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ASSESSING ECO-TOURISM POTENTIAL AND SOCIO-ECONOMIC IMPACTS IN DAMBETHENNA ESTATE, SRI LANKA

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ABSTRACT

Dambethenna Estate in Haputale is an ecologically rich landscape with significant yet underutilized potential for eco-tourism development in Sri Lanka's central highlands. This study evaluates the estate's eco-tourism potential and examines the socio-economic impacts of the existing tourism activities on local communities. A mixed-method research design was employed, incorporating questionnaires, interviews, field observations, and spatial analysis. Fifty residents from the Dambethenna *Grama Niladhari Division were surveyed to assess socio-economic effects, while another fifty local and foreign tourists were consulted to evaluate tourism demand and satisfaction. The Weighted Sum Method (WSM) was applied to determine tourism potential across physical, environmental, and social dimensions, supported by SWOT analysis and Chi-square testing.*

Results reveal that several sites, including the Dambethenna Tea Factory, Dambethenna Viewpoint, Samimalee Viewpoint, and Samimalee Temple, possess high eco-tourism potential (0.71), while newly identified attractions such as Catherine Seat I and II show moderate-high potential (0.69). Despite strong environmental appeal, social and infrastructural constraints particularly limited accessibility and lack of land ownership among rural residents, restrict community participation and tourism-driven socio-economic benefits. Chi-square tests further indicate no significant link between tourism growth and improvements in household income or social well-being.

Overall, while Dambethenna Estate demonstrates substantial ecological and landscape value, realizing its eco-tourism potential requires improving accessibility, strengthening community involvement, and adopting structured, sustainable tourism planning. The findings highlight actionable opportunities for enhancing regional development through eco-tourism.

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1. INTRODUCTION

1.1 *Background*

Tourism has become one of the most dynamic economic sectors in the contemporary world, influencing patterns of environmental conservation, community development, and regional economic growth. In many developing countries, including Sri Lanka, tourism contributes significantly to national income, foreign exchange earnings, and employment generation. At the same time, the increasing global emphasis on sustainability has led to the rapid expansion of eco-tourism, a form of tourism that promotes responsible travel to natural areas, supports conservation efforts, and enhances the socio-economic well-being of local communities.

Eco-tourism has gained prominence as a strategic development tool because it provides a pathway for balancing economic benefits with environmental protection. According to the United Nations (2008), the rise of nature-based travel reflects a growing demand for environmentally responsible tourism experiences. Eco-tourism embodies principles such as minimizing environmental degradation, protecting biodiversity, fostering cultural appreciation, and empowering rural communities through participatory development. As Morrison et al. (2012) articulate, eco-tourism can stimulate economic growth in underdeveloped regions by promoting inclusive development and encouraging stakeholders to adopt sustainable practices. These attributes make eco-tourism an attractive and viable development strategy for countries like Sri Lanka, which possess diverse landscapes, rich biodiversity, and unique cultural heritage.

Sri Lanka's central highlands, historically shaped by the plantation industry during the British colonial era, offer significant potential for eco-tourism development. Regions such as Haputale, Nuwara Eliya, Bogawantalawa, and Bandarawela are home to ecologically sensitive ecosystems, scenic landscapes, and tea estates that continue to attract domestic and international tourists. Destinations like Lipton's Seat, Kondagala Rock, and historic estate bungalows highlight the unique blend of natural beauty and colonial heritage. These landscapes not only enrich Sri Lanka's tourism offering but also present opportunities to strengthen regional economies, diversify livelihoods, and promote environmental stewardship.

Despite this potential, eco-tourism development in plantation regions faces considerable challenges. Without proper planning and management, increased tourist activity can lead to environmental degradation, biodiversity loss, cultural disruption, and social strain. Unregulated tourism threatens the long-term ecological balance of sensitive areas such as tea estates, forest reserves, and high-altitude ecosystems. Therefore, sustainable tourism development frameworks are essential to ensure that natural resources are conserved while communities are meaningfully integrated into the tourism value chain. The International Ecotourism Society emphasizes that eco-tourism must be grounded in principles that minimize negative impacts, provide enriching educational experiences, respect cultural heritage, and ensure that economic benefits are equitably distributed among local populations.

In this context, Dambethenna Estate in the Haputale region stands out as a highly valuable yet under-explored eco-tourism destination. Situated in the upper Poonagala mountain range, the estate encompasses panoramic viewpoints, tea plantations, forest patches, and culturally significant sites. Although the area attracts a modest number of visitors mainly to locations such as Lipton's Seat and the Dambethenna Tea Factory, many other environmentally and culturally rich sites remain largely unutilized. This underutilization stems from issues such as inadequate infrastructure, limited accessibility, and low community participation, which collectively constrain the region's eco-tourism potential.

Given Sri Lanka's current socio-economic challenges, including economic instability, rural poverty, and environmental vulnerability, there is an urgent need to identify sustainable pathways for regional development. Eco-tourism offers a promising avenue for addressing these challenges by providing income opportunities, strengthening community resilience, and promoting environmental conservation. However, the successful implementation of eco-tourism requires systematic assessment, strategic planning, and collaboration among stakeholders. Evaluating the tourism potential of Dambethenna Estate and examining the socio-economic impacts of existing tourism activities is therefore crucial for developing an evidence-based, sustainable eco-tourism framework for the region.

This study aims to fill this gap by assessing eco-tourism potential across physical, social, and environmental dimensions using the Weighted Sum Method (WSM), alongside exploratory tools such as SWOT analysis and community surveys. Additionally, the research examines the socio-economic impacts of tourism on local communities and identifies structural barriers that hinder sustainable tourism development in Dambethenna. Through these objectives, the study contributes to a deeper understanding of how eco-tourism can be responsibly integrated into the regional development agenda while ensuring the protection of ecological assets and enhancing the quality of life of residents.

