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Geospatial analysis of subnational poverty dynamics: A spatial and temporal framework for evidence-based policy

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ABSTRACT

Poverty exhibits pronounced spatial and temporal variation, necessitating disaggregated analysis to inform targeted development policy. This study investigates the spatial and temporal dynamics of poverty in the Gampaha District of Sri Lanka at the Divisional Secretariat Division level between 2002 and 2012. Secondary data on the poverty headcount ratio and the population living below the poverty line were obtained from the Department of Census and Statistics. The analysis employed ArcGIS-based spatial techniques, including graduated color classification, unique value mapping, integrated bar chart visualization, and field calculations to derive division-level poverty indicators, enabling comparative mapping across two time periods. The results indicate an overall decline in poverty across the district, with the number of high-poverty divisions decreasing from three in 2002 to two in 2012. The maximum poverty headcount ratio declined from 12 percent to 11 percent, while the minimum rate decreased from 4 percent to 3 percent over the decade. However, poverty reduction was spatially uneven. Divisions such as Dompe recorded a substantial decline in the number of poor households, falling from 26,544 to 8,321, whereas Katana experienced a 4.1 percent increase in its poverty headcount ratio, shifting from a low to a high poverty category by 2012. The findings reveal persistent intra-district disparities and shifting poverty hotspots, underscoring the limitations of aggregate district-level statistics. By providing a spatially disaggregated and temporally comparative assessment, the study demonstrates the value of division-level poverty mapping for identifying vulnerable areas and informing region-specific, evidence-based poverty alleviation strategies in Sri Lanka.

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1. INTRODUCTION

Poverty is unique and relative among countries, and it has its own pattern under the conditions of the local contexts (Gweshengwe et al., 2020). Therefore, the geography of space has been more important. Geographical patterns, distribution characteristics, and areal types give prospects and socio-economic details for poverty studies (Zhou & Liu, 2022). It plays a crucial role in anti-poverty measures (Zhou & Liu, 2022). Ghose & Welcenbach (2018) explain a significant contribution of geospatial technologies for spatial decision-making and governance. It supports identifying spatial disparities, reaching more vulnerable communities, digital divide, which is inherently disempowering to marginalized social groups (Ghose & Welcenbach, 2018). Thatcher & Imaoka (2018) seek to theorize the impact of geospatial tools on modern scholarly work. They identify GIS Systems and GIS Science as newly well-established scholarly pieces in the field of geography and

geographic education. They argue about the critical influence of GIS on the political economy of geography and geographic education.

The recent studies have been conducted using GIS regarding poverty and spatial disparities. Arya et al. (2025) integrate the multi-source satellite imagery and socio-economic household data for wealth-based poverty assessment of India. Aguilar et al. (2025) assesses the energy efficiency and energy poverty of the residential building stock of the city of Seville using GIS. Diving into economic and development aspects, Kılıc et al. (2026) study SME development for poverty alleviation using GIS and AHP-based multi-criteria decision analysis. Kayes et al. (2025) use GIS and geospatial techniques for a multidisciplinary task assessing climate-induced vulnerabilities and the poverty alleviation potential of the dry fish industry. This study shows the multidisciplinary intersection of climate studies, economics, poverty, and poverty alleviation solutions. Therefore, geospatial tools, including GIS have been validated as a method for studies of poverty, specifically poverty and spatial disparities.

Geographic Information Systems (GIS) have progressively evolved in Sri Lanka from basic spatial data applications to advanced, integrated analytical platforms supporting public policy and development planning. Early applications demonstrated the utility of GIS for regional analysis, including district-level case studies such as the Hambantota district assessment (Almqvist & Fergéus, 2001) and land valuation modeling in urban contexts (Li et al., 2015). Over time, GIS has expanded into sectoral modernization initiatives, including agriculture and environmental management. For example, De Silva et al. (2025) proposed a common Web GIS platform to support agricultural sector modernization, while Jayapathma et al. (2025) integrated GIS and remote sensing techniques to analyze food security in paddy cultivation. Similarly, Mudalige & Carver (2024) applied GIS-based modeling to assess wilderness attributes, illustrating the methodological maturity of spatial analytics in environmental governance. These developments reflect a broader institutionalization of GIS in Sri Lanka, where spatial technologies are increasingly embedded in planning, monitoring, and evidence-based decision-making processes across multiple sectors.

