Available Online at www.e-iph.co.uk
Indexed in Clarivate Analytics WoS, and ScienceOPEN

E-B Environment - Behaviour Proceedings Journal

AicE-Bs2024Bandung

e-IPH e-International Publishing House Ltd., United Kingdom

https://www.amerabra.org/

12th Asia-Pacific International Conference on Environment-Behaviour Studies
Savoy Homann Bidakara Hotel, Bandung, Indonesia, 04-05 Oct 2024

Trends in Tree Species Selection for Urban Street Planting: A thematic review

Sabarudin Buang[1], Suhardi Maulan[1], Osman Tahir[1], Nur Intan Simangunsong[2]

[1] Faculty of Design and Architecture, Universiti Putra Malaysia, Serdang Selangor, Malaysia
[2] Faculty of Landscape Architecture and Environmental Technology, Universitas Trisakti, Jakarta, Indonesia

gs66867@student.upm.edu.my, suhardi@upm.edu.my, osmanmt@upm.edu.my, nurintan@trisakti.ac.id
Tel: +6012-3112245

Abstract
In major cities, street tree failures pose ongoing challenges related to user safety, tree management, and maintenance. This study evaluates trends in urban street tree selection by analysing 45 articles from 2019 to 2024 using keywords such as “street,” “tree species,” and “selection.” The thematic analysis identifies five key themes: species diversity, ecosystem services, climate adaptability, public perception, and management challenges. Findings highlight the need for a multifaceted approach, recommending criteria to reduce conflicts and ensure proper tree placement. The proposed framework aims to enhance urban tree resilience and coexistence with humans by emphasising genetic diversity and ecological benefits.

Keywords: Street tree, species selection, urban forestry, thematic review

DOI: https://doi.org/10.21834/e-bpj.v9i30.6195

1.0 Introduction

Street tree failures in major cities are a persistent challenge, significantly impacting public safety, tree management, and infrastructure maintenance. Local authorities, tasked with landscape planning and the selection of tree species, play a crucial role in ensuring both public safety and the structural integrity of urban infrastructure. However, the prevalent reliance on reactive measures, such as pre-emptive tree removal, has been criticized for undermining the long-term benefits of urban forestry and fostering an unsustainable cycle of planting and removal (Ramly Hasan et al., 2017). This reactive approach not only leads to the loss of potential ecological and social benefits provided by mature trees but also escalates the costs associated with urban tree management (Mullaney, Lucke, & Trueman, 2015).

The research objective is to analyze the current issues and trends in species selection for street tree planting. This study focuses on investigating the prevailing practices and challenges in urban street tree planting, both within Malaysia and in other global contexts. It involves a thorough examination of the trends in tree species selection, identifying best practices, and understanding the specific issues that affect urban areas. By analyzing these factors, the research aims to establish a foundation for developing an improved tree selection framework that addresses both local and global challenges. As a result, the purpose of this article is to conduct a thematic assessment of discussions on trends in tree species selection for urban street planting that have been published between 2019 and 2024, using the research question below:

DOI: https://doi.org/10.21834/e-bpj.v9i30.6195

RQ: What are the current trends in tree species selection for urban street planting being discussed from 2019 to 2024?

2.0 Materials and Methods

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.

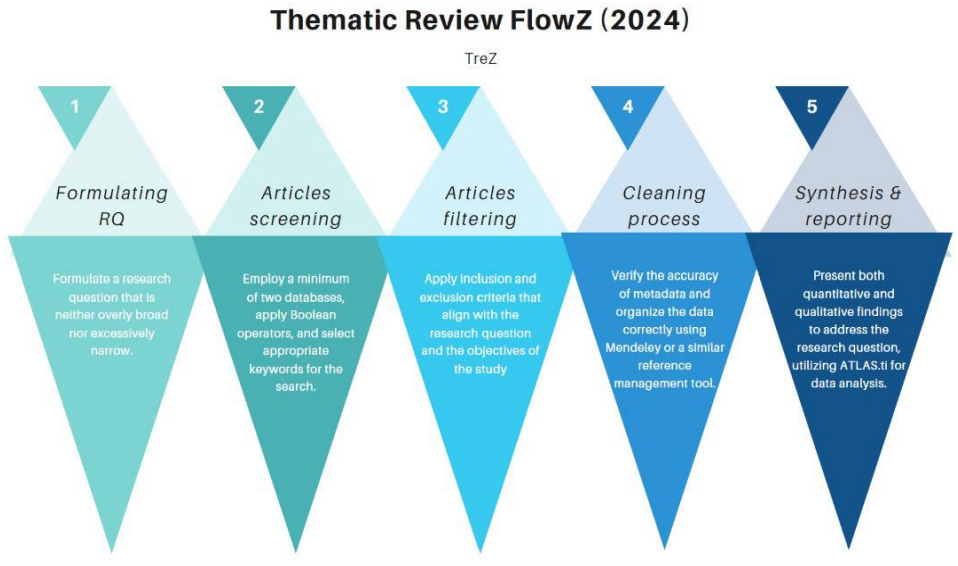


Fig. 1: These are the processes involved in the thematic review FlowZ (2024)

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.

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.

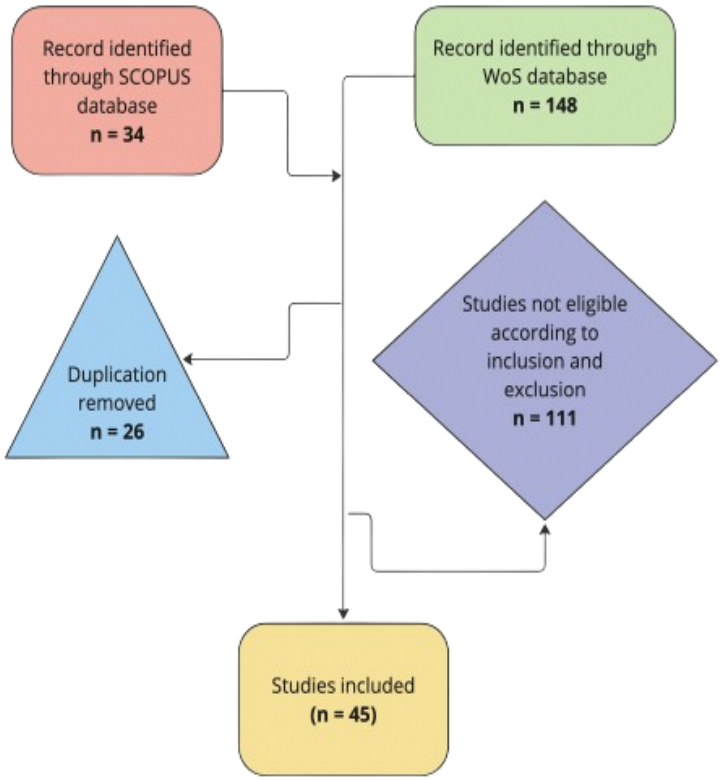


Fig. 2: Inclusion and Exclusion criteria in TreZ (Zairul, 2023)

2.1 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, have provided notable studies, with Italy emphasizing the 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.