1.2 Problem Statement

Sri Lanka's plantation regions possess significant ecological and cultural value, yet much of this potential remains untapped due to inadequate planning, limited accessibility, low community participation, and weak institutional support. In Dambethenna Estate, tourism activity is concentrated around a few well-known sites, while many environmentally rich and culturally significant locations remain overlooked. Although the region offers panoramic landscapes, biodiversity, and unique heritage features, tourism development has not translated into meaningful socio-economic benefits for local communities. Moreover, the absence of systematic assessments has hindered evidence-based decision-making. As a result, there is limited understanding of how eco-tourism can be sustainably developed in Dambethenna and what constraints prevent its expansion. This gap highlights the need for a structured evaluation of eco-tourism potential and an examination of its socio-economic implications.

1.3 Objectives

1.3.1 General Objective

To assess the eco-tourism potential of Dambethenna Estate and examine its socio-economic impacts on local communities.

1.3.2 Specific Objectives

1. To analyze the geographical, physical, and human factors that influence eco-tourism development in Dambethenna Estate.
2. To identify existing and emerging eco-tourism attractions and evaluate satisfaction levels among domestic and international tourists.
3. To assess the feasibility and extent to which eco-tourism can be sustainably developed in the region.
4. To examine the socio-economic impacts of tourism on local livelihoods, income, and community well-being.
5. To identify key constraints and challenges that hinder eco-tourism development in Dambethenna Estate.

1.4 Study Area

Dambethenna Estate is located in the Haputale–Diyatalawa Divisional Secretariat of the Badulla District in Sri Lanka's Uva Province. Positioned along the upper slopes of the Poonagala mountain range, the estate lies at elevations exceeding 1,900 meters, offering extensive views across the central highlands. Covering approximately 925 acres, the estate is geographically bounded by the Dodathenna, Diyakivula, Bandara Eliya, and Bandarawela administrative divisions. The region features steep slopes, forest patches, tea plantations, and scattered rural settlements. Tea cultivation forms the dominant land use, contributing to the region's scenic character and agro-ecological richness. The estate is accessible via the Haputale–Dambethenna (B147) and Bandarawela, Poonagala, Nayabedda (B42) roads. Several natural, cultural, and historical attractions, including viewpoints, forest reserves, tunnels, and temples, make Dambethenna a promising location for eco-tourism development.

2. LITERATURE REVIEW

Eco-tourism has been widely studied across diverse geographical contexts, particularly in regions where natural resources, cultural heritage, and community livelihoods intersect. Existing literature highlights the value of eco-tourism as a tool for regional development, environmental conservation, and socio-economic upliftment, while also emphasizing the challenges associated with sustainability and community participation.

Mamun and Mitra (2012) conducted a seminal study evaluating tourism potential in the Murshidabad District of West Bengal, India, using the Weighted Sum Method (WSM). Their research demonstrated that structured methodological approaches can effectively quantify tourism attributes and identify potential areas for development, even in data-scarce environments. Their findings revealed that tourism, when guided by systematic assessment, can meaningfully contribute to socio-economic development. This methodological foundation is particularly relevant to the present study, which adopts and adapts the WSM framework.

In Sri Lanka, several scholars have examined eco-tourism potential within ecologically

sensitive regions. Hettiarachchi (2007) explored the Knuckles Mountain Range and argued that eco-tourism can serve as an instrument for both conservation and regional development. The study emphasized the importance of managing ecological assets carefully to prevent degradation caused by unregulated tourism. This aligns with broader global concerns regarding the dangers of poorly planned tourism initiatives, especially in biodiversity-rich areas.

Edirisooriya and Wijerathne (2018) assessed the geo-tourism potential of Horton Plains National Park, applying a structured evaluation framework based on Scientific Value, Additional Value, and Risk. Their findings highlighted the park's strong scientific and ecological appeal but also identified vulnerabilities linked to environmental risks. This study underscores that high ecological value alone does not guarantee sustainable tourism; management strategies must balance attraction with protection.

Research on Sri Lanka's tea plantation regions further supports the relevance of eco-tourism in highland landscapes. Galagoda et al. (2005, 2007) examined eco-tourism planning in up-country tea estates and concluded that these landscapes offer exceptional opportunities for nature-based tourism due to their unique ecological and cultural characteristics. They emphasized the need for sustainable tourism models that integrate community participation, environmental stewardship, and alternative tourism concepts. Their findings resonate strongly with the current study area, as Dambethenna Estate shares similar geographical and cultural attributes.

Tourism potential assessments using Geographic Information Systems (GIS) have also been applied in Sri Lanka. Wijerathne and Senevirathna (2017) analyzed the tourism potential of Minneriya National Park using GIS-based methodologies, including network analysis, Chi-square tests, and spatial weighting. Their research demonstrated that spatial analysis tools can identify tourism demand patterns, highlight ecological sensitivities, and guide tourism planning. Additionally, they noted mixed socio-economic impacts, with tourism contributing to some improvements in livelihoods while also being linked to negative social outcomes, including youth involvement in illicit activities. These findings reflect the complexities associated with community-level tourism development.

Mudalige et al. (2005) conducted one of the earliest studies examining environmental risks associated with eco-tourism in Sri Lanka's highland tea estates. Their research stressed the delicate balance required between leveraging natural landscapes for tourism and preserving environmental integrity. They argued that tourism, if not carefully planned, could disrupt ecological processes, degrade natural habitats, and threaten long-term sustainability.

