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THE ACCLAIMED LANDSCAPE OF KNOWLEDGE SHARING

"Warning in Spaces: Blending Heritage, Nature and Design"

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Programme of Landscape Architecture, Department of Built Environment & Technology,
Faculty of Built Environment, UiTM Perak Branch, Seri Iskandar Campus



TALKS 6.0

THE ACCLAIMED LANDSCAPE OF KNOWLEDGE SHARING

"Harmony in Spaces : Blending Heritage, Nature and Design"

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Exploring Public Perspectives on Smart Park Management: A Case Study of Taman Tasik Shah Alam, Selangor

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Abstract

Urban parks are essential components of green infrastructure, providing social, environmental, and health benefits to urban communities. However, many public parks in Malaysia face challenges related to conventional management approaches, including inefficient resource allocation, delayed maintenance responses, vandalism, and safety concerns. While the emergence of smart technologies such as Internet of Things (IoT) system, digital monitoring, and artificial intelligence (AI) has been widely promoted solution, empirical evidence on public perceptions and acceptance of these technologies in the Malaysian context remains limited. This study adopts an exploratory research approach to examine public perceptions, awareness, and acceptance of smart park technologies at Taman Tasik Shah Alam, Selangor. A structured questionnaire survey was conducted among regular park users to gather preliminary insights into perceptions of current park maintenance, safety, cleanliness, and the perceived potential of smart technologies to support park management. Data were analysed using descriptive statistical methods to identify key perception trends and levels of public readiness for smart park initiatives. The findings indicate moderate satisfaction with current park maintenance alongside strong public acceptance and readiness for selected smart park technologies. This providing valuable insights for data-driven urban park management strategies in Malaysia and as a foundation for future large-scale studies.

Keyword: “Smart Park management”, “Public perception”, “Internet of Things (IoT)”, “Urban Park maintenance”, “Taman Tasik Shah Alam”.

INTRODUCTION

Urban parks are vital components of green infrastructure, delivering social, environmental, and health benefits while supporting recreation, biodiversity, and urban sustainability (Beatley, 2016; PLANMalaysia, 2021). Rapid urbanisation has increased pressure on local authorities to ensure that parks remain well-maintained, safe, and accessible. Utusan Malaysia (2023) notes that many urban parks continue to face persistent challenges that related to maintenance efficiency, cleanliness, and safety, which negatively affect user satisfaction and park utilisation. These challenges are closely aligned with global and national policy priorities, particularly Sustainable Development Goal 11, which advocates for safe, inclusive, and resilient public spaces (United Nations, 2015), as well as Malaysia’s Green Infrastructure Planning Guidelines and the Safe City Programme.

In response, smart city initiatives increasingly promote the use of digital and sensor-based technologies to improve urban service delivery. In park management, technologies such as Internet of Things (IoT) sensors, smart waste systems, and digital reporting platforms offer opportunities to enhance monitoring, optimise

resource allocation, and support proactive maintenance. Taman Tasik Shah Alam, one of Selangor's most frequently visited urban parks, continues to experience maintenance challenges despite annual expenditures exceeding RM 1.2 million, largely due to reliance on conventional, labour-intensive management approaches (MBSA, 2023; Utusan Malaysia, 2023). While smart park technologies have shown positive outcomes internationally (Li, Zhang, & Wang, 2020), their successful implementation depends not only on technical feasibility but also on public awareness, acceptance, and readiness. In Malaysia, empirical evidence on public perceptions of smart park initiatives remains limited, highlighting the need for further investigation.

Therefore, the aim of this study is to explore public perceptions and acceptance of smart park management technologies in an urban park context, using Taman Tasik Shah Alam as a case study. Specifically, the study seeks to assess public perceptions of current park maintenance, to examine public awareness and acceptance of smart technologies in supporting park management efficiency; and to evaluate the level of public readiness for the implementation of smart park initiatives in terms of safety and cleanliness within the Malaysian context.

LITERATURE REVIEW

Smart Technologies in Urban Park Management

Smart technologies have become innovative solutions for improving urban parks and their maintenance, helping address problems of inefficient resource allocation, high maintenance expenses, and ineffective monitoring systems. Smart Park management is a digital approach to park management, enhancing maintenance efficiencies, safety, and sustainability using technologies, including Internet of things (IoT) devices, smart waste systems, and artificial intelligence (AI)-based monitoring (Liu, 2023). Smart technologies create opportunities to make evidence-based decisions to plan maintenance more effectively, optimise manpower, and improve overall park conditions. In Malaysia, the planning to develop smart parks aligns with the priorities of national planning documents such as PLANMalaysia's Green Infrastructure Planning Guidelines (2021) and the Ministry of Housing and Local Government's Safe City Programme to ensure sustainable, reasonable, and safe public spaces.

