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A study on socio-economic problems of women-headed households - Special reference in the Mullaitivu district of Sri Lanka

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ABSTRACT

This study aims to identify and analyze the challenges faced by women-headed households (WHHs) in the Manthai-East Divisional Secretariat of the Mullaitivu District, with a focus on the post-war context. A mixed-method approach was employed, using simple random sampling for selecting 70 respondents. Data was collected through well-structured questionnaires, focus group interviews, and observations. Descriptive statistical tools, including mean and standard deviation analyses, were used to examine the demographic characteristics and issues faced by WHHs. The study identified that the most significant issue faced by WHHs was the lack of access to safe drinking water, while the least significant challenge was securing regular work and collecting wages. A factor analysis was performed to reduce the 12 identified problems to four key factors: psychological and familial issues, social problems, economic challenges, and health-related difficulties. The findings of this study reveal that WHHs in the region are facing severe socio-economic hardships, primarily due to the loss of male family members, often as a result of war. With limited access to formal employment, many of these women rely on self-employment or day labor. The study emphasizes the urgent need for targeted interventions, including improved access to safe drinking water, enhanced security, and educational and career opportunities for widows. To support these women, recommendations include prioritizing vocational training, providing financial assistance, and expanding access to social services, healthcare, and education. Tailored interventions that focus on mental health and strengthening community support networks are also crucial for improving resilience and the overall well-being of WHHs.

Keywords: Factor analysis, Mullaitivu district, Post-war era, Socio-economic problems, Women-headed households

INTRODUCTION

In recent decades, there has been a significant global rise in women-headed households (WHHs), which now account for approximately 33% of all households worldwide (Praveen & Singh, 2008). This shift is often attributed to socio-economic transformations such as industrialization, urbanization, and conflict-induced disruptions. In patriarchal societies, such as Sri Lanka, the prevalence of WHHs is further exacerbated by factors like widowhood, displacement, and family fragmentation, especially in post-conflict settings (Baros & Fox, 1997). The consequences of these transformations are particularly pronounced in regions that have suffered long-term conflict.

Sri Lanka's Northern and Eastern provinces, devastated by a three-decade-long civil war, have seen a marked increase in WHHs. According to the 2021 Census, 25.8% of households in the country are headed by women, with the Northern Province experiencing the highest concentration (Department of Census and Statistics, 2022). In particular, the Manthai East Division of Mullaitivu District has witnessed a surge in WHHs, which are often faced with severe socio-economic challenges such as poverty, limited educational opportunities, and pervasive psychosocial stress. These difficulties are compounded by the region's post-war context, where families continue to struggle with insecurity and the psychological toll of the conflict.

This study aims to explore the socio-economic challenges faced by WHHs in the post-war context of Manthai East, focusing on the unique issues that these households face as a result of the prolonged conflict. By investigating these challenges, the study seeks to provide actionable insights that can inform policy recommendations aimed at improving the empowerment and resilience of these vulnerable households, ultimately contributing to their well-being and long-term stability.

REVIEW OF LITERATURE

This study examines the socio-economic challenges faced by women-headed households (WHHs) through a review of global, national, and regional literature. The review is structured into thematic categories: global perspectives, gender norms and structural barriers, the post-conflict context in Sri Lanka, and theoretical underpinnings guiding the research.

This study employs a range of theoretical frameworks to analyze the complex realities of WHHs. Gender Theory highlights power imbalances and structural gender constraints that affect women’s decision-making and access to resources. Intersectionality Theory examines how overlapping identities such as class, race, and marital status intersect to shape disadvantage. Family Systems Theory views WHHs as adaptive units that respond to internal and external pressures resulting from shifts in family roles. Social Capital Theory focuses on the importance of social networks for securing economic and emotional support, while Ecological Systems Theory situates individual households within broader socio-political and environmental contexts. By integrating these frameworks, the study aims to provide a

comprehensive understanding of the socio-economic challenges WHHs face, particularly in post-war environments.

Global perspectives on women-headed households

Research across various countries has consistently shown that WHHs are among the most vulnerable socio-economic groups, facing heightened risks of poverty, unemployment, and limited access to healthcare and education. Yoosefi Lebni et al. (2020), in a qualitative study conducted in Iran, identified three major categories of challenges faced by WHHs—personal, familial, and social—further divided into subthemes such as role overload, social insecurity, psychological distress, and reduced autonomy. Similarly, Correll et al. (2007) emphasized that WHHs often experience higher poverty rates and limited employment opportunities, contributing to a cycle of intergenerational disadvantage.

Connell et al. (2012) further noted that women who lose their spouses often face the burden of multiple roles, with restricted access to well-paying or stable jobs. As a result, many WHHs are confined to low-wage, informal, and part-time employment. Veisani et al. (2015) added that such households are also more likely to experience poor health outcomes, particularly due to lower literacy levels and limited access to healthcare services.

Gender norms and structural barriers

In patriarchal societies, cultural and structural factors significantly limit women's autonomy and recognition as household heads. Dwi et al. (2022) pointed out that WHHs are often stigmatized as weak or morally questionable, with such labels adversely impacting their access to resources and community support. Yoganandham et al. (2022) found that in some rural communities, women are only considered legitimate household heads in the absence of a male adult, further compounding the marginalization of groups like Dalit women.

Moses et al. (2022) highlighted that, in urban areas such as Kampala, Uganda, WHHs rely heavily on social networks to secure housing and resources. However, these same networks can expose women to exploitation by landlords and intermediaries, illustrating the fragility and informal nature of their support systems.

Women-headed households in post-conflict Sri Lanka

In the Sri Lankan context, especially in the Northern and Eastern provinces, decades of civil conflict have produced a disproportionately high number of WHHs. Jeevasuthan (2017) emphasized the economic and psychosocial hardships faced by these households in the Northern Province. Challenges included lack of stable income, livelihood insecurity, and exposure to sexual violence. The Department of Census and Statistics (2022) reported over 7,200 WHHs in Mullaitivu alone, with a significant portion being widowed or affected by war-related displacement.

Despite the breadth of existing research on Sri Lankan WHHs, much of it relies heavily on qualitative or case-study approaches. Few studies adopt a structured, quantitative approach that allows for systematic measurement and comparison of the types and severity of issues WHHs face. This study attempts to bridge this gap through the use of a five-point Likert scale to quantitatively assess socio-economic challenges.

Methodological and contextual gaps

While the literature contributes valuable insights into poverty, employment, education, and health in WHHs, several research gaps persist. First, there is limited understanding of how intersectional identities—such as caste, marital status, ethnicity, and disability—interact to shape the lived experiences of WHHs. Second, most studies are cross-sectional, offering only a snapshot in time, rather than exploring how challenges evolve in the long term through longitudinal research.

Moreover, there is a noticeable lack of differentiated analysis between subgroups such as widows, divorcees, and abandoned women, despite their unique experiences and coping strategies. Additionally, psychological dimensions such as mental health, trauma, and resilience are underexplored, even though they play a crucial role in determining economic stability and social participation.

METHODOLOGY

This study employs both primary and secondary data sources. Primary data were collected through a combination of door-to-door surveys, structured questionnaires, interviews, and case studies, capturing nominal, ordinal, and scale data for subsequent analysis. Secondary data sources included the social resource profile and statistics for Mullaitivu in 2023, annual reports from the Central Bank spanning 2010 to 2023, the consumer income expenditure survey, and the Northern Province statistical handbook for 2023.

A total of 70 respondents were selected through simple random sampling from a population of 673 WHHs in the Manthai-East Divisional Secretariat. The sample size of 70 was chosen to ensure sufficient statistical power while balancing time and resource constraints. Simple random sampling was employed to ensure that every WHH in the study area had an equal chance of selection, thereby reducing selection bias and enhancing the representativeness of the sample.

Primary data collection was carried out over a three-month period, from January to March 2021. Various data collection techniques were employed, including interviews with the household heads and focus group discussions to gather qualitative insights into the socio-economic challenges faced by women-headed households. The survey instrument included both closed-ended questions (for quantitative data) and open-ended questions (for qualitative data). The qualitative data were analyzed thematically to capture the experiences and perspectives of the respondents.

