded streets (Jones, 2018; Walker & Duffield, 1983), underscores their importance in improving public health. Despite these potential benefits, the irresponsible disposal of waste in Dhaka's public spaces threatens their environmental sustainability and compromises the well-being of the city's inhabitants.

The discourse on waste generation necessitates an analysis of the term 'waste' itself, which has evolved from its Latin root 'vastus,' meaning 'to make room,' and its adaptations in Old Northern French 'wast(e)' (noun) and 'waster' (verb) and Gaelic languages into the English lexicon (Barles, 2014). In English translations of Ohno's work, the Japanese word 'muda' was directly translated as 'waste' (1988, 41), with Schonberger (1982) defining 'muda' primarily as 'a loss of quality.' Additionally, Harrison (1992) introduced 'mura' (irregularity) and 'muri' (excessiveness) as precursors to waste, expanding its conceptual meaning (Thürer et al., 2017). While 'muda' is considered waste, 'mura' and 'muri' act as sources of waste, representing conditions that lead to waste creation (Thürer et al., 2017).

A contemporary definition of waste has evolved, with the Oxford Dictionary (1995) offering a broad description that encompasses the notions of superfluity, refuse, and valuelessness (Drackner, 2005). Later definitions in the 1990s and beyond have characterized waste as a by-product of human activities, highlighting its uselessness to the producer (White et al., 1995; Basu, 2009; Dijkema et al., 2000), and emphasizing its role as a signifier of inefficient production processes (Cheremisinoff, 2003). The perception of waste is context-dependent, with societal and environmental considerations influencing its classification (Strasser, 1999). This is underscored by the legal frameworks that define and manage waste to safeguard public health and environmental integrity (Amasuomo & Baird, 2016). The academic discourse thus encapsulates waste as a multifaceted concept, underpinned by its various attributes including quality loss, superfluousness, and inefficiency, which are critical in understanding waste management and environmental sustainability.

**Table 01:** Chronological conception/definition of ‘waste’ (source: authors, 2023).

Year	Attributes from definition
Origin ( <i>undated</i> )	‘To make room’ from Latin root ‘ <i>vastus</i> ’
1882	A loss of quality (Schonberger, 1982)
1988	Japanese word <i>muda</i> was translated directly as ‘waste’ (Ohno,1988)
1992	Irregularity, excessiveness (Harrison,1992).
1995	Superfluous, no longer serving a purpose; unwanted or unusable remains or by-products. Valueless (Concise Oxford Dictionary, 1995) Useless, by-product of human activities (White et al, 1995);
1999	Resource variable: One’s waste, another’s resource (Strasser, 1999)
2000	Materials disposable values (Dijkema et al, 2000).
2003	Result of inadequate/problematic production process (Cheremisinoff, 2003)
2009	Useless object (producer’s perspective) (Basu, 2009)
2017	Type i: Obvious Waste- Any waste that can be reduced without creating another form of waste is obvious waste. Type ii: Buffer Waste - Any waste that cannot be reduced without creating another waste is a buffer. (Thürer, et.al., 2017)

This chronological exploration delineates the evolution of waste from its etymological roots, denoting 'making room' to its contemporary characterization as 'superfluous' or 'no longer serving a purpose.' Historically, within the context of Bangladesh, the conception of 'waste' resonated more with the notion of 'residue,' intended for repurposing within an agriculturally based socio-economic culture, as observed in the study (survey of 2023). Food remnants were left for avian scavengers, solid waste was repurposed as organic fertilizer, and construction materials comprised a mixture of agricultural by-products. The notion of 'single-use' and 'disposal' was absent, supplanted by a culture of 'alternative utilization' in harmony with natural cycles. This symbiotic relationship between human communities and nature fostered cohabitation within a cultural paradigm.