Within this broader GIS trajectory, poverty mapping has emerged as a critical area of research and policy relevance. Foundational work by Amarasinghe et al. (2005a) and Amarasinghe et al. (2005b) produced spatially disaggregated poverty maps and identified clustering patterns of rural poverty and food insecurity, demonstrating the importance of small-area estimation techniques for targeted interventions. World Bank & Department of Census and Statistics Sri Lanka (2005), in collaboration with international partners, further institutionalized poverty mapping methodologies, highlighting their policy implications and lessons for national planning. More recent advances incorporate multidimensional and data-driven approaches. Das et al. (2025) emphasized small-area multidimensional poverty mapping techniques, while (Department of Census and Statistics, 2025) introduced machine learning models that integrate mobile call detail records and remote sensing data to generate high-resolution poverty estimates. These innovations signal a methodological shift from conventional census-based mapping to dynamic, big data-driven analytics, enhancing the precision and timeliness of poverty measurement. Collectively, the Sri Lankan experience demonstrates how GIS-based spatial analysis has transitioned from descriptive mapping to predictive and policy-oriented modeling, strengthening the capacity to address poverty and regional disparities. The only study found, which made the insights in the Gampaha district, using GIS-based techniques, was a study on groundwater quality and GIS use in Gampaha. It highlights the importance of spatial analysis in understanding environmental pressures related to development, rather than a socio-economic poverty study (Amasha et al., 2023). Denawaka et al. (2024) and Edirisinghe et al. (2021) studied the flash floods and heat island effect in Gampaha using GIS-based approaches and satellite imagery. However, these studies did not align on socio-economic and poverty over time.

Although prior studies have substantially advanced the application of GIS, small-area estimation, and data-driven techniques in poverty analysis in Sri Lanka, important gaps remain. Existing research has largely focused on national or district-level assessments, with limited attention to Divisional Secretariat Division units as the primary scale of analysis. In particular, the Gampaha District and its Divisional Secretariat Divisions have not been examined in a comprehensive spatial and temporal framework. Moreover, insufficient emphasis has been placed on identifying intra-district disparities over time and translating spatial findings into clear policy-oriented insights. Accordingly, a focused analysis at the Divisional Secretariat level that integrates both spatial and temporal dimensions is necessary to generate more context-specific evidence and to support targeted, equitable poverty alleviation strategies.

As a developing country, Sri Lanka faces significant challenges in addressing poverty. Despite notable progress in poverty reduction, particularly in urban centers such as Colombo and Gampaha, poverty remains a persistent concern, especially within specific regions and marginalized communities (Department of Census and Statistics, 2022). Regional disparities, limited access to quality education and employment opportunities, inequality and social exclusion based on ethnicity, caste, gender, and disability, vulnerability to external economic shocks, and constraints in accessing essential services such as healthcare and sanitation collectively shape the multidimensional nature of poverty in Sri Lanka. In response, the Sri Lankan government, in collaboration with international organizations and civil society, has implemented various poverty reduction

initiatives focusing on education, healthcare, infrastructure development, inclusive economic growth, and social protection mechanisms to improve living standards and reduce poverty levels nationwide. However, the significant challenge remains whether poverty reduction initiatives are selected based on accurate and precise data and research.

According to the Household Income and Expenditure Survey 2019, the national poverty rate was 3.2 percent under the old poverty line, while it increased to 14.3 percent when measured using the revised poverty line (Department of Census and Statistics, 2022). More recent estimates released on 6 June 2023 indicate that approximately seven million people in Sri Lanka are currently living in poverty. These figures demonstrate that Sri Lanka continues to experience chronic poverty, despite gradual improvements observed during the previous decade. The impacts of the COVID-19 pandemic and the subsequent economic crisis have significantly reversed earlier gains, exacerbating poverty across the country. Consequently, the first Sustainable Development Goal of eradicating poverty has not been achieved in the Sri Lankan context, and poverty has reached one of its most critical stages in recent history. This situation highlights the urgent need for comprehensive poverty alleviation strategies and systematic evaluations of past development processes implemented prior to the economic crisis.

Gampaha District represents a peri-urban interface and is the second most populous district in Sri Lanka. It accounts for approximately 18 percent of the country's total urban area and exhibits a diverse mix of urban, semi-urban, and rural characteristics. Analyzing poverty in the Gampaha District across its Divisional Secretariat Divisions enables an examination of the spatial and temporal dynamics of poverty in relation to development indicators and socio-economic factors. Understanding the patterns of chronic poverty within this district is essential for designing effective and forward-looking poverty reduction strategies.

Poverty research is critical for understanding the underlying causes and consequences of poverty, formulating effective interventions, evaluating poverty alleviation programs, guiding policy decisions, raising public awareness, and promoting collaboration among stakeholders. In Sri Lanka, GIS-based poverty analysis offers valuable tools for examining the spatial dimensions of poverty, identifying priority areas for intervention, analyzing key poverty drivers, and monitoring and evaluating policy outcomes. By effectively utilizing GIS techniques, Sri Lanka can strengthen evidence-based decision-making, enhance poverty reduction efforts, improve socio-economic conditions, and advance progress toward achieving sustainable development goals. Within the national poverty framework of Sri Lanka, the Gampaha District continues to experience persistent poverty, making it essential to understand how poverty has evolved over recent decades and how external factors have influenced these changes. This study therefore seeks to identify the spatial and temporal changes in poverty within the Gampaha District, visualize poverty patterns through the preparation of clear and informative poverty maps, and examine and derive key insights from the observed spatial and temporal changes in poverty.

