Trends in Street Tree Species Selection: Developing a theoretical model

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Abstract

This study develops a framework for urban tree species selection by analyzing trends in 45 recent articles (2019–2024) with keywords "street," "tree species," and "selection." The thematic analysis identifies five themes: species diversity, ecosystem services, climate adaptability, public perception, and management challenges. Addressing gaps in current trends, this research integrates tree morphology in existing models and employs Partial Least Squares Structural Equation Modeling (PLS-SEM) to validate criteria for resilience, social acceptance, and economic viability. The resulting model offers a flexible, context-sensitive approach to sustainable urban forestry, enhancing ecological and social benefits across diverse urban environments.

Keywords: Urban forestry, species selection, thematic review, tree morphology, Partial Least Squares Structural Equation Modelling (PLS-SEM).

DOI: https://doi.org/10.21834/aje-bs.v9i28.452

1.0 Introduction

Urban tree planting in Malaysia dates back over a century, with *Pterocarpus indicus* (Angsana) first documented in Malacca in 1778 (Koening, 1894) and in Penang in 1802 (Burkill, 1966). During the colonial period, the limited knowledge of native species led to the introduction of non-native species such as *Cassia fistula* and *Swietenia* spp., chosen for their rapid growth and suitability for urban revegetation. The initial organized greening initiative in Malaysia was launched in 1973 in Kuala Lumpur's Federal Territory, establishing the Beautification Unit as part of the city's Beautification Programme.

Despite ongoing efforts, major cities in Malaysia face persistent challenges with urban street tree failures, impacting public safety, tree management, and infrastructure upkeep. Local authorities, responsible for urban landscape planning and species selection, are critical in safeguarding public safety and preserving infrastructure integrity. However, the reliance on reactive strategies, such as pre-emptive tree removal, has been criticized for diminishing the long-term ecological and social benefits of urban forestry while perpetuating an unsustainable cycle of planting and removal (Ramly Hasan et al., 2017). This approach also escalates maintenance costs and undermines the value mature trees could provide (Mullaney, Lucke, & Trueman, 2015).

The objective of this study is to examine current issues and trends in urban street tree species selection, with a focus on identifying prevailing practices and challenges both within Malaysia and internationally. Through a thematic analysis of research published between 2019 and 2024, the study seeks to address the research question: *What are the current trends in tree species selection for urban street planting discussed from 2019 to 2024?* By analyzing these trends, and identifying best practices and challenges, the research aims to lay the groundwork for an enhanced tree selection framework that addresses both local and global challenges in urban forestry.

2.0 Literature Review

The thematic review using ATLAS.ti 24, as introduced by Zairul (2020), is implemented in this study to apply a thematic analysis procedure in the literature review. Clarke and Braun (2013) define thematic analysis as identifying patterns and constructing themes through thorough reading on the subject. The subsequent step involves identifying patterns and categories to understand trends in street tree selection. The research aims to analyze and interpret findings to recommend future research in street tree selection models. Literature selection criteria include 1) publications from 2019-2024, 2) keywords "street," "tree species," and "selection," and 3) a focus on street tree selection, specifically limiting the scope to urban planting.

The process begins with developing the research question (Define RQ) and setting the focus and scope of the review. Next, the article screening step (Screen) (Table 1) involves identifying and preliminarily selecting relevant studies. This is followed by the filtering stage (Filter) (Figure 2), applying inclusion and exclusion criteria to refine the selection. The fourth step, called 'cleaning' (Finalize) (Figure 2), thoroughly checks the metadata for accuracy

and completeness. Finally, data extraction (Synthesis) (Table 2) is conducted, using thematic analysis tools like ATLAS.ti to develop themes from the selected articles. This structured approach ensures a reliable and comprehensive literature analysis.

Fig. 1 : These are the processes involved in the thematic review FlowZ (2024)

Table 1: Search strings from Scopus and WoS

Database	Search Strings	Result
SCOPUS	TITLE-ABS-KEY (street AND "tree species" AND selection) AND PUBYEAR > 2018 AND PUBYEAR < 2025 AND (LIMIT-TO (SUBJAREA, "ENVI") OR LIMIT-TO (SUBJAREA, "AGRI") OR LIMIT-TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "ENGI")) AND (LIMIT-TO (DOCTYPE, "ar")) AND (LIMIT-TO (LANGUAGE, "English")) AND (LIMIT-TO (SRCTYPE, "j"))	34
Web of Science (WoS)	Results for "street" AND "tree species" AND "selection" (All Fields) and Open Access and 2024 or 2023 or 2022 or 2021 or 2020 or 2019 (Publication Years) and Article (Document Types) and English (Languages)	148

