

Exploring Visitors' Satisfaction towards Conservation Activities at Botanical Gardens

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Abstract: This study focuses on exploring visitor satisfaction with the conservation and management practices at Melaka Botanical Garden, a renowned facility dedicated to plant study and protection. The research addresses challenges faced by botanical gardens, including funding constraints impacting physical characteristics, overcrowding due to high visitation rates, and cleanliness issues arising from inadequate management. Utilising a quantitative approach, 390 visitors were surveyed using a face-to-face questionnaire with a 5-point Likert Scale. The data were collected using convenience sampling technique and analysed through SPSS Software (Version 23.0) and WarpPLS (Version 8.0). Findings revealed a significant relationship between independent variables and visitor satisfaction, emphasising the pivotal role of conservation activities in shaping satisfaction levels. The study supports the hypothesis that visitor satisfaction correlates with perceived conservation dimensions, with varying attributes contributing to distinct satisfaction levels. Notably, plant species variation emerged as a primary contributor to visitor satisfaction. The research concludes with recommendations for future studies and acknowledges certain limitations in the research design.

Keywords: Botanical garden, conservation, environmental, satisfaction, visitor

Introduction

Botanical gardens play a crucial role in advancing our understanding of plant ecology, encompassing various aspects such as phenological indicators of climate change, plant physiology, growth strategies, and plant-animal interactions. However, their significance is challenged by financial constraints and unpredictable weather conditions, hindering effective management. Reports highlight the struggle faced by botanical gardens in generating sufficient revenue to cover operational costs, posing a threat to their sustainability (Wondafrash et al., 2021). To overcome these challenges, botanical gardens should enhance visitor experience and recognise the pivotal role of visitor support. Factors influencing visitor satisfaction including physical characteristics, values, benefits, and overall maintenance, become critical considerations in sustaining botanical gardens (Danaparamita et al., 2021). Some botanical gardens address budget constraints by engaging volunteers and garnering local and international support, emphasising the societal benefits of such collaborations. However, the influx of visitors, while potentially contributing to revenue, raises environmental concerns, as high visitation rates can lead to pollution and impact the ecosystem services provided by botanical gardens. Striking a delicate balance between revenue generation and environmental preservation necessitates strategic management (Affandi et al., 2020). The rise in visitors' vehicles further intensifies environmental impacts, posing a threat to the ecosystems within botanical gardens (Hengky &

Kikvidze, 2018). Climate change adds another layer of complexity, influencing plant-insect interactions and extreme weather phenomena, impacting visitors' satisfaction and the overall aesthetic and recreational value of botanical gardens (Mosia et al., 2022). Addressing these challenges requires proper training and education for botanical garden staff on tree preservation and cleanliness, emphasising their crucial role in effective garden management (Abdul Ghaffar & Azeman, 2021; D'Antraccoli et al., 2023). Despite prior studies acknowledging various challenges, the literature gap persists in specifically addressing visitors' satisfaction and conservation efforts in botanical gardens. This study aims to fill this void by focusing on cleanliness, landscape, management, plant species, and facilities, providing a comprehensive analysis of factors influencing the success of botanical gardens in their conservation mission.

Literature Review

Botanical Gardens as Tourism Attractions

Botanical gardens play a multifaceted role encompassing scientific research, conservation, public education, and recreational ecosystem services (RES), with a particular emphasis on offering diverse experiences for visitors. Globally, these institutions are recognised as essential contributors to biodiversity preservation and ecological equilibrium. Positioned within the realm of nature-based tourism (NBT), botanical gardens provide nature-oriented environments while simultaneously conserving a wide array of plant species. The increasing popularity of NBT is identified as a strategic approach for fostering economic growth through the sustainable utilisation of natural resources, aligning with the pivotal role of urban green spaces in enhancing economic growth and serving as tourist destinations, as highlighted by Majumdar et al. (2011). The Bali Botanic Garden serves as an exemplary case, transforming from a plant conservation institution into a captivating tourist destination by integrating natural beauty and diverse plant species. As emphasised by Kim et al. (2022), the concept of garden tourism has become a global attraction, attracting millions of visitors to various destinations. The multifaceted roles of botanical gardens, influenced by factors such as destination attractiveness and visitor satisfaction, underscore their significance in meeting the diverse needs of a global visitor base, offering a harmonious blend of scientific exploration and recreational experiences.