2. METHODS

2.1. Study Area

Gampaha District is in the Western Province of Sri Lanka and represents one of the country's most important administrative divisions [Figure 1]. The district comprises thirteen Divisional Secretariat Divisions and serves as a key economic center within the province, making a substantial contribution to the national economy. Gampaha covers an area of approximately 1,387 square kilometers and has a population of about 2.4 million (Department of Census and Statistics, 2025).

The district exhibits a diversified economic structure encompassing agriculture, industry, and services (Pacillo, 2022). Agricultural activities are primarily dominated by coconut and paddy cultivation, while the industrial sector includes manufacturing, construction, and small-scale enterprises (Lakmali & Sakalasooriya, 2025). The service sector is largely composed of retail trade, finance, healthcare, and education.

Gampaha also holds cultural and historical significance, with numerous ancient temples and heritage sites located within the district. In addition, it benefits from a well-developed transportation network, including highways, railways, and bus services, which facilitates connectivity with other regions of the country. In recent years, the district has experienced rapid urbanization and development, supported by increased infrastructure investment and the establishment of several industrial zones (Rewathy et al., 2023). Despite these developments, poverty remains a significant concern, particularly in rural and peri-urban areas (Pacillo, 2022). Understanding the spatial distribution of poverty within the district is therefore essential for policymakers and development stakeholders to design effective poverty reduction strategies and improve overall living conditions.

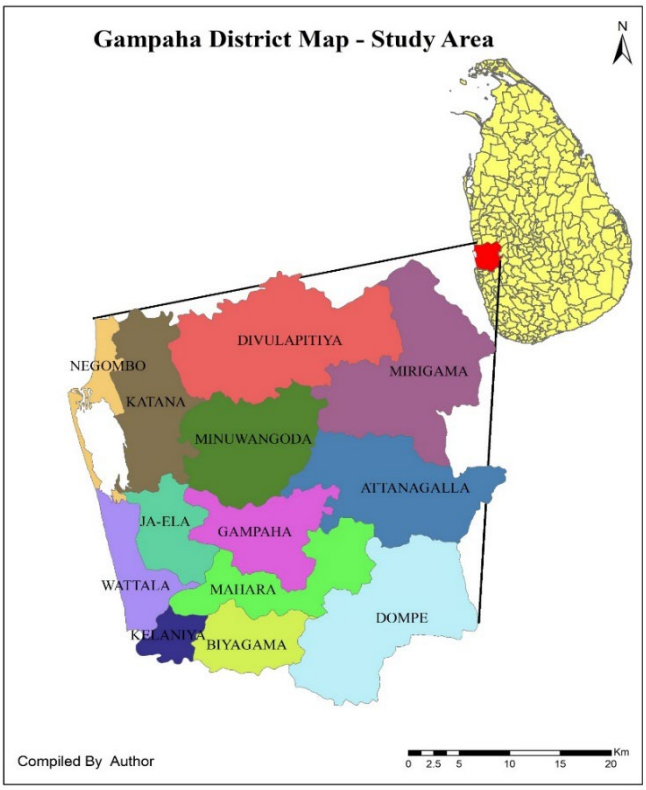

Figure 1. Gampaha District Map - Study Area

2.2. Data Collection Techniques

This study primarily relies on secondary data obtained from reliable and authoritative sources. Ensuring data reliability is a critical aspect of the research process. Accordingly, multiple data sets were collected from recognized institutions. The main categories of data used in this study include poverty-related data; map and location data; and other supporting datasets

Poverty data, which are essential for both spatial analysis and mapping, were obtained from the Department of Census and Statistics of Sri Lanka. Map and location data were sourced from the Geographic Information System Division of the Urban Development Authority and the United Nations Office for the Coordination of Humanitarian Affairs. Subnational administrative boundary data for Sri Lanka were accessed through the Humanitarian Data Exchange platform managed by the United Nations Office for the Coordination of Humanitarian Affairs. Additional datasets were obtained from other credible sources where necessary. All data utilized in the study represent the most recent versions available and were also used to support the literature review and conceptual analysis.

2.3. Ethical Consideration

This study was conducted using secondary data obtained from publicly available sources, including the Department of Census and Statistics of Sri Lanka and spatial datasets provided by the United Nations Office for the Coordination of Humanitarian Affairs and the Urban Development Authority. The research did not involve human participants, personal interviews, surveys, experiments, or the collection of identifiable personal information. Therefore, formal ethical approval from an institutional review board or ethics committee was not required. The study was carried out in accordance with accepted academic and research ethics standards, ensuring proper citation, acknowledgment of data sources, and responsible use of publicly available data.