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.

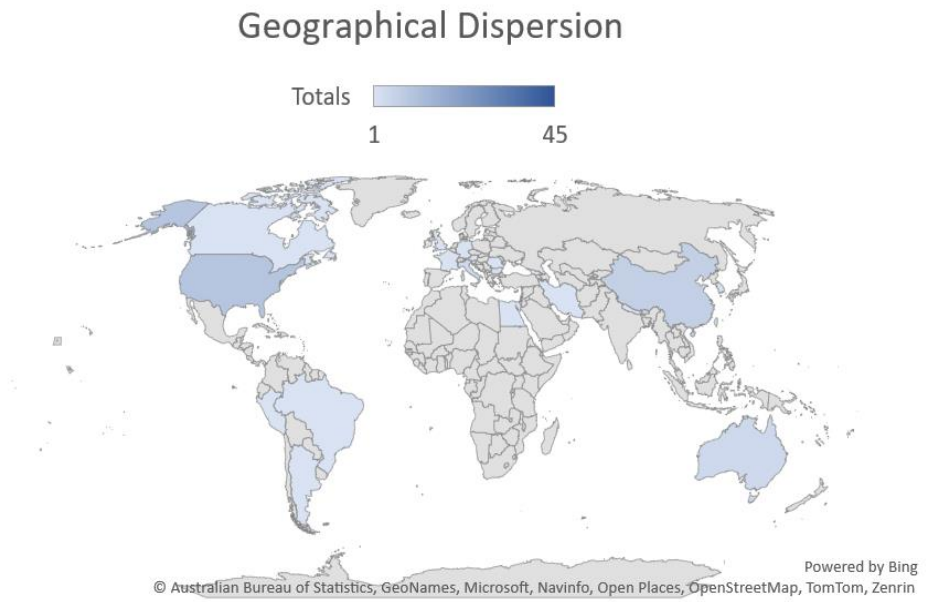


Fig. 3: Map showing the geographical distribution of paper based on contributions from various countries

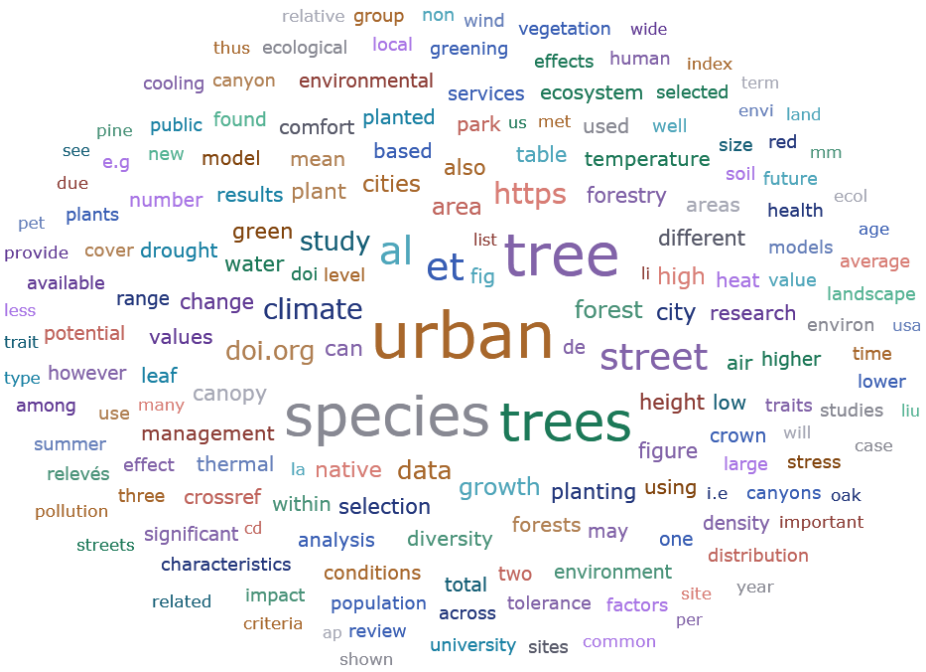


Fig. 4: Word Frequencies identifying key themes and patterns in Street Tree Selection

3.0 Results and Discussions

The word cloud analysis (Figure 4), highlights key terms such as "urban," "trees," "species," and "planting," underscoring the primary focus on the selection of appropriate tree species for urban environments. Additionally, terms related to climate adaptation, such as "cooling," "canopy," and "shade," indicate the significant role that urban trees play in mitigating urban heat islands and enhancing thermal comfort in cities. This emphasis on climate-related benefits aligns with the broader environmental goals of urban forestry, including reducing urban temperatures and improving air quality. Geographical dispersion analysis further reveals that research activities are predominantly concentrated in developed regions, including North America, Europe, and East Asia. Countries like the USA, Canada, Germany, and the UK contribute significantly to the body of literature on urban tree species selection. However, a notable emerging interest from developing regions, such as parts of South America, Africa, and Asia, indicates a growing global recognition of the importance of urban forestry. This trend suggests an increasing awareness and adoption of urban tree-planting practices in diverse climatic and socio-economic contexts, which is crucial for addressing global environmental challenges.

In summary, the review underscores the critical importance of urban trees in enhancing urban biodiversity, promoting sustainability, and mitigating climate impacts. The analysis of word clouds, geographical dispersion, and research trends reveals a balanced focus on both the ecological benefits and practical challenges of urban tree planting. Moreover, the increasing global collaboration and contributions from diverse regions highlight the growing recognition and collective efforts towards sustainable urban forestry practices worldwide. This thematic review thus provides valuable insights into the current state and future research directions on tree species selection for urban street planting.

