

# AI based Sentiment Analysis of Visitors' Perceptions Towards Urban Green Spaces in Kuala Lumpur, Malaysia

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## ABSTRACT

Urban green spaces (UGS) play a vital role in enhancing the quality of life and wellbeing of city dwellers by offering environmental, social, and health benefits. In rapidly urbanising cities such as Kuala Lumpur, Malaysia, assessing these public spaces from the users' perspectives is essential to ensure they meet the needs and expectations of urban residents. This study explores visitors' sentiments and perceptions of UGS by analysing online reviews sourced from Google Reviews. A total of 4 out of 19 UGS locations across Kuala Lumpur were examined, with data extracted using Python-based tools, specifically Selenium and PyCharm. The qualitative data were analysed using a combination of sentiment analysis and content analysis techniques powered by artificial intelligence (AI) and natural language processing (NLP) techniques. The study demonstrates the effectiveness of AI-driven tools for automatic text mining to extract meaningful insights from user-generated content. Based on the data analysis, the four parks achieved an average rating of 4.3 stars or higher, positioning them as exemplary benchmarks for the development and enhancement of future UGS projects in Kuala Lumpur. The findings highlight the value of integrating AI into urban studies to assess public sentiment efficiently and systematically. This approach offers urban planners and policymakers an innovative means to monitor the quality and effectiveness of UGS from the users' viewpoint, ultimately contributing to more inclusive and responsive urban green space planning in Malaysian cities.

**Keywords:** Urban Green Spaces; sentiment analysis; artificial intelligence; user perception; online reviews

## INTRODUCTION

Urbanisation is accelerating globally, with the United Nations projecting that nearly 70% of the world's population will reside in urban areas by 2050 (United Nations Department of Economic and Social Affairs [UN DESA], 2018). Malaysia reflects this trend, with Kuala Lumpur experiencing rapid growth, increasing population density, and continuous infrastructure expansion. While such development often signals economic progress, it also contributes to environmental degradation, reduces access to natural spaces, and intensifies urban stressors such as air pollution, overcrowding, and heat island effects (Kiplagat et al., 2022). These challenges highlight the need for cities to integrate sustainable and inclusive features to enhance liveability and public well-being. Urban green spaces (UGS), including public parks, recreational gardens, and green corridors, are critical components of a healthy urban ecosystem (Iraegui et al., 2020). They provide multiple ecological and social benefits, such as improving air quality, regulating microclimates, encouraging physical activity, enhancing mental well-being, and fostering social cohesion. Importantly, UGS offer opportunities for human-nature interaction, a valuable experience that is increasingly rare in densely urbanised environments (Haase, 2022). Well-planned and accessible UGS not only support environmental functions but also promote social inclusion, community pride, and a sense of shared public ownership.

In Kuala Lumpur, however, growth-oriented urban planning has often prioritised economic expansion at the expense of green infrastructure. Land scarcity, intense real estate pressure, and insufficient integration of UGS into development strategies have resulted in fragmented, underused, or poorly maintained green spaces. Furthermore, assessments of UGS have traditionally focused on quantitative measures—such as area per capita—rather than qualitative dimensions such as user satisfaction or perceived value (Madureira et al., 2018).

Consequently, many green spaces fail to meet the diverse needs and lived experiences of urban residents. To address these concerns, Malaysian planning authorities have adopted several policy frameworks that underscore the importance of sustainable and inclusive urban development. The National Urbanisation Policy 2 (NUP 2.0) advocates for the creation of a “liveable, resilient, and inclusive urban system,” identifying UGS as a vital element for enhancing environmental sustainability and quality of life (Federal Department of Town and Country Planning, 2016). At the municipal level, the Kuala Lumpur Structure Plan 2040 (KLSP2040) sets out a vision for a “Resilient, Inclusive, and Vibrant City,” emphasising the expansion and improvement of UGS to meet not only per capita green space targets but also goals related to equity, accessibility, and responsiveness to public needs (Kuala Lumpur City Hall/Dewan Bandaraya Kuala Lumpur [DBKL], 2020). These local strategies are aligned with the broader targets of the United Nations’ Sustainable Development Goal 11 (SDG 11), particularly Target 11.7, which promotes universal access to safe, inclusive, and accessible green and public spaces (United Nations, 2015).

Despite the existence of comprehensive policy frameworks, there remains a significant gap in systematically capturing the perceptions and experiences of UGS users to inform design and governance. Conventional methods such as field surveys, interviews, and on-site evaluations are often costly, time-consuming, and limited in scope. With the proliferation of user-generated content on digital platforms, however, novel opportunities are emerging for more responsive and data-driven approaches to urban planning. One promising avenue is the application of sentiment analysis, an artificial intelligence (AI) technique that employs natural language processing (NLP) to interpret public opinion from textual data. Although sentiment analysis has been widely used in the hospitality, retail, and tourism sectors (Ghahramani et al., 2021), its use in evaluating public spaces and UGS remains relatively underexplored. Online review platforms such as Google Reviews offer a rich repository of user feedback that can be leveraged to understand how people perceive and experience urban green spaces.

Recent studies have demonstrated the potential of sentiment analysis and topic modelling to extract actionable insights from large volumes of user-generated content (Ghahramani & Pilla, 2021). In this study, we apply an AI-based approach to analyse public perceptions of UGS in Kuala Lumpur using data sourced from Google Reviews. Tools such as Selenium and PyCharm were employed to automate data extraction and facilitate text analysis. The topic modelling method was used to classify reviews and identify key themes related to the quality and usability of UGS. By combining sentiment analysis with qualitative content analysis, this approach presents a scalable, low-cost alternative to traditional methods for evaluating public spaces. It allows planners and policymakers to monitor real-time feedback and uncover nuanced insights about user satisfaction, expectations, and recurring issues. Such an intelligent, data-informed approach can enhance urban governance by helping authorities design and manage green spaces that are more attuned to the needs and preferences of residents and visitors alike.

