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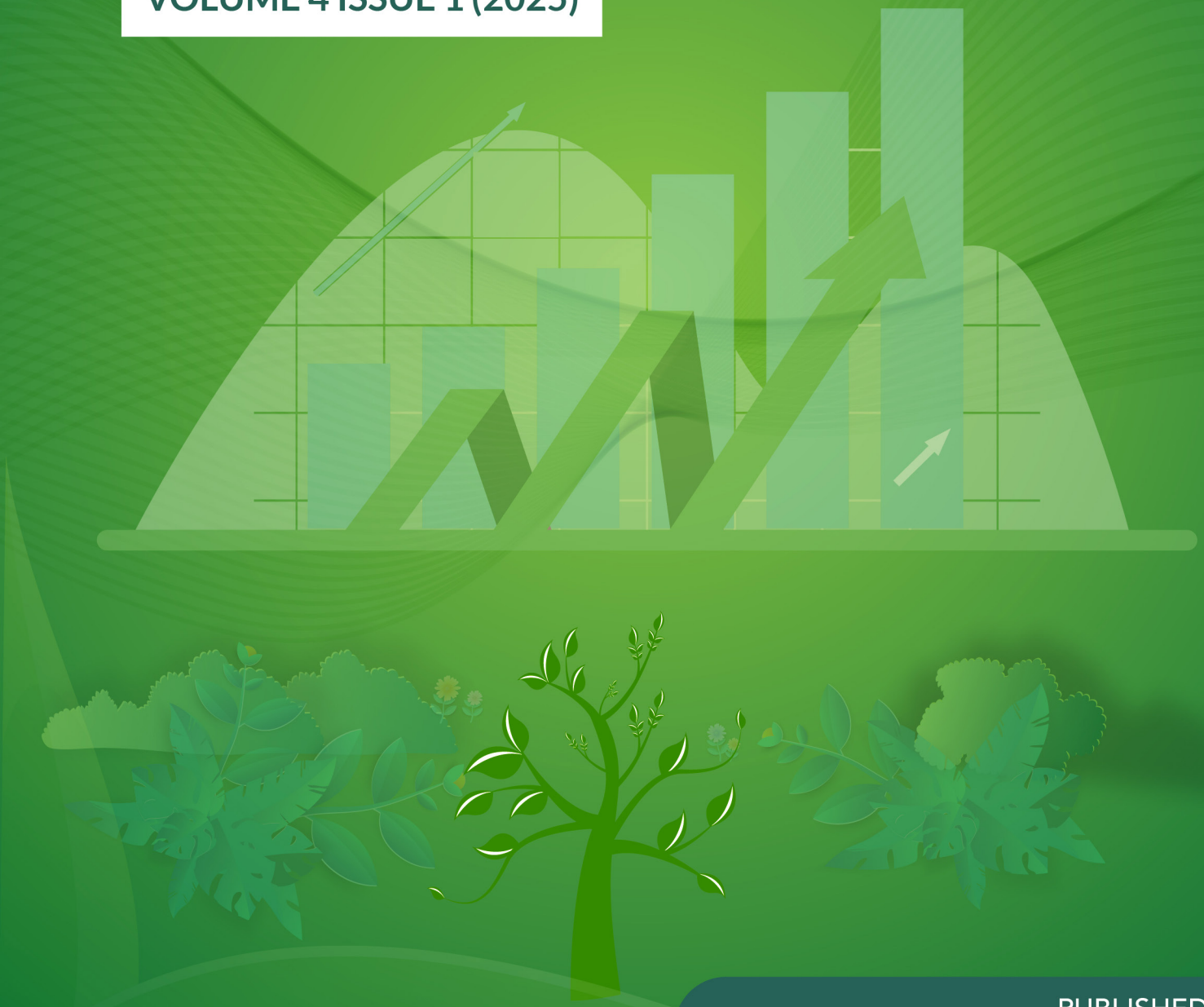

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Hiking Trails Economic and Social Impact: The case of the Lebanon Mountain Trail

Jad Abou Arrage[1], Rita Abboud[2], Omar Sakr[3*]

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ABSTRACT

The Lebanon Mountain Trail (LMT), spanning 450 kilometers, plays a pivotal role in fostering sustainable tourism and enhancing local and rural economic development in Lebanon. In order to assess its role and impacts, this study evaluates the socio-economic contributions of the LMT by employing Travel Cost (TC), Contingent Valuation (CV), and Cost-Benefit Analysis (CBA) methods. To ensure a comprehensive analysis, data were systematically collected through a combination of surveys and key informant interviews. The results of the study indicate that the LMT generates substantial annual economic value, ranging between 17 million USD and 34 million USD. Moreover, the benefit-cost ratio (BCR) demonstrates the LMT's strong return on investment, reaching 42.6 under conservative scenarios and 85.2 under optimistic scenarios. These findings suggest that each dollar invested in the LMT yields substantial returns, underscoring its attractiveness as a sustainable investment. Beyond these aggregate economic contributions, the analysis further delineates direct and indirect economic effects, with the Type 1 multiplier highlighting significant re-spending effects within the local economy. However, while this study emphasizes the LMT's crucial contributions to community development and tourism enhancement, it also acknowledges certain limitations, particularly in capturing induced economic effects. As a result, the study suggests avenues for future research to address these gaps and refine the economic assessment. In conclusion, these findings reinforce the necessity of adopting sustainable management practices and implementing strategic policy interventions to further amplify the LMT's positive role within Lebanon's socio-economic and environmental frameworks.

INTRODUCTION

The Lebanon Mountain Trail (LMT) serves as a prime hiking destination in Lebanon, promoting both sustainable tourism and heritage preservation. Stretching 450 kilometers from Aandqet in the north to Marjaayoun in the south, the trail connects over 75 towns and villages, offering a unique platform for rural development and cultural exchange. Designed with a strong commitment to sustainability, the LMT champions responsible travel to mountain and rural areas, fostering local economic development and promoting environmental conservation through community-based tourism initiatives. More broadly, trail networks such as the LMT are widely recognized for their multifaceted socio-economic benefits. In addition to generating revenue through tourism, long-distance hiking trails play a crucial role in creating local employment, particularly within the tourism and hospitality sectors. At the same time, they encourage environmental stewardship and active community engagement, as evidenced by numerous studies (Brownson *et al.*, 2000; Bennett *et al.*, 2003; Bowker *et al.*, 2004; Otto *et al.*, 2007; Bedford County Commissioners & Fulton County Commissioners, 2014; Lake, 2014; McConnell *et al.*, 2015; Kim & Miller, 2019; do Val Simardi Beraldo Souza *et al.*, 2019; Lukoseviciute *et al.*, 2022a). Given the recognized significance of the LMT, a comprehensive study was conducted in 2024 to assess its socio-economic impact. More specifically, this study pursued three primary objectives: (1) to analyze trail visitor demographics and usage patterns, (2) to assess the trail's direct and indirect economic contributions to local communities, and (3) to estimate the economic value of the trail using the Travel Cost (TC), Contingent Valuation (CV), and Cost-Benefit Analysis (CBA) methods. To achieve these objectives, a mixed-methods approach was employed, seamlessly integrating quantitative data derived from user surveys and economic impact analyses with qualitative insights obtained through key informant interviews. By combining these methods, the study offers a robust and holistic assessment of the LMT's economic footprint and its broader implications for sustainable tourism and rural development in Lebanon.

