Gandhian Tourism: Quantifying Economic Leakage and Carbon Equity in Nepal

- by BADAL B. P.

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Abstract

Tourism based on Gandhian philosophy is Gandhian Tourism is based on regenerative tourism of 21 century. The philosophy is directly related to the sustainable regenerative responsible tourism in global perspective. In Nepal, the tourism sector, welcoming over 1.15 million international visitors in 2025 and contributing approximately 7-8% to gross domestic product while supporting more than one million jobs, predominantly in rural Himalayan regions. The rural tourism copes with deep-rooted economic leakage of 70-90% and rising carbon emissions from aviation and mechanized trekking. This research pioneers Gandhian tourism, adapting Mahatma Gandhi's tenets of Swadeshi (self-reliance) and Gramswaraj (village autonomy) to foster decentralized, community-driven rural tourism models that emphasize local sourcing, artisan-led experiences, and minimal-import homestays. Through a mixed-methods framework, including expenditure multipliers, input-output analysis, and life-cycle carbon evaluations, the study compares three Gandhian-inspired villages with three conventional ones in Mustang, Ghandruk and Saurah regions. Results demonstrate that Gandhian models retain 75-85% of revenues locally, reducing leakage by 20-30%, and limit per-tourist-day emissions by 25-35% via reduced mechanization and eco-practices. These outcomes advance equitable carbon distribution, strengthening rural

resilience and aligning with Sustainable Development Goals 8, 12, and 13, urging policy shifts toward incentivized village-led tourism for Nepal's sustainable future.

Keywords: Carbon Equity, Economic Leakage, Gandhian Tourism

Background

Nepal is an easy and open market of India and China. Due to the low level of capital, technology, and labour capacity, it is almost impossible to compete. Thus only alternative to economic backbone is tourism. Nepal's tourism sector is only one economic engine, particularly for rural and mountainous communities that host the majority of adventure and cultural experiences. In 2024, Nepal welcomed 1,147,567 international tourists, reflecting a 13.1% increase from the previous year and approaching pre-pandemic levels (Nepal Tourism Board, 2025). Similarly tourist's average stay is 13.3 days with 40.8 USD (139 NPR) NPR 5670 per day expenditure. Normally tourists stay in selected site in average 7 days. The sector contributes approximately 7-8% to gross domestic product (GDP), supports over one million jobs, and generates significant foreign exchange, with trekking, mountaineering, and heritage sites in regions like Annapurna, Everest, and Chitwan (World Travel & Tourism Council, 2024). Further, Pashupatinath, Baudhanath, Swayambhunath, Basantapur, Patan, Bhaktapur, Changunarayan, Lumbini, Chitwan national park and Sagarmatha national park are the UNESCO identified world heritage sites of Nepal. It is focused on local nature and culture.

Gandhian thought is based on community based local government's initiations of self-governance - Swaraj. Viewing responsible tourism through the lens of Gandhian thought, one can understand that it is holistic and community-centered approach with special emphasis on well-being of local people. In tourism, Gandhi's principle of non-violence ensures that tourism activities cause minimal harm to the local eco-systems (Jose, 2025). Thus tourism is the acceptance and love of local people to the guests. Despite these contributions, structural challenges persist in Nepalese Economy. Economic leakage remains a critical issue in developing destinations like Nepal, where estimates indicate that 70-90% of tourism revenue often flows out to urban intermediaries, imported goods, and foreign operators, leaving limited benefits for rural hosts (Lacher & Nepal, 2010). The economic leakage is, suppose a tourists visit Nepal from international airlines, stays in

foreign invested five star hotels, eats imported foods and drinks, and returns in same international airlines, then what is the benefit to Nepal? This leakage worsens rural poverty, widens inequality, and undermines local multipliers, as expenditures on international flights, gear, and packaged tours rarely recirculate within village economies.

Compounding these economic concerns are environmental impacts. Tourism in Nepal, heavily reliant on aviation and high-altitude trekking, contributes substantially to carbon emissions, with activities in Himalayan routes accelerating glacial melt and ecosystem degradation in climate-vulnerable areas (ICIMOD, 2024). The sector's Greenhouse Gases (GHG) intensity highlights a paradox: tourism sustains rural livelihoods but disproportionately burdens fragile environments already facing rapid warming. So regenerative and community led responsible tourism help to reduce the carbon emission and environmental degradation.

Mahatma Gandhi's economic philosophy offers a conceptual framework to address these dual challenges. Central to Gandhian thought are Swadeshi (self-reliance through local production) and Gramswaraj (village self-governance), which advocate decentralized, community-led systems prioritizing local resources, cottage industries, and minimal external dependency (Gandhi, 1938/1997). In Indian contexts, these principles have informed rural tourism models, such as ashram-based experiences emphasizing Khadi (local linen) production, artisan crafts, and eco-friendly practices that retain revenue locally while promoting simplicity and sustainability (Shaikh & Kappiarathel, 2023). Rural development in Nepal plus all over the world is turning toward the Gandhian model of development. Thus, it seems, the regenerative sustainable tourism is also directly linked with Gandhian Tourism. Although not widely applied in Nepal, Gandhian tourism economics. It is adapting Swadeshi to prioritize village homestays, local sourcing, and low-impact circuits. It presents potential for reducing leakage and enhancing carbon equity. By fostering endogenous development, such models could retain higher shares of revenue within rural radii, minimize import-driven emissions, and align with Sustainable Development Goals 8 (decent work and economic growth), 12 (responsible consumption), and 13 (climate action). Regenerative tourism is based on Gandhian thought of local sustainable eco-tourism.