3.1 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 categorisations 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)	-	/	-	-	-
(Firion, 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)					

3.2 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.

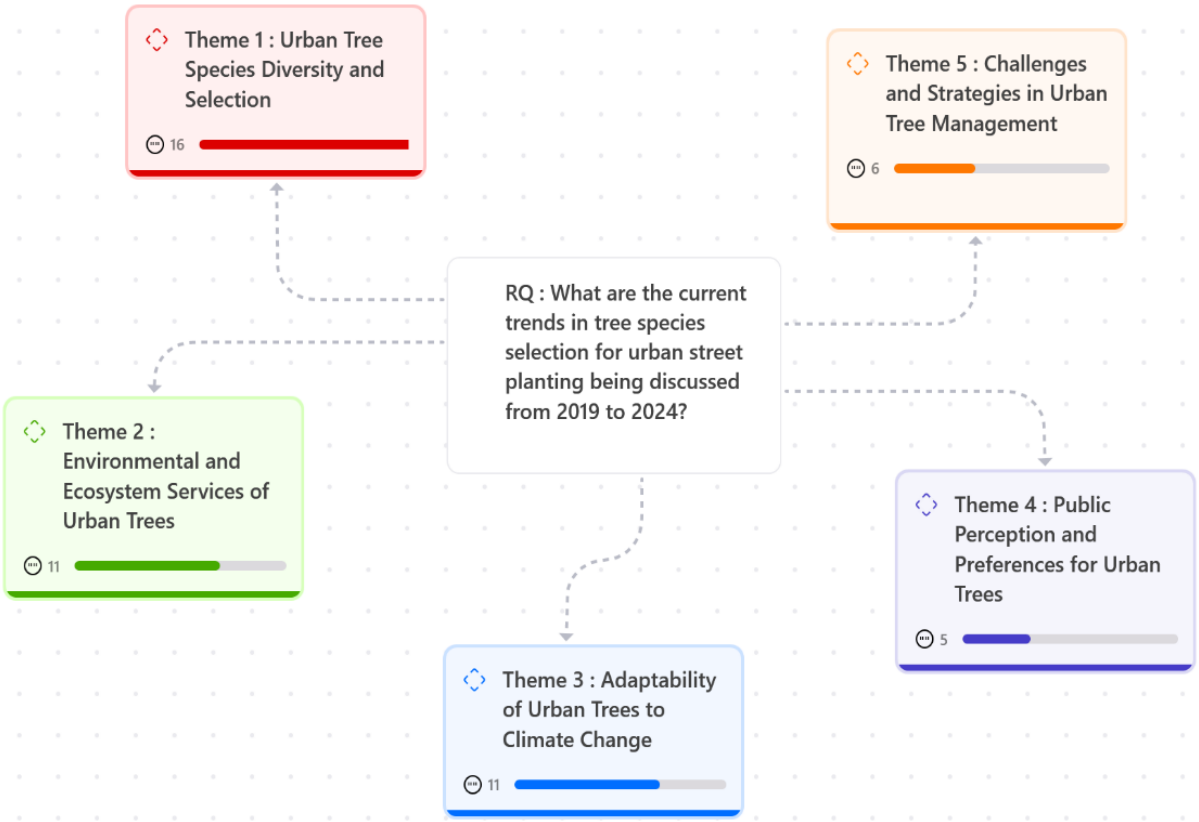


Fig. 5: The themes to answer the Research Question (RQ)

3.2.1 Theme 1: Urban Tree Species Diversity and Selection

The thematic review on urban tree species selection for street planting categorizes 15 articles under the theme of Urban Tree Species Diversity and Selection (Figure 6). This research emphasizes the significance of tree form characteristics, diversity, and species performance in improving urban microclimates and enhancing forest resilience. Studies by Xiao (2024) and Morakinyo (2020) illustrate how strategic species selection can enhance pedestrian thermal comfort and reduce urban heat islands. Additionally, Ma (2020) and Hilbert (2022) emphasize the importance of species diversity for healthy urban forests, while Watkins (2021) and Falfan (2021) focus on phenotypic plasticity and genotypic variation as crucial factors for selecting resilient species. Wang (2021) broadens the discussion by highlighting the ecological values of urban trees beyond their aesthetic and environmental roles.

Furthermore, comparative analyses conducted in 2022 and 2024 offer predictive models for species-specific crown expansion and distribution patterns. Research in 2023, focusing on arid regions, emphasizes the importance of selecting drought-tolerant species for sustainable urban forestry. Collectively, these studies advocate for the selection of diverse, resilient, and contextually appropriate species to maximize the ecological, environmental, and social benefits of urban forestry, addressing the evolving challenges posed by urban environments and climate change.

Despite these advancements, significant research gaps remain in urban tree species selection. Long-term longitudinal studies are lacking, and the genetic basis of adaptability and stress tolerance is underexplored. Many studies fail to integrate ecosystem services

into selection criteria. Insufficient public and stakeholder engagement leads to poor implementation of programs. Adaptive management strategies based on ongoing monitoring and feedback are needed to address dynamic urban conditions and emerging challenges.

