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Research Article

Role of Eco-Adventure Tourism on Sustainable Rural Community Development in Nepal

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Abstract

Eco-adventure tourism is an emerging form of tourism in Himalayan countries worldwide. Nepal being a Himalayan country is growing as a destination for eco-adventure tourism. This paper examines the role of eco-adventure tourism on sustainable community development in rural settlements along the Annapurna Sanctuary Trail (AST), Nepal through the perspectives of local inhabitants with 120 on-site surveys, five key informant interviews, six focus group discussions, in-person observations, and archival studies. The study revealed significant benefits of eco-adventure tourism on income generation, infrastructure development, cultural preservation, community empowerment, social cohesion, and environmental conservation in rural communities in Nepal. Furthermore, the study disclosed that eco-adventure tourism has resulted in sustainable community development by generating livelihood assets: natural capital, financial capital, socio-cultural capital, human capital, and physical capital, along with AST. This paper suggested key policy initiatives particularly environmental protection, effective waste disposal and management, increased engagement of marginalised and economically disadvantaged groups in eco-adventure tourism activities, cultural heritage preservation, and the integration of traditional agricultural and occupational practices into tourism development strategies to strengthen sustainable community development in Nepal.

Keywords: Eco-adventure tourism; Sustainable Community development; Rural settlement; Gandaki (Nepal)

Introduction

A sustainable community refers to the successful integration of every socio-cultural, economic, and environmental aspect into development in which local inhabitants have a strong feeling of affiliation and dedication to their welfare (Cook & Ng, 2001). Sustainable community development emphasises balancing economic growth, environmental protection, and social equity to ensure that development enhances the quality of life of current and future generations of community members (Nepal, 1997; Duffy, 2008; KC, 2016). Rio Earth Summit in 1992 clarified that "sustainable development" goes beyond preserving the environment and adhering to its carrying capacity (Chan & Bhatta, 2013). Indeed, creating sustainable communities is guided by two fundamental concepts of sustainable development: treatment of all

generations and responsible use of available resources (Cook & Ng, 2001).

As an effective approach to community development, sustainable tourism prioritises meeting the rural population's needs and expectations while preserving resources and opportunities for future generations. Sustainable community development is the process of creating livable and resilient communities through a balanced and harmonious interplay between social, economic, and environmental components (Chan & Bhatta, 2013; KC, 2016). It is a dynamic process that encourages the ethical use of available resources, ensures sustainable economic development and social equality, maintains biodiversity, conserves cultural and historical legacies, and fosters community involvement and cooperation (Chan & Bhatta, 2013). However, the pluralism that arises due to the existing wide range of variation in the degree of social cohesiveness and divergence, tenacity of shared institutions and ideas, and cultural variation both within and between communities makes the sustainable community development process more difficult and challenging (Singh *et al.*, 2003). On the other hand, Eco-adventure tourism is widely discussed and intellectually presented as an aspirational concept to address all issues related to local community development in a sustainable way (Chan & Bhatta, 2013; KC, 2016).

Eco-adventure tourism can significantly contribute to making local communities environmentally friendly, economically viable, and socio-culturally sound by preserving biodiversity along with other natural resources and also generating financial support for conservation efforts (KC *et al*., 2021) by generating a continuous in-flow of household income directly or indirectly through diversification of economic activities (KC *et al*., 2015; KC, 2017; Tiwari & Nguyen, 2024); and by respecting and promoting the local cultural heritages and traditional practices (Acharya & Halpenny, 2017; Tiwari & Nguyen, 2024). At the local level, it also seeks to promote sustainable and inclusive development by involving stakeholders during the planning and decision-making process (Upadhyaya & Upreti, 2011; Acharya & Halpenny, 2013; KC, 2016; Tiwari & Nguyen, 2024) and ensuring fair and equitable distribution of socio-economic benefits (Upadhyaya & Upreti, 2011; Tiwari & Nguyen, 2024).

Moreover, eco-adventure tourism also brings investment opportunities into local communities for the improvement of physical infrastructures such as roads, bridges, hospitals, schools, drinking water supply, and electricity (Nicholas & Thapa, 2010; Afenyo & Amuquandoh, 2014; Walter *et al*., 2018). Frequently, it provides education and training opportunities for the local people and empowers them to make their communities more sustainable and resilient (Panta & Thapa, 2018). Additionally, eco-adventure tourism ensures sustainable community development by increasing social cohesion through promoting brotherhoods, raising the sense of cooperation, and strengthening social networking among the locals (Acharya & Halpenny, 2017). In essence, eco-adventure tourism is the most responsible approach for making local communities more vibrant, sustainable, and resilient.