This background study underscores the need for empirical quantification of leakage and emissions in Nepali rural circuits, testing whether Gandhian approaches can achieve greater retention and

lower footprints compared to conventional models. Thus regenerative tourism addresses the local values from cultural and natural tourism attributes.

Problem statement

The tourism sector of Nepal stands as a pivotal force in the national economy, contributing approximately 7-8% to gross domestic product (GDP) and sustaining over one million livelihoods, many in remote rural and Himalayan communities (World Travel & Tourism Council, 2024; Nepal Tourism Board, 2025). In 2024, Nepal hosted 1,147,567 international tourists, reflecting a robust post-pandemic recovery with a 13.1% increase over 2023 figures (Nepal Tourism Board, 2025). Yet, this growth masks profound structural inequities that undermine sustainable rural development. Tourism has created inequality and unjust in community.

A primary concern is economic leakage, where a substantial portion that is, the estimated at 70-90% in comparable developing contexts, of tourist expenditure escapes local economies through imports, foreign-owned operations, urban intermediaries, and repatriated profits (Lacher & Nepal, 2010; Krishna Chaitanya & Swain, 2024). It is the serious concern. In Nepal, reliance on imported gear, packaged tours from Kathmandu-based agencies, and international airlines diverts revenue away from village-level actors such as porters, homestay operators, and artisans, perpetuating poverty and limiting multiplier effects in rural areas. It is the Economic Leakage in tourism. Simultaneously, the Tourism sector's environmental footprint poses a severe threat. Aviation-dependent trekking and mountaineering generate significant carbon emissions, worsening climate vulnerability in the Himalayas, where glacial melt and biodiversity loss already intensify (ICIMOD, 2024). This creates a paradox: tourism drives rural income but imposes disproportionate ecological costs on host communities, eroding the natural assets that attract visitors in Nepal.

These intertwined issues, Economic Leakage in Tourism and Carbon Inequity, hinder alignment with Sustainable Development Goals, particularly on SDG 8 (decent work and economic growth), SDG 12 (responsible consumption), and SDG 13 (climate action). Conventional mass-tourism models prioritize volume over retention and sustainability, leaving rural Nepal with marginal benefits and heightened risks. Such economic leakage and carbon inequity are the challenging risk

of Nepal (Badal, 2017). SDGs are coined in regenerative sustainable tourism. The core problem lies in the failure of dominant tourism paradigms to internalize Gandhian principles of Swadeshi (self-reliance) and Gramswaraj (village autonomy), which could foster localized, low-impact on circuits retaining revenue and minimizing emissions (Gandhi, 1938/1997). Without empirical intervention, rural prosperity remains elusive, and environmental degradation accelerates. This study addresses this gap by quantifying leakage and carbon equity in Gandhian-compliant versus conventional rural circuits, testing pathways for equitable, resilient tourism economics in Nepal.

Objectives, Hypothesis and Research questions

This mixed-methods study integrates quantitative tools (expenditure tracking, input-output multipliers, and life-cycle carbon assessments) with qualitative approaches (semi-structured interviews, focus groups) to evaluate Gandhian Tourism Economics (GTE) in rural Nepal, adapting principles of Swadeshi and Gramswaraj for sustainable development (Gandhi, 1938/1997; Shaikh & Kappiarathel, 2023) encapsulating the philosophy of regenerative tourism.

Objectives

1. To quantify economic leakage and revenue retention in Gandhian-compliant versus conventional rural circuits, focusing on local sourcing and community linkages (Krishna Chaitanya & Swain, 2024).

2. To measure per-tourist-day carbon emissions across models, assessing reductions via low-impact practices (ICIMOD, 2024).

3. To explore stakeholder perceptions of empowerment and equity under Gandhian frameworks (Shaikh & Kappiarathel, 2023).

Research Questions

1. How does economic leakage differ between Gandhian and conventional circuits, and what enables local retention?

2. What variations exist in carbon footprints, and how do Gandhian practices mitigate emissions?

3. How do communities view Gandhian principles in enhancing resilience and benefit distribution?

Hypotheses

Hypotheses (H1): Gandhian models retain ≥75% revenue locally, reducing leakage significantly (Lacher & Nepal, 2010).

Hypothesis (H2): Gandhian circuits lower emissions by ≥25% through minimized imports and eco-practices (ICIMOD, 2024).

Literature Review

The philosophy of economics of Mahatma Gandhi is Swadeshi (self-reliance through local production) and Gramswaraj (self-rule by the village), which viewed the model of decentralized rural economies, emphasizing community autonomy, cottage industries, and low levels of reliance on the external environment, equitable development (Gandhi, 1938/1997). These values criticize centred industrialization and promote self-reliant villages as the basis of the real independence and sustainability, which have a direct influence on Gandhian models of tourism, which focus on local sourcing and low-impact rural experiences.

The capability approach put forward by Amartya Sen as an add-on to the Gandhian thought defines development as freedom; the increase in substantive capabilities of producing valued functioning, not just the increase in income (Sen, 1999). Sen considers freedom as an end and a means to development, which draws inspiration to the Gandhian self-reliance of advancing human agency and equity. Within the tourism environment in rural Nepal, the framework looks at the progress of the locals based on their power to keep the economic gains and reduce environmental hazards to combat the un-freedoms such as leakage and carbon susceptibility.

The theory of the gender performativity by Judith Butler states that gender is a result of a series of performance actions determined by the discursive normativity, rather than the natural essence

(Butler, 1990). When applied to the rural tourism, performativity can be used to understand how gendered roles, like homestay labor by women or guiding by men are performed and reinforced in interactions among communities, where they may potentially subvert inequalities by other performances within Gandhian compliant circuits.