LITERATURE REVIEW

Trails and Tourism

Trails play a fundamental role in tourism by facilitating access to natural and cultural heritage sites, fostering public engagement with the environment, and contributing to the advancement of sustainable tourism practices. Rooted in ancient pathways, trails have historically served as essential connectors between communities, evolving into carefully managed routes designed to accommodate a variety of recreational activities, including hiking, biking, and horseback riding (Lukoseviciute *et al.*, 2022b; IUCN, 2021). To ensure their effective design and management, trails are classified based on specific criteria, as outlined in Table 1. This classification framework not only helps optimize trail functionality for diverse user groups but also plays a crucial role in minimizing ecological impact and preserving the integrity of natural landscapes.

[1] Department of Environmental Health, Faculty of Health Sciences, American University of Beirut, Lebanon
[2] Lebanon Mountain Trail Association, Lebanon
[3] Department of Hospitality and Tourism, Faculty of Business Administration and Economics, Notre Dame University, Louaize Lebanon
[*] Corresponding author's e-mail: omarsakr7@gmail.com

Table 1: Classification of Trails Based on Location and Intended Use

Category	Description and Definition	Tourism Activity
Urban Trails	Trails located within or near urban areas, providing easy access to recreational activities for city dwellers (Abraham & Ramaswamy, 2013)	Popular for walking, jogging, and biking, attracting both residents and tourists.
Rural Trails	Trails found in rural settings, often surrounded by natural landscapes (Bedford County Commissioners, 2014)	Attract tourists seeking nature experiences and rural charm.
Heritage Trails	Trails that highlight historical, cultural, or archaeological sites (Bowker *et al.*, 2004)	Attract tourists interested in history, culture, and educational tours.
Nature Trails	Trails that run through natural landscapes, often within protected areas (Du Preez & Lee, 2016)	Popular among ecotourists, bird watchers, and nature enthusiasts.
Multi-Use Trails	Trails designed for various activities such as walking, biking, and horseback riding (Scipione, 2014)	Frequented by a diverse group of users, enhancing their recreational appeal.
Water Trails	Routes on navigable waterways used for activities like kayaking, canoeing, and boating (Pollock *et al.*, 2012)	Attract tourists interested in water-based recreation and scenic waterway views.
Mountain Trails	Trails located in mountainous regions, offering challenging terrains and scenic vistas (Heintzman, 2020)	Popular among adventure tourists, hikers, and mountaineers.
Forest Trails	Trails within forested areas, providing shaded paths and opportunities for wildlife observation (Cordell *et al.*, 2021)	Attract nature lovers, bird watchers, and educational groups.

According to the classification system presented in Table 1, the Lebanon Mountain Trail (LMT) can be primarily categorized as a rural, nature, and mountain trail. Regardless of their specific classification, trails provide a wide range of valuable services that promote environmentally responsible recreation, including hiking, biking, and wildlife observation. As a result, these activities not only enhance visitor experiences but also contribute to both physical and mental well-being (Brownson *et al.*, 2000; Bennett *et al.*, 2003; Otto *et al.*, 2007; Bedford County Commissioners & Fulton County Commissioners, 2014; Lake, 2014; Kim & Miller, 2019). From an economic standpoint, trails play a significant role in stimulating local economies by generating tourism-related employment and fostering diverse rural tourism activities, which, in turn, drive business growth (McConnell *et al.*, 2015). Moreover, trail tourism has a considerable impact on local expenditure, particularly in sectors such as accommodations, food and beverage, guiding services, and retail. This increased spending not only fosters the development of local enterprises but also strengthens overall community well-being (Bowker *et al.*, 2004; Pollock *et al.*, 2012; Du Preez & Lee, 2016). Given these substantial economic contributions, conducting economic analyses of trail-related tourism is essential for accurately assessing its impacts and evaluating its benefits. Furthermore, such analyses are crucial for informing strategic planning and decision-making, ultimately shaping policies that support both sustainability and economic resilience in tourism destinations (Lawson, 2022).

Economic Valuation of Trails

While trail-related tourism serves as a significant driver of economic growth, standardized methodologies for accurately measuring its economic impact remain underdeveloped. One of the key challenges in this regard is that trails attract a diverse range of users, each with varying preferences for accommodations, guiding services, and trip durations. As a result, this diversity leads to considerable variation in spending patterns, making it difficult to establish a uniform approach to economic assessment. Nevertheless, these differences highlight the crucial role of visitor expenditures in supporting local job creation and sustaining businesses both within and beyond established trail networks (Bowker *et al.*, 2004; Pollock *et al.*, 2012; Du Preez & Lee, 2016). Given the complexity of trail-related economic activity, a comprehensive understanding of its broader contributions is essential for robust economic assessment (do Val Simardi Beraldo Souza *et al.*, 2019). Accordingly, reliable economic data serve as a fundamental tool in guiding informed decision-making processes related to both trail development and environmental protection (Lawson, 2022). To ensure a holistic evaluation, the Total Economic Value (TEV) framework is particularly instrumental, as it encompasses both use and non-use values of trails. Within this framework, use values include direct, indirect, and option values, while non-use values encompass bequest and existence values (Moran, 2005). The specific methodologies employed for estimating these values are presented in Figure 1.

