

# Analyzing The Changes of Green Cover and Drivers of Green Space Transformation in Colombo Municipal Council (CMC) Area From 1956-2023

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## I. INTRODUCTION

Green spaces are more than just patches of grass or trees in a city—they are the lungs of urban life. They help clean the air, reduce heat, support biodiversity, and provide spaces for people to relax and connect with nature. In fast-growing cities like Colombo, however, these green areas are increasingly under pressure. Over the past several decades, rapid urban development, population growth, and changing land use patterns have transformed the cityscape, often at the expense of green cover.

The Colombo Municipal Council (CMC) area, being the heart of Sri Lanka's commercial and administrative activities, has seen major changes since 1956. Roads, buildings, and other infrastructure have expanded, and green spaces have often been replaced or fragmented. To understand these changes, it is important to look at how green cover has evolved over time and what factors have driven these transformations.

This study explores the changes in green cover in Colombo from 1956 to 2023 and investigates the key drivers behind these changes, including urban growth, policy decisions, and socio-economic pressures. By combining historical data, maps, and modern satellite imagery, the research aims to show not just how the city has changed, but why these changes happened. The insights gained will be valuable for city planners, policymakers, and anyone interested in making Colombo greener, healthier, and more sustainable for the future.

## II. LITERATURE REVIEW

Several Sri Lankan studies have examined green cover change and urban transformation in Colombo, providing a strong foundation for this research. Wickramasinghe et al. (2016), in *“Spatial and Temporal Changes of the Green Cover of Colombo City from 1956 to 2010,”* conducted a long-term spatial analysis using GIS and historical maps and identified a significant decline in green cover due to rapid urban expansion and infrastructure development. Their study is directly relevant as it provides historical baseline data (1956–2010), which aligns closely with the early time frame of the present study.

Similarly, De Silva and Perera (2018), in *“Land Use Change and Urban Expansion in Colombo, Sri Lanka: Implications for Planning and Environment,”* examined land use and land cover (LULC) changes and found that wetlands, home gardens, and open lands were progressively converted into commercial and residential developments. This supports the present study's focus on how urban growth has contributed to the reduction and fragmentation of green spaces within the CMC area.

Addressing green space adequacy, Senanayake et al. (2015), in *“Assessment of Green Space Requirement and Site Analysis in Colombo, Sri Lanka: A Remote Sensing and GIS Approach,”* revealed that several administrative divisions in Colombo fall below recommended per-capita green space standards. Their findings are highly relevant to this study's concern regarding unequal green space distribution across wards.

More recently, Atapattu et al. (2022), in “*Estimation of Urban Green Cover Changes in Colombo Municipal Area over Ten Years*,” used satellite imagery to assess green cover dynamics between 2012 and 2022. They observed both increases and declines in vegetation across different wards, highlighting spatial disparities in green cover distribution. This directly complements the 2011–2023 analysis in the present research.

In addition, Jayasinghe and Samarasekara (2019), in “*Drivers of Urban Land Transformation in Colombo Municipal Council Area: A Historical Perspective*,” emphasized how population concentration, economic centralization, and land market pressures have intensified the conversion of open spaces into built-up areas. Their work supports the present study’s examination of socio-economic and policy drivers behind green space transformation.

Furthermore, Ruzaik and Niyas (2022), in “*An Assessment of Challenges Faced by the Mangrove Environment in the Muthurajawela Wetland Area in Sri Lanka*,” demonstrated how urban encroachment and infrastructure development have degraded wetland ecosystems near Colombo. Although focused on wetlands, their findings are closely linked to this study, as wetland loss forms an important component of green cover decline and ecological imbalance in the wider Colombo region.

Overall, these Sri Lankan studies confirm that Colombo has experienced long-term green cover reduction, uneven spatial distribution, wetland degradation, and strong pressure from urban expansion. Together, they provide a clear academic foundation for examining green cover changes and their driving forces in the Colombo Municipal Council area from 1956 to 2023.

