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DECISION-MAKING FOR TREE REMOVAL IN URBAN DEVELOPMENT: INSIGHTS FROM LOCAL AUTHORITIES IN MALAYSIA

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Abstract

The decision to remove trees in development areas can avoid various risks caused by problem trees, but also involves the risk of losing valuable trees. This paper aims to investigate decision-making practices in relation to existing trees in development areas and identify the factors that influence those decisions. Data were collected through semi-structured interviews with landscape architects from selected local authorities and analysed using thematic analysis. Only local authorities requiring a tree preservation survey for landscape plan applications and landscape architects participated in this study. The results show that all factors influencing tree removal decisions are interrelated and vary according to the circumstances. Lack of authoritative resources and spatial constraints have affected the rationality of tree retention decisions and led to tree removal. This study contributes to urban tree retention theory and may improve tree preservation and management strategies. Future research should explore the perspectives of other construction professionals to refine each of the results and conclusions.

Keywords: decision-making, tree removal, tree retention, development, local authority

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INTRODUCTION

Urban tree management involves operational and day-to-day decisions, such as where to protect, retain, or plant trees. Strategic decisions, influenced by institutional requirements or top-down policies, such as local authority targets for tree canopy cover or tree diversity, are crucial for urban tree management (Ordóñez et al., 2019). As trees improve quality of life, especially in urban areas, many cities struggle to balance their ambitious tree canopy cover with urban development pressures. As cities grow, more trees are removed for construction projects. The removal of trees in new developments can have significant environmental and social impacts, such as soil erosion, increased temperatures, and reduced biodiversity. However, retaining problematic trees also contributes to nuisance and potential hazards as they require periodic inspections, pruning or removal, and replacement with suitable species. To improve our decision-making, it is important to understand the various situational factors and constraints that influence these decisions. This paper therefore examines tree removal decision-making practice in development areas and identifies the factors that influence this decision.

LITERATURE REVIEW

Decision making and bounded rationality

Decision-making is one of the steps in the problem-solving process. It involves evaluating different options and choosing the best course of action based on available information and desired outcomes. As different factors and different outcomes get involved in the decision-making process, it can be complex and challenging (Taherdoost & Madanchian, 2024). Bounded rationality is often used to describe the limitations that individuals face when making decisions. This concept posits that decision-making by individuals is subject to limitations that restrict the full exercise of rationality. Consequently, rational individuals will opt for a satisfactory decision rather than one that is optimal (Simon, 1987). In this study, the decision to retain and remove trees in a development area is complex and involves several factors, and some of the factors can influence the rationality of decision-making.

Factors influencing the decision to retain and remove trees in development areas

The size of trees is an important predictor of their retention or removal. Studies have shown that small trees are preferentially removed while larger trees are retained (Guo et al., 2018; Morgenroth et al., 2017). Ordóñez et al. (2023) emphasised the need to preserve old, ageing trees for as long as possible. Roman et al. (2022) also recommended that efforts should be made to retain large, healthy trees, especially if they do not interfere with the construction of new buildings. Morton (2006) argues that selecting a tree in good health and with a long-life

expectancy is the optimal choice for retention on a building site. However, Gilbert (1996) argued that young trees and rare species that have significant landscape value should be prioritised for retention. Furthermore, planting trees in unsuitable locations may indirectly lead to their removal due to the safety risks posed (Klobucar et al., 2021) and the inability to retain every tree due to limited space and other constraints on the site involved (Croeser et al., 2020; Guo et al., 2018, 2019; Morgenroth et al., 2017). Government regulations to protect trees also have an impact on the retention of trees. To date, there is no law on tree designation or regulatory approval for the removal of private trees in Malaysia. And although the Tree Preservation Order has been in force for over two decades, there are still shortcomings in terms of implementation and enforcement (Nik Mohamed Sukri et al., 2017). According to Ordóñez-Barona et al. (2021), the most innovative mechanisms for retaining trees in development areas involve a combination of multiple regulations and the implementation of financial incentives. Kronenberg (2014) found that current regulations do not prioritise urban greenery, and this directly causes the retention of trees in cities to face major challenges due to a lack of funding, inadequate management, and oversight of tree care.