For the analysis of quantitative data, descriptive statistics such as means and standard deviations were used to describe demographic variables and socio-economic conditions. Factor analysis, particularly Exploratory Factor Analysis (EFA), was applied to identify underlying factors from the variables and reduce dimensionality, thus simplifying the interpretation of the results. This method is widely recognized for its ability to validate scales and explore underlying patterns in complex datasets (Aluja et al., 2004; Mashal & Kasirer, 2012). Qualitative data were analyzed thematically, with recurring themes categorized to offer a deeper understanding of the lived experiences of WHHs in the post-war context.

The mixed-method approach was chosen to provide a comprehensive understanding of the socio-economic challenges faced by WHHs. While quantitative data helped identify patterns and relationships, the qualitative data allowed for a deeper exploration of the nuances and personal experiences that could not be captured through closed-ended questions alone. The integration of both data types enhances the validity and depth of the study's findings.

RESULTS AND DISCUSSION

The phases of analysis and interpretation are critical in the research process. The goal of the analysis is to organize, classify, and summarize the obtained data to be better understood and analyzed to provide answers to the study questions.

Demographic profile of the WHHs

Seventy samples were systematically selected from the study area for the research. Among these seventy women sampled, the average age is 42 years, with an average marriage duration of 23 years, and an average family size of three. On average, these women have ten years of experience living as heads of households. Out of the seventy WHHs, 54% (38) became heads due to their husbands' deaths, while 31% (22) experienced separation or divorce, and 10% (7) lost their husbands during the war era. Additionally, 3% (2) of the women's husbands were disabled as a result of the war. Among the thirty-eight male deaths, 84% (32) occurred due to the war. Regarding education, 90% (63) of the respondents studied up to the Ordinary Level. In terms of employment, 43% of the women are self-employed, engaging in activities such as cattle rearing, home gardening, small shops, and sewing. Another 30% work as day laborers, while only 10% are employed in the government sector. The majority of the remaining individuals work in agriculture. The average monthly job income and total income are Rs 9,036 and Rs 12,100, respectively.

The challenges based by the WHHs

This section discusses the various challenges faced by WHHs, highlighting twelve key issues identified through the study. These challenges encompass socio-economic, emotional, and logistical barriers that significantly impact the daily lives and well-being of WHHs. By analyzing these challenges, this section aims to provide a comprehensive understanding of the hardships faced by WHHs and the areas in need of targeted interventions.

Table 1. Mean and standard deviations of ordinal variables (Problems of WHHs)

No	Problems	Mean	Std. Deviation
01	Feel sad without any reason	3.46	1.151
02	Feel lonely& life is boring	3.41	1.346
03	The level of stress is continuously increasing	3.49	1.260
04	The absence of active male member(s) in the family gives rise to difficulty	3.37	1.230
05	Impart discipline to our children is challenging due -.to absence of husband	3.01	1.313
06	I faced stress for the Loan and repaying the Loan	3.03	1.318
07	I am feeling insecure at night due to my husband's absence.	3.97	1.090

08	Getting regular work & Collecting wages from the employer is very difficult	2.60	1.459
09	During the COVID-19 era,it is challenging to manage day-to-day family life.	3.87	1.141
10	In ritual ceremonies, there is a lot of socially neglected	3.76	1.233
11	Having no safe drinking water	4.33	0.928
12	I face difficulties getting available sufficient &Nutrition food	3.80	1.314

(Source - SPSS Output from primary data)

Based on the mean scores, the most significant issue among the twelve identified is the lack of access to safe drinking water, with the highest mean value of 4.33. This is followed by other prominent concerns, including feelings of insecurity at night due to the absence of husbands (mean score: 3.97), challenges in managing day-to-day family life during the COVID-19 pandemic (mean score: 3.87), and difficulties in obtaining sufficient and nutritious food (mean score: 3.80). These four issues emerge as the most critical, as reflected by their relatively high mean scores. In contrast, the least significant concern is the difficulty in securing regular work and collecting wages from employers, which has the lowest mean score of 2.60. This is followed by the challenge of disciplining children in the absence of husbands (mean score: 3.07). The prominence of unsafe drinking water can be attributed to the widespread reliance on unsafe sources such as open wells, communal wells, and neighboring households for drinking water. On the other hand, the lower importance assigned to the difficulty in securing regular work and wages is primarily linked to the educational background of widows, many of whom have completed only up to 12 years of education, often leaving their Ordinary Level (O/L) and Advanced Level (A/L) examinations incomplete. This limitation aligns with findings from Pannampiddiya (2019). As a result, access to government employment remains difficult, prompting these women to engage in self-employment or agricultural activities instead. Therefore, this issue is considered less significant in the study area, given the preference for self-employment over formal private sector work among widows.

Factor analysis for reducing the number of variables

This topic presents the factor analysis used to reduce the number of variables and identify four key factors affecting WHHs. This analysis simplifies the challenges WHHs face by grouping them into distinct categories. The findings provide a clearer focus for addressing the socio-economic difficulties encountered by WHHs,

Table 2. KMO and Bartlett's test

Kaiser-Meyer-Olkin Measure of Sampling Adequacy		0.634
Bartlett's Test of Sphericity	Chi-Square value	251.39
	P value	< 0.001**

(Source - SPSS Output from primary data) Note: ** Denotes significance at 1% level

Based on the mean scores, the most pressing issue among the twelve identified is the lack of access to safe drinking water, with a mean value of 4.33. Subsequently, feeling insecure at night due to the absence of husbands (mean score: 3.97), navigating day-to-day family life challenges during the COVID-19 era (mean score: 3.87), and encountering difficulties in securing sufficient and nutritious food (mean score: 3.80) are also identified as significant concerns. Conversely, the least critical problem is the struggle to secure regular work and

collect wages from employers, scoring the lowest mean value of 2.60. Following closely is the challenge of disciplining children in the absence of husbands (mean score: 3.07).

The prevalence of unsafe drinking water stems from heavy reliance on hazardous sources like open wells, communal wells, and neighboring households for drinking purposes. Conversely, the minor factor influencing the difficulty in securing regular work and wages is the educational background of widows, many of whom have completed only up to 12 years of education with incomplete Ordinary Level (O/L) and Advanced Level (A/L) examinations. Consequently, accessing government employment becomes arduous, leading widows to opt for self-employment or farming activities instead. Thus, this factor is deemed minor in the study area due to widows' preference for self-employment over private work.

Table 3. Factor loading, eigenvalue and percentage of extraction using principle component method based on problems of WHHs

Factor	Problems	Factor loading	Eigen Value	% of variance	Cumulative
1	Feel sad without any reason	0.716			
2	Feel lonely& life is boring	0.784			
3	The level of stress is continuously increasing	0.698			
4	The absence of active male member(s) in the family gives rise to difficulty	0.721	3.121	26.005	26.005
5	Imparting discipline to our children is challenging due to absence of husband	0.515			
6	During the COVID-19 era, it is challenging to manage day-to-day family life	0.488			
7	I am feeling insecure at night due to my husband's absence	0.417	2.017	16.807	42.812
8	On ritual ceremonies, there is a lot of socially neglected	0.815			
9	I faced stress with loan, and repaying loan	0.654	1.582	13.184	55.996
10	Getting regular work & Collecting wages from the employer is very difficult	0.808			
11	I have no safe drinking water	0.581	1.189	9.9.6	65.902
12	I face difficulties getting sufficient nutritious food	0.479			

(Source- SPSS output- from primary data)

The factor analysis results presented in Table 03 provide valuable insights into the problems faced by WHHs. The analysis examines factor loadings, eigenvalues, and the percentage of variance explained by each factor. Factor loadings reveal the strength of the association between each problem and the underlying factors.

For instance, the problem "Feel sad without any reason" (loading 0.716) is moderately associated with Factor 1, while "Feel lonely & life is boring" (loading 0.784) has a strong relationship with Factor 2. The absence of active male members in the family also shows a strong correlation (loading 0.721) with Factor 4, highlighting the social and family-related issues that WHHs face. Eigenvalues indicate how much variance each factor explains. Factor 1 has the highest eigenvalue of 3.121, accounting for 26.005% of the total variance, emphasizing its significance in capturing emotional and psychological concerns.