Subsequently, to understand trends in tree species selection for urban street planting, literature from 2019 to 2024 was analysed. Key criteria included recent publication dates and relevant keywords, ensuring a comprehensive analysis of current insights and developments, and forming the basis for future research recommendations. The literature review was conducted by searching two major academic databases, SCOPUS and Web of Science, chosen for their comprehensive coverage of peer-reviewed journals relevant to tree species selection for urban street planting. In SCOPUS, the search was defined with the keywords "street," "tree species," and "selection" in the title, abstract, and keywords (TITLE-ABS-KEY), targeting publications from 2019 to 2024, and restricted to academic articles in English that were open access (LIMIT-TO (DOCTYPE, "ar"), LIMIT-TO (LANGUAGE, "English"),(LIMIT-TO (SRCTYPE, "j")), (LIMIT-TO (SUBJAREA, "ENVI") OR

LIMIT-TO (SUBJAREA, "AGRI") OR LIMIT-TO (SUBJAREA, "SOCI") OR LIMIT-TO (SUBJAREA, "ENGI")).

This research utilized a meticulous selection process to identify pertinent literature on urban tree species selection, employing specific search strings in SCOPUS and Web of Science (WoS). Initially, 34 articles were identified in SCOPUS and 148 in WoS, reflecting differences in indexing depth, journal coverage, and search algorithms. After merging results and removing 26 duplicates, the consolidated dataset underwent rigorous screening based on predefined inclusion and exclusion criteria, resulting in the exclusion of 111 articles. Ultimately, 45 studies met all eligibility requirements and were included in the thematic review. This systematic approach ensures a comprehensive analysis, minimizing biases and enhancing the validity and reliability of the review's conclusions. The detailed selection process, outlined in Table 1 and illustrated in Figure 2, underscores the diligence required for a thorough review and provides a transparent foundation for future research replication and trust in the findings.

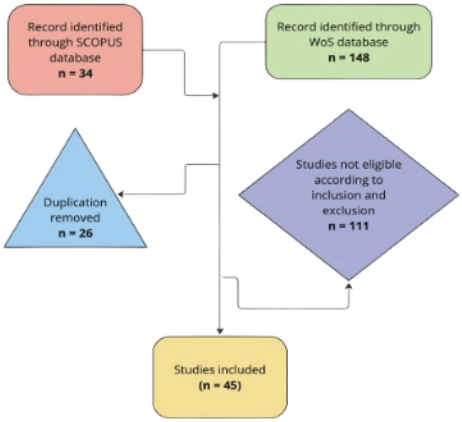

Fig. 2: Inclusion and Exclusion criteria in TreZ (Zairul, 2023)

3.0 Results and Discussions

3.1 Global Research Trends in Urban Tree Species Selection

The thematic review of 45 articles on urban tree species selection, visualized through a geographic distribution map (Figure 3), highlights significant contributions from various countries, showcasing diverse approaches and criteria. The United States and China lead in research output, reflecting their strong commitment to urban forestry. European countries, particularly Italy and the United Kingdom, provide notable studies, with Italy emphasizing multifactorial evaluation of selection criteria. Australian research focuses on

species-specific performance and adaptability, essential for managing urban forests in diverse climates. South American contributions from Brazil and Argentina stress the ecological functions of urban trees, while Asian studies from South Korea and Hong Kong examine public perceptions and environmental services. Research from Egypt and Iran addresses tree selection challenges in arid regions, emphasizing water scarcity and climate adaptability. The thematic insights cover urban tree species diversity, ecosystem services, climate resilience, public perception, and management strategies, underscoring the need for diverse species selection and strategic planning to enhance urban forest resilience and sustainability globally.