International best practices further illustrate the effectiveness of smart park management in enhancing operational outcomes. In Barcelona, smart irrigation systems using soil sensors have reduced water consumption by approximately 25%, while sensor-based waste systems improved collection efficiency (Via Smart Cities, n.d.-a). Similarly, Singapore's implementation of environmental sensors, AI-assisted surveillance, and mobile reporting platforms has improved safety and maintenance response times (Via Smart Cities, n.d.-b). Taken together, these international case studies show that digitalisation of management services improves efficiency, lowers costs, and enhances user experience. Hamamurad et al. (2022) highlight that Malaysia has not yet been achieved given challenges associated with finance, institutions, and public acceptance. Hence, further research such as the present study on Taman Tasik Shah Alam is needed to explore how similar smart technologies can be adapted to improve local park maintenance and management practices.

This study is conceptually informed by technology acceptance frameworks such as the Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT), which emphasise the role of perceived usefulness, ease of use, social influence, and facilitating conditions in

shaping public acceptance of new technologies. Given the exploratory nature of this research these models are only used as interpretive lenses.

Maintenance Challenges and Policy Context in Public Parks

Maintenance inefficiency has long been recognised as a persistent challenge in public park management systems worldwide. Many municipal authorities rely on reactive or corrective maintenance instead of preventive approaches, leading to inefficiencies and increased long-term costs (Watkins, 2020; Elrahman & Asaad, 2021). Studies have shown that deferred maintenance allows small defects to compound into significant infrastructure failures, resulting in safety risks, declining aesthetic quality, and greater public dissatisfaction (Maller et al., 2022; Yung & Chan, 2019). Conventional maintenance practices based on time schedules, manual inspections, and paper-based reporting are often insufficient for complex urban park systems that require continuous monitoring (Kabisch et al., 2017; Gupta & Kumar, 2021). As a result, delays in maintenance responses and lack of performance data reduce operational efficiency and compromise the environmental sustainability of public green spaces. It reinforces a need for maintenance systems to include smart data driven technology to help facilitate efficiencies, accountability, and sustainability in public park management practices.

Within the Malaysian context, national planning frameworks increasingly emphasise the digital transformation of public services and green infrastructure management. The *Malaysia Smart City Framework* (KPKT, 2019), PLANMalaysia's *Green Infrastructure Planning Guidelines* (2021), and the *National Landscape Policy* (JLN, 2020) collectively advocate for technology-based monitoring and sustainable management of urban parks. Nonetheless, little research has demonstrated that urban smart park systems have advanced in implementation due to reasons of funding levels and institutional readiness and capacity (Hamamurad et al., 2022; Lim et al., 2021; Zainal et al., 2020). In Shah Alam, the City Council (MBSA) has successfully introduced smart parking and online complaint platforms, yet these initiatives have not extended to park maintenance or green-space management. This implementation gap presents a significant opportunity to position Taman Tasik Shah Alam as an example of where smart technologies can be implemented in park management to enhance performance, cost-effectiveness and community well-being in alignment with Sustainable Development Goal 11 (Sustainable Cities and Communities).

Research Gap and Contribution

Although international studies have demonstrated the potential of smart park management, empirical research on its adoption in the Malaysian context remains limited. Existing studies primarily emphasise theoretical frameworks or pilot projects in developed cities, with little attention to public perceptions and practical implementation in local urban parks (Hamamurad et al., 2022; Lim et al., 2021). This study addresses this gap by examining Taman Tasik Shah Alam as a representative case, focusing on local maintenance challenges, the suitability of smart technologies, and public acceptance. By providing preliminary empirical evidence from a Malaysian urban park, the study contributes insights to support data-driven and context-sensitive smart park management strategies and informs future large-scale research.

