

# A PILOT STUDY ON THE RELATIONSHIPS BETWEEN TREE CHARACTERISTICS AND PERCEIVED VALUE DIMENSIONS IN URBAN TREE RETENTION



Khalilah Hassan<sup>1\*</sup>, Noorliyana Ramlee<sup>1</sup>, Yeo Lee Bak<sup>2</sup>, Siti Nuratirah Che Mohd Nasir<sup>1</sup>, Nor Diyana Mustapa<sup>1</sup>, Khairul Hisyam Baharuddin<sup>2</sup> and Ayub Awang<sup>3</sup>  
<sup>1</sup>Sustainability, Urban Design & Wellbeing Research Group, Faculty of Architecture & Ekistics, Universiti Malaysia Kelantan, 16300 Bachok, Kelantan, Malaysia  
<sup>2</sup>Faculty of Language Studies and Human Development, Universiti Malaysia Kelantan, 16300 Bachok, Kelantan, Malaysia  
<sup>3</sup>Architectural Heritage and Cultural Studies Research Group, Faculty of Architecture & Ekistics, Universiti Malaysia Kelantan, 16300 Bachok, Kelantan, Malaysia



## Introduction

Urban development often leads to tree loss, reducing biodiversity and disrupting ecosystems. Mature trees provide essential benefits such as air purification, temperature regulation, and carbon storage (Nowak & Crane, 2002). They also enhance cityscapes and carry cultural and symbolic meanings (Ferguson, 2023). In Malaysia, rapid urban expansion has increased tree removal, especially in dense areas where green space is limited (Hassan et al., 2023). Studies show that retaining existing trees offers greater ecological and social benefits than planting new ones (Coleman et al., 2022).



However, many tree retention decisions focus only on structural condition, neglecting values like cultural, aesthetic, or social importance. There is a need for more holistic assessment methods that consider both tangible and intangible tree values.

This pilot study explores how certified arborists in Malaysia assess tree characteristics—esthetic qualities of plant parts, species origin, tree category, growth habit, health condition, and life expectancy—across four value dimensions:

**Utility, Design, Sensory, and Symbolic.**

## Results & Discussion

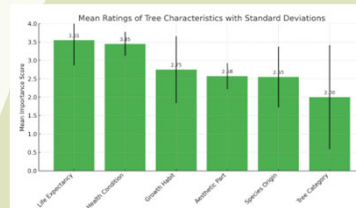


Fig. 2: Mean Importance Ratings & Standard Deviations for Tree Characteristics

### Descriptive Statistics of Tree Characteristics

- The analysis shows that life expectancy received the highest importance rating (Mean = 3.55), followed by health condition (Mean = 3.45) and tree dimension (Mean = 3.16). This suggests that experts prioritize tree traits related to long-term survival, stability, and ecological function.
- In contrast, tree category received the lowest rating (Mean = 2.00), reflecting mixed views on its relevance. Other traits like species origin, growth habit, and aesthetic quality received moderate ratings (Mean = 2.55–2.75).

### Correlation Analysis Between Tree Characteristics and Value Dimensions

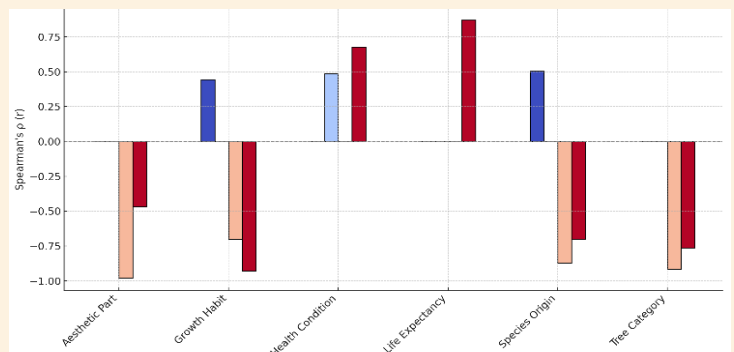
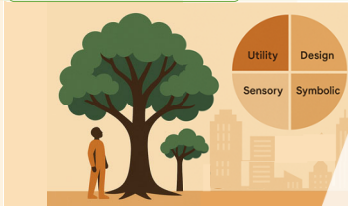