2.4. Data Analysis

Data analysis involves the processes of cleaning, transforming, and organizing raw data for research purposes (Islam, 2020) In this study, poverty-related data were collected as secondary data from official government census and statistical sources. The raw data were extracted and filtered to include only information relevant to the Gampaha District.

The poverty data were categorized into two primary indicators:

1. Number of people living below the poverty line
2. Poverty headcount ratio at the Divisional Secretariat Division level

The data were initially stored and organized using Microsoft Excel. Subsequently, the processed datasets were imported into ArcGIS software, where they were joined to the attribute table of the study area shapefile. These data were then used for mapping and comparative analysis across different years. Both spatial and temporal analyses were conducted to identify patterns and changes in poverty distribution over time.

The organized poverty datasets were integrated into ArcGIS for visualization and mapping. Within ArcGIS, the poverty indicators were linked to the attribute table of the Gampaha District map. Two primary maps were produced for each reference year, representing the number of people living in poverty and the poverty headcount ratio at the Divisional Secretariat Division level. All thirteen Divisional Secretariat Divisions were displayed on a single map to facilitate visualization of spatial disparities in poverty.

An additional set of maps was created to enable temporal comparison by combining poverty maps from two different years. ArcGIS served as the primary tool for mapping and visualization, using available shapefiles and datasets. Data attributes were symbolized using the Symbology functions in ArcGIS. The two poverty indicators were visualized separately using different techniques [Figure 2].

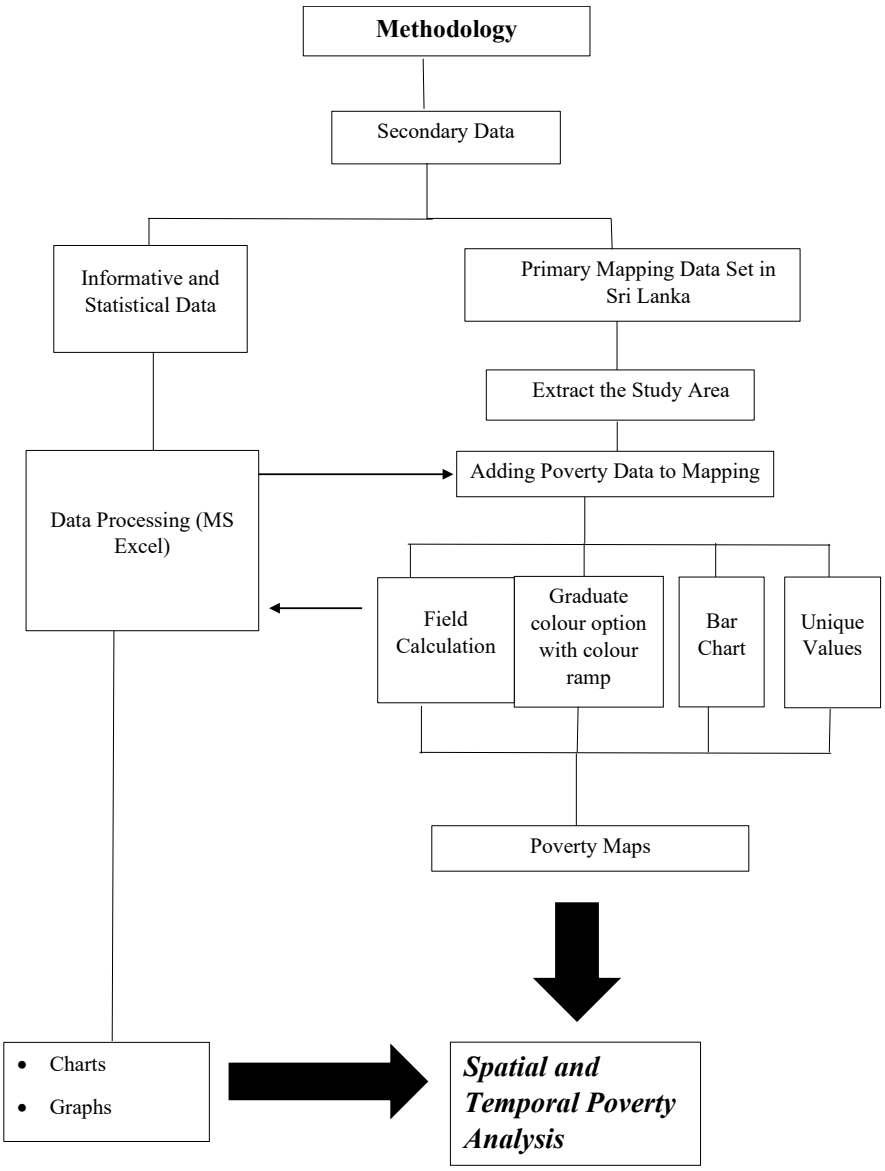

Figure 2. Methodology Chart

2.3.1. Graduated Color Classification

The number of people living in poverty and the poverty headcount ratio at the Divisional Secretariat Division level were represented using graduated color schemes. This method was also applied to classify poverty levels spatially.

