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INTEGRATING URBAN DESIGN PRINCIPLES FOR SUSTAINABLE URBAN PARKS: INSIGHTS FROM USER EXPERIENCE IN GURNEY BAY AND PENANG MUNICIPAL PARK, MALAYSIA

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Abstract

Sustainable urban parks are vital components of resilient and liveable cities, providing environmental, social, and economic benefits. Ensuring their long-term relevance requires design principles that prioritise usability, inclusivity, and ecological sustainability. This study examines urban design principles that contribute to sustainable urban parks, with specific reference to Gurney Bay Park and Penang Municipal Park in Penang, Malaysia. Applying a quantitative approach, a questionnaire survey of 102 respondents was conducted to investigate the relationship between urban design principles and sustainability outcomes. The results reveal six key principles that shape sustainable park development: accessibility, safety, social interaction, aesthetic quality, resilience, and economic viability. Despite these guiding principles, the findings highlight persistent challenges in accessibility, including inadequate transportation connections and limited user satisfaction with available amenities. These shortcomings undermine the parks' potential to serve as inclusive and multifunctional community spaces. The study contributes empirical evidence from the Malaysian context to the discourse on sustainable urban design, offering practical insights for urban planners and policymakers. By embedding sustainability principles into park design and management, cities can enhance user experiences, promote healthier lifestyles, and advance broader urban resilience goals in line with the Penang2030 vision.

Keywords: Urban design principles, sustainable urban parks, accessibility, community engagement, resilient city, Penang 2030

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INTRODUCTION

Urban parks are integral to the development of healthy and sustainable urban environments with studies showing that well-designed parks contribute significantly to physical, mental, and social health (Adibhesami, 2024). These parks act as vital sanctuaries within cities, offering aesthetic value, recreational opportunities, and environmental benefits such as cleaner air, while also fostering social interaction and enhancing community well-being (Pukowiec, 2022; Zhao, Aziz & Ujang, 2024). Despite their many benefits, urban parks risk underutilization as social media and online entertainment draw people indoors. With increasing screen time and busy daily routines, opportunities for community engagement and mental health benefits from nature are reduced (Handoyotomo et al., 2018). Hence, finding ways to revitalize interest in these urban parks is critical for fostering community bonds and enhancing the overall quality of urban life.

While numerous studies have highlighted the benefits of urban parks (Zhang & Li, 2024; Zhang et al., 2024), most studies addressing Malaysian parks have concentrated on issues of provision, safety, or accessibility (Zhao, Aziz, & Ujang, 2024). Few have examined the synergistic relationship between urban design principles and sustainability outcomes in the context of local development visions such as Penang 2030. To address this gap, this study pursues two core objectives: (i) to identify essential urban design principles, and (ii) to explore their effective integration in the creation of sustainable urban parks. Gurney Bay and Penang Municipal Park are examined as case studies, providing insights into how urban park design can be optimized to meet community needs and enhance environmental resilience in support of Penang's green development aspirations.

LITERATURE REVIEW

Urban parks are essential communal space that significantly enhance quality of life by providing inclusive recreational spaces while strengthening community identity and contributing to environmental balance. Recent studies highlight their multifaceted value: Zhang et al. (2024) and Yang (2024) emphasize the role of urban parks in fostering social interactions, offering diverse recreational opportunities, maintaining urban sustainability and enhancing citizen wellbeing. Nevertheless, their effectiveness is often constrained by challenges such as safety concerns, social exclusion, inequities in access, and inadequate planning or provision of open spaces (Zhao, Aziz, & Ujang, 2024; Zhang et al., 2024).