Other important factors influencing tree-related decisions in development areas are the availability of tree data, such as the number and condition of trees, and specialised tools such as sonic tomographs (Ibrahim et al., 2019). Studies have also shown that negative attitudes towards trees and individual preferences influence the removal of healthy trees. Some people think trees are a problem because they provide shade, cause allergies, and need labour to clean up fallen leaves (Kronenberg, 2014). Kirkpatrick, Davison and Daniels (2013) found that society does not actively support or prioritise the greening of cities because other needs, such as the development of grey infrastructure, are seen as more pressing. Due to the high cost of tree removal, especially large trees, some residents and communities retain unwanted trees, including dead or dying trees (Conway, 2016). Higher property value is also associated with greater tree retention, suggesting that property value is a strong predictor of tree presence (Morgenroth et al., 2017).

METHODOLOGY

Study Sample

The present study included a sample of eight landscape architecture professionals. Five participants are directors, deputy directors, and heads of departments; one works at the One Stop Centre (OSC). Table 1 shows the demographic characteristics of the participants. Participants were selected using a purposive sample. This study included local authorities that require tree retention reports for landscape plan applications. The participating local authorities include Kuala Lumpur City Hall (KLCH), Petaling Jaya City Council (PJCC), Ipoh City Council (ICC), Subang Jaya City Council (SJCC), Malacca

Historical City Council (MHCC), Seremban City Council (SCC), Johor Bahru City Council (JBCC), and Pasir Gudang City Council (PGCC). The head of the Landscape Department recommended the participants based on their experience and knowledge of tree retention and removal in the development area.

Table 1: Demographic profile of the semi-structured interview's participants

	Local Authority	Unit/ Department	Position
1	KLCH	City Planning Department	Landscape Architect
2	PJCC	Department of Landscape and Urban Greenery	Landscape Director
3	SJCC	Landscape Department	Head of Department
4	ICC	Park and Landscape Department	Assist. Senior Director
5	SCC	Park and Landscape Department	Landscape Architect
6	HMCC	Landscape Department	Head of Department
7	JBCC	Landscape Department	Landscape Architect
8	PGCC	Engineering and Landscape Department	Head of Department

Procedure and Data Analysis

Interviews allow this study to obtain rich data on tree retention and removal decision practices directly from local authorities. As decision-makers, their insights and perspectives are crucial in understanding the factors that influence tree removal (Silverman, 2006). A letter was sent via email to seek permission to conduct an interview with landscape architects in selected municipalities. Interviews were conducted from March 2022 to September 2022 using face-to-face interviews or video conferencing, depending on the preference and convenience of the participants. Each interview lasted approximately one hour, and participants were asked the following questions: (i) "What decisions are typically made—retention or removal of trees?" and (ii) "What is the rationale behind the decision?". The aim of these questions was to identify the type of decision practices they applied and the factors influencing the decision. The transcribed interviews were analysed using thematic analysis and ATLAS.ti version 9 to generate themes (factors) and subthemes.

RESULTS AND DISCUSSION

Decision-making practice regarding existing trees in development areas

As shown in Table 2, all of the study participants consistently and clearly responded to the interview questions, claiming that tree removal is a common decision in development areas.

Table 2: Interview excerpts about typical decisions regarding existing trees in development areas

P	Code	Excerpts
1	1:45 p 7	...usually, trees will be cut down.
2	2:66 p 11	...many are in the tree removal category.
3	3:24 p 3	...they cut down trees.
4	4:17 p 3	...so far, it has not been retained.
5	5:19 p	...we have no sweet memories; we usually cut them down.
6	6:2 p 3	...the common decision is to remove and replace them.
7	7:29 p 4	...the common decision is to remove a tree.
8	8:5 p 1	...usually, we will give permission to cut down.

(P= Participant)

Upon being queried about the rationale behind the removal of trees in the development area, most participants expressed that they were compelled to grant the developer permission to remove the existing trees in the development area, citing a lack of alternative options. The participants highlighted the efforts made by landscape architects to retain trees, as well as the limitations they face in terms of decision-making opportunities. This study confirms previous findings related to development activities, which lead to the loss of urban tree due to the removal of existing trees (Brunner & Cozens, 2013; Clark et al., 2020; Croeser et al., 2020; Guo et al., 2018). However, this study found that decision making can be a complex process, especially when it involves multiple stakeholders and factors. The tendency to remove trees is higher because there are more factors influencing the decision to remove trees in the development area than the factors influencing their retention.

