

# Assessing the Change of Imageability after Sidewalk Tree Planting Done in Historic Grid Cities with Special Reference to the Grid City of Kandy

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## Abstract

*The early 1960s marked a period of significant development in the field of urban planning, with globalization & modernization. Those work aimed to improve the clarity of a city's image and to identify and address the challenges and issues that could potentially erode a city's identity and character. Then extended theories were built around these theories in recent time to fit the recent architectural landscape of the world.*

*The physical characteristics that determine a city's image and identity are included in its form, especially in historic cities. Sidewalk tree plantation happens to be an intervention that can alter the visible physical features of a historic city eventually effecting the imageability, yet it's effect on imageability is often neglected as a micro intervention. A couple of Sri Lanka's most recognizable cities have experienced changes to their spatial identities and overall appearance as a result of the country's rapid development. Therefore, the main goal of this dissertation is "to assess the urban image of the city and enhance its identity by building a conceptual framework based on Kevin Lynch's extended methodology and his associated concepts, to identify the changes of the urban image before and after the tree plantation project in Kandy."*

*A case study methodology was employed to assess the practical applicability of the established conceptual framework. The examination relied on empirical data collected through a combination of on-site field observations, questionnaires, and semi-structured interviews.*

*It is intended that the research will be a wake-up call to demonstrate how a micro level landscape project like sidewalk tree plantation can affect a historic city like Kandy. The research's concluding section made several recommendations to address these issues, lessen their impact on the historic city's imageability, and offer guidelines for creating a conceptual framework that can be used to evaluate the urban image of the city and strengthen its identity. This framework made an effort to offer a method and rules for enhancing the urban image in Sri Lanka and other growing south Asian nations generally.*

**Keywords:** Sidewalk tree plantation, Imageability, Culture

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## INTRODUCTION

### I. Background of the study

The concept of "imageability" in urban design refers to a city's visual and perceptual qualities that contribute to its identity, legibility, and overall image in the minds of its residents and visitors (Lynch, 1960). According to Lynch (1960), the picture of the imageable environment contains three elements: identity, structure, and meanings.

Historic settings are preserved because of their cultural relevance & it is unique identity, which is expressed in the meanings and values attached to them (Kapila & Amita, 2017). While a historic location's physical authenticity is preserved, its associated values change with time, either enhancing or lessening its Imageability (Kapila & Amita, 2017). With the change of values, it created the necessity of redesigning the city to fulfill the newly found values.

### II. Research Gap

In Sri Lanka as a tropical country with the need of shade, urban greening initiatives are fairly common, yet those interventions aren't thoughtful. While there have been studies on the preservation and restoration of heritage cities, there hasn't been much investigation into how minor modifications, like planting trees, might alter a city's imageability. Studies on the evaluation of the effects of the built environment's aesthetic on city image, particularly in historic city image, are incredibly uncommon in the urban design research agenda, as stated by Sugathadasa and Ariyawansa in the year 2021. The meaning or association properties of the environment have typically been disregarded in environmental cognition studies in favor of the visual and spatial attributes of city images. (Ariyawansa & Sudgathasa)

### III. Research Problem & Objectives

*Rapid urban growth and development have altered many of the original qualities of many cities in the developing world (Chadchan and Shankar, 2009). These visual alterations could cause a city to lose its sense of place and its capacity to set itself apart from other cities. In 2015, a sidewalk tree plantation initiative was taken to reduce the urban heat island of the grid city area of Kandy. This has highly resulted in blocking the views of imageable buildings in the city. The research question of the study would be "How a micro level intervention like tree plantation can affect the imageability of a historic city?" With that 4 research objectives were formed, Enhanced understanding of the impact of urban greening interventions, Identifying the interdependency between the micro change of urban morphology and place identity, Recommendations for urban greening interventions, Methodological advancements in assessing imageability*

### VI. Limitations and Scope of Study

Static users who have a clear mental map of the streets before the tree plantation are used for the study to get a more comprehensive and clear idea of the change in imageability. The research focuses on 4 streets & specific selected points of those streets. Even though professionals, outsiders & inhabitants were used for the study, their answers weren't separately analyzed due to the time limitations of the study.

