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Strengthening Climate Resilient Tourism Sector in Nepal

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Abstract

Tourism plays a crucial role in Nepal's gross domestic product (GDP) and employment generation. However, Nepal's tourism industry is highly dependent on seasonality and environmental conditions, which means deviations in these factors can significantly disrupt tourism activities and services. These disruptions have both direct and indirect effects on economic activities and the livelihoods of communities reliant on tourism. Additionally, the increasing frequency and intensity of climate variables and extreme events adversely impact the health and safety of tourists and those involved in tourism, threatening the sector's sustainability. Current tourism models are also linked to carbon-intensive and polluting activities contributing to ecosystem degradation and exacerbating the climate crisis.

This study employs a mixed-methods approach to gather and analyse field-based data and stakeholder opinions, providing recommendations for policy interventions aimed at enhancing climate resilience in Nepal's tourism sector. Field visits revealed significant climate trends and the impact of disasters on livelihoods, economies, and tourism. National stakeholder consultations and interactions highlighted the multi-level effects of climate vulnerability on local tourism, including infrastructural damage, economic setbacks, and safety concerns. This underscores the urgent need for robust adaptation measures.

Engaging intensively the businesses, private, academia, non-government, and government bodies is essential to fostering a climate-resilient tourism sector. Such collaboration can promote local participation and drive sustainable tourism growth in Nepal.

Keywords: Climate resilience, Tourism, Private sector involvement, Policy intervention

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नेपालमा जलवायु-उत्थानशील पर्यटनको सबलीकरण

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पाण्डुलिपी प्राप्तः ३१ मे २०२३ अन्तिम परिमार्जनः २६ अगस्ट २०२४ स्वीकृतः १९ अक्टोबर २०२३

सार

नेपालको कुल गार्हस्थ्य उत्पादन र रोजगारी सिर्जनामा पर्यटनले महत्त्वपूर्ण भूमिका खेलेको छ। तर नेपालको पर्यटन उद्योग मौसमी र वातावरणीय अवस्थामा अत्याधिक निर्भर छ, जसले गर्दा यी कारक तत्त्वहरूमा आउने विचलनले पर्यटन गतिविधि र सेवा-प्रवाहलाई उल्लेखनीय रूपमा बाधा पुऱ्याउन सक्दछ। यस्ता अवरोधहरूले पर्यटनमा निर्भर रहेका समुदायहरूको आर्थिक गतिविधि र जीविकोपार्जनमा प्रत्यक्ष एवम् अप्रत्यक्ष रूपमा प्रभाव पार्दछ। साथ-साथै, जलवायु परिवर्तन र यससम्बन्धी चरम घटनाहरूको बढ्दो आवृत्ति र तीव्रताले गर्दा पर्यटकहरू र पर्यटनमा संलग्न सरोकारवालाहरूको स्वास्थ्य एवम् सुरक्षामा प्रतिकूल प्रभाव परी समग्र पर्यटन क्षेत्रको दिगोपनालाई नै खतरामा पुऱ्याउँदछ । हालका पर्यटन मोडेलहरू पारिस्थितिक प्रणालीको ह्रास र जलवायु सङ्कटलाई बढावा दिने खालका कार्बन-इन्टेन्सिभ र प्रदूषणकारी गतिविधिहरूसँग पनि जोडिएका छन् । प्रस्तुत अध्ययनले स्थलगत अध्ययनमा आधारित तथ्याङ्क तथा सरोकारवालाहरूको राय सङ्कलन र विश्लेषण गर्न मिश्रित शोधविधि प्रयोग गर्दै ती विश्लेषणको आधारमा नेपालको पर्यटन क्षेत्रमा जलवायु-उत्थानशीलता बढाउने उद्देश्यले नीतिगत हस्तक्षेपको लागि केही सिफारिसहरू तय गरेको छ । स्थलगत भ्रमणहरूले महत्त्वपूर्ण जलवायु प्रवृत्तिको साथै जीविकोपार्जन, अर्थव्यवस्था र पर्यटन क्षेत्रमा वातावरणीय प्रकोपहरूको प्रभाव पत्ता लगाउन सहज बनाएको छ।

राष्ट्रिय सरोकारवालाहरूसँग गरिएका विमर्श एवम् छलफलहरूले पनि स्थानीय पर्यटनमा जलवायु जोखिमको बहुस्तरीय प्रभाववाट पर्यटन पूर्वाधारमा पुगेको क्षति, आर्थिक गतिविधिमा आएको अवरोध र सुरक्षा चुनौतिका मुद्दाहरूमा परेको समस्याबारे प्रकाश पारेका छन्। यी सबै तथ्यहरूबाट के प्रस्ट हुन्छ भने यो क्षेत्रको विकासको लागि बलियो अनुकूलन उपाय तय गर्नु तत्काल आवश्यक देखिन्छ।

जलवायु-उत्थानशील पर्यटन क्षेत्रलाई प्रवद्धन गर्न सरकारी निकायको साथै व्यवसायी, निजी क्षेत्र, शैक्षिक क्षेत्र एवम् गैरसरकारी क्षेत्रलाई सघन रूपमा संलग्न गराउनु अपरिहार्य छ। यस्ता सहकार्यले स्थानीय सहभागितालाई बढावा दिनुको साथै नेपालमा दिगो पर्यटन विकासलाई थप गति दिन प्रेरित गर्न सक्दछ।

शब्दकुञ्जी: जलवायु उत्थानशीलता, पर्यटन, निजी क्षेत्रको सहभागिता, नीति हस्तक्षेप

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1. Introduction

The tourism sector, Nepal's fourth largest industry by employment, offers around 6.7% contributions to the country's gross domestic product (GDP) (World Bank, 2022) and employs 371140 that contributes 11.5% of persons engaged in all industries in the country (National Economic Census, 2018). It also serves as one of the major sources of foreign exchange and revenue (Poudel & Phuyal, 2016). The Government of Nepal has put the highest importance towards increasing the tourism sector's contribution to the country's economy through its stated goal "to contribute greater GDP growth and employment, reduce poverty and increase sustainable access to foreign exchange for national development" (MoCTCA, 2015). The Tourism Vision 2020 of the government of Nepal has clustered the tourism products under five major categories: a) Culture, heritage and people; b) Cities and leisure; c) Outdoors and adventure; d) Religion and pilgrimage; and e) Nature and wildlife (MoCTCA, 2016). Thus, the involvement of people in these five major categories, directly or indirectly, comes under the tourism industry.

The tourism industry largely depends on seasonality and environmental conditions, especially in the Nepalese context (Nepal, 2000; Maharjan et al., 2017) due to the country's diverse geography, climate, and cultural heritage. The geographical diversity of Nepal, including the Himalayas, mountains, hills, and plains, creates varying climatic conditions across regions. This attracts tourists to activities like trekking, mountaineering, wildlife exploration, and adventure sports, which are influenced by seasonal changes. Trekking and mountaineering depend on favorable weather, particularly during spring and autumn when conditions are stable (Gatti et al., 2022). Nepal's rich biodiversity, with national parks and conservation areas, entices wildlife enthusiasts who observe flora, fauna, and endangered species influenced by environmental factors like bird migrations and seasonal animal activities. Religious festivals such as Dashain, Tihar, and Holi showcase Nepalese traditions and rituals tied to agricultural calendars and seasons, making the timing of visits crucial for cultural immersion. Natural phenomena like high mountains, rhododendron blooms, waterfalls, and rivers are influenced by seasons, enhancing the tourism experience when witnessed at the right time. Safety and accessibility are affected by climatic conditions, with heavy rainfall causing landslides and difficult road conditions during the monsoon season, as well as winter snowfall in high mountains, making some areas inaccessible for trekking. To plan and optimize visits, tourists and the tourism industry must understand and appreciate Nepal's unique climate and geography. Even minor changes in conditions related to seasonality and environmental factors can have a detrimental effect on tourism activities and services in Nepal (Nepal, 2000; Becken et al., 2007). The success of

the tourism industry is heavily reliant on favorable climatic variables that directly and indirectly influence the economic activities and livelihoods of communities dependent on tourism (Nepal et al., 2022).