Across these studies, several consistent themes emerge:

1. Eco-tourism has strong potential to drive regional socio-economic development, particularly in underdeveloped or rural landscapes with rich natural and cultural assets.
2. Sustainable tourism frameworks require structured evaluation, community involvement, and careful planning to

prevent negative environmental or social effects.

3. Highland and plantation regions, similar to Dambethenna Estate, are ideal for eco-tourism, but remain underutilized due to infrastructural, institutional, and awareness-related constraints.
4. Quantitative tools such as WSM and GIS-based methods are increasingly important for tourism potential assessment, offering systematic, replicable approaches.

Taken together, the literature indicates that while Sri Lanka possesses substantial eco-tourism potential, many regions remain underdeveloped due to issues of accessibility, limited investment, inadequate planning, and insufficient community engagement. These gaps justify the relevance of the present study, which provides an empirical, structured assessment of eco-tourism potential in Dambethenna Estate and examines its socio-economic implications. The existing body of research affirms the methodological soundness of using weighted assessment tools while highlighting the need for localized studies that integrate community perspectives and region-specific constraints.

3. METHODOLOGY

3.1 Research Design

A mixed-method research design was adopted to comprehensively evaluate the eco-tourism potential of Dambethenna Estate and assess its socio-economic impacts. The study integrated quantitative techniques, such as scoring, weighting, and statistical testing, with qualitative insights derived from field observations and interviews. This approach enabled a balanced understanding of both measurable tourism attributes and human perspectives from local communities and visitors.

3.2 Study Population and Sampling

Two primary groups were targeted:

(1) Local Community

The Dambethenna Grama Niladhari Division, with a total population of 5,191, served as the sampling frame.

- Sample size: 50 residents
- Sampling method: Simple random sampling
- Purpose: To understand socio-economic impacts, tourism awareness, and community participation.

(2) Tourists

Both domestic and foreign tourists visiting Dambethenna and nearby attractions were surveyed.

- Sample size: 50 tourists (25 surveyed on a weekday, 25 on a weekend to capture varied visitation patterns)
- Purpose: To assess satisfaction levels and perceived tourism potential.

The use of simple random sampling ensured fair representation and minimized selection bias.

3.3 Data Collection Method

3.3.1 Primary Data

Primary data were collected through:

- Structured questionnaires administered to residents and tourists
- Informal interviews with estate workers, visitors, vendors, and local authorities
- Field observations at viewpoints, trails, tea plantations, cultural sites, and forest patches

This allowed researchers to validate the physical condition, accessibility, environmental features, and existing tourism services through direct observation.

3.3.2 Secondary Data

Secondary data strengthened contextual understanding and included:

- Topographic and land-use maps
- Estate records and administrative documents
- Government tourism and socio-economic reports
- Books, research articles, and digital sources

Spatial data were used to create maps and visualize terrain, land use, and tourist sites.

3.4 Data Management and Software Tools

Collected data were processed and stored using:

- SPSS 21 – for statistical testing and descriptive analysis
- Microsoft Excel 2007 – for scoring, weighting, classification, and tabulation
- ArcGIS 10.4 – for generating maps and spatial analyses

3.5 Analytical Framework

The study used three major analytical techniques:

3.5.1 Weighted Sum Method (WSM)

WSM was the primary tool used to assess tourism potential. Its selection is justified because:

- It allows systematic comparison of multiple attributes
- It accommodates both qualitative and quantitative data
- It is suitable for contexts with limited detailed datasets
- It has been effectively used in similar tourism studies (Mamun & Mitra, 2012)

The method evaluates potential across three main dimensions:

(1) Physical attributes (Wp)
(2) Environmental attributes (We)
(3) Social attributes (Ws)

Step 1: Assigning Weights to Main Categories (Wi)

The three dimensions (physical, environmental, and social) were ranked by respondents and normalized for computation. Weights were assigned as:

- Physical: 0.50
- Environmental: 0.33
- Social: 0.17

Step 2: Weighting Attributes Under Each Category (Wj)

Respondents ranked the importance of individual attributes within each category (e.g., accessibility, climate, safety, culture). These rankings were normalized to derive attribute weights.

Step 3: Quality Scale (Sj)

Each attribute was scored on a 5-point scale (1–5), later converted to 0.2–1.0. This captured qualitative aspects such as cleanliness, scenic value, facilities, and environmental quality.

Step 4: Calculating Tourism Potential Value (VT)

The Weighted Sum formula used was:

$VT=\sum Wi(\sum WjSj)$

This produced values between 0 and 1, representing the overall eco-tourism potential of each site.

Step 5: Classification and Interpretation

Tourist sites were compared based on their physical, environmental, and social indices, enabling identification of:

- High-potential sites
- Moderately potential sites
- Low-potential or constrained sites

3.5.2 Chi-square Test (χ^2)

The Chi-square test was used to examine two key relationships:

(1) Eco-tourism growth vs. income improvement among residents
(2) Eco-tourism growth vs. incidence of social problems

These analyses helped determine whether tourism influences socio-economic conditions meaningfully.

3.5.3 SWOT Analysis

SWOT analysis was conducted to evaluate:

- Strengths (natural beauty, climate, biodiversity)
- Weaknesses (poor accessibility, limited infrastructure)
- Opportunities (growing tourist interest, digital promotion)
- Threats (environmental degradation, lack of policy support)

This provided strategic direction for sustainable eco-tourism development.

3.6 Ethical Considerations

Participants were informed about the purpose of the study, participation was voluntary, and data were handled confidentially. No personal identifiers were recorded.

4. RESULTS AND DISCUSSION

4.1 Overview of Weighted Sum Method (WSM) Findings

The Weighted Sum Method (WSM) was applied to assess the eco-tourism potential of nine major tourist sites within Dambethenna Estate. Three categories—physical, environmental, and social attributes—were evaluated to generate normalized potential values ranging from 0 to 1. Higher scores indicate stronger suitability for eco-tourism development.