## RESEARCH METHODOLOGY

This study adopts a mixed methods approach as outlined by Creswell and Plano Clark (2017), which integrates both qualitative and quantitative elements to obtain a more holistic and nuanced understanding of visitors’ perceptions toward UGS in Kuala Lumpur. Mixed methods research enables the collection and analysis of different types of data within a single framework, allowing researchers to triangulate findings, address research questions more comprehensively, and leverage the respective strengths of each methodological tradition. Although both qualitative and quantitative data were utilised, the qualitative component forms the core of this study. This component involved collecting user-generated content in the form of reviews and ratings posted on Google Reviews for selected UGS. This digital ethnographic approach allowed the research to access naturally occurring, unsolicited opinions that reflect authentic user experiences. Qualitative data was particularly useful in uncovering users’ emotions, perceptions, and expectations regarding the quality, design, and usability of urban green spaces.

A one-week data mining exercise conducted in March 2023 extracted a total of 12,000 user reviews from four selected urban green spaces. The study employed a suite of Python-based tools, specifically Selenium for automated web scraping and PyCharm as the integrated development environment (IDE) for processing and scripting. Using Google Colab and the Python Streaming Application Programming Interface (Google Places

API, 2018)), all reviews posted by visitors on Google Reviews for popular parks in the Kuala Lumpur area were collected, covering entries from the earliest to the most recent. Although Google Colab imposes a rate limit on the streaming API, the sample was limited to four selected parks Taman Tasik Permaisuri, Taman Eko Rimba, Taman KLCC, and Taman Botani Perdana which occasionally resulted in minor errors during the review collection process. Figure 1 explains the study's methodological diagram, specific sampling strategy, and data analysis.

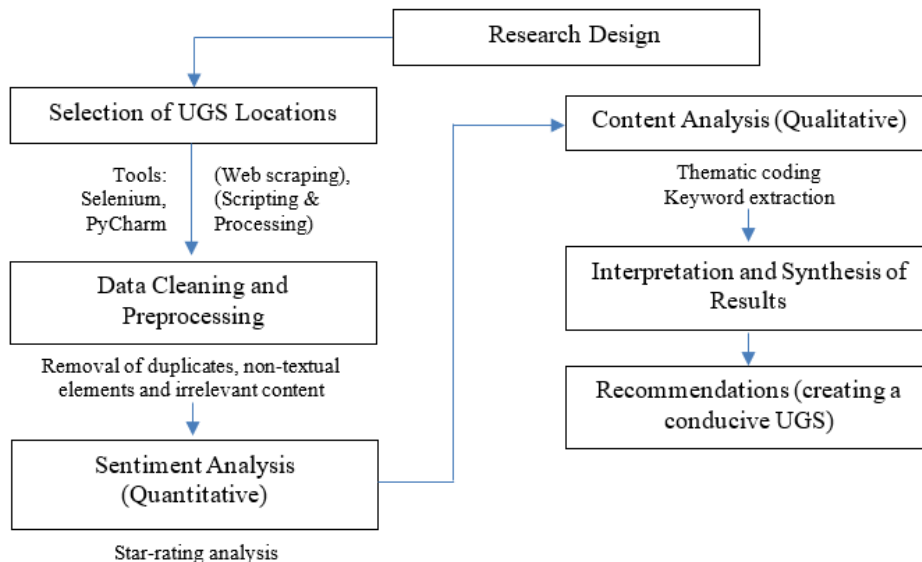


Figure 1. Research process.

The quantitative dimension of the study is integrated through the measurement of sentiment polarity scores and the aggregation of rating data associated with each park. These numerical indicators were analysed to identify general trends in public satisfaction. By combining qualitative content with measurable sentiment scores and star ratings, the study offers a more comprehensive view of public sentiment. A total of four urban green space locations were selected based on the richness of available review data. The collected data underwent two major analytical processes:

- **Sentiment Analysis** – This process was powered by AI techniques, using natural language processing (NLP) to detect the emotional tone of user comments. Sentiment analysis was used to classify textual data into positive, neutral, or negative sentiments and generate a polarity score for each review.
- **Content Analysis** – A complementary qualitative approach was used to identify recurring themes, keywords, and user concerns within the reviews. This involved cleaning the text data and analysing it to reveal patterns and insights related to users' experiences, expectations, and values.

These methods were supplemented by word cloud visualisations to highlight the most frequently mentioned terms and issues. The combination of AI-driven sentiment analysis and thematic content analysis enabled a robust interpretation of how urban green spaces are perceived by their users. By integrating big data analytics with qualitative interpretation, this methodology offers urban planners and decision-makers a scalable, replicable, and cost-effective tool to assess public feedback on green spaces—aligning with the smart city and participatory planning goals of KLSP2040 and the Sustainable Development Goals (SDG 11).

## Study Area

Kuala Lumpur, the capital of Malaysia, was selected as the study area due to the availability and suitability of big data from Google Reviews for sentiment analysis of urban green spaces. Using global-scale user-generated content, the study filtered and mined park-related reviews specific to Kuala Lumpur to focus on relevant, localized insights. This approach enables the analysis of visitor sentiment and key aspects for improving urban green space planning and management in the city. Although there are 19 major parks (UGS) in Kuala Lumpur,

only four were selected for this study; (1) Taman Tasik Permaisuri, (2) Taman Eko Rimba, (3) Taman KLCC, and (4) Taman Botani Perdana (Figure 2). These parks were chosen based on high star ratings (4.3 and above) and a large number of reviews on Google Reviews, offering strong representation of well-visited and accessible neighborhood parks in the city.