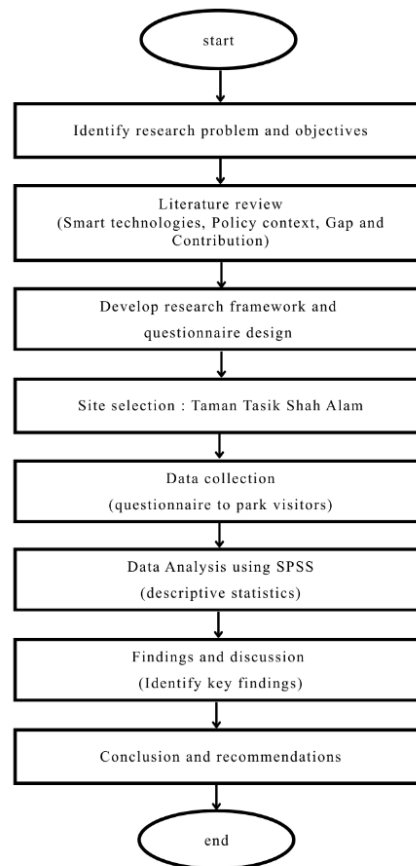
RESEARCH METHODOLOGY

This study adopts an exploratory, cross-sectional survey design to generate preliminary insights into public

perceptions and acceptance of smart park management technologies. A quantitative approach was employed to systematically measure user perceptions, attitudes, and readiness toward smart technology integration in urban park maintenance. Descriptive and inferential statistical analyses were used to identify patterns and relationships among perceived maintenance quality, safety, cleanliness, and acceptance of smart technologies. This approach is appropriate for capturing broad public perspectives and informing early-stage, data-driven strategies for smart park management at Taman Tasik Shah Alam.

Research Flowchart

Figure 1.0 shows the Research Flowchart



Site Selection

Taman Tasik Shah Alam was selected as the study site because it represents one of the most established and actively used urban parks managed by the Majlis Bandaraya Shah Alam (MBSA) compared to other parks based on (Table 1.0). The park continues to face recurring maintenance challenges such as ineffective waste management, vandalism, and delayed repairs (MBSA, 2023; Utusan Malaysia, 2023). These issues make it an ideal case for exploring how smart technologies can enhance management efficiency and sustainability in Malaysian urban parks. Its significance as a key recreational and ecological space aligns with the objectives of PLANMalaysia’s Green Infrastructure Planning Guidelines (2021).

Table 1.0 shows list of urban parks under the administration of Majlis Bandaraya Shah Alam.

No.	Urban Park Name	Size	Remarks
1	National Botanical Garden Shah Alam	~817 ha	Large botanic/forest park
2	Elmina Central Park	~300 ac (~121 ha)	Major central park within a township; part-public/private development
3	Taman Tasik Shah Alam	~43 ha	Classic urban lake garden managed by MBSA
4	Taman Rekreasi Tasik Seksyen 7	~18 ha	Smaller neighbourhood recreation lake park.
5	Other MBSA-urban neighbourhood parks	N/A	Many smaller parks exist under MBSA, but size data not publicly found.

Majlis Bandaraya Shah Alam. (2023). *Corporate Profile MBSA*.

Taman Tasik Shah Alam, located in Selangor, was selected as the study site because it is one of the most established urban parks managed by the Majlis Bandaraya Shah Alam (MBSA). Based on figure 2.0, it serves as a major recreational destination with facilities such as jogging tracks, lakes, and playgrounds. The site was selected because it demonstrates common maintenance challenges faced by large public parks while offering potential for digital transformation through smart technologies. By quantifying public and institutional responses, this research aims to generate empirical insights that support the development of data-driven and sustainable park management models in Malaysia.

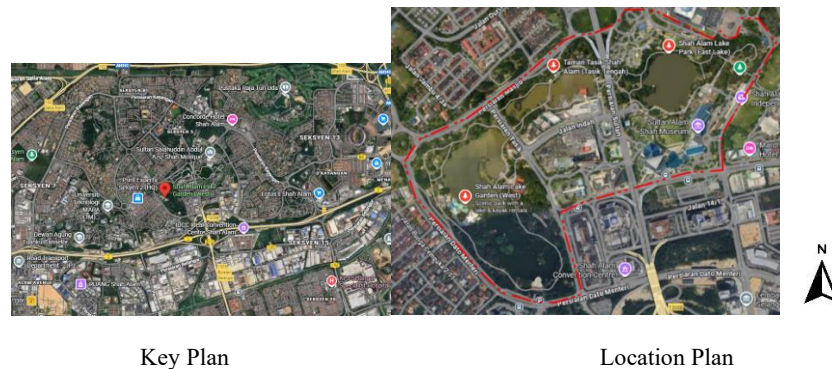


Figure 2.0 shows the location of Taman Tasik Shah Alam
Majlis Bandaraya Shah Alam. (n.d.). *Taman Tasik Shah Alam* [Peta]. Google Maps.