Survey responses revealed that environmental attributes received the highest weight, followed by physical and

social attributes. This aligns with the region's natural appeal and the preferences expressed by tourists seeking scenic and ecological experiences.

4.2 Category-Level Weight Assignments (Wi)

Respondents ranked the importance of the three main categories as follows:

- Physical attributes: 0.50
- Environmental attributes: 0.33
- Social attributes: 0.17

This indicates that most visitors consider scenic beauty, accessibility, and physical features more influential than cultural or social factors when evaluating the tourism value of Dambethenna Estate.

Table 01: Weight assignment (Wi) for the three main categories

Ranking	Attributes	Weights
1	Physical (W_p)	0.5 3/6*
2	Environment (W_e)	0.33 2/6
3	Social (W_s)	0.17 1/6
3+2+1=6*		

Source: Sample Survey, 2023.

4.3 Attribute-Level Weights (Wj)

Attributes such as environmental angle, climate diversity, water and air quality were ranked highest under the environmental category. In contrast, social attributes—including availability of tourist services, local souvenirs, and cleanliness—received comparatively lower weights due to limited facilities in the area. These responses align with field observations that infrastructure and tourism services remain underdeveloped.

Table 02: Weight assignment according to other attributes grading

Rank	Attributes	Weights
Physical Attributes		
1	Topography and regional connectivity	0.5 3/6*
2	accessibility	0.33 2/6
3	time to visit and distance to the nearest city	0.1 1/6
3+2+1 = 6*		
Environmental Attributes		
1	ecological angle and agro-ecology.	0.4 4/10*
2	Climate diversity and quality of air and water	0.3 3/10
3	access to natural forests and animals in the area	0.2 2/10
4	Minimizing natural and man-made disasters	0.1 1/10
4+3+2+1 = 10*		
Social Attributes		
1	Cleanliness of area (roads, work places, places of sightseeing)	0.33 5/15*
2	tourism industry, supplier functionality, national culture, friendliness and human resources (youth) Community size	0.26 4/15
3	probability of social crimes (homicide, robbery, drug use etc)	0.2 3/15
4	tourism industry, supplier functionality	0.13 2/15
5	education level and facilities similar to tourism (reinsurance opportunities, Health, Food, Food, Environmental Resorts and Other Accommodation, Quality Transport etc.)	0.06 1/15
5+4+3+2+1 = 15*		

Source: Sample Survey, 2023.

4.4 Scale Values for Attributes (Sj)

In the third stage of the Weighted Sum Method, each attribute under the physical, environmental, and social categories was evaluated using a **five-point quality scale**, ranging from **1 (very poor)** to **5 (excellent).** To standardize comparisons and ensure

uniform computation across categories, these scores were converted into normalized values from **0.2 to 1.0**, where:

- 1 → 0.2
- 2 → 0.4
- 3 → 0.6
- 4 → 0.8
- 5 → 1.0

This allowed both qualitative and quantitative attributes—such as scenic appeal, cleanliness, accessibility, and cultural richness—to be objectively incorporated into the potential assessment.

Table 03: Method used to calculate the scale values for each attribute within the environmental category of tourism potential.

Attribute	1 (0.2)	2 (0.4)	3 (0.6)	4 (0.8)	5 (1.0)
Ecological angle and agro-ecological attractiveness	Being able to see the surroundings, the location of a systematic tea	Being able to view the surroundings from a higher elevation than any other place, is a systematic teahouse	Set in the middle of a bay-wide tea bin, viewing the environment from a high mountain.	The environment with a different climate that can be viewed from a high mountain	360 degree environmental angle, viewing of 5 provinces

Source: Edited by the author.

4.5 Tourism Potential Scores (VT)

Using WSM, potential values were calculated for each tourist site. The results are summarized conceptually below.

Table 04: Tourism potential value of tourist places in Dambetenna area

Zones	Spots	P_1	P_2	P_3	V_P	e_1	e_2	e_3	e_4	V_e	S_1	S_2	S_3	S_4	S_5	V_S	V_T
Bandaraelliya	Liptan's seat	1	0.4	0.6	0.692	1	1	0.6	0.6	0.88	0.8	0.4	0.6	0.4	0.4	0.564	0.7322
	Dambethenna Tunnel	0.4	0.2	0.2	0.286	0.4	0.2	0.2	0.2	0.28	0.6	0.4	0.6	0.2	0.2	0.46	0.3136
Dambethenna	dambethenna tea factory	1	0.4	0.6	0.692	1	0.8	0.6	0.6	0.82	0.8	0.8	0.8	0.4	0.2	0.696	0.7349
	Dambethenna View point	1	0.4	0.6	0.692	1	1	0.4	0.4	0.82	0.8	0.8	0.8	0.4	0.2	0.696	0.7349
	Samimalee view point	1	0.4	0.6	0.692	1	1	0.4	0.4	0.82	0.8	0.6	0.8	0.2	0.2	0.618	0.7216
	Samimalee Tample	1	0.4	0.4	0.672	0.6	1	0.4	0.6	0.68	0.6	0.8	0.6	0.2	0.2	0.564	0.6562
Diyagula	Forest Resever	0.8	0.2	0.2	0.486	0.2	0.8	0.2	0.6	0.42	0.8	0.4	0.8	0.2	0.2	0.566	0.4778
	Sri Mutthumari amman Temple	0.4	0.2	0.2	0.286	1	0.4	0.2	0.6	0.62	0.4	0.4	0.6	0.2	0.2	0.394	0.4145
ST/ Catharin	Catharin Seat	1	0.4	0.4	0.672	0.6	1	0.8	0.6	0.76	0.6	0.8	0.8	0.2	0.2	0.604	0.6894
	Catharin Seat 02 (a new tourist destination identified)	1	0.6	0.4	0.738	0.8	1	0.2	0.6	0.72	0.6	0.6	0.8	0.2	0.2	0.552	0.7004

Source: Edited by the author.

