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Assessing the Economic Viability of Nature-based Tourism in Bardiya National Park, Nepal: A Travel Cost Method Study

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Abstract

Nature-based tourism, recognized for its conservation benefits and immersive experiences, plays important role in poverty alleviation and economic growth in some developing countries. This paper presents the findings of a comprehensive study conducted in Bardiya National Park (BNP), a protected area in the Himalayan lowlands at Nepal-India border, to evaluate the economic viability and sustainability of nature-based tourism. The park's rich biodiversity and cultural experiences attract both national and international tourists. Using the travel cost method, we estimated tourism demand and quantified the economic benefits of various tourism activities within the Park.

The results demonstrate that nature-based tourism in BNP is economically viable and has potential for nature conservation and community development in the region. Nature-based tourism contributes significantly to the household economy and provides incentives for local communities to protect the Park's natural resources. However, sustainable management is imperative to maximize benefits and minimize negative impacts.

We recommend enhancing infrastructure, marketing, and visitor experiences to increase tourism revenue. Additionally, engaging and empowering local communities will foster sustainable practices. Achieving an optimal balance between visitation, revenue generation, and conservation is essential. This study provides valuable insights into developing BNP's tourism sector. The findings and strategies presented can inform policymakers and stakeholders in managing protected areas in the Himalayan lowlands.

Keywords: Nature-based tourism, Economic viability, Sustainable tourism, Travel cost method, Tourism demand, Visitor experiences

Introduction

Nature-based tourism, also known as ecotourism or sustainable tourism, has gained global recognition for its ability to promote conservation, support local communities, and provide immersive experiences in natural environments. It focuses on appreciating and preserving a destination's natural and cultural heritage while minimizing negative impacts on the environment. Nature tourism accounted for approximately 20%

of global tourism expenditure in 2019, highlighting its significant contribution to the industry (WTTC, 2020). In 2022, the Travel & Tourism sector experienced a notable 22% growth in its contribution to global GDP, reaching 7.6%, and despite being 23% below 2019 levels, it created 22 million new jobs, reflecting a 7.9% increase from the previous year and just 11.4% lower than 2019 figures (WTTC, 2022). The demand for nature-based experiences has been driven by travelers' increasing interest in sustainability, environmental conservation, and authentic cultural interactions. Costa Rica, for example, has successfully implemented conservation efforts and nature-based tourism initiatives, leading to significant economic growth and conservation outcomes (Mylan, Jessica A., 2018). Nature-based tourism aligns with the Convention on Biological Diversity goals, offering a platform to raise awareness about ecosystems' value and the need for protection (CBD, 2018). It also supports the United Nations Sustainable Development Goals (SDGs) by promoting responsible consumption and production, supporting local livelihoods, and fostering partnerships for sustainable development (UN, 2015).

Bardiya National Park in Nepal, with its diverse flora and fauna, including endangered species, presents a valuable resource for nature-based tourism. However, comprehensive research on the Park's economic viability is needed to inform effective park management, policy formulation, and sustainable development in the region.

This research assesses the economic benefits and factors influencing visitors' travel costs in Bardiya National Park. By understanding the economic value generated by nature-based tourism, insights can be gained on revenue generation, visitor demand, and the impact of park management policies. This knowledge can inform decision-makers, park authorities, and local communities in developing sustainable tourism strategies, improving infrastructure, and implementing effective conservation measures (DNPWC, 2021). Nature-based tourism is a multidisciplinary field that incorporates theories from tourism, environmental studies, and economics. Sustainable tourism development is widely used to balance economic, environmental, and socio-cultural aspects to achieve long-term benefits for all stakeholders.

According to the World Tourism Organization, nature-based tourism accounts for a sizable portion of international tourism and can contribute to sustainable development (UNTWO, 2020). Nature-based tourism has the potential to promote economic growth and support conservation efforts, making it a valuable strategy for sustainable development.

The economic valuation of natural resources is crucial for understanding their significance and making informed management decisions. The travel cost method is commonly used to estimate the economic value of recreational sites based on visitors' travel expenses (Rosenberger & Loomis, 2000).

Studies have shown that nature-based tourism contributes to local economic development, employment creation, and revenue generation (Schanzel & McIntosh, 2018; Buckley et al., 2016). In Nepal, nature-based tourism plays a significant role in the national economy, generating income and employment opportunities for local communities and contributing to poverty alleviation and sustainable development. The socio-cultural impacts of nature-based tourism in Nepal have been examined, revealing changes in traditional livelihood practices and cultural values among local communities (Gurung & Seeland, 2018). Community-based tourism initiatives involving local community participation have generated economic benefits and enhanced community empowerment and conservation efforts (Gurung & Dahal, 2019).