Visitors Satisfaction at Botanical Gardens

Research on visitor satisfaction at botanical gardens highlights the importance of effective environmental management, as demonstrated by Danaparamita et al. (2021) in their study of Bogor Botanical Garden, attributing positive satisfaction outcomes to well-managed environmental activities. Complementary findings by Wessenberg et al. (2015) underscore visitors' perception of botanical gardens and plant collections as key contributors to enriching experiences and stress relief, particularly notable among students. Critical determinants influencing visitor satisfaction include the provision of quality facilities, cleanliness, effective landscape management, and superior services, as identified by Abdul Gaffar & Azeman (2021) and Che Rose & Basri (2019). Constructing positive perceptions and ensuring visitor satisfaction are deemed primary objectives in tourist area development, serving as crucial benchmarks for evaluating industry offerings and guiding adjustments by tourism operators in response to visitor feedback, as emphasised by Danaparamita et al. (2021) and supported by Hidayat et al. (2022). This comprehensive understanding informs ongoing management strategies for tourist areas, facilitating the enhancement of visitor experiences and overall satisfaction levels.

Conservation Activities at Botanical Garden

Botanical gardens, serving as educational and conservation centres, have gained prominence for their role in providing valuable learning experiences for students and contributing to the preservation of biological diversity. Increasing awareness and fostering a shared understanding through

environmental education, demonstrating the economic and social advantages that humans can derive from the environment, including flora and fauna (Yusof, 2019). Indrawardani et al. (2019) highlight the primary goal of botanical gardens in conserving resources and promoting sustainable utilisation, with collaboration being a common practice in both in situ and ex situ conservation efforts. In situ conservation, exemplified by home gardens, involves preserving species in their natural habitats, contributing to waste reduction and soil conservation. Ex situ conservation, crucial for protecting threatened plants, faces challenges such as limited space and financial constraints but plays a pivotal role, particularly within botanical gardens. The systematic collection and management of plants, including rare and endangered species, are crucial for the continuous survival of species, with visitors' satisfaction serving as a significant metric in evaluating the success of both in situ and ex situ conservation approaches.

Landscape of Botanical Gardens

The concept of "landscape" transcends rural origins, encompassing both natural and human-made elements in urban and rural settings. Landscape architecture, a subset of this broader concept, is dedicated to crafting spaces for human habitation, excluding agricultural and forestry areas. Effective landscape management, necessitating collaboration among diverse stakeholders, is pivotal in shaping environments, with landscape development projects like public park construction contributing significantly to Malaysia's overall landscape (Che Rose & Basri, 2019). Greenery and visual enhancements in well-managed landscapes positively impact visitor experiences, creating serene atmospheres. Challenges, as evidenced in Ujana Rimba Tropika Park, Malaysia, reveal the impact of inadequate facilities on perceived landscape management quality. Comprehensive landscape planning and management are imperative to optimise visitor experiences, particularly in public spaces like botanical gardens. These gardens, functioning as living museums, play a vital role in fostering community benefits, plant awareness, and contributing to the well-being of visitors in urbanised landscapes.

Cleanliness of Botanical Gardens

Cleanliness is integral to facilitating social interactions, extending beyond personal hygiene to encompass environmental health, free from pollutants and potential damages (Abdul Gaffar & Azeman, 2021). Che Rose & Basri (2019) emphasise the impact of a well-maintained park on creating a serene atmosphere, contributing to clean and fresh environmental air, and garnering high satisfaction levels in open spaces designated for activities like yoga. In botanical gardens, the provision of strategically located and visible trash cans is crucial for ensuring optimal cleanliness, integral to the image, comfort, safety, and enjoyment of the garden. Beyond educational and recreational objectives, cleanliness emerges as a factor enhancing visitor satisfaction and contributing to the safety and tranquillity of the garden, fostering engagement in conservation efforts and attracting more visitors. Volunteer activities, including planting and cleanliness initiatives, not only contribute to a vibrant and clean environment but also underscore the multifaceted importance of cleanliness in botanical gardens.