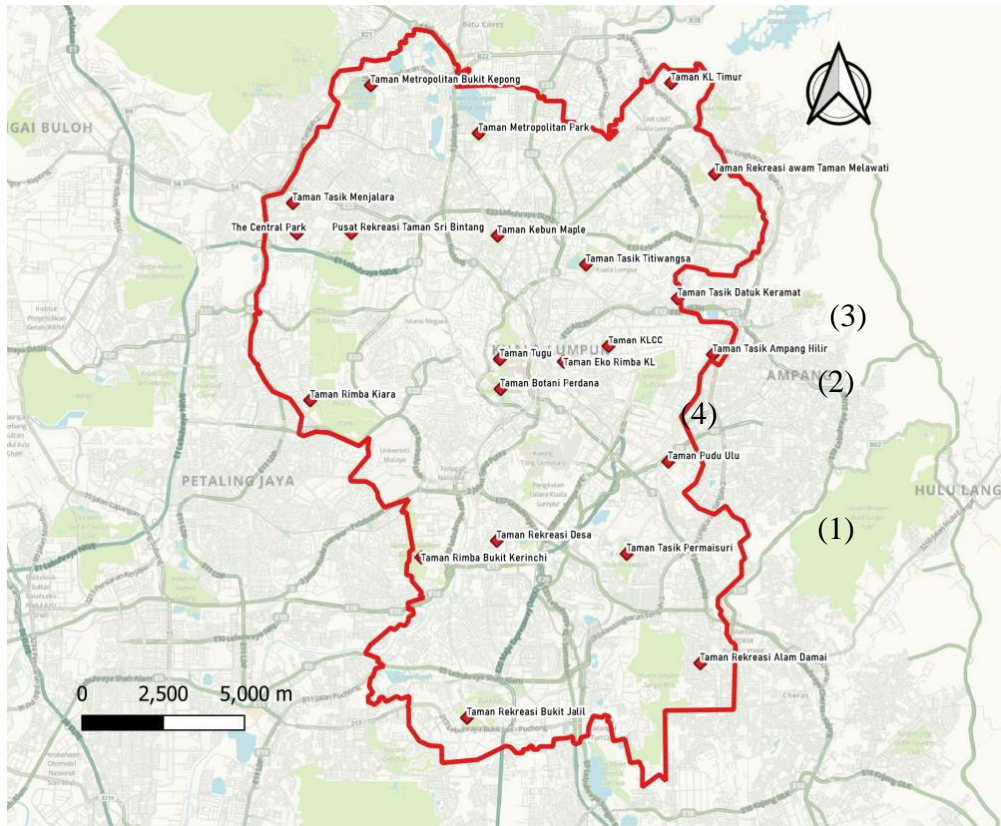


Figure 2. Locations of four selected UGS within the Kuala Lumpur City.

This study used publicly available user-generated content from Google Reviews, with no direct interaction or collection of identifiable personal data. All data were anonymized and analysed solely for academic purposes. In line with ethical internet research guidelines, user privacy was respected, and no attempts were made to trace or contact reviewers. Although formal ethical approval was not required, the research adhered to principles of responsible data use and digital ethics.

## FINDINGS AND DISCUSSION

### The Nature of Selected Urban Green Spaces

The authors gathered data on the following keywords for a simple comparative analysis of the selected four (4) urban green spaces in Kuala Lumpur City, as detailed in Table 1.

Table 1. Comparison of key elements/keywords of the selected four UGS in Kuala Lumpur

Elements / Keywords	Taman Tasik Permaisuri	Taman KLCC	Taman Eko Rimba	Taman Botani Perdana
Location	General terms such as "city" or "center" are used due to the location in Kuala Lumpur, along with specific words like "living" and	General terms such as "city" or "center" appear due to the location in Kuala Lumpur, with specific terms like "shopping."	General terms such as "city" or "near" are used because of the Kuala Lumpur location, with specific references to "food."	General terms such as "city" or "central" are used, with specific mentions of "food" and "hill" due to the location



	"community."			in Kuala Lumpur.
Quality	General descriptors like "beautiful" and "nice," with specific words such as "best" and "enjoy."	General descriptors like "beautiful" and "nice," along with specific words such as "awesome" and "pleasant."	General terms such as "beautiful" and "nice," with more specific mentions of "view" and "environment."	General terms such as "beautiful" and "nice," with the specific word "fresh."
Characteristics	Diversity of biodiversity and a dominant lake feature, with specific mentions of "big" and "large garden size."	Emphasis on scenic landscapes, including water fountains and ponds, with specific mention of "dominant fountains" and "pool."	Biodiversity features such as nature, birds, fish, and trees.	A variety of biodiversity elements, including lakes and flowers, with the most dominant aspect being greenery.
Activities	General recreational activities such as walking and jogging, with specific mentions of "feeding" and "playing."	Recreational activities predominantly involving "jogging" and "walking."	Activities include walking, shopping, photography, and socializing.	Recreational activities specifically include "cycling" and "taking pictures."
Issues	General concerns such as cleanliness and maintenance, with specific issues mentioned like "crows" and "open/close" conditions.	General concerns include cleanliness, maintenance, and security, with specific issues such as "hot weather."	General issues such as cleanliness, maintenance, and security, with specific mention of "entrance fee" and "TLK."	Common issues like cleanliness, maintenance, and security, with specific concerns such as "crowded," "closed," and "TLK."