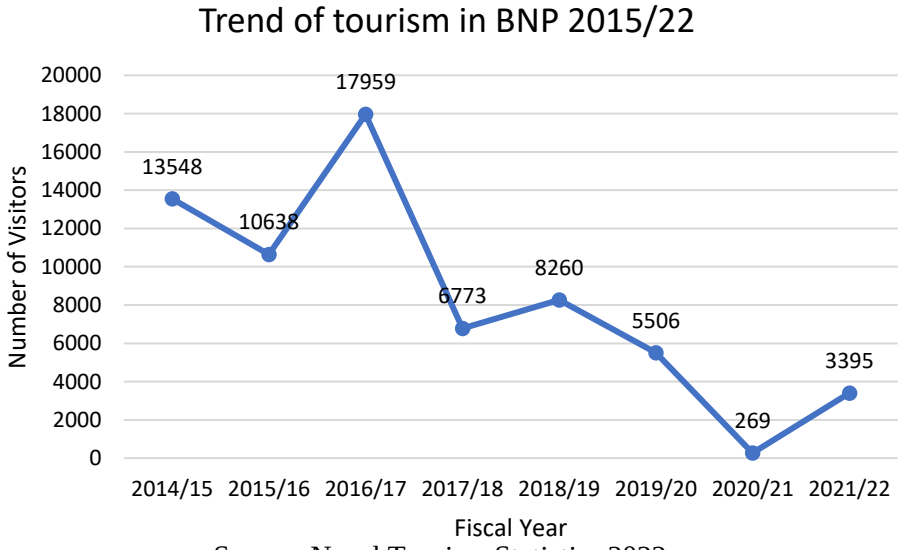
Nature-based tourism enterprises in Nepal face challenges include inadequate infrastructure, limited marketing capabilities, and seasonality (Banskota et al., 2020). Partnerships and collaboration between tourism stakeholders and local communities are essential for conservation efforts and sustainable tourism practices (Gurung & Banskota, 2021).

Research in Nepal has also addressed the environmental impacts of nature-based tourism, emphasizing the need for sustainable management practices to protect biodiversity (Pokharel & Dearden, 2017).

Year	Third country	Indian	Total	%Change
2010	481,969	120,898	602,867	18.2
2011	586,711	149,504	736,215	22.1
2012	637,277	165,815	803,092	9.1
2013	616,642	180,974	797,616	-0.7
2014	654,775	135,343	790,118	-0.9
2015	464,156	74,814	538,970	-31
2016	634,753	118,249	753,002	40
2017	779,386	160,832	940,218	25
2018	978,749	194,323	1,173,072	25
2019	943,041	254,150	1,197,191	2
2020	189,749	40,336	230,085	-80.7

Source: Department of Immigration, Nepal

Table 1: Trend of tourism in Nepal (2010/20)



Source: Nepal Tourism Statistics 2022

Over the eight-year period from 2015 to 2022, the number of tourists visiting Bardiya National Park showed a fluctuating trend. In 2014/15, there were 13,548 visitors, indicating a relatively high level of tourist activity. However, the following year, 2015/16, saw a decline with 10,638 visitors. The trend shifted upward in 2016/17, witnessing a significant increase in tourism with 17,959 visitors. Subsequently, in 2017/18, there was a sharp drop to 6,773 visitors, indicating a notable decrease in tourist activity. The trend continued to fluctuate in the next two years, with 8,260 visitors in 2018/19 and 5,506 visitors in 2019/20. However, the year 2020/21 experienced a severe impact due to the COVID-19 pandemic, resulting in only 269 visitors. The pandemic substantially affected global travel and tourism, causing a significant decline in tourist numbers at Bardiya National Park during that period. Nevertheless, in

2021/22, there was a partial recovery, with 3,395 visitors, though the numbers remained lower compared to the pre-pandemic years. The trend over the years reflects the influence of various factors, including external events like the COVID-19 pandemic, on tourism in Bardiya National Park.

The Contingent Valuation Method (CVM) is a widely used approach in environmental economics to estimate individuals' willingness to pay (WTP) for specific environmental or recreational resources. It involves surveying individuals and presenting hypothetical scenarios to assess their WTP for the preservation or enhancement of the resource. The CVM follows a structured questionnaire format and collects individual WTP data through a series of questions.