### III. CHANGES OF GREEN COVER IN CMC AREA

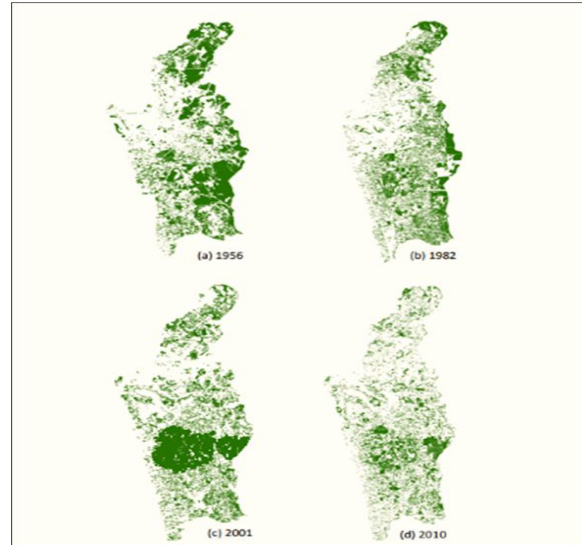


Figure 1 Changes of Green Cover in CMC in 1956 to 2010 source: Prepared by Authors using map of Li, Pussella, (2017)

#### ➤ From 1956 to 2010

Urbanization has significantly altered the spatial distribution of green cover in Colombo Municipal Council (CMC) over the decades, as depicted in Figure 5.8. The progressive decline in vegetation from 1956 to 2010 reflects the impact of rapid urban expansion, infrastructural development, and population growth in Sri Lanka's commercial capital.

#### *Green Cover in 1956*

In 1956 (Figure 1.a), Colombo exhibited extensive green cover, particularly in the southern and central parts of the city. The distribution of vegetation was relatively uniform, with large patches of trees and open green spaces dominating the landscape. During this period, urban development was relatively low, and natural vegetation, wetlands, and agricultural lands played a crucial role in maintaining ecological balance.

#### *Green Cover in 1982*

By 1982 (Figure 1.b), a noticeable decline in green cover is observed, particularly in the northern and central regions of Colombo City. Urban expansion and infrastructure development began replacing vegetated areas with built-up structures. The reduction in

greenery corresponds with the increased demand for housing, commercial spaces, and road networks during the post-independence economic development phase.

*Green Cover in 2001*

The year 2001 (Figure 1.c) marks a significant change in the city's green landscape. While some larger green patches remained, particularly in the southeastern part of the city, fragmentation became more evident. The increase in urban density and conversion of open spaces for commercial and residential projects further contributed to the loss of green cover. However, specific areas, such as the southern part of Colombo City, still maintained relatively dense vegetation, possibly due to the presence of parks, sports grounds, and protected areas.

*Green Cover in 2010*

By 2010 (Figure 1.d), Colombo's green cover had been further reduced, leaving only small, scattered patches of vegetation amidst the highly urbanized environment. The transformation of wetlands, deforestation, and land reclamation for infrastructure projects played a key role in this decline. Although some green spaces persisted, they were highly fragmented and confined to designated parks, gardens, and institutional lands.

Finally, the analysis of green cover changes from 1956 to 2010 in Colombo Municipal Council highlights a clear trend of urban expansion at the cost of natural vegetation. The drastic reduction in green spaces poses challenges such as increased urban heat, loss of biodiversity, and reduced environmental resilience.<sup>1</sup>

<sup>1</sup> The temporal analysis of green cover in Colombo from 1956 to 2010 illustrates a progressive decline in vegetated areas due to intensified urban expansion and land-use conversion. Key drivers include infrastructure growth, land reclamation, and the

➤ *Green Space Changes in CMC from 2011 – 2015*

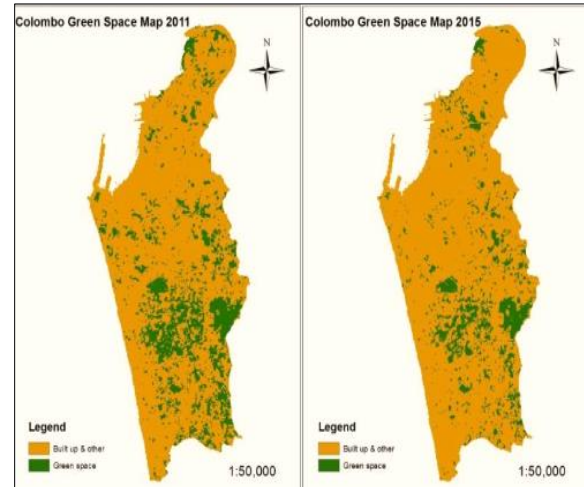


Figure 2- Green Spaces Map 2011&2015 Source: Prepared by Authors using map of Li, Pussella, (2017)

*Green Cover in 2011*

In 2011, the green cover in Colombo appeared to be moderately scattered, with concentrated patches of vegetation in the southern and southeastern sections of the municipality. Based on the key observations from the map (figure 2), densely built-up areas dominate the northern and central parts of Colombo, including commercial and residential zones such as Fort, Pettah, Maradana, and Slave Island, where very limited green spaces are visible.