Nepal, being a popular eco-adventure tourism destination, attracts a significant number of visitors from around the globe for trekking, mountaineering, rafting, and wildlife watching each year (KC, 2017). The country's diverse landscape, ranging from lush tropical forests to the peaks of the Himalayas, provides a wide range of opportunities for adventure and nature-based activities (KC *et al*., 2015; Bhatta, 2019). The presence of a higher degree of natural, cultural, religious, and ethnic diversity in Nepal makes the country's rural areas the most fascinating eco-adventure destination in the world (Bhatta, 2019). However, rural communities in Nepal frequently face several development-restraining factors, including a lack of know-how, information, monetary resources, physical challenges, isolation, regional disparity and fragility, and occasionally even security (Tiwari, 2009). On the other hand, the integration of the locals into eco-adventure activities is also not as expected, as only a small portion of the local population, notably those residing alongside the trail, are benefitting from the development of eco-adventure tourism (Chan & Bhatta, 2013; Bhatta, 2019), whereas those inhabiting off the trail, frequently receive little to no advantages in many cases. In many instances, eco-adventure tourism has also exacerbated regional inequality and environmental deterioration, including the erosion of identity and cultural legacy (KC, 2017; Acharya & Halpennny, 2013).

So, based on the above backdrop, there is a significant gap between the rhetoric around eco-adventure tourism and the reality of its practical contribution to sustainable community development (Sharply, 2009). Furthermore, most of the prior studies on eco-adventure tourism have primarily concentrated on its broad effects on socio-cultural, socio-economic, and environmental elements of the local communities, very few empirical studies have been conducted to date on its role in sustainable community development at the local level in case of developing countries (Chann & Bhatta, 2013; KC, 2016). In this regard, this paper aimed to assess the local community's perceptions of changes brought forth by eco-adventure tourism in physical, ecological, environmental, socio-economic, and socio-cultural dimensions of rural communities and hence to examine how eco-adventure tourism has contributed to sustainable community development in rural settlements along the Annapurna Sanctuary Trail (AST) in Gandaki Province.

Materials and Methods

Conceptual framework

Conceptual framework for sustainable community development through eco-adventure tourism is shown in Fig.1.

The selection of the Study Area

Dhampus, Landruk, and Ghandruk villages along the Annapurna Sanctuary Trail (Fig. 2) were selected purposively as research sites for this study. Starting from two entry points, Phedi and Birethanti, the trail leads toward the ending point, Annapurna Base Camp (ABC), passing through several rural settlements in the southern part of Annapurna Himalayan region in Gandaki Province, of which these three settlements are most promising villages with plentiful of eco-adventure tourism activities attracting a large volume of tourists each year. Moreover, these hamlets are the main rest stops for hikers heading to or returning from ABC. Because of its unusual geographical features and diverse biological and cultural heritages, the area has become a well-known destination for trek seekers and nature lovers.

Dhampus, Landruk, and Ghandruk are located in different wards of Machhapuchhare (Ward – 7) and Annapurna (Ward- 7, 10, and 11) Rural Municipalities in Kaski district in Gandaki Province, representing only a small portion of the wards along the main route of the Annapurna Sanctuary Trail. These three villages have a total population of 9,134 people residing in 2,276 households (CBS, 2011) with vernacular architecture using clay, stones, slabs, timber, and slate for roofing in scattered to compacted communities. Almost all households are supplied with both safe drinking water and electricity (either local micro-hydropower or national grid lines) (ARM, 2019; MRM, 2019). The area is connected to the highway network through muddy and gravelled roads.

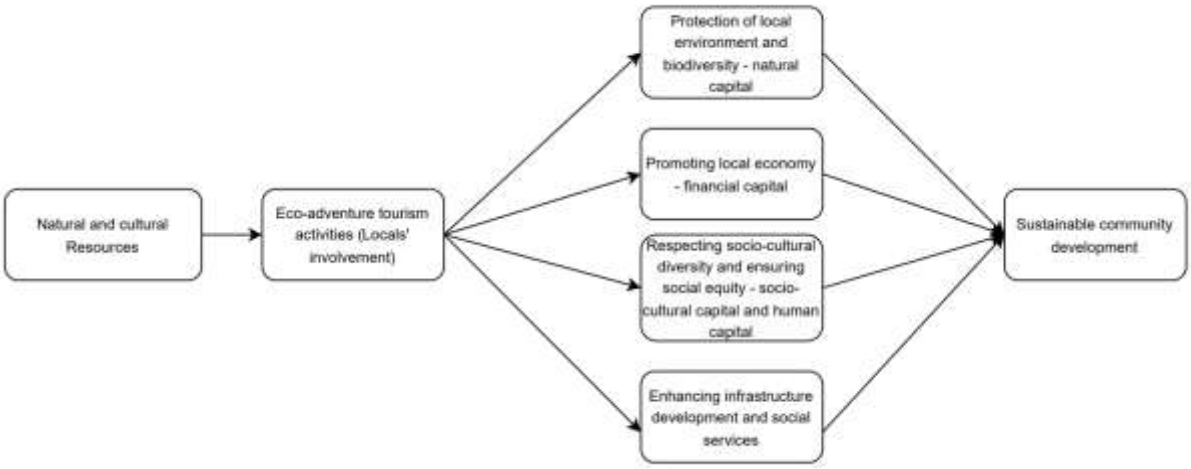

Fig. 1: Conceptual framework for sustainable community development through eco-adventure tourism.