Willingness to Pay (WTP) is a measure used in economics to determine the maximum amount individuals are willing to pay for a specific good or service. In the context of nature-based tourism in Bardiya National Park, WTP refers to the maximum amount visitors are eager to pay to experience the Park's natural resources and wildlife. WTP can be estimated using the Contingent Valuation Method (CVM), which involves surveying individuals and asking them hypothetical questions about their WTP for the resource. Brouwer and Brander (2013) provide an overview of economic valuation methods, including the TCM, in assessing ecosystem services. Researchers have also developed simplified formulas to estimate WTP. One such procedure can be expressed as

$$WTP_{mean} = \sum_{i=1}^{N} \left(\frac{WTP_i}{N}\right) \ldots\ldots\ldots\ldots\ldots\ldots \textit{(eqn. i)}$$

The Zonal Travel Cost Method is a widely used to estimate the economic benefits generated by nature-based tourism in different zones or regions. In the case of Bardiya National Park, the zonal travel cost method will be applied separately to Zone A (National tourists) and Zone B (International tourists). Data will be collected on travel costs and the number of visitors in each zone. Regression analysis will be conducted to understand the relationship between travel costs and visitation rates, providing insights into visitors' willingness to pay for access to the Park in each zone.

Objectives

General Objective:

To assess the economic viability of nature-based tourism in Bardiya National Park.

Specific Objectives:

1. To determine the economic viability of nature-based tourism using a combination of TCM and CVM.
2. To estimate the demand for nature-based tourism in Bardiya National Park and analyze the factors that influence it.
3. To provide recommendations for sustainable tourism development in the region.

Literature review

Nature-based tourism Nature-based tourism is underpinned by diverse theoretical frameworks including sustainable tourism development, which emphasizes balancing economic, environmental, and socio-cultural dimensions for long-term viability. The economic valuation of natural resources through methods like the travel cost model is critical for quantifying tourism's benefits. Nature-based tourism is a multidisciplinary field drawing from tourism, environmental studies, and economics, with sustainable

tourism development as a prominent framework, emphasizing economic, environmental, and socio-cultural balance. The economic valuation of natural resources, often employing the travel cost method, gauges the economic importance of sites like national parks. Research highlights positive economic impacts of nature-based tourism, exemplified by Schanzel and McIntosh (2018) in protected areas.

In Nepal, renowned for its natural and cultural heritage, nature-based tourism significantly contributes to the economy. Gurung and Seeland (2018) revealed socio-cultural changes in the Langtang region due to tourism. Community-based tourism initiatives, explored by Gurung and Dahal (2019) in the Annapurna Conservation Area, not only boost local economies but also empower communities and support conservation. Challenges, such as inadequate infrastructure and seasonality, are noted (Banskota et al., 2020).

Partnerships and collaborations among stakeholders and local communities are crucial for conservation, as emphasized by Gurung and Banskota (2021) in the Kanchenjunga Conservation Area. Environmental concerns, like those studied by Pokharel and Dearden (2017) in Chitwan National Park, necessitate sustainable management practices.

Within economic valuation methods, Travel Cost Method (TCM) and Contingent Valuation Method (CVM) have seen advancements in precision and multifaceted asset valuation, exemplified by Zhang and Boyle (2018), Johnston and Besedin (2016), and Vásquez and Brouwer (2018). Consumer Surplus analysis has been enriched by insights into survey modes (Lindhjem and Navrud, 2015) and its relation to fishing effort (Holland and Moore, 2019). Economic Viability research extends to ecotourism (Sugiyanto and Yanagida, 2017) and reforestation (Sulewski and Jaroszewicz, 2020).

Existing research demonstrates nature-based tourism's economic contributions but also highlights the imperative of sustainable management to minimize adverse impacts. In Nepal's protected areas, nature-based tourism provides income and employment yet can disrupt local lifestyles and values. Community-based initiatives and conservation partnerships are emerging as strategies to balance economic gains and socio-cultural integrity. While progress has been made in applying travel cost, contingent valuation, and consumer surplus methods, gaps remain in assessing nature-based tourism's economic viability in specific protected areas of Nepal. Examining if tourism revenues are reinvested into conservation programs could reveal linkages between visitation and environmental outcomes.