Species Variation of Plants in Botanical Gardens

Botanical gardens play a crucial role in conserving plant species threatened by extinction, cultivating rare plants, and preserving genetic diversity, potentially housing up to 100,000 plant species. Studies, including Namoff et al. (2010), highlight a positive correlation between botanical garden collections' size and captured genetic diversity, crucial for species survival. Beyond conservation, botanical gardens attract visitors with their scenic beauty and diverse plant species, serving as outdoor recreation spaces and educational centres. Visitors engage in hands-on learning, observation, and plant identification, fostering environmental awareness and education (Salvarci & Aylan, 2021). Thus, botanical gardens stand as pivotal destinations for nature-based recreation and learning, embodying their dual role as conservation centres and educational hubs.

Visitors Facilities at Botanical Gardens

Kim et al. (2022) advocate for botanical gardens to integrate sustainable garden tourism elements into their facilities, fostering garden culture that enhances the urban environment. In South Korea, garden culture promotes an appreciation for gardens resembling the natural world. Karasah & Var's (2013) study on Nezahat Gökyiğit Botanical Garden in Turkey highlights its diverse recreational amenities, including picnic spots, playgrounds, and amphitheatres, catering to both educational and leisure needs while serving conservation and research purposes. These criteria underscore botanical gardens' significance as not only attractive destinations but also as vital centres for botanical research, education, and collaboration within the botanical community.

Environmental Management at Botanical Gardens

The quality of a tourist destination is heavily influenced by its environmental management, which encompasses various activities to maintain and utilise garden areas, plant collections, and supporting infrastructure. Public gardens, such as botanical gardens, attract visitors seeking serenity, tranquillity, and spiritual and restorative benefits, emphasising their importance as settings to showcase the intricate relationships between plants, animals, and humans (Ballantyne et al., 2008). This study focuses on botanical gardens' dual role as tourism attractions and conservation centres for plant diversity. Understanding visitors' satisfaction with conservation activities and the quality of various elements provided by botanical gardens is essential. The conceptual framework, illustrated in Figure 1, delineates landscape, cleanliness, plant species variation, visitors' facilities, and environments as independent variables under the perceived conservation dimension, with visitors' satisfaction as the dependent variable. This framework, grounded in prior research on conservation dimensions and visitors' satisfaction in botanical gardens, serves as a foundational guide for assessing and enhancing visitor experiences in such settings.

- H1: There is a significant relationship between the level of satisfaction among visitors and landscape of botanical gardens.
- H2: There is a significant relationship between the level of satisfaction among visitors and cleanliness of botanical gardens.
- H3: There is a significant relationship between the level of satisfaction among visitors and plants' species variation of botanical gardens.
- H4: There is a significant relationship between the level of satisfaction among visitors and visitors' facilities of botanical gardens.
- H5: There is a significant relationship between the level of satisfaction among visitors and environment of botanical gardens.

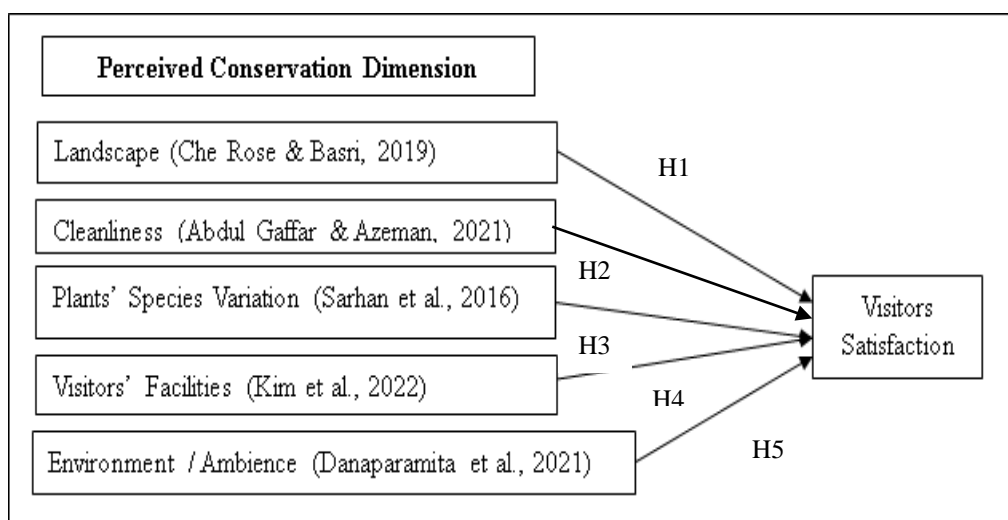


Fig. 1. Conceptual Framework of Visitors Satisfaction at Botanical Garden (Authors)

