

# Vegetation composition and landscape preference with reference to the Royal Botanic Gardens, Peradeniya, Sri Lanka.

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## Abstract

*“Between every two pines is a doorway to a new world” A quotation by John Muir emphasizes that even within the simplest aspect of nature, there is immense beauty and nature is not just a place to visit, it is a realm of wonder and exploration. In creating this realm, the interplay between vegetation composition and landscape preference is important. Landscape architecture needs to involve a place making process carefully when composing and manipulating vegetation to address preferential needs of humans including aesthetic, psychological and spiritual. The objective of this study is to enquire the impact of vegetation composition on landscape preference. The study is based on vegetation composition indicators through six visual concepts, which describe landscape character-relationships to theories of landscape preference (coherence, disturbance, visual scale, imageability, complexity and naturalness). This study was conducted with reference to vegetation composition at Royal Botanic Garden, Peradeniya, Sri Lanka using with a sample of thirty participants. Final data collection was done based on an online questionnaire survey with quantitative and qualitative data. Five spaces were selected as case studies for final questionnaire after the pilot study. Finding revealed recommendations to guide future landscape designs and maintenance practices in botanical gardens and similar public spaces.*

**Keywords:** Vegetation Composition, Landscape Preference, Vegetation Composition indicators, Royal Botanic Gardens, Landscape

## Introduction

Landscape architecture is a field that shapes the built environment, aiming to create aesthetically pleasing and functional spaces that meet the needs and preferences of users. According to ELC landscape is a zone or area, which perceive by people, whose character is the result of the action and interaction of natural and/or human factors (Council of Europe, 2000). It emphasizes that core of landscape can be considered as human and human perceptions and preferences are an important part of that landscape (Ren, 2019). Landscape preference depends on the composition of landscape elements and there has been growing interest in understanding vegetation as landscape elements in urban and natural environment including influence of wellbeing and preference (Maulan et al., 2006).

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Understanding the factors that affect landscape preference is not only academically important but also has practical implications for landscape architecture. Landscape architects must take decisions about vegetation composition, plant selection, layout and maintenance to create outdoor spaces that resonate with users (Ren, 2019).

Understanding how different vegetation compositions impact landscape preference is crucial for landscape architects to create captivating and engaging outdoor environments. Explore the impact of vegetation composition on landscape preference to enhance the knowledge and practice of landscape architecture is important.

### **Need of the study**

For instance, research has revealed that certain landscape elements, such as water features, squares, and openness, have varying degrees of influence on landscape preference in urban parks (Cai et al., 2022). Additionally, vegetation types in green spaces impact landscape preference, as indicated by a model developed in another study (Duan & Li, 2022). Moreover, investigations have explored how vegetation aggregation, determined by specific criteria, can affect landscape preference, shedding light on the role of vegetation arrangement (Costa, 2022). The need to understand the vegetation composition together with landscape preference of human is essential in designing new spaces. The findings of this research will inform landscape architects' decision-making processes, enabling them to create more attractive and user centric outdoor spaces.

## **01. VEGETATION COMPOSITION AND LANDSCAPE PREFERENCE**

Vegetation composition is the process of combining different plants into a unified whole. When vegetation composition is often compared to other arts such as painting, sculpture, weaving and music, it is perhaps, the most dynamic artform because the results are a work of art in three dimensions seen from many points of view, using materials that are constantly changing. Arranging these materials into an ordered whole is a physical artistic expression of the design concept using plants as the constantly changing medium (Nancy A. Leszczynski, 1999). Plant composition can create visually captivating landscapes, enhance user experience and contribute to the overall design (Starke & Simonds, 2013).

Landscape preference refers “the tendency for humans to favor certain landscapes more than others and the theories developed to explain those tendencies” (Falk, 2016). Interaction between human and nature are frequently studied through investigation of landscape and preferences (Appleton, 1975). The interaction between people and natural environment causes people to feel and have different preferences for the surrounding environment. As well as pleasant landscapes can give physical and mental benefits to people (Li et al., 2021). Also previous researches have done to explore the landscape preferences of people under different moods has practical significance in determining to what extent human physical and mental health can be restored through exposure to specific landscapes. And they studied that human landscape preferences are associated with their moods (Li et al., 2021). Human preference for vegetation compositions in green areas with different structures and concrete and asphalt sites were assessed through field perception in winter and summer and the activity types through different vegetation types were evaluated (Gao et al., 2019).