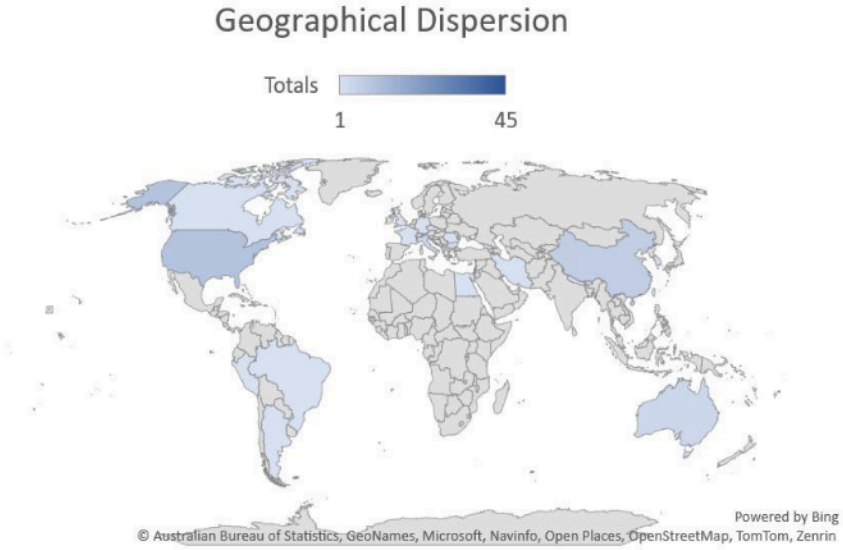

Fig. 3: Map showing geographical distribution of paper based on contribution from various country

This review synthesises current trends in tree species selection for urban street planting from 2019 to 2024, highlighting key themes such as species diversity, environmental services, climate adaptability, public perception, and urban tree management strategies. The word cloud visualisation (Figure 4) underscores the prominence of terms like "urban," "tree," "species," "trees," "street," and "environmental," reflecting the core focus areas of the reviewed literature. Studies the importance of selecting diverse and resilient tree species to enhance urban forest health and ecosystem services, such as carbon sequestration, reducing air pollution, and reducing thermal comfort. Research also highlights the need for adaptive management strategies to address climate change impacts, emphasising drought tolerance and phenotypic plasticity. Public perception studies indicate the critical role of community engagement in tree selection processes, aligning urban forestry practices with public preferences. Additionally, strategic planning

and efficient management are essential to overcome water scarcity and urban heat islands. This comprehensive review advocates for an integrated approach, combining scientific insights, public involvement, and effective management to develop sustainable and resilient urban forests, enhancing urban life quality and environmental health.

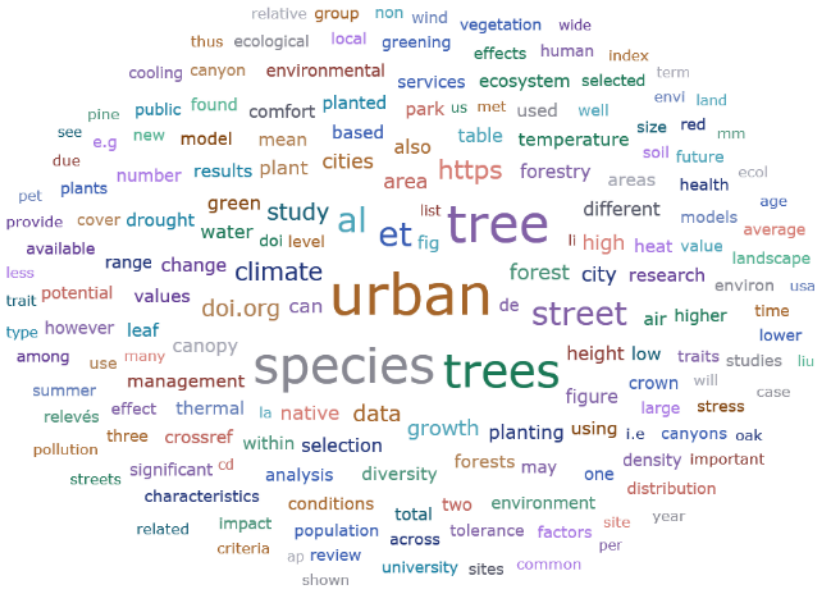

Fig. 4: Word Frequencies identifying key themes and patterns in Street Tree Selection

3.2 Quantitative Reporting

Table 2 provides a comprehensive categorisation of research articles focusing on different aspects of tree species selection for urban street planting. Theme 1, Urban Tree Species Diversity and Selection, comprising 15 articles, emphasises the importance of diverse species selection to enhance urban forest resilience and functionality, focusing on phenotypic plasticity, genotypic variation, and underutilised species. Theme 2, Environmental and Ecosystem Services of Urban Trees, with 9 articles, highlights the critical role of urban trees in providing environmental benefits such as carbon sequestration, pollution reduction, and thermal comfort, stressing the need for integrating species' environmental functions in the selection process. Theme 3, Adaptability of Urban Trees to Climate Change, includes 11 articles addressing tree resilience to climate impacts, focusing on species adaptability, climate analogues, and drought-tolerant species. Theme 4, Public Perception and Preferences for Urban Trees, with 5 articles, explores public attitudes towards urban trees, emphasizing the importance of engaging the community in decision-making and aligning tree selection with public preferences. Theme 5, Challenges and