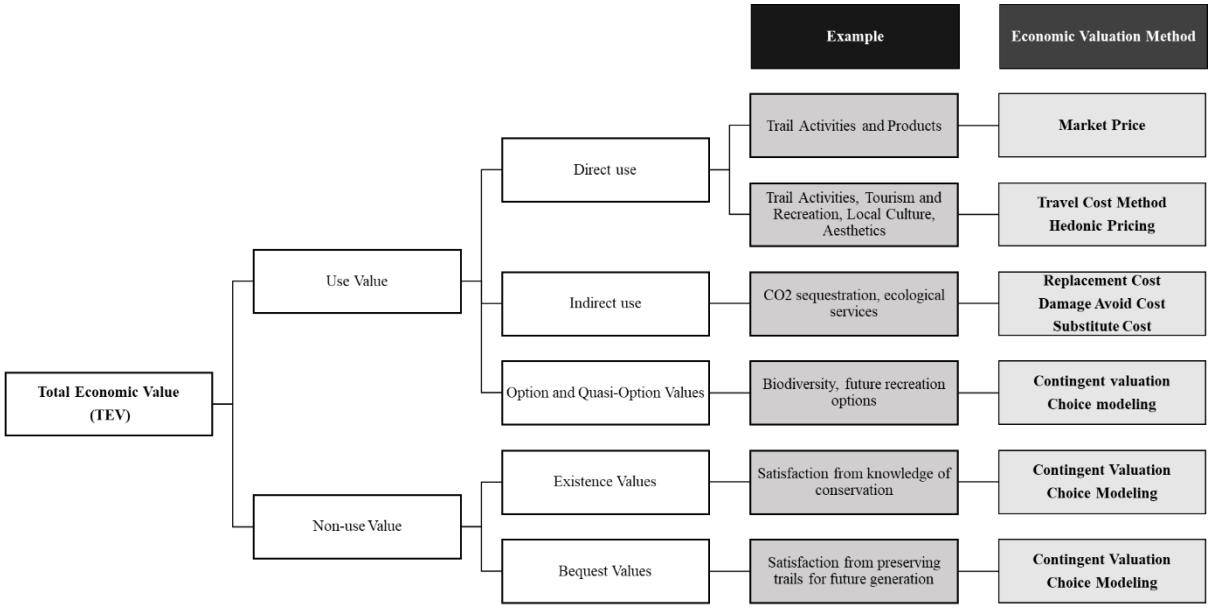

Figure 1: Components of Total Economic Value and Associated Valuation Methods

To comprehensively assess the economic contributions of the LMT, this study adopts the Total Economic Value (TEV) framework, integrating two distinct methodologies: the Travel Cost Method (TCM) and the Contingent Valuation Method (CVM). Specifically, the TCM is employed to estimate use values by analyzing visitor travel expenses along the LMT, while the CVM is utilized to assess non-use values within Lebanese society, particularly in terms of willingness to pay for trail preservation. The selection of these methods is justified by several key factors. First, their accessibility to data, particularly in data-limited contexts such as Lebanon, enhances their applicability. Additionally, both approaches have been widely recognized for their effectiveness in capturing both the direct and indirect economic impacts of recreational trails. Beyond these primary valuation methods, this study also incorporates Cost-Benefit Analysis (CBA) to rigorously evaluate the economic feasibility of the LMT, thereby providing a more comprehensive assessment of its overall benefits (Table 2).

Table 2: Overview of Economic Impact Assessment Tools

Assessment Methods	Type	Application and Strengths	Data Needs	References
Travel Cost Valuation (TCM)	Revealed Preference	Assesses economic impact through visitor spending (e.g., travel, accommodation), reflecting actual visitor behavior and expenditure.	Detailed visitor data on travel, costs, and behavior	(Bowker *et al.*, 2004; IUCN, 2007; Du Preez & Lee, 2016; Lukoseviciute *et al.*, 2022b)
Contingent Valuation (CV)	Stated preference	Measures willingness to pay for environmental goods or services. Effective for non-market goods, assesses non-use values.	Survey data on willingness to pay	(Baral *et al.*, 2007)
Cost-Benefit Analysis (CBA)	Additional approach	Evaluates costs and benefits of projects, providing a clear numeric representation of project feasibility.	Cost and benefit data on projects	(Hans *et al.*, 2005; Bowker *et al.*, 2007; Otto *et al.*, 2007; McDonald, 2015)

Economic Impact of Trails

Economic impact analysis serves as a fundamental tool for understanding the influence of recreational trails on local, regional, and even national economies. By providing a detailed assessment of economic contributions, such analyses enable local managers to prioritize investment areas and promote sustainable development (Lukoseviciute *et al.*, 2020). More specifically, by examining visitor spending patterns, economic impact assessments effectively capture changes in income, employment, and overall economic output within a given region (Çela *et al.*, 2009; Pollock *et al.*, 2012; Maria Raya *et al.*, 2018; State,

2019). In addition to quantifying economic contributions, these analyses also identify key areas where trail-related activities generate substantial economic value. As a result, they offer valuable insights that support evidence-based policy formulation and strategic management decisions. Furthermore, the economic effects of trails are typically categorized into three distinct types: direct, indirect, and induced effects, as illustrated in Figure 2. Ecotourism significantly amplifies these impacts, which recreational trails effectively facilitate. It possesses immense potential for poverty alleviation, serving as a leading source of economic growth, job creation, and income diversification in developing regions. Ecotourism sites become a major source of income for local people through direct employment as managers, guides, and service providers, as well as through the sale of local goods and services. This directly aligns with the direct, indirect, and induced effects of trail-related tourism, where visitor spending at local businesses, procurement of supplies, and subsequent household spending all contribute to economic growth (Khan, 2022).

