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

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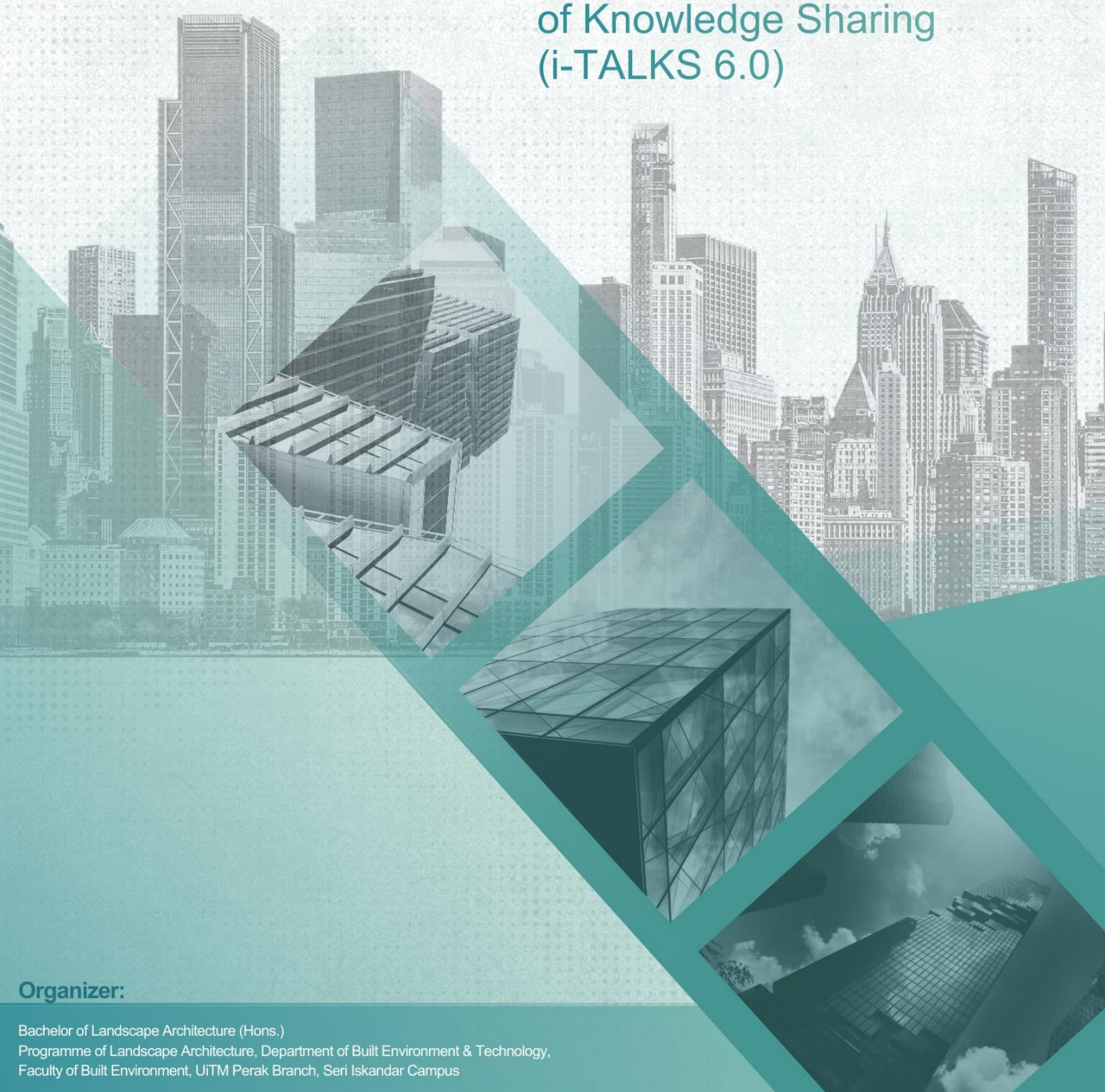
6th Conference On The Acclaimed Landscape of Knowledge Sharing (i-TALKS 6.0)



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Bachelor of Landscape Architecture (Hons.)
Programme of Landscape Architecture, Department of Built Environment & Technology,
Faculty of Built Environment, UiTM Perak Branch, Seri Iskandar Campus

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Assessment and Solution Aspects of Fallen Tree Incidents in Kuala Lumpur

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Abstract

The urban trees present invaluable ecological and social advantages in tropical cities, but the rising rates of the fallen trees have become a major concern of the public safety in Kuala Lumpur. Poor rooting areas, high density of infrastructure and exposure to weather conditions, which are extreme, also worsen the threat of tree failure in highly urbanised commercial areas like Bukit Bintang. This research will analyse the reasons behind the cases of fallen trees and determine the existing tree management within the city of Bukit Bintang, Kuala Lumpur. The study is based on the qualitative case-study design with simple quantitative observations. Field-based assessment of tree condition using simplified Level 1 and Level 2 principles of Tree Risk Assessment and semi- structured interviews with practitioners of local authorities and analysis of maintenance records and climatic data were used to collect the data. The research is conducted in three strategically chosen streets that reflect various urban situations. Results suggest that the root confinement, soil compaction, structural peculiarities of the species, as well as high target occupancy are the main factors that determine the chances of tree failure instead of the health of a tree in general. The species that were identified to pose higher risk levels were large- canopy and aggressive-root species such as *Ficus* species, *Eucalyptus deglupta* and mature *Samanea saman* when they are planted in limited urban sites. Most of the current management practices are mostly reactive based on visual inspection and post incident response and minimal use of standard risk assessment frameworks. The study recommends the implementation of proactive and risk-based approaches of urban tree management, such as standardized tree risk assessment procedures, better tree species selection, expansion of rooting space to urban design, and integration of technology-assisted monitoring systems. These measures have the potential to minimize instances of fallen trees and aid in healthier and more robust cityscapes in Kuala Lumpur.