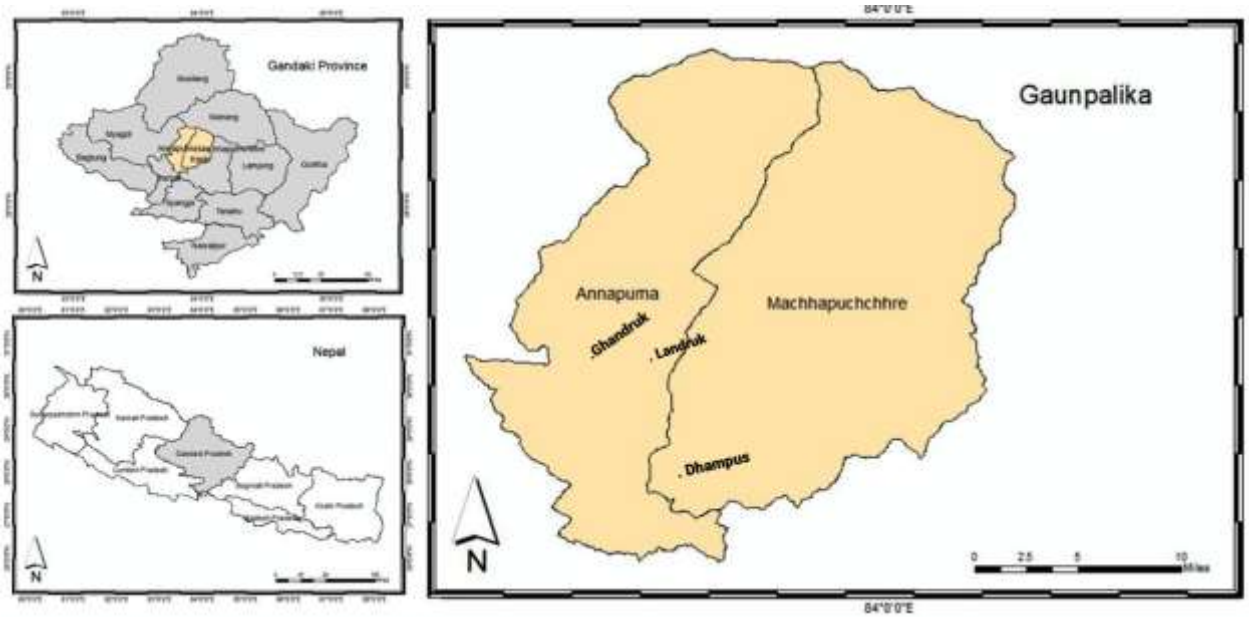

Fig. 2: Study area map

These settlements are mostly dominated by Janajati (*Gurung, Magar, Rai, Newar*), followed by Brahmins, Chhetries, and Dalits (*Damai, Kami, Sarki*). A large portion of the inhabitants in these settlements have turned to eco-adventure tourism as their primary source of income, which includes the establishment of hotels, lodges, guesthouses, teahouses and homestays, grocery stores, craft stores, and Bhatti (*local inns*) that provide a wide range of amenities and services. Besides these, there are a large number of locally owned eateries, including bakeries, teashops, cafes, and restaurants, to meet the demand of tourists, providing both typical Nepalese and international foods.

Eco-adventure tourism encompasses a wide range of activities in the study area, including trekking, mountaineering, bird-watching, spirituality, and experiencing the socio-cultural and religious events and festivals of the indigenous communities, all while enjoying the landscape and rural lifestyle.

Data Collection

Primary data were gathered using mixed methods, including on-site surveys with 120 randomly selected tourism entrepreneurs, five key-informant interviews with local leaders, officers, and tourism operators, six focused groups with Tourism Management Committees and Mother's Groups, in-person observation, and archival study. Respondents were asked to express their opinions and insights through a carefully designed survey form, including both open-ended and closed-ended questions related to household background information, and changes in the physical, ecological, environmental, socio-economic, and socio-cultural state of rural settlements due to eco-adventure tourism activities based on 7-point Likert scale, with '1' being very low and '7' being very high changes. Key informant interviews, focus group discussions, and in-person field observations were carried out to detail rural settlements' physical, ecological, environmental, socio-economic, and socio-cultural aspects alongside the Annapurna Sanctuary Trail. Moreover, this paper is the part of first author PhD dissertation, the data related to socio-demographic and economic profile of respondents (Table 1) is also published in his previous publication (Tiwari & Nguyen, 2024) too.

Data Analysis

Descriptive statistics (frequency distribution, percentage distribution, mean, and std. deviation) were employed to describe the general background information of respondents and perceived physical, ecological, environmental, socio-economic, and socio-cultural changes due to eco-adventure tourism development in rural areas resulting from growth and development of eco-adventure tourism. Kruskal-Wallis H-test has been applied to describe the differences in the perceived values of tourism entrepreneurs for the aforementioned changes based on the three major rural settlements (Dhampus, Landruk, and Ghandruk). Analysis has been accomplished using Microsoft-Exel and IBM SPSS Statistics 26 with a p-value less than 0.05. The information derived from key-informant interviews, informal focal group discussions, and in-personal field observations were subjected to thematic analysis for verification/triangulation of the findings derived after the abovementioned qualitative analysis.