Research Instruments

However, the data were collected through a structured questionnaire survey distributed to park visitors who use Taman Tasik Shah Alam for recreational activities. The questionnaire consists of both closed-ended and Likert-scale questions focusing on respondents' demographic information, awareness of smart technologies, perceptions of park maintenance, and acceptance of technology-based solutions. Bryman (2016) states that the use of a structured format ensures data consistency and reliability for statistical analysis.

Sampling Method

A judgmental (purposive) sampling approach was employed to ensure that respondents possess relevant knowledge and direct experience related to the study objectives. Respondents were selected among park users present during the data collection period, focusing on individuals who regularly used the park for recreational activities. The data were collected over three days, from 28 to 30 November 2025, during the weekend (Friday to Sunday) to obtain higher participation and representative responses from park users.

The population of the Shah Alam parliamentary area is approximately 438,745 residents (Department of Statistics Malaysia, 2020). Based on the Krejcie and Morgan (1970) sample size table, a sample of 384 respondents would be required for full statistical representativeness. However, due to time and logistical constraints, a smaller sample size was adopted, consistent with the exploratory nature of the study. The sample size exceeded the minimum threshold commonly recommended for preliminary quantitative analysis, allowing for meaningful descriptive statistics and analysis under the assumptions of the Central Limit Theorem (Ghasemi & Zahediasl, 2012).

Table 2.0 shows the Sample Size Determination using Krejcie and Morgon

<i>Table for Determining Sample Size of a Known Population</i>									
N	S	N	S	N	S	N	S	N	S
10	10	100	80	280	162	800	260	2800	338
15	14	110	86	290	165	850	265	3000	341
20	19	120	92	300	169	900	269	3500	346
25	24	130	97	320	175	950	274	4000	351
30	28	140	103	340	181	1000	278	4500	354
35	32	150	108	360	186	1100	285	5000	357
40	36	160	113	380	191	1200	291	6000	361
45	40	170	118	400	196	1300	297	7000	364
50	44	180	123	420	201	1400	302	8000	367
55	48	190	127	440	205	1500	306	9000	368
60	52	200	132	460	210	1600	310	10000	370
65	56	210	136	480	214	1700	313	15000	375
70	59	220	140	500	217	1800	317	20000	377
75	63	230	144	550	226	1900	320	30000	379
80	66	240	148	600	234	2000	322	40000	380
85	70	250	152	650	242	2200	327	50000	381
90	73	260	155	700	248	2400	331	75000	382
95	76	270	159	750	254	2600	335	1000000	384
<i>Note: N is Population Size; S is Sample Size</i>					<i>Source: Krejcie & Morgan, 1970</i>				

Krejcie, R. V., & Morgan, D. W. (t.t.). Krejcie and Morgan Table.

FINDINGS & DISCUSSION

Referring to Table 3.0 shows the demographic profile shows that most respondents were male (59.4%) compared to female (40.6%). Most respondents were aged between 21–30 years (50.0%), followed by those aged 31–40 years (31.3%). In terms of park visit frequency, most respondents visited the park weekly

(46.9%), while leisure was identified as the main purpose of visit (40.6%).

Table 3.0 shows the demographic of the respondents that involved in this study.

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	19	59.4
	Female	13	40.6
Age	21-30	16	50.0
	31-40	10	31.3
	41-50	3	9.4
	>50	3	9.4
Frequency of park visits	daily	2	6.3
	weekly	15	46.9
	monthly	10	31.3
	rarely	32	15.6
Purpose of visit	exercise	12	37.5
	leisure	13	40.6
	outing	4	12.5
	others	3	9.4

Based on Table 3.0, most respondents are young adults who visit Taman Tasik Shah Alam regularly, mainly for leisure and exercise. As frequent park users, they have sufficient exposure to park conditions, making their perceptions of maintenance, safety, and cleanliness reliable for assessing current park management performance (Kabisch et al., 2017).