Even though trees are identified to have seasonal changes, detail physical changes & changes in different seasons which effect the imageability, the seasonal change wasn't considered in the study. Yet most of the trees have a comparatively static change throughout the years. Micro

characteristic differences such as the leaf type is not considered considering the depth of views in the study.

## V. LITRATURE REVIEW

### 5.1 URBAN IMAGE

Place has a psychological as well as a physical component. Physical shape, activity, and significance are all combined to produce a sense of place (Montgomery, 1998). According to Salma Salah El-Essawy (2018), location is primarily characterized by a physical environment that is built based on how it interacts with people's psychological and social processes and the activities they engage in there. When an individual's affective perceptions and functional demands converge with the physical and cultural characteristics of the location, the spaces transform into places (Salma Salah El-Essawy, 2018).

The quality of a location that makes it distinctive and memorable is called imageability. It's a subjective measure of how vividly and easily something can be imagined or pictured in one's mind (lynch, 1960). According to Lynch (1960), the physical environment of an urban image consists of five components that can affect how likable it is, which are,

**Table 12 - 5 elements of imageability** **Source - Lynch (1960)**

|          |                                                                                                                                                  |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------|
| Path     | Movement pathways that people might use to move and travel                                                                                       |
| District | An area that stands out from other regions by having a constant personality or distinctive urban form.                                           |
| Landmark | Point references regarded as being outside of the observer. They stand out more if they have a distinct shape and stand out from the background. |
| Edge     | A boundary between two areas or districts using a liner element that is liner as a path                                                          |
| Node     | A node is a place where people congregate or where paths come together, such a square or a roundabout.                                           |

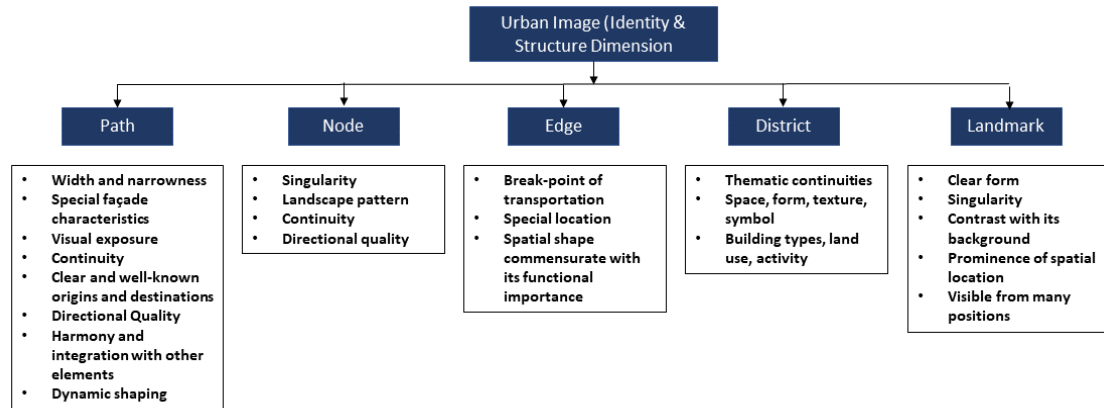
### ***Distinguishability***

Through Wiliams (1978), it has been shown that a positive image will have a strong impact on the distinguishability of the visual sceneries. Tveit et al.'s (2006) state that imageability measures a landscape's capacity to evoke a distinct mental picture in the mind of the viewer and thereby making it a distinguishable place when imageability is high.