Factor 2, with an eigenvalue of 2.017, explains 16.807% of the variance, while Factor 3 (eigenvalue 1.582) explains 13.184%, focusing on socio-economic challenges. Factor 4, with an eigenvalue of 1.189, explains 9.96%, capturing issues related to basic needs and security. The cumulative variance, which reflects the total variance explained by all factors, reaches 65.902%, showing that the four factors together account for approximately 66% of the variance. This outcome is favorable as it allows the researcher to streamline the number of variables, reducing them from 12 to 4 underlying factors.

These results suggest that the challenges faced by WHHs can be categorized into emotional well-being issues, social and economic difficulties, and problems related to accessing basic necessities. The factor analysis provides a clearer understanding of the underlying structure of these challenges, offering a foundation for targeted interventions and policy development to support WHHs more effectively. The factor analysis provides a clearer understanding of the structure of the challenges WHHs face, revealing that their difficulties can be grouped into four main categories: emotional well-being, social and family dynamics, socio-economic hardships, and basic survival needs. These findings have important implications for developing targeted interventions. For example, improving access to safe drinking water should be prioritized, as it emerged as the most significant issue. Additionally, addressing the emotional and psychological well-being of WHHs, especially in the context of post-war trauma, could help mitigate some of the stress and insecurity these women experience. This study's comprehensive approach, integrating both quantitative and qualitative insights, highlights the need for multifaceted policies and interventions to support WHHs, especially in post-conflict regions like Mullaitivu.

CONCLUSION

The study reveals that a significant proportion of women-headed households (WHHs) in the region are grappling with severe socio-economic challenges, primarily stemming from the loss of male family members, often due to war-related causes. With limited access to formal government employment, most of these women rely on self-employment or day labor to sustain their families. The findings underscore the urgent need for targeted support initiatives to improve their financial security and overall well-being. Key interventions should focus on improving access to safe drinking water, enhancing personal and family security, and providing educational and career opportunities for widows. By categorizing these challenges into emotional, social, economic, and basic needs-related issues, factor analysis helps pinpoint the areas where targeted interventions could create the most impact. Addressing these core issues can significantly improve the security and quality of life for WHHs in the region, offering a clearer path to enhanced resilience and empowerment.

RECOMMENDATIONS

To address the challenges faced by women-headed households (WHHs), prioritizing vocational training and skill development is essential to improving employment opportunities and fostering financial independence. Providing financial assistance or microloans will strengthen the economic stability of small businesses run by WHHs. Expanding access to social services, healthcare, and education is also crucial to ensuring that these households have the resources needed to enhance their quality of life. Access to safe drinking water must be prioritized, as many families currently rely on contaminated sources; installing filtration systems and developing sustainable water sources will significantly improve health and alleviate daily struggles. Improving security and offering emotional support, particularly in the post-COVID era, can reduce insecurity and help women manage the demands of family life. Additionally, increasing widows' access to government employment through educational and vocational programs can reduce their reliance on informal labor. Tailored interventions focused on social support, mental health, and emotional well-being will enhance resilience and improve the overall quality of life for WHHs. Strengthening community support networks will also help alleviate feelings of loneliness and better equip women to navigate adversity.

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Spatial evaluation of cultural tourism potential in Anuradhapura district, Sri Lanka: GIS based weighted overlay analysis

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ABSTRACT

Cultural tourism is an important tool of socioeconomic development as well as the maintenance of historical heritage, especially in culturally heritage-rich few like the Anuradhapura District. The tourism potential of this region is not well explored despite its importance because of many drawbacks such as inappropriate infrastructure development, unplanned urbanization, and agricultural encroachment. This paper is an effort to assess the spatial suitability of Anuradhapura on cultural tourism development, which is done on a Geographical Information Systems (GIS) platform. A Weighted Overlay Analysis (WOA) was developed to incorporate various spatial databases involving elevation, land use/Land cover (LULC), road accessibility, close to cultural heritages sites, and climatic situations. The layers were standardized and the weights of each layer were determined through literature research and expert based relevancy to suitability of tourism. District suitability was analyzed into four classes of both highly suitable, moderately suitable, low suitable and unsuitable. The results indicate that 27.42% of the land area (approximately 196,764 hectares) is highly suitable for cultural tourism, characterized by optimal accessibility, cultural density, and favorable environmental conditions. An additional 59.37% is moderately suitable,

indicating areas with development potential under certain improvements, while 13.2% of the district is either low in suitability or unsuitable due to natural or infrastructural constraints. Validation against field observations and existing tourism hotspots showed a strong spatial correlation between predicted high-suitability zones and current visitor patterns. The study concludes that data-driven spatial planning is essential for sustainable tourism development in heritage regions. Recommendations include improving infrastructure and accessibility in high-potential zones, involving local communities in tourism activities, and applying geospatial tools for continuous monitoring and planning. This research presents an original and replicable GIS-based framework for cultural tourism suitability analysis, offering valuable insights for planners, policymakers, and conservationists in balancing development with heritage preservation.

Keywords: Cultural tourism, Heritage management, GIS, Tourism suitability mapping

INTRODUCTION

Cultural tourism is becoming an increasingly important component of the global tourism business, with chances to combine economic development and cultural heritage protection (UNWTO, 2019). Defined as a sort of tourism that allows tourists to interact with a region's tangible and intangible cultural treasures, it has become a pillar of regional development and cultural preservation efforts. Sri Lanka is very famous for its natural beauty and native products, and tourism is one of the vital sectors for the Sri Lankan economy. Sri Lankan tourism is identified as a third economic sector in generating income for the nation (Nuskiya & Kaldeen, 2019). Cultural tourism, a well-known sub-sector of tourism, aims to connect visitors with a certain destination's cultural heritage, traditions, and lifestyle. Anuradhapura is a UNESCO World Heritage Site in Sri Lanka and has enormous potential for cultural tourism due to its rich archaeological legacy and strong traditions dating back over two millennia. Tourism is one of the world's fastest-growing economic sectors, making substantial contributions to national economies and offering job opportunities in a variety of places. Before the COVID-19 pandemic, tourism accounted for over 10% of worldwide GDP and 7% of international trade, according to the United Nations World Tourism Organization (UNWTO, 2020). It takes many forms, including leisure, adventure, cultural, and eco-tourism, and is driven by reasons such as globalization, increased disposable money, and advances in transportation and technology (Smith et al., 2017). The highest ecological, topographical, and cultural value and potential can be identified with a number of categories, including ecological, topographical, climatological, hydrological, and cultural potentials, which are more helpful in determining a tourist destination's suitability. Therefore, the growth of tourism can also aid in regional development (Fareena, 2023). Economically, it promotes regional growth and infrastructural expansion, while socially, it fosters cultural interchange and local community empowerment (Hall & Page, 2014). However, if not managed properly, it can lead to environmental deterioration, cultural commodification, and socioeconomic disparities (Gossling & Hall, 2006). As a result, modern tourism planning prioritizes sustainable methods that combine economic growth, environmental protection, and cultural authenticity.

Anuradhapura is, one of Sri Lanka's first established urban areas and capitals, is home to landmarks of tremendous historical and spiritual value, such as the sacred Jaya Sri Maha Bodhi tree, Ruwanwelisaya Stupa, and other ancient monasteries (Silva, 2015). They are pilgrimage places related to religion as well as an international tourist attraction. Nevertheless, random urban sprawling, rural cultivation, and territorial limitations, all act as a challenge to the viability of cultural tourism in Anuradhapura in the long-term, making it necessary to put in place a systematic and data-base planning approach. GIS enables scholars to conduct the analysis of the possibilities of tourism destinations keeping in mind environmental, socioeconomic, and infrastructural factors (Batista et al., 2020). Popular GIS-based tool used in tourism planning includes WOA, particularly in undertaking appropriateness analysis. The method involves aggregation of several spatial data and giving different sets of criteria different weights based on their relative worth (Eastman, 1999). The weighted layers are subsequently aggregated to form composite suitability map that identifies places more suitable to a given activity such as cultural tourist development. WOA has successfully been applied in myriad researches to evaluate tourism potential. As an illustration, Abebe et al. (2019) have employed WOA to evaluate the cultural tourism feasibility in Ethiopia having considered such factors as proximate locations to heritage sites, accessibility as well as land use and environmental restriction. Windingly, studies in India and Turkey have indicated that WOA is useful in determining the right tourism areas without having any environmental and social effects (Demirel et al., 2018; Kumar et al., 2020). The literature emphasizes the necessity of using GIS-based approaches, such as WOA, in cultural tourism planning, particularly in heritage-rich areas like Anuradhapura.