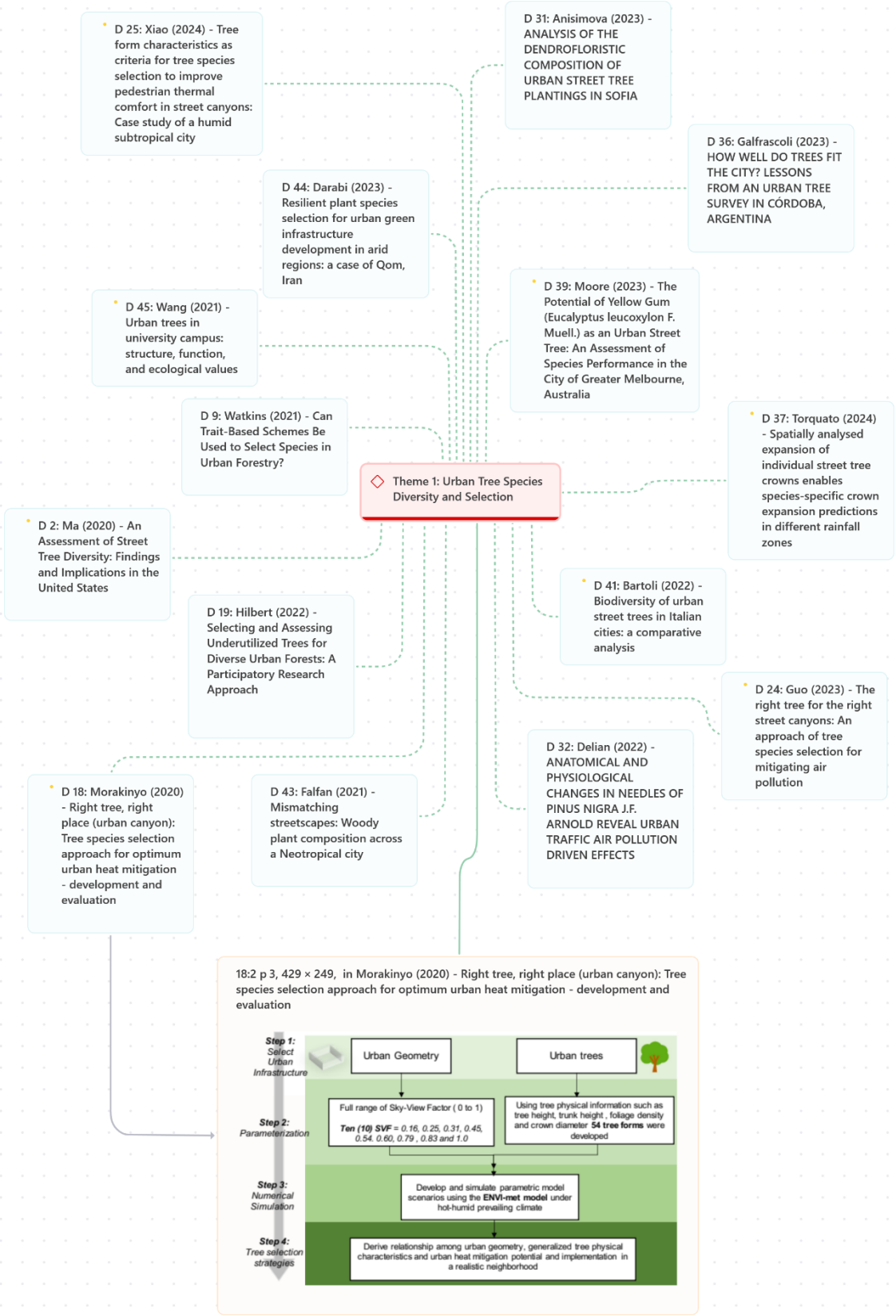


Fig. 6: Theme 1 categorises 15 articles related to Urban Tree Species and Selection

3.2.2 Theme 2: Environmental and Ecosystem Services of Urban Trees

Environmental and Ecosystem Services of Urban Trees encompasses nine studies, highlighting the diverse benefits urban trees offer, particularly in relation to carbon sequestration and air pollution mitigation (Parsa 2020; Moreno 2024). Research by Speak (2022) and D'Amato (2023) emphasizes the importance of context-specific tree management strategies, while Cregg (2023) examines genotypic variability in response to heat and drought stress. Studies like Alpaidze (2021) model ecosystem services, and Zheng (2024) and Shah (2022) introduce new approaches to evaluating thermal comfort and energy considerations. Wujeska-Klause (2020) discusses both cooling effects and potential nighttime warming, stressing balanced management. Despite these advancements, research gaps in long-term quantitative studies, holistic modelling, species-specific adaptation, and public engagement persist. Further research on climate resilience is needed to optimize urban forestry's benefits.