### ***Extending Lynch's 5 elements of imageability***

According to Lynch (1960) in an environment that can be easily visualized the different components of that environment such, as shapes, colors, sizes and arrangements can create an image in the mind of someone experiencing that environment. Therefore, than aiming for one projection it is more appropriate to separate and focus on these different elements individually. When talking about Imageability, it's necessary to be timely since it's a quite old theory. In the

study done by Al-Matrafi (2017) the 5 elements have been decoded to do an extensive study of imageability.



**Figure 0.1 - Characteristics of 5 elements which effect the final mental image**

## 5.2 THE COMPONENTS OF ANALYZING THE URBAN IMAGE

According to Lynch (1960), identity, structure, and meaning of the particular city are generating the image of a city.

**Urban Structure** - Urban form and layout are mainly related to urban structure (Al-Matrafi, 2017).

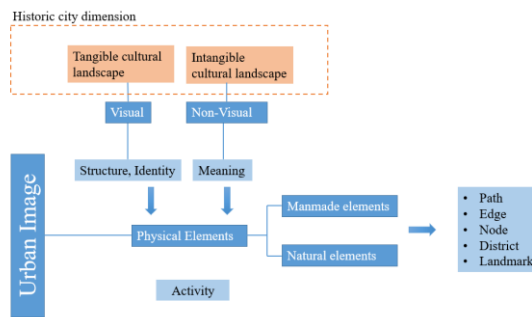
**Urban Meaning** - Peoples responses, to places are greatly influenced by the emotions they associate with those places and the significance they give them (Nasar, 1998).

**Urban Identity** - Gospodini (2004) suggest that many cities experience a worsening "identity crisis" in this competitive race for a city's identity. Cities are said to be placing more emphasis on their built heritage in their pursuit of identity (Maide et al., 2007, p. 7).

### The relationship between urban image and unique identity

The historical significance of a city, location, or building evokes cultural memories and mental representations based on a range of predetermined values (Sugathadasa & Ariyawansa, 2021).

According to Jani and Hussain (2011), the cultural landscape is shaped by two factors, namely: Tangible cultural landscape (physical) & Intangible cultural landscape (spiritual). Lynch (1960) claims that the grid design is an undifferentiated matrix, making it impossible to accurately locate anything there, and Nguyen et al. (2023) add that monotony & rigidity can be downsides of some grid towns



**Figure 0.2 - Analytical components of urban image of a historic city** Source – The author based on Al-Matrafi, (2017), Jani and Hussain

### 5.3 TREE PLANTATION IN URBAN CONTEXT

According to a study done in the sidewalks of avenue of Shanghai (Qiu et al., 2021), the importance of Trees was found as the second entity that highly effects the image of the city. What mainly differentiated an avenue from a building façade without sidewalk trees is its permeability. The concept of biophilia (Wilson, 1984) is an innate and genetically determined affinity of human beings with the natural world.