High-Potential Sites (VT ≥ 0.69)

- Dambethenna Tea Factory
- Dambethenna Viewpoint
- Samimalee Viewpoint
- Samimalee Temple
- Catherine Seat I & II (newly identified sites)

These locations scored high due to strong environmental features, scenic viewpoints, and historical or cultural relevance. The Catherine Seat sites, in particular, exhibited exceptionally high environmental attractiveness (0.74), highlighting their suitability for eco-based tourism.

Moderate-Potential Sites (VT = 0.44–0.59)

- Forest Reserve (near Sri Muththumari Amman Kovil)

This site possesses strong ecological appeal but is hindered by steep terrain, difficult accessibility, and limited visitor facilities.

Low-Potential Sites (VT < 0.40)

No site fell into the low-potential category, indicating that all assessed locations possess at least some eco-tourism value, though development feasibility varies.

4.6. Interpretation of Physical, Environmental, and Social Scores

Environmental Attributes

Environmental scores were consistently the highest across sites (0.28–0.88), confirming the strong natural appeal of the region. Viewpoints and forested areas scored particularly high due to landscape beauty, biodiversity, and panoramic views.

Physical Attributes

Although the area's topography supports eco-tourism, especially for hiking and scenic viewing, poor road conditions, limited signage, and difficult access routes lowered physical scores for several sites.

Social Attributes

Social potential values were the lowest among the three categories. Contributing factors include:

- Lack of tourism-related awareness programs
- Limited hospitality services
- Few eco-friendly accommodations
- Weak community participation
- Low availability of guides and souvenirs

These results suggest that improving social infrastructure is essential for sustainable eco-tourism growth.

4.2 Chi-Square Test Results

4.2.1 Eco-tourism Growth vs. Income Improvement

- P-value > 0.05
- Cramer's V = 0.132 (weak association)

This indicates no significant relationship between current tourism activities and improvements in household income. Tourism has not yet generated meaningful economic benefits for the majority of residents.

4.2.2 Eco-tourism Growth vs. Social Problems

- P-value > 0.05
- No evidence of increased social issues linked to tourism (e.g., drug use, diseases, criminal activity)

This suggests that tourism activities have not negatively affected community well-being, which is a positive sign for future eco-tourism expansion.

4.3 Tourist Satisfaction Analysis

Tourist satisfaction was evaluated across physical, social, and environmental dimensions:

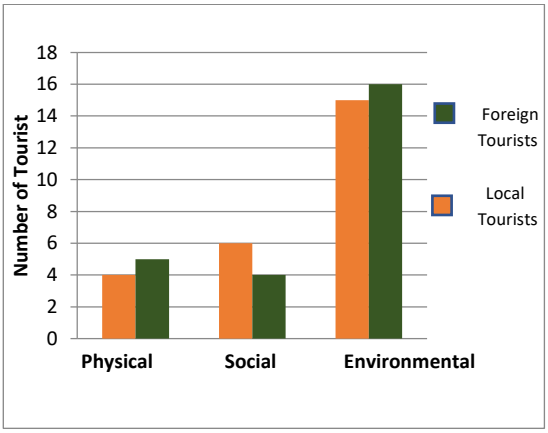
Local Tourists

- High satisfaction with environmental features
- Moderate satisfaction with physical conditions
- Low satisfaction with social facilities

Foreign Tourists

- Very high appreciation for scenery and climate
- Lower satisfaction with social and physical services compared to locals

Both groups consistently valued environmental characteristics, indicating that Dambethenna's natural features are the strongest foundation for eco-tourism development.



Graph 1: Tourism satisfaction in the three main categories
Source: Sample Surveys, 2023.

4.4 Summary of Key Findings

1. Environmental quality is the strongest tourism asset**,** reflected in the highest attribute scores**.**
2. Several high-potential eco-tourism sites exist, including newly identified locations like Catherine Seat II.

3. Social infrastructure and community involvement are the weakest components, limiting tourism benefits.
4. Tourism currently has minimal socio-economic impact, with no measurable income improvement.
5. Tourism poses no significant social threats, making the area suitable for sustainable expansion.
6. Accessibility issues remain a major barrier**,** especially in steep or remote sections of the estate.

5. DISCUSSION

The findings of this study provide a multi-dimensional understanding of Dambethenna Estate's eco-tourism potential and the socio-economic dynamics surrounding tourism activity in the region. This discussion integrates the empirical findings from the Weighted Sum Method (WSM), Chi-square tests, tourist satisfaction analysis, and field observations with broader theoretical concepts and comparative literature. It highlights the opportunities for sustainable eco-tourism development, identifies structural barriers, and situates Dambethenna within regional, national, and global eco-tourism contexts.

5.1 Environmental Potential and Ecological Strengths

The results show that environmental attributes consistently recorded the highest potential values across all tourist sites, with scores ranging from moderate (0.28) to exceptionally high (0.88). This affirms the significant ecological appeal of Dambethenna Estate, characterized by panoramic viewpoints, lush tea plantations, forest edges, favorable climate, and high landscape heterogeneity.