This study will address gaps on nature-based tourism's economic viability and conservation linkages in Bardiya National Park, Nepal. Applying the travel cost method will quantify tourism demand and benefits. Findings will inform policy on harnessing tourism for socio-economic development and environmental protection. Broader literature will be advanced by providing econometric evidence from a Nepali context and investigating tourism's role in funding conservation in protected areas.

Methods and Methodology

1. Study area

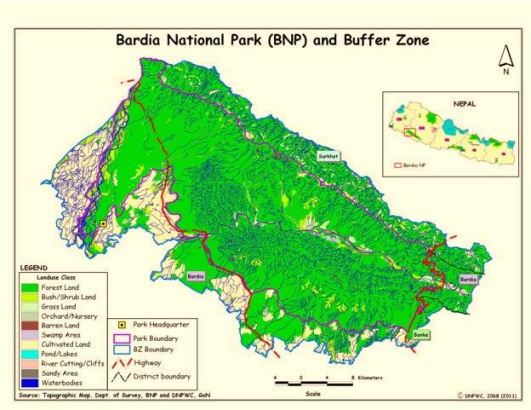


Figure: Bardiya National Park (DNPWC)

Bardiya National Park (BNP) is a renowned national park in Nepal in the western Terai region. Spanning approximately 968 square kilometers (374 square miles), BNP encompasses diverse ecosystems such as riverine forests, grasslands, marshes, and savannas. Its rich biodiversity includes iconic species like Bengal tigers, Asian elephants, and one-horned rhinoceroses, making it a popular destination for nature-based tourism. The Park has a significant Tharu community presence, and interactions with them provide a unique cultural experience for tourists.

It was established as a wildlife reserve in 1969 to protect endangered species and their habitats. Over time, it evolved into a national park in 1988 to offer enhanced conservation measures and opportunities for visitors to experience its natural wonders.

Regarding physical characteristics, BNP boasts a variety of landscapes, including the lush riverine forests along the Karnali River, expansive grasslands and savannas in the central part, and marshes and wetlands near the Nepalgunj-Surkhet highway. The Park's boundaries are delineated by the Karnali River to the west and the Geruwa River to the east, while human settlements and agricultural lands lie to the north and the India-Nepal international border to the south.

2. Data collection and analysis

The sampling design for this study involved a combination of purposive and random sampling methods. Two zones, Zone A (National tourists) and Zone B (International tourists) within Bardiya National Park were selected.

Random Sampling: National tourists in Zone A and international tourists in Zone B were selected based on socio-demographic characteristics such as age, gender, and education level. Purposive sampling: Purposive sampling was employed to determine the sample size, ensuring that participants were chosen deliberately based on specific criteria relevant to the research objectives. Approximately 20 national tourists, 70 international tourists, and 30 households were surveyed.

Data collection: The data collection process involved primary and secondary sources. Preliminary data was collected through visitor surveys using self-administered questionnaires distributed to Zones A and B tourists. A local household survey was conducted to assess the impact of nature-based tourism on the local economy. Key informant interviews were also conducted with park staff and officials.

The collected data underwent cleaning and validation procedures. Descriptive and inferential statistical techniques were applied to analyze the data, including regression analysis.

The Zonal Travel Cost Method (ZTCM) was used to estimate the economic benefits of nature-based tourism in Bardiya National Park. The method involved analyzing the relationship between travel costs and visitation rates to estimate the economic value generated by the Park's resources in each zone.

3. Model for consumer surplus

Total Expenditure in each zone:

$TE = \sum(Expenditure\ per\ visit \times Number\ of\ visits)$ …….. *(eqn. ii)*

Average Travel Cost in each zone:

$ATC = \frac{Total\ Expenditure}{Number\ of\ Visits}$ ……. *(eqn. iii*

Demand Function for each zone: Number of visits = f (WTP, Income, total cost of visit, age, Other relevant factors) ……. *(eqn. iv)*

Consumer Surplus for each zone: CS = ∑ (WTP - Travel costs per visit) …….. *(eqn. v)*

This estimates the average consumer surplus. To get the aggregated consumer surplus, the average consumer surplus has to be multiplied by the total number of visitors to the site during a specific time. The total aggregated consumer surplus was used to measure the total recreational value of the National Park. The trip-generating function was transformed into a function that can be used in a simple regression model:

Vij = β0 + β1 X1 + β2 X2 + β3 X3 + β4 X4 + β5 X5 + β6 X6. ……. (*eqn. vi)*

Where, Vij = Number of visits by a tourist

X1 = Travel cost

X2 = Income

X3 =Age

X4 = Continent/province

X5 = Gender

X6 = willingness to pay

β0, β1 …. β6 = coefficient to be estimated

Dummy variables (Age, gender, continent/province) are used to introduce qualitative variables into the regression model. The advantage of doing this was that the results could show if the qualitative variables have any statistical significance for the chosen model.