Factors influencing of tree removal decision in development areas

Figure 1 shows that six factors influence tree removal decisions in development areas. The selection, planting, and maintenance history are social-related factors, focusing on previous tree planting trends and their maintenance practices that led to present-day issues. Unsuitable species selection and planting can result in "maintenance burden" and "risk of failure and nuisance". This indirectly affects the decision to remove trees, as this poses a risk of disturbance and safety, e.g., falling branches and trees obstructing views or damaging the built structure. The unhealthy condition of trees is a result of inadequate maintenance procedures, and this indirectly influences the decision to remove a tree.

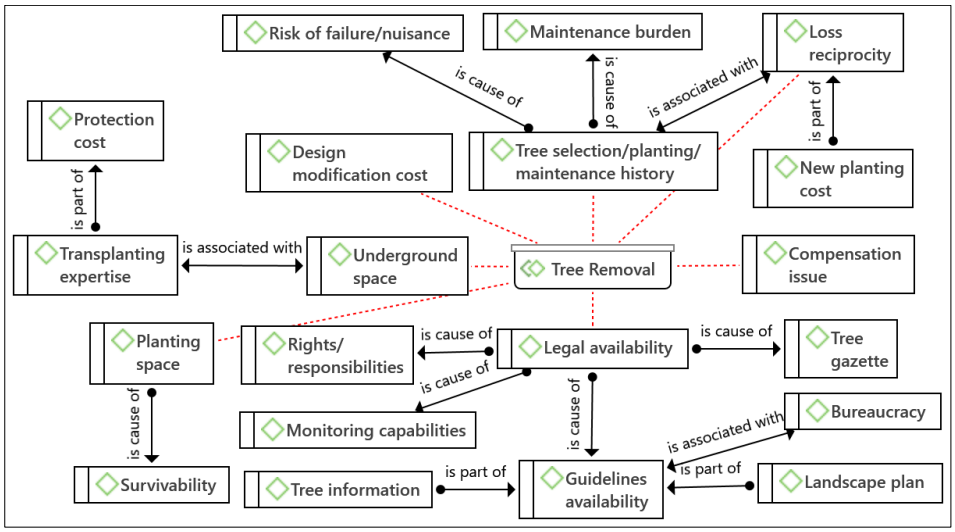

Figure 1: Factors associated with tree removal decisions in development areas

This study supports previous research on environmental disturbance caused by improper tree planting and species selection (Brunner & Cozens, 2013). The findings of the study by Conway (2016) show that trees are removed several years after planting because they have just realised the inappropriateness of the trees. To minimise the negative impact and maximise the positive effect, Vogt et al. (2017) recommended that tree removal be done optimally and in accordance with the location.

Retaining unsuitable trees also requires high maintenance by local authorities. Granting the developer permission to remove the trees enables the local authorities to reduce removal and maintenance cost, while also allowing them to gain benefits of planting new trees. Furthermore, to avoid creating new compensation issues, local authorities are more likely to approve tree removal applications. For developers, since the cost of removing trees is cheaper than retaining them, they are more inclined to remove trees. The implementation of structural and design alterations for retaining trees will also incur significant expenses. Additionally, developers may perceive tree removal as a way to minimise potential obstacles and delays during construction. Retaining trees by transplant also makes it difficult for the developer and adds significant costs to the construction process. Financial constraints on transplanting trees are the main reason trees are removed by developers. The process of transplanting trees can be expensive, as it involves not only the cost of uprooting and transporting trees, but also the expenses associated with ensuring their survival in the new location. Additionally, developers may lack the necessary knowledge and skills to successfully transplant trees, leading them to opt for removing them instead. Furthermore, the size and age of the tree also play a significant role in the decision

to transplant or remove it. Larger and older trees are often more difficult to transplant successfully, as their root systems are more extensive and established. Consistent with the findings, tree removal can offer advantages by allowing for the correction of past planting mistakes through the replacement of new and better trees. Tree removal is also driven by profit returns in addition to minimising risk. According to Nik Mohamed Sukri et al. (2022), removing trees can provide more benefits in enhancing the sustainability of urban forests. However, (Conway, 2016) and (Guo et al., 2019) found that property owners often choose to retain trees due to the significant cost involved in their removal. Similarly, Guo et al. (2019) observed a similar trend, where the financial burden of tree removal influenced the decision to retain them intact. These findings contrast with the results of the current study, highlighting divergent perspectives on tree retention and its associated costs.