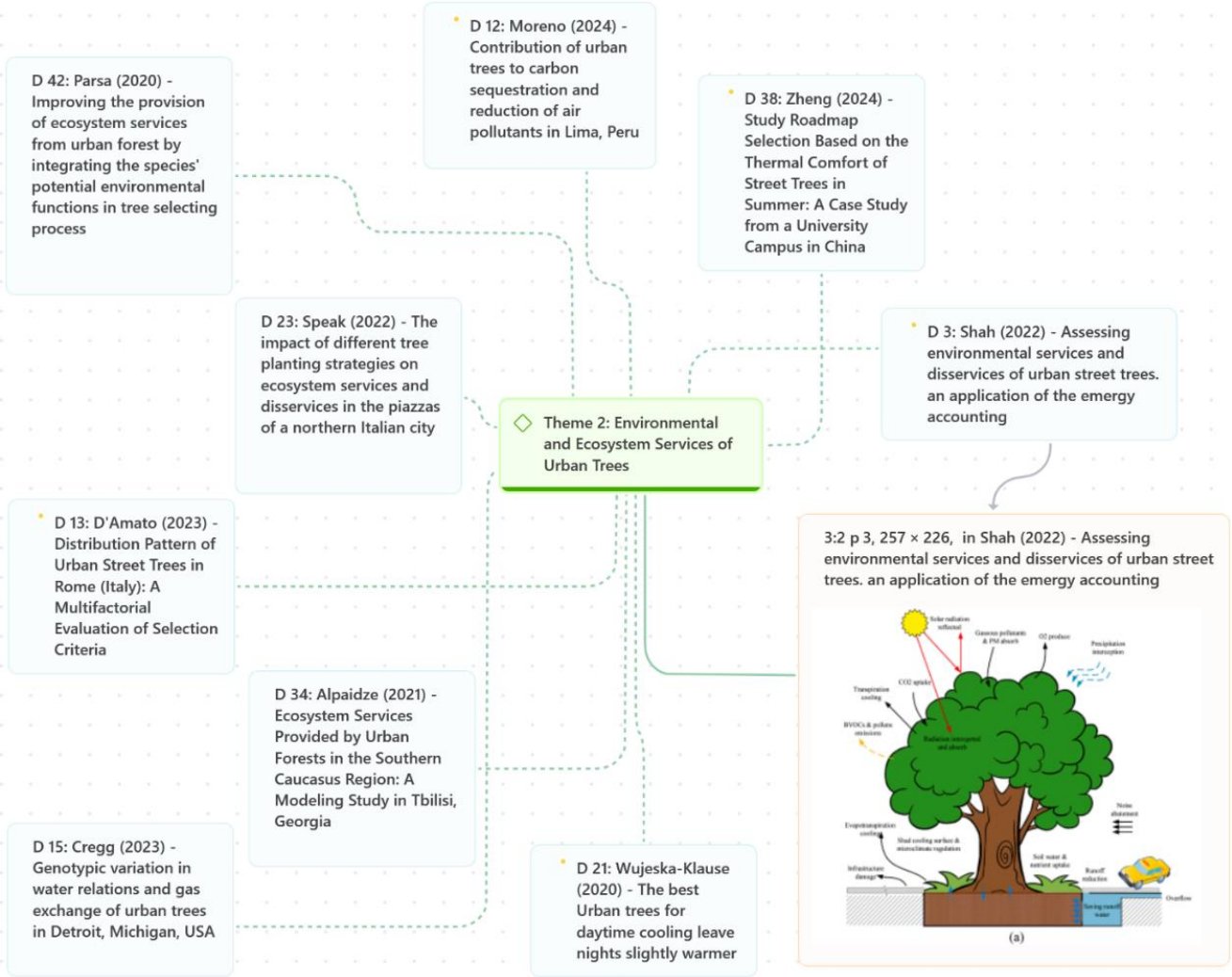


Fig. 7: Theme 2 categorises 9 articles related to Environmental and Ecosystem Services of Urban Trees

3.2.3 Theme 3: Adaptability of Urban Trees to Climate Change

Adaptability of Urban Trees to Climate Change reviews 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.

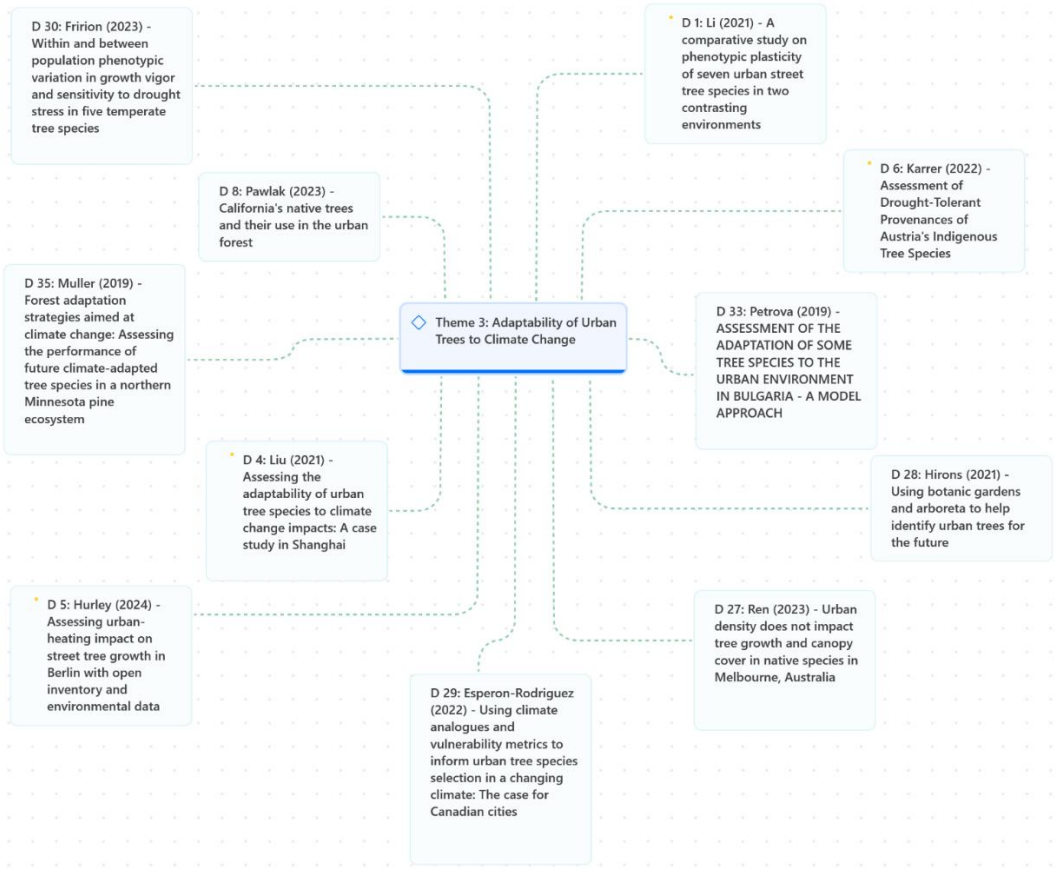


Fig. 8: Theme 3 categorises 11 articles related to the Adaptability of Urban Trees to Climate Change

