The Southern Expressway's Influence on Settlement Patterns Change Using Remote Sensing in Mahara And Biyagama DS Divisions In Sri Lanka.

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1. Introduction

Infrastructure development plays a pivotal role in transforming rural settlement patterns, particularly in developing countries. This study investigates the impact of highway construction on rural and suburban settlements in Sri Lanka, focusing on Kadawatha, a rapidly urbanizing area formed by the merging of the Mahara and Biyagama divisional secretariat divisions. The concept of settlements, as defined encompasses the totality of human communities, including their social, material, organizational, spiritual, and cultural elements. (United Nations,1976). These settlements are dynamic entities that evolve due to various factors, such as population growth, economic development, environmental changes, and historical events. (Li, N. and Jiang, S ,2018). In Sri Lanka, urbanization was initially propelled by the economic liberalization of the 1970s; however, the subsequent civil war in Sri Lanka stunted development, particularly in the northern and Eastern regions. Following the end of the civil war in 2009, the country launched an extensive infrastructure development agenda, including large-scale road networks, significantly affecting rural and suburban landscapes. This research utilizes Geographic Information Systems (GIS) to analyze the transformation of Kadawatha area from 2011 to 2023, focusing on land use, population density, and economic activities. Findings from this study are expected to provide critical insights into the relationship between infrastructure development and settlement transformation, with implications for sustainable urban planning in developing nations.

2. Materials and Methods

The Mahara and Biyagama DS Divisions in Sri Lanka's Gampaha District were selected as study sites due to their proximity to the Southern Expressway and accelerated urbanization rates. Located approximately 25 Kilometres north and 15 Kilometres northeast of Colombo, respectively, Mahara's coordinates are 6.9233° N, 79.9522° E, covering 90 Square Kilometres, while Biyagama spans 62 Square Kilometres at 6.9561° N, 79.9847° E. Collectively, the study area encompasses 157.8563652 Square Kilometres. Landsat-8 and Landsat-7 satellite imagery, with a 30-meter resolution, was employed for remote sensing analysis.

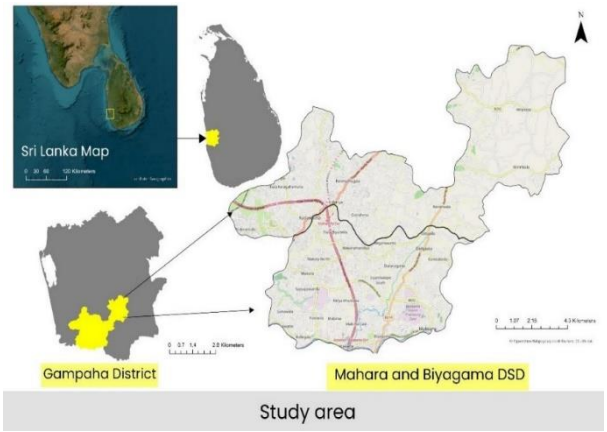

Figure 1: Study area map

The study employed Landsat 7 and 8 satellite imagery (2011, 2023) for land use classification, utilizing supervised classification to delineate specific settlement patterns. Google Earth used check ground truth verification and Overlay analysis (Intersect), enabling a comprehensive assessment of land use and settlement transformations influenced by the Southern Expressway (Figure 2).