The constraints on retaining the trees through transplanting are primarily due to the limited space and the presence of underground utility cables. The relocation of trees belonging to the local authorities is not possible due to their location in the road reserve, which runs parallel to utility cables and pipes. The excavation of trees also poses a significant threat to both the infrastructure and the safety of individuals. In addition, transplanting a large tree within a confined area will pose challenges in preparing the root ball. Proper preparation of root balls of sufficient size is essential for the survival of the tree after transplanting. Previous studies have shown that spatial factors, such as tree protection zones affect tree preservation, for example Suchocka et al. (2019), which found insufficient tree protection due to construction space shape, and Despot dan Gerhold (2003), where they found limited space to be the main barrier to tree protection in development areas.

Most of the restrictions that apply to retaining trees are related to the local authorities as decision-makers. Difficulties include the designation of existing trees and the limited ability to monitor urban trees, especially on private land. This is because local authorities do not have the right or authority to do so due to existing laws and policies. In addition, there are limitations due to cumbersome and complicated procedures for both sides, i.e., local authorities and developers, to retain trees. Local authorities have to take the initiative in certain situations to persuade various parties to retain trees, especially when it comes to trees on private land. If the developer wants to retain the tree after the development order (DO) has been approved, there are also problems, as the DO application must be amended and resubmitted. This process can be time-consuming and may cause delays in development projects. Furthermore, developers may face financial constraints in modifying their plans to accommodate the retention of trees, making it more challenging to retain them.

Power directly influences the decision-making trend (Suliman et al., 2021). This finding is in line with previous studies that show institutional

constraints on retaining trees in development areas. Among those constraints are the lack of emphasis on urban greening in current regulations (Kronenberg, 2014), ineffectiveness of current penalties and fines (Clark et al., 2020; Ibrahim et al., 2019), as well as the restricted regulation of trees in private areas (Brunner & Cozens, 2013). Besides enforcing tree removal penalties, permits, and zoning planning for private areas, Ordóñez-Barona et al. (2021) suggest that decisions must be made collectively and incorporate many rules. This approach is important to ensure that the decision-making process is fair and inclusive, taking into account the perspectives and interests of various stakeholders.

This study discovered that all factors influencing tree removal decisions are interrelated, emphasising the importance of considering multiple factors when making decisions. The reasons for the decision vary according to the circumstances. The level of tree health, risk, and maintenance burden associated with a history of inappropriate species selection and planting are all direct influences on the decision to remove trees in development areas. Removing problematic trees by developers in situations involving trees requires local authorities to maximise utility by addressing the issues they pose, such as potential damage to infrastructure or safety hazards. This approach not only saves costs for the local authority in terms of maintenance and potential liabilities, but it also allows for the opportunity to replace the removed tree with a new one that is better suited for the development project. Additionally, developers can ensure that the replacement tree is carefully selected and planted in a suitable location, further enhancing the overall aesthetic and environmental benefits of the area. This study additionally discovered some factors that not only limit the effectiveness of tree retention decision-making, but also lead to tree removal. There is the lack of authority for local authorities that limits their ability to retain trees in private areas, time constraints, procedures, and limited resources that contribute to the difficulty of making rational tree retention decisions, as well as limited space for tree growth or potential conflicts with existing infrastructure, which further complicate the decision-making process.

CONCLUSION

Tree removal is a common decision in development areas. The study highlights the interconnected factors influencing tree removal decisions, emphasising the importance of considering multiple factors. Lack of authority and spatial constraint complicate the decision-making process and lead to tree removal. These findings enhance the management of urban trees and contribute to literature on tree retention and decision-making. Future research could incorporate existing and recent viewpoints with other stakeholders.

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