Results

Socio-Demographic and Economic Profile of Respondents

Table 1 highlights the descriptive statistics of the socio-demographic and economic profiles of 120 tourism entrepreneurs. Of the 120 respondents, the majority were male (55.8%), age group 30-45 years (42.5%), janajati (71.7%), married (95.8%), lived in nuclear families (84.2%), had completed primary education (57.5%), inhabiting semi-pakki house (59.2%), had an annual income of 10-50 lakhs (51.6%), and holding 5-10 ropani of land (35.8%). A significant majority of respondents (66.6%) provide both accommodation and food services i.e., guest houses, hotels, and homestays. Over half of enterprises (55.0%) were self-owned.

Perceptions of Social and Environmental Changes Around the Rural Settlements Along Annapurna Sanctuary Trail

Fig. 3 illustrates the perceived physical, environmental, ecological, socio-economic, and socio-cultural changes resulting from eco-adventure tourism development along AST. The mean scores of five change indicators, derived from 22 observed variables (see Annex A), are presented separately for three rural settlements. Tourism entrepreneurs from Ghandruk, Dhampus, and Landruk perceived similar types of changes induced by eco-adventure tourism in terms of socio-cultural and socio-economic dimensions. The high mean scores values indicate that there have been significant changes in socio-cultural (Ghandruk X'= 5.94, Dhampus X'= 5.35, and Landruk X'= 5.26) and socio-economic (Ghandruk X'= 4.72, Landruk X'= 4.52, and Dhampus X'= 4.24) aspects as a result of the growth and development of eco-adventure tourism in these areas.

There have been severe impacts on the socio-cultural fabric of rural communities, including native cultures, customs, traditions, norms and values, rituals, languages, food style, housing style, and traditional occupational and cultural practices resulting from tourism activities. However, on-site visits witnessed that eco-adventure tourism has motivated locals from diverse ethnic communities (Brahmin, Chhetri, Gurung, Magar, and others) to conserve and promote their native cultural heritages. The growth and development of eco-adventure tourism have resulted in gender equality, enhancing social cohesion, and encouraging inclusive participation in the decision-making and planning process.

Moreover, it has resulted in fair and equal economic opportunities for tourism activities. During the focus group discussion (FGD), a Dalit woman (35 years old) at Dhampus remarked, "*There is no caste/ethnic-based restriction on the involvement of locals in tourism activities in the village; everyone has equal opportunities to engage in and benefit from these activities.*" This highlights that the opportunities and benefits are distributed fairly, ensuring no caste/ethnic group is excluded.

Table 1: Socio-demographic and economic profile of tourism entrepreneurs (n=120)

Variables	**Categories**	**Frequency (%)**
Gender	Female	53 (44.2%)
	Male	67 (55.8%)
Age group (Year)	Below 30 Years	13 (10.8%)
	30-45 Years	51 (42.5%)
	46-60 Years	46 (38.3%)
	Above 60 Years	10 (8.3%)
	Minimum = 20 Yrs., Maximum = 79 Yrs., Mean = 44.61 Yrs. and SD = 12.607	
Caste/Ethnicity	Brahmin	15 (12.5%)
	Chhetri	11 (9.2%)
	Janajati	86 (71.7%)
	Dalits	8 (6.7%)
Legal Marital Status	Married	115 (95.8%)
	Single	5 (4.2%)
Family Type	Joint Family	19 (15.8%)
	Nuclear Family	101 (84.2%)
Family Size (number)	Minimum = 1, Maximum = 12, Mean = 4.27 and SD = 1.860	
Education Level	Illiterate	13 (10.8%)
	Primary Level	69 (57.5%)
	Secondary Level	34 (28.3%)
	Tertiary Level	4 (3.4%)
Types of Tourism-Based Occupation	Guest Houses/Hotel (Accommodation & Food, managed by worker from operating unit)	40 (33.3%)
	Homestays/Tea Houses (Accommodation & Food, managed by family members)	40 (33.3%)
	Restaurants (Fast Food items)	23 (19.2%)
	Café/Tea shops, Bakeries, Bhatti, (Refreshment items)	17 (14.2%)
Types of Ownership of Tourism Enterprises	Self-Ownership	66 (55.0%)
	Family-Ownership	54 (45.0%)
State/Types of Houses	Kachhi/Thatched (Mud, Stone, Thatched roof)	5 (4.2%)
	Kachhi/Tiled (Mud, Stone, Tiled roof)	13 (10.8%)
	Semi-Pukka (Brick and metal roofing sheet)	71 (59.2%)
	Pukka (RCC i.e., Cement, Stone, Tile)	31 (25.8%)
Annual Household Income @ NRP	Less than 10 Lakhs	40 (33.3%)
	10-50 Lakhs	62 (51.6%)
	Above 50 Lakhs	18 (15.1%)
	Minimum = 2,00,000, Maximum = 1,5000,000, Mean = 28,92,500 and SD = 33,11,950.92	
Land Holding @ Ropani	Less than 5 Ropani	39 (32.5%)
	5-10 Ropani	43 (35.8%)
	More than 10 Ropani	38 (31.7%)
	Minimum = 1, Maximum = 85, Mean = 10.88 and SD = 12.716	