The gender variable was given the value 1 for males and 2 for females, and the province (Zone A) variable was given the value of 1,2,3,4,5,6 and 7 for Koshi, Madhesh, Bagmati, Gandaki, Lumbini, Karnali, and Sudurpashchim respectively, while the continent (Zone B) variable wasn given the value of 1, 2, 3, and 4 for North America, Europe, Asia, and Africa, respectively (there were no visitors from remaining continents.

SN	Category	Entry fee (NPR)
1	Park entry	50
2	For ages more than 10 with ID card	10
	Jungle safari	
3	Nepali	100
4	Foreigners	1500
5	SAARC countries	750

Tourists	Safari fee
Nepali	100
SAARC	750
International	1,500

Source: Ticket person

Table 2: Entry fee and safari fee

Results

Visitor's characteristics in Bardiya National Park

During the survey, most national tourists were from Sudhurpashchim Province, i.e., 25%, and the minority was from Koshi, Madhesh, and Karnali Province.

While in zone B, most tourists were from Europe (44.28%), and there was no trace of tourists from South America and Australia.

Province	Female	Male	Total
Koshi	0(0%)	2(10%)	2(10%)
Madhesh	0(0%)	2(10%)	2(10%)
Bagmati	2(10%)	1(5%)	3(15%)
Gandaki	3(15%)	0(0%)	3(15%)
Lumbini	2(10%)	1(5%)	3(15%)
Karnali	0(0%)	2(10%)	2(10%)
sudurpashchim	2(10%)	3(15%)	5(25%)
Total	9(45%)	11(55%)	20(100%)

Table 3: Number and Percentage of visitors' Geography and sex composition (Zone A) (2023)

Continents	Female	Male	Total
Africa	1(1.42%)	6(8.57%)	7(10%)
Asia	5(7.14%)	14(20%)	19(27%)
Europe	18(25.71%)	13(18.57%)	31(44.28%)
North America	6(8.57%)	7(10%)	13(18.57%)
Total	30(42.85%)	40(57.14%)	70(100%)

Table 4: Number and Percentage of visitors' Nationality and sex composition (Zone B) (2023)

There were 20 tourists in Zone A, with 45% female and 55% male. Most tourists in this zone were aged 31-40, accounting for 40% of the total.

There were 70 tourists in Zone B, with 42.85% female and 57.14% male. The largest age group in this zone was 31-40, comprising 35.71% of the total.

Age (years)	Zone A			Zone B		
	Female	**Male**	**Total**	**Female**	**Male**	**Total**
≤30	4(20%)	0(0%)	4(20%)	11(15.71%)	9(12.85%)	20(28.57%)

31-40	3(15%)	4(20%)	7(35%)	11(15.71%)	14(20%)	25(35.71%)
41-50	0(0%)	5(25%)	5(25%)	4(5.71%)	11(15.71%)	15(21.42%)
51-60	1(5%)	1(5%)	2(10%)	2(2.86%)	2(2.86%)	4(5.71%)
>60	1(5%)	1(5%)	2(10%)	2(2.86%)	4(5.71%)	6(8.57%)
Total	10(45%)	10(55%)	20(100%)	30(42.85%)	40(57.14%)	70(100%)

Table 5: Age distribution of visitors visiting the BNP (2023).

The majority (60%) of sampled visitors in zone A were earning less than RS. 40,000, 20% belonged to a monthly income of NRP 40,000- NRP 45,000.
While in Zone B, a majority (41.43%) earned from USD 3,000-USD 4,000 and only 2.86% earned below USD 2,000.