## **Landscape preference related theories**

### **Information processing theory**

Information is the ultimate concept of their approach and it has been dominant to human experience and survival throughout the evolution of the human (Kaplan et al, 1998). People need to gain information to feel the environment, but an individual also values environments with capable information for exploration (Kaplan et al., 1998; S. Kaplan, 1975 as cited in Kaymaz, I.C. (2012)).

### **Biophilia hypothesis**

Ulrich (1993) explains that the certain rewards or advantages related with natural settings have been critical for the survival during evolution of humans, suggestions for biophilia, and then retained, positive replies unthreatening natural settings.

## **02. APPLICATION AND ANALYSIS OF THEORIES AND METHODOLOGY**

### **Theoretical framework and Preference model**

In the book, “capturing landscape visual character using indicators: touching base with landscape is aesthetic theory” by Mari S. Tveit highlights a method of capturing the visual landscape character through concepts related to landscape perception. Nine concepts that reflects the visual character of a landscape are complexity, coherence, disturbance, stewardship, imageability, visual scale, naturalness, historicity, and ephemera.

According to the theoretical framework developed by Tveit et al (2006), reflects the relationship between concepts and theories related to landscape preference and experience. Concepts describing landscape character-relationships to theories of landscape preference and experience were discussed under this research (Ode et al, 2008).

According to this study, six concepts selected.

1. Coherence, II. Disturbance, III. Visual scale, IV. Imageability , V. Complexity ,VI. Naturalness

Table 2 shows the relationship between vegetation composition qualities in landscape and the visual concepts describes under the landscape preference theories.

**Table 1 : Identified concepts, ( As cited in Ode et al, 2008)**

Theory	Concept	References
Biophilia	Complexity	Kellert & Wilson (1993)
Information Processing Theory	Coherence	Kaplan & Kaplan (1982,1989)
Biophilia	Disturbance	Kellert & Wilson (1993)
Aesthetic of care	Stewardship	Nassauer (1995)
Spirit of place/genius Loci/vividness Topophilia	Imageability	Lynch (1960) Litton (1972) Bell (1999) Tuan (1974)
Prospect refuge theory Information processing theory	Visual scale	Appleton (1975)
Restorative landscape Biophilia	Naturalness	Kaplan & Kaplan (1989) Ulrich (1979,1984) Kellert & Wilson (1993)
Topophilia Landscape heritage/Historic landscapes	Historicity	Tuan (1974) Lowenthal (1979,1985) Fairclough et al. (1999)
Restorative landscapes	Ephemera	Kaplan & Kaplan (1989) Ulrich (1979,1984)

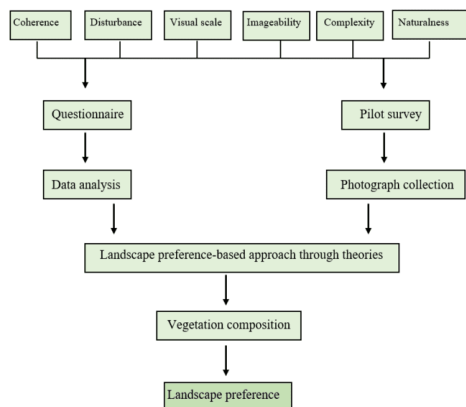
Note: Compiled by author as cited in Ode et al, 2008

**Table 2-Preference model**

Information processing theory	Coherence	Repeating colors and patterns
Biophilia	Disturbance	Visibility of disturbing elements
Prospect and refuge	Visual scale	Degree of openness
Spirit of place	Imageability	Viewpoints, landmarks, or unique element
Biophilia	Complexity	Shape diversity and size variation
Biophilia	Naturalness	Permanent vegetation cover and degree of wilderness

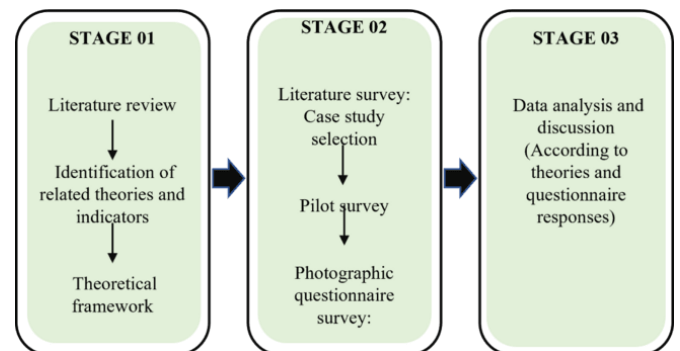
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### Strategy of the study and Methodology



**Fig 1: Strategy of the study**

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**Fig 2: Methodology**

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The table shows concepts connectivity with the questionnaire.