Table 4.0 shows the mean score for park maintenance among public perspective

Item	Mean	Std. Deviation
1- The park is generally well maintained.	3.50	880
2- I often notice damaged facilities (benches, lights, playgrounds, etc.)	2.75	803
3- The waste management system in the park is effective.	3.47	950
4- Maintenance issues are fixed quickly by the authorities.	3.19	931
5- Cleanliness and safety are important factors for me when visiting the park.	4.09	818

From Table 4.0, the item *“I often notice damaged facilities (benches, lights, playgrounds, etc.)”* was excluded from the reliability analysis due to its low reliability value (Cronbach’s alpha = 0.30). This item also recorded a relatively low mean score ($M = 2.75$), indicating weaker agreement among respondents compared to the other items. As this value falls below the acceptable threshold for internal consistency, the item does not align well with the remaining items in the construct. Therefore, it was removed to improve the overall reliability and consistency of the measurement scale.

Public perceptions of current park maintenance at Taman Tasik Shah Alam

As mentioned earlier, Objective 1 of this study focuses on understanding public perceptions of current park maintenance at Taman Tasik Shah Alam, which is reflected in the findings discussed above. There are five items to examine the part maintenance, according to Table 5.0, the descriptive statistics indicate a generally positive perception of park maintenance among respondents. The statement *“Cleanliness and safety are important factors when visiting the park”* recorded the highest mean value ($M = 4.09$, $SD = 0.82$), highlighting that maintenance-related aspects remain a key priority for park users. The item *“The park is generally well maintained”* recorded a relatively moderate mean value ($M = 3.50$, $SD = 0.88$), indicating overall satisfaction with current maintenance conditions. This is followed by *“The waste management system in the park is effective”* ($M = 3.47$, $SD = 0.95$), suggesting that waste handling practices are perceived as effective. However, the statement *“Maintenance issues are fixed quickly by the authorities”* showed a comparatively lower mean score ($M = 3.19$, $SD = 0.93$), indicating room for improvement in response efficiency.

Table 5.0 shows the mean score for park maintenance among public perspective

Item	Mean	Std. Deviation
1- The park is generally well maintained.	3.50	880
3- The waste management system in the park is effective.	3.47	950
4- Maintenance issues are fixed quickly by the authorities.	3.19	931
5- Cleanliness and safety are important factors for me when visiting the park.	4.09	818

The findings in Table 5.0 indicate that respondents generally perceive the park as moderately well maintained, particularly in terms of overall condition and waste management effectiveness. However, the lower mean score for maintenance response time highlights inefficiencies in addressing issues promptly, reflecting the limitations of conventional, reactive maintenance approaches as noted by (Watkins, 2020; Elrahman & Asaad, 2021). The results highlight opportunities for integrating smart technologies as supportive tools to enhance monitoring and responsiveness rather than as standalone solutions.

Perceived roles of smart technologies in supporting park management efficiency

The findings above are aligned with Objective 2, highlighting respondents' awareness and acceptance of smart technologies as supportive tools to improve park management efficiency at Taman Tasik Shah Alam. By referring to Table 6.0, the descriptive statistics indicate positive perceptions of how smart technologies contribute to park management efficiency. The statement *“I would support the use of mobile apps or sensors that allow visitors to report issues directly to the authorities”* recorded the highest mean value ($M = 4.19$, $SD = 0.69$), indicating strong support for technology-enabled reporting systems that can improve response efficiency. This is followed by *“I am confident that using technology will make parks more sustainable in the long term”* ($M = 4.13$, $SD = 0.66$), suggesting that respondents recognise the long-term management benefits of smart technologies. In contrast, *“I have seen or experienced smart features in public parks”* recorded a moderate mean score ($M = 3.53$, $SD = 1.02$), indicating that while support and confidence are high, actual exposure to smart park features remains limited.

Table 6.0 presents the mean scores on how smart technologies contribute to park management efficiency.

Item	Mean	Std. Deviation
1- I have seen or experienced smart features (e.g., automatic lighting, digital information boards) in public parks.	3.53	1016
2- I am confident that using technology will make parks more sustainable in the long term.	4.13	660
3- I would support the use of mobile apps or sensors that allow visitors to report issues directly to the authorities.	4.19	693

Results from Table 6.0 show strong public acceptance of smart technologies despite limited direct exposure to existing smart features. Respondents express high confidence in the long-term sustainability benefits of smart systems and strong support for technology-enabled reporting platforms, indicating readiness for digital participation in park maintenance (Li et al., 2020; Liu, 2023).