Methodology

This study employs a descriptive research design to offer a comprehensive depiction of visitors' satisfaction with conservation and management practices in botanical gardens. Utilizing a structured questionnaire with a 5-point Likert Scale, the research assesses satisfaction levels and identifies influencing factors among 385 respondents aged 18 and above at Melaka Botanical Gardens. The study employed convenience sampling technique. The site selection was based on its unique flora species and educational significance. Data analysis involves the use of the Statistical Package for the Social Sciences (SPSS) for descriptive analysis of botanical garden aspects. Additionally, Partial Least Squares Structural Equation Modeling (PLS-SEM) via WarpPLS Version 8.0 evaluates hypotheses, offering insights into factors shaping visitor satisfaction. WarpPLS allows for simultaneous assessment of reflective and formative measurement models, providing estimates based on actual composites and SEM factors. Hypotheses are rigorously evaluated through descriptive analysis, and partial least squares, ensuring a robust examination of visitor satisfaction determinants in botanical garden settings.

Findings and Discussion

The analysis of Table 1, conducted through SPSS, involved the examination of mean values and standard deviations (Std. Dev). The mean values for each construct fell within the range of 4.06-4.37, categorising them as "satisfied." This indicates that a significant majority of respondents expressed satisfaction with all the constructs outlined in the research statement.

Table 1. Mean and Standard Deviation Analysis

Construct	Min	Max	Mean	Std. Dev
Landscape	1	5	4.27	0.756
Cleanliness	1	5	4.06	0.826
Plant's Species Variation	1	5	4.12	0.772
Facilities	1	5	4.32	0.774
Environment	1	5	4.37	0.696

Assessment of the Measurement Model

As depicted in Table 4, concerning convergent validity, all composite reliability (CR) values exceeded the suggested minimum cutoff point of 0.7 by Chin (2010) (as cited in Dey et al., 2020), and with the exception of one item, all values for Cronbach's Alpha were also above 0.7. Hair et al. (2013) recommended a minimum average variance extracted (AVE) criterion of 0.05 (as cited in Dey et al., 2020). However, only the construct in row number 3 met the AVE minimum criteria, with a value of 0.530. Fornell and Larcker (1981) proposed that convergent validity is established when a latent construct explains at least half of the variance in the indicators it is associated with. They further suggested using the average variance extracted (AVE) to indicate the average amount of variance that a construct explains in its indicators relative to the sum variance of its indicators.

Table 2. Results of Measurement Model

Construct	Cronbach's Alpha	CR	AVE
Landscape	0.784	0.847	0.481
Cleanliness	0.739	0.821	0.437
Plants' species variation	0.739	0.871	0.530
Facilities	0.779	0.844	0.475
Environment	0.790	0.852	0.491
Visitors' Satisfaction	0.575	0.746	0.373

Applying the Fornell and Larcker (1981) criterion in Table 3, the square root of the Average Variance Extracted (AVE) value was compared with the inter-correlations of the construct and other constructs in the research model. All values demonstrated superiority over each construct's correlation, affirming the adequacy of the measurement model. This outcome showed substantial evidence regarding the reliability, convergent validity, and discriminant validity of the model (Dey et al., 2020).

Table 3: Discriminant Validity of Construct (Fornell-Larcker criterion)

	Landscape	Cleanliness	Plants	Facilities	Environment	VS
Landscape	0.694					
Cleanliness	0.394	0.661				
Plants	0.454	0.497	0.728			
Facilities	0.554	0.492	0.417	0.689		
Environment	0.508	0.422	0.504	0.577	0.701	
Visitors' Satisfaction	0.643	0.608	0.667	0.675	0.625	0.611

Furthermore, following Cohen's (1998) criteria, an R2 value exceeding 0.67 is considered significant, between 0.33 and 0.67 is moderate, and below 0.19 is weak (as cited in Dey et al., 2020). In reference to Figure 3, the R2 value for visitors' satisfaction (VS) is 0.70, surpassing the threshold for significance. This indicates a substantial percentage of variance in the dependent variable that can be robustly explained by the independent variables, as the value exceeds the significant threshold of 70%.