The objective of this study is to determine the spatial potential of cultural tourism development in Anuradhapura District by the use of GIS and WOA. It evaluates the level of suitability of land by using important criteria like topography, accessibility, landscape to heritage and infrastructure. The goal is to contribute to strategic planning by geographically locating regions most inclined to sustainable initiatives in what concerns cultural tourism. The research deploys measures that include proximity to cultural sites, accessibility, and limitations of the environment, and land-use trends to outline how parts of the land can be developed to accommodate sustainable tourism. The project will provide a discussion on the construction of equilibrium between cultural preservation and economic advantage to the local community by integrating the local socioeconomic data with the spatial analysis. Legislators, tourism planners and conservationist should take note of the conclusions of this study and act appropriately. They help to preserve the unique cultural heritage of Anuradhapura in the long term, not only that, as reported by the United Nations Educational, Scientific, and Cultural Organization (UNESCO, 2018), they ensure that they are implementing best practices in heritage tourism management. In this paper, background information has been organized to reference other literature and give details of the study area, research methodology, findings, and ways through which efficient planning of cultural tourism development can be envisioned.

METHODOLOGY

Study area

Anuradhapura district is based in North Central Province of Sri Lanka. It is located between latitudes 7°30'N and 8°30'N and longitudes 79°30'E and 80°30'E. The topography of the district is also flat with many historic irrigation tanks making the district the center of agriculture. The Malwathu Oya is one of the major rivers. Anuradhapura's rich history began when King Pandukabhaya made it his capital in the fourth century BCE. Under King Devanampiya Tissa, who supported Buddhism in the area, it thrived as a significant metropolitan hub. Anuradhapura District's population was projected to be 954,000 as of 2021. 91% of people are Sinhalese, with a small minority of Tamils (1%), and Sri Lankan Moors (8%), among others (DCS Report, 2020). Anuradhapura is located in the Dry Zone of the island, and it falls into the seasonally dry tropics (Panabokke1996). The Northeast monsoon from December to February brings rainfall to the area. Study Area obtains annual rainfall of 1700 mm and Temperature 28°C to 32°C (Sri Lanka Meteorological Department, 2022).

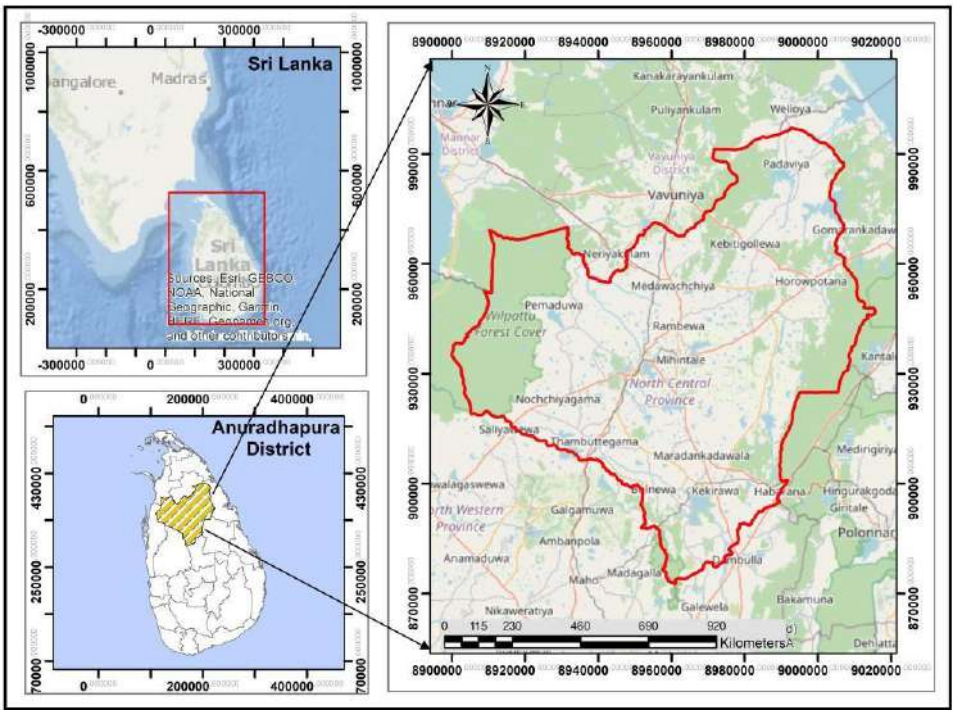

Figure 1. Location of study area (Source: Retrieved using ArcGIS 10.8)

Research design

This study assesses the potential and suitability of cultural tourism in the Anuradhapura district through the application of GIS. The research adopts an applied methodology, utilizing spatial analytics techniques such as WOA and mapping methods. The conceptual framework, illustrated in Figure 2, outlines the overall research design. The analysis incorporates five main criteria and 16 sub–criteria to evaluate the district's tourism capacity.