Strategies in Urban Tree Management, also comprising 5 articles, examines practical management aspects, strategic planning, and addressing low tree diversity drivers. This review underscores the need for a holistic approach to urban forestry, integrating scientific insights, public engagement, and strategic planning to create resilient and sustainable urban forests, providing a comprehensive framework for future research and practice.

Table 2: These are categorisation showing research articles based on authors and themes

	Theme 1: Urban Tree Species Diversity and Selection	Theme 2: Environmental and Ecosystem Services of Urban Trees	Theme 3: Adaptability of Urban Trees to Climate Change	Theme 4: Public Perception and Preferences of Urban Trees	Theme 5: Challenges and Strategies in Urban Tree Management
(Li, Yiyong et al., 2021)	-	-	/	-	-
(Ma, Bingqian et al., 2020)	/	-	-	-	-
(Shah, Aamir Mehmood et al., 2022)	-	/	-	-	-
(Liu, Ming et al., 2021)	-	-	/	-	-
(Hurley, Alexander Gideon et al., 2024)	-	-	/	-	-
(Karrer, Gerhard et al., 2022)	-	-	/	-	-
(Acharya, M et al., 2023)	-	-	-	/	-
(Pawlak, Camille C et al., 2023)	-	-	/	-	-
(Watkins, Harry et al., 2021)	/	-	-	-	-
(Kim, Sang Seup et al., 2021)	-	-	-	/	-
(Hilbert, Deborah R et al., 2023)	-	-	-	-	/
(Moreno, Roberto et al., 2024)	-	/	-	-	-
(D'Amato, Luca et al., 2023)	-	/	-	-	-
(Wang, Ching-Wen et al., 2023)	-	-	-	/	-
(Cregg, Bert et al., 2023)	-	/	-	-	-
(Abdelmejeed, Ahmed Yasser et al., 2024)	-	-	-	-	/
(Davis, Nora et al., 2021)	-	-	-	/	-
(Morakinyo, Tobi Eniolu et al., 2020)	/	-	-	-	-

(Hilbert, Deborah R et al., 2022)	/	-	-	-	-
(Huber-Smith, Nicola K. et al., 2023)	-	-	-	-	/
(Wujeska-Klause, Agnieszka et al., 2020)	-	/	-	-	-
(Doroski, Danica A et al., 2020)	-	-	-	-	/
(Speak, A F et al., 2022)	-	/	-	-	-
(Galfrascoli, L et al., 2023)	/	-	-	-	-
(Torquato, V et al., 2024)	/	-	-	-	-
(Delian, G et al., 2022)	-	-	-	/	-
(Petrova, Slaveya et al., 2019)	-	-	/	-	-
(Jeong, Mi-Kyung et al., 2023)	-	/	-	-	-
(Parsa, Samaneh et al., 2020)	-	-	/	-	-
(Bartoli, F et al., 2022)	/	-	-	-	-
(Anisimova, M et al., 2023)	/	-	-	-	-
(Ren, W et al., 2023)	-	/	-	-	-
(Moore, N et al., 2023)	/	-	-	-	-
(Bartoli, Flavia et al., 2022)	-	-	-	-	/
(Falfan, E et al., 2021)	/	-	-	-	-
(Alpaidze, Z et al., 2021)	-	/	-	-	-
(Xu, Jian et al., 2020)	/	-	-	-	-
(Murray, Brad et al., 2023)	/	-	-	-	-
(Guo, Jun et al., 2023)	/	-	-	-	-
(Fririon, V et al., 2023)	-	/	-	-	-
(Karrer, G et al., 2022)	-	-	/	-	-
(Guo, Jian et al., 2022)	/	-	-	-	-
(Fricker, G Andrew et al., 2023)	/	-	-	-	-
(Murray, Brad et al., 2023)	-	/	-	-	-
(Davis, N et al., 2021)	/	-	-	-	-

3.3 Qualitative Reporting

This thematic review identifies five key themes, as shown in Figure 5, which include urban tree species diversity and selection, environmental and ecosystem services, climate change adaptability, public perception, and urban tree management strategies. Emphasizing environmental services underscores their role in promoting urban sustainability, while the focus on species diversity highlights the importance of biodiversity and forest resilience. Additionally, research on climate adaptability and public perception emphasizes the need for climate-resilient species and community involvement. Collectively, these themes enhance the understanding and implementation of effective urban tree species selection, addressing both ecological and social aspects.