3.2.4 Theme 4: Public Perception and Preferences of Urban Trees

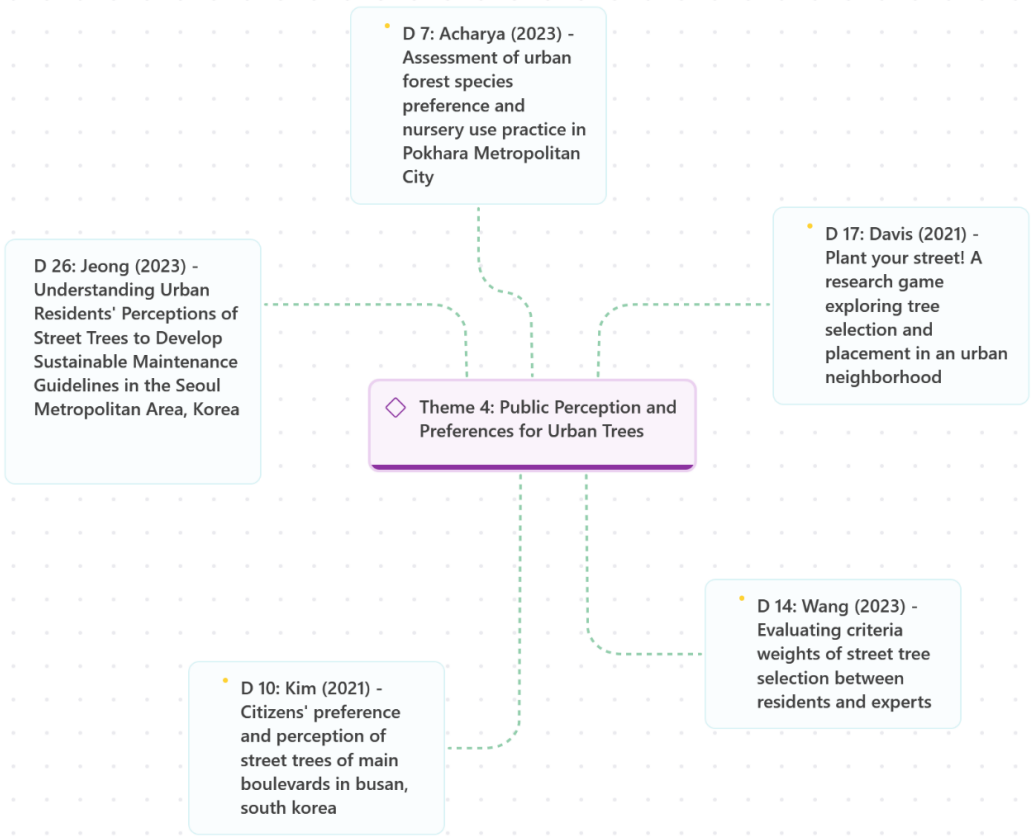


Fig. 9: Theme 4 categorises 5 articles related to Public Perception and Preferences of Urban Trees

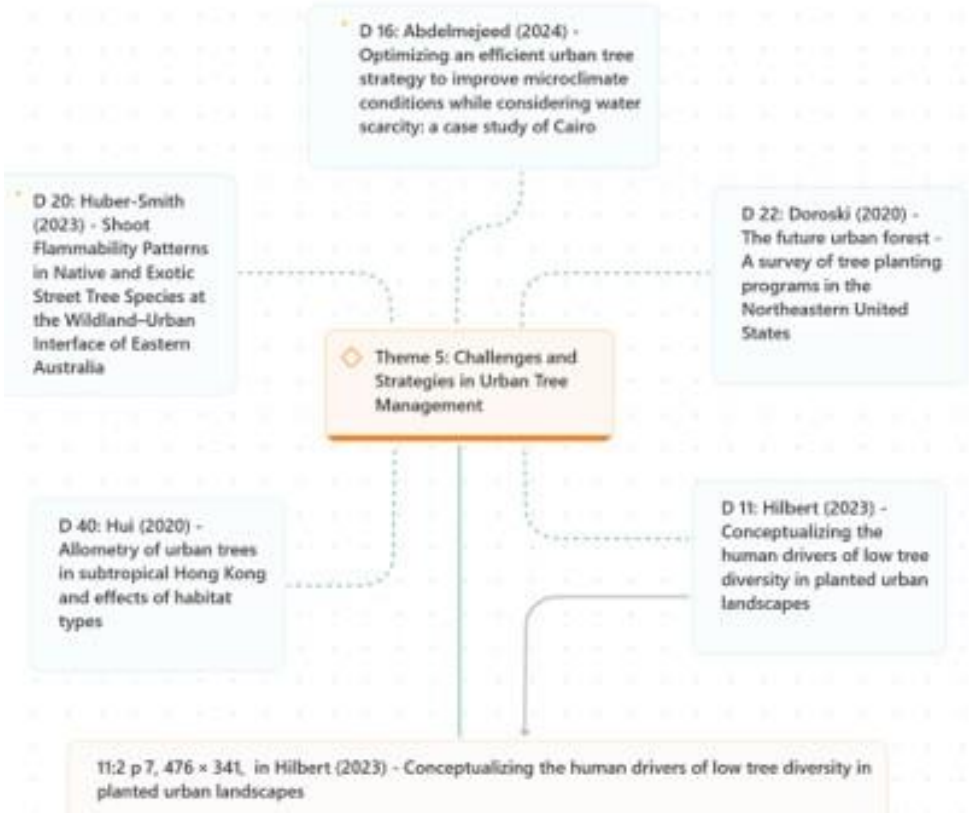
The thematic review explores public perceptions and preferences regarding urban trees, categorized under Theme 4: Public Perception and Preferences for Urban Trees. This review categorizes five key articles that provide significant insights into community engagement and its impact on urban forestry. Jeong (2023) delves into residents' viewpoints in the Seoul Metropolitan Area, creating sustainable maintenance guidelines that align with public expectations. Similarly, Kim (2021) investigates citizens' preferences for street trees on long main boulevards in Busan, revealing the influence of aesthetic value, shade provision, and air quality improvement on public sentiment. Acharya (2023) evaluates species preferences and nursery practices in Pokhara, emphasizing the need to align tree selection with local preferences to enhance community support. Davis (2021) introduces a research game that explores tree selection and placement, showcasing the potential of interactive tools for public engagement. Wang (2023) compares selection criteria between residents and experts, highlighting the necessity of merging expert knowledge with public preferences to develop balanced urban tree management strategies.

Community engagement is crucial in urban forestry, requiring a participatory approach that aligns with public expectations. Significant research gaps include the need for longitudinal studies on public perception and better engagement with diverse demographics. Enhancing public education and policy integration will improve the sustainability and effectiveness of urban forestry programs.

3.2.5 Theme 5: Challenges and Strategies in Urban Tree Management

Challenges and Strategies in Urban Tree Management explores the complex factors essential for effective urban forestry. Hilbert (2023) discusses human influences like biological constraints, market availability, and planting decisions, stressing the need for integrated strategies to enhance tree diversity. Abdelmejeed (2024) focuses on optimizing tree strategies for microclimate improvement and water management in Cairo, while Hui (2020) highlights species-specific growth impacts in Hong Kong. Dorowski (2020) emphasizes the importance of diverse, well-planned tree planting programs in the Northeastern U.S., and Huber-Smith (2023) calls for fire-resistant species in Australia. The studies underscore the need for adaptive management strategies that consider ecological, social, and economic factors.

Despite valuable insights, significant research gaps persist. Long-term studies on management strategy sustainability are lacking, and existing models often overlook ecological, social, and economic factors. More research on localized management strategies and public engagement is needed, alongside adaptive strategies addressing climate change impacts on urban tree management. Addressing these gaps through long-term studies, integrated management models, localized strategies, public engagement, and climate adaptation research is crucial for advancing urban tree management. These efforts will contribute to developing sustainable and resilient urban forests, enhancing the quality of urban life and environmental health.