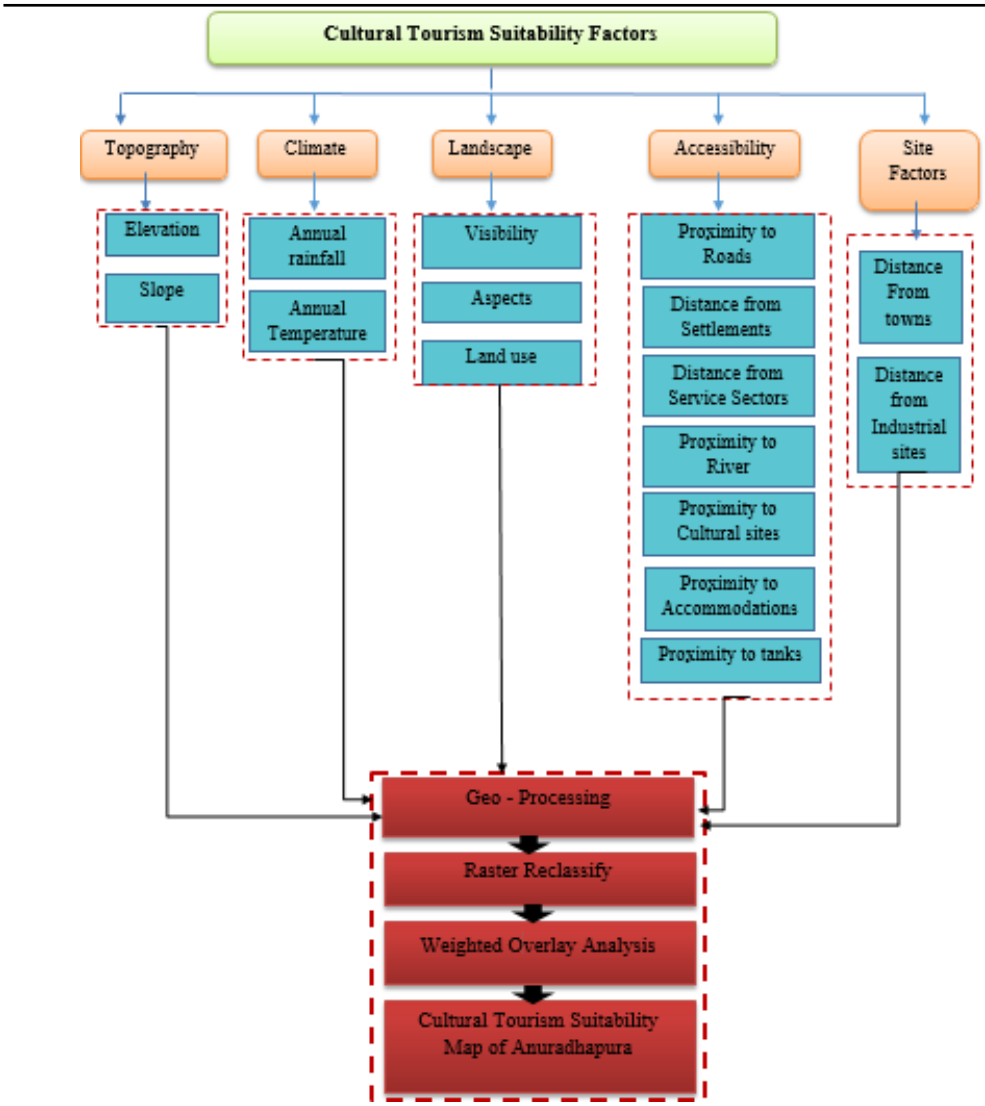

Figure 2. Research flow chart

Data collection and research methods

The cultural tourism suitability analysis for the Anuradhapura district utilized both primary and secondary data to identify key factors influencing cultural tourism potential. Field surveys, including GPS-based data collection and interviews with knowledgeable individuals, identified significant cultural, historical, and accessibility elements. Secondary data from sources such as USGS DEM, the Sri Lanka Meteorological Department, and the Survey Department of Sri Lanka were integrated into GIS-based methodologies. Factors like elevation, slope, visibility, and aspect were analyzed using raster surface analysis, while climate data (Temperature and Rainfall) was interpolated using the IDW method. Land use data was reclassified through the Google Earth Engine to identify areas suitable for tourism development. Accessibility was assessed using Euclidean distance methods to

analyze proximity to roads, settlements, service sectors, rivers, cultural sites, and accommodations. Buffer analysis was used to determine the distance from towns and industrial sites, ensuring the cultural relevance and minimal industrial impact. This comprehensive GIS-based approach facilitated the identification of areas most suitable for cultural tourism, balancing accessibility, heritage preservation, and environmental sustainability.

Table 1. Listed data sources

Factors	**Criteria**	**Geo Processing**	**Source**
Topography (F1)	Elevation (C1)	Raster Surface Analysis	USGS DEM Data https://earthexplore.usgs.gov
	Slope (C2)	Raster Surface Analysis	USGS DEM Data https://earthexplore.usgs.gov
Climate (F2)	Temperature (C3)	IDW	Sri Lanka Meteorological Department (Data From the Year of 2023)
	Rainfall (C4)	IDW	Sri Lanka Meteorological Department (Data From the Year of 2023)
Landscape (F3)	Visibility (C5)	Raster Surface Analysis	USGS DEM Data https://earthexplore.usgs.gov
	Aspect (C6)	Raster Surface Analysis	USGS DEM Data https://earthexplore.usgs.gov
	Land use (C7)	Reclassify	Google Earth Engine https://earthengine.google.com
Accessibility (F4)	Proximity to roads (C8)	Euclidean distance	Survey Department of Sri Lanka https://www.survey.gov.lk
	Proximity to settlements (C9)	Euclidean distance	BBBike extracts Open Street Map https://extract.bbbike.org
	Distance from service sectors (C10)	Buffer	BBBike extracts Open Street Map https://extract.bbbike.org
	Proximity to rivers (C11)	Euclidean distance	Survey Department of Sri Lanka https://www.survey.gov.lk
	Proximity to cultural sites (C12)	Euclidean distance	BBBike extracts Open Street Map https://extract.bbbike.org
	Proximity to accommodation (C13)	Euclidean distance	BBBike extracts Open Street Map https://extract.bbbike.org

	Proximity to Tanks (C14)	Euclidean distance	Survey Department of Sri Lanka https://www.survey.gov.lk
Site factors (F5)	Distance from Towns (C15)	Buffer	Survey Department of Sri Lanka https://www.survey.gov.lk
	Distance from Industrial sites (C16)	Buffer	Field Survey Coordinates Data gathered from: CTDroid Sri Lanka mobile GPS version

The determination of criteria and sub-criteria for cultural tourism suitability analysis involves evaluating and allocating suitable regions for cultural tourism. The most relevant criteria and sub–criteria influencing the selection of cultural tourism sites are identified, as shown in the table. They are Topography, Landscape, Accessibility, Climate, and Site Factors. According to the WOA each criterion is weighted, and the suitability ratings can be given one of the four levels (high suitable to not suitable) depending on designated boundaries. The systematic procedure helps to have the expansive analysis of land suitability towards the development of cultural tourist draws.

Table 2. Weighted values for the selected criteria

Criteria & Weight	**Unit**	**Rating**	**Weighted Values**	**Class Description**
Elevation (C1) 8%	Elevation Range (m)	4	0-100	High Suitable
		3	100-300	Moderate Suitable
		2	300-600	Low Suitable
		1	>600	Not Suitable
Slope (C2) 7%	Slope (%)	4	0-10	High Suitable
		3	11-20	Moderate Suitable
		2	21-30	Low Suitable
		1	>30	Not Suitable
Temperature (C3) 10%	Annual Temperature (°C)	4	21-23	High Suitable
		3	24-26	Moderate Suitable
		2	26-28	Low Suitable
		1	>28	Not Suitable
Rainfall (C4 10%	Annual Rainfall (mm)	1	1000-1200	High Suitable
		2	1300-1500	Moderate Suitable
		3	1500-1700	Low Suitable
		4	>1700	Not Suitable
Visibility (C5) 5%	Visibility Range (km)	3	>10	High Suitable
		2	1-5	Low Suitable
		1	<1	Not Suitable

Aspect (C6) 6%	Aspect	4	South	High Suitable
		3	East	Moderate Suitable
		2	West	Low Suitable
		1	North	Not Suitable
Land Use (C7) 9%	Land Use	4	Water Bodies	High Suitable
		3	Urban Area	Moderate Suitable
		2	Forest	Low Suitable
		1	Cultivation Area	Not Suitable
Proximity to roads (C8) 5%	Distance Range (km)	4	1-2	High Suitable
		3	3-6	Moderate Suitable
		2	7-10	Low Suitable
		1	>10	Not Suitable
Proximity to Settlements (C9) 5%	Distance Range (km)	4	1-2	High Suitable
		3	2-4	Moderate Suitable
		2	4-6	Low Suitable
		1	6-8	Not Suitable
Distance From Service Sectors (C10) 5%	Distance Range (km)	4	<1	High Suitable
		3	1-3	Moderate Suitable
		2	4-6	Low Suitable
		1	7-10	Not Suitable
Proximity to rivers (C11) 5%	Distance Range (km)	4	1-2	High Suitable
		3	2-3	Moderate Suitable
		2	3-5	Low Suitable
		1	>5	Not Suitable
Proximity to Cultural sites (C12) 5%	Distance Range (km)	4	1-2	High Suitable
		3	2-3	Moderate Suitable
		2	3-5	Low Suitable
		1	>5	Not Suitable
Proximity to Accommodation (C13) 5%	Distance Range (km)	4	<1	High Suitable
		3	1-3	Moderate Suitable
		2	4-6	Low Suitable
		1	>6	Not Suitable
Proximity to Tanks(C14)	Distance Range (km)	4	<1	High Suitable
		3	1-3	Moderate

5%				Suitable
		2	4-6	Low Suitable
		1	>6	Not Suitable
Distance from Towns (C15) 4%	Distance Range (km)	4	<1	High Suitable
		3	1-2	Moderate Suitable
		2	2-3	Low Suitable
		1	>4	Not Suitable
Distance From Industrial Sites (C16) 6%	Distance Range (km)	4	>10	High Suitable
		3	7-10	Moderate Suitable
		2	4-6	Low Suitable
		1	<3	Not Suitable

Table 3. Values for major criteria

Factors	Weight Values
F1	15%
F2	20%
F3	20%
F4	35%
F5	10%

Data analysis

The WOA is also a common approach used in multi-criteria decision-making procedure, especially in ranking suitable lands to diverse undertakings. It entails the application of weights to various criteria in regard to relative significance with regards to the research aim. These weightings are then synthesized in a procedural character to give a compound fit map. WOA allows for the integration of multiple factors, such as topography, accessibility, environmental features, and cultural significance, ensuring a comprehensive evaluation of the area under study. The WOA assigns weights to each criterion and suitability ratings are categorized into 4 classes (Highly suitable to Not suitable) based on specific thresholds. The cultural tourism suitability of each criterion was generated (Figure 3) based on score values utilized for different ranges.