Theme 1: Urban tree species diversity and selection categorizes research emphasizing tree diversity, form characteristics, and species performance for enhancing urban microclimates and forest resilience. Studies by Xiao (2024) and Morakinyo (2020) highlight strategic species selection to improve pedestrian thermal comfort and mitigate urban heat. Ma (2020) and Hilbert (2022) stress species diversity's role in forest health, while Watkins (2021) and Falfan (2021) focus on phenotypic and genotypic factors for resilience. Comparative analyses in 2022 and 2024 model crown expansion, and studies in 2023 emphasize drought tolerance for arid regions.

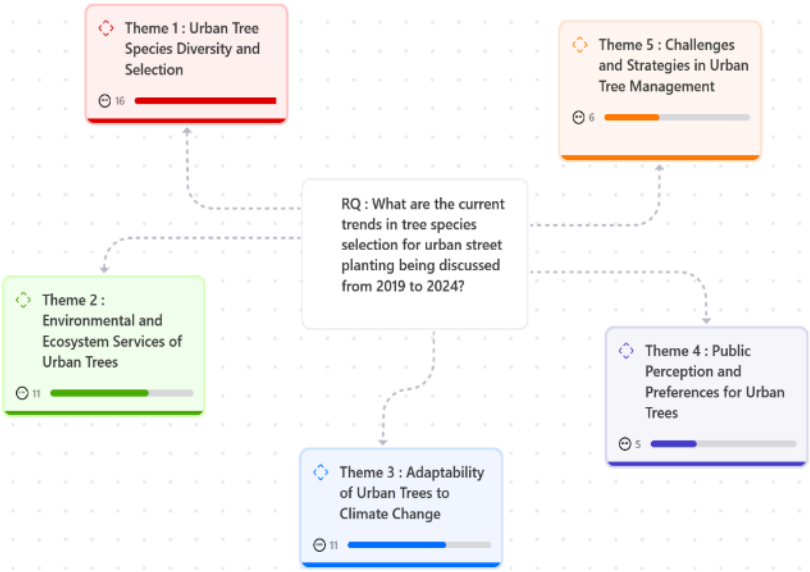

Fig. 5: The themes to answer Research Question (RQ)

While these findings support diverse, resilient species for maximizing urban forest benefits, gaps remain. Long-term studies on adaptability, genetic stress tolerance, and ecosystem service integration are limited. Public engagement is often insufficient, and adaptive management strategies are needed to meet the changing demands of urban environments and climate challenges.

Theme 2: Environmental and ecosystem services research highlight urban trees' roles in carbon sequestration and air pollution mitigation (Parsa 2020; Moreno 2024). Speak (2022) and D'Amato (2023) emphasize context-specific management, while Cregg (2023) explores genotypic variability in response to heat and drought. Studies by Alpaidze (2021) model ecosystem services, with Zheng (2024) and Shah (2022) introducing new methods for evaluating thermal comfort and energy benefits. Wujeska-Klause (2020) underscores the dual cooling effects and nighttime warming, stressing balanced management. Despite progress, gaps remain in long-term studies, comprehensive modelling, species-specific adaptation, and public engagement, with further research on climate resilience essential for maximizing urban forestry benefits.

Theme 3: Adaptability of urban trees to climate change categorizes 11 articles focusing on enhancing urban forest resilience. Fririon (2023) emphasizes the importance of genetic diversity for drought resilience, while Li (2021) showcases the phenotypic flexibility of street tree species under various stressors. Muller (2019) and Liu (2021) evaluate climate-adapted species in Minnesota and Shanghai, respectively, highlighting the need for localized strategies. Studies like Hurley (2024) and Esperon-Rodriguez (2022) examine microclimate effects and vulnerability metrics for species selection. Karrer (2022) and Petrov (2019) stress drought tolerance, while Hirons (2021) and Ren (2023) explore research contributions from botanical gardens and urban density's minimal effects on native trees. Despite progress, gaps remain in long-term studies, comprehensive adaptation models, and localized research. Broader studies on species resilience and public engagement are essential for improving urban tree sustainability.