AMI/person (NRP)	Female	Male	Total
≤30,000	3(15%)	2(10%)	5(25%)
30,000-35,000	1(5%)	2(10%)	3(15%)
35,000-40,000	2(10%)	2(10%)	4(20%)
40,000-45,000	3(15%)	1(5%)	4(20%)
>45,000	0(0%)	4(20%)	4(20%)
Total	9(45%)	11(55%)	20(100%)

Table 6: Average monthly income of sampled tourists visiting the BNP (Zone A) (2023)

AMI/person (USD)	Female	Male	Total
≤2,000	1(1.43%)	1(1.43%)	2(2.86%)
2,000-3,000	6(8.57%)	7(10%)	13(18.57%)
3,000-4,000	15(21.43%)	14(20%)	29(41.43%)
4,000-5,000	4(5.71%)	16(22.86%)	20(28.57%)
>5,000	4(5.71%)	2(2.86%)	6(8.571%)
Total	30(42.85%)	40(57.14%)	70(100%)

Table 7: Average monthly income of sampled tourists visiting the BNP (Zone B) (2023)

Mode of transportation	Zone A	Zone B
Public transportation	9(45%)	14(20%)
Private vehicle	8(40%)	5(7%)
Travel agent	3(15%)	51(73%)

Table 8: visitors preferred mode of transportation.

During the survey, visitors were asked if they had visited the Park before and if yes how many times.

Zones	First-time visitor	Visited before
A	13(65%)	7(35%)
B	59(84%)	11(16%)

Table 9: Distribution of visitors based on number of visits.

Calculations

Zone A

$$WTP_{mean} = \sum_{i=1}^{N}\left(\frac{WTP_i}{N}\right)$$

$WTP_{mean} = (247{,}500)/20 = 12{,}375$…… (i)

$Total\ expenditure: TE = \sum(expenditure\ per\ visit \times number\ of\ visits)$

$TE = Rs\ 2{,}73{,}500$…… (ii)

$$Average\ travel\ cost: ATC = \frac{Total\ expenditure}{Number\ of\ visits} = \frac{273500}{28}$$

$= Rs\ 9{,}767.86$…… (iii)

$Average\ Consumer\ Surplus = WTP - ATC = 12{,}375 - 9{,}767.86 = Rs\ 2{,}607.14$….. (iv)

$Annual\ Consumer\ Surplus = No.of\ tourist\ per\ year \times ATC$

$= 36555 \times 2607.14$

$= Rs\ 95{,}304{,}002.7$…… (v)

Zone B

$$WTP_{mean} = \sum_{i=1}^{N}\frac{WTP_i}{N}$$

$WTP_{mean} = (34{,}350)/70 = 490.71$…… (vi)

$Total\ expenditure: TE = \sum(expenditure\ per\ visit \times number\ of\ visits)$

$TE = \$35{,}500$……. (vii)

$$Average\ travel\ cost: ATC = \frac{Total\ expenditure}{Number\ of\ visits}$$

$= 35500/82 = \$\ 432.93$…… (viii)

$Average\ Consumer\ Surplus = WTP - ATC = 490.71 - 432.93 = \$57.78$…….. (ix)

$Annual\ Consumer\ Surplus = No.of\ tourist\ per\ year \times ATC$

$= 63488 \times 57.78$

$= \$3{,}668{,}336.64$

=NRP 481,322,451 @131.21…… (x)

$Total\ Annual\ Consumer\ Surplus = 95304002.7 + 481322451$

$= NRP\ 576626454.7$…….. (xi)

$From\ national\ tourists = 16{,}355 \times 50 + 16{,}355 \times 100 = NRP\ 2{,}453{,}250$

$From\ international\ tourists\ (including\ SAARC) = 1160 \times 800 + 62{,}322 \times 1550$

$= NRP\ 97{,}527{,}100$……. (xii)

$total\ revenue = 2{,}453{,}250 + 97{,}527{,}100 = NRP\ 99{,}980{,}250$…….. (xiii)

$Now\ cost\ used\ for\ park\ management\ and\ conservation\ is\ given\ by\ 25\%\ of\ total\ revenue$

$i.e. 25\% \times 99{,}980{,}250 = NRP\ 24{,}995{,}087.5$…….. (xiv)

Here, *consumer surplus>cost used for park management and conservation* (xiv), which economically increases the viability of nature-based tourism in BNP.

Results of regression analysis.