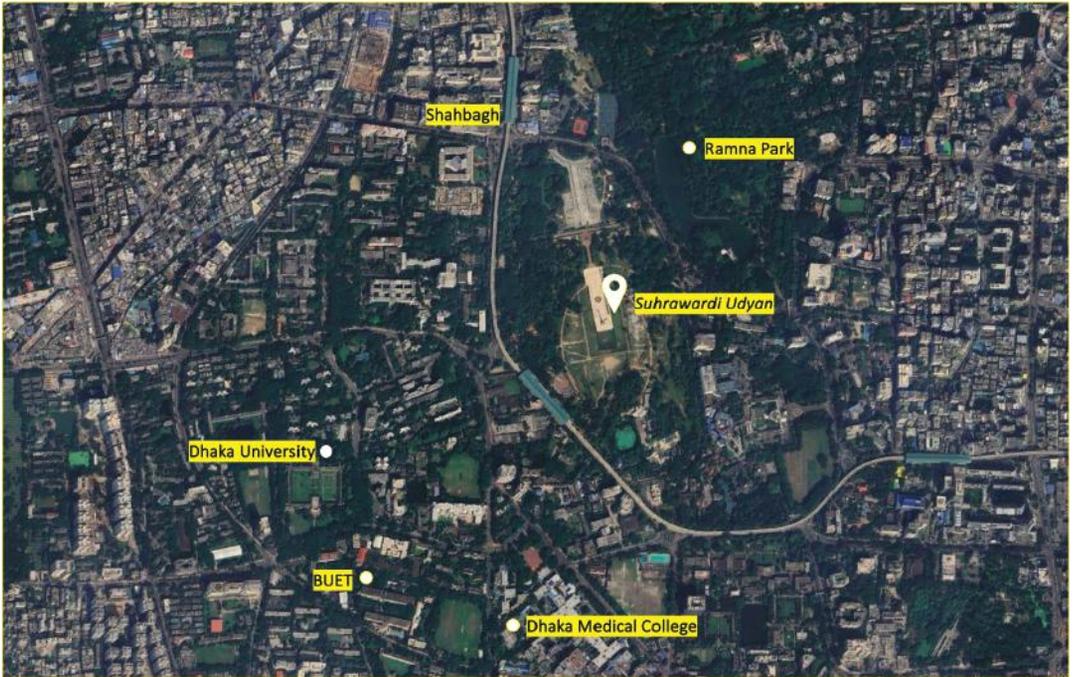
Nevertheless, the societal transition occurring in the 1990s in Bangladesh witnessed the emergence of recycling practices within urban systems, often facilitated by female household members and children, who exchanged kitchen commodities for recycled clothing or traded broken items for confectionery treats (survey, 2023). Later, as urbanisation accelerated, so did the volume of waste, propelled by both population growth and the diversification of waste materials in urban areas, as Wilson (2007) historically asserted the pattern of urbanisation impact in developing countries. This evolution underscores a significant cultural shift in Bangladesh from a recycling-centric ethos to one inclined towards disposal, highlighting a historical shift in societal attitudes towards waste management. This backdrop sets the stage for the contemporary challenge of irresponsible waste dumping in public spaces, rooted in a complex cultural shift.

The scholarly discourse on irresponsible waste behaviour further reveals the influence of social norms (Cialdini et al., 1990), socio-demographic effects (Al-Khatib et al., 2009), laws and regulations (Nguyen et al., 2019), and other external and internal influential factors of waste disposal habits (Srun & Kurisu, 2019) and 'littering' behaviour (Chaudhary, et al., 2021; Robinson, 1976; Schultz, 2013). Although, scholars have long sought to understand factors influencing the relationships between people and urban green environments (Bedimo-Rung et al., 2005; Giles-Corti et al., 2005; McCormack et al., 2010; Rung et al., 2011; Wan et al., 2020), existing literature primarily focuses on municipal waste management practices, the behavioural dynamics of waste disposal in public recreational spaces in Dhaka remain scantily addressed. Some studies suggest that individual perceptions of the physical environment play a crucial role in shaping waste disposal behaviours in urban green spaces. Aligning with these findings, Wan et al. (2020) argue that both tangible (urban infrastructure) and intangible (environmental perception) elements significantly influence the behaviour of people in urban greenery. This research aims to extend these insights, advocating for a deeper understanding of how behavioural tendencies and environmental perceptions interconnect, positing this understanding as a critical foundation for enhancing waste management strategies in public locales, particularly in Dhaka.

To navigate this research path, the study embraces Bronfenbrenner's 'bio-ecological model' (1977, 1979) as its guiding framework. Originally devised to analyze child behavioural development, this model's multi-layered approach offers a comprehensive lens through which to examine the psychological and behavioral dimensions of waste production in public spaces. By integrating the microsystem, mesosystem, exosystem, macrosystem, and chronosystem dimensions, the model enables a deeper inquiry into the waste-generation crisis, probing the intricate interplay between human agents and their physical environment in the context of Dhaka.

## **2.0 METHODOLOGY**

This study used an exploratory research approach to focus on the Suhrawardy Udyan, an important public space in Dhaka with a rich socio-political and historical background and substantial cultural heritage value (Figure 01). The park has been a focal point for social public gatherings since the liberation war period, hosting various day-to-day and occasional activities such as recreational pursuits, walking, leisure, street food vending, cultural events, and annual book fairs or exhibitions. These diverse activities make it an important case to investigate people's behaviour of waste-making in public spaces.