Keyword: Urban Tree Risk, Fallen Trees, Tree Risk Assessment, Urban Safety, Kuala Lumpur

INTRODUCTION

Research highlights that it is in the heavily populated cities of tropical regions such as Kuala Lumpur exhibit extreme levels of density relied on city trees because it affects the quality of air, control of the temperature and contributes to the community. As an example, (Hasan et al., 2021) alleged that in 2024 city trees will be an essential part of the overpopulated world. tropical cities like Kuala Lumpur. Cadaval et al. also observed that as the cases of fallen trees were increasing, it also becomes a safety issue in the city. On 22 October 2025, in Kuala Lumpur, in the middle of the night, it was pouring, several trees were knocked down, caused death to one man and injury to another person when a tree fell. collided with a passing car. Urban aging canopy, number of storms, and crucial infrastructure. society constraining root areas are one of the most significant features in society that help trees to fall. It is necessary to mention that wind, opinion, and five additional factors mentioned as the leading causes of the trees failures in city settings are present. root disorders, city tree acts, and types of trees ((Straits

Times, 2025); (Salim & Husin, 2021)).

When it comes to the problem of fallen trees, a holistic approach based on the physical condition of trees and the managed urban tree strategies must be efficient in addressing the cases of fallen trees. This will contain structural and biophysical components of tree risk and the elements that explain the immediate or distant. environment and climate. These structural and biophysical data are canopy forms, root stability patterns. internal deterioration, inclining grade, and other surrounding or what are known as climatic causes as wind. direction or soil fertility (Chau et al., 2023). Moreover, risk management of the failures of trees relies on the issues of management on keeping track of activities, pruning and maintenance planning based on ((Salim & Husin, 2021); (Abdul Hayat Mat Saad et al., 2023)). The use of AI-IoT surveillance systems and sonic tomography technology helps in early detection of instability in trees that result to appropriate stability restoration before it is late. The latter can be found in ((Chau et al., 2023); (Abdul Hayat Mat Saad et al., 2023)). Thus, this research will attempt to fulfil three main objectives: (i) determine weather condition and trees properties and structural issues that result to Kuala Lumpur incidents of trees and (ii) test existing management methods of monitoring and maintenance and pruning and (iii) come up with practical solutions on how to minimize dangers in the city that are caused by trees. The study is a combination of incident data processing that includes management system evaluation to develop evidence-based solutions that can be used to make cities safer spaces in Kuala Lumpur.

LITERATURE REVIEW

Introduction to Urban Tree Management

Urban trees are also a key element of a sustainable city, which brings them various environmental, social, and aesthetic advantages. They are observed to have a significant positive effect on air quality by capturing contaminants and producing particulate matter. Similarly, the cooling effect of cities because of shading effect offered by urban trees, in conjunction with evapotranspiration, reduces noise and helps to mitigate floods. Despite these environmental benefits, besides these, trees in cities present some other type of functionality that facilitates the welfare of the population; they provide a place where people engage in leisure activities, visual relaxation, and psychological calming in crowded environments (Locosselli et al., 2021). Such benefits are more vital in tropical urban areas like Kuala Lumpur where urbanization rate is high, population density is high, and weather patterns are unpredictable and create heavy pressure on the green areas. Nevertheless, urban trees are prone to high risk of structural failures which could endanger human life, property, traffic flow and utilities. In 2025, Kuala Lumpur, where there were intense rainfall and storms, several people got hurt and died because of a collapsing tree. This accident revealed shortcomings in the maintenance of trees, their observation, and the control of species ((The Star, 2025); (Straits Times, 2025); (Salim & Husin, 2021)). These incidences highlight the need to have an all-inclusive strategy of managing trees in urban areas that would promote the ecological values of the area against the safety constraints.

Causes of Tree-fall Incidents

The failure of the trees in urban areas is the product of a complex interaction of the physical properties of trees, environmental stresses and the physical limitations of the urban environment. Physical tree characteristics, including species, age, canopy size, wood density, root structure, internal rot, among others, affect the chances of failure ((Chau et al., 2023); (Byard, 2024)). Urban environments have an increased vulnerability to failure in the trees with limited root zone, especially large canopy, where the growth of deep roots is hindered by soil

compaction, or the root growth is physically limited by pavements and underground utility lines among other systems ((Sukri et al., 2024); (Lazim & Misni, 2016); (Salim & Husin, 2021)). The failure of trees is also caused by the environmental factors; heavy rainfall, winds, and tropical storm are conditions that increase the exposure of trees which have been already damaged. A high correlation between the extreme weather events and the falls of trees has been recorded by international studies. For example, (Buson & Bortolini, 2025), established that wind gusts as well as cumulative rainfall were the leading causes of tree falls compared to any other cause in the city of Venice, Italy. (Mendes et al., 2024), found out that almost half of all the trees falls in Lisbon, Portugal, were because of a strong wind in 12 hours. According to (Locosseli et al., 2021), climate-related variables were noted to be among the factors that led to the collapse of urban trees in the case of the city of São Paul in Brazil. Overall, these investigations show that the limitations of the physical capabilities of trees in the environment are aggravated by the environmental factors, which is why the assessment of the threat to human safety needs to be conducted in a comprehensive manner.