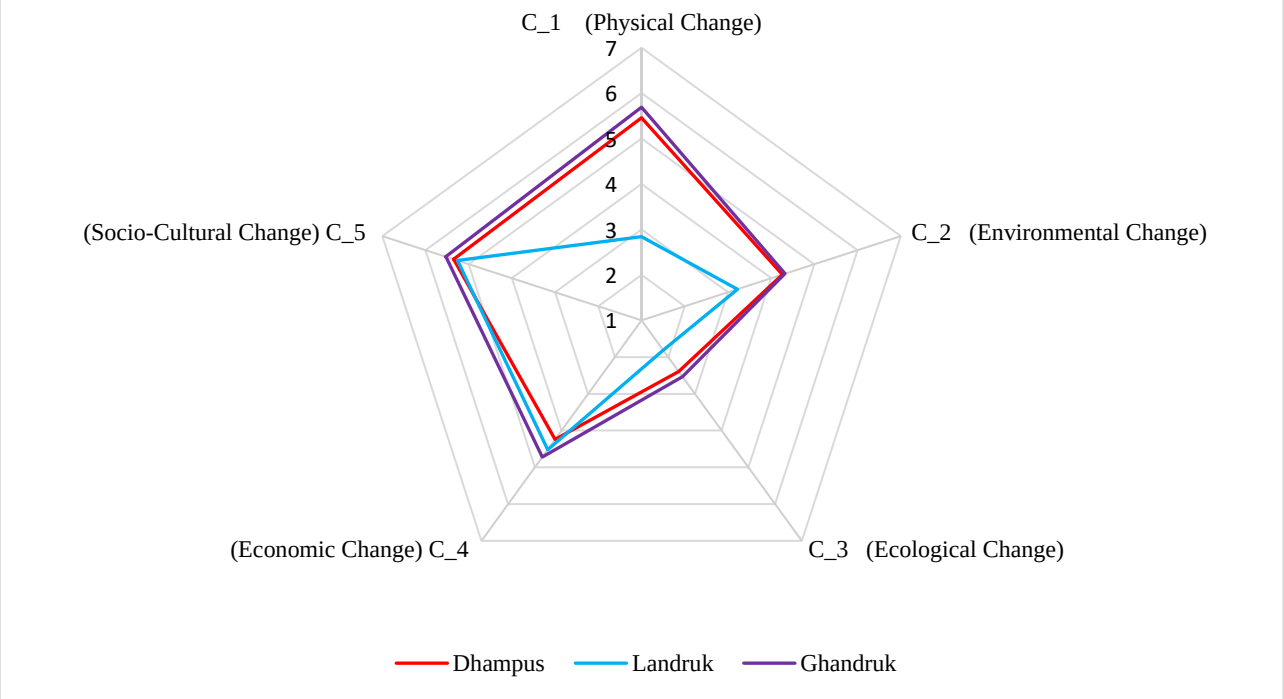

Fig.3: Perceived value of change in the state due to eco-adventure tourism development by tourism entrepreneurs based on three major rural settlements along the AST

[Note: Mean Values calculated from individual scores: 1=Very low; 2=Low; 3=Somewhat low; 4=Neutral; 5=Somewhat high; 6=High; 7=Very high.]

Most locals are engaged in diverse tourism-related activities, either as business owners or employees. These activities include running hotels, lodges, motels, homestays, restaurants, cafes, tea shops, and other auxiliary services such as guiding, chauffeuring, portering, and so on. Eco-adventure tourism has improved living standards for locals by enhancing both direct and indirect household income. It has created new employment opportunities across different sectors, extending beyond traditional agriculture to areas such as hospitality, guided tours, food services, and local crafts. During informal discussions in Landruk, the President (45 years old) of the Tourism Management Committee (TMC) stated, "*Every year, there is a significant influx of visitors to the village, creating employment opportunities and generating economic resources that help boost annual household income*." Moreover, it has expanded micro-financial services for locals. A tourism entrepreneur (35 years old) in Ghandruk explained, "*We now have access to financial services right at our doorstep, thanks to various cooperatives and branches of several development banks. There is no need for us to travel to Pokhara for these services anymore*."