To be effective, the urban park design must respond to contextual factors such as population density, demographic diversity, and equitable accessibility, ensuring spaces are inclusive and responsive to user needs. In Malaysia, the Department of Town and Country Planning (2005) articulate guiding principles for urban parks under the *Total Planning and Development*

Doctrine, which stresses the interconnected relationship between people, the Creator, one another, and the environment. These principles prioritize accessibility, safety, aesthetics, and sustainability which complemented Richard Rogers' *Towards an Urban Renaissance* (1999) that identifies three critical forces shaping urban parks—technological innovation, ecological pressures, and social transformation—underscoring the importance of adaptive, resilient, and sustainable approaches in contemporary park planning and design.

Key Urban Design Principles in Urban Park

Connectivity and Accessibility

Parks should be easy to reach and navigate by walking, cycling, and public transport to maximize use and equity. Kevin Lynch (1960) emphasized that clear, legible urban form — particularly well-defined paths, edges, nodes and landmarks — is essential for seamless integration of open spaces into the city. ADA-compliant features ensure inclusivity for all users. Walking- and cycling-friendly connections and high-quality transit access strongly improve park accessibility and use (Zhang et al., 2022), while park networks that are physically and perceptually connected encourage broader patterns of use across communities (Li, Dali & Nordin, 2023). While, inaccessible or poorly designed paths and entrances create real exclusionary effects for people with disabilities, reducing independence and quality of life (Kapsalis, Jaeger & Hale, 2024). Thus, designing clear pathways, protected bike lanes, frequent transit stops near park entrances, and ADA-compliant entrances, surfaces, signage, and facilities support both connectivity and social inclusion, helping parks to serve diverse populations equitably (De la Barrera et al., 2023).

Social Interaction and Inclusivity

As urban parks function as social catalysts that foster engagement across diverse communities, it is crucial to design spaces that encourage interaction (Gehl, 1987). Physical, social, and environmental elements of parks—such as seating areas, community gardens, and inclusive facilities create welcoming environments for all, including marginalized groups (Cui, Maliki, & Wang, 2024). Parks that are designed with involvement from people with disabilities, universal access features (ramps, accessible walkways), and varied amenities are crucial so that all users feel able to interact and belong (Selanon, Puggioni & Dejnirattisai, 2024).

Safety and Comfort

A safe and comfortable park enhances the overall user experience. Well-lit pathways, clear sightlines, and natural surveillance improve perceived security. Gehl (1987) emphasized the importance of human-centered design, incorporating

shaded areas, ample seating, and weather protection to create an inviting and inclusive space for all. Recent studies reinforce these principles, showing that lighting designs that promote legibility and perceived safety improve how people feel in parks at night (Lis et al., 2023), while maintenance, planting design, and scenic vistas are significant in fostering perceived safety in neighbourhood parks (Kurzi et al., 2024). Comfort, especially thermal comfort (shade, water features, visible environmental amenities) also strongly influences how long users stay and how frequently they visit (Chan, Chau, & Leung, 2017; Niu et al., 2022).

Aesthetic Quality

Visually appealing parks enhance urban landscapes. Landry (2000) advocated for inspiring designs that stimulate creativity and cultural vibrancy. Thoughtful landscaping, art, water features, and natural materials create harmony, attracting visitors and encouraging cultural activities. Chen, Marzbali and Abdullah (2024) emphasized that landscape attractiveness in urban parks significantly strengthens place identity and fosters social interaction, reinforcing the importance of aesthetic and inspiring park designs.

Resilience and Adaptability

Parks must continuously adapt to environmental and social changes to remain relevant. Geddes (1915) emphasized the importance of sustainable and flexible design in urban spaces, highlighting the need for green infrastructure that supports both ecological processes and human well-being. Recent studies further validate these ideas: Sabri and Ponrahono (2024) demonstrated that small urban parks can play a crucial role in enhancing urban resilience to climate change when assessed against clear sustainability criteria and indicators. Abdul Latip et al. (2023) indicate that visitor awareness and satisfaction are closely tied to the presence of sustainable design features, underscoring the importance of adaptability in urban park management. Well-designed urban green spaces not only support environmental sustainability but also promote social cohesion and economic vibrancy (Mohd Nor & Sahrir, 2024).