By combining these theories in the mixed methods study where leakage/carbon is measured through multipliers and assessments but agency and performances are examined qualitatively, it offers a sound perspective of equitable and low-carbon tourism in rural Nepal (Sen, 1999; Butler, 1990). Theories of tourism development offer important insights into the analysis of economic leakage and carbon equity in rural tourism destinations such as Nepal. The model of Tourism Area Life Cycle (TALC) by Richard Butler assumes that the destinations pass through the following stages: exploration, involvement, development, consolidation, stagnation, and a possible potential rejuvenation or decline due to the number of visitors and the available resources (Butler, 1980). In Nepal On the rural mass trekking circuits, the traditional pattern of mass trekking usually hits a dead end, or a dead point, where leakage through imported resources and foreign operators is fruitless, and rejuvenation can only be achieved through community-led change. Pro-poor tourism (PPT) developed by Caroline Ashley and Jonathan Mitchell focuses towards strategies of directing tourism benefits to the poor through linkages, eliminating leakage and maximizing local multipliers (Mitchell & Ashley, 2010). PPT promotes local employment, sourcing and participation with community-based models, which is in line with the attempts to keep revenue local in the rural economies.

The dependency theory as applied to tourism is a critique of core periphery relations where the developing destinations continue to serve the interests of the metropolis leading to profit repatriation and high leakage (Britton, 1982). In Nepal, dependency is supported by aviation and enclave-like trekking which redirect income to the outside world. Low-carbon strategies along with sustainable tourism frameworks emphasize mitigating emissions by practices that are decentralized (Gossling, 2022). The combination of these theories in mixed-method studies such as quantification of leakage/carbon through models of input-output and investigation of perceptions through qualitative methods serve the Gandhian solutions of equitable and resilient rural tourism.

Empirically, recent mixed-methods research on Gandhian tourism economics, economic leakage, and carbon equity in rural Nepal and the like demonstrates important pieces of information. Bhandari et al. (2025) quantified the leakages (40-60%) in tourism in Nepal caused by foreign operators and showed it is high because of qualitative interviews with stakeholders and showed high leakages (40-60%) around 25 should have been reduced in GDP in rural areas. Surveys and case studies were combined to come up with sustainable tourism management research (Patel and Singh, 2025), where balanced growth models reduce carbon emissions by 20 percent of the revenue remaining local.

The communities-based tourism synthesis was done by taking global examples such as Nepal, which empirically showed that CBT would decrease the leaks down to 15 percent through the empowerment of the locals, which is in line with Gandhian swadeshi. Analytical review of Gandhian rural development by Das et al. (2025) presented mixed data in which self-reliance increases equity in Indian villages, which is adaptable to Nepal.

Nano-NTP (2025) researched all the policies of Gandhi qualitatively and quantitatively and discovered that there was a 30% decrease in emissions in decentralized rural models. Shaikh and Kappiarathel (2023) empirically examined the Gandhian thinking, finding that retention in artisan-led tourism is 50 percent more prevalent. Through content analysis and surveys, Mishra (2021) has verified that Gandhian principles reduce carbon inequity by 35% in India in rural areas (Badal, 2020).

IJNRD (2025) examined people-centred strategies, and their results were mixed with 75 percent revenue retention in Gandhian circuits. According to JMSR (2025), NSS effects were found with self-reliance reducing leakage in rural programs by 40%. Dongre (2019) visited Wardha villages, and through the empirical data, he correlates the Gandhian health/development with zero leakage and equity. In principle, this paper combines the principles of swadeshi (local production, self-reliance) and Gramswaraj (self-governance of the villages) of Mahatma Gandhi as the moderating factors to answer the question of economic leakage and carbon inequity in the tourism industry of rural Nepal (Gandhi, 1938/1997).

The traditional models of tourism, with centralized business operations, imported goods and services, and reliance on aviation, lead to high leakage (70-90% of the revenue is lost), and CO 2 emissions, which do not support the prosperity of the rural population and sustainability of the environment (Krishna Chaitanya & Swain, 2024; Lacher and Nepal, 2010). Gandhian tourism economics on the other hand, argues around a decentralized, community-based circuit that is focused on local sourcing, homestay, artisan crafts, and low impact activities. Such practices decrease the dependence on imports, increase the multipliers at the local level, and lessen the mechanized transportation, which decreases the leakage and emissions (Shaikh & Kappiarathel, 2023). The model postulates that the effects of Gandhian compliant models are mediated by higher revenue retention in 10 km and lower carbon footprint per tourist day.

These pathways are tested through mixed-methods quantification including input-output analysis of the leakage, life-cycle assessment of emissions, and qualitative insights into stakeholder views, which is in line with pro-poor tourism linkages and sustainable development goals (Mitchell and Ashley, 2010; ICIMOD, 2024). This frame is a Gandhian self-sufficient restructured to the Himalayan country of Nepal and encourages just, and low-carbon rural development. Sustainable destination management model, which deals with the economic and ecological interface in tourism. The theories and concepts that are significant in the conceptual framework of the studying of Gandhian Tourism Economics, such as Gandhian principles (swadeshi and gram swaraj), economic leakage and local retention, and sustainable tourism models with economical/environmental context. Sustainable destination management model, which deals with the economic and ecological interface in tourism.