These findings are consistent with global eco-tourism literature, which emphasizes that landscapes with rich biodiversity, visual appeal, and unique ecological features tend to attract nature-based tourists (Weaver, 2001; Fennell, 2015). In Costa Rica, often cited as a global eco-tourism model, forest reserves, mountain viewpoints, and agro-ecological systems form the backbone of its nature-based tourism industry. Similar to Costa Rica's Monteverde and Arenal regions, Dambethenna combines agricultural landscapes with biodiverse forest patches, offering strong potential for interpretive tourism, nature trails, and agro-ecological tours.

At a national level, these patterns align with the findings of Hettiarachchi (2007) in the Knuckles Conservation Range and Edirisooriya & Wijerathne (2018) in Horton Plains. Both studies reported that strong environmental value and scenic diversity formed the core tourism appeal of these eco-sensitive regions. The similarities further validate the environmental strength of Dambethenna as a high-potential eco-tourism landscape.

From a theoretical perspective, the Triple Bottom Line (TBL) model emphasizes environmental sustainability as a prerequisite for successful eco-tourism. Dambethenna's strong ecological appeal forms the "planet" component of the TBL framework, making it an ideal candidate for sustainable tourism-provided that development remains sensitive to ecological constraints.

5.2 Physical Attributes and Accessibility Constraints

Despite strong environmental appeal, physical attributes such as accessibility, connectivity, and visitor infrastructure yielded moderate-to-low scores in several locations. Respondents frequently noted steep terrain, narrow roads, limited signage, and insufficient transportation options as critical barriers to tourism.

This pattern closely mirrors findings from other plantation-based tourism studies in Sri Lanka, including those conducted in up-country tea estates (Galagoda et al., 2005; 2007). Historically, plantation roads were designed for estate operations rather than tourism, resulting in infrastructure that is scenic but not visitor-friendly.

Comparable highland regions worldwide face similar challenges. For example:

- In Nepal's mid-hill regions, difficult terrain limits access to otherwise beautiful eco-tourism sites.
- In Vietnam's Sapa region, poor road conditions once constrained tourism growth until targeted infrastructure investments were introduced.

The Tourism Area Life Cycle (TALC) theory provides a useful lens for interpreting these findings. Dambethenna appears to be in the exploration stage, characterized by limited infrastructure, small tourist numbers, and a lack of formal tourism planning. Without strategic investment, destinations in this early stage often struggle to advance into the development phase.

Improving accessibility - through road maintenance, visitor signboards, and mobility enhancements - will be crucial for unlocking the area's full eco-tourism potential.

5.3 Social Attributes, Community Participation, and Local Awareness

Social attributes received the lowest overall scores, reflecting limitations in tourism services, community engagement, safety infrastructure, and availability of trained guides. These results underscore a structural issue common to many rural and plantation communities: tourism operates around them, but not with them.

The Chi-square tests revealed:

- No significant relationship between eco-tourism growth and income improvement
- No significant relationship between tourism and social problems

The first finding echoes numerous studies in Sri Lanka that highlight weak benefit distribution within rural tourism landscapes (e.g., Minneriya, Udawalawe, Ella). Many communities remain peripheral to decision-making processes, resulting in minimal economic spillover.

This challenge is well explained by the Community-Based Tourism (CBT) framework. CBT emphasizes the need for active community participation, equitable benefit-sharing, local capacity building, and co-management of tourism sites. At present, Dambethenna exhibits characteristics of low-participation tourism, where private entities and external visitors benefit more than residents.

The second Chi-square finding, however, is encouraging. Unlike certain tourism-heavy areas where social issues (drug use, waste generation, cultural erosion) become prominent, Dambethenna appears socially stable. This positions the region favorably for planned eco-tourism expansion, as communities remain receptive and unaffected by tourism-related disturbances.

5.4 Comparison with Eco-tourism Studies in Sri Lanka

The findings resonate strongly with national patterns identified in previous research:

- Knuckles Range (Hettiarachchi, 2007)

Tourism potential was high, but accessibility and community roles were weak.

- Horton Plains (Edirisooriya & Wijerathne, 2018)

Ecological value was high, but environmental risks and management issues created vulnerabilities.

- Minneriya (Wijerathne & Seneviratne, 2017)

Positive economic impacts existed, but social challenges (youth behavior, illegal fishing) emerged.

Dambethenna differs in key ways:

- It does not currently suffer from environmental degradation.
- It has lower tourist pressure compared to major parks.
- Community-related social issues are minimal.
- Ecological diversity is significant but underutilized.

These unique characteristics position Dambethenna as a promising greenfield eco-tourism destination, one that can avoid negative impacts through early implementation of sustainable planning frameworks.

5.5 Comparison with International Eco-tourism Models

Placing Dambethenna within an international context strengthens understanding of its potential.

Costa Rica (Monteverde, Arenal):

Eco-tourism success was heavily based on:

- community ownership,
- scientific research stations,
- environmental interpretation programs, and
- strong policy support.

Dambethenna shares environmental strengths but lacks organizational and institutional support.

Kenya's Maasai Mara:

Community partnerships through conservancies have enabled local empowerment and income generation.

Dambethenna's tea estate communities could similarly benefit from community-private partnerships.

Thailand's Chiang Mai Highlands:

Agro-tourism blended with eco-tourism in tea and coffee plantations.

Dambethenna's tea landscapes offer similar potential for interpretive agro-ecological tourism, tea trails, and plantation experiences.

These comparisons reinforce that environmental appeal alone is not enough; policy support, investment, and community engagement are the critical missing components.

5.6 Interpretation of Accessibility and Land Ownership Issues

Two major constraints identified were:

1. Poor accessibility to several tourist sites, particularly Catherine Seat II and forest trails.
2. Lack of land ownership for rural communities, which restricts their participation in eco-tourism ventures.

Both issues have deep roots in Sri Lanka's plantation history. Under colonial rule, estate lands were owned by plantation

companies, leaving estate residents with limited land rights. This has historically marginalized communities and restricted their ability to develop home-based tourism enterprises.