The trees located in urban areas are susceptible to internal structural inefficiencies such as decay, cavities, cracks, and canopy imbalance and external environmental factors that can cause an unexpected failure or collapse in the typical environmental conditions ((Byard, 2024); (Chau et al., 2023)). Biological reaction of trees to urban development is also significant and contributes to more vulnerability of a tree to collapse. As an example, the consequences of urbanization on the physical properties of soil, hydro-logical, and microclimate are proven to cause further destabilization of mature trees ((Cadaval et al., 2024); (Salim & Husin, 2021)). In addition, the roadside trees are also subject to some other stress factors provided by vibrations caused by passing cars; in combination with less space to develop the roots and canopy, it increases the chances of collapse (Hasan et al., 2021). As a result, the internal structural status, as well as the external environmental pressures, should also be taken into consideration when developing an efficient urban tree risk-mitigation plan.

Current Fall Trees Cases

Figure 1
Location: Jalan Sultan Haji Ahmad Shah
Date: 22 October 2025

Source: Berita Harian

Figure 2
Location: Tanah Perkuburan Islam Jalan Ampang
Date: 24 November 2025

Source: Berita Harian

Figure 3
Location: Jalan Pudu

Date: 17 January 2025
Source: The Star

Figure 4
Location: Stesen LRT Bangsar
Date: 24 November 2025
Source: KOSMO!

Evaluation and Risk Evaluation strategies

High-tech methods of tree assessment have been developed to discover risks posed by the failing tree, hence protecting people against risks posed by such trees. Many of the conventional approaches are based on the visual inspection of the conspicuous defects (trunk lean, uncovered roots, cracks, fungus, or imbalanced canopy) ((Salim & Husin, 2021); (Lazim & Misni, 2016); (Abdul Hayat Mat Saad et al., 2023)). Although it is appropriate in most conditions, the visual inspection has a low ability to expose defects that are located internally. Thus, others are

investigating alternative methods of evaluation that use modern technology, such as sonic tomography, resistograph examination, and AI-IoT tilt measurement system ((Hui et al., 2022); (Chau et al., 2023); (Abdul Hayat Mat Saad et al., 2023)). As an example, (Chau et al., 2023), proved that AI-IoT surveillance of trees in cities allowed giving early alerts on progressive lean and structural instability, which made it possible to intervene before the failure of trees. Likewise, (Hui et al., 2022), concluded that predictive instability of urban trees in their precocious presence at the time of a typhoon can be detected by smart tilt sensors, which validates the predictive potential of technology-enabled tree surveillance

By integrating the local conditions, including the type of soil, underground water movement, the direction of the wind, and the degree of species-specific damage, tree hazards assessment will be more accurate ((Abdul Hayat Mat Saad et al., 2023); (Hasan et al., 2021)). With the help of Geographic Information Systems (GIS), remote sensing, and other innovations, it is possible to create an inventory of trees in a certain area, trace the history of failures of trees, and determine the area with the maximum level of risk ((Cadaval et al., 2024); (Chau et al., 2023)). Integrating predictive analytic instruments and technology-driven monitoring enables managers to move away to be responsive and proactive, hence using resources in a more effective way to enhance safety in urban settings.

Existing Malaysian Tree Management practices

Kuala Lumpur has local bodies that are involved in the management of trees in the vicinity, including the Dewan Bandaraya Kuala Lumpur (DBKL). The duties of DBKL include but are not limited to pruning, checking the roots of the trees, eradicating unhealthy trees, and overall care of urban trees ((Salim & Husin, 2021); (Lazim & Misni, 2016)). Despite the actions taken by DBKL to take care of trees, there are several problems that are yet to be addressed. These are irregular maintenance, the lack of centralized tree risk databases, and the lack of the monitoring of the urban tree population in the city ((Salim & Husin, 2021); (Lazim & Misni, 2016)). Moreover, a major aspect of tree species selection is to identify the species with a lower probability of toppling in the regions where the soil compaction inhibits the development of roots ((Cadaval et al., 2024); (Hasan et al., 2021)). Lastly, the legal and policy framework that safeguards trees in Kuala Lumpur is inconsistent and diffuse, and this is likely to be a limiting factor in the application of proactive tree management practices ((Lazim & Misni, 2016); (Sukri et al., 2024)).

Solution Strategies and Technological Integration

The combined method of using technology, government policies, and community engagement is necessary to reduce the threat of tree falls. According to the latest developments in technology, high-tech monitoring systems that can measure the health of trees, their structure, and environmental conditions, including AI-IoT tilt sensors, sonic tomography, and GIS-based inventories, are the sources of data to be used in continuous assessments of the health of trees and their structural stability ((Hui et al., 2022); (Chau et al., 2023); (Abdul Hayat Mat Saad et al., 2023)). Predictive analysis will help detect trees that are at the greatest risk, according to their species, location features, and history of performance failures (Cadaval et al., 2024). Besides, the community can be engaged by building reporting systems and educational programs to recognize the risks that may occur in advance ((Lazim & Misni, 2016); (Hasan et al., 2021)).

Prevention management methods, including the proper choice of tree species, and improvement of the root zone, spatial planning, and regular pruning, help minimize the risk of the trees experiencing any environmental stresses when they still give ecological and aesthetic benefits ((Cadaval et al., 2024); (Hasan et al., 2021)). The systems of management of urban forests involving complete integration of innovative levels of monitoring and predictive

assessment, policy frameworks, and citizen involvement are well placed to manage the risk, improve resilience, and maintain the multifunctional worth of urban forests.