Sustainability of Urban Park

The sustainability of an urban park can be assessed by evaluating user satisfaction with activities that foster social interaction—activities that are themselves underpinned by high-quality design elements such as accessible pathways, visual enclosure, seating, and maintenance. Zyed et al. (2025) found that inadequate sidewalk conditions, poor lighting, and limited social surveillance during elementary school commutes in Fukuoka heightened children's perceptions of environmental risk, underscoring how design deficiencies can undermine safety and well-being—even within routine travel activities. This suggests that in urban

park contexts, the absence of well-designed elements may similarly impede safe, social engagement and long-term sustainability of the space. Achieving sustainability requires a multi-faceted approach that integrates strategies such as green design, resource efficiency, and inclusive community engagement. By aligning park design with sustainability goals, cities can create spaces that are both functional and resilient, contributing to the broader vision of a sustainable urban future.

Economic sustainability of urban parks lies in their ability to generate long-term value while minimizing costs. Parks contribute to local economies by attracting tourism, supporting businesses, and hosting events such as markets and festivals. They also increase property values and municipal revenues, while small-scale commercial activities like cafés or kiosks contribute to the park upkeep. Sustainable practices—such as native planting and energy-efficient infrastructure—reduce maintenance costs, making parks more financially resilient (Mohd Nor & Sahrir, 2024; Sabri & Ponrahono, 2024).

Social sustainability in urban parks emphasizes inclusivity, equity, and community engagement. Parks should be accessible to all, with amenities that cater to diverse groups, including children, the elderly, people with disabilities, and various cultural communities. Public participation in park design and management ensures spaces reflect community needs, fostering ownership and pride. By offering recreational opportunities, cultural events, educational programs, and inclusive playgrounds, parks strengthen social bonds, support physical and mental well-being, and enhance social cohesion. Zhang et al. (2025) suggest that equitable access across different travel modes, coupled with streetscape quality, is key to ensuring park use among marginalized and mobility-limited populations.

Environmental sustainability is central to urban park design, as parks help counter the negative impacts of urbanization. Green infrastructure such as permeable surfaces, stormwater systems, and floodable parks reduces runoff, prevents flooding, and improves water quality (Martín Muñoz et al., 2024). Using native plants not only is cost effective, but also supports biodiversity, lowers irrigation needs, and increases carbon storage, strengthening climate resilience (Rehman et al., 2025). By integrating these features, sustainable parks enhance ecological health, support resilience, and deliver lasting environmental benefits to cities.

RESEARCH METHODOLOGY

This study examines the sustainability of Penang Municipal Park and Gurney Bay Park by evaluating the integration of urban design principles through user experience. The assessment focuses on two key dimensions: **accessibility** and **social engagement**. Accessibility, reflects how easily the parks can be reached and navigated by diverse groups, ensuring equity and encouraging sustainable modes of transport. Social engagement, on the other hand, reflects the parks' capacity to foster community interaction, inclusivity, and vibrant social activities, positioning them as hubs for leisure and cultural exchange. Together, these dimensions provide a holistic measure of how urban parks contribute to social, environmental, and economic sustainability. Situated merely 4.4 kilometres apart, these parks serve a critical function for Penang's urban population of 722,384, providing vital green spaces for recreation, exercise, and social interaction.

Quantitative technique is adopted to evaluate the integration of urban design principles in the selected urban parks. A structured questionnaire survey was distributed via Google Forms to the public, specifically targeting park users of the selected case study, as park user constitute the most knowledgeable and directly affected group, thereby ensuring that the data reflects informed perspectives grounded in actual experiences. This sampling strategy is adopted as depth and relevance of responses are prioritised over statistical generalisation which is particularly valuable for this exploratory and context-specific research. Although pose certain limitations—such as the exclusion of individuals with limited internet access or digital proficiency, the use of online distribution through Google Forms further enhanced efficiency, cost-effectiveness, and accessibility, enabling the study to reach a diverse pool of respondents within a relatively short time frame. To enhance representativeness, the survey is disseminated through local community groups, social media platforms, and university networks, capturing diverse user perspectives, including families, youth, elderly individuals, and special needs users. Data collection was conducted over a one-month period, yielding 102 valid responses. This final sample is considered sufficient for correlation analysis; based on conventional power estimates ($\alpha = 0.05$, power = 0.80), it provides adequate sensitivity to detect medium effect sizes ($r \approx 0.30$) (Cohen, 1988; Field, 2018).