From a development theory perspective, these barriers reflect structural inequalities that limit the capacity of rural populations to benefit from tourism. Pro-poor tourism literature emphasizes that ownership and access to assets (land, capital, skills) determine how communities can benefit from tourism growth.

For Dambethenna, addressing these structural constraints is essential if eco-tourism is to serve as a vehicle for inclusive development.

5.7 Implications for Sustainable Tourism Development

The results collectively suggest that Dambethenna is at a critical turning point. With strong environmental assets but weak physical and social infrastructure, the region must adopt a sustainable tourism development pathway that balances environment, economy, and community.

Key implications include:

Environmental Sustainability

- Protecting forest edges, biodiversity, and scenic viewpoints
- Preventing unregulated commercial development
- Introducing environmental education programs

Economic Sustainability

- Creating opportunities for local entrepreneurship
- Integrating community-based tourism models
- Promoting agro-tourism and tea-based experiences

Social Sustainability

- Strengthening community awareness
- Building local capacity through training
- Ensuring equitable benefit-sharing mechanisms

The TBL framework highlights that long-term success requires synergy between environmental, social, and economic pillars. Dambethenna currently excels in environmental potential but needs strategic interventions to strengthen the other two pillars.

5.8 Positioning Dambethenna within the Tourism Area Life Cycle (TALC)

Based on the results, Dambethenna Estate is firmly in the Exploration Stage of the TALC model:

- Few tourists visit beyond known sites
- Infrastructure is minimal
- Local involvement is low
- There is limited promotional activity

With proper planning, the region could progress into the Involvement and Development stages, characterized by community participation, improved facilities, and structured tourism products.

However, without planning, the destination risks stagnation, similar to several underdeveloped tea-region attractions in Sri Lanka.

5.9 Summary of Discussion

This discussion demonstrates that:

- Dambethenna's natural environment positions it strongly for eco-tourism.
- Physical and social limitations constrain the full exploitation of this potential.
- Socio-economic benefits are currently minimal and require structured planning.
- The region compares favorably with both national and international eco-tourism cases.
- With proper policy support, community involvement, and targeted investment, Dambethenna can evolve into a sustainable, high-value eco-tourism destination.

6. LIMITATIONS OF THE STUDY

Like all field-based research conducted in complex rural and ecological settings, this study encountered several limitations that should be acknowledged when interpreting the results. These limitations do not invalidate the findings but provide important context for their scope, generalizability, and methodological boundaries.

First, the sample size of 50 residents and 50 tourists, although adequate for exploratory eco-tourism research, limits the precision of statistical generalizations. A larger sample may have captured a broader range of perceptions, particularly from underrepresented groups such as estate women, youth, and seasonal workers. Future studies incorporating stratified sampling or longitudinal surveys would provide deeper insights into socio-economic patterns.

Second, the study's geographical focus was confined to the Dambethenna Estate area. While this offers a detailed case study, the eco-tourism potential in neighboring estates and the wider Haputale–Bandarawela region remains unexplored. Since many ecological and socio-cultural attributes are shared across plantation landscapes, extending the geographic scope would strengthen regional comparisons and provide a more holistic understanding of eco-tourism dynamics in Sri Lanka's central highlands.

Third, seasonality posed unavoidable constraints. Tourism patterns, environmental conditions, and accessibility vary significantly between dry and rainy seasons. Fieldwork conducted during a specific period may not fully reflect seasonal variations in visitor flow, climate conditions, and environmental sensitivity. Future research incorporating multiple seasonal data points would enrich analyses of tourist satisfaction and environmental carrying capacity.

Fourth, the study relied partly on self-reported data obtained through questionnaires and interviews, which may be influenced by respondent bias, misunderstanding of questions, or reluctance to disclose sensitive socio-economic information. Although steps were taken to minimize such effects, observational triangulation and mixed-method validation would further enhance data reliability.

Fifth, the Weighted Sum Method (WSM), while well-suited for multi-criteria evaluation, involves subjective weight assignments based on respondent perceptions. Although normalization reduces bias, alternative models, such as the Analytical Hierarchy Process (AHP) or GIS-based multi-criteria evaluation, could yield more nuanced prioritization of eco-tourism attributes.

Lastly, the study was conducted without comprehensive economic valuation or in-depth ecological assessments such as biodiversity surveys. Integrating ecological indicators, carbon sequestration values, or habitat quality assessments would provide a more robust foundation for eco-tourism planning.

Despite these limitations, the study provides a meaningful, methodologically sound evaluation of eco-tourism potential and socio-economic impacts, forming a strong basis for future research and sustainable tourism development in Dambethenna Estate.

7. CONCLUSION AND RECOMMENDATIONS

7.1 Conclusion

This study examined the eco-tourism potential of the Dambethenna Estate and its socio-economic impacts on local communities through a mixed-method assessment that integrated the Weighted Sum Method (WSM), Chi-square analysis, tourist satisfaction surveys, and qualitative field observations. The overall findings demonstrate that Dambethenna Estate possesses substantial ecological and landscape value, making it a promising destination for eco-tourism development within Sri Lanka's central highlands. However, socio-economic benefits currently remain limited, and several structural constraints hinder the region from fully capitalizing on its natural appeal.

Environmental attributes emerged as the strongest component of eco-tourism potential. High scenic quality, panoramic viewpoints, favorable climate, and lush agro-ecological settings contribute to consistently high environmental scores across the surveyed sites. Locations such as the Dambethenna Viewpoint, Samimalee Viewpoint, Catherine Seat I and II, and forest edges near the Sri Muththumari Amman Kovil demonstrate exceptional environmental potential, reflecting Dambethenna's strong position within Sri Lanka's nature-based tourism landscape. These environmental strengths align with global eco-tourism principles emphasizing conservation, natural beauty, and low-impact tourism experiences.