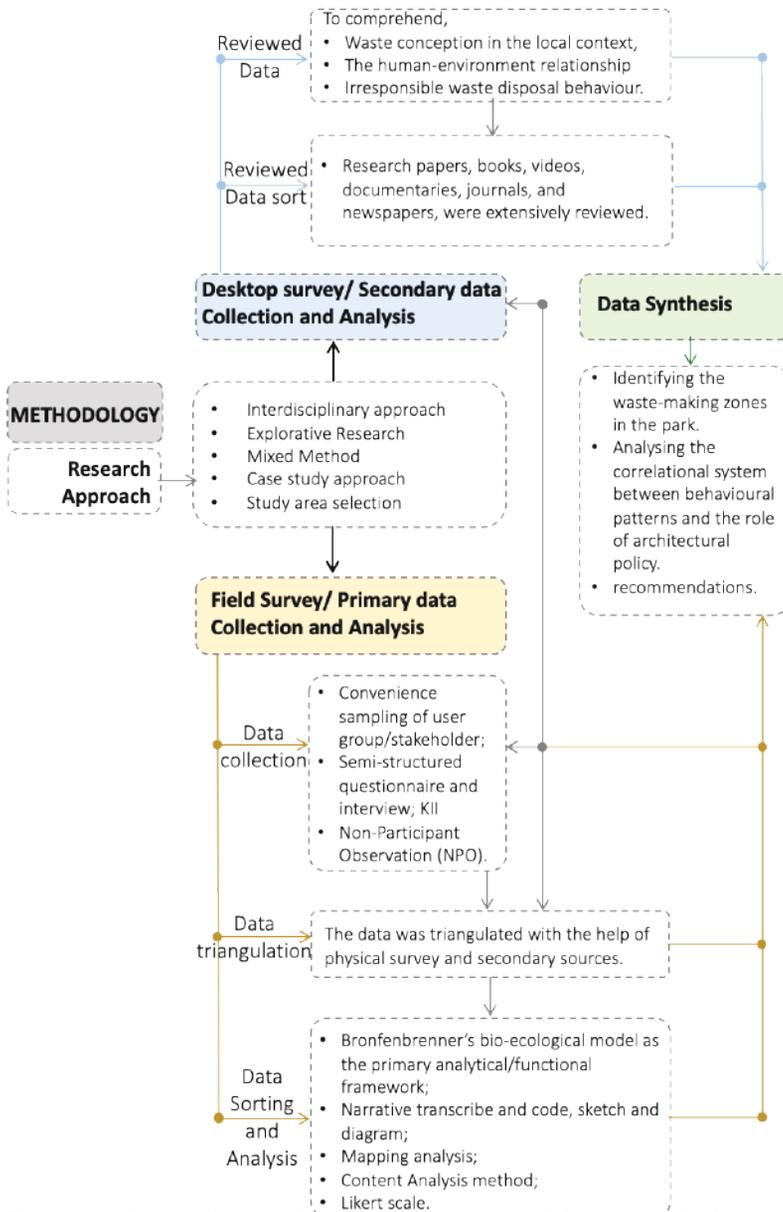


**Figure 01:** Aerial map shows the location of the Suhrawardy Udyan and important surrounding areas including residential neighbourhood, university and colleges. Local users of the park come from these areas (source: Google map, 2024).

The investigation employed an interdisciplinary method using a mixed-method approach to guide data collection and analysis. Secondary data sources, including research papers, books, videos, documentaries, journals, and newspapers, were extensively reviewed to understand human behaviour in public space, local waste conception, environmental perception, and the relationship between the built environment and irresponsible waste disposal behaviour. These sources informed the study and identified research gaps, particularly in addressing waste management issues and neglecting the root causes of irresponsible waste behaviour. These helped to formulate specific objectives for this research: (i) to identify the park's waste-making zones, (ii) to analyze waste-making behavioural patterns, and (iii) to explore the contributions of architectural design and policy in reducing waste in public green space.

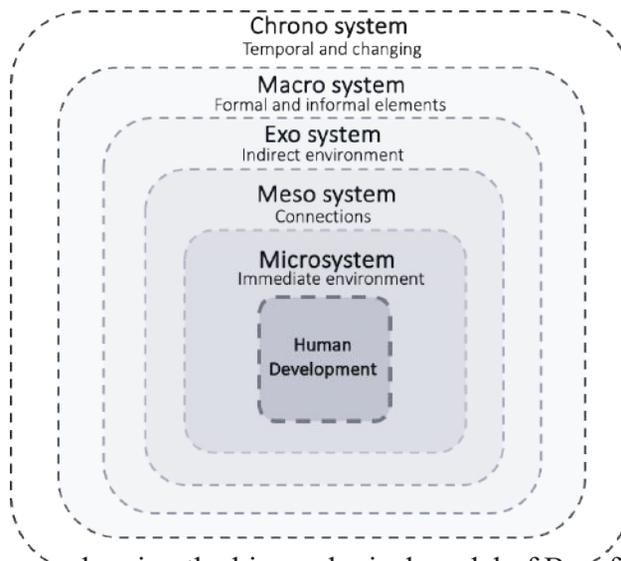
For primary data collection, an extensive physical field survey was conducted in the Suhrawardy Udyan. The area is surrounded by several university campuses, e.g., Dhaka University, BUET, and Dhaka Medical College, with (Figure 01) a significant number of students as regular users of the park. The Convenience Sampling (CS) method was used to select students, as well as outsiders and street vendors, for interviews including KII (Key Informant Interview) (Figure 02). Semi-structured

questionnaires and Non-Participant Observation (NPO) have been used to collect both qualitative and quantitative data (Creswell & Poth, 2016). In addition, sketches, photographs, and mapping techniques were used to gather visual research data. Photographs and videos documented specific areas of waste generation and for mapping the vendor's zones, entrance points, walkways, and gathering spaces.



**Figure 02:** Diagram shows the methodology diagram of the research (source: authors). The collected interview data has been transcribed, coded and analyzed using the

Content Analysis method. Behavioural variances and activity patterns were compared between regular users and occasional visitors, creating a time-based activity map using the Likert scale (1932; Joshi et al., 2015). Examining the long-term and complex social causes of waste-making necessitates a theoretical model for multi-scalar analysis. Therefore, Bronfenbrenner's bio-ecological model (1977) was used. This model also provides a comprehensive framework for rethinking architectural contributions to public space.