2.3.2. Bar Charts

Bar charts were generated to depict Divisional Secretariat Division level variations in both the poverty population and the poverty headcount ratio. These charts were integrated into the maps using GIS graphing tools.

2.3.3. Unique Value Mapping

The unique value technique was applied to display Divisional Secretariat Division level poverty characteristics individually, allowing clearer differentiation among administrative units.

2.3.4. Field Calculation

As census data provided poverty headcount ratios only at the national level, field calculations were performed in ArcGIS to derive poverty indicators at the Divisional Secretariat Division level.

3. RESULTS

Poverty distribution varies significantly across space, and distinct geographic patterns were identified using spatial statistical techniques within a Geographic Information System. Concentrated poverty clusters, spatial disparities, and localized outliers were quantified through GIS-based spatial analysis. The results reveal pronounced spatial variations in poverty levels, characterized by clear classifications into high, moderate, low, and very low poverty concentrations, as well as isolated pockets of high and low poverty within areas exhibiting contrasting average poverty levels. Spatial classification into these categories was conducted using the calculate geometry function in ArcGIS.

In 2002, Mirigama, Attanagalla, and Dompe Divisional Secretariat Divisions recorded the highest number of poor households in the district [Figure 3]. Six Divisional Secretariat Divisions, namely Divulapitiya, Minuwangoda, Gampaha, Mahara, and Biyagama, fell into the moderate poverty category. This group represented the majority of the thirteen Divisional Secretariat Divisions in Gampaha. Katana and Ja Ela recorded low poverty levels, while Negombo, Wattala, and Kelaniya exhibited very low poverty rates compared with other divisions in the district.

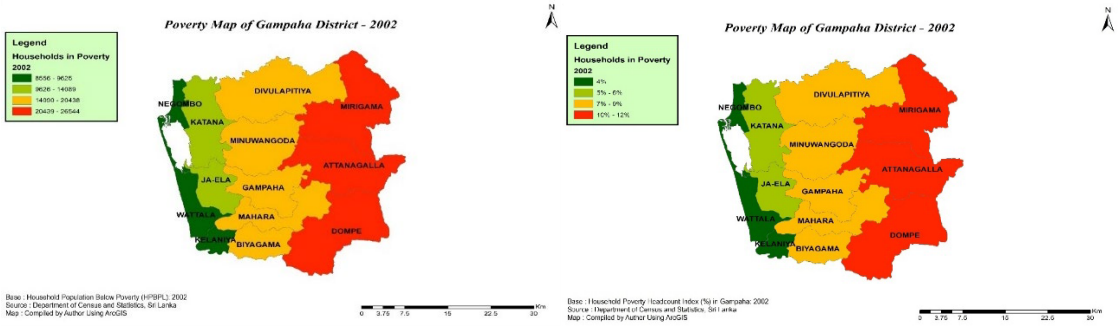

Figure 3. Poverty Map of Gampaha District - 2002

The poverty headcount ratio for households reflected a similar spatial pattern. Mirigama, Attanagalla, and Dompe recorded the highest proportions of poor households, with poverty headcount ratios ranging between 10 percent and 12 percent. This indicates substantially higher poverty levels compared with both district and national averages, with approximately one in ten households living below the poverty line in these divisions in 2002. Divulapitiya, Minuwangoda, Gampaha, Mahara, and Biyagama again formed the moderate poverty category, representing the majority of Divisional Secretariat Divisions. Katana and Ja Ela recorded lower poverty rates of approximately 5 percent to 6 percent. The lowest poverty levels, at around 4 percent, were observed in Negombo, Wattala, and Kelaniya. Nevertheless, poverty was present in all Divisional Secretariat Divisions, with at least 4 percent of households living below the poverty line across the district.

Beyond categorical mapping, Divisional Secretariat Division level analysis further highlighted spatial disparities in poverty distribution. Bar chart representations indicated that Dompe and Mirigama recorded the highest poverty headcount ratios, with approximately 12 percent of households living below the poverty line [Figure 4]. Attanagalla followed closely with a poverty headcount ratio of 11 percent. In contrast, Negombo and Wattala recorded the lowest poverty levels at approximately 4 percent. Divisional Secretariat Divisions with poverty headcount ratios exceeding 10 percent were identified as highly vulnerable areas, characterized by increased risks of food insecurity, social instability, and heightened inequality.