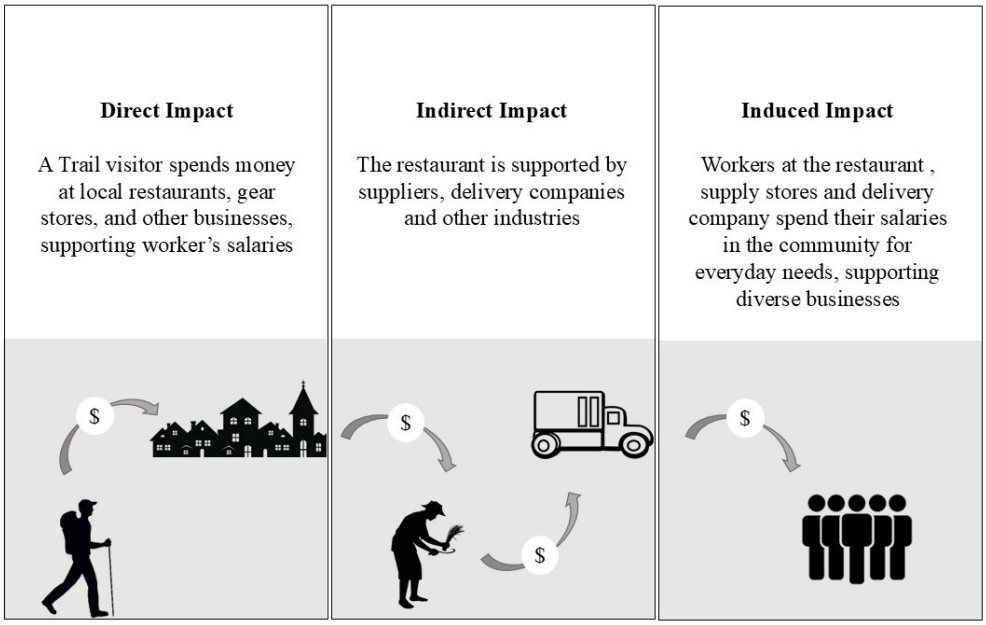

Figure 2: A representation of Direct, Indirect and Induced Impacts

Direct effects represent the most immediate economic benefits arising from consumer spending on goods and services directly associated with trail use. These expenditures typically include accommodations, food, guiding services, and recreational gear (Çela *et al.*, 2009; Lukoseviciute *et al.*, 2020). Such effects are particularly evident in business revenue generated through tourist expenditures (Lukoseviciute *et al.*, 2022b), as well as in the initial round of spending at local businesses, such as restaurants and retail stores located near the trail (Camoin Associates, 2021; Baronak *et al.*, 2022). In addition to these direct benefits, trails also generate indirect economic effects, which stem from the secondary economic activity initiated when trail-related businesses procure supplies and services from local vendors. For instance, businesses catering to trail users often stimulate local supply chains by increasing demand for raw materials, employment, and production (McDonald, 2015; Camoin Associates, 2021). As a result, regional economic output expands, as evidenced by increased supplier purchases to accommodate growing consumer demand (Çela *et al.*, 2009; Scipione, 2014). Beyond direct and indirect effects, induced effects further amplify the economic significance of trails. These effects emerge from changes in household income generated through trail-related employment and spending. More specifically, they capture how wages earned by employees in directly and indirectly affected businesses are subsequently re-spent within the local economy, generating ripple effects across multiple industries (McConnell *et al.*, 2015; State, 2019). Consequently, these consumption-driven impacts are essential for understanding the broader economic importance of recreational trails (Baronak *et al.*, 2022; Lukoseviciute *et al.*, 2022a). Taken together, these findings underscore the multifaceted economic value of recreational trails. To further conceptualize these economic interactions, the multiplier effect—originally introduced by John Maynard Keynes—provides a valuable framework for analyzing the circulation of external funds within a region, particularly in tourism-driven economies (Lukoseviciute *et al.*, 2022b). Since the 1990s, the income multiplier has been widely utilized to guide policy decisions by assessing various economic impacts, including gross output, income, value added, and employment (Archer & Fletcher, 1996; Hsu, 2019; Tafel & Szolnoki, 2020). Specifically, Type 1 Multipliers capture both direct and indirect effects, while Type 2 Multipliers extend the analysis to include induced effects (Sacks *et al.*, 2002; Lukoseviciute *et al.*, 2022a). Given the complexity of modern economies, formal economic models are

essential for conducting precise analyses, as reliance on a single multiplier may provide an incomplete assessment of economic impact (Morgan, 2010).

Economic Impact Assessment

Economic impact assessments serve as essential tools for evaluating the influence of tourism on local economies. To achieve this, various modeling approaches have been developed, including the Input-Output (I-O) model, the Keynesian-type model, and the Ad hoc model (Hsu, 2019; Lukoseviciute *et al.*, 2022b). Notably, these models differ considerably in terms of data requirements, spatial scale, and analytical costs (Table 3). Among these approaches, the I-O and Keynesian models are widely utilized due to their capacity to capture complex economic linkages. However, in data-limited contexts, the Ad hoc model is often preferred for its relative simplicity and targeted approach to analyzing tourism-related economic impacts. More specifically, the Ad hoc model estimates both direct and indirect economic effects through structured surveys of visitors, businesses, and residents. This methodology proves particularly valuable in assessing nature-based tourism in rural areas, where conventional economic data may be scarce (Archer & Owen, 1971; Lukoseviciute *et al.*, 2022b). Given these advantages, the present study adopts the Ad hoc methodology, as it offers a practical and effective means of capturing the economic impacts of recreational trails, particularly in regions where data availability is constrained.

Table 3: The comparison of the main different theoretical economic impact assessment models

Criteria	I-O Model	Keynesian- Type Model	Ad hoc Model
Definition	Estimates regional economic changes and multiplier effects through direct, indirect, and induced impacts (Bowker *et al.*, 2007; Çela *et al.*, 2009).	Assesses tourism expenditure impacts by comparing spending to economic leakages (Archer, 1977; Dwyer *et al.*, 2010).	Estimates tourism expenditure impacts using simplified formulas and local surveys (Archer & Owen, 1971; Hsu, 2019).
Data Requirements	I-O table	Employment, income or output data, tourists' expenditure, data on taxes, direct and indirect multipliers for all tourism economic sectors.	Employment, income or output data, tourists' expenditure residents' income and local expenditure.
Spatial scale	Up to spatial scale of available I-O table	No Limit	No Limit
Operational cost	High	Low	Medium
Time required for analysis	It is not time-consuming unless an I-O table or adequate data is unavailable.	It is time-consuming to collect all required data	It is time-consuming to collect all required data
The magnitude of multiplier	I-O Multiplier >	Keynesian Multiplier >	Ad hoc Multiplier
Economic sectors covered	All economic sectors	Tourism Sector	Tourism Sector

MATERIALS AND METHODS

The development of an economic assessment tool for trails, specifically applied to selected sections of the Lebanon Mountain Trail (LMT), adopts a multi-phase approach that acknowledges the multi-sectoral nature of economic impact analysis. In this context, the methodology employed in this study comprises four key steps: (1) Desk Review, (2) Choice of Economic Impact Assessment Methods, (3) Data Collection, and (4) Quantitative Analysis.

Desk Review

The desk review consisted of a structured Systematic Literature Review (SLR), a rigorous method designed to minimize bias and ensure comprehensive data collection on the economic impact and overall value of trails. Through this process, the SLR provided an in-depth analysis of advanced economic impact studies focused on recreational and nature trails, thereby ensuring both objectivity and thoroughness (Lukoseviciute *et al.*, 2022b). To achieve this, relevant articles on a range of topics, including recreational, nature, and hiking trails, ecotourism, socio-economic impact, ecosystem services valuation, and pertinent case studies, were systematically gathered. Subsequently, the collected data was then cross-referenced to identify information specifically applicable to the context of Lebanon and the LMT.

Economic Assessment Methods

The second phase of this study involved the careful selection of appropriate economic assessment methods to effectively quantify the economic value of hiking trails. In this context, drawing upon the existing literature and carefully considering the specific context of nature-based

tourism in rural areas, the Ad hoc model was chosen. Moreover, this model was implemented in conjunction with two primary economic valuation techniques: Travel Cost Valuation (TC) and Contingent Valuation (CV), as well as Benefit-Cost Analysis (BCA). These methods were selected based on their methodological accuracy, close alignment with the study objectives, and suitability for contexts characterized by limited data availability. Consequently, this second step focused on both the choice of economic assessment methods and the development of specific tools designed to capture the economic value of hiking trails (Lukoseviciute *et al.*, 2022b).

The Ad hoc model is employed to estimate both the direct and indirect economic impacts of trail-related tourism. This estimation is achieved through surveys administered to key stakeholders, encompassing trail visitors, local businesses, and residents. By calculating income multipliers derived from changes in tourist expenditure, the Ad hoc model provides a robust and practical framework for assessing economic impacts within rural, nature-based tourism settings. Its straightforward approach, coupled with its capacity to yield meaningful results despite limited data availability, renders it an optimal choice for evaluating tourism impacts in regions characterized by constrained statistical resources (Archer & Owen, 1971; Lukoseviciute *et al.*, 2022b).

The Travel Cost (TC) valuation method plays a pivotal role in evaluating the economic impact of recreational activities, particularly those that do not involve direct market transactions. More specifically, this method estimates the cost per trip based on a range of factors, including travel distance, transportation costs, and other expenditures incurred by visitors while using the trail (Bowker *et al.*, 2004; Du Preez & Lee, 2016; do Val Simardi Beraldo Souza *et al.*, 2019; Lukoseviciute *et al.*, 2022b). Fundamentally, the TC method operates on the premise that the cost of visiting a recreational site can serve as a reliable proxy for the value that visitors place on the experience. As a result, this method was selected for its capacity to generate empirical, visitor-driven data on trail-related expenditures, thereby offering a robust approach to quantifying the economic value of recreational activities in contexts where traditional market-based data is unavailable. The TC is calculated as follows:

Travel Cost (TC) = Transportation Cost (TrC) + Total Expenses (TE) per Trip ....(1)

Where transportation cost is defined as the sum of travel distance and travel time, while total expenses encompass all expenditures incurred along the trail. These include costs for local guides, food and beverage consumption, purchases of local products, entrance fees to museums and nature reserves, equipment rentals, and transportation between trail villages and sections.