Source: Research fieldwork (2023)

As shown in Table 1, the AI-based sentiment analysis of visitors' reviews reveals five core themes that reflect public perceptions of urban green spaces (UGS) in Kuala Lumpur namely; location, quality, characteristics, activities, and issues. The strategic location of parks—often described as central, accessible, and near vibrant urban features such as food and shopping areas—enhances their attractiveness and usage. Visitors also expressed positive sentiments regarding quality, frequently using words like “beautiful,” “awesome,” and “pleasant,” which reflect a high level of satisfaction with the overall park ambiance. In terms of characteristics, the presence of rich biodiversity, large green areas, and scenic features like lakes and fountains contributes to the ecological and aesthetic appeal of these spaces.

Common activities mentioned include walking, jogging, cycling, photography, and family-oriented engagements, underscoring the multifunctional role of UGS in supporting physical activity and social interaction. Despite the overall positive outlook, recurring issues such as cleanliness, maintenance, security, overcrowding, and entrance fees were noted, suggesting the need for improved park management and facilities. These insights, drawn from AI-powered content analysis of user-generated data, demonstrate how integrating sentiment analysis into urban planning processes can provide valuable, real-time feedback from users. This approach not only complements traditional evaluation methods but also supports the development of more inclusive, responsive, and user-centered UGS in Kuala Lumpur.

## Sentiment Analysis of Urban Green Spaces

A total of four urban green spaces (UGS) were selected as the primary study areas for this research: Taman Tasik Permaisuri, Taman Eko Rimba, Taman KLCC, and Perdana Botanical Gardens. These parks were chosen based on the richness, diversity, and consistency of user-generated content available on Google Reviews, especially in terms of textual feedback and star ratings. The selection represents a range of spatial typologies and functions—from highly urbanised recreational parks to ecologically sensitive nature reserves—offering a balanced view of UGS in Kuala Lumpur. As these parks attract a high volume of visitors, they serve as ideal case studies for analysing public sentiment. The sentiment analysis results are summarised in Figure 3.

### Taman Tasik Permaisuri

Sentiment analysis of Taman Tasik Permaisuri revealed a largely positive public perception, with approximately 79.1% of reviews expressing favourable opinions. Visitors commonly praised the park's scenic environment, well-maintained landscape, jogging tracks, shaded picnic areas, and family-friendly atmosphere. Features such as mature trees, seasonal landscaping, and occasional horse-riding guards enhanced the overall experience. In contrast, negative sentiment accounted for 9.8% of reviews, often highlighting concerns such as vandalism, poor cleanliness, inadequate maintenance, and staff behaviour. Some users also mentioned issues like misleading operating hours and uncollected waste. Meanwhile, 11.1% of reviews were neutral, typically consisting of brief or factual observations that lacked evaluative content.

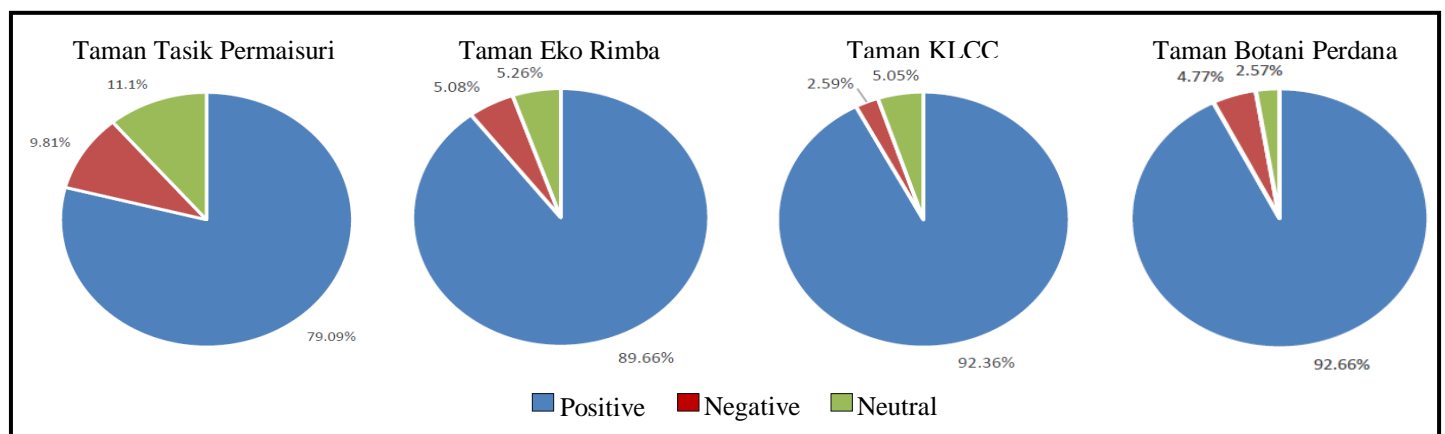


Figure 3. Sentiment analysis of the four UGS in Kuala Lumpur.