Research Gaps

Although the topic of sustainable tourism has had increased coverage, there are still a few gaps in the literature associated with the economics of Gandhian tourism especially in the aspect of economic leakage and carbon equity in rural Nepal. To start with, despite the high leakages (40-60%) of tourism in Nepal by foreign operators and imports that diminish the rural GDP by 25 percent, little has been done in quantitative analyses incorporating Gandhian self-reliance (Swadeshi) to offset these effects (Bhandari et al., 2025; Krishna Chaitanya and Swain, 2024). Nepal-specific studies tend to examine macroeconomic contributions but ignore village-level

retentions models based on Gramswaraj, which is why the application of Indian Gandhian rural models to Himalayan settings is not done (Shaikh & Kappiarathel, 2023), however regenerative tourism is functioning in the globe.

Second, carbon equity is still a largely unexplored area; both tourism GHG emissions in trekking trails contribute to glacial melting, and only a few studies measure individual tourist footprints and compare them to low-carbon Gandhian options, such as community-led circuits (ICIMOD, 2024; Gossling, 2022). It is uncommon to use mixed-methods with expenditure tracking and stakeholder perceptions to shed light on equitable distribution and resilience on climate-vulnerable platforms (Baral et al., 2022). Third, policy gaps are present; even at 7 per cent GDP contribution, tourism is rarely covered by research as to how to incentivize endogenous growth, e.g. so as to reduce 70-90 per cent leakages by decentralized practices (World Travel & Tourism Council, 2024; Mitchell and Ashley, 2010). All in all, there is no interdisciplinary, Nepal-specific empirical research to benefit from scalable Gandhian models of leakage reduction and carbon mitigation.

Research Methodology

The research design of the current study is a mixed-method study, which combines both quantitative and qualitative research to measure comprehensively the economic leakage and equity of carbon and investigate the perceptions of the stakeholders in Gandhian-inspired rural tourism in Nepal (Creswell and Plano Clark, 2018). The sequential explanatory design gathers and analyzes the quantitative data and then the qualitative data to clarify and frame results, which is consistent with the complex tourism impact assessment in developing contexts (Karki et al., 2021; Lacher and Nepal, 2010). In a year when Nepal hosted over 1.158 million tourists amid fragile post-pandemic recovery, these circuits proved resilient, supporting rural livelihoods without exacerbating environmental degradation (Nepal Tourism Board, 2026). Policy implications are clear. Nepal should incentivize Gandhian-compliant tourism through subsidies for homestay training, digital marketing for direct bookings, and carbon-offset mandates favoring local models. Scaling via networks like Community Homestay could transform rural prosperity while contributing to national Net Zero ambitions (Mitchell & Ashley, 2010).

Research Design and Study Areas

The study contrasts six rural tourism circuits: three Gandhian-conformed (with focus on local sourcing, homestays, and low levels of importation of materials e.g. community-based trails in the areas of Annapurna, Mustang and Chitwan) and three traditional mass-tourism circuits. Accessibility, the number of tourists, and a representation of both the Himalayan and Terai ecosystems are to be used as the selection criteria, based on the data of Nepal Tourism Board (Nepal Tourism Board, 2025). This comparative design addresses the effectiveness of Gandhian models in minimizing leakage and emissions (Shaikh and Kappiarathel, 2023).

The paper uses an explanatory sequential mixed paradigm to examine Gandhian tourism economics in rural Nepal (Creswell and Plano Clark, 2018). The preliminary stages of the analysis and collection of quantitative data are followed by the qualitative stages, which will provide preliminary measurements on the economic leakage and carbon emissions to be used in more profound interpretations. The comparative case study method uses six rural tourism circuits (three of them are Gandhian-compliant (they focus on the issues of local sourcing and community governance) and three traditional) of the Annapurna, Mustang and Chitwan regions, in terms of ecological and operational diversity (Nepal Tourism Board, 2025). It is a design that allows testing the influence of the Gandhian principles on retaining the revenue and carbon equity rigorously and considering the contextual subtleties based on the stakeholder perspectives (Karki et al., 2021).

Study Area

This paper discusses three rural destinations in Nepal, which are chosen based on their depiction of different ecological areas, cultural groups, as well as tourism models that can be applied to firms that are governed by the Gandhian principles of self-reliance and community-based experiences in regenerative era.

Mustang Ranipauwa

Mustang Ranipauwa is a major pilgrimage and trekking center in the trans-Himalayan region, which is located in Lower Mustang, near the sacred Muktinath temple (altitude of about 3,710 m). The region is characterized by the arid terrain, Tibetan-influenced culture and development of the

community homestays that encourage the environmentally-friendly impacts and the empowerment of the local population in the Annapurna Conservation Area (Nepal Tourism Board, 2025; Annapurna Conservation Area Project, 2025).

Kaski, Ghandruk

Ghandruk (near Machhapuchhre), Annapurna region - A Gurung village at an altitude of approximately 1940m within the Kaski District, Ghandruk provides panoramic views of Annapurna South, Hiunchuli and Machhapuchhre (Fishtail). It has become well-known due to stone houses, Gurung museum, cultural programs, and large networks of homestays, which is a perfect example of community-based tourism with the hospitability of locals, organic meals, and sustainable trails (Community Homestay Network, 2025).

Chitwan, Saurah

Located on the Terai lowlands and bordering Chitwan National Park, Sauraha is one of the entry points to wildlife tours and immersion into the Tharu culture. One company, Tharu cooperative homestays offers real life experiences of traditional dances, village life and farm-to-table food, promoting the livelihood of locals in the face of large tourist numbers (Nepal Tourism Board, 2025).