RESEARCH METHODOLOGY

The research design is a qualitative case-study design with a simplistic quantitative observation to examine the factors that lead to arboreal failure in Kuala Lumpur with a specific focus on the urban surrounding of Bukit Bintang. Bukit Bintang is chosen due to its high commerciality, high pedestrian and vehicular traffic, and the presence of roadside trees, which are exposed to stressors and limitations of urban environments, and damage by storms. These circumstances make the area a critical place of study of the possibility of tree failure in a highly populated urban environment. To collect data in a context- and situation-relevant way, the study will focus on three strategically selected streets or public spaces in Bukit Bintang. These rows have been chosen out of historical incidences of tree falls, visible features of tree stress and due to their saliency as pedestrian routes. The example of each row is a different state of an urban environment and thus the example of a commercial street, a walkway, and a planting area on the edge of the road, thus enabling the exploration of the local situation and the management styles of diverse areas of the urban environment.

The three main methods to be used to gather data will be field observation, semi-structured interviews and document analysis. Field observations will be done in all the three chosen rows with a view of recording the physical, biological as well as site specific conditions of the trees in the respective areas. Such observational parameters as identification of the species, estimation of height and diameter at the breast height (DBH), condition of the crown, structural defects, root exposure or confinement, history of pruning, soil properties, pavement pressure, and the area of utilities and buildings will be observed. To be consistent, the field assessment protocol will be based on simplified guidelines based on Level 1 and Level 2 Tree Risk Assessment (TRA). To support the observational facts, photographs and GPS coordinates will be taken. Individuals who will be interviewed semi-structured will include the staff of the local authority, municipal workers and the management personnel of the park whose responsibility is the management or monitoring of the trees of Bukit Bintang and the surrounding regions. Some of the interview questions will cover the daily maintenance, inspection, and operational difficulties, frequent reasons of tree failures, and the effectiveness of the existing risk management measures. Informed consent will be used, and where possible, audio-taped during the interviews and transcribed in a full manner to be analysed later.

The evaluation of documents will involve the inspection of maintenance records, fallen trees reports, pruning policy, design policy affecting roadside vegetation planting in Bukit Bintang and other relevant weather-related information like rainfall and winds. The documents will give a background of the contexts within which the conditions of trees and practices are managed within the selected rows. Thematic analysis of the qualitative data will be incorporated in data analysis alongside descriptive analysis of the observational data. Thematic analysis will be used to show patterns and categories of responses in interviews, field observations, and documentary materials and, thus, outline important factors that contribute to tree stability. The frequency of defects, site conditions and species that are most seen to be at risk in the three chosen rows will be summarised using descriptive analysis.