### Taman Eko Rimba

Taman Eko Rimba received overwhelmingly positive sentiment, with 89.7% of reviews highlighting favourable experiences. Users appreciated the park's unique natural features, including forest trails, biodiversity, and peaceful ambiance—all within a central urban location. Many described it as a “green escape” ideal for jogging, family outings, and stress relief. These findings align with literature (e.g., Gascon et al., 2015) that links green space access to mental and physical wellbeing. Negative sentiment was minimal, at just 5.1%, but included concerns about closed facilities, maintenance issues, crowdedness, and inadequate parking. Addressing these issues is essential to maintaining high visitor satisfaction. A further 5.3% of reviews were neutral, consisting of factual observations or general comments without strong emotional tone—for example, trail descriptions, expected reopening dates, or reminders to bring insect repellent. Overall, the findings for Taman Eko Rimba underscore the strong link between the unique characteristics of urban green spaces and positive public sentiment, affirming their value in promoting urban wellbeing.

### Taman KLCC

The analysis of Taman KLCC indicated a very strong positive perception, with 92.4% of reviews reflecting satisfaction. Visitors praised its iconic musical water fountain, well-maintained green spaces, jogging paths, and children's playgrounds. Its strategic location—adjacent to public transport, dining, and shopping—enhanced its appeal as a multifunctional destination. The park is often described as a “green oasis” amid the

city's dense urban fabric. Negative sentiment was minimal, at around 2.6%, but pointed to issues such as mosquito presence at night, overcrowding on weekends, security concerns, and poor lighting in certain areas. While not widespread, these issues should be addressed to ensure user comfort and safety, particularly during peak hours. Approximately 5.1% of reviews were neutral, often comprising general or unrelated comments, such as shopping experiences, restaurant feedback, or brief greetings. These reviews offered little evaluative content related to the park itself. In summary, Taman KLCC enjoys high public approval, with its iconic features, central location, and multifunctional design contributing significantly to positive sentiment. Continued efforts to address minor concerns related to crowd control, maintenance, and safety will help sustain and further enhance its quality and user satisfaction.

### Taman Botani Perdana (Perdana Botanical Gardens)

As one of Kuala Lumpur's oldest and most expansive green spaces, Taman Botani Perdana recorded a predominantly positive sentiment, with 92.7% of reviews expressing satisfaction. The activity aspect was a major contributor, with visitors frequently engaging in jogging, photography, nature walks, and other recreational pursuits. The garden's lush landscape, floral diversity, and tranquil environment were repeatedly mentioned as highlights. Negative sentiment accounted for just 4.8%, mainly concerning limited parking, cleanliness, and restricted operating hours. Such infrastructure-related challenges, while not dominant, may affect user convenience. Neutral comments (2.6%) typically included factual or incidental remarks, such as attending nearby events or spotting wildlife. In sum, the gardens' rich biodiversity and recreational offerings contribute significantly to its reputation as a top-tier UGS in the city. The researchers have concluded few key findings of the sentiment analysis derived from the four UGS in Table 2.

Table 2. Summary of key findings from the sentiment analysis of the four UGS

<p><b>Positive sentiment trends:</b></p> <p>All four parks demonstrated high levels of positive sentiment, ranging from 79.1% at Taman Tasik Permaisuri to over 92% at both Taman KLCC and Perdana Botanical Gardens. These sentiments were shaped by a variety of attributes:</p>	<p>Taman Tasik Permaisuri: Valued for its family-friendly atmosphere, greenery, and picnic facilities.</p> <p>Taman Eko Rimba: Praised for its biodiversity, forest setting, and accessibility as a tranquil retreat within the city.</p> <p>Taman KLCC: Recognised for its iconic location, musical water fountain, and well-integrated recreational and shopping amenities.</p> <p>Perdana Botanical Gardens: Celebrated for its spaciousness, diverse flora, and suitability for leisure, jogging, and creative inspiration.</p>
<p><b>Negative sentiment trends:</b></p> <p>Negative sentiment was consistently low across all four parks, ranging from 2.6% to 9.8%, but recurring themes did emerge:</p>	<p>Cleanliness and maintenance: Mentioned in reviews for Taman Tasik Permaisuri, Taman Eko Rimba, and Perdana Botanical Gardens.</p> <p>Overcrowding and congestion: Especially during weekends at Taman KLCC and Perdana Botanical Gardens.</p> <p>Limited parking facilities: A common concern at Perdana Botanical Gardens.</p> <p>Security or lighting issues: Noted particularly in KLCC Park during evening hours.</p>
<p><b>Neutral sentiment trends:</b></p> <p>A small proportion of reviews (approximately 2.6%–11.1%) were categorised as neutral, generally consisting of factual or unrelated observations. These contributed limited insight but reflect the presence of non-evaluative user interactions within public review platforms.</p>	

## Content Analysis of Urban Green Spaces

Prior to the sentiment analysis, the content analysis was conducted on the collected reviews, focusing on five key aspects: location, physical characteristics, types of activities supported, perceived quality, and recurring issues or concerns and the results was presented in Figure 4.

### Taman Tasik Permaisuri

As shown in Figure 4, the activity aspect emerged as the most prominent theme in the content analysis of Taman Tasik Permaisuri, accounting for 34% of all user reviews. Activities such as jogging, picnicking, and family recreation were frequently mentioned, highlighting the park's value as a site for physical exercise and social interaction. These activities provide not only opportunities for relaxation and connection with nature but also contribute to stress reduction and overall mental well-being. The presence of jogging tracks, open picnic spaces, and children's playgrounds enhances the park's appeal for families and individuals seeking outdoor leisure. Sample user comments include; "It's a good place for jog, relax and also picnic"; "Excellent place for jog, there is a lake where you can feed the fishes"; "Nice place for jogging and relax with family. Have huge playground for kids to play, also can feed fish at *tasik* (lake) while picnic"; and "Nice place to go for exercise. Giving you different level of jogging track. Suitable for family picnic". Furthermore, the characteristic aspect made up 26% of the reviews, reflecting the park's distinct physical features and ecological value. Users frequently mentioned the central lake inhabited by freshwater fish, as well as the decorative flower gardens, which together create a visually appealing and biodiverse environment. Such characteristics not only enhance aesthetic value but also support local wildlife and biodiversity. Selected review excerpts include; "In the middle of the pond there is a large tree with a huge number of birds!"; "Very good and big exercise place, there are a lot of fish in the lake"; "There is a lake where you can feed the fishes" and "The lake view just nice and awesome."