## 6. RESEARCH METHODOLOGY

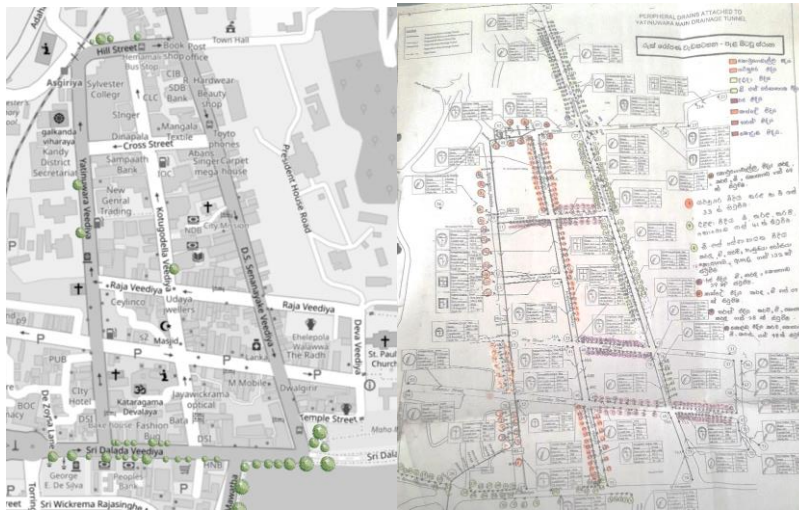
### 6.1 RESEARCH METHODOLOGY

#### Case Study Selection - Grid city of Kandy as a cultural city of Identity

The capital city of Sri Lanka and the last remaining royal kingdom of Sri Lanka, Kandy city is a beautiful hill country location. The city was established in the 14th century as the Royal Kingdom, and UNESCO designated it as a world heritage site due to its unique identity & history. It consists of a significant grid city. As a result, both locals and tourists from around the globe frequently visit this historic city (Sugathadasa & Ariyawansa, 2021).

#### Sidewalk tree Plantation

In 2015 a sidewalk planting program was undertaken by Kandy Municipal Council to achieve key goals as adding more greenery, comfort to the city dwellers and mitigating pollution issues. It was said that the only consideration while selecting the plants were in being indigenous & medium Height (Up to 15 m).



**Figure 0.1- Before and after maps of sidewalk tree plantation Source – Mapped by the author, Archives of Municipal Council, Kandy**

They also mentioned that they are in the process of doing more arbitrary tree plantation at the grid city area which is a very negative practice. Cullen (1970), highlights on how the small variations in the projections in viewing can change the visual experience in the third dimension.

#### ***Selection of 4 case study streets***

The most prominent parameter that changed the visual attribute of the city is the dynamic attributes of tree plantation. It will be analyzed considering the existing imageability of the city as analyzed by Silva (2011). According to the above literature, high-imageable cities are considered as the most vulnerable to change & low-imageable cities as the least vulnerable to change. So, the 4 Case studies will be selected considering the above two variables. A street with high imageability (According to KIM) & Diverse Line of Tree lines (D.S.Senanayake Street) , A street with high imageability & Monotonous Line of Tree (Dalada Street), A street with low imageability & Diverse Line of Tree (Cross street), A street with low imageability & Monotonous Line of Tree (Yatinuwara Street)

#### ***Piolet imageability parameter***

As per the theoretical framework, first, the city's imageability was analyzed using the basic theories of Kevin Lynch & the meaning analysis of the city done by Silva (2011), Temple of the Tooth Relic; Kandy Lake, and the Udawatta Forest Reserve, forms the nucleus destination image of Kandy (Silva, 2011).

#### ***Tree Architecture Parameter***

The levels of tree diversity in each street was measured by considering the diversity of plant species & characteristics of their tree architecture such as variations of Height, permeability, colors & any other descriptions of uniqueness.

#### **View selection Criteria (Views of selected 4 streets)**

Serial vision of each street were identified considering closure (Cullen, 1971) and a sequence of revelations were created considering the dynamic views. Google street view images were used

for an easy comparison with the past images. Then the views will be categorized according to the prominent element of the 5 elements (Lynch, 1960) for easier analysis & also for the creation of the survey.

|       |                  |                                                            |
|-------|------------------|------------------------------------------------------------|
| A     | Landmark         | Unique visual with the vehicular node and space in far     |
| B     | Edge             | Pedestrian prominent edge                                  |
| C,F   | Node             | Mostly Pedestrian oriented Node                            |
| D,G   | Path             | Heritage Buildings are covered by trees                    |
| E     | Path             | Clustered buildings without character are covered by trees |
| F,H,J | Edge<br>Landmark | Edge with heritage buildings                               |
| I     | Path, landmark   | Only other side of the landmark has the plantation         |

**Figure 0.3 - Dalada Street Serial Vision categorization**  
Compiled by Author



**Figure 0.2- Sri Dalada Street Serial vision selected dynamic views**  
Source – Compiled by the Author

Then this analysis output catalogue is used for the analysis & the survey making.