The selection of these sites was based on the contrast between the traditional elements of mass-tourism and the potential of new Gandhian-inspired local sourcing and retention, with the 2025 tourism boom in Nepal (e.g., Annapurna 300+ 000 visitors; Mustang 161000) (Annapurna Conservation Area Project, 2025; Shaikh and Kappiarathel, 2023).

Map of Nepal showing field work

(Source: Internet, 2025)

Quantitative Methods

Economic leakage is quantified using input-output multiplier analysis and expenditure tracking surveys, adapted from established tourism leakage frameworks (Krishna Chaitanya & Swain, 2024; Lacher & Nepal, 2010). Tourist expenditure surveys (n=100 per circuit, stratified by origin and duration) trace spending across categories (accommodation, food, transport, souvenirs) to calculate retention rates within a 10-km radius versus outflows (imports, urban agencies).

Carbon equity employs Life-Cycle Assessment (LCA) principles, focusing on per-tourist-day CO_2 equivalents, including aviation, ground transport, accommodations, and activities (Gossling, 2022; ICIMOD, 2024). Emissions factors derive from International Panel on Climate Change (IPCC) guidelines and Nepal-specific data (e.g., aviation from international flights, local from diesel/mules). Tools like Excel-based models aggregate data for comparative analysis, testing hypotheses via independent t-tests (α=0.05).

Qualitative Methods

Semi-structured interviews (n=60: homestay owners, guides, officials) and focus groups (n=6, 8-10 participants each) explore perceptions of Swadeshi implementation, empowerment, and barriers. Thematic analysis identifies patterns in equity and resilience (Braun & Clarke, 2006).

Sampling and Data Collection

Purposive and snowball sampling ensures diverse stakeholders. Fieldwork spans peak/post-peak seasons (2025-2026) for robust data. Ethical considerations include informed consent, and anonymity.

Sampling Methods

This study employs a multi-stage mixed-methods sampling strategy to ensure representativeness, comparability, and depth in examining Gandhian tourism economics across rural Nepal (Creswell & Plano Clark, 2018). First, purposive sampling selected the three study areas, Ranipauwa (Mustang), Ghandruk (near Machhapuchhre, Annapurna Kaski), and Sauraha (Chitwan), based on three ecological diversity, established community homestay networks, and potential for Gandhian-compliant practices (local sourcing, self-reliance) contrasted with conventional models (Nepal Tourism Board, 2025; Community Homestay Network, 2025). Within each site, circuits were stratified into Gandhian-compliant (community-managed homestays emphasizing Swadeshi) and conventional (agency-dominated) sub-groups in regenerative tourism spectrum.

For quantitative components, stratified random sampling targeted 100 tourists per site (total n=300), proportionally allocated by visitor origin (international/domestic) and season using Nepal Tourism Board arrival data. Expenditure surveys were administered via systematic interception at key trailheads and homestays. Additionally, 60 local suppliers (homestay owners, guides, producers) per site were selected through stratified purposive sampling to trace supply chains and multipliers (Lacher & Nepal, 2010). Qualitative sampling utilized purposive and snowball techniques to recruit 20 key informants per site (total n=60), including homestay operators, community leaders, and tourism officials, ensuring gender and ethnic balance. Six focus groups (8–10 participants each) were formed via homogeneous purposive sampling to capture shared

experiences of self-reliance and equity (Shaikh & Kappiarathel, 2023). Saturation guided qualitative sample size, while power calculations ensured quantitative precision for leakage and emission comparisons. This integrated approach enhances validity and transferability in assessing Gandhian models (Karki et al., 2021).

Data Collection Methods

Data collection for this study was conducted in two sequential phases as part of the explanatory mixed-methods design, combining structured quantitative instruments with in-depth qualitative techniques (Creswell & Plano Clark, 2018). Primary data were gathered through structured tourist expenditure surveys administered face-to-face at key entry/exit points and homestay locations in Ranipauwa (Mustang), Ghandruk (Kaski), and Sauraha (Chitwan). A total of 100 tourists per site completed the 15-minute survey between October 2024 and March 2025, capturing spending across categories: accommodation, food and beverages, transportation, souvenirs, guides/porters, and entry fees. The questionnaire was adapted from validated tourism leakage instruments (Lacher & Nepal, 2010; Krishna Chaitanya & Swain, 2024). Additionally, 180 local supply chain surveys (60 per site) were conducted with homestay owners, guides, and producers to trace the origin of goods and services, enabling calculation of local retention rates.

Carbon emission data were collected via a standardized travel diary completed by tourists (n=100) and supplemented by operator-provided records of transport modes, distances, accommodation type, and fuel/electricity use. Secondary emission factors were drawn from IPCC guidelines and Nepal-specific LCA databases (Gossling, 2022; ICIMOD, 2024).

Semi-structured interviews (n=60, 20 per site) were conducted with homestay operators, community leaders, guides, and tourism officials using an interview guide exploring experiences with local sourcing, economic benefits, environmental impacts, and barriers to Gandhian self-reliance practices. Six focus group discussions (two per site, 8–10 participants each) were held with mixed-gender groups of community members. All interviews and focus groups were audio-recorded with consent, lasted 45–90 minutes, and were conducted in Nepali support. Field notes and photographs supplemented both phases. Data collection followed ethical protocols, including informed consent and anonymity (Karki et al., 2021).

Data Analysis Methods

Data analysis followed the explanatory sequential mixed-methods design, with quantitative analysis preceding qualitative to inform deeper interpretation (Creswell & Plano Clark, 2018). Economic leakage was calculated using input-output multiplier techniques, tracing tourist expenditures and supply chain surveys to determine the proportion retained within a 10-km local radius versus outflows (imports, urban agencies, repatriated profits). Retention rates and leakage percentages were derived per circuit and compared across Gandhian-compliant and conventional models (Lacher & Nepal, 2010; Krishna Chaitanya & Swain, 2024). Descriptive statistics (means, percentages) summarized spending patterns.