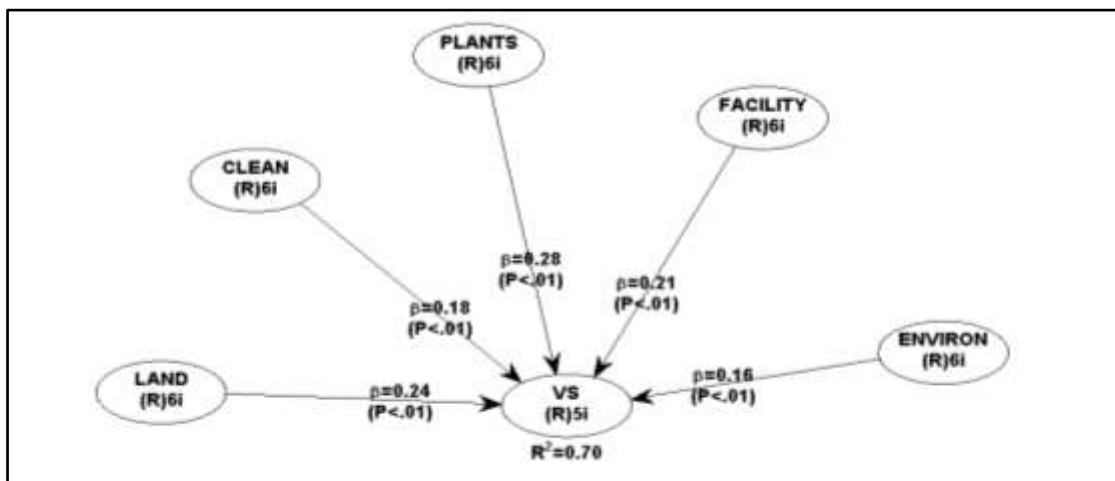


Fig. 1. Research Model with Path Coefficient and P-Values

The assessment of the structural model

As per Table 4, Variation Inflation Factor (VIF) values, ranging from 1.667 to 2.112, all of which are below the threshold of 10. According to O'Brien (2007), VIF values exceeding 10 may not invalidate the regression analysis results, but it is advisable to address multicollinearity issues by eliminating certain variables, applying ridge regression, or combining variables into a single index to enhance reliability. Thus, the results confirm the absence of multicollinearity issues among the constructs, as the VIF values fall below 10.

The results in Table 4 revealed significant relationships between the dependent variable and all independent variables. Hypothesis H1 was supported ($p < 0.05$; $\beta = 0.24$), indicating a significant relationship between visitors' satisfaction and the landscape of the botanical garden. This suggests that visitors' satisfaction is influenced by the landscape of the botanical garden, with 15.4% ($R^2 = 0.154$) of the respondents expressing satisfaction with the landscape at Melaka Botanical Garden. This finding

aligns with a study by Che Rose & Basri (2019), which highlighted the importance of a soft landscape, providing a calm atmosphere and attractive natural attractions.

Hypothesis H2 was also supported ($p < 0.05$; $\beta = 0.18$), revealing a significant relationship between visitors' satisfaction and the cleanliness of botanical gardens. The cleanliness of the botanical garden was found to influence visitor satisfaction, with 11.1% ($R^2 = 0.111$) of respondents expressing satisfaction. This underscores the role of cleanliness in influencing visitors' satisfaction, as emphasised by Abdul Gaffar & Azeman (2021).

Hypothesis H3, indicating a significant relationship between visitors' satisfaction and the plants' species variation of botanical gardens, was supported ($p < 0.05$). The plants' species variation was found to explain visitors' satisfaction, with the highest percentage ($R^2 = 0.193$) among all variables. This suggests that plant species diversity plays a crucial role in determining visitor satisfaction and contributes to genetic diversity, aligning with the findings of Namoff et al. (2010).

Hypothesis H4 was supported ($p < 0.05$), indicating a significant relationship between visitors' satisfaction and the visitors' facilities of botanical gardens. However, the satisfaction level with facilities was relatively low, with an R^2 value of 14.5%. Ahmad et al. (n.d) highlighted the importance of good visitor facilities in attracting more visitors, suggesting that Melaka Botanical Garden may need improvement in this aspect.

Similarly, Hypothesis H5 was supported ($p < 0.05$), revealing a significant relationship between visitors' satisfaction and the environment of botanical gardens. However, the environment showed the lowest satisfaction level among visitors, with an R^2 value of 9.8%. This indicates a need for improvement in managing the environmental conditions of Melaka Botanical Garden.