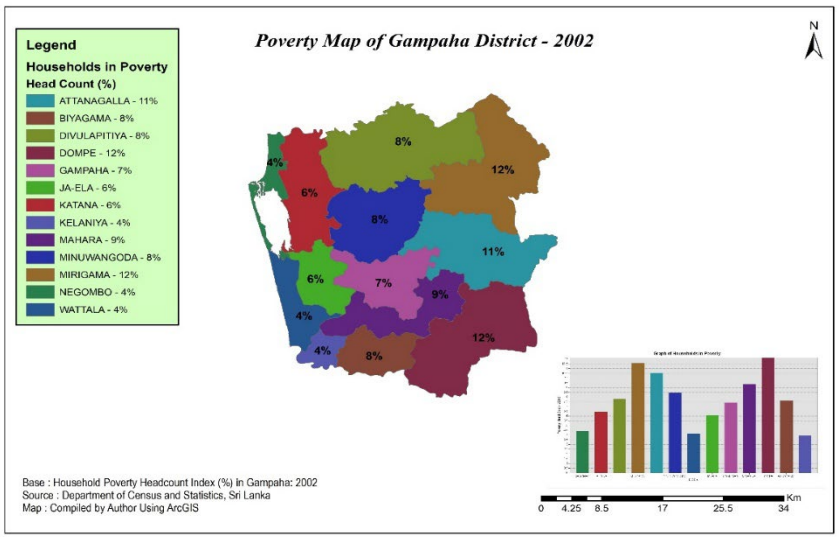

Figure 4. Poverty Map of Gampaha District (DSD vise %) – 2002

In 2012, the poverty population was similarly classified into four categories at the Divisional Secretariat Division level. Mirigama and Katana recorded the highest numbers of people living in poverty within the district [Figure 5]. Divulapitiya, Minuwangoda, Attanagalla, Mahara, and Dompe formed the moderate poverty category, which again comprised the majority of the thirteen divisions. Wattala, Gampaha, Biyagama, and Ja Ela recorded low poverty levels, while Negombo and Kelaniya exhibited very low poverty levels relative to the rest of the district.

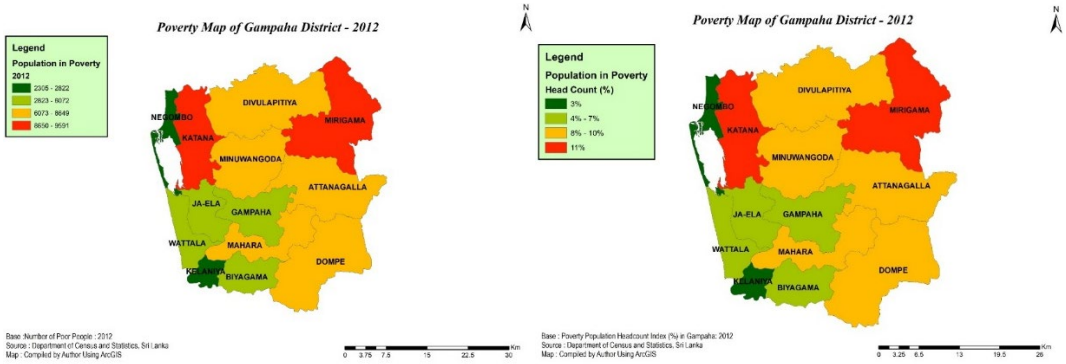

Figure 5. Poverty Map of Gampaha District - 2012

The poverty headcount ratio for the population in 2012 followed a pattern like that observed in the poverty population distribution. Mirigama and Katana recorded the highest poverty ratios, at approximately 11 percent, indicating that nearly one in ten individuals in these divisions lived below the poverty line. These levels suggest elevated vulnerability to adverse health outcomes, including chronic illness, higher mortality rates, and lower life expectancy. Divulapitiya, Minuwangoda, Gampaha, Mahara, and Biyagama comprised the moderate poverty category. Low poverty rates, ranging from approximately 4 percent to 7 percent, were observed in Wattala, Gampaha, Biyagama, and Ja Ela. The lowest poverty rate declined to around 3 percent in 2012, indicating an improvement compared with 2002. Negombo, Wattala, and Kelaniya continued to exhibit very low poverty levels. However, poverty remained present across all divisions, with at least 3 percent of the population living below the poverty line in every Divisional Secretariat Division.

Divisional Secretariat Division level analysis further reinforced these findings. Bar chart representations revealed that Katana and Mirigama recorded the highest poverty headcount ratios, each at approximately 11 percent [Figure 6]. Divulapitiya, Dompe, and Minuwangoda followed with poverty headcount ratios of around 10 percent. Negombo and Kelaniya recorded the lowest poverty levels at approximately 3 percent. Divisions with poverty headcount ratios exceeding 10 percent were identified as particularly vulnerable, facing heightened risks of food insecurity, social instability, and pronounced inequality.