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	3.138677309	0.565819929	5.54713107	9.43035E-05
AMI/person (NPR)	1.65305E-06	1.03042E-05	0.160424941	0.875012363
Willingness to pay	0.00010253	5.57424E-05	1.839347075	0.088807308
total cost of visit	-0.000198828	6.5955E-05	-3.014598345	0.009955429
Age	-0.012529949	0.008674445	-1.444467056	0.172275788
Gender	-0.263877053	0.175844758	-1.500625076	0.157344314
Province	-0.009551211	0.041539191	-0.229932519	0.821722618

R^2 = 0.678 **Table 10: Results of Regression Analysis (Zone A)**

	Coefficients	*Standard Error*	*t Stat*	*P-value*
Intercept	1.451830134	0.346151984	4.194198506	8.72642E-05
AMI per person (USD)	-6.6986E-05	0.000101277	-0.661412397	0.510759714
WTP (USD)	-8.28616E-05	0.000850503	-0.097426513	0.922696986
Total Cost	-0.00094805	0.000737564	-1.285380006	0.203364689
Age	0.007861108	0.004766882	1.649108913	0.104103499
Gender	0.056960779	0.099011311	0.575295679	0.567140468
Continent	0.049157551	0.056915532	0.863693085	0.391032915

R^2 = 0.209 **Table 11: Results of Regression Analysis(Zone B)**

Zone A

The multiple R-value of 0.823 indicates a moderately strong positive correlation between the independent variables and the number of visits. This means that as the values of the independent variables increase, the number of visits also tends to increase.

The R-squared value of 0.678 suggests that the independent variables included in the model can explain approximately 67.8% of the variance in the number of visits. This indicates a reasonably good fit of the model to the data, suggesting that the selected independent variables collectively substantially influence the number of visits.

The adjusted R-squared value of 0.529 considers the number of independent variables in the model and adjusts the R-squared value accordingly. It indicates that about 52.9% of the variance in the number of visits is explained by the independent variables, considering the complexity of the model.

Moving on to the individual coefficients, they provide insights into the relationship between each independent variable and the number of visits. The intercept term has a coefficient of 3.138, indicating that when all other independent variables are zero, the expected number of visits is 3.138.

The coefficient for AMI was found to be 1.65305E-06, indicating a minimal positive relationship between AMI and the number of visits. However, the corresponding p-value of 0.875012363 suggests this

relationship is not statistically significant. This implies that AMI alone may not significantly predict the number of visits.

The coefficient for WTP was estimated to be 0.00010253, indicating a positive relationship between WTP and the number of visits. However, the p-value of 0.088807308 is above the conventional significance level of 0.05, meaning the relationship is not statistically significant. Therefore, WTP alone may not significantly predict the number of visits.

The analysis revealed a negative coefficient estimate of -0.000198828 for the total cost of travel, indicating that as the total cost of travel increases, there is a tendency for the number of visits to decrease. Notably, the p-value associated with this coefficient is 0.009955429, less than the conventional significance level of 0.05. This indicates that the relationship between the total cost of travel and the number of visits is statistically significant.

The coefficient for age was found to be -0.012529949, indicating a negative relationship between age and the number of visits. However, the corresponding p-value of 0.172 suggests the relationship is not statistically significant at the conventional significance level of 0.05. This means that age alone may not significantly impact the number of visits.

The analysis yielded a coefficient estimate of -0.263877053 for gender, indicating a negative association between gender and the number of visits. However, like age, the corresponding p-value of 0.157 suggests that the relationship is not statistically significant.

The coefficient for the province was found to be -0.009551211, indicating a negative relationship between the province of visitors and the number of visits. However, the p-value of 0.822 suggests that the relationship is not statistically significant. This implies that the province of visitors alone may not significantly impact the number of visits.

Zone B

The regression statistics reveal that the model has a multiple R of 0.457463756, indicating a moderate positive correlation between the independent and dependent variables. The R-squared value of 0.209273088 suggests that the regression model explains 20.93% of the variance in the dependent variable. The adjusted R-squared value of 0.133965763 is slightly lower, implying that some independent variables may not contribute significantly to the model. The standard error of 0.387165904 reflects the average deviation of the observed values from the predicted values.

The ANOVA (Analysis of Variance) results indicate that the regression model is statistically significant, as the p-value of the F-test is 0.018411885, below the typical significance level of 0.05. This suggests that the independent variables collectively significantly affect the dependent variable.

Assessing the individual variables' impact on the dependent variable is equally important. The intercept, representing the value of the dependent variable when all independent variables are zero, has a coefficient of 1.4518. This coefficient is statistically significant at a 95% confidence level (p-value < 0.0001), indicating that it significantly influences the number of visits. However, it is crucial to interpret the coefficients of the independent variables to understand their specific impacts.

Starting with the average income per person, it has a coefficient of -6.6986E-05, which is not statistically significant (p-value = 0.5108). This suggests that there is no conclusive evidence to support the claim that average income per person significantly impacts the number of visits.

