

## **Leveraging Geospatial Technology for Eco-Friendly Buddhist Heritage Tourism in Galle District, Sri Lanka**

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### **Introduction**

The Galle District of Sri Lanka is renowned for its rich Buddhist heritage and biodiversity. However, the rapid growth of tourism has led to significant environmental and cultural degradation, which threatens the sustainability of these valuable resources. This research explores how geospatial technology can be leveraged to promote eco-friendly tourism practices that support heritage conservation and environmental protection in the Galle District. By integrating spatial analysis and mapping techniques, the study aims to identify potential eco-friendly tourist sites, manage visitor flows, and understand factors influencing sustainable tourism development. Additionally, a web platform is developed to provide visitors with accurate and up-to-date information on these sites, ensuring sustainable tourism management. While focused on the Galle District, this approach offers potential for replication in other regions of Sri Lanka facing similar challenges.

### **Methodology**

The research employs geospatial technology, web application development, and consulting services to encourage environmentally sustainable tourism in Buddhist Cultural Destinations of Sri Lanka including data collection, geospatial analysis, and web-based technological application.

**Data Collection:** The first step of the research focuses on gathering spatial and non-spatial data starting from satellite imagery, GIS layers or cultural values, and tourist flows and impact on the environment by field research in the selection sites and interviews with key stakeholders according to the cluster sampling technique.

**Geospatial Analysis:** Satellite and GPS technologies are used in

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analyzing data, evaluating environmental vulnerability and evaluating sustainable tourism sites using Multi-criteria Decision Analysis (MCDA) with threats such as encroachment and deforestation.

**Web-Based Platform:** Web environment is set up for tourists where they receive accurate and sustainable information, an interactive map, and route planner and a conversation bot for suggestions for their trip.

## Results and Discussion

Through the application of Geospatial technology, this research has found that sustainability must be integrated when planning for Buddhism shrine tourists that visit these sites.

### Spatial Distribution and Environmental Sensitivity of Heritage Sites:

The Buddhist heritage sites in Galle District are situated in the ecosystem sensitive area and majority of sites are in the breakable state due to the impact from an uncontrolled number of tourists, thus, the conservation and management issues need attention (Table 1). Environmental Sensitivity was determined by considering factors like proximity to water bodies, soil erosion risk, and ecological significance. Vegetation Density was classified using satellite imagery and field assessments, categorizing areas as high, moderate, or low based on their vegetation cover.

**Table 1: Environmental Sensitivity of Buddhist Heritage Sites in Galle District**

Site Name	Vegetation Density	Proximity to Water Bodies	Soil Erosion Risk	Environmental Sensitivity
Japanese Peace Pagoda	Moderate	200 m	Moderate	High
Yatagala Raja Maha Viharaya	High	2 km	Low	High
Sudharmalaya Buddhist Temple	Low	750 m	High	High

### Understanding factors influencing sustainable tourism development

In assessing the factors influencing sustainable tourism development, three key criteria were identified. These findings underscore the significance of these factors in promoting sustainable,

Criterion	Correlation	p-value
Easily Accessible	0.430	0.032
Infrastructure	0.533	0.006
Topography	0.550	0.004

eco-friendly Buddhist heritage tourism development.

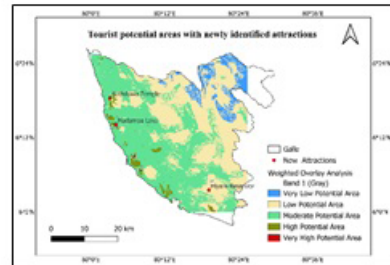


Figure 1: MCDA Map with newly identified attractions

### Identification of New Eco-Friendly Tourist Attractions:

The research identified new sustainable tourism sites in Galle District through stakeholder recommendations from field surveys. Their potential was assessed using MCDA maps, created by weighted overlays of factors identified through SPSS analysis, such as topography and infrastructure (Fig. 1). These sites can ease congestion and diversify tourism (Table 2).