ANALYSIS AND FINDINGS

Respondents Profile

Majority of the park users (respondents) are young adults aged 18 to 34, aligning with Erik Erikson's stage of young adulthood, which emphasizes social engagement and physical activity (Erikson, 2003). Most youth are frequent park users, engaging primarily in relaxation and nature-seeking behaviours, with

substantial segments visiting parks once or twice per week (Yao, Yun, Zhang, Meng & Mu, 2022). At Gurney Bay Park, 96.6% of visitors fall within this age group, while Penang Municipal Park records 79.5%. This highlights the appeal of both parks to young adults. Additionally, more females frequent both parks, underscoring the need for safe, inclusive, and well-equipped urban spaces.

Accessibility

Accessibility is a key element of urban design emphasized in this study, particularly in relation to transportation modes used by park visitors. **Table 1** reveals that only 1.7% of respondents use public transportation, such as buses, to access Gurney Bay Park, while the other 98.3% relied on private vehicles, that include cars and motorcycles. Similarly, respondents visiting Penang Municipal Park also predominantly uses private vehicles due to the limited public transport options in the area.

Table 1: Modes of Transport used by Respondents

Mode of Transport	Gurney Bay Park		Penang Municipal Park	
	Frequency	Percentage (%)	Frequency	Percentage (%)
Public Bus	1	1.7%	0	0.0%
Motorcycle	9	15.5%	10	22.7%
Taxi	0	0.0%	0	0.0%
E-Hailing	0	0.0%	0	0.0%
Own Car	48	82.8%	34	77.3%
Total	58	100.0%	44	100.0%

Source: Author, 2025

This strong dependency on private-owned transportation highlights a significant challenge in making these parks sustainable, as poor transit connectivity limits accessibility, increases carbon emissions, and restricts inclusivity. Enhancing public transport links, such as integrating public transportation routes or providing a variety of last-mile connectivity solutions, could encourage broader community access, reduce environmental impact, and contribute to the long-term sustainability of these urban parks.

Social Engagement

Respondents of this study generally find the social and physical activities available at Gurney Bay Park enjoyable, unique, and motivating, though they express lower agreement regarding the challenge level of activities, with safety receiving a mean score of only 3.7, indicating a need for improvement. Similarly, respondents at Penang Municipal Park rate their activity satisfaction highly, with a mean value of 5.02 for enjoyment and a higher score of 3.84 for challenging

activities, likely due to the presence of hiking trails. Based on overall satisfaction ratings, the sustainability of both parks is moderate, with respondents rating their satisfaction between 2 and 6. However, the higher mean values at Penang Municipal Park suggest that it demonstrates a more substantial level of sustainability than Gurney Bay Park, highlighting the importance of diverse and engaging activities in promoting long-term park usage and sustainability. The sustainability of an urban park can be evaluated by looking at user satisfaction with activities that encourage social interaction, which are supported by high-quality design elements. The Spearman's rho correlation analysis in **Table 2** and **Table 3** highlights significant relationships between design elements and user satisfaction factors, including uniqueness, challenge, safety, motivation, and enjoyment.