Table 4: Path Coefficient and Hypothesis Testing

Hypothesis	Standard Beta	Standard Error	Path Coefficients	p-value	Decision	VIF	R ²
H1	0.24	0.049	0.235	<0.001	Supported	1.821	0.154
H2	0.18	0.049	0.181	<0.001	Supported	1.667	0.111
H3	0.28	0.049	0.285	<0.001	Supported	1.915	0.193
H4	0.21	0.049	0.210	<0.001	Supported	2.112	0.145
H5	0.16	0.049	0.155	<0.001	Supported	1.849	0.098

Analysing the overall perceived conservation dimension, the mean values in Table 1 indicated that most respondents were satisfied with the conservation activities in Melaka Botanical Garden. Figure 1 further showed that 70% ($R^2 = 0.70$) of respondents were satisfied with the overall perceived conservation dimension, signifying a significant and robust satisfaction level with the conservation efforts and management of Melaka Botanical Garden. In determining the most perceived conservation dimension influencing visitors' satisfaction, the beta coefficient analysis (Table 4) identified plants' species variation as the most significant contributor ($\beta = 0.28$). This emphasises that visitors strongly associate satisfaction with the diversity of plant species, aligning with the botanical garden's role as a conservation center for various plant species. Landscape emerged as the second contributor, with a beta coefficient ($\beta = 0.24$), highlighting its importance in enhancing the physical appearance and management of botanical gardens. Facilities were the third significant contributor, with a beta coefficient ($\beta = 0.21$), underscoring their role in contributing to visitor satisfaction as essential elements of a recreational park. In contrast, the environment showed the lowest beta coefficient ($\beta = 0.16$), indicating the least satisfaction among visitors. This suggests a need for improvement in managing the environmental conditions of Melaka Botanical Garden to enhance visitor satisfaction. In summary, the study provided valuable insights into the perceived conservation dimensions influencing visitors' satisfaction at Melaka Botanical Garden. The findings can guide future efforts to enhance the botanical garden's landscape, cleanliness, plant species variation, facilities, and environment to improve overall visitor satisfaction and contribute to the conservation goals of the garden.

Conclusion

The study findings reveal that visitors at botanical gardens place high importance on plant species variation as the primary conservation dimension, constituting 19.3% of visitors' satisfaction. Collaboration in conservation, particularly led by botanical gardens, gains prominence. Landscape attributes follow at 15.4%, signifying its significance as a vital conservation element. Scientific research and education significantly influence landscape perception. Facilities, at 14.5%, emerge as another crucial dimension, emphasising the importance of adequate amenities, such as accessible toilets. However, the environment attribute lags behind at 9.8%, indicating a need for improvements in providing unique experiences aligned with visitors' well-being. Effective conservation efforts positively impact visitor satisfaction at Melaka Botanical Gardens, fostering a connection between conservation initiatives and overall visitor contentment. Sustainable development relies on preserving plant diversity, positioning botanical gardens as pivotal hubs for conservation. The study contributes valuable insights for both the tourism sector and individual botanical gardens, emphasising the centrality of visitor satisfaction and the role of conservation attributes in shaping positive experiences and long-term relationships. These findings offer practical implications for enhancing tourist attractions, drawing repeat visitors, and promoting overall conservation efforts.

Suggestion for Future Research

This study offers valuable recommendations for future research and enhancements at Melaka Botanical Garden. A recurring investigation into visitor satisfaction, particularly regarding cleanliness, landscape design, and recreational amenities, is proposed to gauge improvements over time. Prioritising the management weaknesses identified in the study, ongoing assessments can guide the botanical garden towards continuous enhancement. Moreover, embracing contemporary information technologies, such as QR codes on tree signage, can elevate the educational experience for visitors. By revitalising the existing system and leveraging social media platforms, the management can disseminate valuable information about plant variations and other botanical insights. Addressing visitor concerns, additional garbage cans and recycling bins strategically placed throughout the park can mitigate littering issues and enhance cleanliness. Improvements in travel guides, easily accessible facilities, information centres, and transportation access can be pivotal to meeting visitors' informational needs. The study advocates for organisational initiatives, such as charity runs, to infuse vibrancy into the botanical garden and attract increased visitor participation. These multifaceted recommendations align with the overarching goal of fostering visitor satisfaction and elevating the overall experience at Melaka Botanical Garden.

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