Abrupt shifts in climatic variables and extreme weather events pose significant risks to the health and safety of tourists and individuals involved in tourism activities (Scott et al., 2012). Such events can include heavy rainfall, landslides, storms, or other natural disasters resulting in physical hazards, disrupting transportation infrastructure, and causing damage to tourist facilities (Rosselló et al., 2020). The consequences are not limited to the immediate impact but can also create a negative perception of the destination, potentially leading to a decline in visitor numbers and revenue (Jopp et al., 2010). Furthermore, the increasing frequency and intensity of climate-induced disasters, a result of climate change, have a profound negative impact on the sustainability of tourism activities (Poudel et al., 2017). Disasters such as glacial lake outburst floods and avalanches pose long-term damages to the natural environment, cultural sites, and infrastructure. These effects undermine the overall attractiveness of the destination and hinder the recovery of the tourism sector (Nyupane & Chhetri, 2009). Disruptions in climatic variables or extreme events can jeopardize the livelihoods of individuals and lead to economic instability and social challenges within these communities (Pandey et al., 2015). It indicates the susceptibility of Nepalese tourism to even minor changes in seasonality and environmental conditions, underscoring the need for careful management and adaptation to environmental changes. The sensitivity of tourism to climatic variables, the risks posed by extreme weather events, and the vulnerability of tourism-dependent communities all necessitate proactive measures to ensure the sustainability and resilience of the Nepalese tourism industry.

Nepal is globally recognized for its abundant natural and cultural treasures, including the Himalayas, diverse landscapes, rich biodiversity, historical monuments, and vibrant traditions (Devkota et al., 2020). The gradual changes in topography along the South to the North have created numerous microclimatic habitats. Within a short span of 200 km across South to North, people can experience the warm tropical climate in the lowland Tarai at about 60 m. mean sea level (msl) to alpine climate in the Himalayas with a height of above 4900 m msl at Lobuche, a small settlement near Mount Everest in the Khumbu region of Nepal, with embedded countless valleys in between irrigated by rivers and surrounded by hills (Mattas, 2021). Despite creating a major hindrance for transportation facilities, such changes in topography have offered panoramic natural beauty with varieties of biodiversity (Bhusal, 2012). Equally, the country is diverse in culture, linguistics, and ethnicity, harboring over 125 castes and ethnic groups (CBS, 2016). The residents living in

the three distinct geographic regions – high mountains (Himal), hills (Pahad) and Terai (Madhesh) – have adopted different customs and cultures according to the climate and terrain. Cultural and ethnic diversity is displayed through food, attire, celebration, and observance of many festivals and rituals, as well as artistic and historical monuments and buildings. The way of life, especially in the countryside and at the core of the old cities, is still traditional and warm for visitors. Such natural, cultural, and traditional diversities have served as the main attractions in the tourism industry.

The rich natural and cultural diversity attracts tourists from all over the world. There are twelve National Parks, one hunting reserve, six conservation areas and 13 buffer zones in Nepal (DNPWC, 2023). The country has ten World Heritage sites, as declared by the United Nations Educational, Scientific and Cultural Organization (UNESCO). Of these, eight are of cultural significance, and two are of natural heritage sites. The country is an attractive destination for mountaineers, harboring eight of the fourteen peaks above 8000 meters worldwide.

Moreover, the trekking routes, especially in the Annapurna, Everest and Langtang regions, are among Nepal's most popular tourist destinations. Even after COVID-19, out of 230085 tourists, 13304 tourists trekked in different parts of Nepal in 2020; and in 2021, such number is 12012 out of 150962 tourists (Nepal Tourism Statistics, 2020, 2021). Conservation areas are also very attractive destinations, as over half (51.4%) of the total tourists arriving in the country visit national parks. Most international tourists visit Nepal for holidays and pleasure (65%), though a significant number of visitors come for pilgrimage, adventure, business and other official purposes (MoCTAC, 2016). March – April and October – November are peak seasons as most tourists visit during these months, while June and January are off-season as the number of tourists arriving is low during these months.

Nepal opened its door to international tourism in 1951. From then on, the tourism industry has gradually been acknowledged in different policy instruments, recognizing its contribution to local and national economic development (Devkota et al., 2020). In 1959, the Department of Tourism (DoT) was established, and since then, the tourism sector has invariably been featured in the national development plans. The DoT was upgraded to the Ministry of Tourism in 1976 based on the recommendation of the first-ever Tourism Master Plan prepared in 1972. Such institutional developments were instrumental in registering several monuments of Kathmandu Valley and national parks as UNESCO World Heritage. The Ministry of Tourism brought the Tourism Act (1978) as a legal framework to manage, regulate and develop the sector. The Master Plan was reviewed in 1985, highlighting tourism

as the most dynamic sector in economic development and the primary source of foreign exchange earnings, while trekking was its mainstay. It also emphasized the need for the government to adequately direct and promote tourism to realize its potential in markets and tourism product development.

The tourism policy in Nepal came into effect in 1995, marking a significant milestone in developing and promoting the country's tourism industry (Devkota et al., 2020). It was revised in 2008 after some amendments to address pertinent issues, including rural tourism, eco-tourism, agro-based tourism, adventure tourism, education tourism and health tourism. The new policy aims to develop tourism as an essential sector for the national economy and to improve the nation's natural, cultural, and human environments to develop and expand the tourism industry. The following year, the Government unveiled Tourism Vision 2020 with the target of welcoming two million visitors and creating one million new jobs, among others, by 2020 (MoTCA, 2009). The Tourism Vision 2020 also highlights the need to sustainably use natural resources and the roles of conservation areas in tourism development. It also has noted climate change as a threat in its SWOT (strength, weakness, opportunity, and threat) analysis, though the policy lacked any such measure to address the issue.

The government brought a 10-year National Tourism Strategic Plan (NTSP) (2015-2024) in 2015 to help achieve the much-needed directions and guidance for the growth of tourism in the country (MoCTCA 2015). The NTSP's overall goal is 'to provide the government and stakeholders with a guiding framework along the economic development vision through technical and financial assistance to develop the tourism industry as a key catalyst for rapid economic growth and job creation'. The strategic plan sets out nine key interventions[1] to improve the tourism economy, including promoting private sector investment, improving infrastructure, product development, and using local resources. NTSP has noted that "even a small change in the climate and weather pattern will directly impact tourism in Nepal."

Moreover, Nepal promulgated its new constitution in 2015, declaring the country a federal republican state. Under the Directive Principles, Policies and Responsibilities

1 The key interventions to improve the tourism economy of the country includes (i) promotion of private sector investment, including FDI and public-private partnership by improving the investment environment; (ii) improvement of infrastructure with more focus on aviation; (iii) a focus on product development around the periphery of the infrastructure that is being developed; (iii) prioritisation of a few areas and products; (iv) improvement of support to facilitate the private sector; (vi) improvement of the legal and regulatory frameworks; (vii) development of mid-level technical manpower; (viii) promotion of the use of local resources through cross-sector linkages; and (ix) access to microfinance to promote micro enterprises in tourist destinations (NTSP, 2013).

of the State, Article 4.51.1 of the Constitution of Nepal has underlined the importance of tourism by mentioning a separate article under the state policy. It states that "developing environment-friendly tourism industry as an important basis of the national economy by identifying, protecting, promoting and publicizing the historical, cultural, religious, archaeological and natural heritage sites of the country, and prioritizing local people in the distribution of benefits of the tourism industry." The constitution has included the 'right to a clean and healthy environment' under fundamental rights and duties, favoring tourism promotion in Article 3.30. Nepal has now implemented the federal governance system, delegating more authority to the local level. Nepal's transition to federal governance involved key steps: a 2015 constitution defining federal, provincial, and local powers; subsequent laws addressing roles and finances; the Local Governance Act empowering municipalities and rural areas; the Fiscal Arrangements Act enhancing local resources; electoral laws enabling local elections; and regulations clarifying roles. These efforts aimed to empower local governments, fostering autonomy for efficient service delivery. Local authorities harnessed this power for infrastructure development, prioritizing activities like boundary road construction and advancing community-focused growth. Similarly, local governments are also prioritizing tourism services as one of the major pillars for local economic development, hence identifying and promoting new destinations for both national and international visitors.