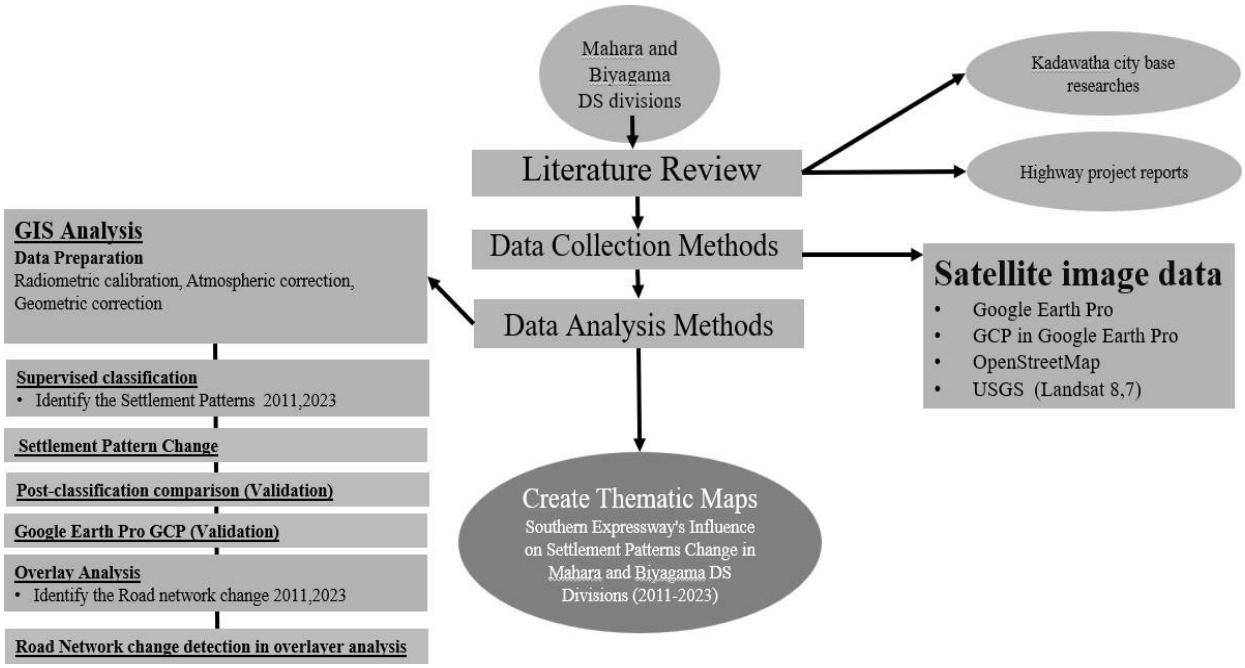

Figure 2: Methodology flowchart

3. Results and Discussion

The supervised classification results (Figure 3) illustrate changes in settlement patterns within the study area from 2011 to 2023. In 2011, settlement coverage was recorded at 53.95 km², expanding significantly to 68.69 km² by 2023, indicating a growth of 14.73 km² in settlement areas (Table 1). For classification purposes, smaller forests, paddy fields, and other undeveloped regions were categorized as non-settlement areas, totalling 103.90 km² in 2011 and subsequently declining to 89.17 km² by 2023. This study quantifies settlement expansion during these periods, highlighting the extent of urbanization influenced by infrastructure development (Figure 3). Data analysis for 2011 and 2023 reveals a marked increase in settlement expansion, closely linked to the construction of the Southern Expressway and associated road networks. In 2011, there was no expressway in this area, while by 2023, extensive road systems catalysed growth in industrial and commercial activities. Additionally, establishing a provincial interchange bus station spurred a large volume of bus services, especially those connecting to the southern province of Sri Lanka. This enhanced connectivity has subsequently driven various economic activities, with new housing developments, commercial enterprises, and service- based industries proliferating around these transportation hubs, progressively transitioning the area's rural landscape to urban.

The migration of individuals working in Colombo to this suburban area further underscores the impact of infrastructure improvements on settlement patterns. As demand for services grew, banking, hospitality, dining, and other essential service industries emerged, contributing to the area's urbanization. These developments collectively illustrate how infrastructure, specifically the Southern Expressway, has been a key driver in transforming land use, economic activity,

and population distribution in the Kadawatha region. This study highlights the significance of infrastructure in accelerating urbanization, with implications for regional planning and policy aimed at managing urban growth sustainably.

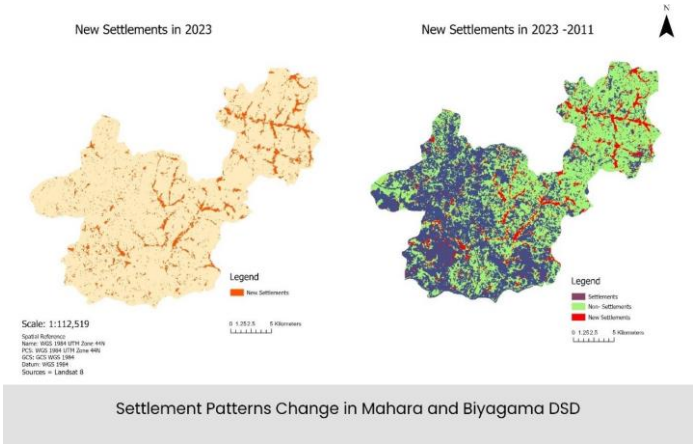

Figure 3: Settlement patterns Change in Mahara and Biyagama DSD

Table 1. Settlement patterns Change in Mahara and Biyagama DSD image classification result

Year	**Settlement area (km^2)**	**Non -Settlement area (km^2)**
2011	53.95264	**103.90372**
2023	68.68659	**89.16672**
Changed area	**14.73**	**14.73**

4. Conclusion

In this research, the settlement area of Mahara and Biyagama DSD in 2023 is more than the settlement area in 2011. The change is 14.73 km2. The area around Kadawatha was the most settlement area during the growth. Because of new road system in that area along with the Southern Expressway, the settlement has grown. With that, the Kadawatha area has changed economically and socially. The overall accuracy of the study, validated through the Google earth, and accuracy level is 82%. Recommendations include strategic town planning initiatives.

5. Acknowledgment

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6. Keywords

Remote Sensing, Road network, Settlement patterns

7. References

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