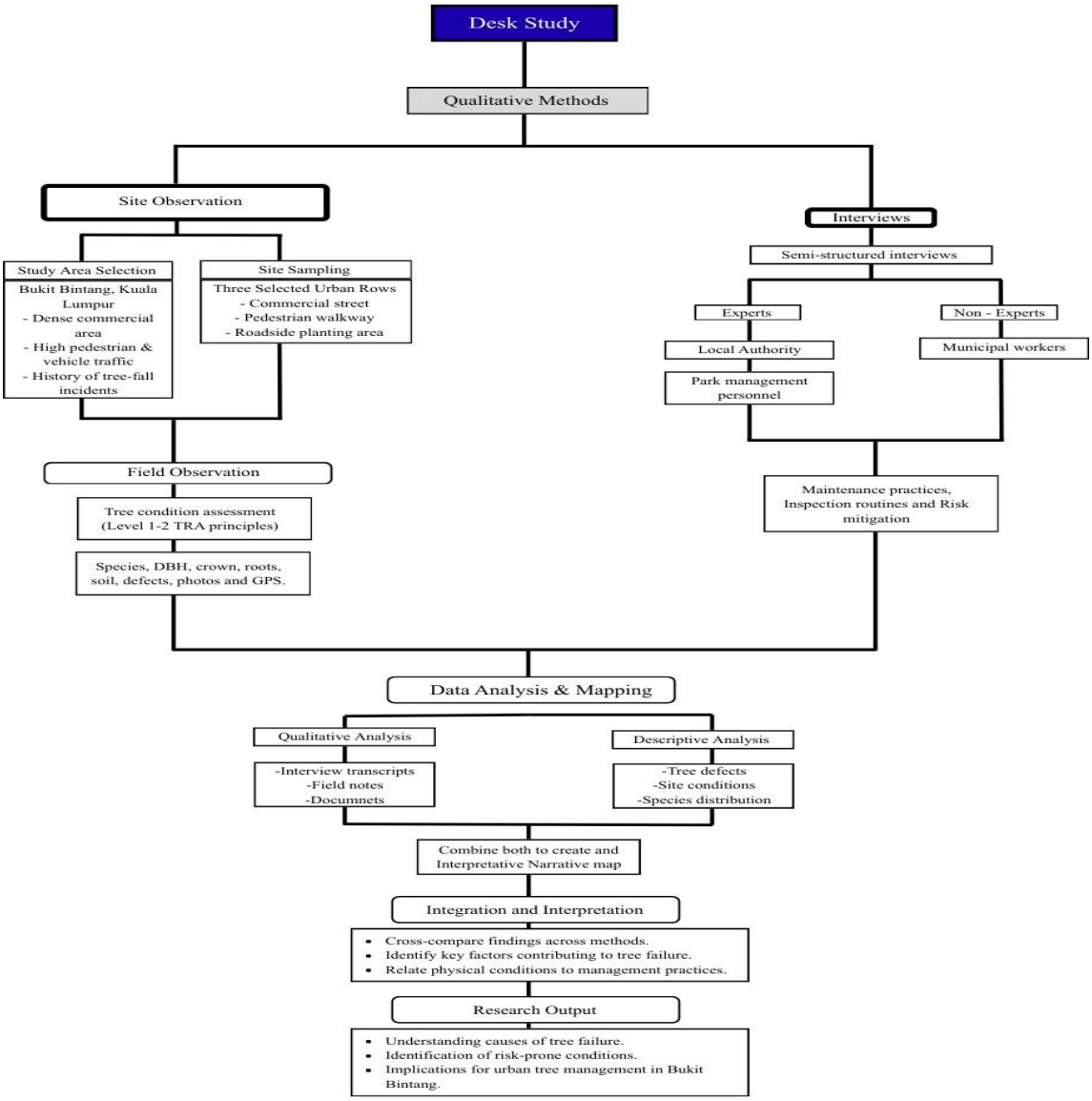

Figure 5: The diagram of methodology flowchart

The flowchart has schematic representation of the study framework. The qualitative case-study approach that was used to investigate the factors of urban tree failures within the Bukit Bintang district of Kuala Lumpur was supplemented by crude quantitative observations. The parallel and divergent urban conditions were chosen analytically by three separate rows of streets or public spaces. The data collection was based on field observations done according to simplified Level 1 and Level 2 principles of Tree risk assessment. Relevantly, semi-structured interview was conducted on relevant local authorities and management personnel using a semi- structured instrument. Weather records and related records were also analysed. The qualitative data were processed using thematic analysis, and the descriptive statistical methods were used on the observational data. Finally, an attempt was made to synthesize the findings to explain how the conditions of trees, site traits, and the management practices that mediate the risks associated with the failure of trees.

ANALYSIS AND DISCUSSION

Site Observation

A field-based tree condition assessment took place at Bukit Bintang, Kuala Lumpur. The evaluation was done on the areas with high human and vehicular traffic with the aim of determining the danger of tree falls. Bukit Bintang is a compact business community. The urban trees find this environment very challenging, which can be explained by the fact that soil space is limited, and infrastructure and human activity are high. The evaluation covered several factors among them, the structural quality of the trees, the root stability, the strength of trunks, the growth of the crown, and the site factors. The research was done based on the International Society of Arboriculture (ISA) Tree Risk Assessment (TRA) protocols.

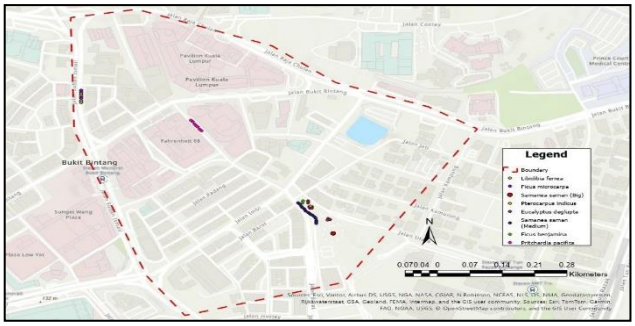

Figure 6: Map Distribution of Selected Urban Tree Species within the Bukit Bintang Commercial District, Kuala Lumpur

Figure 6: Map Distribution ofStudy Area Context

The locality is a busy business and tourist destination, which has intensive land use, building density, and significant foot- and vehicle-traffic. The boundary is defined by a polygon which includes the major roads such as Jalan Sultan Ismail, Jalan Gading, and Persiaran TRX Barat. The location has an area of about 0.28 km 2 and this is a small urban block. Planting of the trees is limited by the current infrastructure and buildings.

Site 1- Jalan Sultan Ismail

Figure 7: Enlargement map of Site 1
Source: Author, 2026

Figure 8: *Libidibia ferrea*
Source: Author, 2026

Figure 9: *Ficus macrocarpa*
Source: Author, 2026

Jalan Sultan Ismail is a very urbanised commercial arterial road characterised by high-rise construction, continuous surfaced roads, heavy motor traffic and heavy human movement. The assemblage of trees along this avenue has been dominated by *Libidibia ferrea* and the *Ficus macrocarpa* which are medium-to-large canopy taxa commonly used in urban healing. Although *Libidibia ferrea* tended to exhibit an intermediate level of structural stability, some of them exhibited limited root growth that could largely be explained by a limited planting strip and soil compaction. Interactions between evidential pavement-root were observed at various locations, which indicated permanent stress on roots.

The *Ficus macrocarpa* was at a high risk. On site surveys were recorded on aggressive root growth, shallow rooting plates and progressive root degradation, especially in areas of high human traffic. Despite bole and crown integrity being commonly considered as fair, the interaction between the loss of root anchorage and the large amount of mass of the crown has a significant effect on the predisposition to uprooting during storms. Given that the target occupancy was high in Jalan Sultan Ismail, failure of the arboreal would pose great dangers to the population and critical infrastructure. Therefore, the case in point demonstrates that even the high-canopy species planted in the setting where severe space restrictions apply may harbor high risks despite having a shallowly healthy phenotype.