All these efforts have brought significant benefits to the Nepalese economy and its people through tourism. As home to the majestic Himalayas, including Mount Everest, Nepal has become a popular destination for nature-based tourism like adventure and ecotourism. Tourism has played a vital role in driving economic growth by generating foreign exchange earnings, creating employment opportunities, and stimulating various sectors such as hospitality, transportation, and handicrafts. According to the World Bank (2022), tourism contributed 6.7% to Nepal's GDP in 2022, directly supporting over one million direct and indirect jobs. As the Nepal Tourism Board reported, Nepal's tourism revenue reached NPR 77.8 billion in the fiscal year 2018/2019[2]. The influx of tourists has also led to infrastructure development, improving connectivity and living standards for local communities.

Moreover, tourism has fostered cultural exchange, preserving and promoting Nepal's rich heritage and empowering local communities through entrepreneurship and income generation. Initiatives like the Annapurna Conservation Area Project (ACAP) and the Pacific Asia Travel Association (PATA) Nepal Chapter's Sustainable Tourism Task Force exemplify the efforts to preserve culture, empower communities,

2 Fiscal year 2018/19 is taken as it is normal year. Then after, COVID-19 has drastically reduced Nepal's Tourism revenue.

and promote responsible tourism practices. Tourism has uplifted livelihoods, enhanced the nation's global visibility, and contributed significantly to Nepal's economy.

Nepal's tourism policy instruments emphasize the need to promote sustainable and ecological tourism, but the sector's impact on nature and ecology is often ignored. The current tourism model is extractive as it prioritizes short-term economic gain from tourism activities without necessarily focusing on long-term sustainability, preservation of local culture, or the well-being of local communities and their environment. Still, Nepalese tourism seems dependent on travel-related activities and overconsumption of natural resources. This adds to the increasing greenhouse gas emissions and, ultimately, the climate crisis (Baloch et al., 2023; Sunlu, 2003; Thomas, 2013; Francios, 2020). This paper only focuses on the positive aspects of tourism and does not investigate its negative impact on climate change and natural resources.

Moreover, tourism policy instruments need to be more adequately informed by empirical evidence relevant to climate change impacts. However, it is crucial to enhance tourism resilience and sustainability in the long run. Thus, this study aims to understand stakeholders' engagement and recommend potential policy interventions to strengthen climate-resilient tourism in Nepal.

2. Literature Review

2.1 Climate Change and Tourism in Nepal

Temperature and precipitation are the most important climatic variables that create climatic hazards in Nepal (Fort, 2015; Phuyal et al., 2017). Microclimatic variables, including fog, mist, storms, and other extreme weather conditions, are also responsible for creating adverse conditions in the tourism sector. The changing patterns of temperature and precipitation have incurred a multiplier effect on tourism resources and activities (K. C. & Thapa Parajuli, 2015). These effects include increased demand for outdoor activities and adventure tourism, expansion of eco-tourism and cultural tourism opportunities, growth in employment and entrepreneurship within the tourism sector, infrastructure development to accommodate the influx of visitors and promotion of sustainable tourism practices. Different climatic events and hazards, including receding snow lines, melting glaciers, increased intensity and frequency of cloudbursts, floods and landslides, have the potential to change nature and quality of tourism resources (Tse-ring et al.

2010; Ritika et al., 2021), and therefore, tourism appeal of particular areas and regions (Sharma, 2012).

Nepal is experiencing changes in temperature and precipitation patterns over the period that have directly affected tourism industries (Chapagain et al., 2021). The recent report reveals that the surface maximum temperature has increased by 0.056^0C per year while the minimum temperature has increased by 0.002^0C over the period in Nepal. However, this rate differs for different climatic zones within the country (DHM, 2017). The increasing rate of surface temperature is reported higher in the mountain region, with 0.086^0C per year, compared to the Tarai lowland, with 0.021^0C per year. The increasing rate of temperature triggers and accelerates different climatic hazards such as heat waves, drought, landslides, and floods (Malla, 2008; Devkota and Phuyal, 2017). It also hastens the melting rate of ice in the Himalayan region (Orlove, 2009), further triggering the rate of avalanches and other disasters in mountain tourism (Nepal, 2011). The changing trend of the climatic variables determines the cost of the tourism operation (K. C., 2017). The increasing trend of temperature is responsible for other impacts, such as endemics and other hazards in destinations that affect both tourists and service providers (Henderson, 2007; K. C. & Thapa Parajuli, 2015). It also limits tourism services, specifically outdoor activities (Nyaupane & Chhetri, 2009; Nepal, 2011). It impacts the service sources and increases the business operation cost (Nepal, 2011; K. C. & Thapa Parajuli, 2015; K. C., 2017). As the time of monsoon withdrawal is shifting towards consecutive months, its effect is seen on the tourism operator for setting the daily planning (Becken & Hay, 2007). Thus, this shift in the monsoon will require a change in the existing operation and management system.

2.2 Climate-Induced Disasters and Tourism in Nepal

Climate-induced disasters are a major concern for the development and promotion of tourism business in Nepal (K. C. et al., 2021). The country is ranked the 4th most vulnerable to climate change risks globally (Gentle et al., 2014). Several climate-induced hazards directly affect tourism and services (Nyaupane & Chhetri, 2009; Nepal, 2011). Among these, floods, landslides, avalanches, lightning, forest fires, storms and heavy rainfall are major hydro-meteorological-based and climate-induced hazards that affect the tourism industry directly and indirectly (Thakuri et al., 2020). The other climate-induced hazards are windstorms, hailstorms, cloudbursts, fires and epidemics (Ghimire et al., 2014).

National Climate Change Impact Survey Report, 2016 - the first-ever conducted climate change impact survey in Nepal has revealed that climatic variables have

caused an increase in the frequency and intensity of disasters, including flash floods and landslides, over the period (CBS, 2018). It is pushing more than 1.9 million people to high vulnerability and exposing an additional 10 million people to climate risks. Increases in such disasters and rises in temperature have caused a negative impact on tourist flow in Nepal (KC, 2017).

Floods and landslides have been recorded more frequently in recent years, which have incurred the most serious damage in the tourism business. The intensity of flooding has been increased in recent years compared to past decades because of heavy rainfall and river overflow (NAPA, 2010). At times, it damages roads and other infrastructures and inundates heritage sites of tourist interest. For example, the flood of August 2017 in Lumbini and Chitwan was a recent example of its severity when a number of tourist destinations were affected, and thousands of tourists were stranded for several days. Similarly, the major tourism destination Pokhara-Chitwan-Lumbini is linked by a road, which has the potential to landslide. Recently, the tourism enterprises in the area are experiencing a sharp decline in business as the landslide strikes the conjoining highway. Numbers of such incidences have been reported recently. Further, COVID-19 added to the harsh impact of tourism. Moreover, mountain tourism which has a good share of contribution to the overall tourism sector and employment generation is experiencing challenges due to increased incidents of climate-induced hazards, including heavy rainfall avalanches and snowstorms (Nepal, 2011; Devkota, 2017), avalanches in the Everest region in 2014 and the snowstorm in Thorun-La of Annapurna circuit in the same year are an example of such events that claimed lives of tourists, employee, and added risk on the investment.