**Table 3-Relationship between vegetation composition indicators and presented questions.**

Concept	Vegetation composition Indicators	Question Presented
Coherence	Repeating colors and patterns	I. Pattern repetition II. Colors
Disturbance	Visibility of disturbing elements	Pleasant visuals
Visual scale	Degree of openness	Visual presentation
Imageability	Viewpoints, landmarks, or unique element	I. Uniqueness II. Memorable
Complexity	Shape diversity and size variation	I. Shape diversity II. Tree density
Naturalness	Permanent vegetation cover and degree of wilderness	I. Natural II. Stress releasing

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### Royal Botanic Garden as a case study

Royal Botanic Garden is situated in the Central Province of Sri Lanka, approximately 5.5 kilometers to the west of the city of Kandy. The location of the garden, near the Mahaweli River, which is known for its status as the longest river in the country, only adds to its charm. The gardens' beauty is further highlighted by the flourishing growth of different vegetation.



**Fig 3:** Location of the Royal Botanic Garden, Peradeniya, Sri Lanka.

Source; Google maps, Edited by author.

## 03. DATA PRESENTATION OF THE CASE STUDY, ANALYSIS AND DISCUSSION.

### Vegetation composition of the selected sceneries

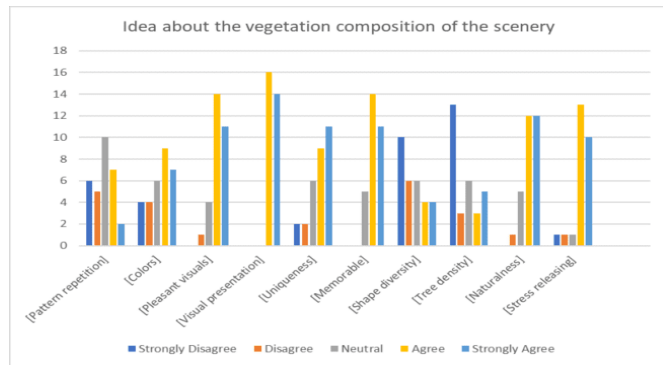
#### SCENERY C -Great Lawn

The Great Lawn of the Royal Botanic Garden in Peradeniya, Sri Lanka, is a magnificent and expansive open space that serves as one of the most important spaces and focal point of this landscape. The most unique landscape element is the Java Willow tree (*ficus benjamina*) which occupies the center of the great lawn as a landmark.



**Fig 4 :** Scenery C-Great Lawn

Source; Taken by author



**Fig 5:**Idea about the vegetation composition of scenery C- Great Lawn

Source; Compiled by author

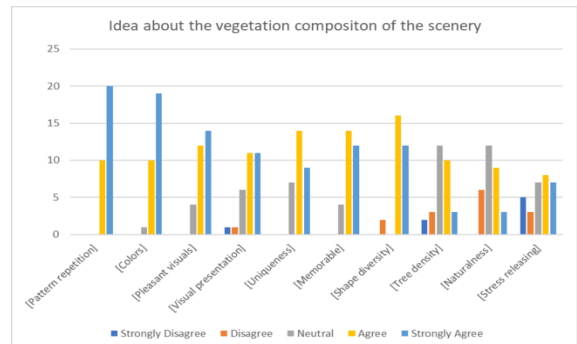
**SCENERY B -Ribbon Border**

The ribbon border of coleus varieties is one of the most attractive spaces in flower section of Royal Botanic Garden. This landscape feature is situated against a backdrop of lush greenery and adjacent to the surrounding landscape, enhancing the visual impact of coleus varieties.



**Fig 6:** Scenery B – Ribbon border

Source: Taken by author



**Fig 7:** Idea about the vegetation composition of scenery B-Ribbon border

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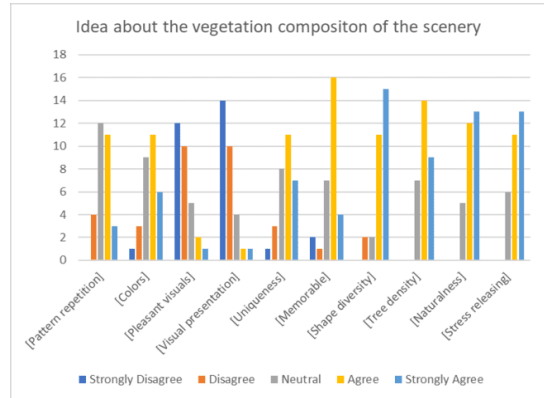
**SCENERY A – Main Road**

The main road of the botanical garden leading to the Great Circle is a picturesque avenue that immediately captures the attention of visitors because of the trees such as *aphelandra sinclairiana*, *terminalia bellirica*, *cullenia ceylanica* and *Santalum ellipticum zipp* . Mature trees line beside the main road creating natural canopy and the canopy filters sunlight, casting shadows on the road. This shade and shelter create comfortable and inviting environment.