Tourism entrepreneurs from Ghandruk and Dhampus perceived comparable types and higher levels of change induced by eco-adventure tourism in physical and environmental dimensions. The higher mean values for physical change indicate that eco-tourism activities have brought notable changes to the physical landscapes of rural communities in Ghandruk and Dhampus, impacting the geography of the areas and replacing open spaces. On-site visits revealed that numerous tourism-related infrastructures such as hotels, guest houses, restaurants, recreational parks, gardens, and parking areas are being constructed, alongside the extension of roads and footpaths. While the road extensions improve accessibility, they also increase the risk of landslides in several locations. On the other hand, although a mass influx of tourists in Ghandruk and Dhampus leads to a significant increase in waste, both solid and liquid, effective waste collection and management practices within the residential areas help maintain a clean, healthy, and livable local environment. During an informal discussion in Dhampus, a community volunteer mentioned, "*We have a mobile task force in place to ensure effective waste and rubbish collection within the residential areas. Additionally, we hold weekly sanitation programmes to keep our environment clean and healthy*." Furthermore, locals are using clean energy (electricity, LPG, and solar energy) as a fuel source. No significant air pollution, apart from traffic-induced dust during winter, has been observed in the areas. In this regard, an officer (46 years old) from the Annapurna Conservation Area Project at Ghandruk stated, "*There has been no significant air pollution over time, aside from dust caused by the movement of vehicles like jeeps, buses, taxis, and motorbikes during peak season. All households primarily use clean energy sources such as LPG, along with micro-hydroelectricity and solar power. The use of firewood is strongly discouraged by both the TMC and ACAP*."

Eco-adventure tourism activities unite various community-based organisations, such as youth clubs, mother groups, tourism management committees, and other local organisations to collaborate on protecting the local environment and biodiversity. Moreover, the lower mean scores for ecological change indicate that there were no notable eco-adventure tourism-induced changes in the ecological aspects of rural communities in Dhampus and Ghandruk, including ecosystem productivity, forest areas, and wildlife habitat and breeding cycles. A local woman (25 years old) in Dhampus explained, "*There is no shortage of forest products, and we have plenty of water available year-round*."

In contrast, the lower mean score indicates that there are no significant eco-adventure tourism-induced changes related to the physical, environmental, and ecological aspects of Landruk. This may be due to the relatively lower number of tourists visiting this area compared to Dhampus and Ghandruk. According to an officer (tourism section) of ACAP, "*Landruk is less affected by tourism activities compared to Dhampus and Ghandruk, as it is not accessible by frequent transportation means as the other two areas. The total number of tourists arriving is low as it mainly receives overnight tourists but very few one-day visitors*." However, the area has experienced considerable changes in its socio-economic and socio-cultural aspects.

The results of the Kruskal-Wallis H-test (Table 2) also confirm that there is a significant difference in the perceived mean scores of physical change (5.46±0.757 in Dhampus, 2.84±0.585 in Landruk, and 5.69±0.455 in Ghandruk; H=79.657, df=2; p<0.001), environmental change (5.28±0.738 in Dhampus, 4.46±0.504 in Landruk, and 6.34±0.704 in Ghandruk; H=48.869, df=2; p<0.001), and ecological change (2.39±0.625 in Dhampus, 1.81±0.489 in Landruk, and 2.53±0.707 in Ghandruk; H=25.475, df=2; p<0.001), based on individual scores across the three rural settlements. Ghandruk shows the highest change in the physical, socio-economic, and socio-cultural dimensions as it is most impacted by tourism activities, whereas Landruk experienced a relatively lower change regarding the physical, environmental, and ecological aspects.

Table 2: Location-wise differences for the change in States of rural communities due to eco-adventure along the AST (n=120)

Dimension/ Latent Variable	**Dhampus**	**Landruk**	**Ghandruk**	**Overall**				
	Mean±SD	**Mean±SD**	**Mean±SD**	**Mean**	**Std. Dev.**	**H-Value**	**df**	**P-value**
C_1 **(Physical Change)**	5.46±0.757	2.84±0.585	5.69±0.455	4.66	1.432	79.657	2	0.000**
C_2 **(Environmental Change)**	5.28 ±0.738	4.46 ±0.504	6.34 ±0.704	5.36	0.825	48.869	2	0.000**
C_3 **(Ecological Change)**	2.39±0.625	1.81±0.489	2.53±0.707	2.24	0.685	25.475	2	0.000**
C_4 **(Socio-Economic Change)**	4.24±0.239	4.51 ±0.354	4.72±0.458	4.49	0.410	26.597	2	0.000**
C_5 **(Socio-Cultural Change)**	5.35±0.406	5.26±0.350	5.94±0.239	5.37	0.349	9.107	2	0.011*
Grouping Variable: Rural Settlements Significant level at *p < 0.05, **p < 0.001								