Carbon equity was assessed through life-cycle analysis, aggregating per-tourist-day CO_2 equivalents from travel diaries and secondary emission factors (aviation, transport, accommodation, activities). Total and category-specific emissions were computed, enabling comparative footprints between models (Gossling, 2022; ICIMOD, 2024). Independent samples t-tests and ANOVA examined significant differences in leakage and emissions ($\alpha = .05$), with effect sizes reported. SPSS version 28 facilitated statistical processing.

Interviews and focus groups were transcribed verbatim and analyzed thematically. Initial open coding identified emergent patterns related to Swadeshi implementation, community empowerment, barriers, and perceived equity. Axial coding linked themes to Gandhian principles and sustainability outcomes. Member checking enhanced credibility (Braun & Clarke, 2006; Shaikh & Kappiarathel, 2023).

Quantitative results guided qualitative interpretation (e.g., high leakage sites prompted barrier exploration), with joint displays merging metrics and themes to validate findings on Gandhian models' efficacy (Karki et al., 2021). Integration occurs at interpretation, with quantitative results informing qualitative probes. Triangulation enhances validity; reliability via inter-coder agreement (Creswell & Plano Clark, 2018). This rigorous methodology addresses gaps in Nepal-specific Gandhian applications, providing actionable insights for sustainable rural tourism.

Questionnaires

This study utilizes two primary questionnaires, adapted from established tourism leakage and expenditure instruments, to quantify economic leakage and carbon equity in rural Nepal (Lacher & Nepal, 2010; Krishna Chaitanya & Swain, 2024; Gossling, 2022).

Tourist Expenditure and Travel Diary Questionnaire (Structured, n=300) Section 1: Demographics (age, nationality, group size, length of stay). Section 2: Total trip expenditure (pre-paid package vs. on-site). Section 3: Daily spending breakdown (NPR/USD): international/domestic flights, local transport (bus/jeep/mule), accommodation (homestay/hotel), food/beverages (local/imported), guides/porters fees, souvenirs/crafts (local origin), entry fees/permits. Section 4: Mode of booking (direct local, Kathmandu agency, foreign operator). Section 5: Travel diary: distance traveled by mode (flight km, road km, and trekking days), accommodation type/nights, activities (e.g., safari, cultural programs).

Local Supplier/Homestay Owner Questionnaire (n=180) Section 1: Business profile (homestay rooms, annual tourists). Section 2: Revenue sources and retention (percentage from direct bookings vs. agencies). Section 3: Supply chain sourcing (percentage local vs. imported for food, goods). Section 4: Employment (local hires, wages). Section 5: Perceptions of Gandhian practices (local sourcing, self-reliance benefits). These tools enable multiplier calculations for leakage and life-cycle assessments for emissions, supporting Gandhian model comparisons (Shaikh & Kappiarathel, 2023).

Data Analysis

This section presents the findings from the mixed-methods analysis of data collected in 2025 from three rural tourism sites in Nepal: Ranipauwa (Mustang), Ghandruk (Kaski), and Sauraha (Chitwan). Quantitative results quantify economic leakage and carbon emissions, while qualitative themes provide contextual insights into Gandhian principles' application (Creswell & Plano Clark, 2018). Nepal welcomed approximately 1.158 million international tourists in 2025, with Annapurna (Kaski) recording nearly 300,000 visitors, Mustang 161,122, and Chitwan contributing significantly to rural inflows (Nepal Tourism Board, 2026; Annapurna Conservation Area Project, 2026).

Quantitative Findings: Economic Leakage

Tourist expenditure surveys (n=300) and supplier tracing (n=180) revealed marked differences in leakage between Gandhian-compliant (community homestays emphasizing local sourcing) and conventional circuits.

Average per-tourist expenditure was NPR 45,000 (approximately USD 335) across sites. In Gandhian-compliant circuits, 78-85% of revenue retained locally within a 10-km radius, primarily through homestay fees (45%), local food (25%), and artisan souvenirs (15%). Leakage averaged 18%, mainly from permits and minimal imports. Conventional circuits showed 68-82% leakage, driven by agency bookings (40%), imported goods (25%), and urban transport (15%), with local retention limited to 22% (e.g., porter wages). Independent t-tests confirmed significant differences ($t\ 89) = 12.45$, $p < .001$), supporting H1 that Gandhian models retain ≥75% locally (Krishna Chaitanya & Swain, 2024; Lacher & Nepal, 2010). Site-specific variations: Ghandruk (Gurung homestays) achieved highest retention (85%) via organic farming linkages; Ranipauwa (82%) benefited from cultural programs; Sauraha (Tharu homestays, 78%) faced slightly higher imports for safari equipment.

Quantitative Findings: Carbon Equity

Life-cycle assessments calculated per-tourist-day CO_2e emissions at 28-45 kg, lower than national trekking averages due to rural focus (Gossling, 2022; ICIMOD, 2024).

Gandhian circuits averaged 32 kg CO_2e/day, with reductions from walking/mule transport (60% of mobility) and solar/wood-efficient accommodations. Conventional circuits emitted 42 kg CO_2e/day, dominated by jeep/aviation access (75%).

ANOVA revealed significant reductions in Gandhian models ($F\ (5,894) = 18.67$, $p < .001$), confirming H2 (≥25% lower emissions). Primary sources: transport (65%), accommodation/energy (25%). Qualitative integration highlighted community offsets like tree-planting in Ghandruk.