**Fig 8:** Scenery A- Main road

Source: Image taken by author



**Fig 9:** Idea about the vegetation composition of scenery A- Main road

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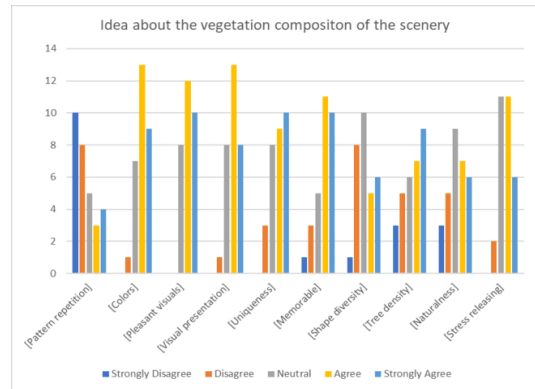
### SCENERY J – Great Circle

The great circle is large flat land area that covered with grass and filled with ornamental flowering beds from place to place around this circular landscape. Great Circle is laid out in a circular pattern, creating a harmonious and balanced landscape. The circular design often imparts a sense of unity and the greenery of this area provides inviting environment and tranquil setting to users. Flower beds showcase a diverse of plant species, adding different colors, textures, fragrance, and visual interest to the Great Circle.



**Fig 10:** Scenery J - Great circle,

Source: Image taken by author



**Fig 11:** Idea about the vegetation composition of scenery J – Great Circle

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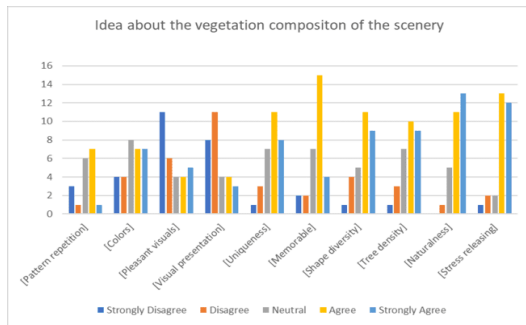
### SCENERY G – Arboretum

The Arboretum section in the Royal Botanical Garden Peradeniya is indeed a unique area that sets itself apart from the other sections in the garden. The Arboretum is a collection of trees that are grown for scientific, educational, and aesthetic purposes is primarily shaded due to the presence of ancient and significant trees that provide a dense canopy overhead.



**Fig 12:** Scenery G- Arboretum section

Source: Image taken by author



**Fig 13:** Idea about the vegetation composition of scenery G- Arboretum

Compiled by author

## FINDINGS AND DISCUSSION

The analysis of five sceneries areas within the Royal Botanic Garden, Peradeniya, offers valuable insights into the complex relationship between vegetation composition and landscape preference. These sceneries, namely Scenery C, Scenery B, Scenery A, Scenery J, and Scenery G, provide diverse examples of how different vegetation composition influence landscape preferences in a botanical garden landscape.

**Table 4: Agreed percentages to vegetation composition indicators on sceneries - According to the questionnaire results**

Indicators	Coherence		Disturbance	Visual scale	Imageability		Complexity		Naturalness	
	Pattern repetition	Color			Pleasant visuals	Visual presentation	Uniqueness	Memorable	Diversity	Density
Scenery C	23%	30%	47%	53%	30%	47%	13%	10%	40%	50%
Scenery B	33%	33%	40%	37%	47%	47%	53%	33%	30%	27%
Scenery A	37%	37%	7%	3%	37%	53%	37%	47%	40%	37%
Scenery J	10%	43%	40%	43%	30%	37%	17%	23%	23%	37%
Scenery G	39%	23%	13%	13%	37%	50%	37%	33%	37%	43%

Compiled by author

Scenery C, the scenery of great lawn has low grass vegetation that allows for easy movement, great visibility and the area is perfect for relaxation. *Ficus benjamina* plant that planted in the center act as a landmark and vegetation composition make it unique and visually appealing landscape. According to the results, majority of participants (47%) agreed to the pleasant visuals of scenery C and it proves that the disturbance is low within the scenery. And scenery C is highlighted with 53% percentage in degree of openness of vegetation composition that increase concept of visual scale. Vast grass cover area with minimal vegetation of this scenery is favored for its open, tranquil, and visually pleasing qualities. Visitors appreciate its spaciousness and stress-relieving atmosphere.