2.3 Climate Change Impact on Tourism in Nepal

The changing pattern of climatic variables and changes in the intensity, frequency and location of climate change-induced disasters have created adverse impacts on tourism in Nepal (Nyaupane & Chhetri, 2009; Devkota, 2017). It increases the stress on the environment and brings more risks than opportunities for tourism-based economies (K. C., 2017). Nepal falls among the top 20th list of the most multi-hazard prone countries in the world, which is ranked 4th, 11th and 30th in terms of climate change, earthquake, and flood risk, respectively (Koirala, 2014). Moreover, landslides, fires, droughts, epidemics, storms, hailstorms, avalanches and GLOF are the other major disasters in Nepal (Dangal, 2011). The key sectors affected or potentially affected by climate-induced disasters in Nepal include agriculture, health, water and energy use, infrastructures, biodiversity, ecosystem

services, and tourism (CBS, 2018). Increases in such natural disasters and rises in temperature have caused a decrease in tourist flow in Nepal (KC, 2017).

Since Nepal is mostly dependent on nature and adventure tourism, as 4 out of 5 tourists visit Nepal for holiday pleasure and trekking & mountaineering purposes, the weather patterns require careful consideration before carrying out any nature or adventure-related activities. The weather conditions, rainfall, fog, and wind speed must be considered, especially for major outdoor tourism activities, including trekking, bungee jumping, hiking, and rafting (Nyaupane & Chhetri, 2009). Lorde et al. (2016) rightly remark that the changes in climatic conditions and variables have a proportionate relation to the satisfaction of an individual tourist with the destination, comfort level, and demand. Similarly, climate change could incur additional investment and increase operating costs such as installing heating-cooling, food and water supply, and insurance costs (Jauhari, 2014). Moreover, it could also impact a tourist's total length of stay and limit the quality of the holiday, ultimately having a chain effect on the tourism economy (Filimonau et al., 2011). The increasing frequency of climate-induced hazards, including floods and landslides, also impacts tourism infrastructures such as roads and trails (Nyaupane & Chhetri, 2009; Nepal, 2011). Globally, climate change damages on tourism range from 0.1% to 0.5% of GDP by 2060 (Bosello et al., 2009, 2012; Agrawala, 2013). However, the loss and damage at the country context is significant. A recent technical report by the government reveals that changes in climate variability and extreme events have observed impacts on the national economy, equivalent to 1.5% to 2% of the current GDP (MoSTE, 2014).

The natural resource-based tourism is likely to be affected due to climate change (Nyaupane & Chhetri, 2009). For example, melting glaciers or snow-capped mountains in the Himalayas might reduce the number of trekkers/ mountaineers. Long Babk in 2001, researchers from the UNEP and ICIMOD identified 3,252 glaciers and 2,323 glacial lakes in the Hindu-Kush Himalayas, of which 44 are filling rapidly and that might burst soon (Mool et al., 2001). 20 years back, the ICIMOD team further identified 47 potentially dangerous glacier lakes – 25 in China, 21 in Nepal and 1 in India (Bajracharya et al., 2020). Considering the average vertical lapse rate of 6.5 °C per km, the present glaciated area above 5,000 m is likely to be snow-free with an increase in temperature of 1°C in the next few years. Glacier lake outbursts (GLOF) and avalanches are frequently seen in the Himalayas, which decreases the number of tourists visiting those areas.

Similarly, an increase in temperature of 3-4 °C could result in the loss of 60-70 percent of snow cover from the Himalayas (Alam & Regmi, 2004). This will make

the major cause of mountain landscapes losing their beauty, adversely impacting visiting trekkers and climbers. This will bring hardships to the mountain communities as many depend on tourism as their livelihood opportunity. It is a similar case with diminishing flora and fauna due to climate change, which serves no purpose for tourists to visit the place, affecting the tourism industry further.

2.4 Policy and Governance of Nepalese Tourism Sector

Nepal's venture into international tourism began in 1951, and over time, the country recognised the substantial economic potential this industry held (Shrestha & Shrestha, 2012). The pivotal establishment of the Department of Tourism (DoT) in 1959 marked a milestone, integrating tourism into the fabric of national development plans. As Nepal's tourism sector evolved, the inaugural Tourism Master Plan took shape in 1972. This comprehensive blueprint steered the sector's growth and played a significant role in recognising Nepal's UNESCO heritage sites, underscoring its cultural and natural wealth on the global stage. In a strategic move in 1976, the Department of Tourism was elevated to the status of the Ministry of Tourism. This elevation signified the growing importance of tourism in Nepal's economic landscape and provided a platform for shaping more comprehensive policies. The subsequent enactment of the Tourism Act in 1978 laid down the foundational regulatory framework for the industry's operations (Devkota et al., 2020).

By 1985, Nepal's Tourism Master Plan highlighted a paradigm shift towards active government sector promotion. This emphasis on strategic promotion aimed to leverage Nepal's diverse tourism offerings and attract a wider range of visitors. Following the advent of multi-party democracy in 1990, Nepal's tourism policies gained new dimensions and enhancements. In 1995, the Tourism Policy underwent a significant expansion, encompassing a diverse array of forms such as rural, eco, agro, adventure, education, and health tourism. This inclusive approach aimed to tap into various tourism niches and broaden the sector's scope. Subsequently, the 2008 update further refined Nepal's tourism policy framework, aligning it with changing trends and demands. This period marked a transition towards a more participatory and dynamic approach to tourism development. In 2020, the Tourism Vision took a forward-looking stance, focusing on growth while remaining attuned to environmental concerns. This vision recognized the importance of responsible tourism to safeguard Nepal's natural heritage and the well-being of its communities.

The National Tourism Strategic Plan (2015-2024) underscored the role of the private sector, the need for infrastructure development, innovative product creation, efficient use of local resources, and the incorporation of climate resilience strategies.

This plan aimed to ensure that the benefits of tourism reached various strata of society while also acknowledging the impacts of climate change on the industry. Nepal's constitution of 2015 enshrined the significance of tourism. The constitution emphasized environmentally friendly development, the preservation of cultural heritage, and the equitable distribution of benefits arising from tourism activities. With the transition to federal governance, local authorities gained enhanced decision-making power to pursue targeted tourism growth (Devkota et al., 2020). Furthermore, Nepal's climate change policies acknowledged the vulnerability of the tourism sector to climate impacts, with the National Adaptation Plan (NAP) and nationally determined contributions recognizing the need for adaptation strategies within the sector.

Nepal's rich tapestry of policies and strategies has evolved to address the multifaceted dynamics of its tourism industry. From early recognition of the economic potential to embracing sustainability and resilience, these endeavors mirror the nation's commitment to harnessing tourism for economic growth and its people's well-being. Nevertheless, a recent report compiled by the National Planning Commission reveals that the existing tourism policy, despite its age, needs to align with the principles of Nepal's newly established constitution (NPC, 2021). Furthermore, it lacks the ability to address the goals outlined in the sustainable development agenda effectively and adequately tackle challenges stemming from disasters. Consequently, the necessity to formulate a fresh tourism policy is evident, which can give the tourism sector a rejuvenated mandate and a comprehensive roadmap. This novel policy should meticulously assess the gaps between various policies and establish a cohesive linkage that elucidates the operational framework for all stakeholders involved. Such an initiative would rectify the current inadequacies and propel the tourism sector towards a more prosperous trajectory (NPC, 2021). By fostering a harmonious synergy among policies and stakeholders, this reimagined policy has the potential to foster the growth and prosperity of Nepal's tourism sector in the times ahead.