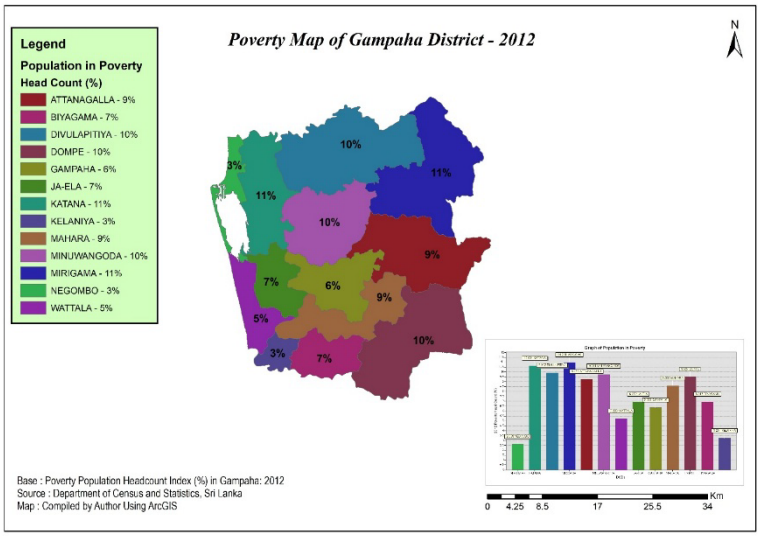

Figure 6. Poverty Map of Gampaha District (DSD vise %) - 2012

Feature by feature analysis reveals notable temporal and spatial changes, including both positive and negative trends. A key achievement between 2002 and 2012 is the overall reduction in poverty levels across the district. However, temporal changes in poverty vary considerably across Divisional Secretariat Divisions. Poverty headcount ratios for both households and population were classified into four categories, and the number of Divisional Secretariat Divisions in the high poverty category declined over the decade [Figure 8]. In 2002, three Divisional Secretariat Divisions were classified as high poverty areas, whereas in 2012 this number declined to two.

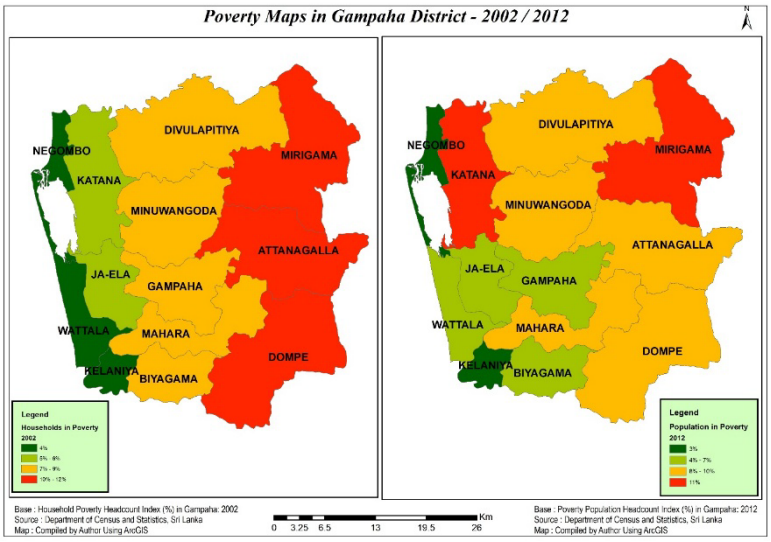

Figure 8. Poverty Map of Gampaha District - 2002 / 2012

4. DISCUSSION

Poverty cannot be measured solely in relation to prevailing societal standards. Temporal and spatial dimensions are also essential for understanding the distribution, movement, and dynamics of poverty. Temporal mapping across two time points within a ten-year interval provides a temporal framework for analyzing changes in poverty in the Gampaha District, while spatial analysis enables the examination of how poverty patterns are distributed and reorganized across space over time.

Feature-wise analysis shows notable spatial and temporal changes, with both improvements and declines. Overall poverty levels decreased from 2002 to 2012, though trends varied across Divisional Secretariat Divisions. The number of divisions in the high-poverty category declined from three in 2002 to two in 2012, indicating gradual improvement.

Mirigama remained in the high-poverty category throughout the period, although its poverty rate slightly declined (~1%). In contrast, Katana became the highest-poverty division by 2012, rising from low to high poverty with a 4.1% increase (11% in 2012), indicating slower poverty reduction relative to others. Attanagalla and Dompe improved to moderate poverty, with Dompe showing a marked decline in poor households (26,544 to 8,321) and a ~4% reduction.

Divulapitiya, Minuwangoda, and Mahara stayed in the moderate category, while Biyagama and Gampaha improved to low poverty by 2012. Ja Ela remained unchanged, and Wattala stayed in the low-poverty category. Overall, most divisions clustered in the moderate category, with shifts into and out of it over time.

Poverty ranges also narrowed, with the minimum headcount declining by ~1% and the maximum falling from 12% to 11%. Despite overall improvement, two divisions remained in the high-poverty category, underscoring uneven and spatially varied poverty reduction across the district.