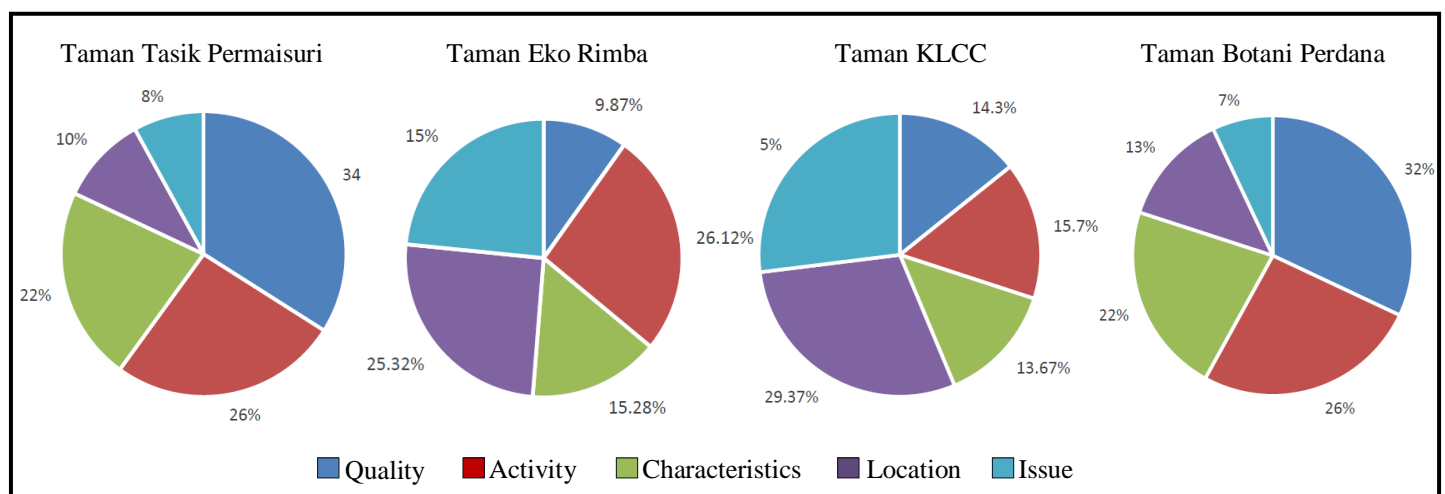


Figure 4. Content analysis of the five key elements of UGS.

The quality aspect on the other hand, accounting for 22% of the reviews, highlighted users' perceptions of the park's maintenance, longevity, and overall ambiance. Many visitors acknowledged the park's long-standing presence and consistent upkeep, noting its suitability for family-oriented activities. Sample comments include; "Nice Park that has been running since 1997. Many changes over the years yet still feeling great"; "Good local park"; "Cozy, nice place for family activities and well maintained". The issue aspect comprised 10% of the reviews and focused on concerns such as poor waste management, temporary closures, and lack of upkeep in certain areas. Although less dominant than positive aspects, these concerns indicate areas that require attention from park authorities to ensure sustained visitor satisfaction. Example reviews include; "Big place and nice but the dustbin not maintained, many rubbish on the floor" and "Still closed. Can't jog or play. Although the government has given flexibility for jogging." Finally, the location aspect accounted for 8% of the reviews. While the park is generally considered accessible and conveniently located, this aspect was mentioned less frequently compared to others. A typical comment reflecting this theme is "Many shop lots and restaurants around this park".



## **Taman Eko Rimba**

For Taman Eko Rimba, the location aspect accounted for approximately 9.9% of the reviews. The park's central location in Kuala Lumpur plays a significant role in its popularity and appeal, particularly due to its accessibility and convenience for urban residents and tourists. Its unique positioning as a natural retreat within a dense urban setting enhances its value as a green refuge in the city. Example reviews include; "A great jogging trail at the center of the city with beautiful KL Tower scenery"; "Taman Eko Rimba Kuala Lumpur is a great nature retreat located in the heart of the city"; "Large Park in the city center"; "It was rather refreshing to have nature that is easily accessible in the middle of the city".

The activity aspect comprised 26.1% of the content analysis. This highlights the diversity of activities offered at Taman Eko Rimba, including jogging, picnicking, nature walks, and notably, photography. The park's scenic features and forest-like atmosphere make it a popular spot for Instagram users, wedding shoots, and convocation photography, enhancing its social appeal. Sample user comments include; "You can do lots of activities here in the park such as picnic, jogging and exercise, walk in nature, wedding and convocation photography"; "For those who want to do an outdoor wedding photoshoot, there are many spots". The characteristic aspect accounted for around 25.3% of the analysis. Users frequently highlighted distinctive features such as the suspension bridge, diverse flora, and the mature forest landscape. These attributes define the park's unique identity as a tropical jungle in the city, enhancing its ecological and experiential value. Representative reviews include; "Lots of trees and a hanging bridge – the main attraction for tourists"; "If you want to feel the height of walking on a suspension bridge, try going to the eco jungle. The most fun place for me"; "The diverse landscape with mature trees, together with water birds, provides an interesting place for photo enthusiasts".