Larger green clusters are found in the southern zones of the CMC, likely corresponding to areas like Cinnamon Gardens (Colombo 07), which is known for housing parks, schools, embassies, and institutional compounds with garden space. The eastern fringe also shows several green areas, likely linked to canal buffers, marshy lands, and recreational grounds. These spatial patterns suggest a clear north-to-south gradient, where green cover increases as one move southward, away from the densely urbanized commercial hub of the city (Pussella,2017).

transformation of wetlands, leading to severe habitat fragmentation and ecological imbalance. This long-term loss of green infrastructure undermines urban climate regulation, biodiversity conservation, and overall environmental resilience.

*Green Cover in 2015*

In 2015, the Colombo Municipal Council (CMC) area was undergoing rapid urban transformation, largely driven by infrastructure development, housing demand, and economic growth. These urban pressures significantly impacted the extent and quality of green cover within the city limits.

According to Weerakoon and Pussella (2017), who analyzed land cover changes using satellite imagery and aerial photographs, Colombo's green cover had been in steady decline from the mid-20th century. By 2015, much of the natural and semi-natural vegetation in the CMC area had been replaced by built-up structures. The researchers noted that green cover in Colombo had reduced from over 50% in the 1950s to less than 20% by 2015, primarily due to unplanned urban expansion and loss of private green spaces like home gardens.

*Key informant interviews with CMC officers and long-term residents revealed that many small gardens and vacant plots had been replaced with retail and apartment complexes between 2011–2015, especially in Colombo 11 and 13.*

However, the situation was not uniform across the city. Some zones such as Cinnamon Gardens, Kollupitiya retained higher green cover owing to large plots, institutional lands, and preserved street trees. In contrast, densely populated commercial zones like Pettah and Kotahena had minimal vegetation due to heavy construction and congestion.

➤ *Green Cover Changes in the CMC Area from 2020–2023*

Between 2012 and 2022, the Colombo Municipal Area (CMA) experienced a notable increase in its green cover, rising from 22.36% to 26.17%. This growth, however, was not uniform across all vegetation types. While playgrounds and grasslands expanded, other categories such as tree cover, shrub cover, wetlands, rooftops, and Ipomoea cover saw reductions. Figure 5.9 shows the green cover distribution in CMC in 2022. The distribution of green cover varied among the 15 postal zones within the CMA. Zones like ward 36 recorded the highest green cover, reaching 42.89% in 2022, while Colombo 11 had the lowest. Notably, five zones Colombo 04, 05, 06, 09, and 13 experienced a decline in green cover over the decade (Li, Pussella, 2017).

*Questionnaire data from Ward 36 (Cinnamon Gardens) and Ward 372 (Havelock Town) revealed that community-led tree planting and roadside gardening projects were key contributors to this rise.*

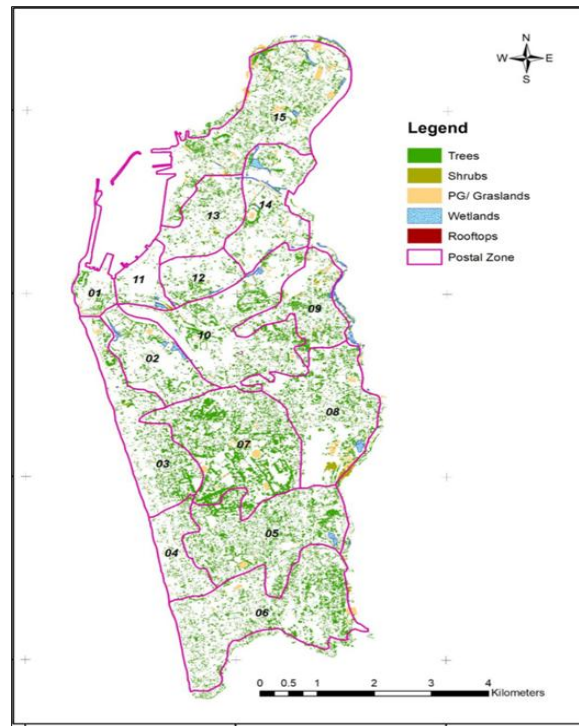


Figure 3 Green Cover in CMC in 2022 Source: Atapattu et al. (2022)

Between 2020 and 2023, the Colombo Municipal Council (CMC) area continued to experience changes in green cover due to urban development, infrastructure projects, and ongoing environmental initiatives. These years were also marked by the impact of the COVID-19 pandemic, which slowed down certain construction activities and temporarily improved environmental conditions in some areas. Recent GIS-based analysis by Wijesinghe et al. (2023) indicates that the green cover in the CMC area increased from 22.36% in 2012 to 26.17% by 2022, reflecting an overall positive trend during the decade. Although this data extends slightly beyond 2020, it includes the initial years of the 2020–2023 period and provides useful insight into the changing urban landscape.