4.1. Uneven Spatial Allocation of Poverty Reduction Outcomes

Some Divisional Secretariat Divisions recorded rapid progress in poverty reduction, largely influenced by urbanization, trade, and economic diversification (Amasha et al., 2023; Lakmali & Sakalasooriya, 2025; Pacillo, 2022; Rewathy et al., 2023). Attanagalla, Dompe, Gampaha, and Biyagama demonstrated comparatively strong poverty alleviation outcomes. In contrast, Mirigama exhibited very slow progress and remained the only division consistently classified within the high poverty category.

4.2. Slow Poverty Reduction in Rural Areas

The highest poverty levels were concentrated in Attanagalla and Mirigama, which are relatively remote and less urbanized Divisional Secretariat Divisions. Urbanization is closely associated with trade expansion and the creation of new economic opportunities (Lakmali & Sakalasooriya, 2025; Rewathy et al., 2023). Effective poverty reduction, therefore, requires targeted capital investment in rural areas (Sakalasooriya, 2016). At the government level, rural planning initiatives should be explicitly aligned with poverty alleviation strategies.

4.3. Lack of Regional Planning

The absence of comprehensive regional planning in the Gampaha District has contributed to uncoordinated poverty alleviation efforts. Spatial mapping highlights this deficiency, particularly in divisions such as Katana, where poverty reduction has decelerated (Sakalasooriya, 2016). The lack of an integrated regional framework weakens the effectiveness of national poverty alleviation programs at the local level.

Although Gampaha is the second most populous and urbanized district in Sri Lanka and is strongly connected to the national economy, poverty alleviation efforts appear insufficiently integrated with national development strategies (Deyshappriya, 2021). This is evident from the relatively slow poverty reduction observed in strategically important Divisional Secretariat Divisions such as Gampaha and Biyagama. As a result, overall poverty eradication in the district has progressed at a slower pace than expected.

4.4. Limitations

While the findings offer useful insights into the spatial and temporal dynamics of poverty in Gampaha District, they should be interpreted in light of several data and methodological limitations. The analysis is constrained by limited availability of updated and disaggregated poverty data, with Divisional Secretariat Division–level estimates only available for 2001 and 2012, while more recent data are reported only at the district level. In addition, inconsistencies in poverty indicators across time (household-based versus individual-based measures) affect strict comparability between periods.

Further, the study captures poverty primarily through poverty line indicators, which limits its ability to reflect the multidimensional nature of deprivation, including sector-specific livelihood conditions. Finally, spatial mapping at the Divisional Secretariat Division level cannot fully represent fine-scale variations in poverty within divisions. Despite these constraints, the analysis remains useful for identifying broad spatial and temporal patterns and disparities in poverty across the district.

5. CONCLUSION

This study analyzed the spatial and temporal dynamics of poverty in Gampaha District (2002–2012) using GIS at the Divisional Secretariat Division level. While overall poverty declined, reductions were uneven across space, with persistent disparities between divisions. Areas with stronger urban and economic linkages improved more, while some rural divisions remained vulnerable or experienced worsening conditions, reflecting unequal access to opportunities, infrastructure, and development interventions.

The findings highlight the value of GIS-based, small-area analysis in revealing localized poverty hotspots that are hidden in aggregate statistics. Although poverty reduction efforts have had measurable

impacts, outcomes remain spatially uneven due to persistent rural–urban gaps and weak coordination in development planning. This underscores the need for a more targeted, equity-focused, and spatially informed poverty reduction framework.

Future work should use updated post-2012 data, particularly considering recent economic shocks, and adopt multidimensional poverty indicators. Advances in GIS, remote sensing, and predictive spatial modeling can further improve poverty monitoring and forecasting. Strengthening data integration, institutional coordination, and capacity building will be essential to institutionalize spatial poverty analysis and support more inclusive and sustainable development aligned with the Sustainable Development Goals.

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DECLARATION OF COMPETING INTEREST

The author declares no competing interests.

DECLARATION OF GENERATIVE AI USE

During the preparation of this work, the author used OpenAI's ChatGPT to assist with language refinement, grammatical editing, paraphrasing, formatting, and improving academic readability. After using this tool, the author carefully reviewed, edited, and verified all content as needed and takes full responsibility for the accuracy, originality, and integrity of the published article.

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AUTHOR'S CONTRIBUTIONS

Isuru Udakara Yakandawala: Conceptualization, methodology, investigation, data curation, formal analysis, visualization, writing original draft, writing review and editing**.**

AVAILABILITY OF DATA AND MATERIALS

The data supporting the findings of this study were obtained from publicly available sources, including the Department of Census and Statistics, Sri Lanka, and the Humanitarian Data Exchange. Administrative boundary data are available through the United Nations Office for the Coordination of Humanitarian Affairs. Additional processed datasets used in the analysis may be made available by the author upon reasonable request.

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