Fig. 3: Grouped Bar Chart of Spearman Correlation by Tree Characteristic and Value Dimension

## Methodology



### PARTICIPANTS & SAMPLING PROCEDURE

- 20 certified arborists from across Malaysia
- All had qualifications and **practical experience** in urban tree assessment
- Minimum **5 years of experience** in urban tree evaluation
- Direct involvement in **tree retention decisions** on construction sites

### DATA COLLECTION

- Structured, questionnaire & Focused on expert perceptions of key tree characteristics
- Assessed **biological & morphological traits vs Perceived Value Dimensions**
- Procedure: Distributed in person during an arborist program; Briefing provided (verbal + written) to explain purpose; Used a 5-point Likert scale (0 = Not Important at All, 4 = Absolutely Essential)

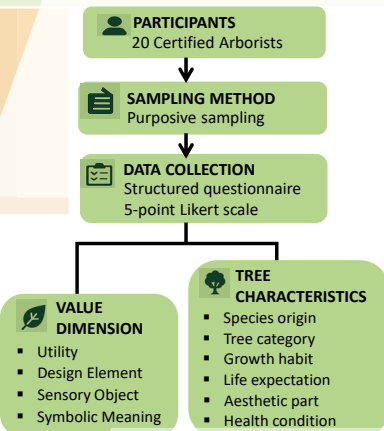


Fig. 1: Overview of Participants, Sampling, Data Collection and Data Analysis

### DATA ANALYSIS

- Using IBM SPSS Statistics (v25).
- Descriptive statistics:** summarize expert ratings for each tree characteristic & value dimension.
- Spearman's rank correlation:** identify relationships between tree characteristics and perceived values.

## Conclusion

This pilot study explores how tree characteristics and perceived values influence decisions to retain trees in urban development. Results show that arborists consider both biological traits—like life expectancy, health, and growth habit—and subjective values such as symbolism and aesthetics. For instance, trees expected to live longer are seen as more useful, while those viewed as visually attractive may not always carry deep cultural meaning. This suggests that decisions about tree retention are not just technical but also shaped by cultural and emotional factors.

The study offers a starting point for future research that combines scientific data with cultural and practical insights. Future studies should involve more participants, include community opinions, and track how values may change over time. By combining expert knowledge with public perspectives, cities can create better urban greening strategies—especially in fast-growing places like Malaysia, where sustainable growth and biodiversity protection are key goals.

### Summary of Tree Characteristics and Perceived Values

#### Life Expectancy vs. Utility Value

- Strong positive correlation ( $r_s = 0.870, p < 0.01$ )
- Trees that live longer are viewed as more useful
- Supported by models like SULE, TreeAZ, SRIV, and STARS
- Long-living trees deliver better ecosystem services over time

#### Aesthetic Value vs. Symbolic Meaning

- Very strong negative correlation ( $r_s = -0.979, p < 0.01$ )
- Attractive trees are not always seen as culturally or spiritually important
- Aesthetic value is based on looks; symbolic value is tied to cultural or emotional meaning

#### Species Origin (Native vs. Non-native)

- Negative with utility ( $r_s = -0.704, p = 0.001$ ) and symbolic value ( $r_s = -0.873, p = 0.000$ )
- Positive with design value ( $r_s = 0.503, p = 0.024$ )
- Native trees seen as valuable for design and cultural identity

#### Tree Category (Deciduous vs. Evergreen)

- Negative with utility ( $r_s = -0.762$ ) and symbolic value ( $r_s = -0.917$ )
- Evergreen trees preferred for year-round services and symbolic meaning (longevity, resilience)

#### Growth Habit (Growth Rate)

- Negative with utility ( $r_s = -0.930$ ) and symbolic value ( $r_s = -0.701$ )
- Positive with design value ( $r_s = 0.445$ )
- Fast-growing trees add quick impact; slow-growers offer lasting value

#### Health Condition

- Positive with utility ( $r_s = 0.679$ ) and sensory value ( $r_s = 0.488$ )
- Healthy trees improve appearance, survive better, and offer more benefits