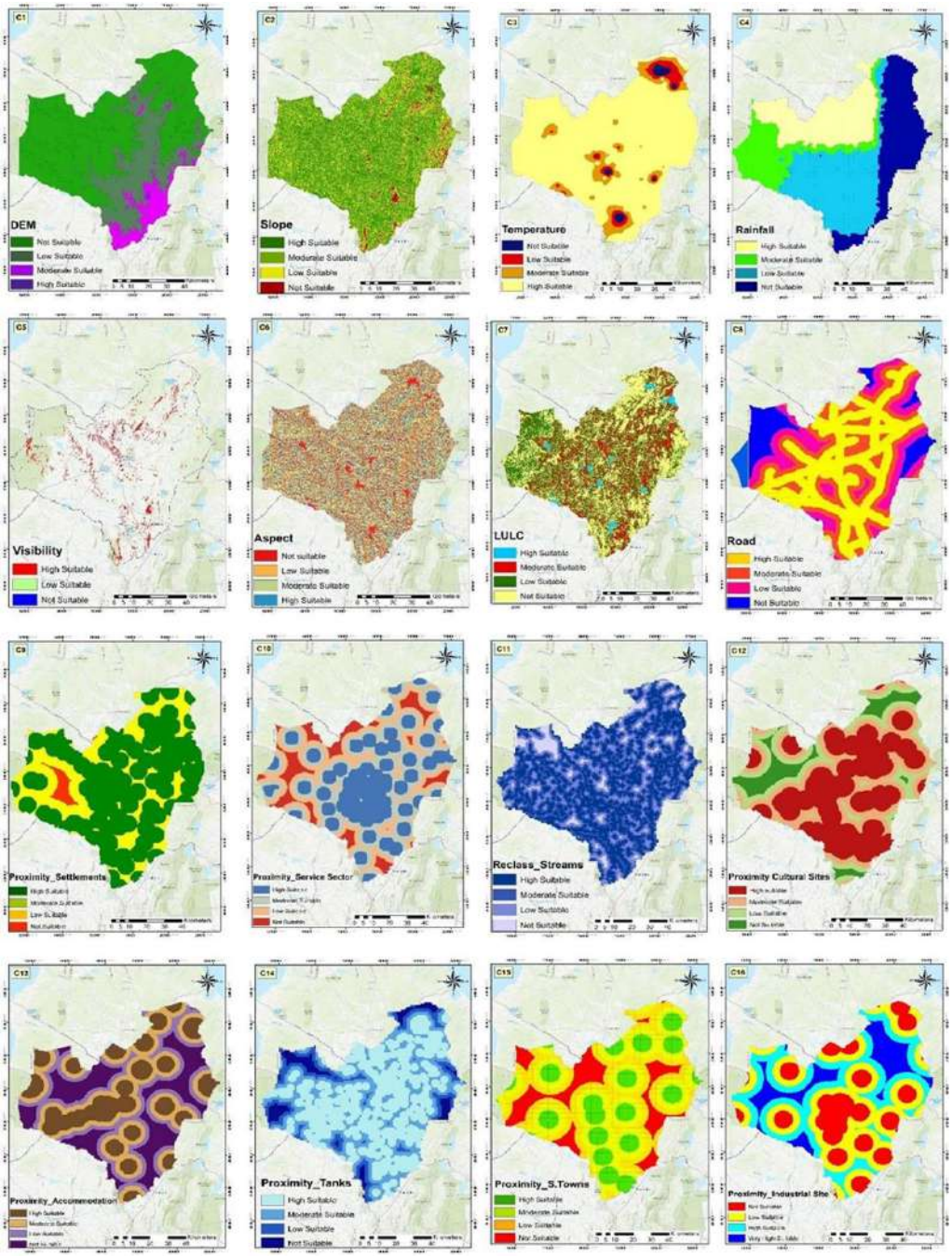

Figure 3. Cultural tourism suitability for selected criteria

RESULTS AND DISCUSSION

Topography

Topography is of great significance in predicting the appropriateness of the regions to develop cultural tourism, especially topography in terms of elevation of the terrain and slope. Topographical analysis was carried out in the Anuradhapura District, where most of the landscape is flat, and the ASTER DEM of USGS was used. The lower ground with smooth slopes (0-10, 0-100 m) was observed to be very conducive when it comes to tourism because accessibility is achieved easily, and infrastructure can easily be established and constructed safely. On the contrary, the area with a height of more than 600 m or steepness of more than 30 percent was grouped under inappropriate because these areas are prone to soil erosion, inaccessible, and expensive to construct. Topography was given a 15 percent weight in the overall suitability analysis, and this was to show its average but important weight. A large amount of the highly suitable areas of land of 27.42 percent, which were mapped out to be critical tourist areas, were situated in the generally flat terrain of the district. Such level ground, which boosts the physical viability of the construction of the facilities, also conserves both the aesthetic and historic value of the cultural sites. In general, topography has helped in the tourism industry in ensuring accessibility as well as preservation, and therefore makes it a study that is used in base when conducting suitability tests of lands that would be used in cultural tourism.

Climate

Climate is a major determinant of attractiveness and comfort to tourism, especially outdoor cultural tourism in such an area as Anuradhapura. The research evaluated temperature and rainfall data obtained by the Sri Lanka Meteorological Department on the year 2023 through the interpolation technique of IDW of GIS analysis. The cultural tourism could be offered at the optimum temperature range between 21-23ºC, as this provides an optimum environment to visit the sites and other activities that are outside. Zones above 30^{o} were also graded as not appropriate, because the warmer the environment gets, the more it can discourage tourists, besides causing a high rate of degradation of heritage sites. In like manner, the range of rainfall of 1200 1300 mm was also declared as optimal due to its beneficial aspect of green environs without posing problems of floods. Regions receiving more than 1700 mm of rainfall were also perceived to be less accommodating since the excess rain would cause erosion and inconvenience to tourists. The WOA weight of climate was 20%, which is high and reflects the impact of climate on land suitability. The climate of the Dry Zone in Anuradhapura overall favors year-round tourism; there is conducive rainfall in the Northeast monsoon, and the temperatures are comfortable for the convenience of tourists visiting or staying there. The issue of climate is, therefore, a contributing factor to the aspects of environmental sustainability as well as directly proportional to the experiences as a tourist and the rate of tourists in the various seasons.

Landscape

Cultural tourism greatly depends on the landscape because it helps in determining the beauty and feel of a place. In the Anuradhapura study, this criterion included visibility, aspect (orientation), and land use types, which were analyzed by use of raster surface data and reclassification tools like the Google Earth Engine. Sites that

had scenic visuals of over 10 km were found to be very suitable as they provide wide views of cultural and natural objects, which make them visually interesting to tourists. Aspects that were favored as suitable with regard to exposure to natural light were those facing South, as it provided better visibility of the site and a comfortable environment. In land use, water bodies and areas designated as cultural/recreational areas were considered highly favorable in terms of tourism development, whereas areas under cultivation or forest cover were less favorable because it was either under cultivation or with dense vegetation that prevents access and site viewing. Landscape received 20 percent of the total weight in WOA, and so it is one of the criteria most able to influence. These landscape considerations are not only important to the visual appearance but also to the site conservation and site explanatory purposes. Hence, a concise combination of natural and cultural landscapes can enhance the attractiveness and sustainability of the cultural tourism destination.