## 7. METHODOLOGY, DATA ANALYSIS AND FINDINGS

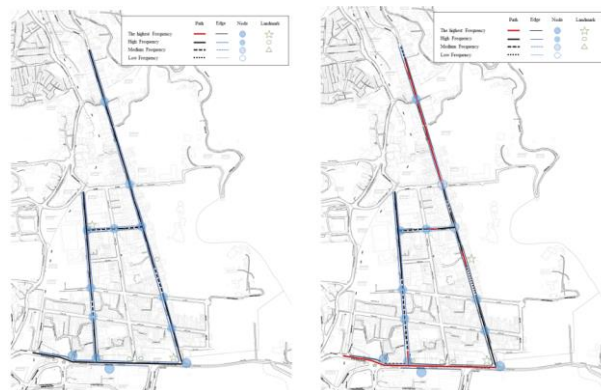
### IDENTITY & STRUCTURE DIMENSION OF THE IMAGE STUDY

Streets were analyzed visually (By using before and after images from Google maps) under the characteristics of paths, nodes, edges and landmarks according to the extended study of (Al-Matrafi, 2017). Below shows Dalada Street path analysis as an example.

| Character                                    | Description                                                                                                                                                                                                                                                                                                                              | D,G                                  | E                           |
|----------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|-----------------------------|
| Width and Narrowness                         | Have not affected                                                                                                                                                                                                                                                                                                                        | Before tree plantation<br>Width - 9m | After tree plantation<br>9m |
| Special façade characteristics               | In E the special façade character have not really decreased even though it has been camouflaged. The camouflage effect of trees has been able to bring the focus of the eye of the pedestrian into the road. The visual prominence of billboards has reduced in D,G with tree growing over it, highlighting more on the façade character | High                                 | Higher                      |
| Visual exposure                              | Has decreased                                                                                                                                                                                                                                                                                                                            | High                                 | Low                         |
| Continuity                                   | Continuity has mostly increased with tree plantation on both sides throughout the street.                                                                                                                                                                                                                                                | Yes                                  | Yes                         |
| Clear and well-known origins and destination | decreased reducing the legibility                                                                                                                                                                                                                                                                                                        | Yes                                  | No                          |
| Directional quality                          | has increased with the added continuity                                                                                                                                                                                                                                                                                                  | High                                 | Higher                      |
| Harmony and integration with other elements  | The disconnection between the main road & pedestrian pathway has decreased with the tree plantation                                                                                                                                                                                                                                      | Low                                  | High                        |
| Dynamic shaping                              | Due to trees of different heights in the pathway overall has gotten dynamic                                                                                                                                                                                                                                                              | Static                               | Semi dynamic                |

**Figure 0.1- Left to right - Paths observational analysis conclusion table of Dalada street & Paths analysis conclusion table of Dalada Street**  
Source – Compiled by Author

After the side by side comparison & categorization of the points of streets, the overall frequency change was considered and was mapped as below using space syntax (which is often used for imageability studies are used for the mapping of the conclusion).



**Figure 0.2 - The evaluation of the city image questionnaire sample**

## MEANING DIMENSION OF URBAN IMAGE

### Likert Scale Numeration assessment in quantifying sample factors

- Visual preference survey (Nelessen, 1994)
- Semi structured interviews
  - **Section One: Basic and general information**
  - **Section two - The urban image and identity**

This was adopted by combining Al-Matrafi, (2017) with Kapila (2011) in order to,

1. Compare the previous image that we analyzed through a map considering the study of Lynch (2011) & Lynch (1960)
2. Ascertain people's opinions and perceptions in an effective way

In questions like,

- What environmental elements come to your mind, when you hear the name “Kandy”?
- Please list 5 of the environmental elements in the City of Kandy that you could recall. – buildings, areas, streets, structures, natural features, multi-sensory cues, activities, etc
- Locations that you most-likes and 5 areas that you most dislikes in the city?
  - **Section three – The evaluation of the city image**

City image was evaluated through photograph analysis surveys. 4- 5 images were selected from each street, consisting of different characteristics (Image selection criteria is shown later)

Street views + the views taken by the researcher on site were used. Street view (Google maps) had to be used to compare with the exact historical views in the most applicable way, yet the pedestrian view is also given in the most recent images & videographs taken.