Scenery B, the ribbon border serves functional and ornamental purposes as well as guide visitors using vegetation composition. This scenery creates a harmonious composition due to forms, textures and colors of vegetation while providing contrast in form and texture. The repetitive pattern of vegetation and the color creating dynamic and visually appealing scenery. This scenery

B featuring densely arranged coleus plants with vibrant foliage, highlights the importance of pattern repetition, color diversity, and shape variations. Therefore, scenery B has highest complexity and suggesting a high level of diversity and density in vegetation composition.

Vegetation composition of scenery A encourages exploration and direct visitors to a focal point. The landscape features symmetrically balanced through three layered vegetation composition. The dense vegetation enhances its distinct character and visual impact. Scenery A (Main Road) has a relatively low visual scale (3%) as this landscape consist of degree of enclosure because of vegetation composition with three layers of vegetation.

Scenery J, the scenery of great circle mainly provides grassy surface for relaxation with unobstructed views. The low proportion of vegetation ensures the uninterrupted view of the surrounding landscape because of the higher degree of openness. Scenery J shows the value of harmony and minimal visual disturbance in landscape design. Visitors appreciate the minimal disturbance created by the circular layout and flower beds, emphasizing the importance of visual disturbance and visual scale in landscapes.

Vegetation composition of scenery G from the arboretum section of botanical garden is densely vegetated area that creates distinctive woodland landscape with high diversity and high density. Visitors prefer the soothing experience and the sense of mental relief that provide by the composition of vegetation. Scenery G is votes as high level of coherence (39%) due to the pattern and colors in vegetation composition of the scenery.

Scenery J (Great circle) has the lowest coherence (10%) as there is no color and pattern repetition can be seen. With its high vegetation density and diverse plant species, attracts visitors seeking a connection to nature and stress relief. This scenery highlights the appeal of landscapes that reflect a harmonious coexistence with nature. The naturalness of Scenery C(Great lawn) and scenery G(Arboretum) have higher landscape preference of participants compared to other sceneries. The naturalness, vegetation cover and the feel of stress releasing positively affected landscape preference of users. The imageability of all sceneries have high imageability scores and indicate that they are unique and memorable.

Overall, this analysis highlights the importance of considering visual concepts relate to vegetation composition, such as coherence, disturbance, visual scale, imageability, complexity and naturalness, when designing landscapes to cater to diverse visitor preferences. The Royal Botanic Garden, Peradeniya, serves as a valuable case study for landscape architects and designers in creating emotionally resonant and visually appealing landscapes.

## **CONCLUSION**

The study involved collecting both qualitative and quantitative data through photographic questionnaire and the royal botanic garden, Peradeniya, Sri Lanka was selected as the case study. Selected most preferred sceneries were assessed with its vegetation composition and landscape preference.

Low vegetation density creates a unique sense of openness, tranquility, and visual depth, making it a memorable and stress-releasing space. Significance of pattern repetition, color diversity, and shape complexity can be considered as most preferred aspects in vegetation composition. Users appreciated the dynamic and visually appealing composition created by closely spaced colorful plants as well. The landscape preference for shape diversity with colors and pattern repetition

highlights the importance of balancing coherence and complexity in a design to engage and captivate viewers. And this study showcases the importance of tree density, naturalness, and memorability. This study highlights the naturalness as one of the most preferred indicators which allowed them to experience a sense of wilderness, relaxation, and a closer connection to untouched nature. These findings provide overall idea on, how to combine the characteristics of vegetation composition such as form, line and pattern, texture, and color to achieve successful visual composition.

In summary, the preferences of visitors within the Royal Botanic Garden in Peradeniya varied based on the unique vegetation composition characteristics of each scenery. These findings underscore the importance of considering a balance between coherence, complexity, imageability, naturalness, visual scale and disturbance in landscape design to cater to diverse visitor preferences and create emotionally resonant and visually appealing landscapes. The findings of this study can be used in future by landscape architects and designers to create emotionally resonant and visually appealing environments that meet the multifaceted needs of users within botanical gardens and similarly designed landscapes.

“Man does not weave this web of life. He is merely a strand of it. Whatever he does to the web, he does to himself.”

A quote by Chief Seattle which was said a long time ago can be applied even today. Man is a part of nature, whatever we do to change that will affect ourselves.

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