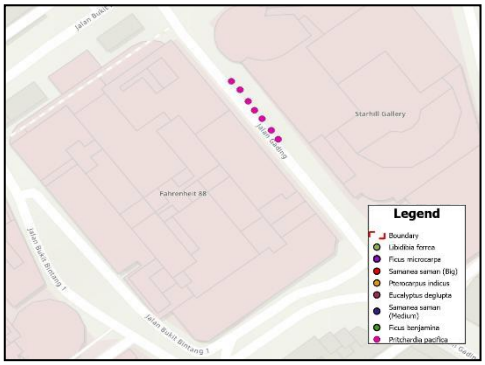

Figure 10: Enlargement map of Site 2
Source: Author, 2026

Figure 11: *Pritchardia pacifica*
Source: Author, 2026

Site 2- Jalan Gading

Jalan Gading is a relatively small-scale urban street, which is 523haracterized by reduced traffic rates and a more controlled planting environment. The arboreal taxon that was the most common occurrence in this street was *Pritchardia pacifica* a palm species that is regularly used in urban landscapes. The field appraisal indicated that the root, bole and crown conditions of *Pritchardia pacifica* were generally satisfactory and the structural aberrations were minimal. Its small-scale growth, comparatively low crown mass, and non-aggressive root system make it very applicable in the urban limited space planting areas. In addition, the site assessment did not show any significant pavement damage or root confinement effects.

Although the constraint in terms of soil volume that surrounds the hardscape is invariable, the structural qualities and growth patterns of the species reduce the likelihood of failure. Therefore, the three sites that were assessed showed that Jalan Gading had the lowest aggregate tree risk. The case illustrates the importance of the wise choice of species in city trees. The use of structurally compact and site-compatible like *Pritchardia pacifica* has been shown to improve safety performance and at the same time provide aesthetic and environmental benefits.

Site 3- Persiaran TRX Barat

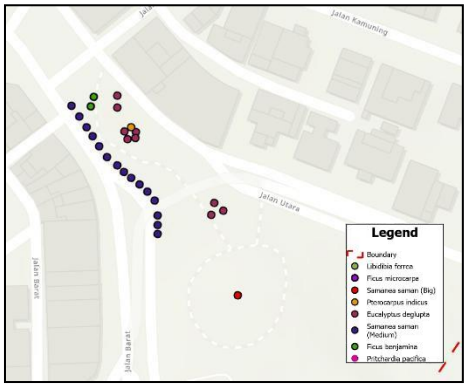

Figure 12: Enlargement map of Site 3
Source: Author, 2026

Figure 13: *Samanea saman* (Big)
Source: Author, 2026

Figure 14: *Samanea saman* (Medium)
Source: Author, 2026

Figure 15: *Ficus benjamina*
Source: Author, 2026

Figure 16: *Eucalyptus deglupta*
Source: Author, 2026

Figure 17: *Pterocarpus indicus*
Source: Author, 2026

Persiaran TRX Barat is a key connector road that surrounds the development at the Tun Razak Exchange (TRX) and is characterised by large road reserves, high traffic exposure and comparatively new urban landscape. Although the street has newer infrastructure, there is a mixture of various tree species of diverse sizes, such as big-canopy trees, medium-sized trees, *Pterocarpus indicus*, *Eucalyptus deglupta*, and *Ficus benjamina*. These included *Samanea saman* (big) that had the greatest potential risk, as it had a large diameter, high mass of the crown, and much lateral branching. Some of them exhibited poor branch unions and lopsided development of the crown, augmenting mechanical strain on the trunks and the root systems.

Poor root condition and narrow trunk form were seen in *Eucalyptus deglupta*, which was especially susceptible to wind-induced disastrousness. *Ficus benjamina* exhibited root constraint and lifting of pavements, which indicated unsuitable adaptability to urban constrained soil landscapes. Conversely, *Pterocarpus indicus* and medium sized *Samanea saman* tended to be in fair structural conditions although site restrictions have been noted like soils compacting as well as closeness to traffic which is considered a mediocre risk factor. Despite Persiaran TRX Barat having greater road reserve as compared to the old streets, it is highly exposed to wind and traffic vibration as well as environmental stress, which raises the possibility of impact of the failure of trees.

Result of Tree Condition at the Site Observation Area

Table 1 presents a comparative summary of the structural condition, health status, and overall risk level of the observed tree species within the Bukit Bintang study area, allowing identification of species that pose higher potential failure risk.

Table 1: Tree Condition Summary by Species – Bukit Bintang

No.	Species	Root Condition	Trunk Condition	Crown Condition	Site Condition	Overall Health	Key Defects Observed
1	*Libidibia ferrea* (Leopard tree)	Fair	Fair	Good	Fair	Healthy	Limited soil space, pavement-root interaction.
2	*Ficus macrocarpa* (Malayan Banyan)	Poor	Fair	Fair	Poor	Declining	Aggressive roots, soil compaction, high pedestrian exposure.

3	*Samanea saman* Big (Rain Tree)	Fair	Poor	Fair	Fair	Declining	Large DBH, heavy crown, weak branch unions.
4	*Pterocarpus indicus* (Angsana)	Fair	Fair	Fair	Fair	Healthy	Minor trunk wounds, moderate crown spread.
5	*Eucalyptus deglupta* (Rainbow Gum)	Poor	Poor	Fair	Fair	Declining	Tall slender form, wind exposure, shallow roots.
6	*Samanea saman* Medium (Rain Tree)	Fair	Fair	Good	Fair	Healthy	Moderate crown extension.
7	*Ficus benjamina* (Weeping Fig)	Poor	Fair	Fair	Poor	Declining	Root lifting pavement, confined planting pits
8	*Pritchardia pacifica* (Fiji Fan Palm)	Good	Good	Good	Fair	Healthy	Minimal defects observed.