Complementing the TC method, Contingent Valuation (CV) is an established economic valuation method utilized to assess individuals' Willingness to Pay (WTP) for environmental goods or services. This method involves directly eliciting participants' WTP for specific trail services or contributions to conservation efforts (FAO, 2000; Bennett *et al.*, 2003; Champ *et al.*, 2017). Even in scenarios where no direct expenditures occur during outdoor recreation, natural resources retain intrinsic value. Accordingly, the CV method effectively captures both actual consumer spending and surplus value—representing what individuals are willing to pay for recreational opportunities—and evaluates WTP for non-market goods. These non-market goods encompass recreational experiences and passive use values, such as existence, option, and bequest values (Bennett *et al.*, 2003; Otto *et al.*, 2007; Haefele *et al.*, 2016). Importantly, the CV method is particularly effective in estimating values in contexts where markets or readily available substitutes do not exist, as it accounts for existence, option, indirect use, and non-use values. WTP reflects the maximum amount individuals would pay rather than forgo an increase in a specific good or service, thereby encompassing both direct use and passive use values (Bennett *et al.*, 2003; Baral *et al.*, 2007; Otto *et al.*, 2007; Haefele *et al.*, 2016). The CV is calculated as follows:

WTP = Mean WTP for Voluntary Access Fees + Mean WTP for Donations to Protect the Trail ....(2)

Finally, Benefit-Cost Analysis (BCA) serves as a systematic approach for estimating the relative strengths and weaknesses of various alternatives. By quantifying the benefits and costs associated with each option, BCA provides a solid foundation for making informed resource allocation decisions. Notably, this method is widely applied to identify the most economically efficient alternative, incorporating not only direct and indirect economic impacts but also environmental and social benefits (Hans *et al.*, 2005; Bowker *et al.*, 2007; Otto *et al.*, 2007; McDonald, 2015). The equation for BCA is as follows:

Benefit-Cost Ratio = (Total Benefits (B))/(Total Costs (C)) ....(3)

In this equation, B represents the monetary and non-monetary benefits derived from the trail, or its economic value, while C encompasses all costs related to trail management, maintenance, and promotions. In this study, BCA is employed to evaluate the overall economic efficiency of the LMT. Specifically, it assesses direct, indirect, and socio-economic impacts to inform decisions pertaining to LMT management and conservation. This method was chosen for its demonstrated ability to provide a comprehensive evaluation of the LMT's economic efficiency. By rigorously comparing benefits and costs, BCA ensures that resources are allocated in a manner that maximizes both economic and societal gains.

Data Collection and Quantitative Analysis

The final steps in the methodology involve a structured approach to fieldwork and data collection, utilizing tools specifically tailored to the context of Lebanon and the selected sections of the LMT. Although international studies provide valuable insights into the economic impact of trails (Casey *et al.*, 1995; Pollock *et al.*, 2012; Scipione,

2014), there remains a notable scarcity of data specific to Lebanon. To bridge this critical gap, the study employs a mixed-methods approach, combining surveys and key informant interviews with a diverse range of stakeholders, including trail users, tour organizers, and local service providers. By integrating these multiple perspectives, the study ensures a comprehensive and contextually relevant economic assessment of the LMT. The study design flowchart, which outlines the methodology and data collection process, is presented in Figure 3.

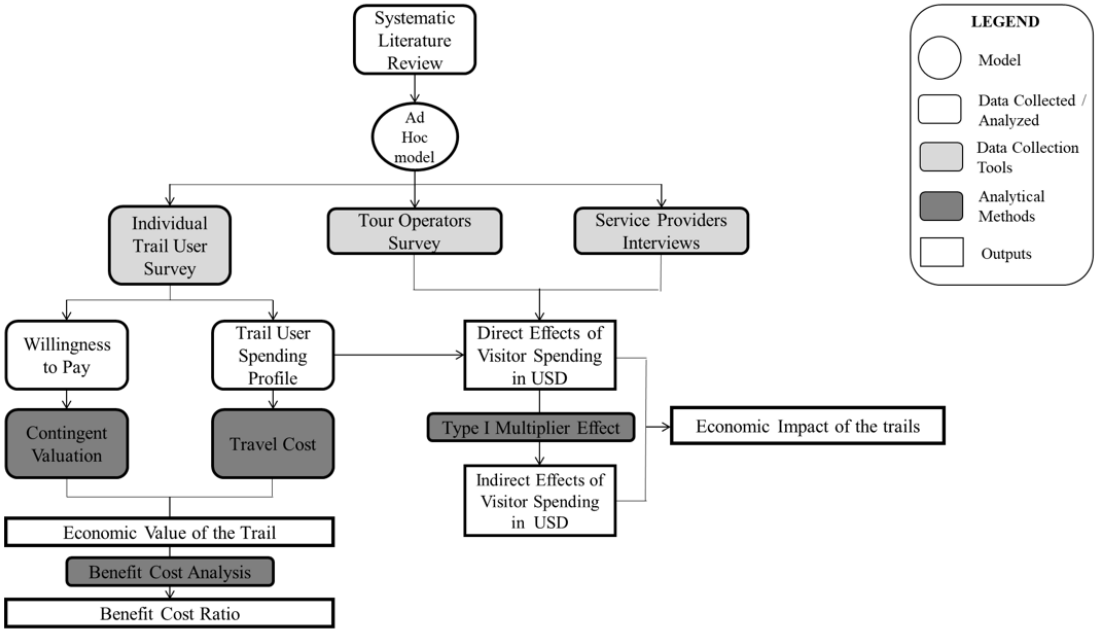

Figure 3: The Study Design Flowchart

Surveys

In response to the absence of prior studies on the LMT's economic impact, this study adopted a data-driven methodology. Given that traditional economic models typically rely on inputs such as annual family income, they were deemed unsuitable due to these data gaps. As an alternative, detailed surveys and interviews were employed to gather context-specific data, despite their time-intensive nature. To ensure a comprehensive assessment, the methodology involved the design and administration of two distinct online surveys targeting different stakeholder groups. First, a survey completed by 200 trail users in March 2024 collected data useful for the calculation of the recreational value of the trail using the Travel Cost method, and the existence value of the trail using the Contingent Valuation methods. To mitigate potential biases in responses, the survey was structured to first gather information on respondents' trip expenditures including demographics, travel details, hiking habits, spending patterns, and all travel-related-costs, before inquiring about their willingness to donate for the LMT protection and maintenance, and to pay access fees to the trail. Second, a separate survey targeted 16 Lebanese tour operators involved in hiking activities along the selected LMT sections. Specifically, this survey explored socio-demographics, trail usage patterns, stakeholder interactions, and the potential for volunteer engagement. By incorporating these diverse perspectives, the study provided a comprehensive understanding of the tourism industry's perception of the trail's economic contributions (Seville *et al.*, 2014). Both surveys were strategically disseminated via Google Forms in February 2024, with the LMTA facilitating distribution through its extensive networks. Furthermore, a snowball sampling approach was employed, leveraging respondents to refer additional participants, thereby expanding reach and ensuring broader representation. To enhance the reliability and validity of the collected data, all survey instruments underwent pre-testing and iterative refinement in collaboration with the LMTA. This rigorous process incorporated feedback to improve clarity and ensure alignment with the study's objectives. Ultimately, the collected data from both surveys proved critical for capturing direct spending on the LMT and estimating its economic value using the Travel Cost and Contingent Valuation methods (Tomes *et al.*, 2005; Trail Facts, 2005; Scipione, 2014; Lawson, 2022).