Conversely, physical attributes such as road accessibility, signage, transport options, and trail conditions received moderate scores, highlighting infrastructural limitations. Several potential sites are located on steep slopes or off poorly maintained roads, creating challenges for safe and comfortable tourist access. These findings suggest that planned infrastructure upgrades guided by environmental sensitivity are essential for sustainable tourism development.

Social attributes proved to be the weakest dimension. Limited community awareness, low tourism-related participation, lack of formal tourism training, and minimal availability of tourist services (guides, homestays, souvenirs, rest areas) restricted the overall tourism potential. The Chi-square tests reinforced these findings: there was no statistically significant relationship between tourism growth and improvements in household income or social well-being. Although tourism has not introduced notable social problems, an encouraging sign, it also has not created meaningful material benefits for most residents.

Despite these limitations, Dambethenna remains well-positioned for sustainable eco-tourism expansion. The region is at a favorable early stage of the Tourism Area Life Cycle (TALC), where strong environmental assets can be strategically leveraged before the onset of environmental degradation or overcrowding. Comparisons with domestic and international eco-tourism models emphasize that early planning, community engagement, and infrastructural improvements are crucial for sustainable growth.

Overall, the study concludes that Dambethenna Estate has high environmental potential, moderate physical potential, and low social potential. Realizing its full eco-tourism capacity will require targeted investments, community-based tourism initiatives, environmental safeguards, and

coordinated efforts among government agencies, estate management, tourism stakeholders, and residents.

7.2 Recommendations

Based on the results and the theoretical frameworks of sustainable tourism, community-based tourism (CBT), and the Triple Bottom Line, the following recommendations are proposed:

1. Improve Accessibility and Visitor Infrastructure

Targeted improvements to key access roads, walking trails, and viewing platforms would significantly enhance the physical feasibility of eco-tourism. These improvements should be environmentally sensitive, avoiding wide-scale land clearing or intrusive construction.

Suggested actions include:

- Upgrading essential access roads with proper drainage
- Installing directional signboards and interpretive signage
- Developing safe walking paths and shaded resting points
- Introducing eco-friendly waste disposal systems at key sites

Infrastructure development must align with sustainable design principles to preserve the area's ecological integrity.

2. Strengthen Community Awareness and Participation

Eco-tourism cannot succeed without active community engagement. Awareness programs should be introduced to help residents understand the economic and social benefits of sustainable tourism. Initiatives may include:

- Training local guides, homestay operators, and tourist service providers
- Conducting community workshops on eco-tourism opportunities
- Encouraging local youth to participate in trekking guide training, handicrafts, and digital promotions
- Integrating community voices into tourism decision-making bodies

Empowering residents will help shift the region from passive observation to active involvement.

3. Promote Community-Based Tourism (CBT) Enterprises

To maximize socio-economic benefits, the establishment of small-scale, community-run tourism enterprises is essential. These may include:

- Homestays
- Tea-tasting experiences or plantation tours
- Local food stalls and handicraft shops
- Eco-guiding and trekking services
- Cultural and heritage interpretation programs

Such activities enable revenue generation while preserving local identity and promoting responsible tourism.

4. Develop a Strategic Eco-Tourism Master Plan

A comprehensive, stakeholder-inclusive eco-tourism master plan should be developed to guide long-term development. The plan should address:

- Zoning of high-, moderate-, and low-impact tourist areas
- Carrying capacity limits
- Environmental protection guidelines
- Visitor management strategies

- Emergency response measures in steep or forested zones
- Monitoring and evaluation frameworks

This plan must be led by local authorities in collaboration with estate management companies, tourism experts, and community representatives.

5. Strengthen Environmental Conservation Initiatives

Environmental sustainability must remain central to eco-tourism development. Recommended interventions include:

- Protecting forest edges and reforesting degraded slopes
- Establishing biodiversity conservation programs
- Implementing nature interpretation points
- Conducting waste management and anti-littering campaigns
- Monitoring sensitive sites through community ranger programs

These actions would maintain Dambethenna's ecological appeal and support long-term environmental stewardship.

6. Promote Digital Marketing and Destination Branding

To attract responsible tourists, Dambethenna should develop a recognizable identity as a highland eco-tourism destination. This can be supported through:

- Social media campaigns
- Professional photography and video storytelling
- Partnerships with domestic travel influencers
- Collaborations with travel agencies and eco-lodges
- Creation of an official website or digital map featuring trails, viewpoints, and attractions

Digital promotion will expand visibility and attract nature-focused travellers seeking authentic, low-impact experiences.

7. Encourage Policy Support and Public–Private Partnerships

Government support is essential for infrastructure development, training programs, and regulatory frameworks. Partnerships between estate companies, tourism authorities, and local communities would facilitate:

- Shared investment in eco-tourism facilities
- Co-management of viewpoints and forest areas
- Joint preservation and revenue-sharing models
- Long-term stewardship of natural resources

Such partnerships ensure that tourism development remains collaborative and sustainable.

7.3 Final Remark

Eco-tourism presents a viable pathway for enhancing sustainable development in Dambethenna Estate. With its striking landscapes, rich cultural heritage, and unique plantation environment, the region possesses all the foundational characteristics of a successful eco-tourism destination. However, harnessing this potential requires thoughtful planning, community empowerment, environmental stewardship, and coordinated stakeholder action. If implemented effectively, eco-tourism can contribute meaningfully to regional development while preserving the ecological

and cultural integrity of Dambethenna for future generations.

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