Discussion

Protection of Environment and Biodiversity

Eco-adventure tourism plays a crucial role in generating and maintaining natural capital along the AST. Findings indicate that eco-adventure tourism aids in the preservation of natural resources, conservation of biodiversity, and protection of landscapes along the trail, akin to KC *et al*.'s findings in 2015. Based on on-site observations and interactions with locals, the forest area increased following ACAP's intervention to promote eco-adventure tourism in this region, mirroring the findings of KC *et al.* (2015). An increase in forest area enhances greenery and the scenic beauty of the location, which attracts more visitors. Moreover, locals are prohibited from cutting trees and plants on their own land without consent from ACAP and may only purchase a limited quantity of timber at a subsidised price for housing. Dried wood and fallen tree limbs can be utilised at no cost (Adhikari & Fischer, 2011; KC *et al.* 2015), all contributing to increased greenery around homes and fostering environmental sustainability within the community. This promotes floral diversity along the AST. With the expansion of forested areas, there is also a rise in faunal diversity, similar to trends observed in Masoala National Park, Madagascar (Ormsby & Mannle, 2006). Observations and informal interactions with locals reveal that wild animals, including deer, porcupines, jungle fowl, and monkeys, have increased in the forest, leading to the destruction of crops and vegetation, which results in human-wildlife conflict in Ghandruk and Landruk (KC *et al*., 2015). Furthermore, the strict prohibition of hunting wild animals by ACAP supports an increase in both quantity and species diversity in the area, similar to findings by Stem *et al.* in Costa Rica in 2003. Thus, eco-adventure tourism significantly contributes to conserving biodiversity, maintaining ecosystem productivity, and preserving wildlife habitats and their breeding cycles along the trail. However, issues such as littering along the trail, waste management at dumping sites, construction-related damages, the replacement of open spaces with tourism-related structures, and traffic-induced pollution due to uncontrolled tourism growth and mismanagement in Ghandruk and Dhampus must be urgently addressed with appropriate policies to make communities more environmentally sustainable.

Promoting the Local Economy

Eco-adventure tourism generates financial capital, creates employment opportunities, and contributes to household income by diversifying the rural economy. This includes establishing hotels, lodges, homestays, restaurants, tea shops, groceries, bakeries, cafés, craft shops, and Bhattis (local inns) within settlements along the AST, as supported by the studies of KC (2016), KC *et al.* (2015), Stem *et al.* (2003), and Bhatta (2019). Being labour-intensive, eco-adventure tourism offers numerous employment opportunities for the underprivileged, youths, women, and the indo-ethnic communities in roles such as workers, porters, tour guides, and chauffeurs, echoing the findings of Das and Syiemlieh (2009) and KC (2017). There are more job opportunities for locals in Ghandruk compared to the other two locations, due to a relatively higher flow of visitors. Findings indicate that eco-adventure tourism has bolstered traditional businesses and the local economy, in line with the results of Clifton and Benson (2012) and Acharya and Helpenny (2013). Furthermore, the integration of eco-adventure tourism activities with agricultural pursuits, handicrafts, and other local productions has provided increased benefits for locals within rural communities, resonating with the findings of Lipton & Bhattarai (2014). Additionally, locals earn from leasing land and property in Dhampus. Field observations reveal that many households in Dhampus remain engaged in handicraft production and agricultural activities alongside tourism. Moreover, locals are gaining access to banking and micro-financial services in their area following the introduction of eco-adventure tourism activities along the AST, similar to findings by KC *et al.* in 2021. Direct field observations show that microfinance, cooperatives, and some development banks are providing financial services to those in need, both in Ghandruk and Dhampus. Thus, eco-adventure tourism aids in promoting the local economy by generating regular revenue from hotels, restaurants, souvenir shops, and entrance fees, as indicated in the study by Lacher and Nepal.

Respecting Socio-cultural Diversity and Ensuring Social Equity

Eco-adventure tourism is responsible for promoting socio-cultural diversity within the rural communities along AST. From the in-site visit, it is seen that locals from diverse caste/ethnic and religious groups with different customs, traditions, life rituals, and cultures are living together with peace and harmony within a single community (KC *et al*., 2015; Upadhyaya, 2011). In addition, it is also observed that eco-adventure tourism helps foster cross-cultural understanding between visitors and locals through participating in various cultural functions. Furthermore, visitors are encouraged to respect local customs, dress codes, and religious practices along AST. Moreover, locals in Ghandruk are feeling pride in their native culture and identity due to the presence of tourists in their place, in alignment with the findings of Clifton and Benson (2006). Further, locals have started to conserve their religious and cultural heritage in Ghandruk after the intervention of eco-adventure tourism, as in the case of KC (2016).

On the other hand, findings show that eco-adventure tourism has increased social cohesion, mutual understanding and cooperation, brotherhoods, and social networking among the locals, similar to the study by Poudel (2014), KC (2017), and Achary and Halpenny (2017). In

addition, eco-adventure tourism intervention has reduced caste-based discrimination and addressed gender disparities through the active inclusion of women in tourism-related economic activities in Ghandruk, as supported by the study of KC *et al.* (2021) and Acharya and Halpenny (2013). Moreover, eco-adventure tourism promotes social inclusion and equity by involving all stakeholders in the decision-making and planning processes and ensuring fair and equitable distribution of benefits and opportunities in Ghandruk and Landruk, similar to the findings of Upadhyaya *et al.* (2011), Acharya and Halpanney (2017), KC *et al.* (2021), Upadhyaya & Upreti, (2011), and KC (2016),

Based on on-site observation and interaction with locals, it is found that households with higher income have been able to invest in their family's health and safety, as well as send their children to colleges and universities in the city centres like Kathmandu, Pokhara, and even overseas as in the study of Pradhan and Grandon (2008), Bajracharya (2011) and. KCand Thapa-Parajuli (2014). Moreover, eco-adventure tourism is helping to enhance community empowerment and human capital development along AST through various capacity-building, skill-based training, and education programs, similar to the findings of Panta and Thapa (2018). Thus, it is evident that eco-adventure tourism contributes to the development of both socio-cultural capital and human capital along the trail.