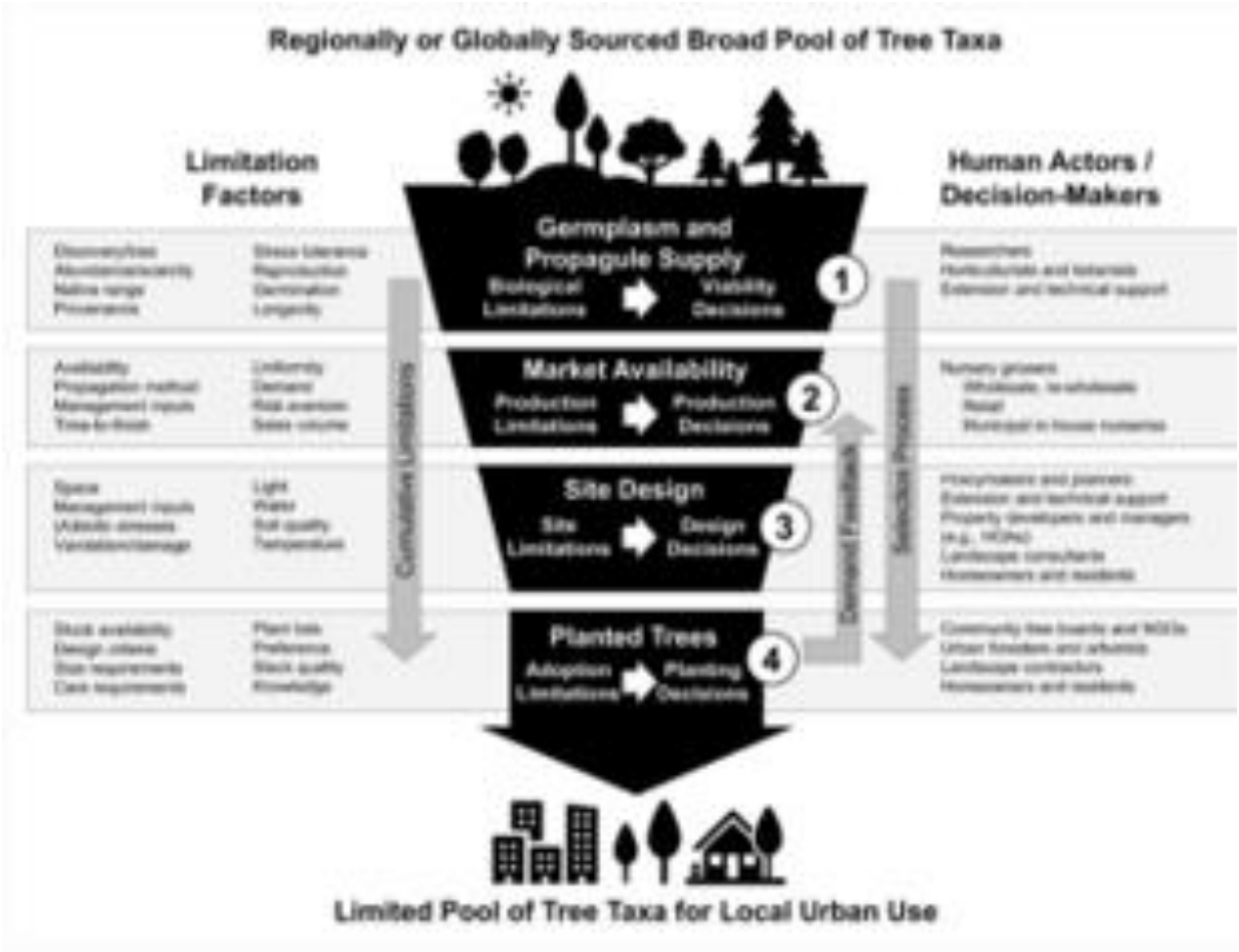


Fig. 10: Theme 5 categorises 5 articles related to Challenges and Strategies in Urban Tree Management

4.0 Conclusion and Recommendations

The thematic review on trends in urban tree species selection for street planting highlights the multifaceted nature of urban forestry, emphasizing genetic diversity, phenotypic plasticity, and ecosystem services. Current research underscores the importance of selecting tree species that thrive in diverse urban environments while providing essential ecosystem services such as carbon sequestration, air pollution mitigation, and thermal comfort (Xiao, 2024 Morakinyo, 2020). However, a significant gap exists in long-term studies tracking tree species' performance and adaptability, crucial for understanding resilience to urban stressors and climate change.

Moreover, there is a disparity between expert recommendations and public preferences, with Wang (2023) highlighting the need for community engagement in tree selection processes. Future research should develop participatory approaches that align community values with ecological objectives. Localized studies are necessary to understand specific adaptation mechanisms and ecosystem services provided by different tree species in various urban settings.

The core research problem centres on developing a systematic and practical approach to street tree selection that balances the benefits of urban trees with the challenges posed by urban environmental stressors, climate change, and socio-economic factors. Inadequate tree selection can lead to infrastructure damage, increased maintenance costs, and the loss of urban green spaces, vital for urban resilience and quality of life.

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.

Future studies should develop comprehensive, adaptive management models integrating ecological, social, and economic factors, incorporating long-term monitoring and assessment. By fostering interdisciplinary collaboration and utilizing advanced technologies like climate analogues and vulnerability metrics, urban forestry can better anticipate and respond to climate change challenges. Addressing these gaps will enhance urban ecosystems' resilience and sustainability, improving urban life quality and supporting broader environmental and social goals.

5.0 Contributions and Benefits of Study

This thematic review on urban tree species selection for street planting significantly advances the field of urban forestry by providing a comprehensive analysis of key factors such as genetic diversity, ecosystem services, climate adaptability, public perception, and management strategies. The study advocates for long-term, localised research and adaptive management models integrating ecological, social, and economic factors. These insights are valuable for urban planners, policymakers, and environmental managers, promoting the development of resilient and sustainable urban forests that enhance urban livability and ecological health. The practical contributions include offering context-specific insights that urban planners and local authorities can directly apply to optimize the sustainability and resilience of urban green spaces.