3. Methods

The study adopted a convergent parallel mixed-method approach to collecting empirical data: quantitative information, qualitative information, and narratives and stories through primary and secondary data collection procedures.

The quantitative information: Data was collected from several sources. Socio-economic data were collected from the Ministry of Finance (MoF), National Planning Commission (NPC), Nepal Rastra Bank (NRB), and Central Bureau of Statistics (CBS). Tourism-related statistics and data were gathered from the Ministry

of Culture, Tourism and Civil Aviation (MoCTCA), Nepal Tourism Board (NTB), Tourism Department, and Himalayan Rescue Association (HRA). The data on observed climate change trends and projections were collected from the Department of Hydrology and Meteorology (DHM). The data on disaster events relevant to the tourism sector and their loss and damage was extracted from the DesInventar dataset in the disaster risk reduction (DRR) Portal of the government of Nepal. The information from different sources was cross-checked to maintain the consistency of the analysis. The study has also collected information on each activity of the tourism sector to determine the main physical losses and damages to tourism sectors caused by climate change. These data are limited in that they represent the period between 1985 and 2016. This is due to the need for a complete data set for regression analysis, which establishes the connection among various factors. It is also an international practice to analyze environmental impact of climate for a minimum of 30 years (Climate Change Committee, n. d.).

The qualitative information: Field visits were conducted to assess the effects of climate-induced disasters on the tourism industry and gather insights from various stakeholders to enhance climate-resilient tourism. Three major tourism sites – Langtang, Pokhara, and Chitwan – were selected based on the criteria, including popularity, ecological representation, recent disaster occurrences, tourism sub-sectors, and National Adaptation Plan (NAP) identification. Stakeholder consultations and focus group discussions (FGDs) were conducted at the local and national levels. Local entrepreneurs, including tea shop owners, hoteliers, government representatives, tourist guides, and porters, were consulted alongside relevant government agencies, associations, and the private sector. The study involved five focus group discussions (FGDs) – three in Pokhara and one each in the other two districts, three consultation meetings with Trekking Agencies' Association of Nepal (TAAN), Hotel Association Nepal (HAN), and Nepal Mountaineering Association (NMA), respectively, seven key informant interviews (KIIs) including experts and tourism entrepreneurs, and field observations of disaster impact over three days in Langtang, four days in Pokhara, and two days in Chitwan. A checklist guided these consultations to understand climate change impacts, disaster frequencies, sectoral effects, and response mechanisms. The study analyzed climate change impact by collecting narratives and stories, focusing on changing climatic trends, disaster timelines, and their impacts on tourism over three decades. Disaster-affected areas, such as damaged infrastructure and flooded sites, were observed. The findings offer site-specific insights into climatic variables, disaster impacts, and implications for livelihoods, economies, and overall tourism sector resilience.

4. Results and Discussion

4.1 Results Based on Secondary Data

4.1.1 Contribution of Tourism to the National Economy

The study examines tourist arrival trends in Nepal from 1985 to 2016, encompassing various purposes and modes of travel. For that, several data have been analyzed. The result shows a rapid increase in foreign tourist arrivals, despite a temporary decline between 2000 and 2006, attributed to internal political instability. Notably, 2015 witnessed a dip due to a massive earthquake and an unofficial blockade along the Nepal-India border. Tourists visit Nepal for outdoor, cultural, natural, wildlife, recreational, and other tourism activities, with a substantial portion (36%) engaging in recreation and leisure, followed by nature and wildlife (29%) and outdoor adventures (12%). The country also attracts visitors for cultural and pilgrimage purposes (5%) and various other activities (18%).

The data also revealed that tourists predominantly enter Nepal by air, while those entering by land are primarily from India. The proportion of land-based tourists has grown, accounting for 24% of total arrivals in 2016 compared to 15% in 1985, indicating an increasing number of Indian visitors. Nepal remains a year-round tourist destination, with peak seasons in spring (March to May) and autumn (September to November), though substantial numbers visit even during off-peak periods. The average duration of tourist stays has risen from approximately 11 days per visit in 1985 to around 13 days in 2016. Marketing efforts and diversified offerings play a role in prolonging tourist stays. The study suggests a dual focus on attracting more visitors and extending their stay to enhance further the tourism sector's impact on Nepal's economy and reputation as a desirable travel destination.

It is also observed from the data that Nepal's tourism sector, though small, displays robust growth and diverse economic contributions. It generates significant employment, tax revenue, and foreign exchange earnings. Trekking, hotels, and travel agencies stand as key employment generators within the industry. Direct jobs in travel and tourism reached 497,500 in 2017, projected to grow further. The sector's direct contribution to GDP was NRs 99.8bn (4.0% of GDP) in 2017, which is predicted to rise annually, emphasizing its economic impact. Tourism revenue sources include entry fees and permissions for adventurous activities. The positive link between GDP growth and tourist arrivals is evident, signifying the sector's role in bolstering economic opportunities. Tourists' spending per visit has risen, encouraging potential for extended stays and diversified offerings. Various studies confirm tourism's bi-directional relationship with GDP, underlining its positive

impact on economic growth. Despite challenges, tourism's contribution to Nepal's GDP has expanded significantly over the last three decades. Sub-sectors, such as trekking and hotels, play pivotal roles in shaping this contribution.

4.1.2 Climatic Impact on Tourists in Nepal

Climate change-induced disasters have brought about significant loss and damage (L&D) within Nepal's tourism sector, affecting vital components such as infrastructure, workforce, tourists, and investments. Scholarly research has estimated that the growing frequency of climate-induced hazards results in L&D costs equivalent to approximately 2-3% of the country's total GDP on an annual basis (IDS-Nepal, PAC, and GCAP, 2014). As climate variability intensifies, there is a growing concern that L&D within the tourism sector could become even more severe, particularly with regard to extreme shifts in rainfall patterns and temperature.

Examining the available data from 1985 to 2015, it becomes evident that the trend of L&D on the national and tourism GDP has been on the rise. The overall economic loss and damage to tourism GDP increased from NRs 0.0778 billion in the period from 1985 to 1990 to NRs 1.4624 billion in the period from 2010 to 2015. An analysis of specific sub-sectors within tourism reveals that outdoor and adventure tourism and leisure and recreation tourism have borne a significant share of this loss (Table 1). This escalating economic loss is primarily attributed to four major climate-induced hazards: floods, landslides, snowstorms, and avalanches. These hazards have led to an annual economic loss in tourism GDP, amounting to approximately $987,968 over the last three decades. Notably, floods and landslides have inflicted more substantial economic losses than avalanches and snowstorms due to their widespread impact across various geographic zones within the country.

Table 1: Economic Loss and Damages to the Tourism Sector in Nepal (in NRs. billion)

Years	Entire GDP of Tourism	Outdoor and Adventure Tourism (ADT)	Cultural and Pilgrimage Tourism (CT)	Leisure and Recreational Tourism (RT)	Ecosystem Based Tourism (ET)	Other Tourism (OT)
1885-1990	0.0778	0.0106	0.0004	0.0497	0.0068	0.0015
1990-1995	0.2591	0.0418	0.0044	0.1140	0.0302	0.0129
1995-2000	0.4084	0.1155	0.0141	0.2803	0.0592	0.0249
2000-2005	0.4662	0.1154	0.0462	0.2301	0.0606	0.1169
2005-2010	0.7270	0.1813	0.1102	0.3235	0.1056	0.2043
2010-2015	1.4624	0.1422	0.1199	0.8289	0.1330	0.2311

Source: Researcher's calculation

The implications of climate change extend beyond mere economic repercussions. Increasing occurrences of landslides and floods have destroyed crucial infrastructure such as bridges and trekking trails in prominent tourist destinations like Mt. Everest and the Annapurna Circuit. The escalation of temperature-related issues has triggered additional hazards like wildfires and habitat loss, posing a significant risk to biodiversity and endangered species (WRF, 2006; Lal et al., 2001). Such developments also have far-reaching implications for Nepal's tourism sector. Given the tourism industry's reliance on natural resources, it remains particularly vulnerable to the adverse impacts of climate change. Addressing this issue necessitates swift and effective measures to both mitigate and adapt to these challenges. By proactively addressing the increasing risks associated with climate-induced hazards, Nepal can safeguard its tourism sector, minimize economic losses, and ensure the industry's sustainable growth for years to come.