According to the semi structured interviews, analysis charts were created for all 4 streets. Below shows the results of Sri Dalada Street.

### Sri Dalada Street– Imageable street with diverse tree lines

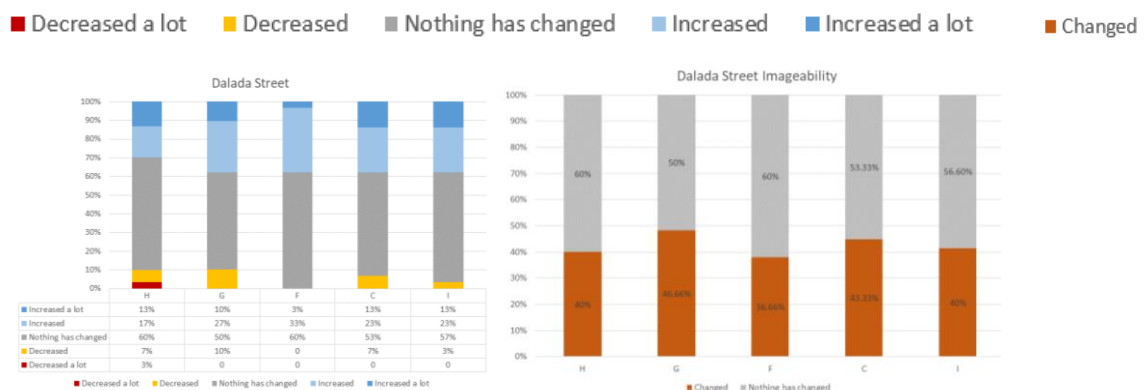
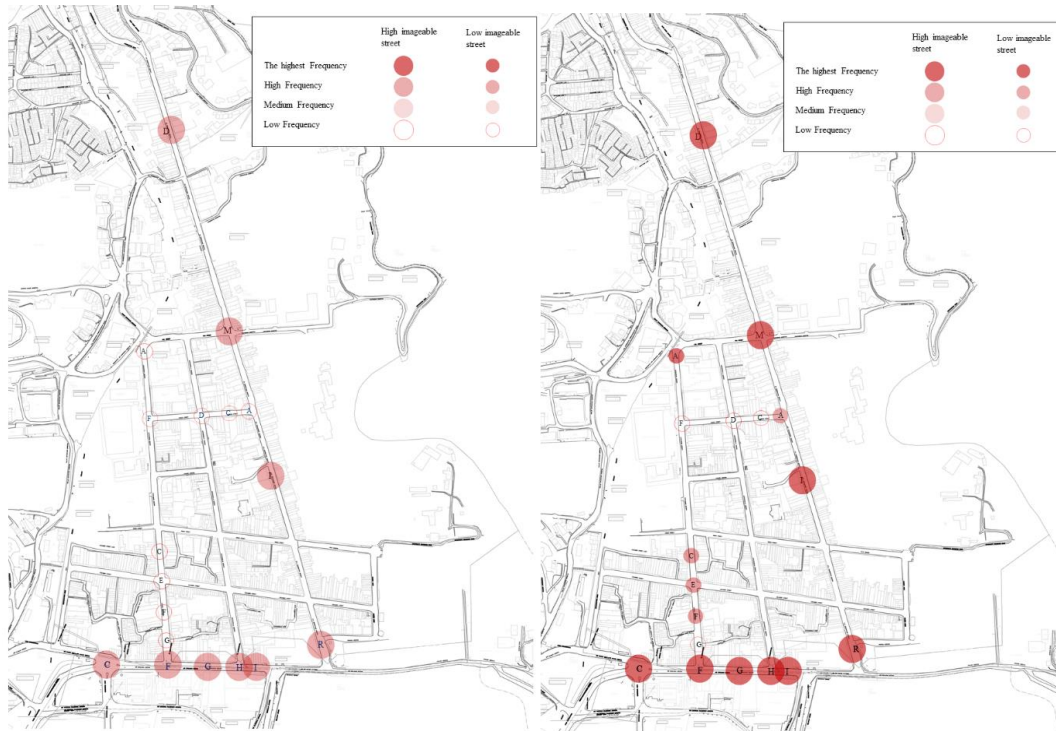