Theme 4: Public perception and preferences of urban trees highlight five studies that underscore the importance of community engagement in urban forestry. Jeong (2023) explores residents' perspectives in Seoul, developing maintenance guidelines aligned with public expectations, while Kim (2021) identifies the influence of aesthetics, shade, and air quality on tree preferences in Busan. Acharya (2023) examines species selection in Pokhara, advocating alignment with local preferences for community support. Davis (2021) demonstrates the value of interactive tools in engaging the public, and Wang (2023) emphasizes integrating expert and public criteria for balanced management. A participatory approach enhanced public education, and policy integration are essential for the sustainability and success of urban forestry initiatives.

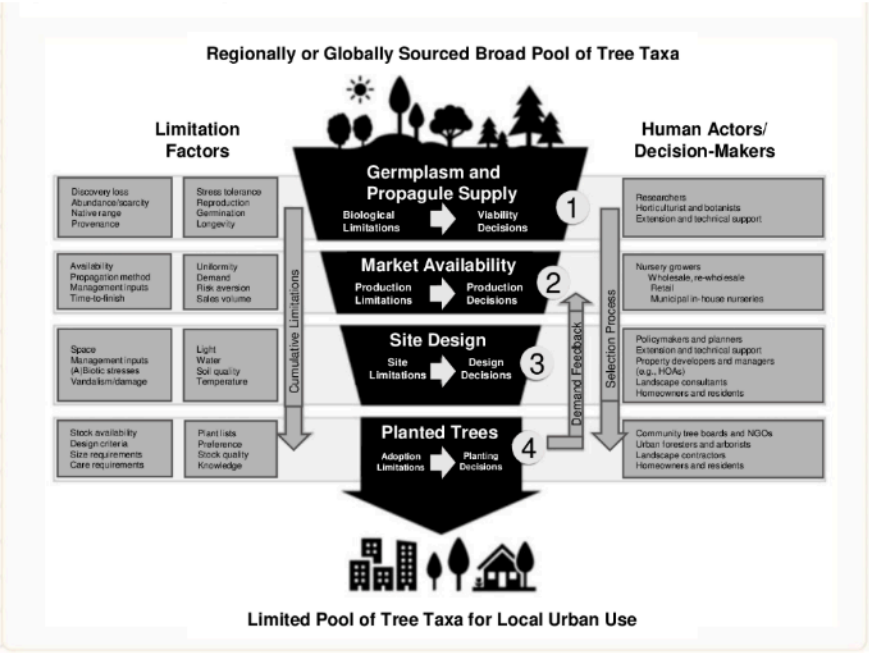

Fig 6: Conceptualizing the Human Drivers of Low Tree Diversity in Planted Urban Landscapes
(Source: Hilbert 2023)

Theme 5: Challenges and strategies in urban tree Management highlight essential strategies for effective urban forestry. Hilbert (2023) examines human factors affecting tree diversity, while Abdelmejeed (2024) optimizes microclimate and water management strategies in Cairo. Hui (2020) addresses species-specific growth in Hong Kong, Dorowski (2020) advocates for diverse planting in the Northeastern U.S., and Huber-Smith (2023) stresses the need for fire-resistant species in Australia. These studies underscore adaptive management strategies that integrate ecological, social, and economic factors. However, gaps remain in long-term sustainability studies, localized strategies, public engagement, and climate adaptation. Addressing these through comprehensive research will strengthen urban tree management, enhance urban forest resilience and improve urban environmental health.

3.4 Issues in the selection and placement of urban landscape trees in Malaysia.

Landscape practitioners encounter several challenges in managing landscape trees, impacting urban green spaces' sustainability and functionality. One of the primary issues is the lack of specific guidelines for tree species selection and placement. Moreover, In Malaysia, the lack of specific guidelines for tree species selection poses a significant

challenge for landscape practitioners tasked with urban forest management. This deficiency often results in the planting of tree species that are not well-adapted to the local climatic and soil conditions, leading to increased maintenance costs and higher mortality rates among urban trees (Ahmad et al., 2021). For example, the frequent selection of exotic species over native ones, driven by aesthetic considerations rather than ecological suitability, has contributed to issues such as poor tree health and increased vulnerability to pests and diseases (Latif et al., 2019). This problem is exacerbated by Malaysia's diverse climatic zones, where a one-size-fits-all approach to tree selection fails to account for the unique environmental conditions of each region (Ismail et al., 2022).