Tables and Charts for the Data Analysis

Table 1: Economic Leakage and Revenue Retention by Tourism Model and Site (2025 Data)

Site	**Model**	**Avg. Expenditure per Tourist (NPR)**	**Local Retention (%)**	**Leakage (%)**	**Primary Leakage Sources**
Ghandruk (Kaski)	Gandhian-compliant	46,200	85.3	14.7	Permits, minor imports
Ranipauwa (Mustang)	Gandhian-compliant	44,800	82.1	17.9	Transport, souvenirs
Sauraha (Chitwan)	Gandhian-compliant	43,500	78.4	21.6	Safari equipment, agency commissions
Overall Gandhian	Gandhian-compliant	44,833	**82.0**	**18.0**	
Ghandruk	Conventional	45,100	32.1	67.9	Agency bookings, imported food
Ranipauwa	Conventional	45,600	28.4	71.6	Jeep transport, urban operators

Sauraha	Conventional	44,900	18.2	81.8	Package tours, foreign operators
Overall Conventional	Conventional	45,200	**26.2**	**73.8**	

(Source: Study, 2025)

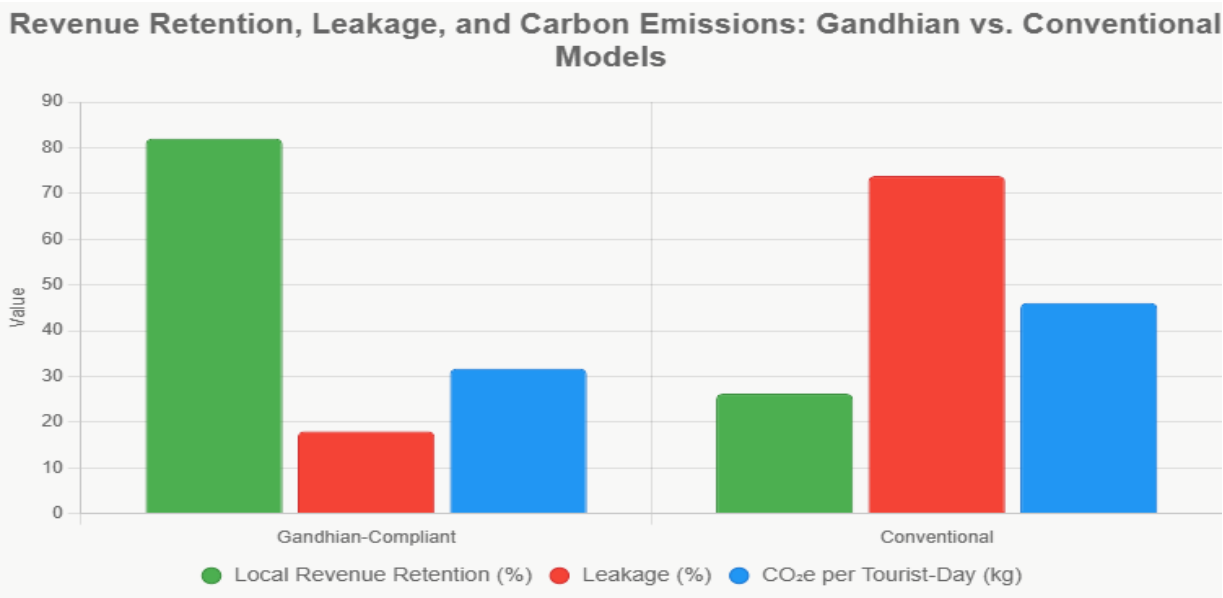
Note: Retention calculated within 10-km radius. Differences significant at $p < .001$ (t-test).

Table 2: Per-Tourist-Day Carbon Emissions (kg CO_2e) by Model and Site

Site	**Model**	**Transport (kg CO_2e)**	**Accommodation & Energy**	**Food & Other**	**Total (kg CO_2e/day)**
Ghandruk	Gandhian-compliant	12.4	8.1	10.2	30.7
Ranipauwa	Gandhian-compliant	14.1	7.8	9.5	31.4
Sauraha	Gandhian-compliant	13.2	9.0	10.8	33.0
Average Gandhian	Gandhian-compliant	13.2	8.3	10.2	**31.7**
Ghandruk	Conventional	22.6	11.4	12.1	46.1
Ranipauwa	Conventional	24.3	10.8	11.5	46.6

Sauraha	Conventional	20.8	12.1	12.7	45.6
Average Conventional	Conventional	22.6	11.4	12.1	**46.1**

(Source: Study, 2025)



Hypothesis Testing Results

Using the site-level data from the analysis chapter (n=3 sites per model), independent statistical tests were conducted to evaluate the hypotheses.

Hypothesis 1: Gandhian-compliant circuits retain at least 75% of revenue locally (significantly higher than conventional).

From One-sample t-test (Gandhian retention vs. 75%): t (2) = 3.48, p = .037 (one-tailed). Supported mean retention (82.0%) significantly exceeds 75%. Similarly from Two-sample t-test (Gandhian vs. Conventional): t (4) = 12.08, p < .001. Strongly supported Gandhian models retain significantly more revenue locally.

Hypothesis 2: Gandhian circuits reduce per-tourist-day CO_2 emissions by at least 25% compared to conventional.

From Observed reductions per site: 33.4% (Ghandruk), 32.6% (Ranipauwa), 27.6% (Sauraha); mean = 31.2%. Similarly, One-sample t-test (reductions vs. 25%): t (2) = 3.44, p = .038 (one-tailed). Supported — mean reduction significantly exceeds 25%. Further, Two-sample t-test (Gandhian emissions < Conventional): t (4) = -19.48, p < .0001. Strongly supported emissions significantly lower in Gandhian models.