Nevertheless, alcoholism and drug abuse and locals living in modern houses, nuclear families, changing religions following Western cultures, customs, languages, and way of living led to threats to indigenous cultures in Dhampus, as supported by the study of Walter *et al.* (2018). Similarly, due to more readily available and cheaper products after the flourishment of eco-adventure tourism, the livelihood of indigenous occupational communities such as pottery, carpentry, blacksmith, and so on are under threat. Consequently, many young from such communities give up their traditional family occupation in Landruk. These social concerns should be addressed immediately with appropriate planning and policies from different governmental levels for making the community socio-culturally tolerable.

Provision of Infrastructures and Services

Eco-adventure tourism helps enhance infrastructural development within rural communities along AST. Infrastructures and services for tourists have benefited locals in many ways in Ghandruk and Dhampus, as suggested by the study by KC *et al.* (2015). ACAP invests collected revenue (visitor entrance fee) for the growth and development of eco-adventure tourism activities along AST (Nepal, 1997). Indeed, investments are made in infrastructure development like expansion and extension of roads and foot trails, construction of desks and benches for primary schools, health posts, museums, public toilets, and recreational parks in Ghandruk and Dhampus as in the finding of Nicholas & Thapa, 2010; Afenyo & Amuquandoh, 2014; and Walter *et al*., 2018. In addition, ACAP has installed micro-hydro projects in several rivulets to promote tourism, which freed the rural settlements from load shedding in Ghandruk and Landruk, supported by the study of KC *et al*., 2015. The increasing arrival rate of tourists demands more improvement and development of infrastructures along the AST, similar to the finding of Gezon (2014) in the Ankarana protected area, Madagascar. So, it is clear that eco-adventure tourism has helped to enhance physical capital within the rural communities along the trail. However, environmentally friendly designs and construction engineering must be used to develop infrastructure that meets the demands of the community and the tourism sector.

Conclusion

This study examined the changes in the physical, environmental, ecological, socio-economic, and socio-cultural aspects of rural communities resulting from eco-adventure tourism development. Eco-adventure tourism contributes to biodiversity conservation, environmental protection, promotion of the local economy, poverty reduction, infrastructure development, appreciation of socio-cultural diversity, increase in mutual understanding and brotherhoods, increase in social cohesion, social inclusion & gender equality, community empowerment, social equity, and enhancing the livelihoods of locals, it also poses challenges such as management of garbage & littering along the trail, replacing open spaces due to tourism-related constructions, traffic-induced pollution, and threats to Indigenous culture and occupational activities. This study emphasizes the need for policies and practices that promote sustainable community development through inclusive and responsible tourism practices. Key considerations include environmental protection, effective waste disposal and management, increased engagement of marginalised and economically disadvantaged groups in eco-adventure tourism activities, cultural heritage preservation, and the integration of traditional agricultural and occupational practices into tourism development strategies for sustainable community development.

Authors' Contribution

S Tiwari & A Thapa designed the work plan. S Tiwari performed research work and collected required data. A Thapa & J Timilsina analysed the data. S Tiwari prepared the draft of manuscript. A Thapa, J Timilsina critically revised the manuscript. Final form of manuscript was approved by all authors.

Conflict of Interest

The authors declare no conflicts with the present publication.

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Annexes A

Descriptive statistics for 22 indicators used for assessing perceptions of tourism service providers for changes in various aspects of rural settlements due to eco-adventure tourism development.

Indicators/ Observed Variables	Mean	SD
Physical Changes		
Expansion of basic tourism infrastructures	4.16	1.995
Road and foot-trail expansion	5.26	0.777
Expansion of recreational parks	5.08	2.091
Adequacy of public utilities	5.29	0.447
Landscapes & Tectonics & Geology	4.12	1.699
Open Spaces	4.05	1.652
Environmental Changes		
Protecting natural resources and local environment	5.56	0.742
Renewable & clean energy for tourism activities	5.77	0.444
Local organizations partnering for protecting local environment	5.60	0.854
Air quality overtime in the rural area	4.55	1.777
Disposal system for waste/garbage	5.33	0.803
Ecological Changes		
Ecosystem productivity	2.37	1.495
Forest area	2.17	1.299
Wildlife habitat & breeding cycle	2.18	1.325
Socio-economic Changes		
More employed locals i.e., engaged in tourism activities	4.61	0.690
Quality of life i.e., improved living standard of locals through increasing direct and indirect household income	4.46	0.731
Access to financial services	4.38	0.840
Socio-cultural Change		
Gender equality	5.22	0.550
Social cohesion	5.55	0.603
Cultural preservation	5.15	0.430
Fair and equal opportunities	5.35	0.681
Inclusive society (participation of all in d/making and planning process)	5.58	0.566