Key Informant Interviews:

To ensure a representative sample, the local service providers interviewed for this study were strategically selected to cover different sections of the LMT across the five Lebanese governorates through which it passes, as illustrated on the map (Figure 4). This selection process was designed to capture diverse tourism dynamics across various regions of Lebanon, including areas characterized by seasonal tourism and limited infrastructure, as well as those with year-round tourism and enhanced services. By

incorporating these varied contexts, the study provides a comprehensive understanding of tourism variations, particularly in terms of indirect economic impacts. Notably, the selected trail sections range in length from 13 to 24 kilometers. In total, 30 local service providers were interviewed using a combination of face-to-face and telephone methods. The primary objective of these interviews was to estimate the economic value of the LMT through market demand analysis and an assessment of the spending patterns for services and activities offered along the trail. In this regard, the data provided by trail service providers complemented the trail users' survey data and facilitated the estimation of average expenditures on key trail services and activities, such as accommodation, food, and guiding. This, in turn, offered a more refined measure of the trail's direct economic impact.

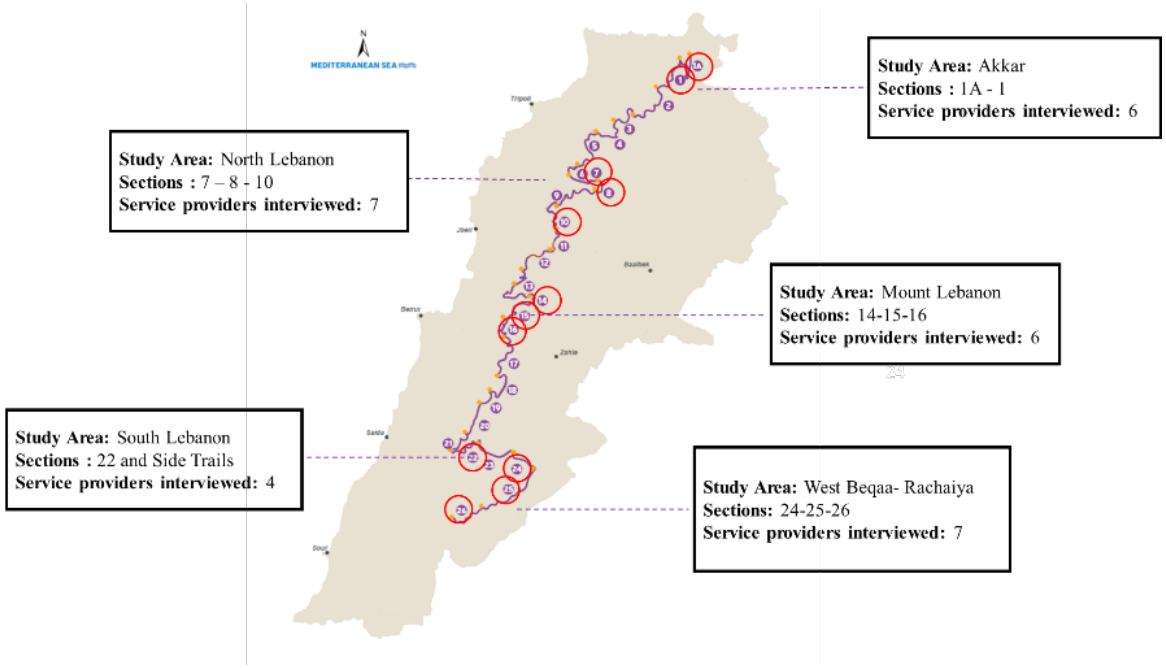

Figure 4: Selected sections along the Lebanon Mountain Trail

RESULTS AND DISCUSSION

The results and discussion section is structured into three parts: (1) Trail Users Profile, (2) Service Providers Profile, and (3) a Comprehensive Economic Assessment. The trail user profile examines demographics, including residence, gender, age, income, employment, and marital status, as well as motivations for trail use, trail preferences, seasonal activity patterns, group composition, and accommodation choices. Insights from service providers, such as guides, accommodations, and local businesses, shed light on their economic contributions and perspectives. The Comprehensive Economic Assessment encompasses estimations of the Economic Value, which includes the recreational value of the trail assessed using the Travel Cost method and the existence value of the trail measured through the Contingent Valuation method. Furthermore, a Cost-Benefit Analysis (CBA) is conducted to evaluate the overall benefits of the LMT. Additionally, the Economic Impact is determined by both the direct and indirect economic impacts of the trail, along with the calculation of the associated multiplier effect.

Trail Users Profile

Table 4 presents a summary of key findings from the survey of trail users along the LMT, showcasing respondents' demographics, interests, trail usage patterns, expenditures, and accommodation preferences.

Table 4: Survey Findings on LMT Users

Category	Findings
Demographics	Nationality: 93% Lebanese, 7% foreigners (local appeal, growing international interest).
	Gender: 63.4% male, 36.6% female. Outdoor activity participation is typically more balanced than on the LMT (Scipione, 2014; Outdoor Foundation, 2022)
	Age: 26–35 (29.7%), 46–55 (27.7%), 36–45 (21.8%), 18-25 (10%) and 56-65 (8.9%)
	Household Income: <$1,000 (21.8%), $1,000–$2,000 (24.8%), , $2,001–$3,000 (18%), >$3,000 (35.3%). Results confirm that participation in outdoor activities tends to increase with income (Heintzman, 2020).

	Employment: Private sector (52.5%), freelancers (26.7%), public sector (6%), retired (5%), students (6%). Lower retiree participation compared to global trends (Lu & Lee, 2019)
	Marital Status: Married (53.5%), single (41.6%), divorced (3.9%) and 1% widowed. Consistent with similar studies (Abraham & Ramaswamy, 2013).
Interest	Motivation: Nature/cultural discovery (81.2%), tourism/recreation (77.2%), health/exercise (59.4%), Sports/fitness: 56.4%, Work/research (19.8%), reconnecting with heritage (2%).
Trail Use	Most Popular Sections: Sections 6, 10, 13, 16, 18, 19, and side trails (Douma/Ehmej).
	Seasonal Use: Spring (57.4%) peak season, autumn (42.6%) growing demand, summer (29.7%) climate factors affecting trail use, winter (23.8%) affected by trail accessibility.
	Usage Pattern: 60% on Weekdays and 40% on weekends, differing from global weekend-preferred patterns.
Activities	Recreational hiking (85.1%), long-distance trekking (37.6%), snowshoeing (25.7%), Walking a pet (10.9%), trail running (8.9%), mountain biking (4%), birdwatching (6.9%).
Group Composition	83.3% in groups, 33.7 % in Couples and 16.8% alone.
Accommodation	Guesthouses (80.3%), mountain hostels (21.6%), religious accommodations (37.8%), camping (32.4%). Less preference for hotels, chalets, apartments, bungalows, and Airbnb.