**Table 2: Newly Identified Eco-Friendly Tourist Attractions in Galle District**

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Site Name	Environmental Impact Score	Cultural Significance Rating	Accessibility Score
Kothduwa Temple	Low	High	Medium
Hiyara Reservoir	Medium	Medium	Medium
Madampa Lake	Low	Medium	Medium

### Tourist Arrival Patterns and Environmental Impact

High visitation rates, such as Madu Ganga’s 250,000 visitors annually, cause significant environmental impacts. Geospatial technology, using satellite imagery and GIS mapping, tracked visitor movements and analyzed environmental data for each site. Kanneliya Forest Reservoir shows moderate impact, while Kottawa Reservoir experiences low impact. This data helps optimize visitor management and relieve pressure on sensitive areas (Table 3/ Figure 2).

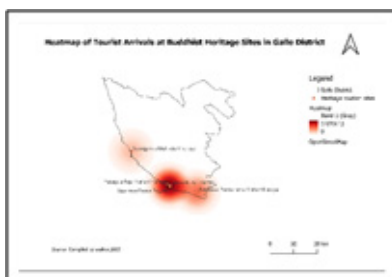


Figure 2: Heat map for Tourist arrival patterns in Galle District

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**Table 3: Tourist Arrivals and Environmental Impact Assessments**

Site Name	Average Visitors Per Year	Environmental Impact Assessment
<u>Madu Ganga</u>	250,000	High
<u>Kanneliya Forest Reservoir</u>	35,465	Moderate
<u>Kottawa Reservoir</u>	1371	Low

*Source: Sri Lanka Tourism Development Authority, 2022. Annual Report 2022: Year in Review. SLTDA, Colombo.*

### Development and Utility of the Web Platform

The web platform, developed based on stakeholder input, leverages GIS and real-time data to guide tourists in minimizing environmental impact and managing congestion. It directs visitors to eco-friendly, less crowded sites, with its validity confirmed through testing with local users (Fig. 3).

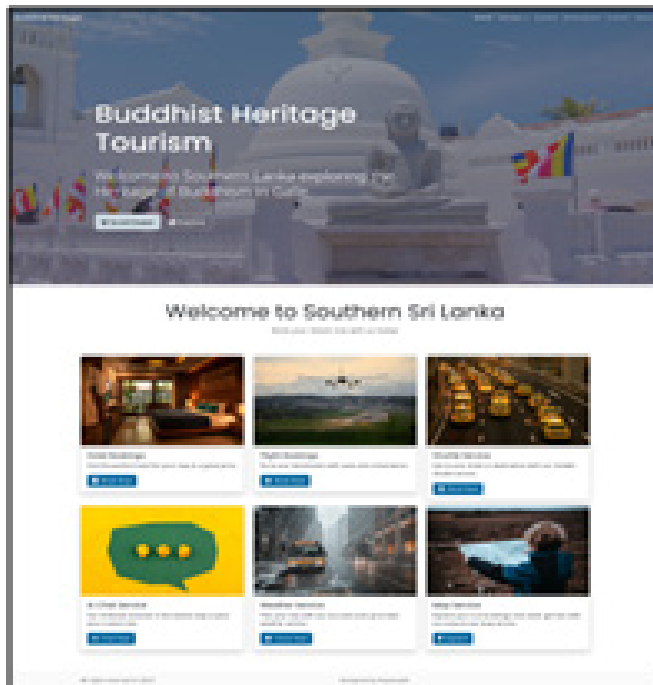


Figure 3: Website Homepage

## Discussion

The practice of geospatial technology is crucial for sustainable tourism development, helping to identify areas vulnerable to tourist impact and coordinate tourist movement by determining appropriate activities. It provides valuable lessons for similar regions. However, the study may be limited as it was conducted some time ago and focused solely on the Galle District. Future studies should expand the scope, use advanced technology like AI, and include more heritage sites. Overall, it contributes to environmentally sustainable Buddhist heritage tourism on an international scale.

## Conclusion

This research highlights the importance of integrating geospatial technology into the management of eco-tourism in Buddhist heritage sites in Sri Lanka's Galle District. The study effectively demonstrates how geospatial analysis can identify vulnerable areas and promote efficient tourist flow management to protect both cultural and environmental resources. Future research should explore the use of more advanced techniques, such as machine learning, to further enhance site management and visitor flow prediction. In the immediate term, the findings from this research can be utilized by local tourism authorities to implement sustainable tourism practices and protect at-risk heritage sites.

**Keywords:** Buddhist Heritage, Eco-Friendly Tourism, Geospatial Technology, Galle District, Sustainable Tourism

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