Accessibility

Accessibility is the strongest indicator consideration of assessing tourism suitability in Anuradhapura, with the maximum weight of 35 per cent in WOA. It also comprises accessibility to roads, settlements, service facilities, rivers, tanks, cultural attractions, and accommodation systems. A Euclidean distance and buffer evaluation using GIS showed that places that were at a distance of 1 to 2 km from major roads and other cultural attractions were classified as highly suitable areas. The zones make it simpler to access the destinations and get basic services like accommodation and medical attention by the tourists. On the other hand, areas exceeding 5 km far away from major streets, cultural sites, or places were considered inappropriate because of the fewer connections. Accessibility also takes into consideration the closeness to rivers and tanks, which have served the settlement and culture in Anuradhapura in the past and now act as scenic and cultural tourist attraction sites. Proximity to other settlements was found between 1 and 3 km, sufficiently good small distances to enjoy facilities, but avoiding the times when serenity is interfered with. It is critical to understand that accessibility is not only logistically convenient but also critical to marketing multi-site tours, which are much more gratifying to the tourist and profitably promote local economies. In general, accessibility has a direct influence on the feasibility of tourism development in terms of practicality and commercial viability, hence being the central point of spatial planning in heritage tourism.

Site factors

Site-specific factors comprise proximity to towns and distance to industrial areas, also having a combined weight of 10 % in the WOA analysis. These factors make sure that the tourism development is strategically positioned as well as environmentally friendly. The regions located at a distance of less than 3 km from the town were graded as highly suitable because they have some infrastructure in the form of accommodation, restaurants, and hospitals. It also has town proximity, which helps its operations and enriches the visitor experience without the need to interrupt the town with large new development. Conversely, sites close to manufacturing areas were declared inappropriate, and those not more than 3 km away due to the possibility of noise, air, and contamination problems that will impinge on the peaceful and reflective nature of the cultural tourism. Information through which this research was conducted was based on the Survey Department of Sri Lanka and a field survey through GPS

instruments. The factors of a site make certain that the development of tourism does not impinge on incompatible uses of land or does not overlap with them. They contribute to the maintenance of the authenticity and integrity of heritage environments. Site factors can help the development to be more balanced in a way that respects the potential of tourism and the welfare of the community by influencing development away from disruptive areas to more culturally appropriate zones.

WOA process assigns weights to each factor based on its importance and combines them to identify areas most suitable for cultural tourism development. The analysis reveals zones classified as highly suitable, moderately suitable, and not suitable, providing a clear roadmap for strategic planning. The evaluation of these factors demonstrates a holistic approach to cultural tourism planning. By considering topography, climate, landscape, accessibility, and site-specific factors, the thesis provides actionable insights for sustainable and effective tourism development in the Anuradhapura district. These findings are essential for policymakers, planners, and stakeholders aiming to balance economic growth with cultural and environmental preservation.

$$W_i^s = \sum_{j=1}^{j=m} w_{ij}^s \, w_j^a , \qquad i = 1,2,3 \ldots n \quad (1)$$

W_i^s : Total Weight of the Study Area

w_{ij}^s : Weight layer of all criteria with factor

w_j^a : Weigh of criteria

m: Number of Criteria

n: Number of Sites

j: Specific Criterion within a particular factor

i: Each individual site that is being evaluated for its suitability

This technique combines multiple criteria, assigning weights based on their relative importance. The weights represent the extent to which each criterion can promote the overall compatibility with cultural tourism. This method of evaluation is essential since cultural tourism is associated with a multidimensional nature of different factors, including topographic value, accessibility ecological situation, and infrastructure, which should be evaluated sequentially. The approach is outlined by Saaty (1980) and Nuskiya (2022). The weighted values of all criteria are summed to create a single suitability score for each site.

The Weighted Overlay Analysis methodology and GIS tools ensure a systematic evaluation of an area's potential for cultural tourism. The suitability map provides a clear visual representation of the results, facilitating decision-making for stakeholders. This approach integrates modern technology with established theoretical frameworks, making it a robust tool for sustainable tourism planning.

Table 4. Area cover on the classified land suitability map for Cultural tourism

Suitability Score	Suitable Land (h)	Weighted Percentage
Most Suitable	196,764	27.42%
Moderate Suitable	426,143	59.37%
Low Suitable	58,442	8.14%
Not Suitable	36,369	5.07%
Total	**717,900**	**100%**

The total land area analyzed is 717,900 hectares. The analysis divides the study area into four categories based on its suitability for cultural tourism. Most Suitable (27.42%) areas that possess the highest potential for cultural tourism, fulfilling most of the essential criteria, such as proximity to cultural attractions, accessibility, and infrastructure. These areas cover 196,764 hectares. Moderately Suitable (59.37%) regions that meet many of the suitability criteria but may lack some critical factors. These areas are significant for cultural tourism development, covering 426,143 hectares. Low Suitable (8.14%) regions with limited potential for cultural tourism, either due to geographical constraints or lack of cultural significance, these areas cover 58,442 hectares.

Not Suitable (5.07%) areas are deemed unsuitable for cultural tourism, potentially due to natural barriers, lack of infrastructure, or absence of cultural or historical value. This analysis demonstrates the strategic use of GIS for cultural tourism planning, offering insights into how land can be utilized effectively to promote tourism while preserving its cultural and natural assets.

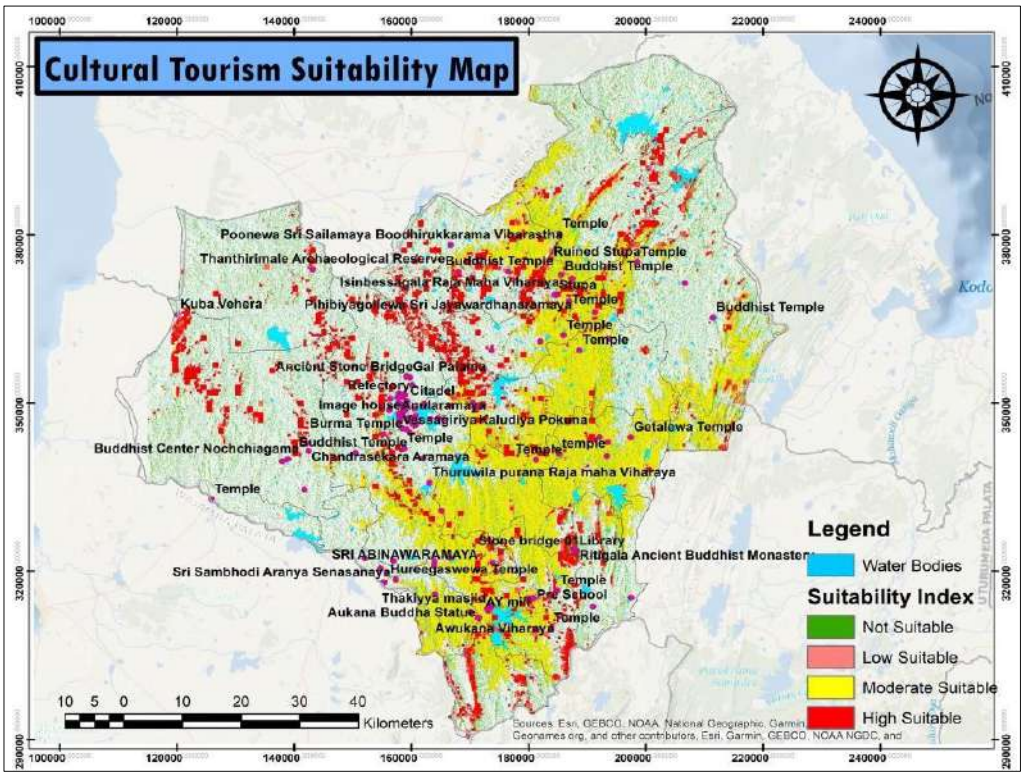

Figure 4. The suitability site for cultural tourism in the Anuradhapura district (Source: Retrieved using ArcGIS 10.8)

The map is a strategic tool for identifying and prioritizing areas for cultural tourism development. It supports decision-making for sustainable tourism planning, ensuring resources are focused on high-potential regions. The map categorizes the region into different zones based on their suitability for cultural tourism. Highly suitable areas, highlighted in red, these areas have the most potential for cultural tourism due to the presence of significant cultural or historical landmarks, good accessibility, and infrastructure. Moderate suitable areas, shown in yellow, these regions have moderate potential but may require additional development or preservation efforts. Low suitable areas are indicated in blue or lighter shades; these areas have limited potential and may lack cultural significance or infrastructure.