Figure 0.3 – Sri Dalada street survey analysis

Compiled by the Author

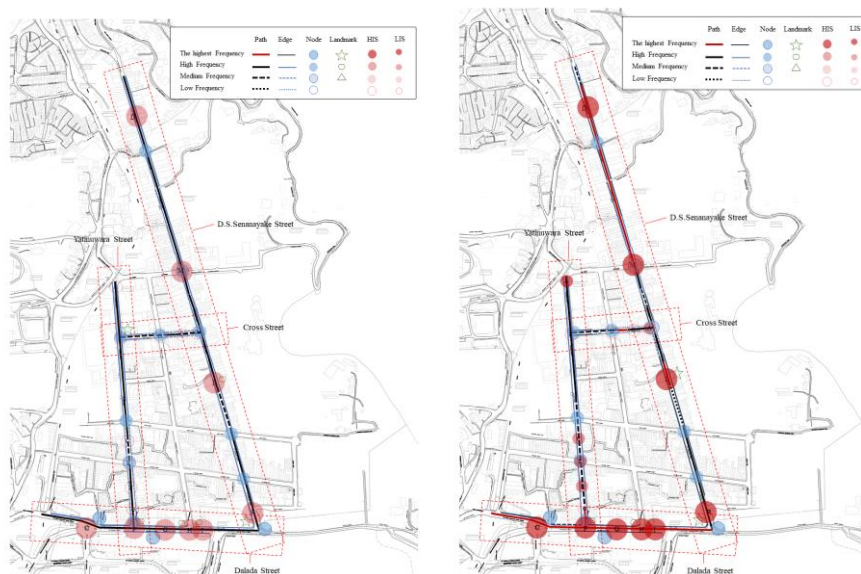
Then the meaning dimension before and after study summery was mapped as below.



**Figure 0.4 – Left to Right - Frequency of Meaning dimension of imageability before tree plantation, Frequency of Meaning dimension of imageability after tree plantation Mapped by the Author**

#### OVERALL URBAN IMAGE

Then the overall imageability before & after the tree plantation initiative is shown in below maps in both Identity/Structure & Meaning dimensions portraying the overall imageability.



**Figure 0.5 – Left to Right - Overall Imageability Before tree Plantation, Overall Imageability after tree plantation Mapped by the Author**

Then street by street overall imageability was summarized along with closeup comparison of each street & comparative images.

#### CHAPTER FOUR: CONCLUSION AND RECOMMENDATIONS

The study investigates the impact of urban tree planting on city imageability. It finds that while tree planting can enhance the physical environment, its effect on overall imageability depends significantly on the city's existing character. The study reveals that the cultural and historical significance of a city, or the meaning dimension, plays a more crucial role in determining imageability than physical changes. Imageability positive view characteristics & negative view characteristics were identified & It recommends that before implementing any urban greening projects, a comprehensive assessment of the city's existing imageability be conducted to ensure that the interventions align with its unique character.