**Figure 03:** Diagram showing the bio-ecological model of Bronfenbrenner (1977) (source: authors).

The choice of Bronfenbrenner's bio-ecological model (Bronfenbrenner, 1977; 1979; Bronfenbrenner & Morris, 1998; 2007) is apt for offering a 'scalar' framework for understanding waste-making behaviour as it encompasses interconnected systems, each shedding light on different facets of individual and collective behaviour within a given environment (Figure 03). The microsystem analysis examines specific zones and user groups, revealing the direct impact of the immediate environment on individual waste practices. The mesosystem focuses on interactions between diverse elements like street food vendors, regular users, and occasional visitors, revealing the dynamics within the larger park environment. The exosystem considers external influences such as socio-economic conditions, cultural norms, and institutional policies, exploring how these factors manifest in waste practices across the park. The macrosystem examines overarching cultural and societal norms, contributing to the design and use of public spaces. The chronosystem uses a temporal dimension, crucial for understanding the historical evolution of waste practices and linking

historical changes with the present-day use and design of the park. Through Bronfenbrenner's bio-ecological model (1977), the study delineates how the physical environment, interactions, external influences, cultural norms, and historical changes collectively contribute to observed waste practices within the Suhrawardy Udyan.

### 3.0 FINDINGS

As a significant public green space, the Suhrawardy Udyan serves as a central location for social gatherings and a variety of activities on a regular basis (Table 02). It provides multi-functional spaces, offering walking and exercise areas in the morning, featuring picturesque green landscapes. In the afternoons, it offers a variety of street foods along winding pathways, providing recreational and leisure opportunities for all age groups. The park includes areas such as children's play zones and spaces for sports, demonstrating its adaptiveness to multi-user needs guided by features such as 'tree node reference' and 'turning' (see Figure 04). The park's socio-political legacy endures through regular political meetings, weekly gatherings, and annual episodic events like the National Book Fair and Bengali New Year fair (Pohela Boishakher mela). Activity mapping captures the liveliness and significance of the space (Table 02). However, news reports, literature, and primary data also shed light on the substantial insensitivity and irresponsibility exhibited by users, as highlighted in sources such as The New Age Bangladesh on waste dumping (Tanzil, 2022) and The Daily Star on deforestation and eco-grief (Morshed, 2021).

**Table 02:** Activity pattern and intensity mapping using the Likert scale (1932) (survey, 2024).

Time/Temporal dimension	Activities	Less active	Medium active	Active	Most active	Vibrant
Morning (6 am - 8 am)	Exercise, morning walk, vendors, social gathering.					
Noon (9 am -12 pm) (12 pm - 3 pm)	No significant activity					
Afternoon & Evening (4 pm -7 pm) (7 pm - 9 pm)	Street vendor, recreation, children's play, social gathering, evening walk or exercise etc.					
Night (9 pm -5 am)	No significant activity					



**Figure 04:** The photographs show the various activities in the Suhrawardy Udyan. (source: survey, 2023)

The spatial mapping from the 2023 field survey depicts waste-producing zones (Figure 05), with vendors and customers identified as significant contributors to solid waste, surrounded by dense waste areas. While some vendors provide bins, customers often discard waste along walkway sidelines. Additionally, the park's entrance has become another dumping space, with a mini landfill-like zone where solid wastes are dumped and burnt (Figure 05, 2a). Open pits for sanitation highlight the park's hygiene conditions (Figure 05, 2a). Specific areas, such as Mukto Moncho, (Figure 05, 3 and Figure 06, top) reveal waste accumulation, with political gatherings contributing to the disposal of one-time plastic plates. The waste zones span the park, beginning with the entry dumping zone, moving through walkways marked by 'linear waste edges', open grasslands with polythene, and stair seating at Mukto Moncho adorned with disposed material, reaching the Swadhinata Stambha zone with waste disposed at sitting, vendor spaces, and walkways (Figure 06).



Figure 05: (Top) Aerial map shows the waste-making zones in the Suhrawardi Udyan.

The rest of the images show various waste disposal zones. The locations of the photographs have been labelled in the Aerial map (source: survey, 2023).

Responses to irresponsible waste-making behaviour highlight concerns about the lack of waste infrastructure, regulatory measures, and policy implications by authorities. Users express that consequences include ‘easy’ waste disposal anywhere in the park (Survey, 2023). As they responded, “wastes are disposed of everywhere in the park...” and “In this situation, it is ‘easy’ to dispose of anywhere...”.



**Figure 06:** Photographs showing different waste-producing zones of the *Suhrawardy Udyan*: nodes, pathway turning points, vendors areas, walkways, sitting areas, and entrance (source: survey, 2023).

The survey participants also blame the problematic socio-cultural norms and practices. For example, one person asserted (2023), “Since we are not used to having waste bins in a park, we grow up with the habit of throwing waste around.” Some respondents (of 2023) pointed out laziness as a cultural habit, while another person provided an example of placemaking in their well-maintained campus, where proper law enforcement and waste infrastructure influence responsible waste disposal. “Sometimes we are influenced by others. When we see a ‘place’ is previously contaminated or others already disposed of, we also become convinced of disposing irresponsibly...”.