The core research problem lies in developing a comprehensive and practical framework for selecting street tree species that are both resilient to urban environmental stressors and compatible with urban infrastructure. Improper tree selection can lead to hazardous conditions, especially in street areas where the interaction between tree growth and infrastructure can pose significant safety risks (Ramly Hasan et al., 2017). Local authorities are responsible for landscape planning, including tree species selection, to ensure public safety and maintain infrastructure integrity. However, the current practices often involve reactive measures, such as pre-emptive tree removal, which undermine the long-term benefits of urban forestry and contribute to an unsustainable cycle of planting and removal.

3.5 Theoretical Development

A street tree species selection model is essential for maximizing urban tree benefits and minimizing conflicts. By systematically considering tree morphology—such as growth patterns, root structures, and climate resilience—this model aids urban planners in choosing species that reduce infrastructure damage and maintenance costs (Alvey, 2006; Jim, 2008). Such a model supports sustainable urban development by promoting biodiversity and ecological resilience, helping cities maintain ecological balance and adapt to environmental challenges (Speak et al., 2020). Ultimately, a robust selection model that integrates ecological, social, and economic factors fosters sustainable, resilient urban ecosystems, enhancing livability and public support for urban forestry. Miller (1997) presents a foundational framework for urban forestry that emphasizes integrating tree selection and management into broader urban planning (Figure 7). He argues that urban forestry contributes to the ecological, social, and economic well-being of cities and should be an essential part of urban infrastructure. Miller's framework considers environmental, cultural, economic, and social factors to guide informed decision-making for sustainable, livable urban areas. However, the framework's comprehensive nature poses challenges, as balancing and prioritizing diverse factors can lead to conflicts and suboptimal outcomes. Despite these limitations, Miller's work remains vital for urban planners and policymakers, offering valuable guidance for managing urban greenspaces effectively.

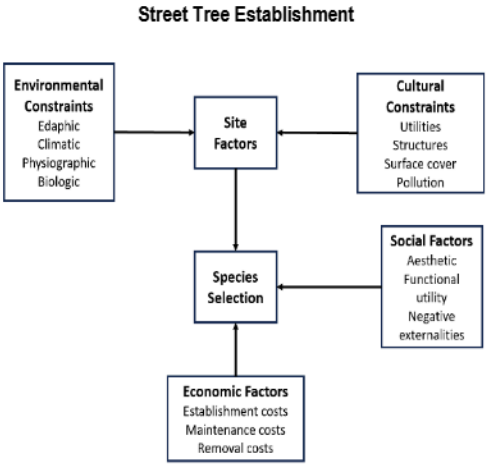

Figure 7: Selection Model by Robert W. Miller, 1997

3.6 Integrating Tree Morphology Characteristics into the selection model

Figure 8: " Street Tree Selection Framework: Integrating Morphological, Environmental, and Management Criteria"
(Source: 200 Malaysia's Native Trees for Street Planting, 2024)

Integrating tree morphology into selection models is essential for developing resilient urban forests, as characteristics such as size, form, root architecture, and growth rate critically influence a species' adaptability to urban environments. Selecting trees with morphology suited to urban conditions enhances growth, reduces maintenance requirements, and fosters sustainable, resilient landscapes. Morphologically informed species selection is especially important to ensure each tree's suitability for street planting. As noted in *200 Malaysia's Native Trees for Street Planting* (2024), appropriate tree selection should consider spatial requirements and align with design objectives. Choosing species that are well-suited to their designated locations not only promotes healthy growth but also minimizes conflicts with infrastructure and urban surroundings.

The " Street Tree Selection Framework: Integrating Morphological, Environmental, and Management Criteria" guides urban tree selection by aligning species with specific urban needs. The model's core principle, "Selecting the Right Tree for the Right Place," is surrounded by layers addressing road hierarchy, adaptability, and morphological features like size, form, and resilience. The adaptability layer includes tolerance to microclimate, pests, and soil limitations, while the outer layer considers tree aesthetics and functions such as canopy size and leaf structure for shade and pollution mitigation (Morakinyo & Lam, 2020). Species selection based on root systems and growth patterns helps prevent infrastructure conflicts (Xiao, 2024). Trees with large canopies and dense foliage improve thermal comfort and air quality, while selecting low-litter species helps maintain urban cleanliness (McPherson et al., 2017). This model promotes sustainable urban forestry by addressing environmental stresses and enhancing ecosystem services.