#### REFERENCES

- Damayanti, R., & Kossak, F. (2016). Extending Kevin Lynch's concept of imageability in third space reading; case study of Kampung, Surabaya-Indonesia. *A/Z : ITU Journal of Faculty of Architecture*, 13(1), 57–67. <https://doi.org/10.5505/itujfa.2016.36349>
- MADAWALA, & CHANDRASEKARA. (2018). THE IMPACT OF LANDSCAPE CHARACTERISTICS OF URBAN POCKETS ON VISITORS AND RESIDENTS A study with reference to Kandy City. *FARU* 2018.
- Singh, R. P. B., & Kumar, S. (2018, March 25). Ayodhya: The Imageability and Perceptions of Cultural Landscapes. *Space and Culture, India*, 5(3), 13–29. <https://doi.org/10.20896/saci.v5i3.305>
- Salma Salah El-Essawy. (2018, March 15). Quantifying the City's Identity a Morphological Analysis of the Historic Rue Rosette. *International Journal of Engineering Research And*, V7(03). <https://doi.org/10.17577/ijertv7is030103>
- Dissanayake, Morimoto, Ranagalage, & Murayama. (2019, August 14). Land-Use/Land-Cover Changes and Their Impact on Surface Urban Heat Islands: Case Study of Kandy City, Sri Lanka. *Climate*, 7(8), 99. <https://doi.org/10.3390/cli7080099>
- Masakorala, P.P. and Dayawansa, N.D.K., 2015. Spatio-temporal Analysis of Urbanization, Urban Growth and Urban Sprawl Since 1976-2011 in Kandy City and Surrounding Area using GIS and Remote Sensing. *Bhumi, The Planning Research Journal*, 4(2), pp.26–44. DOI: <http://doi.org/10.4038/bhumi.v4i2.8>
- (n.d.). The symbolic authenticity of Kandy, Sri Lanka.
- Lynch, K. (1964, June 15). The Image of the City. <https://doi.org/10.1604/9780262620017>
- Qiu, W., Li, W., Liu, X., & Huang, X. (2021, July 21). Subjectively Measured Streetscape Perceptions to Inform Urban Design Strategies for Shanghai. *ISPRS International Journal of Geo-Information*, 10(8), 493. <https://doi.org/10.3390/ijgi10080493>
- Tveit, M., Ode, Å., & Fry, G. (2006). Key concepts in a framework for analysing visual landscape character. *Landscape Research*, 31(3), 229–255. <https://doi.org/10.1080/01426390600783269>
- Tao, Y., Wang, Y., Wang, X., Tian, G., & Zhang, S. (2022). Measuring the Correlation between Human Activity Density and Streetscape Perceptions: An Analysis Based on Baidu Street View Images in Zhengzhou, China. *Land*, 11(3), 400. <https://doi.org/10.3390/land11030400>
- Sugathadasa, N., & Ariyawansa, R. G. (2021). Impact of Built Environment Aesthetics on the Image of Kandy Historic City, Sri Lanka. *Department of Estate Management and Valuation*, 18. <https://journals.sjp.ac.lk/index.php/SJRE/article/view/5041>

Montgomery, J. (1998) Making a city: Urbanity, vitality and urban design, *Journal of Urban Design*, 3:1, 93-116, DOI: 10.1080/13574809808724418 260

Kapila, & Amita. (2017). The symbolic authenticity of Kandy, Sri Lanka. *Cultural Landscapes of South Asia*.

Silva (2011). MAPPING MEANING IN THE CITY IMAGE: A CASE STUDY OF KANDY, SRI LANKA. *Architectural and Planning*.

Jani, H. H., & Hussain, M. R. M. (2011). Cultural landscape: a new paradigm for landscape architecture. *Landscape Architecture*. <http://irep.iium.edu.my/29758/>

Nguyen, N. H., Alawadi, K., & Hinai, S. A. (2023). A grid is not a tree: toward a reconciliation of Alexander's and Martin's views of city form. *Urban Planning*, 8(3). <https://doi.org/10.17645/up.v8i3.6291>