4.1.3 Climate Change Impact on Foreign Tourist Arrival

The impact of climate change on foreign tourist arrivals has significant implications for the tourism industry, a crucial economic sector. Analyzing the underlying determinants of tourism success is essential for economic benefit maximization. This study employs a single equation model of demand, a common methodology to assess the implications of foreign tourist demand. This approach offers statistically accurate results and a comprehensive overview of tourism demand. The model's linear form encompasses various factors: GDP of the origin country, exchange rates, average cost of visiting the destination, consumer price index, temperature, precipitation, and unobserved variables. Data for these variables are sourced from national and international statistical sources. The measurement of tourism demand is based on the total number of tourists arriving from countries of specific origins per year, with foreign tourist-contributed GDP measured in local currency.

Prevailing economic theory assumes constant elasticity and non-constant slopes in product demand models. A double-log transformation is commonly used to model constant elasticity, with the natural log of total tourist arrivals as the dependent variable and natural logs of independent factors as explanatory variables. This transformation allows interpretation of each coefficient's impact on tourist arrivals, indicating the percentage change in arrivals due to a one-percent change in an independent variable, all else being constant. The study observed that maximum temperature and rainfall data were at a stationary level, limiting the use of Vector Autoregression (VAR) and Vector Error Correction Model (VECM) models. An Ordinary Least Square (OLS) regression was found to be appropriate. The model's robustness was verified through post-performance tests for multi-collinearity and

autocorrelation. While the model's statistical fit is suitable, the choice of functional form should be driven by economic theory.

The estimated regression result demonstrates the relationship between climate change and foreign tourist arrivals. Variables such as GDP, exchange rate, average cost, consumer price index, temperature, and precipitation all play a role. Notably, a 1% increase in the GDP of the country of origin corresponds to a 0.199% increase in tourist arrivals in Nepal. Exchange rate and average cost show negative relationships, indicating that a 1% increase in these factors decreases foreign tourist arrivals by 0.464% and 0.459%, respectively. Consumer price index, representing inflation, positively affects arrivals. Temperature and rainfall have notable impacts. A 1% increase in maximum temperature leads to a 1.533% increase in tourist arrivals, while a 1% increase in minimum temperature corresponds to a 1.047% decrease. Precipitation's influence is less significant, with a 1% increase potentially causing a 0.749% rise in arrivals, though not statistically significant due to the concentrated rainy season. The result highlights the sensitivity of tourism to temperature and suggests that rainfall may have a more nuanced impact. This analysis contributes to informed decision-making in managing tourism amid changing climate conditions.

4.1.4 Estimation of Climate Change Impact on Tourism GDP

This study also explores the ramifications of climate change on the overall GDP generated by the tourism industry, as well as its specific sub-sectors. Following Johnson and Ashworth's (1990) model, the study analyses national tourism sector data from 1985 to 2015. The regression results show that a 1% increase in certain input factors leads to a corresponding increase in tourism GDP: 0.572% for ADT, 0.431% for RT, and 0.134% for other tourism sectors. However, CT only contributes 0.078%. Moreover, the model underscores the sensitivity of tourism activities to temperature and rainfall. A 1% decrease in average minimum temperature results in a 3.66% increase in total tourism GDP, while the same percentage increase in average maximum temperature leads to a remarkable 9.36% increase in tourism GDP. Conversely, a 1% rise in precipitation causes a decrease in tourism GDP by 0.525%. The regression outcomes reveal significant insights into the connection between climate change and tourism GDP.

The regression results indicate that the GDP contribution of different tourism sectors is heavily influenced by those from various sub-sectors, such as outdoor and adventure, culture and pilgrimage, nature and wildlife, leisure and recreation, and other tourism sectors. The analysis demonstrates parallels with the impact of

climatic variables on tourist arrivals. Similar relationships are observed between average minimum temperature, tourist arrivals, and tourism GDP, as well as average maximum temperature and the same variables. However, the study indicates that changes in precipitation have a less pronounced impact on tourism GDP, which aligns with the observation that tourist arrivals are lower during the rainy season. These findings reveal valuable insights into the intricate interplay between climate change, climatic variables, and the tourism sector's GDP, emphasizing the significance of temperature and its varying effects across different sub-sectors. Further analysis of the impact of climate change on individual sub-sectors of tourism may generate more evidence for policymakers.

4.1.5 Projected Economic Costs of Loss and Damages on the Tourism Sector

Tourism is crucial to Nepal's economic development, contributing significantly to its GDP. The World Travel and Tourism Council (WTTC) indicates that tourism makes up 7.5% of Nepal's GDP and is projected to rise at an annual rate of 4.3%, reaching 8.3% by 2027. The trend of tourism GDP demonstrates this growth trajectory until 2030. Future projections are based on various annual growth rates derived from authoritative sources, ranging from 4.3% to 3.7%. Globally, the anticipated economic cost of loss and damages in the tourism industry is relatively modest, projected to range from 0.1% to 0.5% of GDP by 2060. However, the extent of these losses could escalate due to unprecedented climate change, particularly in countries like Nepal, where tourism heavily relies on nature-based activities and constitutes a significant portion of the economy.

The shifts in climatic variables and the increasing frequency of climate change-related extremes have varying impacts on both the national economy and the tourism industry. These changes affect resources in tourist destinations, leading to indirect environmental repercussions on areas such as biodiversity, water resources, landscapes, visibility, health, agriculture, and small industries. Moreover, these changes could trigger societal shifts, such as the migration of indigenous communities, alterations in tangible and intangible cultural aspects, and potential conflicts arising from climate-induced issues like droughts and water shortages. These impacts have a direct bearing on the tourism industry, and, by extension, the GDP generated from it. Notably, the loss and damage experienced by the tourism sector due to climate-induced hazards are on the rise and are expected to become even more substantial in the future. As a result, careful consideration of climate change's impact on the tourism sector is imperative for Nepal's sustainable economic growth and the preservation of its natural and cultural assets.

The findings offer policymakers invaluable insights for shaping Nepal's tourism future. Despite challenges, the rising foreign tourist influx underscores Nepal's allure. Addressing instabilities, understanding diverse visitor interests, and tailoring experiences are crucial. Enhancing infrastructure, especially transportation and accommodations, will improve visits' quality and quantity. Targeted off-peak marketing can tap wider markets and extend stays. Sustainable practices safeguarding heritage are vital for lasting success. These insights provide a strong foundation for informed decisions. Aligning policies with global travel dynamics can help Nepal not only sustain its tourist growth but also establish a distinctive position on the global tourism map.

4.2 Evidence from Stakeholders Consultation

4.2.1 Stakeholders Experience on Climate Change Impacts in Tourism

To assess the ramifications of climate change on Nepal's tourism sector, our study drew upon a rich tapestry of narratives and accounts gathered from diverse locations. Respondents shared their experiences of changing climatic events, disaster timelines, and the resulting effects on their tourism businesses and services over three decades. The study also took note of disaster-affected areas, including damaged infrastructure like bridges and trekking trails due to landslides and flooding. The field visits and consultations provided specific trends of climatic variables, climate-induced disasters, their implications for livelihoods and local economies, and their overall impact on the tourism sector. Table 2 shows the results derived from FGD, KII and consultation meetings.