Source: Author, 2026

Table 1 offers the comparison of the structural condition, health status and general risk level of eight tree species in the study area of Bukit Bintang. The results reveal the distinct differences in the condition of trees and the risk of the species. *Ficus microcarpa*, *Ficus benjamina*, *Eucalyptus deglupta* and large *Samanea saman* were determined to have high aggregate risk level primarily because of poor root conditions, lack of enough soil space, and high pedestrian and vehicular exposure. Major flaws that were common in these species included violent root systems, pavement clashes, heavy crowns, and structural imbalance, which predisposes them to failure.

In contrast *Pritchardia pacifica*, on the contrary, was in good condition of root, trunk, and crown, which resulted in a low assessment of the risk. The minimal size and a limited number of structural defects can reduce the risks of failure and probability of impact. The species such as *Libidibia ferrea*, *Pterocarpus indicus* and medium-sized *Samanea saman* were categorized as moderate risk that is characterized by the average structural conditions, local site limitations and a moderate crown development. In general, the results suggest that the root condition and site effect are the key influencing factors of tree risk in Bukit Bintang area, rather than tree health. The trees located in highly populated urban areas with small soil cover and high target population are at higher risk levels. Trees in heavily urbanized areas with limited soil space and high occupancy by targets have higher risk levels. This highlights the importance of choosing the right species and managing sites effectively in urban tree planning. This explains the need to select the appropriate species and sites in the planning of urban trees.

Expert and Practitioner Interviews: Urban Tree Management in Bukit Bintang

Interview Background and Purpose

The purpose of the interview is to gather first-hand data on the company's mission to enhance its performance and the methods it uses to achieve strategic goals. The background used in the interview is to collect first-hand information about the mission of the company to support its performance and the means it employs to attain the strategic objectives. The interviews were semi-structured and were held with the local authority staff, municipal workers and park management personnel who are directly involved in management and maintenance of urban trees in Bukit Bintang, Kuala Lumpur. These interviews were conducted to have the expert opinions about the current tree management practices, operational problems, causes of tree failures, and the current mitigation strategies of risks. The findings of the interview supplement field observations and document analysis with practitioner-based reflections on the risks of trees in an urban setting (highly urbanised commercial environment).

Interview Questions and Responses

Question 1: What are the primary aims of the management of trees in Bukit Bintang?
Response: The specialist described that the key goals of the city trees management in Bukit Bintang are the safety of people and aesthetic quality. Plants that grow near high traffic streets, and walks are well regulated in terms of avoiding dangers as well as ensuring aesthetic beauty. Trees located in high-traffic areas are assigned priority as the importance of failure would be the most drastic.

Question 2: What are the current routine maintenance practices of urban trees in Bukit Bintang? Response: Common practices associated with the routine maintenance are frequent pruning, over-extension branches, pruning away dead or hanging branches, and structural inspection of trunks that are leaning or cracks that are visible. Most mature trees tend to depend on rainfall whereas newer trees or trees of high value might be provided with extra irrigation. The frequency of maintenance depends on the type of tree, its size, age and location with those along major roads and pedestrian areas given priority.

Question 3: What are the key issues in management of urban trees in this region?
Response: Several issues of operation were identified. These are small soil volume, extreme soil compaction, and closeness of tree to pavements, roads, and buildings all of which limit the development of roots and decrease the tree stability. Dense human and traffic movement also makes it hard to provide maintenance services and creates safety issues when inspecting and pruning. Further, the implementation of proactive and comprehensive tree risk assessments is impeded by resource constraints lack manpower, funding, and specialised equipment.

Question 4: Which of the tree species are more prone to fall in Bukit Bintang and why?
Response: The expert claims that some species are at a higher risk of structural failure because of their growth patterns and exposures to the urban environments. *Ficus microcarpa*, *Ficus benjamina* and huge *Samanea saman* were found to be especially weak. The species are likely to contain aggressive or shallow root systems and heavy and bulky crowns, which augment mechanical stress when planted in tight urban areas with compacted soils.

Question 5: What are the general reasons of trees failure that are witnessed in Bukit Bintang?
Response: The problem of tree failure in Bukit Bintang was due to the combination of factors. Root instability was also found to be a major cause in compacted or limited soil areas. They have structural defects like codominant stems, trunk cavities, cracks, and internal decay, which make them even more dangerous to failure. The triggering

factors are usually the environmental stressors, especially heavy rainfall and strong wind. The mechanical damage caused by neighbouring building works and human intervention, fungus and infestation by pests were also reported.

Question 6: What are the current ways in which the local authority controls the risks of trees?
Response: Most of the mitigation methods that are currently used are mostly reactive in nature in which they are aimed at correcting apparent flaws and relying on the presence of complaints or occurrence of accidents. Precautionary steps would be the pruning, dead branch removal and root pruning in extreme cases. The trees that are often spotted to be unstable can be cut or substituted. Nonetheless, judgments are made on experience in the field instead of risk assessment instruments.

Synthesis of Interview Findings

Overall, the interview findings show that urban tree management in Bukit Bintang relies on experience and reactive practices. This is due to limited resources and tough urban conditions. Routine maintenance happens regularly, but the lack of standard risk assessment procedures and proactive monitoring makes hazard prevention less effective. These insights back up the field observations and highlight the need for a more coordinated, preventive, and risk-focused approach to urban tree management in Kuala Lumpur, especially in busy commercial areas.