Service Providers Profile

Building on the findings from interviews conducted with 30 service providers across five sections of the LMT, the demographic data reveals a predominantly male representation (63.3%), while females constitute 36.7% of the respondents. Notably, the interviewed service providers represent a diverse range of sectors that contribute to the local economy along the LMT. Specifically, these include guides (26.7%), accommodation providers (90%), food and beverage services (83.3%), experiential activities (36.7%), sales of local products (13.3%), reserve managers (3.3%), and ski trainers (3.3%). It is important to highlight that some providers offer multiple services, reflecting the multifunctional nature of rural businesses in the region. In terms of age distribution, the majority of service providers fall within the 36-45 (30%) and 46-55 (30%) age groups, with a significant portion also represented in the 56-65 age category (26.7%). Regarding marital status, 60% of the tourism service providers are married, indicating substantial family involvement in their operations. Additionally, 23.3% of respondents reported having households with seven or more members, underscoring the prevalence of large family sizes. From an economic perspective, income data reveals that 66.7% of service providers earn less than $1,000 per month, highlighting widespread financial constraints within this sector. Furthermore, business registration is reported by 56.7% of respondents, suggesting that nearly half of the service providers operate informally. On average, service providers employ 6.7 workers, a relatively high number given the rural nature of tourism businesses in the region. Overall, these findings underscore the diverse demographic and economic landscape of service providers along the LMT, shedding light on both the challenges and opportunities for fostering sustainable tourism development.

Comprehensive Economic Assessment

Economic Value: The Economic Value of the LMT is determined by adding the (a) Travel Cost and (b) the Contingent Valuation, thereby providing a comprehensive assessment of the trail's monetary significance.

To calculate the Travel Cost for trail users, transportation costs must be added to direct expenses. Transportation costs comprise travel distance, travel time, and petrol expenses, while direct expenses include costs for food, local guides, entrance fees, and other trip-related expenditures. The transportation cost has two primary components: travel distance cost and travel time cost. Travel distance cost is calculated at $0.2 per kilometer, based on a petrol cost of $20 per gallon for 100 km. Travel time cost is calculated at $1.25 per hour, reflecting the average wage in Lebanon. The formula for total transportation cost is:

Transportation Cost (Trc) = (Travel Distance x 0.2) + (Travel Time x 1.25) ....(4)

The average transportation cost per trail user is $40.02. To estimate the total number of trail users, Lebanon's population of approximately 4,000,000 was considered, with 69% (aged 15 to 65) deemed the potential trail user demographic. Assuming 10% of this demographic are actual trail users, this yields 276,000 individuals. Two scenarios were then estimated: a conservative estimate where 25% of potential trail users engage with the trail once per year (69,000 visits annually), and an optimistic estimate where 50% engage (138,000 visits annually). These figures represent a range of potential usage levels for the LMT (Figure 6). In the conservative scenario (69,000 users in 2024), the total transportation cost is $2,761,380. In the optimistic scenario (138,000 users), the total transportation cost is $5,522,760.

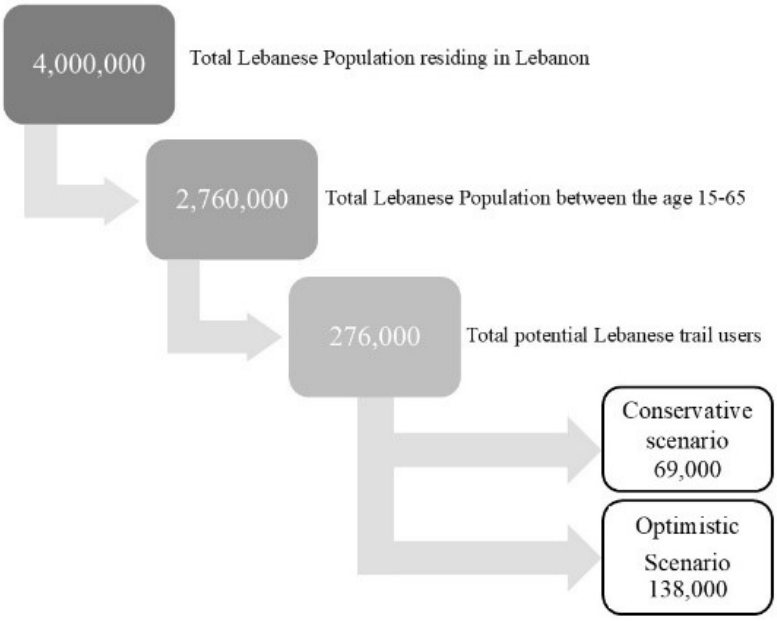

Figure 6: Estimated Number of Trail Users in Lebanon: Optimistic and Conservative Scenarios

In order to complete the Travel Cost calculation, the average total expenses per person and per visit to the LMT were calculated. These trip-related expenditures encompass costs for food, local guides, entrance fees, local products, and other items such as equipment and transportation during the trail visit. The average total expenditure is $36.60 for a one-day trip and $103.37 for a two-day trip. These figures were derived by averaging estimates provided by users, service providers, and tour operators. Survey results indicate that 87% of respondents spend one full day on the trail, while 53% spend two full days and one night. Total expenditures were calculated by multiplying these percentages by the conservative (69,000 users) and optimistic (138,000 users) scenarios, and subsequently multiplying the results by the average expenditure per trip. In the conservative scenario, total expenditures are estimated at $2,198,898.90 for one-day trips and $3,790,480.50 for two-day trips. In the optimistic scenario, estimated expenditures increase to $4,397,797.80 for one-day trips and $7,580,961.00 for two-day trips. To calculate the total travel cost (TC), the transportation cost (TrC) is added to the total expenses (TE) for both one-day and two-day trips, and for both scenarios. This results in a total travel cost (TC) of $9,872,699.40 for the conservative scenario and $19,745,398.80 for the optimistic scenario (Table 5 and Table 6).