Table 2: Stakeholders View on Tourism in Nepal

A. Outdoor and Adventurous Tourism (ADT)	
Service/ Products	Rafting/canoeing, trekking, mountaineering/expedition, wildlife (Flora/fauna/ fish), areal adventurous (Paragliding, mountain flight, ultra-light flight, skydiving, para-hawking and helicopter)
Major Climate Extremes	Unpredictable weather, loss of visibility, heavy rainfall, extreme temperature, seasonal shift
Experience Impacts	Decreases on water level/rapid, water sources depletion, biodiversity/habitat loss, increased wet and dry landslides, avalanche; ice level decrease, ice trap, snow storm, dense fog, No more adventurous, uncomfortable camping site, loss of scenic view, business loss, increase tourists' disappointment, flight cancellation, passenger stranded, increase in operation cost, unsecured campsite, increase in insurance cost, high risk of life, difficulties in rescue and evacuation, drinking water scarcity, loss of base camp/expedition route, accident rate high.

B. Culture and Pilgrimage Tourism (CT)	
Service/ Products	Local architecture (Karnali, Dolpa, Manag, Mustang, Humla, Dolpa, Mithila), Tharu arts (Chitwan, Eastern and Western Nepal), Heritage site in Kathmandu, Festivals, Baraha Chhetra Pilgrimage (Eastern Nepal), Devghat, Muktinath, Hot Spring (Pokhara)
Major Climate Extremes	Rainfall, snowfall, floods, acidic rain, changing seasonality, flooding due to heavy rainfall, snow fall/rainfall
Experience Impacts	Damage to local architecture, damage and wash out the arts, weathering of wood crafts and metal roof, endangered and inaccessible for pilgrimage, damage the roofs, swept away and extinction of the indigenous arts
C. Nature and Wildlife Tourism i.e. Ecosystem based Tourism (ET)	
Service/ Products	Jungle safari/walk, rafting, boating, canoeing, kayaking, fishing, trekking and expedition, sightseeing and hunting.
Major Climate Extremes	Extreme temperature and rainfall, visibility, flood, landslides, fire, drought, lake eutrophication, snowstorm, heavy snowfall
Experience Impacts	Habitat and biodiversity losses, water pollution, river course change, change of habitat of migratory birds, loss of wetland, shift in the water sprouts, snowline shifting, vegetation shifting, human life loss, wildlife extinction, damage of trail, increasing snow melting, base camp destruction, climbing route damage, tour cancellation, avalanche and GLOF, revenue losses.
D. Recreational and Leisure Tourism (RT)	
Service/ Products	Accommodation, food and beverage, hospitality, information, sightseeing, transportation, group and mass tourism.
Major Climate Extremes	Extreme temperature and rain, landslide, floods, drought, endemic, loss of visibility and storm.
Experience Impacts	High expenses on operation costs, decreasing the accommodation rate, decreasing tourist flow, damaging the infrastructure, blocked supply chain, blockage in tourism value chain.

In the study area, stakeholders opined that outdoor and adventurous tourism, encompassing rafting, trekking, mountaineering, and aerial activities, faces operational and safety concerns due to unpredictable weather, low visibility, heavy rainfall, temperature fluctuations, and seasonal changes. Culture and pilgrimage tourism, featuring local architecture, Tharu arts, heritage sites, and festivals, grapple with climate-related issues like structural damage, cultural artifact deterioration, and accessibility problems due to floods and changing weather. Nature and wildlife tourism, offering jungle safaris and trekking, confront habitat loss, water pollution, river course alterations, and natural disasters. Recreational and leisure tourism, covering accommodations and hospitality, is impacted by extreme weather,

landslides, floods, and supply chain disruptions, causing higher costs and fewer tourists. These findings underscore the study area's tourism's vulnerability to climate variations.

On the other hand, in terms of services/products, in outdoor and adventurous tourism, unpredictable weather, reduced visibility, heavy rainfall, temperature fluctuations, and seasonal changes pose safety and enjoyment risks. Culture and pilgrimage tourism experiences issues such as rainfall, snowfall, floods, acidic rain, changing seasons, and flooding, leading to damage to cultural and religious sites. Nature and wildlife tourism confronts extreme temperatures, rainfall, floods, landslides, fires, and habitat loss, affecting biodiversity and human safety. Recreational and leisure tourism grapples with extreme weather, landslides, floods, and operational disruptions. These findings highlight the diverse and significant challenges posed by climate events in the study area that also resembles Nepal's tourism sectors.

Similarly, the impact on people and communities engaged in Nepal's tourism sectors, as discussed in focus group sessions, consultations, and expert opinions, is both extensive and complex. In outdoor and adventurous tourism, there are concerns over declining water levels, biodiversity loss, and safety risks due to unpredictable weather and natural disasters. Culture and pilgrimage tourism faces architectural damage and challenges in preserving indigenous arts, while nature and wildlife tourism grapples with habitat loss and ecological disruptions. Recreational and leisure tourism deals with rising costs and infrastructure damage. These impacts encompass a wide range of issues, including economic losses, safety hazards, and environmental degradation, highlighting the multifaceted challenges posed by climate-related events in the tourism industry.

The collected narrative stories from several sites and stakeholders underscored that the tourism sector has indeed felt the impact of climate change at the grassroots level – including the study areas, i.e. Langtang, Pokhara and Chitwan. In this area, the increasing frequency of climate-induced disasters has led to loss and damage to tourism infrastructure, resulting in higher operational costs, diminished service quality, and economic challenges. These disasters have caused injuries and fatalities among both tourists and employees, emphasizing the need for effective adaptation and resilience strategies in Nepal's tourism sector. A Plethora of research reports already support the findings of this study and agree that extremes in Nepal have diverse and significant impacts on various tourism sectors, including outdoor adventures, cultural and pilgrimage experiences, nature and wildlife encounters, and recreational and leisure activities, leading to economic and environmental

challenges for tourism business in the tourism industry. It demands stakeholder consultations at the national level that help to reinforce the multi-scalar impact of climate change on the tourism industry in Nepal.

4.2.2 Interventions for Climate-Resilient Tourism

Nepal is endowed with a rich natural and cultural heritage that attracts tourists from all over the world. However, conditions are changing due to climate change. There is increasing vulnerability as rainfall patterns shift, temperatures rise, and the frequency and intensity of natural disasters increase. This has demanded the engagement of different stakeholders to develop a resilient tourism sector in the country.

4.2.3 Tourism Stakeholders and Private Sector Engagement

Multiple stakeholders are engaged in the tourism sector in multi-layer roles. Government agencies mainly play the role of enablers in developing and implementing policy instruments, along with engaging other stakeholders, including academia, civil society organizations, experts, and the private sector. Moreover, the private sector is a crucial stakeholder as it is the main investor in the tourism sector. The private sector is also the main source of innovation, specifically through marketing strategies so as to sell tourism products and services and hence generate more benefits.

There are few public academic institutions that are playing the crucial role in producing trained human resources specifically, through offering formal training. However, the private sector includes diverse levels of institutions based on their services within the country's tourism industry. Consultations, field visits, and literature reviewed during this study suggested that the private sector has multiple roles to play in the tourism industry. Their role ranges from investment in the industry to conservation of resources and communicating their services (Table 3).