Overall Tree Risk Result

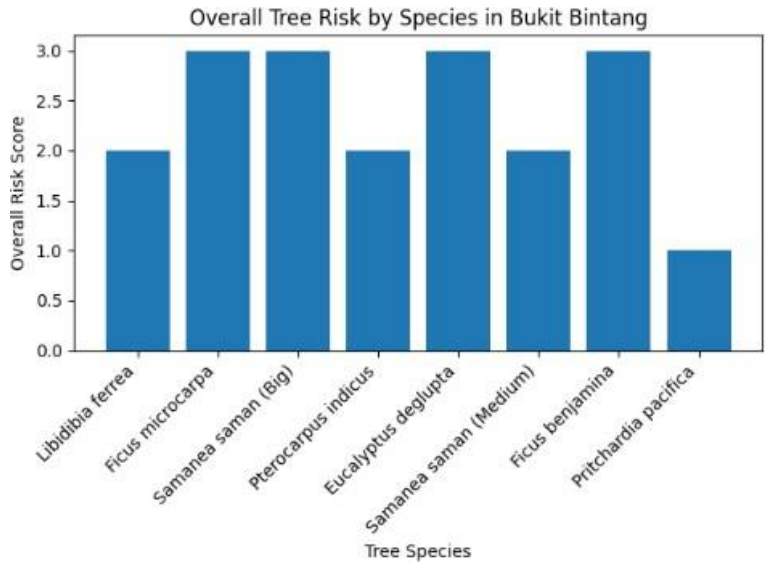

Figure 18: Illustrates the overall tree risk levels by species within the Bukit Bintang study area.
Source: Author, 2026

Species that had the riskiest scores across all features were *Ficus microcarpa*, *Ficus benjamina*, *Eucalyptus deglupta* and large *Samanea saman*. The presence in the urban corridors of high traffic leads them to these levels of risks implying that the likelihood of hitting and structural collapse is high. The rationale behind classifying these species as high-risk is due to aggressive root systems, low soil volume, poor root conditions and mass of the crown which collectively pose a threat to the stability of trees in the presence of environmental stressors such as wind and heavy rainfall. The moderate risk score was observed in *Libidibia ferrea*, *Pterocarpus indicus* and medium-sized

Samanea saman. Though the structural environment and health of these species was reasonably good, the site factors such as moderate crown extension, partial soil compaction and closeness to pedestrian routes were contributory to an increased, yet not critical, degree of risk.

Pritchardia pacifica recorded the least total risk score of any of the evaluated species. Its positive structural attributes including a compact growth form, sound root and trunk status and low level of interaction with the adjacent infrastructure support this evaluation. As a result, the likelihood and the potential outcomes of the tree failure process is reduced greatly through the decreased mass of the crowns and minimized chances of failure. In general, the graph shows that site-related variants and species-specific structural peculiarities have a more powerful impact on the level of risk in general rather than general tree condition. These results explain

CONCLUSION AND RECOMMENDATION

This paper examined the causes of fallen trees in Kuala Lumpur based on a narrow case study of Bukit Bintang commercial area. The study offers a broad insight into the interaction of tree structural attributes, site limitations, and management activities to determine urban tree failure risk in a dense tropical city setting because it involves field-based assessments of trees condition, expert and practitioner interviews, and document analysis. The results show that site-related constraints are the major factors that determine the risk of the failure of trees in Bukit Bintang, but not the health of the trees overall. The main factors that impacted on the tree stability throughout the study area were found to be root confinement, soil compaction, lack of planting space, and high target occupancy. Ficus macrocarpa, Ficus benjamina, Eucalyptus deglupta and fully-grown Samanea saman were found to offer greater risk levels when planted in very limited areas of urban space, especially along important commercial routes and highways. Conversely, structurally compact species were found to have lower levels of risk in the exposure of the same urban conditions, which highlights the significance of species-site compatibility in the urban trees planning.

The analysis also found out that the existing urban tree management in Bukit Bintang is still more of a reactive management approach that relies on visual inspection and response after an occurrence. Even though the routine maintenance process (pruning and defect removal) is performed regularly, no standardized tree risk assessment frameworks and active monitoring restrict the early identification of structural instability. The presence of resource limitation in terms of manpower, funding and access to sophisticated assessment tools, also exacerbate the management strategies that are in place. Considering these results, this paper provides a reason why there is a necessity to shift towards proactive and risk-based urban tree management in Kuala Lumpur. The use of standardized tree risk assessment procedures by local authorities should be a priority to ensure that there is similar assessment and early intervention, especially in the high-risk commercial locations.

The selection of species needs to be made more site-specific by considering the use of large-canopy and aggressive-root species should be limited to the small spaces and the structurally compact and site-appropriate species should be encouraged. The redevelopment work in urban areas must be designed with an enhanced design of planting such as larger volumes of soil, more permeable surfaces, and more favourable rooting conditions to enable the trees to be more stable in the long run. Besides that, the incremental adoption of information technologies-based monitoring tools, including GIS-enabled tree inventories and structural monitoring systems, could facilitate data-driven decision-making as well as enhance preventive management. It is also important to strengthen the institutional capacity by specific training and allocating resources to enable the shift in the treatment of urban trees of reactive maintenance to preventive risk management of the urban trees. Overall, this paper has

concluded that in the context of dense tropical cities, enhancing the safety of trees in cities needs an integrated and site-sensitive approach in managing the urban trees to achieve a balance between ecology and community safety. Proactive evaluation, proper choice of species and better planting design will not only decrease the number of fallen trees accidents, but it will also make the urban landscape at Kuala Lumpur more resilient and sustainable.

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