Table 5: Travel Cost Value for the Conservative Scenario

Duration	Percentage of survey responses	Number of estimated visits	Total Expenditures	Transportation Cost	Travel Cost
1 day	87%	60,030	$2,198,898.90	$2,413,206.00	$4,612,104.90
2 days	53%	36,570	$3,790,480.50	$1,470,114.00	$5,260,594.50
				TOTAL	$9,872,699.40

Table 6: Travel Cost Value for the Optimists Scenario

Duration	Percentage of survey responses	Number of estimated visits	Total Expenditures	Transportation Cost	Travel Cost
1 day	87%	120,060	$4,397,797.80	$4,826,412.00	$9,224,209.80
2 days	53%	73,140	$7,580,961.00	$2,940,228.00	$10,521,189.00
				TOTAL	$19,745,398.80

To comprehensively assess trail users' willingness to pay (WTP) for access to the LMT, as well as for its protection and development, the Contingent Valuation (CV) method was employed. The findings indicate that the mean WTP for donations was $112.25 per person, whereas the mean WTP for voluntary access fees was $5.10 per person. Building on these individual estimates, an extrapolation to the entire user base was conducted under two scenarios. In the optimistic scenario, the total estimated WTP for donations reached $13,924,062, while the estimated WTP for access fees amounted to $412,564.80, leading to an overall total WTP of $14,336,626.80. Conversely,

in the conservative scenario, the total WTP for donations was estimated at $6,962,031, and the WTP for access fees at $206,282.40, culminating in a total WTP of $7,168,174.02. These findings highlight the potential financial contributions that could be mobilized for the sustainable management and conservation of the LMT.

The aggregate Economic Value of the LMT is determined by adding the TC and CV, thereby providing a comprehensive assessment of the trail's monetary significance. In the conservative scenario, TC is estimated at $9,872,699.40, while CV amounts to $7,168,174, leading to a aggregated economic value of $17,040,873.40. Conversely, in the optimistic scenario, TC increases to $19,745,398.80, and CV rises to $14,336,626.80, resulting in a higher aggregated economic value of $34,082,025.60. These figures underscore the substantial financial worth of the LMT, reflecting both direct expenditures and users' perceived value of the trail.

To further evaluate the economic viability of the LMT, a Cost-benefit Analysis (CBA) was conducted. This approach assesses the profitability of investing in the trail by considering both private and social costs and benefits. The benefit-cost ratio (BCR) serves as a key indicator of cost-effectiveness, where a BCR greater than 1 signifies a financially viable investment. In the conservative scenario, the analysis reveals total annual benefits of $17,040,873.40 against an annual cost of $400,000, yielding a BCR of 42.60. This implies that for every $1 invested, the trail generates a net benefit of $41.60. Meanwhile, in the optimistic scenario, total benefits increase significantly to $34,082,025.60, leading to a BCR of 85.21. This indicates an even higher net benefit of $84.21 per $1 invested. These findings highlight the strong economic impact of the LMT, demonstrating its significant return on investment and its potential as a catalyst for sustainable rural development.

Economic Impact

To quantify the direct economic impact of the LMT, data collected from the sample population was extrapolated to the estimated total number of trail users. This process involved several key steps. First, the average economic impact per category was calculated, as presented in Table 7. Next, the percentage of users in each category was determined. Finally, these percentages were applied to the estimated total number of trail users to project the overall economic impact.

Table 7: Direct Economic Impact of hiking trails along the LMT

Income Source	Conservative Scenario Value ($)	Optimistic Scenario Value ($)
Total accommodation income	1,126,233.96	2,252,467.91
Total local guide income	102,792.50	205,585.00
Total income from meals in facilities along the LMT	1,348,987.00	2,697,974.00
Total income from equipment and tool rental	282,244.50	564,489.00
Total expenditure on transportation	859,356.90	1,718,713.79
Total income from locally produced items	2,780,729.00	5,561,458.00
Total income from museum entrance fees	146,906.52	293,813.04
Total income spent on local shops	1,105,365.39	2,210,730.78
Total income spent on entrances to reserves	296,182.50	592,365.00
Total Income	8,048,797.27	16,097,596.52

The results indicate a significant economic contribution of the LMT, varying based on the estimation approach used. Under the conservative scenario, the total direct economic impact is estimated at $8,048,797.27. In contrast, the optimistic scenario suggests a higher economic impact, reaching $16,097,596.52. These estimates underscore the LMT's role as a driver of economic activity, reinforcing its value as a key component of Lebanon's nature-based tourism sector.

In addition to the direct economic contributions of the LMT, its indirect economic impact is generated through the re-spending of income within the local economy by vendors, suppliers, and households. This process creates a ripple effect, amplifying the initial economic benefits. To estimate these indirect effects, a multiplier of (1.5 - 1) was applied, as suggested by Woodfin (2010). By incorporating this multiplier into the analysis, the indirect economic impact was derived from the direct economic impact figures. Accordingly, in the conservative scenario, the estimated indirect economic impact amounts to $4,024,398.64, whereas in the optimistic scenario, it reaches $8,048,798.26. These figures highlight the broader economic influence of the LMT beyond direct expenditures, underscoring its role in sustaining local livelihoods and businesses.

To further assess the economic significance of the LMT, the Type 1 Multiplier—which quantifies the combined direct and indirect effects of economic spending—was calculated using the following equation:

Type 1 Multiplier = (Direct effects + Indirect effects)/ (Direct Effects) ....(5)

For both the conservative and optimistic scenarios, the Type 1 Multiplier is 1.5, meaning that for every dollar of direct expenditure, an additional $0.50 is generated in the local economy through indirect effects (Table 8). This result reflects a significant economic impact, indicating that the initial spending by trail users leads to further economic activity in the region. Compared to similar studies (Smith, 2022), the LMT's Type 1 Multiplier of 1.5 is slightly higher, likely due to the region's specific economic conditions, including the presence of local vendors and services benefiting from the re-spending of trail user expenditures.

Table 8: Type 1 Multiplier Effect for the LMT

Scenario	Direct Effects ($)	Indirect Effects ($)	Type 1 Multiplier
Optimistic Scenario	16,097,596.52	8,048,798.26	1.5
Conservative Scenario	8,048,797.27	4,024,398.64	1.5

CONCLUSION

The economic assessment of the Lebanon Mountain Trail reveals its substantial contribution to the local economy, with an estimated annual value ranging from USD 17,040,873.40 to USD 34,082,025.60. When compared against manageable annual costs of USD 400,000, these figures result in compelling benefit-cost ratios (BCR) of 42.60 and 85.21, respectively. This significant return indicates that each dollar invested in the LMT yields returns of USD 42.60 and USD 85.21, thereby affirming the trail as a highly lucrative investment. Moreover, this study underscores the importance of sustainable tourism and natural resource management in maintaining these benefits. However, it is important to note that, due to data limitations, the assessment did not fully account for induced economic effects. Consequently, this suggests that future research could provide a more comprehensive understanding of the trail's total economic impact. In light of these findings, the study confirms the Lebanon Mountain Trail's critical role in the local economy and its potential for long-term sustainability. Specifically, the findings highlight the economic benefits derived from tourism and ecosystem services, emphasizing the trail's significance as an investment in both environmental conservation and local development.

While the study presents a conservative estimate of the trail's value, it also identifies limitations in capturing the full scope of its economic impacts. Thus, the relevance of these findings is clear for policymakers and stakeholders in the tourism and conservation sectors. Moving forward, it is recommended that efforts be made to improve management practices, foster community engagement, and ensure continued research to fully realize the LMT's potential for sustainable development.

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