Identified cultural tourism sites in Anuradhapura

The map shows the cultural tourism attractions in the Anuradhapura District. It mentions that, as part of a specific plan, 50 prominent sites were identified for conservation. These include ancient religious sites, historical buildings, natural landmarks, and other significant cultural and archaeological sites. The listed attractions are categorized by their significance, such as temples, shrines, monuments, and other cultural landmarks. Special attention is given to preserving these sites for cultural tourism development. The accompanying map illustrates the locations of these

attractions using GIS tools.

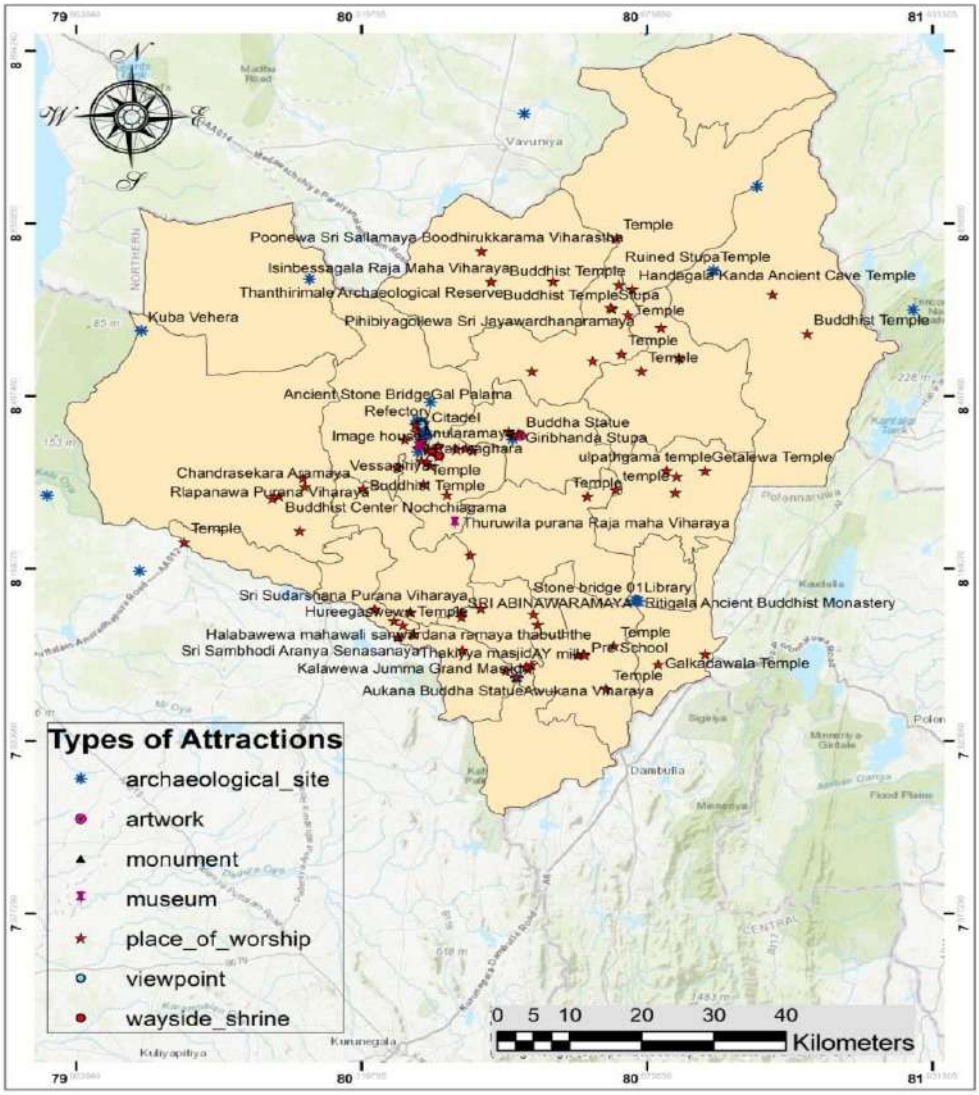

Figure 5. Identified cultural tourism sites in Anuradhapura district (2025)
(Source: Retrieved using ArcGIS 10.8)

CONCLUSION AND RECOMMENDATIONS

Background of the study has focused on finding and examining the possibilities to develop cultural tourism in Anuradhapura District through GIS based approach by site suitability analysis. The report showed that 27.42 percent of the land area as highly suitable or highly desirable to operate cultural tourism, whereas 59.37 percent is moderately suitable. The findings point out that much of the district presents good

prospects of cultural tourism especially in regions where the cultural assets match with the natural landscape including topography, ease of accessibility, and infrastructure development. The spatial analysis demonstrates that decent zones are centralized in significant places of history, certifications of the richness of the area in terms of heritage value. The analysis furnishes a solid geographic underpinning to the planning and policy-making, implying that by making interventions strategically, Anuradhapura can emerge as a major cultural tourist destination in Sri Lanka. Thus, the study confirms the viability of cultural tourism planning using spatial suitability and indispensability in achieving a sustainable development of a region. The findings emphasize the need for a balanced approach that integrates tourism development with cultural and environmental preservation. First, an implement with GIS-based strategic planning approach has to be laid forth, focusing on the highly and moderately suitable zones brought about by spatial analysis. Hence, in these zones, tourism infrastructure investments, such as access roads and/or visitor centers, and sanitation facilities, should be targeted for building so as to cater to accessibility and comfortable visitation. Second, community engagement has to be prioritized in order for the local population to have an active role in tourism planning and to reap the benefits from it economically. Engaging local communities in planning and decision-making processes is critical to ensuring that tourism projects are inclusive and equitable. There is a need to enhance the existing infrastructure, such as transport networks, and accommodation facilities, also actively promote smart use of digital technologies in marketing. Sustainable strategies are suggested by the study as precautionary interventions against over-tourism and in alleviating environmental degradation (Nuskiya, 2022). A continuous monitoring and evaluation mechanism should be established using GIS updates and feedback tools to assess the impacts of tourism activities, ensuring sustainable and adaptive planning over time.

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AUTHORS GUIDELINES

Aims and scope

Sri Lanka Journal of Multidisciplinary Research (SLJMR) is published by the Eastern University, Sri Lanka. It is a refereed journal that publishes original articles and reviews, and short communications relating to any field of study. The journal is multidisciplinary, innovative and international in its approach.

General

Submission of a manuscript to the Editor-in-Chief involves the assurance that it is original and that no similar paper, other than an abstract or an oral or poster presentation, has been or will be submitted for publication elsewhere without the consent of the Editorial Board. The language of publication is English. Papers are edited to increase clarity and ease of communication.

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- The maximum length of contribution is 5000 words, including figures, tables and references. The papers should be written clearly and concisely.
- Manuscripts should be typed in double line spacing in Times New Roman 12-point size onA4 page with 2.5 cm margin.
- Although a rigid format is not insisted upon, it is usually convenient to divide the papers into sections such as Title, Abstract, Keywords, Introduction, Materials and Methods, Results and Discussion, Conclusions, Acknowledgements, References, Tables and Figures.

Title page

- Title informative and not more than 30 words
- Authors listed
- Addresses at which the work was carried out after all the names
- The present addresses of the authors, if different from the above, should appear in a footnote
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- Running title not exceeding 45 characters

Abstract

- Indicate why and how the work was done, the results and conclusions
- 250 words or less

Keywords

- Maximum six words
- Avoid choosing keywords from the Title
- They should be in alphabetical order and separated by commas

Introduction

- Describe clearly the current state of work in the relevant field
- Describe the reasons for carrying out the experiments
- Give a clear statement of the objectives and hypotheses being tested

Methodology

- Sufficient information must be given in this section to allow the reader to understand the experimental design and statistical methods used in the data analysis.

Results and discussion

- It should be combined to avoid repetition
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- State the most important outcome of your work
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Campbell, C.L. & Madden, L.V. (1990) *Introduction to Plant Disease Epidemiology*. New York, NY: John Wiley & Sons.

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Dissertation or thesis:
Lenné, J.M. (1978) *Studies of the biology and taxonomy of Colletotrichum species*. PhD thesis, Melbourne, University of Melbourne.

Online material:
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