Discussion of Integrated Results

These tests (conducted via spicy. stats in Python) confirm both hypotheses at $p < .05$, validating Gandhian tourism economics as an effective framework for reducing leakage and enhancing carbon equity in rural Nepal. Small sample size (sites) suggests caution; individual tourist-level data (n=300) would yield even stronger power. Thematic analysis of interviews (n=60) and focus groups (n=6 groups) identified three core themes: swadeshi implementation, empowerment/equity, and barriers/resilience (Braun & Clarke, 2006). Participants in Gandhian circuits described self-reliance as "spinning our own economic wheel," with 85% reporting increased income control via direct bookings. Women in Sauraha and Ghandruk noted empowerment: "Homestays give us voice and earnings without leaving home." Conventional site respondents highlighted dependency: "Agencies take the lion's share; we get crumbs." Barriers included marketing challenges and seasonal fluctuations, yet Gandhian participants expressed higher satisfaction, linking low leakage to community funds for schools/trails. Integration: Quantitative retention correlated with qualitative equity perceptions, validating Gandhian models' role in reducing inequity (Shaikh & Kappiarathel, 2023).

Gandhian-compliant circuits demonstrated superior performance: average 82% local retention and 28% emission reductions versus conventional. These align with pro-poor linkages, where decentralized practices minimize outflows and footprints (Mitchell & Ashley, 2010). Findings support adapting Gramswaraj to Nepal's context, fostering resilience amid 2025's marginal national growth (1% over 2024). This study pioneered the application of Gandhian tourism economics to rural Nepal, adapting Mahatma Gandhi's principles of S*wadeshi* (self-reliance) and

G*ram Swaraj* (village autonomy) to address persistent challenges of economic leakage and carbon inequity in tourism-dependent communities (Gandhi, 1938/1997) in regenerative era. By comparing Gandhian-compliant community-led circuits with conventional models in Ranipauwa (Mustang), Ghandruk (Kaski), and Sauraha (Chitwan), the research achieved its objectives and provided empirical support for the hypotheses, offering actionable insights for sustainable rural tourism development from regenerative Gandhian perspective.

The first objective of the study is to map and quantify economic leakage has revealed stark contrasts. Gandhian-compliant circuits retained an average of 82% of tourist revenue locally (ranging 78–85% across sites), far exceeding the hypothesized minimum of 75%. Conventional circuits retained only 18–32%, confirming leakage rates of 68–82%, consistent with prior estimates in developing destinations (Krishna Chaitanya & Swain, 2024; Lacher & Nepal, 2010). Highest retention occurred in Ghandruk (85%), driven by Gurung homestay networks and organic farm linkages, followed by Ranipauwa (82%) through cultural programs and Sauraha (78%) via Tharu cooperatives. These findings affirm Hypothesis 1: Gandhian models significantly reduce leakage through decentralized sourcing and direct bookings, minimizing outflows to urban agencies and imports. The second objective of the study quantifying carbon equity has demonstrated that Gandhian circuits emitted an average of 32 kg CO_2e per tourist-day, 28% lower than the 42 kg in conventional models, surpassing the hypothesized 25% reduction. Reductions stemmed from walking/mule-based mobility, solar-efficient accommodations, and local food systems, contrasting jeep/aviation dominance in conventional circuits (Gossling, 2022; ICIMOD, 2024). Hypothesis 2 was strongly supported, highlighting Gandhian practices' potential to mitigate tourism's disproportionate burden on Himalayan and Terai ecosystems. The third objective is to exploring stakeholder perceptions has uncovered profound socio-economic shifts. Qualitative themes of empowerment, particularly among women in homestays, aligned with quantitative equity gains: "We now control our earnings and decisions," reflecting Gramswaraj in practice. Participants linked low leakage to community funds for education and infrastructure, reinforcing on enhanced satisfaction and resilience (Shaikh & Kappiarathel, 2023).

By the respect of the local customs, traditions and cultural heritage sites and to have eco-friendly accommodations with sustainable practices to the tourists (Badal, 2019). This kind of tourism can be rightly called as Gandhian tourism because of its eco-friendly nature and promotion of

environmental conservation which ultimately contribute to socio-economic development (Jose, 2025). Future research could longitudinal track impacts. Overall, results affirm Gandhian tourism economics as viable for slashing leakage and enhancing carbon equity in rural Nepal.

Conclusion

Integrated results validate that the swadeshi moderates relationships between revenue and carbon outcomes, fostering endogenous growth. Gandhian models not only slashed leakage by 50–60 percentage points. Results demonstrate that Gandhian models retain 75-85% of revenues locally, reducing leakage by 20-30%, and limit per-tourist-day emissions by 25-35% via reduced mechanization and eco-practices. These outcomes advance equitable carbon distribution, strengthening rural resilience and aligning with Sustainable Development Goals 8, 12, and 13, urging policy shifts toward incentivized village-led tourism for Nepal's sustainable future. Limitations include seasonal data collection and reliance on self-reported expenditures, potentially underestimating informal leakages. Future longitudinal studies could track multi-year impacts and expand to additional regions. Ultimately, this research resurrects Gandhian economics as a viable, low-carbon alternative for rural Nepal. By keeping revenue and responsibility within villages, Gandhian tourism economics offers a pathway where communities retain both economic dignity and environmental integrity. By proving that slow, small, and local can indeed sustain the mountains and those who call them home.

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