Table 3: Private Sectors' Involvement in Tourism in Nepal

Tourism Products/Strategies	Private Sector Support
Promote resource preservation and responsible resource usage	Develop and expand the array of available destinations
Establish rigorous quality benchmarks for fostering sustainable tourism growth	Simplify the process of setting benchmarks and obtaining certifications
Enhance the quality and diversity of available accommodations	Improve the scope and coverage of the markets
Provide technological assistance for the creation of imaginative tourism initiatives	Offer technical assistance and resources for effective marketing and online distribution

Tourism Products/Strategies	Private Sector Support
Foster economic prosperity within the local community	Create inventive strategies to engage local communities
Overcome investment barriers	Providing access to new markets or enter into the new markets
Protect, promote and safeguard the rights and interests of tourists	Enhance the availability of comprehensive information networks
Encourage healthy competition in the tourism industry	Promote diversity by discouraging monopolies and fostering a variety of endeavours
Ensure sustainable tourism standards are maintained	Support research methods and quantitative assessments; secure investment and funding
Ensure public health and sanitation standards	Secure investment and funding for advanced and innovative technologies
Enhance better communications and communication channels	Secure investment and funding for cost-effective, state-of-the-art technological interventions
Empower all pertinent stakeholders, including local residents, through capacity building	Secure investment and funding for training facilities

In the face of climate change, the private sector has multifarious roles in tourism, including mobilization of financial resources, raising capital through innovative financial mechanisms, improved service delivery by better service levels through the economics of scale and/or new technologies and facilitating access to a wider range of skills in planning, management, and implementation. In fact, the private sector's investment in tourism is also at risk if it is avoided to consider climate change risks. Hence, private sector engagement is crucial to developing climate-resilient tourism. The specific role of the private sector in developing a resilient tourism sector is further described in the next sub-section.

4.2.4 Role of the Private Sector in the Resilient Tourism Industry

The private sector is vital in Nepal's tourism, spanning transportation, accommodation, and innovation in energy, water, and infrastructure. Public-private partnerships, emphasized in Nepal's Tourism Strategy, are crucial. Tourism interfaces with sectors like hotels, communication, energy, and transport, making private sector engagement imperative. It enhances service delivery, mobilizes diverse financing resources, and promotes innovation. Private sector flexibility aids in overcoming challenges. The private sector in Nepal can enhance climate resilience in tourism through supply chain management, diversifying tourism products,

exploring innovative financing, and improving climate information management. Collaborating with local suppliers reduces carbon emissions and supports communities. Diversification minimizes vulnerability and benefits local communities. Innovative financing aids sustainable infrastructure and renewable energy adoption. Improved climate information management enables effective decision-making and enhances safety for tourists. Engaging the private sector, academia, and experts fosters a climate-resilient tourism sector, promotes local participation, and drives sustainable growth. This collaboration is crucial for Nepal to enhance overall resilience and mitigate climate change impacts in its tourism industry.

Further, the legal and regulatory framework needs to be strengthened. Similarly, there is a need for better awareness and orientation about disaster risk reduction and climate change adaptation in the context of the tourism sector. However, close coordination and collaboration between the government, private sector, and other relevant stakeholders are necessary for developing the climate-resilient tourism sector in Nepal.

5. Conclusion and Recommendation

Nepal's tourism sector, heavily dependent on seasonal patterns and environmental conditions, faces significant disruptions due to climate variability and disasters. Utilizing a mixed-methods approach, this study has gathered and analyzed field-based data and stakeholder opinions to offer policy recommendations for enhancing climate-resilient tourism in Nepal.

5.1 Key Findings

- Field visits and stakeholder consultations reveal that climate change and natural disasters profoundly affect local communities, economies, and the tourism sector.
- Interviews across Nepal confirm that local tourism is particularly sensitive to climate change, leading to issues such as infrastructure damage, financial strain, and safety concerns.

5.2 Recommendations

- **Collaborative Efforts**: Stakeholders, including government, private sector, and local communities, must work together to develop a climate-resilient tourism sector. Given the private sector's crucial role as the primary investor,

strategies should be devised to enhance private sector engagement, minimise investment risks, and maximise tourism benefits.

- **Incorporate Climate Change into Tourism Policies:** Tourism policy instruments should explicitly address climate change, considering both current impacts and future projections. As climate change impacts are expected to intensify, integrating climate resilience into policy frameworks is essential for sustaining the tourism sector.
- **Establish a Data Management System:** A comprehensive data management system is needed to monitor climate-related damages, track losses, and estimate maintenance costs. Improved data management will enable better assessment of climate impacts and inform more effective response strategies.
- **Conduct Further Research:** Additional research is necessary to assess in detail the impacts of climate change on the tourism sector, including vulnerability assessments. This will help formulate targeted strategies to address specific risks and enhance resilience.

By implementing these recommendations, Nepal can strengthen its tourism sector's ability to withstand climate-related challenges and ensure more sustainable growth.

6. Suggested Course of Action

We have suggested the following course of action to implement the recommendations. The suggestions are based on the results and findings of the study and the authors' discussion and consultation with relevant stakeholders and policymakers.

S.N.	Recommendation	Responsible Agencies	Suggested Action
1	Multi-stakeholders Engagement in Resilient Tourism Development	Federal Government Sector (MOCTCA, Department of Tourism, NTB etc)	Formulate policy instruments, prepare laws/acts/ guidelines/regulations/frameworks/code of conduct for stakeholder coordination, ensure product quality assurance, establish institutional mechanisms, support infrastructure development and financial arrangements, and facilitate product identification and conservation.
		Provincial government,	Formulate provincial policies, coordinate with other stakeholders, establish institutional mechanisms, support infrastructure development and financial arrangements, and facilitate product identification, development, and conservation.

S.N.	Recommendation	Responsible Agencies	Suggested Action
		Local government	Conserve natural and cultural heritage, support private sector service provision, and facilitate infrastructure development and product identification.
		Private Sector (FNCCI and Tourism sectors related association)	Identify and develop products, promote and market tourism, provide financing, support plan implementation, advocate for entrepreneurs' rights, and explore new tourism markets.
		Development Partner	Prepare and implement projects, support infrastructure development, and provide financial assistance.
		Academia and universities.	Develop curricula for academic and training courses, conduct research for product identification and market analysis, and support capacity and human resources development.
2	Multi-stakeholders Engagement in Climate Resilient Policy	Government Sector (MOCTCA, NTB)	Formulate policies and plans for multi-stakeholder engagement in resilient tourism, prepare codes of conduct and criteria for responsible tourism development, establish institutional mechanisms, and ensure coordination among stakeholders
		Non-Government	Project preparation, resilient tourism product identification and development, support to financing,
		Private Sector	Identify product, develop, promote, and market products, and advocate for resilient tourism practices.
		Academia and Universities	Develop curricula for academic and training courses, conduct research for product identification, market analysis, and support capacity and human resources development
3	Integrated Tourism Sector's Data Management	NSO	Data collection, compilation and analysis of tourism and climate change related.
		MOCTCA	Collect, compile, and analyse data related to tourism and climate change.
		NPC	Analysis of raw data, support to planning and budgeting for climate change resilience tourism development,
4	Adequate R & D on Tourism Vulnerability	Government	Develop a framework for research on vulnerability, support human resource development, and create curricula for university and school education on Vulnerability Risk Assessment (VRA) in tourism.

Authors Contribution Statement

Ram Kumar Phuyal: Developed the research ideas and formulated the overarching goals and aims of the study. Designed the methodology, applied the study framework, conducted the research and investigation process, and was responsible for drafting and finalizing the manuscript.

Thakur Prasad Devkota: contributed to the formulation of research goals and aims, and participated in the research and investigation process.

Niranjana Devkota: Applied the study framework and contributed to drafting the research manuscript.

Conflict of Interest Statement

The authors declare that they have no conflicts of interest.

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