This increase was largely driven by:

- The development of new public green spaces (e.g., urban parks, waterfronts)

- Tree planting campaigns initiated by the Colombo Municipal Council and the Urban Development Authority (UDA)
- Restoration and landscaping efforts around key urban features like Beira Lake and Viharamahadevi Park

*Interviewees from UDA confirmed targeted greening policies were implemented around Beira Lake and Viharamahadevi Park, supported by public-private partnerships.*

However, the distribution of green cover remained unequal. Colombo 07 (Cinnamon Gardens) maintained the highest percentage of green space due to its wide streets, institutional land, and residential gardens. In contrast, Colombo 11 (Pettah) and Colombo 13 (Kotahena) showed the lowest green cover, mainly due to intense commercial activity and limited space for vegetation (Wijesinghe et al., 2023). In summary, from 2020 to 2023, the Colombo Municipal Council area saw a modest but meaningful improvement in its green cover. This was achieved through policy interventions, urban greening initiatives, and improved community engagement. However, to maintain this positive trend, there is a continuing need for integrated green infrastructure planning, equitable green space distribution, and enforcement of land-use regulations.<sup>2</sup>

#### IV. DRIVERS OF GREEN SPACE TRANSFORMATION IN COLOMBO MUNICIPAL COUNCIL (CMC) AREA

Understanding the drivers behind this transformation is essential for urban planners, policymakers, and environmentalists to maintain and expand green spaces in the city. This section aims to explore the various drivers influencing the transformation of green spaces in Colombo's urban landscape, focusing on the CMC area. These drivers are shaped by both natural and human-induced factors and include urbanization,

policy and governance, land-use patterns, socio-economic factors, and climate change.

##### ➤ *Urbanization and Population Growth*

Urbanization is one of the most significant drivers behind the transformation of green spaces in the CMC area. Colombo has seen rapid population growth due to rural-to-urban migration and natural population increase. The demand for housing, infrastructure, and commercial space has led to the encroachment of green spaces, including parks, wetlands, and open fields (De Silva & Wijewardena, 2019). As the population grows, more land is needed for housing and commercial development, reducing the available land for green spaces (Gunawardena et al., 2020).

*Field observations in Ward 37 (Kollupitiya) and Ward 20 (Pettah) revealed a sharp decline in roadside greenery and open fields due to high-rise commercial developments. Questionnaire results show that 78% of respondents believe urban development has reduced access to nearby green spaces.*

With the increasing density of the population, developers often prioritize high-rise buildings and commercial zones, which tend to replace low-density areas that were once green. The reduction of green space, in turn, has adverse effects on urban residents, including limited access to recreational areas, increased pollution, and reduced biodiversity (Dissanayake, 2018). This cycle of urbanization tends to marginalize the importance of green spaces, despite their potential to improve urban resilience and quality of life (Wickramasinghe et al., 2022).

##### ➤ *Economic Development and Real Estate Expansion*

Economic development plays a significant role in the transformation of green spaces within the CMC area. As Colombo continues to develop into a global city with a booming economy, there is a growing demand for real estate. The construction of office buildings, shopping malls, residential complexes, and industrial

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<sup>2</sup> Between 2020 and 2023, the Colombo Municipal Council area experienced moderate improvements in green cover, influenced by urban greening policies, restoration projects, and the temporary slowdown in development during the COVID-19 pandemic. GIS-based assessments highlight a continued, though

uneven, spatial distribution of greenery, with affluent zones like Colombo 07 retaining higher vegetation density compared to densely built-up areas such as Colombo 11 and 13. Sustaining these gains demands consistent policy support, strategic landscape planning, and equitable access to green infrastructure.

zones is prioritized, often at the expense of green spaces (Wijesekera & Dissanayake, 2019).