In conclusion, the integration of tree morphology characteristics into tree selection models is vital for creating urban forests that are both functional and sustainable. By carefully considering these traits, urban planners and local authorities can make informed decisions that enhance the resilience of urban trees, reduce conflicts with infrastructure, and maximize the ecological and social benefits that trees provide to urban communities. This approach not only supports the health and longevity of urban forests but also contributes to the broader goals of urban sustainability and climate resilience.

3.7 Proposed Conceptual Tree Selection Modelling

A street tree selection model should integrate ecological, environmental, social, and economic factors for a holistic approach. Key objectives include maximizing urban trees' ecological, social, and economic benefits; preventing conflicts with infrastructure to enhance safety and reduce maintenance; and developing an objectives-driven model aligned with urban planning goals. This model would ensure sustainable, socially accepted, and economically viable urban forestry, supporting overall urban sustainability.

The framework for the "Proposed Conceptual Tree Selection Model" (Figure 9), presents a structured approach to optimizing street tree selection by integrating tree morphology into various constraints and factors that influence urban tree planting decisions. The framework aims to balance environmental, cultural, economic, and social factors to achieve the dual objectives of maximizing street tree benefits and minimizing

conflicts with human activities. The integration of tree morphology and these constraints leads to the development of an Optimized Street Tree Selection Model aimed at maximizing the benefits of urban trees while preventing conflicts with human activities and urban infrastructure. The proposed model emphasizes a balanced approach that aligns tree selection with ecological, cultural, economic, and social requirements, ultimately contributing to more sustainable and harmonious urban environments.

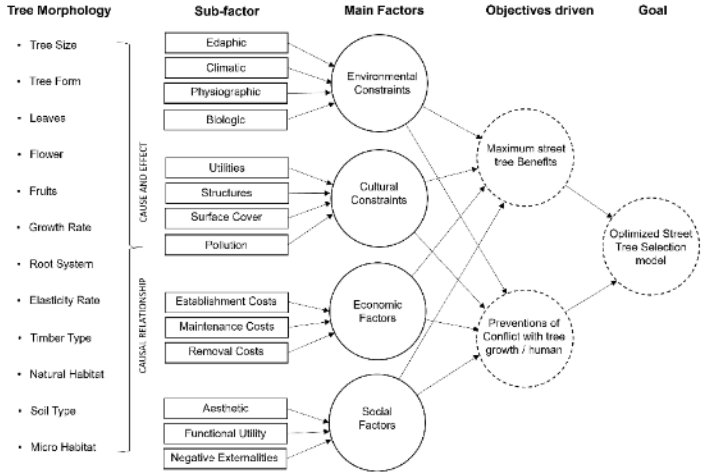

Figure 9: Framework for the Proposed Conceptual Tree Selection Model

4.0 Conclusion and Recommendations

The conceptual model will undergo quantitative validation using Partial Least Squares Structural Equation Modelling (PLS-SEM), a statistical approach that examines the relationships among factors influencing urban street tree selection. Data for validation will be collected through surveys distributed to industry professionals, ensuring the model comprehensively represents the complexities of urban environments. Subsequently, an expert panel will evaluate the model for practicality, relevance, and scientific rigour, facilitating iterative refinements. A pilot implementation in selected urban settings will further assess the model's practical application in species selection. Feedback from real-world conditions will inform final adjustments, enhancing the framework's focus on resilience to urban stressors, infrastructure compatibility, and ecological benefits, thereby offering a robust strategy for sustainable urban forestry.

While this is an important and timely research topic, presents several limitations that must be acknowledged. One of the primary challenges is the limited availability of localized data on tree species performance under specific urban conditions in Malaysia. Many studies on urban forestry and street tree selection are based on data from temperate climates, which may not be directly applicable to the tropical context of Malaysia. As a

result, researchers often have to rely on international literature, which might not accurately reflect the unique environmental and cultural factors at play in Malaysian urban areas.

In conclusion, the optimization of street tree selection is a complex process that involves balancing the benefits of trees with the prevention of conflicts between tree growth and human activities. This methodological rigour adds a layer of scientific credibility to the model, ensuring that it is not only theoretically sound but also practically applicable. By integrating tree morphology into factors such as cultural, economic, social, and environmental constraints, urban planners can develop objective-driven models that enhance the sustainability and liveability of urban areas.

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