The quality aspect represented approximately 15% of the reviews. This aspect reflects visitors' perceptions of the park's cleanliness, infrastructure, and overall environment. Positive emotional responses often stem from well-maintained surroundings and family-friendly facilities. Example reviews include; "Good for family activities, such as exercise and jogging"; "Cozy, nice place for family activities and well maintained"; "Very beautiful and suitable for leisure for the whole family to hang out here". Lastly, the issue aspect contributed about 15.3% of the analysis. While less frequent than positive comments, these reviews pointed to parking difficulties, maintenance shortcomings, and congestion, particularly during peak hours. Addressing these concerns is essential to ensure consistent quality and enhance the overall visitor experience. Selected comments include; "The parking space, however, was rather difficult to access"; "Parking still not resolved and weak"; "Some parts of this park are not well maintained and need to be addressed".

## **Taman KLCC**

For Taman KLCC, the location aspect contributed approximately 14.3% of the content analysis. Strategically located in the heart of Kuala Lumpur, adjacent to the iconic Petronas Twin Towers, Taman KLCC offers convenient access for both locals and tourists. Its central location enhances its attractiveness as a recreational destination within a bustling urban environment. Sample user comments include; "Nice green area in the busy city"; "Big Park right in the city center with water park and play area for kids" and; "A nice and clean park in the middle of the city". Next, the activity aspect accounted for 15.7% of the analysis. Visitors often engage in activities such as jogging, leisure walking, relaxing, and photography, especially with the Petronas Twin Towers as a backdrop. These diverse activities highlight the park's multifunctional use and its appeal to a broad demographic, including fitness enthusiasts and tourists. Examples of visitor comments include; "I think here is the best spot if you want to take some pictures with the Petronas Towers in the background"; "Nice place to take pictures of the Twin Towers"; "Nice place to walk around, clean and secure place"; "Good place to just sit around and relax, even to do jogging".

The characteristic aspect was the most dominant, comprising 29.4% of the analysis. Taman KLCC is renowned for its musical fountain shows, water features, rubberized jogging trails, and lush landscaping, which significantly contribute to its unique identity. These elements enhance the visitor experience and are key attractions for both day and night visits. Selected comments include: "Nice place, especially at night. Beautiful fountain light"; "The park is really beautiful to watch the fountain display from, especially at night"; "The

walking trail with its rubberized paving was so conducive to hiking and the trees kept one cool”. The quality aspect represented 27% of the feedback. This includes perceptions related to the cleanliness, upkeep, design, and aesthetic appeal of the park. Many visitors expressed high satisfaction with the overall quality and visual environment. Sample reviews include; “Nice Park with a good view of the Petronas Towers”; “A very romantic and beautiful place with such a wonderful view and colourful lights”; “Amazing place and beautiful views outside and inside of KLCC Park” and “One of the best parks in Malaysia”.

The issue aspect accounted for 13.7% of the reviews. While the number of complaints was relatively low, recurring concerns included heat exposure, limited shaded areas, and occasional overcrowding. These issues can affect visitor comfort, particularly during midday hours, and addressing them could further enhance park usability. Examples of such feedback include; “Wear a hat, it’s very hot”; “Plenty of trees to shade from the sun”; “Hot. Better wear a cap” and “Make sure you bring your hat and have sunblock – it’s hot”. In summary, the content analysis of KLCC Park highlights its strengths in location, unique features, recreational functions, and maintenance quality. The park’s iconic landmarks and well-designed amenities make it one of Kuala Lumpur’s most celebrated urban green spaces. However, managing heat-related discomfort and improving shade infrastructure could enhance the overall visitor experience. These insights are valuable for guiding future improvements and sustaining the high standard of urban green space provision in the city.

### **Taman Botanical Perdana**

The results of the content analysis for Perdana Botanical Gardens revealed that the quality aspect had the highest proportion, accounting for 32% of the sentiment. This suggests that visitors highly value the park’s overall standards, including cleanliness, facilities, maintenance, and the overall visitor experience. Many reviews praised the garden’s peaceful atmosphere, cleanliness, and well-maintained amenities. Sample feedback includes; “Very nice place and I recommend”; “Great place for some peace and respite in the city” and; “Very interesting and nice place. You can easily spend a day here”. The activity aspect contributed approximately 26% of the analysis. Visitors frequently engaged in a range of leisure and fitness activities, such as walking, jogging, cycling, sightseeing, and photography. The park’s diverse and scenic environment makes it a popular destination for those seeking both recreation and relaxation. Examples of reviews include; “Good place for exercise. Relax”; “A great place for exercise and for family bonding”; “Great place to have an evening walk with family and friends” and; “One of the best places for jogging and doing photoshoots in KL.”

The location aspect represented 13% of the sentiment. The garden’s strategic location in central Kuala Lumpur enhances its accessibility and appeal to both residents and tourists. Visitors appreciated the convenience of a large, tranquil green space situated in the heart of the city. Sample comments include; “It is a big botanical garden in the middle of the city and many different themed small gardens exist in the place”; “A great park in the city center to enjoy nature and cardio workouts” and; “Botanical Garden near to the city center in Kuala Lumpur. Amazing place to visit when you travel to Malaysia”.