*Key informant interviews with officials from the Urban Development Authority confirmed that lands formerly allocated for public recreation in Ward 372 (Havelock Town) were re-zoned for mixed-use development due to economic pressure. Residents in Ward 33 (Borella) expressed concern, with 65% stating that real estate activities have encroached upon community play areas.*

Real estate developers view land as a valuable commodity, and the high demand for urban properties drives the conversion of open spaces into built-up areas. Green spaces are often seen as an underutilized resource that can be transformed into profitable ventures. This market-driven approach has resulted in the loss of many open spaces, including public parks and recreational grounds, further diminishing the city's green footprint (Wickramasinghe et al., 2022). While economic growth and development are vital for Colombo's future, a balance between infrastructure development and the preservation of green spaces is necessary. Green spaces are not only vital for environmental sustainability but also contribute to the city's economic resilience by attracting tourists and enhancing property values in the long term (De Silva & Wijewardena, 2019).

#### ➤ *Policy and Governance*

Policy and governance frameworks are critical in shaping the future of green spaces in the CMC area. The lack of stringent policies to protect and promote green spaces contributes to their transformation. Urban planning regulations and zoning laws often fail to prioritize green spaces or allocate sufficient land for parks and recreational areas (Gunawardena et al., 2020).

The Colombo Municipal Council (CMC) has recognized the importance of green spaces in enhancing the city's quality of life. However, despite the formulation of policies like the 'Green City Plan,' enforcement of these policies has been weak, and the allocation of funds for the maintenance and development of green spaces remains inadequate (Wijesekera & Dissanayake, 2019). Political interests, competing land-use demands, and the influence of powerful real estate developers often hinder the effective implementation of policies that safeguard green spaces.

*Interviews with Colombo Municipal Council officers revealed inconsistent enforcement of green zoning regulations. In Ward 36 (Cinnamon Gardens), despite policy guidelines for preserving tree cover, field visits showed unauthorized trimming and replacement with paved surfaces in private and public premises.*

The absence of a cohesive and integrated urban planning strategy also leads to fragmented green spaces. These disconnected pockets of green land make it difficult to create an interconnected green network, diminishing their effectiveness in addressing urban environmental issues such as air pollution and heat islands (Dissanayake, 2018).

#### ➤ *Land Use and Zoning Patterns*

Land use and zoning regulations in Colombo's urban development have a direct impact on green spaces. The expansion of residential, commercial, and industrial areas, often dictated by market demands, is a primary driver of green space transformation (De Silva & Wijewardena, 2019). In many instances, green spaces that were once designated for public use or conservation have been rezoned for commercial or residential development (Gunawardena et al., 2020).

*GIS-based analysis of Ward 02 (Modara) confirmed the conversion of several open lots into parking facilities and commercial stalls, as corroborated by local authorities. Approximately 70% of survey participants from this ward reported the disappearance of vacant green spaces within the past five years.*

Zoning regulations often prioritize built infrastructure over natural spaces, contributing to a decrease in green coverage in urban areas. Furthermore, land conversion to high-density residential or commercial buildings leads to the loss of green buffers and open spaces, which are essential for ecological balance and urban resilience (Wijesekera & Dissanayake, 2019).

Despite these challenges, there is growing awareness of the need to integrate green spaces within the urban environment through policies such as mixed-use zoning and green infrastructure. The creation of urban parks, green roofs, and vertical gardens is slowly gaining momentum, but much work remains to be done to ensure that future development includes adequate green spaces (Wickramasinghe et al., 2022). The following figure 4 shows this land use zoning patterns of CMC area.

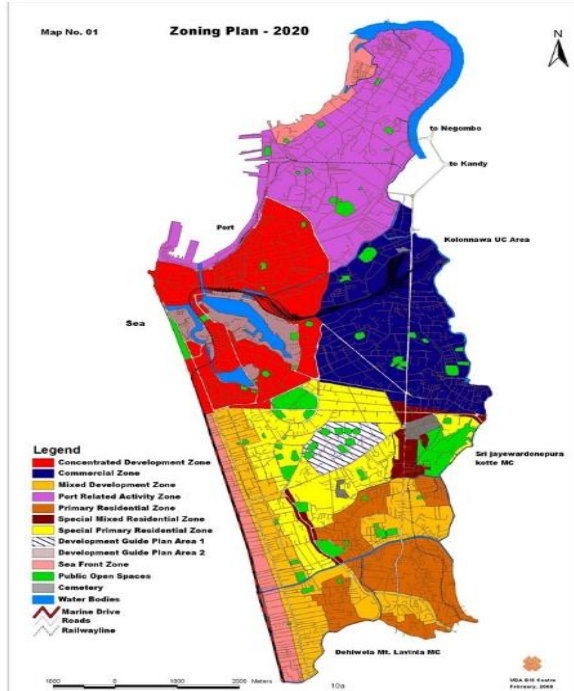


Figure 4 Land use zoning patterns in Colombo Municipal Council Area Source: GIS Unit, Urban Development Authority (2020)