References

Abdelmejeed, A. Y., & Gruehn, D. (2024). Optimizing an efficient urban tree strategy to improve microclimate conditions while considering water scarcity: a case study of Cairo. Discover Sustainability, 5(1). https://doi.org/10.1007/s43621-024-00247-w

Acharya, M., Subedi, B., & Subedi, S. (2023). Assessment of urban forest species preference and nursery use practice in Pokhara Metropolitan City. Banko Janakari, 33(1), 37–45. https://doi.org/10.3126/banko.v33i1.56497

Bartoli, F., Savo, V., & Caneva, G. (2022). Biodiversity of urban street trees in Italian cities: a comparative analysis. Plant Biosystems, 156(3), 649 – 662. https://doi.org/10.1080/11263504.2021.1906347

Cregg, B., Rouse, R., & Ellison-Smith, D. (2023). Genotypic variation in water relations and gas exchange of urban trees in Detroit, Michigan, USA. URBAN FORESTRY \& URBAN GREENING, 81. https://doi.org/10.1016/j.ufug.2023.127858

D'Amato, L., Bartoli, F., Savo, V., Paiella, P. A., Messina, F., Caneva, G., D'Amato, L., Bartoli, F., Savo, V., Paiella, P. A., Messina, F., & Caneva, G. (2023). Distribution Pattern of Urban Street Trees in Rome (Italy): A Multifactorial Evaluation of Selection Criteria. SUSTAINABILITY, 15(19). https://doi.org/10.3390/su151914065

Davis, N., & Winter, P. L. (2021). Plant your street! A research game exploring tree selection and placement in an urban neighborhood. Urban Forestry and Urban Greening, 64. https://doi.org/10.1016/j.ufug.2021.127244

Hilbert, D. R., Koeser, A. K., Andreu, M. G., Hansen, G., Roman, L. A., Thetford, M., & Thompson, G. L. (2023). Conceptualizing the human drivers of low tree diversity in planted urban landscapes. AMBIO, 52(9, SI), 1532–1542. https://doi.org/10.1007/s13280-023-01876-7

Hurley, A. G., & Heinrich, I. (2024). Assessing urban-heating impact on street tree growth in Berlin with open inventory and environmental data. Urban Ecosystems, 27(2), 359–375. https://doi.org/10.1007/s11252-023-01450-9

Karrer, G., Bassler-Binder, G., & Willner, W. (2022). Assessment of Drought-Tolerant Provenances of Austria's Indigenous Tree Species. Sustainability (Switzerland), 14(5). https://doi.org/10.3390/su14052861

Kim, S. S., Lee, J.-S., Lee, D. H., & Choi, Y. (2021). Citizens' preference and perception of street trees of main boulevards in Busan, South Korea. Sustainability (Switzerland), 13(6). https://doi.org/10.3390/su13063141

Li, Y., Ling, L., Xia, D., Ji, Y., Wang, J., Li, C., Meng, Y., Fang, X., & Chen, Y. (2021). A comparative study on phenotypic plasticity of seven urban street tree species in two contrasting environments. Polish Journal of Environmental Studies, 30(1), 739–750. https://doi.org/10.15244/pjoes/122613

Ma, B., Hauer, R. J., Wei, H., Koeser, A. K., Peterson, W., Simons, K., Timilsina, N., Werner, L. P., & Xu, C. (2020). An Assessment of Street Tree Diversity: Findings and Implications in the United States. Urban Forestry and Urban Greening, 56. https://doi.org/10.1016/j.ufug.2020.126826

Miller, R. W. (1997). Urban Forestry: Planning and Managing Urban Greenspaces. Prentice Hall.

Moreno, R., Nery, A., Zamora, R., Lora, Á., & Galán, C. (2024). Contribution of urban trees to carbon sequestration and reduction of air pollutants in Lima, Peru. Ecosystem Services, 67. https://doi.org/10.1016/j.ecoser.2024.101618

Morakinyo, T. E., Ouyang, W., Lau, K. K.-L., Ren, C., & Ng, E. (2020). Right tree, right place (urban canyon): Tree species selection approach for optimum urban heat mitigation - development and evaluation. Science of the Total Environment, 719. https://doi.org/10.1016/j.scitotenv.2020.137461

Parsa, V. A., Salehi, E., & Yavari, A. (2020). Improving the provision of ecosystem services from urban forest by integrating the species' potential environmental functions in tree selecting process. LANDSCAPE AND ECOLOGICAL ENGINEERING, 16(1), 23–37. https://doi.org/10.1007/s11355-019-00401-x

Pawlak, C. C., Love, N. L. R., Yost, J. M., Fricker, G. A., Doremus, J. M., & Ritter, M. K. (2023). California's native trees and their use in the urban forest. URBAN FORESTRY \& URBAN GREENING, 89. https://doi.org/10.1016/j.ufug.2023.128125

Shah, A. M., Liu, G., Huo, Z., Yang, Q., Zhang, W., Meng, F., Yao, L., & Ulgiati, S. (2022). Assessing environmental services and disservices of urban street trees. an application of the emergy accounting. Resources, Conservation and Recycling, 186. https://doi.org/10.1016/j.resconrec.2022.106563

Wang, C.-W., & Tu, H.-M. (2023). Evaluating criteria weights of street tree selection between residents and experts. Landscape and Ecological Engineering, 19(4), 633–646. https://doi.org/10.1007/s11355-023-00568-4

Xiao, Q., Fan, X., Guo, Y., Li, S., He, W., Deng, Y., Xiao, Z., Wang, P., & Wu, C. (2024). Tree form characteristics as criteria for tree species selection to improve pedestrian thermal comfort in street canyons: Case study of a humid subtropical city. Sustainable Cities and Society, 105. https://doi.org/10.1016/j.scs.2024.105339

Zairul, M., & Mohd Zairul. (2020). A Thematic Review on Student-Centred Learning in The Studio Education. Journal of Critical Reviews, 7(02), 504–511.

Zheng, G., Xu, H., Liu, F., Lin, X., Wang, S., & Dong, J. (2024). Study Roadmap Selection Based on the Thermal Comfort of Street Trees in Summer: A Case Study from a University Campus in China. Sustainability (Switzerland), 16(11). https://doi.org/10.3390/su16114407