Interview data reiterates that users are influenced by the physical environment, especially ‘places’ that have been previously contaminated, which leads to subconscious participation in irresponsible waste disposal. The misconception that certain waste items will compost when disposed of on absorbent surfaces contributes to irresponsible waste-making. Vendors claim that the lack of necessary waste infrastructure and placemaking creates a compulsion to participate in the park's waste-making activities. Waste disposal habits, as indicated by both primary and secondary data, arguably link to the role of the park's malleable environment. Analysing such behaviours within Bronfenbrenner's 'bio-ecological model' (1977) provides valuable insights into the complex relationship between individuals and their environment. The following sections will elaborate on that.

### **3.1 Microsystem**

The microsystem, as defined by Bronfenbrenner (1977), encompasses the intermediate settings where individuals and their immediate environment interact. In the context of the Suhrawardy Udyan, this microsystem manifests through the complex relationship between park users and their surroundings. Regular users, particularly campus students and street vendors (Figure 04), play a pivotal role in shaping waste-making behaviours. The Park itself serves as an intermediate ‘place’ influencing these behaviours.

Among the user groups, a distinction emerges between regular users and occasional visitors in their perception of the park environment (Table 02). Regular users, notably campus students, exhibit a heightened sense of territoriality, creating a psychological boundary with the space. For them, the Suhrawardy Udyan functions as a peripheral territory within the campus boundaries. Vendors, reliant on the park for their livelihood, also perceive it as a supportive or peripheral territory. This territoriality makes the student group more conscious about the space, leading to a sense of ownership and a more pronounced awareness of waste-making issues.

Unlike the student group, vendors’ (street food market activity) waste practices

remain problematic. The lack of their territorial attachment to the park translates into irresponsible waste disposal. Vendors, limited by the informal nature of their operations and frequent eviction threats (from the authority), often create informal dump stations in basin areas –leading to burning waste openly and causing environmental pollution. These dump stations represent an unsustainable, informal waste management system and lack of placemaking in the park. Acknowledging informality through thoughtful design of placemaking could enhance vendors' sense of territoriality (Sack, 1986) and foster transformative changes in the waste-generation behaviour or responsible environmental behaviour (Ojedokun, 2011). Literature indicates that personal norms, moral values, and subjective norms significantly influence recycling intentions and waste prevention behaviour (Matthies et al., 2012; Chan & Bishop, 2013; Bortoleto et al., 2012). This study aligns with these findings, emphasizing the scope of creating a sense of territoriality and placemaking that can eventually craft personal attitudes and norms towards waste-making behaviours. Incorporating these factors into waste management strategies can lead to more effective and sustainable practices.

### **3.2 Mesosystem**

The mesosystem in the Suhrawardy Udyan encompasses the interactions and relationships among various elements, such as peer groups, cultural norms, and physical settings that collectively influence waste behaviours in different areas of the park. A survey conducted in 2023 revealed that socio-cultural norms and spatial-cultural habits were the two most frequently cited factors by respondents regarding their waste production behaviours (Figure 05, 2a). Key informants from the Dhaka North City Corporation (DNCC) emphasized that current cultural practices and norms are the primary obstacles to sustainable waste management in the city (survey, 2023).

Scholarly literature supports these observations, indicating that the lack of adequate waste infrastructure and bin arrangements significantly contributes to improper waste disposal behaviours. For instance, Schultz et al. (2013) found that societal and cultural factors greatly influence littering behaviours in the United States. They argue that establishing proper waste infrastructure and bin arrangements can create a sense of convenience for waste disposal, which is crucial in shaping waste behaviours. This perceived convenience not only encourages responsible disposal but also influences the overall behaviour and psychology of users. In Suhrawardy Udyan, the development of an appropriate waste disposal landscape as part of the mesosystem could significantly enhance responsible waste practices. By creating a convenient and accessible waste disposal infrastructure, users are more likely to adopt responsible behaviours. This approach aligns with the findings of various scholars who emphasize the importance of

built environment design in promoting sustainable waste management practices.

### **3.3 Exo-system**

The exo-system, an extension of the mesosystem within Bronfenbrenner's ecological systems theory, considers external factors that indirectly influence an individual's behaviour. In the context of Suhrawardy Udyan, this exo-system comprises various external influences on park users, shaping their interactions with the physical environment. An analysis of visual data from Suhrawardy Udyan (Figure 05, 06) reveals that certain areas, particularly previously contaminated sites within the park, establish a new 'normal' scenario wherein waste appears to be an intrinsic part of its landscape. Some respondents (of 2023) noted that they tend to dispose of waste in the same place where it was contaminated before, indicating a cyclic pattern of behavioural irresponsibility. This phenomenon aligns with the studies by Hornik et al. (1995) and Cialdini et al. (1990), which demonstrate that spatial scenarios serve as potent external catalysts for waste-making behaviour. These studies underscore the significant impact of specific built-environmental characterization (i.e. normalization of waste in this case) on individual's psychology and actions.