➤ *Socio-Economic Factors and Public Awareness*

The socio-economic status of residents in the CMC area also influences the demand for and transformation of green spaces. Low-income neighborhoods are often more vulnerable to losing green spaces due to urban development pressures. In these areas, public green spaces serve as important social and recreational venues, providing a place for community interaction and outdoor activities (Gunawardena et al., 2020). However, economic inequality and the prioritization of commercial development often mean that low-income areas are deprived of these spaces. Wealthier neighborhoods, on the other hand, may be able to maintain and enhance their green spaces through private investments and better access to resources. This uneven distribution of green space exacerbates social inequalities and limits access to nature for disadvantaged communities (Wickramasinghe et al., 2022).

Public awareness and community engagement also play a significant role in the preservation of green spaces. Citizens' attitudes toward green spaces are shaped by factors such as education, income, and cultural values. In Colombo, efforts to raise awareness about the importance of green spaces and

environmental sustainability are gaining traction, especially with the growing concerns over air pollution, climate change, and the overall quality of urban life. However, more significant efforts are needed to foster a sense of collective responsibility for preserving green spaces (Dissanayake, 2018).

Survey findings indicate that residents in low-income segments of Ward 20 (Pettah) lack access to formal parks or green areas, while residents in Ward 36 (Cinnamon Gardens) benefit from privately maintained gardens. Interviewees in Modara noted the absence of municipal attention to green upgrades in underserved areas.

➤ *Climate Change and Environmental Sustainability*

Climate change is increasingly recognized as a driver of urban transformation. The impacts of climate change, such as rising temperatures, flooding, and erratic weather patterns, necessitate the preservation and expansion of green spaces in urban areas. In the CMC area, green spaces serve as crucial elements in mitigating the effects of climate change, including reducing the urban heat island effect, improving air quality, and managing stormwater runoff (De Silva & Wijewardena, 2019).

Urban green spaces, including parks, gardens, and urban forests, contribute to enhancing the resilience of cities to climate change impacts. However, as urban development continues, there is a risk of losing these natural solutions to climate challenges. Urban planners and policymakers must prioritize climate resilience in their green space strategies, ensuring that these areas are maintained and expanded as part of Colombo's adaptation to climate change (Gunawardena et al., 2020).

Community feedback collected during interviews emphasized the role of green spaces in coping with urban heat, especially in dense areas like Borella and Pettah. A majority (84%) of respondents supported the idea that increasing green cover could reduce flood risk and heat during peak summer months.

So finally, the transformation of green spaces in the CMC area is driven by a complex interplay of urbanization, economic development, policy frameworks, land-use patterns, socio-economic factors, and climate change. As Colombo continues to grow and evolve into a modern metropolis, there is an urgent need to balance development with the preservation of green spaces. Policies that promote

sustainable urban planning, the integration of green infrastructure, and community involvement in decision-making are essential to maintaining and expanding green spaces in the city. The preservation of green spaces is not just a matter of aesthetic value; it is integral to the health, well-being, and resilience of Colombo's urban environment. By addressing the drivers of green space transformation and integrating sustainable practices into urban development, Colombo can create a greener, more liveable city for its current and future generations.

## V. CONCLUSION

Over the last six decades, Colombo has changed a lot, and unfortunately, its green spaces have often paid the price. While some parks and tree-covered areas remain, many have been lost or broken up as the city grew to meet the needs of its people. Roads, buildings, and other developments have reshaped the city, showing just how much urban growth can affect the natural environment. Looking at why these changes happened helps us understand the bigger picture. Decisions around land use, population growth, and city planning have all played a part in shaping Colombo's green spaces. By studying these patterns, we can learn how to better protect what remains, restore what's been lost, and plan for a future where nature and development can coexist. Green spaces are more than decoration—they make the city cooler, cleaner, and more enjoyable to live in. Preserving and expanding them is essential for the well-being of Colombo's residents and for creating a city that is both vibrant and sustainable. This study highlights the importance of valuing our green spaces and using the lessons of the past to guide a greener, healthier future for Colombo.

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