Levels of public acceptance and readiness toward smart park initiatives (safety)

These findings are associated with Objective 3, reflecting the level of public acceptance and readiness toward smart park initiatives, particularly in relation to safety aspects. From Table 7.0, the descriptive statistics indicate a high level of agreement regarding the role of smart technology in enhancing park safety. The statement *“IoT devices (e.g., smart lighting, CCTV, sensors) make the park a safer place to visit”* recorded the highest mean value ($M = 4.25$, $SD = 0.67$), indicating strong confidence in the effectiveness of IoT-based safety features. This is followed by *“IoT-based safety systems help to reduce vandalism or unwanted incidents in the park”* ($M = 4.22$, $SD = 0.66$), suggesting that respondents believe smart technologies contribute to crime and incident prevention. Additionally, *“I feel more secure knowing that the park uses smart technology for surveillance and monitoring”* also showed a moderate mean score ($M = 4.13$, $SD = 0.66$), reflecting positive perceptions of enhanced personal security through smart surveillance systems.

Table 7.0 shows the mean scores for safety-related among public perspective.

Item	Mean	Std. Deviation
1- I believe IoT devices (e.g., smart lighting, CCTV, sensors) make the park a safer place to visit.	4.25	672
2- I feel more secure knowing that the park uses smart technology for surveillance and monitoring.	4.13	660
3- IoT-based safety systems help to reduce vandalism or unwanted incidents in the park.	4.22	659

Safety-related perceptions in Table 7.0 reveal high confidence in IoT-based solutions such as smart lighting, CCTV, and sensors. Respondents believe these technologies enhance personal safety and help reduce vandalism, a finding supported by Yung and Chan (2019), shows that smart surveillance systems improve both perceived and actual safety in public parks.

Levels of public acceptance and readiness toward smart park initiatives (cleanliness)

The results also support Objective 3, indicating public acceptance and readiness toward smart park initiatives related to cleanliness. Referring to Table 8.0, the descriptive statistics indicate a high level of agreement towards the use of IoT systems in park management. The statement on IoT systems helping to maintain park cleanliness recorded the highest mean value ($M = 4.34$, $SD = 0.60$), followed by the ability of IoT to identify areas requiring faster cleaning and maintenance ($M = 4.31$, $SD = 0.64$). The belief that smart technology can improve waste management and reduce littering also showed a moderate mean score ($M = 4.28$, $SD = 0.62$).

Table 8.0 shows the mean scores for cleans-related among public perspective.

Item	Mean	Std. Deviation
1- IoT systems (e.g., smart bins, sensors) help maintain the cleanliness of the park more effectively.	4.34	602
2- The use of IoT can help identify areas that need cleaning or maintenance faster.	4.31	644
3- I believe smart technology can improve waste management and reduce littering in the park.	4.28	624

Table 8.0 presents the highest agreement across all dimensions, particularly regarding cleanliness and waste management. Respondents strongly believe that IoT-based systems can improve park cleanliness, enable faster identification of problem areas, and reduce littering. This aligns with international findings that smart waste systems enhance operational efficiency and environmental sustainability (Via Smart Cities, n.d.-a).

Limitation

This study is subject to several limitations. As an exploratory study with a limited sample size, single-site focus and time limitation, the findings reflect preliminary perceptions rather than generalisable conclusions. Additionally, they may be influenced by respondents' individual experiences and awareness of smart technologies themselves. Future studies should incorporate larger samples, multiple park sites, and may also apply Exploratory and Confirmatory Factor Analysis to validate perception constructs and examine their structural relationships in extend these findings.

CONCLUSION & RECOMMENDATIONS

This study examined public perceptions of smart park management at Taman Tasik Shah Alam, focusing on maintenance efficiency, safety, and cleanliness. The findings show that although the park is generally perceived as moderately well maintained, conventional maintenance practices remain limited in terms of response speed, monitoring, and resource optimisation. The results indicate strong public acceptance and readiness for the adoption of smart technologies. Respondents expressed high confidence in IoT-based solutions such as smart waste systems, sensor-driven monitoring, and technology-enabled reporting platforms, particularly for improving cleanliness and safety. Although direct exposure to existing smart park features remains limited, the overall perception of smart technology adoption is highly positive.

Based on these findings, local authorities particularly Majlis Bandaraya Shah Alam are encouraged to pilot selected smart technologies, including smart bins, IoT-enabled lighting, and mobile reporting applications,

to enhance maintenance efficiency and user engagement. This study contributes preliminary empirical evidence on smart park adoption in Malaysia and supports policy efforts toward data-driven, sustainable urban park management aligned with Sustainable Development Goal 11. Future research should involve larger samples, multiple sites, and longitudinal analysis to further evaluate the effectiveness and scalability of smart park management initiatives.

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