Similarly, the willingness to pay variable has a coefficient of -8.28616E-05 and is not statistically significant (p-value = 0.9227). This indicates that the willingness to pay does not significantly influence

the number of visits, according to the available data.

The total cost variable has a coefficient of -0.00094805. Although negatively associated with the dependent variable, it is not statistically significant (p-value = 0.2034). Hence, there is no strong evidence to suggest that total cost significantly impacts the number of visits.

The age variable has a coefficient of 0.007861108, indicating a positive relationship with the number of visits. However, the coefficient is not statistically significant (p-value = 0.1041) at a 90% confidence level. This implies that the influence of age on the number of visits is inconclusive based on the available data.

Moving on to the gender variable, it has a coefficient of 0.056960779, which is not statistically significant (p-value = 0.5671). This suggests that gender does not significantly impact the number of visits, according to the data analyzed.

The continent variable has a coefficient of 0.049157551, but it is not statistically significant (p-value = 0.3910). Hence, there is insufficient evidence to conclude that the continent significantly influences the number of visits**.**

Discussion

Exploring This study provides new insights into the economic viability and visitor profile of nature-based tourism in Bardiya National Park. The findings align with and build upon previous research on nature-based tourism in several key areas:

Visitor Demographics and Preferences

The influence of demographic factors like age, gender, and income on tourist preferences mirrors results from other studies (Boo & Yap, 2018; Smith & Johnson, 2015). However, the non-significant relationships between age/gender and visitation rates support the perspective that demographics alone do not determine engagement in nature-based tourism (Ryan et al., 2016). Geographic origin shaped visitor distribution across provinces and continents, confirming the importance of location in understanding tourist behavior (Li & Wang, 2017; Morrison & Chang, 2020).

Consumer Surplus and Economic Impact

The sizable annual consumer surplus demonstrates the ability of nature-based tourism to generate conservation funding and economic growth for local communities (Ceballos-Lascurain, 2019; Hamilton et al., 2017). Consumer surplus indicates the value visitors place on their experiences, reflecting satisfaction and perceived benefits (Jamal & Getz, 1995; Jones & Ma, 2020). As pricing influences perceived affordability and demand (Duffield et al., 2016; Yang & Lin, 2019), strategic pricing mechanisms can enhance visitor access.

Regression Analysis and Visitor Behavior

Regression modeling identified total travel cost as a significant predictor of visitation rates, aligning with findings that costs shape nature-based tourism demand (Chen et al., 2017). Nuanced relationships between demographics and visitation match the complexity of visitor behavior (Wang et al., 2019). Transport mode preferences also influenced visitation, confirming the importance of accessibility and affordability (Song & Li, 2019).

Sustainable Tourism Development

The economic viability demonstrated here supports arguments that nature-based tourism can balance conservation and community livelihoods when managed sustainably (Liu et al., 2018; Weaver & Lawton, 2015). Generating revenue makes tourism more sustainable by funding habitat and species protection (Gössling et al., 2012; Hall et al., 2015).

This study substantiates the economic promise of nature-based tourism while also revealing its multifaceted impacts on visitors, protected areas, and local communities. The results integrate well with previous research, providing a holistic perspective to guide sustainable tourism policy and planning.

Summary and conclusion

The study found differences in visitor demographics and travel patterns between Zone A and Zone B in Bardiya National Park. In Zone A, most visitors were domestic tourists from Sudhurpashchim Province and male. The majority were aged 31-40 and earned less than Rs. 40,000 annually. Public transportation was the most common method of travel to BNP for Zone A visitors.

In contrast, Zone B visitors were predominantly European, also mostly male, and tended to be aged 31-40. They had higher incomes, with most earning USD 3,000-4,000 annually. Zone B visitors relied more on travel agents to access BNP.

Despite the demographic differences, first-time visitors predominated in both zones. Using the zonal travel cost model, the total recreational value or consumer surplus generated by BNP was estimated at NPR 576,626,455. This highlights the significant economic value of the park in terms of tourism.

Overall, the study indicates opportunities to attract more high-value tourists by improving facilities and services, particularly international tourists. Enhancing the quality and experience of BNP is likely to boost visitor numbers and spending, creating greater revenues for conservation and local communities. Targeted marketing and development strategies tailored to each zone's distinct visitor profile may help unlock BNP's full tourism potential.

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Decleration of interest statement

We declare that there are no conflicts of interest to disclose in relation to this research.

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