In Gurney Bay Park (Table 2), pathways and entrances demonstrate a moderate positive correlation with both perceived safety and user motivation, underscoring the importance of connectivity and ease of access in shaping visitor confidence and engagement. Open spaces and seating areas also show positive but weaker associations with experience uniqueness and enjoyment, indicating that while physical amenities contribute to comfort and leisure, they alone are insufficient to significantly elevate the overall park experience. By comparison, the strongest influences on user perception stem from the provision of green infrastructure in the park and the park's integration with surrounding urban form. Spatial integration shows the highest overall associations, particularly with uniqueness ($\rho = 0.521$, $p < 0.001$) and motivation ($\rho = 0.486$, $p < 0.001$). These findings highlight that dynamic qualities such as sustainability and contextual integration exert a far greater impact on user satisfaction and engagement than static amenities, reinforcing the idea that urban parks must be designed as integrated, sustainable spaces to achieve long-term social and environmental value.

Table 2: Correlation Between the Activity's Satisfaction and Urban Design Principles at Gurney Bay

Urban Design Principles			Activity's Satisfaction				
			Experience Uniqueness	Challenging	Safety	Motivated	Fun
S p e a r m a n ' s r	Pathways and entrances connecting park to nearby areas	Correlation Coefficient	0.304	0.152	0.442	0.404	0.284
		Sig. (2-tailed)	0.021	0.256	<0.001	0.002	0.031
		N	58	58	58	58	58
	Adequate open spaces and seating areas	Correlation Coefficient	0.278	0.057	0.217	0.084	0.261
		Sig. (2-tailed)	0.037	0.674	0.105	0.536	0.050
		N	57	57	57	57	57
	Landscaping and public art reflect	Correlation Coefficient	0.253	0.156	0.308	0.382	0.216
		Sig. (2-tailed)	0.055	0.242	0.019	0.003	0.103

Urban Design Principles			Activity's Satisfaction				
			Experience Uniqueness	Challenging	Safety	Motivated	Fun
h o	local history and culture	N	58	58	58	58	58
	Cafe spaces, market areas, and local vendor within the park	Correlation Coefficient	0.288	0.357	0.479	0.346	0.321
		Sig. (2-tailed)	0.028	0.006	<0.001	0.008	0.014
		N	58	58	58	58	58
	Provision of green infrastructure in the park	Correlation Coefficient	0.343	0.446	0.484	0.470	0.493
		Sig. (2-tailed)	0.008	<0.001	<0.001	<0.001	<0.001
		N	58	58	58	58	58
	Integration of the park and surrounding buildings and spaces	Correlation Coefficient	0.521	0.431	0.496	0.486	0.510
		Sig. (2-tailed)	<0.001	<0.001	<0.001	<0.001	<0.001
		N	58	58	58	58	58
	**. Correlation is significant at the 0.01 level (2-tailed).						
	*. Correlation is significant at the 0.05 level (2-tailed).						

Source: Author, 2025

While user satisfaction at Penang Municipal Park, is strongly linked to elements that enhance cultural identity, safety, and social vibrancy, as shown in Table 3. Landscaping and public art reflecting local history and culture show strong correlations with multiple dimensions of experience—uniqueness, motivation, and fun—highlighting the importance of cultural expression in fostering meaningful engagement. Similarly, café spaces, market areas, and local vendors demonstrate high associations with safety and motivation, indicating that vibrant social and commercial activities strengthen the park’s role as a safe and lively community hub. Pathways and entrances also significantly contribute to safety and motivation, underlining the importance of accessibility. In addition, safety perceptions themselves are positively associated with, emphasizing that secure environments are crucial for active park use. While green infrastructure in the park shows moderate correlations with uniqueness and fun, its impact is less pronounced compared to cultural and social features. Overall, the findings suggest that Penang Municipal Park’s sustainability is most strongly driven by cultural identity, safety, and socially engaging amenities rather than static physical features alone.