The characteristic aspect accounted for 22% of the sentiment. Visitors frequently mentioned the park’s diverse flora, themed gardens, and natural features as standout qualities. The presence of old trees, flower gardens, and biodiversity-rich areas contributes positively to the garden’s visual and experiential appeal. Sample reviews include; “Perdana Botanical Garden, please come and enjoy the beauty of various flora and fauna”; “Greenery, old trees, beautiful flowers— that moment was very pleasant to the mind”; “Consists of different gardens such as Hibiscus Garden, Sunken Garden & Herbarium, which are so pretty to watch”; “It has so many sections including butterfly park, deer park (which is currently unavailable), rare fruit trees”. The issues aspect represented the smallest portion of sentiment at 7%. Concerns raised by visitors included parking limitations, congestion, and maintenance or cleanliness issues. While relatively minimal, these issues may affect the overall visitor experience, particularly for those seeking a quiet and restorative environment. Examples include; “Congestion and limited parking make it less accessible during peak hours”; “Maintenance of some areas needs improvement to match the overall quality” and; “Not enough shaded areas during hot weather”. Overall, the sentiment analysis indicates that Perdana Botanical Gardens is widely appreciated for its high-quality facilities, diverse activities, rich natural features, and accessible location. While most feedback was positive, addressing practical concerns—especially related to parking, cleanliness, and infrastructure—will be crucial in sustaining its reputation and enhancing visitor satisfaction. This analysis offers valuable insights for

park management and urban planners seeking to improve and maintain Kuala Lumpur's premier urban green spaces.

## DISCUSSION OF RESULTS

This section discusses the comparative findings from the sentiment and content analyses conducted across the four selected urban green spaces (UGS) in Kuala Lumpur: Taman Tasik Permaisuri, Taman Eko Rimba, Taman KLCC, and Taman Botani Perdana. By examining the similarities and differences in sentiment and key content aspects, a more nuanced understanding of user experience and park functionality is achieved. As shown in Table 3, all four parks recorded high levels of positive sentiment, indicating a generally favorable public perception. This consistent trend suggests that these urban green spaces are widely appreciated and successfully serve their roles in providing accessible, safe, and pleasant environments for recreation and relaxation. High positive sentiment reflects the effectiveness of park design, location, facilities, and management in meeting user needs.

Table 3. Summary of comparative assessment for the sentiment and content analysis of the UGS

Comparative elements	Taman Tasik Permaisuri	Taman Eko Rimba	Taman KLCC	Taman Botani Perdana
UGS aspects	The dominance of the activity aspect reflects the popularity of recreational activities among visitors, including jogging, sightseeing, picnicking, and cycling		The characteristic aspect is the most prominent due to the presence of unique features such as the musical fountain and swimming pool, which serve as the park's main attractions	The quality aspect is the most prominent, reflecting the park's well-maintained, attractive atmosphere and serene environment
Similarities	Each park received a strong majority of positive sentiment in the analysis			

When comparing dominant content aspects, Taman Tasik Permaisuri and Taman Eko Rimba share a similar profile, with activity emerging as the most prominent theme. Visitors to these parks frequently mentioned engaging in jogging, walking, cycling, photography, and picnicking, highlighting the parks' capacity to support a wide range of recreational functions. Their natural settings, combined with accessible pathways and open spaces, make them ideal for both individual and family-oriented outdoor activities. In contrast, Taman KLCC was distinguished by a dominant focus on its characteristic features, particularly the musical fountain show, scenic water elements, and modern urban design. These iconic attractions significantly shape the identity of KLCC Park and attract both locals and tourists. The integration of built and natural features in a central urban location enhances its appeal and supports multifunctional use, including leisure, social interaction, and tourism.

Meanwhile, Taman Botani Perdana stood out for its emphasis on quality, which was the most frequently mentioned aspect in visitor reviews. This reflects users' appreciation for the park's cleanliness, well-maintained infrastructure, thematic gardens, and overall tranquillity. The park is often described as a peaceful, aesthetically pleasing retreat in the city, suggesting that high environmental quality plays a vital role in shaping positive sentiment, particularly among visitors seeking nature immersion and relaxation. In summary, while all four parks received overwhelmingly positive sentiment, each displays a distinct profile based on its dominant content aspect. Taman Tasik Permaisuri and Taman Eko Rimba emphasize active use and recreational flexibility. Taman KLCC offers unique urban attractions and visual features that shape its identity, while Perdana Botanical Gardens provides a serene and high-quality environment focused on design, maintenance, and natural beauty. These differences underscore the diverse roles UGS play in urban life and offer valuable insights for tailoring management and development strategies to enhance the visitor experience and park performance.

## CONCLUSION

This study explored visitors' perceptions of four key urban green spaces (UGS) in Kuala Lumpur Taman Tasik Permaisuri, Taman Eko Rimba, Taman KLCC, and Taman Botani Perdana—through AI-based sentiment and content analysis of Google Reviews. Using a mixed-methods approach, the research uncovered valuable insights into public sentiment and key experiential aspects across diverse park typologies. All four parks received overwhelmingly positive sentiment, with KLCC Park and Taman Botani Perdana leading in user satisfaction. Activity emerged as the dominant aspect in Tasik Permaisuri and Eko Rimba, reflecting strong engagement in jogging, walking, and picnicking. Meanwhile, Taman KLCC stood out for its distinctive features, particularly the musical fountain, while Taman Botani Perdana was most valued for its overall quality, maintenance, and serene environment. Content analysis revealed recurring issues such as parking constraints, cleanliness, and overcrowding, which require attention to improve visitor satisfaction. These findings highlight the diverse needs and preferences of UGS users. The study demonstrates the effectiveness of AI-driven sentiment analysis as a tool for urban planners and policymakers to assess user feedback systematically. It supports more inclusive and responsive planning, enabling improvements to urban green infrastructure based on real user experiences and expectations.

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