Furthermore, appropriate policy interventions in similar cases proved to be critical in addressing such scenarios. For instance, a study by Xu et al. (2017) found that government initiatives, such as improving the segregation of waste disposal infrastructure by providing recycling bins, positively influenced recycling intentions in China. This underscores the pivotal role of external factors in shaping waste disposal behaviours. It is a critical finding that is equally consistent with the users' conception of Suhrawardy Udyan, where spatio-cultural influences as part of the exo-system, play a subtle role in encouraging people to generate more waste.

### **3.4 Macrosystem**

The macrosystem represents the outermost layer of Bronfenbrenner's bio-ecological model, including formal and informal elements such as laws, policies, social norms, and customs. In Suhrawardy Udyan, the macro system explores how environmental perception, the human-nature relationship, cues, and affordances play a role in waste-making behaviours.

The respondents, including students and city dwellers, point out shortcomings in the system and a lack of policy implications, indicating that laws and regulations are crucial determinants of waste behaviours. Yet, social customs and cultural attributes form an integral part of the macro system. Recycling attitudes, experiences of environmental cues, and community concerns are identified as key determinants of recycling behaviour (Tonglet et al., 2004; Srun & Kurisu, 2019). A critical observation of users' behaviour patterns (Figure 06), where they conceive specific zones of the park and designate for waste dumping, aligns with the cues they receive

from the park environment. It reveals the ways the environment has been designed to provide certain modalities of cues on waste-making behaviours. This aligns with Brunswick's Probabilistic Functionalism (Brunswick, 1952; 1955; 2023; Ittelson et al., 1975), which posits that users receive cues from their environment, influencing their actions.

The conventional top-down design of architecture inside the park (i.e. Swadhinata Stambha, see Figure 5, 2b; Figure 07), as revealed in the photographs, indicates a consumer form of (users') relationship with the park. The natural environment of the park is immersed from being a source of natural experience to a visually consumable backdrop for architecture. This shift impacts environmental perception and the human-nature relationship, highlighting the role of alternative and more exploratory spatial/architectural infrastructure inside the park to change public perception and ethos towards nature and generate waste.



**Figure 07:** Swadhinata Stambha activities, which remarks the objective and visual consumable spatial perception of nature (top); and waste disposal edges/spatio-behavioural pattern of the Stambha. (source: survey, 2023).

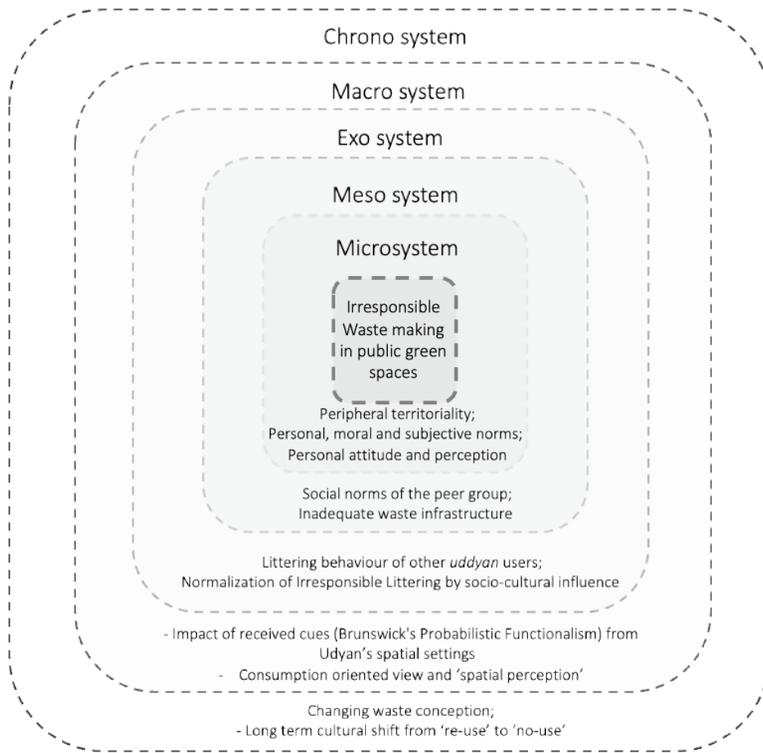
The photographs reveal a traditional top-down architectural design within the park, exemplified by the Swadhinata Stambha (refer to Figure 5, 2b; Figure 07). Such approaches in creating an environment foster a consumer-oriented relationship with the park, where the natural environment is reduced to a visually consumable backdrop for the architectural elements rather than being valued as a source of natural experience. This shift in environmental perception significantly impacts the

human-nature relationship, underscoring the necessity for alternative, more exploratory, and co-created spatial and architectural infrastructure within the park. This nature-sensitive genre of spatial infrastructure could transform public attitudes, fostering a deeper appreciation of nature as a living entity and cultivating a culture of environmental awareness. Consequently, the cocreated spatial infrastructure can mitigate waste generation and promote sustainable interactions with the natural environment.

### **3.5 Chronosystem**

The chronosystem introduces the temporal dimension, considering the historical evolution of waste-generation practices in the Suhrawardy Udyan. This historical perspective illuminates a cultural shift from a rural, agricultural-based era to a modern period characterized by a lack of sustainable waste disposal practices and a pervasive insensitivity towards environmental concerns. Earlier, waste was viewed as a resource for reuse and recycling, but the advent of Western lifestyle standards, alongside rapid industrialization, has transformed this perception of waste to disposable and without value.