Table 3: Correlation Between the Activity's Satisfaction and Urban Design Principles at Penang Municipal Parks

Urban Design Principles			Activity's Satisfaction				
			Experience Uniqueness	Challenging	Safety	Motivated	Fun
S p e a r m a n , s r h o	Pathways and entrances connecting park to nearby areas	Correlation Coefficient	0.342	0.083	0.458	0.361	0.352
		Sig. (2-tailed)	0.023	0.594	0.002	0.016	0.019
		N	44	44	44	44	44
	Adequate open spaces and seating areas	Correlation Coefficient	0.188	0.244	0.404	0.341	0.126
		Sig. (2-tailed)	0.222	0.111	0.007	0.023	0.417
		N	44	44	44	44	44
	Landscaping and public art reflect local history and culture	Correlation Coefficient	0.393	0.296	0.600	0.585	0.510
		Sig. (2-tailed)	0.008	0.051	<0.001	<0.001	<0.001
		N	44	44	44	44	44
	Cafe spaces, market areas, and local vendor within the park	Correlation Coefficient	0.417	0.383	0.575	0.472	0.390
		Sig. (2-tailed)	0.005	0.010	<0.001	0.001	0.009
		N	44	44	44	44	44
	Provision of green infrastructure in the park	Correlation Coefficient	0.312	0.261	0.573	0.351	0.352
		Sig. (2-tailed)	0.040	0.087	<0.001	0.020	0.019
		N	44	44	44	44	44
	Integration of the park and surrounding buildings and spaces	Correlation Coefficient	0.188	0.225	0.403	0.407	0.239
		Sig. (2-tailed)	0.223	0.143	0.007	0.006	0.118
		N	44	44	44	44	44

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).

Source: Author, 2025

Accessibility, social interaction, and safety are critical components of sustainability, as illustrated by the well-connected spaces of Penang Municipal Park and the aesthetic appeal of Gurney Bay Park. Correlation analysis indicates that pathways, café areas, and landscaping are vital for user satisfaction. To improve sustainability, both parks need better public transport access, enhanced safety measures, and versatile multifunctional spaces. The comparative analysis between these two parks reveals distinct factors shaping user satisfaction between Gurney Bay Park and Penang Municipal Park.

At Gurney Bay, accessibility features such as pathways and entrances exhibit moderate correlations with safety ($\rho = 0.442$, $p < 0.001$) and motivation ($\rho = 0.404$, $p = 0.002$), while open spaces and seating areas enhance perceptions of uniqueness ($\rho = 0.278$, $p = 0.037$) and enjoyment ($\rho = 0.261$, $p = 0.050$).

These findings underscore the importance of physical design in establishing baseline usability and comfort. Conversely, Penang Municipal Park demonstrates stronger associations with cultural and social dimensions, where landscaping and public art significantly influence uniqueness ($\rho = 0.393$, $p = 0.008$), motivation ($\rho = 0.585$, $p < 0.001$), and fun ($\rho = 0.510$, $p < 0.001$). Similarly, café spaces and local vendors correlate with safety ($\rho = 0.575$, $p < 0.001$) and motivation ($\rho = 0.472$, $p = 0.001$), highlighting the role of social vibrancy and local identity in driving satisfaction. Overall, safety consistently emerges as a determinant of motivation across both parks, aligning with studies that emphasize security as a prerequisite for active and prolonged park use (Zhang et al., 2024). However, while Gurney Bay's appeal is largely functional, rooted in accessibility and spatial openness, Penang Municipal Park demonstrates how socio-cultural features transform parks into vibrant community destinations. This contrast suggests that sustainable urban park design should balance physical accessibility with cultural and social activation to maximize user engagement and long-term urban resilience.