This shift in perception is evident in how park users interact with waste materials, highlighting the urgency of addressing the current waste management crisis through co-created design and comprehensive policy interventions. The present-day pollution of Suhrawardy Udyan demands responsive and innovative approaches. There is a critical need for policy changes, infrastructural rethinking, and architectural modifications to transform public spaces in Dhaka city into sustainable environments. By fostering a cocreated design process and implementing effective policies, it is possible to alter contemporary public attitudes towards waste and promote a culture of environmental stewardship. This approach not only addresses the immediate waste management issues but also ensures the long-term sustainability of urban public spaces.



**Figure 08:** Image showing a transformed Bronfenbrenner’s bio-ecological model (1977) showing the multi-layered attributes of the waste-making psychology in the *Suhrawardy Uddyan* (source: authors)

In conclusion, the findings underscore the multi-layered and complex nature of waste-making behaviours within the *Suhrawardy Uddyan*. The ecological model, with its micro, meso, exo, macro, and chrono-dimensions, provides a comprehensive framework for understanding these behaviours (Figure 08). The integration of user perceptions, sociocultural norms, environmental cues, and external influences emphasizes the importance of a holistic approach to addressing waste-related challenges in public spaces. The study contributes to bridging the existing gap in waste management discussions by unravelling the intricate dynamics of human behaviour within the unique context of the *Suhrawardy Uddyan* in Dhaka.

#### 4.0 DISCUSSION

The dynamics of waste generation in the *Suhrawardy Uddyan* reflect a complex interplay of socio-environmental factors. As a significant public space, the park serves as a versatile arena for various activities ranging from morning walks to afternoon leisure and social gatherings, demonstrating its adaptability to the evolving

needs of urban users. However, this vibrancy coexists with a disconcerting reality of insensitivity and irresponsibility regarding waste disposal, a concern underscored by multiple sources, including *The New Age Bangladesh* and *The Daily Star*.

Spatial mapping from the field survey, as outlined in this paper, vividly illustrates waste generation zones with alarming densities of waste. The findings section presents an analysis of the behavioural patterns of park users across five different scalar systems and suggests potential strategies to address the crisis. A synthesis of the findings delineates key recommendations for spatial actions, respective scales, and concerned stakeholders. The recommendations can also make important scholarly contributions to addressing irresponsible waste generation in public spaces like Suhrawardy Udyan in Dhaka or elsewhere. These recommendations are as follows:

Within the Suhrawardy Udyan, user responses highlight the profound influence of microsystem components on waste-generation behaviours. Regular users, particularly campus students and vendors, exhibit a strong connection to the park environment. Despite this connection, the transition from waste awareness to responsible waste practices is often hindered, indicating a critical gap in fostering a sense of belonging. This gap necessitates focused design interventions. Developing a sense of 'place' is recommended by acknowledging the various forms of informal commercial spatial practices and conception of territoriality. Rather than periodically evicting vendors or replacing them with permanent recreational infrastructure, strategic designing should incorporate informal vendors into the waste management system and their transient spatial production as a mainstream architectural practice inside the park. If facilitated under the guidance of a regulatory authority like Dhaka South City Corporation (DSCC), this approach can create a profound sense of belongingness and responsibility towards the park and significantly reduce waste generation.

On the mesosystem scale, it is essential to address social and cultural norms related to waste by ensuring the availability of suitable and easily accessible waste disposal infrastructure. A survey conducted in 2023 revealed that the current lack of necessary waste-disposal infrastructure has led to a pervasive presence of waste in the park. This has significantly influenced user's perceptions of the natural environment, leading them to view it as unhygienic, thereby resulting in irresponsible waste-generation practices.

The pervasive presence of waste in the park also affects the exo-system scale, creating an external influence that normalizes irresponsible waste disposal behaviour. As stipulated in the findings, park areas that previously accumulated waste gather relatively greater amounts of waste, creating a 'cyclic pattern' where physical settings emerge as crucial catalysts in shaping waste-generation behaviour. To break this pattern, clear segregation between waste-disposing zones and the rest of the environment needs to be created through discrete planning. Achieving this

goal requires effective coordination among DSCC personnel, landscape architects, and planners to successfully design the necessary segregation.

On the macrosystem scale, careful articulation of the park's natural environment is needed to provide positive cues or signs. The recommendations highlight the need for tailored waste disposal architectural solutions that can be 'co-created' or co-designed through 'active participation/interaction' with existing users. A co-created programmatic, functional, and landscape solution would foster strong engagement with the public.

As discussed in the findings section, the development of such architectural components should also focus on nurturing nature-sensitive attitudes and transformative experiences. The findings clearly warrant that such an approach should be distinct from existing architectural examples that exploit nature merely as an architectural backdrop. This architectural modality could initiate a cultural shift from an objective perception of the natural environment to a more subjective and nature-sensitive perception. This shift could change waste disposal behaviour in the park by making its users feel more connected and sensitive to its landscape, emphasizing the evolving human-environment relationship.