DISCUSSION

This study highlights the importance of integrating urban design principles to enhance the sustainability of urban parks. By analysing user experiences at Gurney Bay Park and Penang Municipal Park, the findings provide valuable insights into how well-designed parks can serve as inclusive, multifunctional spaces that foster community engagement. While both parks serve important recreational roles, their differing physical designs and layouts critically influence user experiences, revealing strengths in accessibility and aesthetics but also weaknesses in cultural representation and functional sustainability. Penang Municipal Park is characterized by its expansive green spaces and extensive pathway networks, which support accessibility, daily recreation, and integration with surrounding neighbourhoods. While Gurney Bay Park emphasizes waterfront aesthetics, vibrant event spaces, and leisure-oriented design, attracting social gatherings and tourists but revealing gaps in cultural heritage integration and long-term sustainability. These variations demonstrate how physical layout influences user preferences, usage patterns, and overall park performance.

Situating these findings within international contexts, urban parks in cities such as Singapore, Seoul, and Copenhagen exemplify best practices by integrating multifunctionality, cultural identity, and ecological resilience (Angelia et al., 2023; Kim & Jung, 2019). Likewise, European models underscore inclusive design, accessibility through public transport, and diverse amenities that cater to varied demographic groups, reinforcing the centrality of user-centred planning (Kabisch et al., 2022). In comparison, Penang's parks could benefit from embedding stronger cultural narratives, incorporating climate-adaptive

infrastructure, and strengthening integration with urban mobility systems. These lessons highlight the need for Penang to move beyond aesthetic enhancements toward holistic design strategies that align with global sustainability agendas while retaining local identity. Penang Municipal Park benefits from well-connected pathways and open spaces, while Gurney Bay Park excels in aesthetics and social interaction but falls short in historical and cultural integration. Correlation analysis further indicates that factors such as pathway accessibility and café spaces positively influence user satisfaction, pointing to the importance of carefully planned amenities in sustaining long-term engagement. From a policy and planning perspective, the study emphasizes the importance of community engagement, safety, and essential amenities in creating attractive and functional urban parks. Recommendations include hosting regular community events, integrating cafés and local vendors, and improving shaded seating areas to enhance comfort and usability. Conversely, the neglect of urban design principles—such as inadequate maintenance, limited accessibility, and uninspiring design—risks creating underutilized and unsustainable spaces. Finally, while this study provides valuable insights for urban planners and policymakers in Penang, certain limitations must be acknowledged. The contextual challenges during data collection constrain generalizability. Future research should build on these findings through larger-scale studies and advanced analytical approaches to better capture causal relationships and multidimensional park dynamics. Nonetheless, the research contributes to the broader agenda of achieving sustainable, inclusive urban parks in alignment with the Penang 2030 vision.

CONCLUSION

In conclusion, this study emphasizes the significance of integrating comprehensive urban design principles to ensure the sustainability of urban parks, with specific insights drawn from Gurney Bay Park and Penang Municipal Park. Findings demonstrate that **Connectivity and Accessibility**, **Social Interaction and Inclusivity**, and **Safety and Comfort**—as pivotal to park sustainability. Addressing identified gaps—such as the need for shaded seating, café spaces, and improved connectivity—can transform these parks into multifunctional hubs that respond to diverse community needs while advancing the vision of Penang 2030: “*A family-focused green and smart city that inspires the nation.*” Beyond practical recommendations, this study contributes to the academic field of urban design and planning by empirically linking user experience with design attributes, offering evidence-based insights into how specific spatial elements influence social interaction, accessibility, and long-term sustainability. Methodologically, the use of correlation analysis provides a valuable starting point for examining these relationships, while also highlighting

the necessity of adopting more advanced analytical tools, such as regression or structural equation modelling (SEM), to capture causality and multidimensional dynamics. By situating local findings within broader global discourses on sustainable urbanism, this study enriches ongoing debates on how parks can function as key instruments of urban resilience, social equity, and cultural expression, ultimately positioning Penang's parks as potential models for sustainable urban development in Southeast Asia.

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ETHICAL STATEMENT

This study was carried out in compliance with the research ethics regulations of Universiti Malaya. Prior to participation, all respondents were fully briefed on the purpose of the study and provided voluntary informed consent. Strict measures were observed to ensure anonymity and confidentiality throughout the research process.

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