Finally, as discussed previously in the findings section, shifts in historical context, embedded in the chronosystem scale, have radically shaped a transformed attitudes towards 'waste' and its management. The transition from a rural, agricultural-based period to the present-day urbanized landscape has created such a changing dynamics of waste. Changing people's perceptions towards waste requires an urgent holistic approach. Overall, the findings underscore that addressing this crisis demands a comprehensive spatial strategy integrating user perceptions and cultural norms and engaging architectural designs in policy implications. The existing policy framework, which envisions park's development merely as 'physical infrastructure' and seeks engineering and planning solutions to 'fix' its environment, has already proven to be inadequate in numerous scholarly literature (Diep et al., 2023). The case of Suhrawardy Udyan stands as emblematic of urban public spaces in Dhaka, calling for proactive action and revision of such policy mindsets. The findings of this paper assert that landscape architects and urban designers need to play a pioneering role in addressing intermediate scales and devising sustainable spatial solutions to preserve the park's vitality and environmental health (Table 03).

**Table 03:** Analysed outcome through the scalar system of Bronfenbrenner’s bio-ecological model (source: authors).

Scalar system	Behavioural pattern	Recommendation/key features	Spatial Strategy
<b>Micro system</b>	- Personal, moral and subjective norms, attitude and perception of littering	Participatory placemaking	<b>1.</b> A belongingness centric spatial design: co-created functional and socio-cultural landscape <i>(stakeholder: public users, students)</i>
	- Gap between territorial connection and responsible participation	Acknowledging the informality and transient spatial practice	
	- Vibrant evening street food market and waste generating activity.		
<b>Meso system</b>	- Socio-spatial norms of peers	Convenient waste disposal landscape	<b>2.</b> A transient planning for acknowledging urban informality and responsible economic landscape, rather than fixed infrastructural development. <i>(stakeholder: vendors)</i>
	- Inadequate waste infrastructure		
<b>Exo-system</b>	- Normalization of irresponsible littering by socio-cultural influence	Culturally engaging waste management system	<b>3.</b> An inclusive policy framework, ensuring public-private partnership for implementing such participatory public space modality. <i>(stakeholder: DSCC and Government Authority)</i>
		Plan and zoning for segregated waste infrastructure	
<b>Macro system</b>	- Impact of received cues from Udyan’s spatial settings	Nature-centric experiential landscape planning	
	- Consumption oriented view and ‘spatial perception’	Co-designed public functions in the identified waste zones	
<b>Chrono system</b>	- Long term cultural shift from ‘re-use’ to ‘no-use’	Interacting architectural design to initiate cultural transformation towards waste	

## 5.0 CONCLUSION

In examining the psychology of waste generation in public spaces, this paper has employed Bronfenbrenner’s bio-ecological model to comprehend the dynamic relationship between urban environments, human behaviour, and environmental sustainability. Through the case of the Suhrawardy Udyan, it becomes evident that the health of such spaces directly impacts the overall well-being of the urban landscape. While these areas serve as vital organs, providing essential respite and rejuvenation for city dwellers, their degradation due to waste and pollution can turn them into an "unhealthy organ" of the urban body.

The imperative to address waste and pollution in Suhrawardy Udyan is not merely about preserving a single park but safeguarding the broader health of Dhaka. As the findings of this research elucidate, discreet architectural interventions are necessary to seamlessly integrate waste management into the policy framework governing

public spaces. By focusing on concepts such as belongingness, territoriality, co-creation, and place-making carefully curated spatial interventions can engender a sense of ownership among park users, thereby fostering responsible waste management behaviour. The paper identifies specific areas within the park as key waste generation points, such as entrances, sitting areas, walkways, vendor spaces, and dumping zones, which require targeted spatial strategies. Understanding user behaviour is crucial for devising effective waste reduction measures through extending concepts of belongingness and territoriality among all possible stakeholders, including the authorities (i.e. DSCC, RAJUK, etc.). In this regard, engaging regular users, including students and vendors, through a sense of ownership is instrumental in cultivating a culture of responsible waste management.

However, the vision of a healthy, breathable city necessitates both reactive and proactive measures. While architectural interventions and waste management systems are indispensable components of this vision, the attainment of sustainable urban well-being demands collaborative efforts across multiple fronts. Transforming Suhrawardy Udyan into a sustainable breathing hub requires synergy between design, government policy, and public awareness initiatives. This paper emphasizes the interconnectedness of public-space architecture and urban well-being, highlighting the importance of holistic approaches to contemporary waste-related crises. It argues for better policy recognition of the pivotal role and capacity of architects and urban designers in addressing these issues. Current policy frameworks suffer significantly from the misconception that waste generation is solely a planning or engineering problem, underestimating the contributions of architects and urban designers.

Furthermore, the recognition of gender and age-related dynamics in waste-making behaviour suggests avenues for further research and intervention. As male users emerge as primary contributors to interviews regarding waste-making behaviour, a gender-responsive inquiry and age-related behaviours are warranted. By interrogating these scholarly avenues, future endeavours can devise more inclusive and effective strategies for promoting responsible waste management practices among diverse user groups in urban public spaces.

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