

Impact of Climate Change on Economy of Nepal with Special Edges on Tourism Industry: Threats to Development and Stability

Saidur Rahman^{1*}, Sukanta Sarkar²

Abstract

Nepal is rich in biodiversity with Himalayan ecosystems and natural resources. Nepal's natural resources are a valuable and cultural asset for local communities, as well as supporting many of the country's industries. Safety is an important part of nature tourism and can attract or repel tourists. Climatic factors include temperature, precipitation, clouds, air, wind, and humidity. A key component of the industry's expansion is making traveler access safe and simple. Climate change will change the environment in which tourists come and change demand. Nepal's climate is diverse and complex, affected by uneven terrain and regional climate. Nepal is considered a vulnerable country to climate change due to its economic, physical, geographical and political diversity. In Nepal, the effects of climate change have resulted in unparalleled losses and devastation. Nepal is extremely susceptible to the consequences of both natural disasters and climate change. The impact of climate change on the world's susceptibility to earthquakes and floods is significant. Weather-related disasters, floods, earthquakes, floods and severe weather conditions cause loss of life, property and livelihood, and seriously damage all security and economic conditions in the country. Climate change will directly affect tourist arrivals and reduce business income. The relationship between foreign visitor arrivals and Nepal's GDP is positive. Therefore, before a real disaster occurs, the government must implement the necessary policies to mitigate the impact and save the economy.

Keywords: Climate change, environmental impact, Nepal economy, global warming, sustainable tourism

INTRODUCTION

One of the most important problems facing humanity in the twenty-first century is climate change, which is predicted to have a significant effect on water-dependent, climate-sensitive businesses [1]. Mountain glaciers are home to religious traditions, customs and traditions, most notably represented by the culture of travel. The rapid retreat and disappearance of ice directly affects the livelihood and survival of local people and threatens ice culture. As the glacier landscape continues to retreat and disappear, aboriginal religious beliefs about the spiritual significance of ice also affects. One of Nepal's main industries is tourism [2]. Temperatures, unpredictable rainfall, floods, earthquakes, snow melting and re-rains, increase or decrease in water levels and water quality directly affect travel. Cultural values such religious practices, traditions or behaviours of local communities are affected by climate change [3]. The worldwide economy of Nepal is impacted by

*Author for Correspondence

Saidur Rahman
E-mail: saidur7862@gmail.com

¹Associate Professor, Department of Sociology, Aligarh Muslim University, Uttar Pradesh, India

²Associate Professor, Department of Economics, Gambella University, Gambela, Ethiopia

Received Date: September 24, 2024

Acceptance Date: October 07, 2024

Published Date: October 10, 2024

Citation: Saidur Rahman, Sukanta Sarkar. Impact of Climate Change on Economy of Nepal with Special Edges on Tourism Industry: Threats to Development and Stability. International

climate change and global warming. Increasing climate, pressure on jobs and health, and pressure on crops and livestock will further negatively impact economic growth.

Temperatures and precipitation in Nepal are already changing more quickly than the world average, making it a country extremely sensitive to climate change [4]. Due to its location, Nepal faces a number of climate and water hazards, including rapid snow and ice formation in the mountains during the monsoon season and heavy rainfall in mountainous areas [5]. It is projected that the effects of climate change, such as decreased agricultural output, food poverty, deforestation, biodiversity loss, and infrastructural damage, might put millions of Nepalese people at danger [6]. The majority of Nepal's greenhouse gas emissions are attributed to agriculture, with the remainder coming from energy, forestry and land-use change, industry, and garbage [7]. Nepal's geographic location of plains, hills, and plateaus exposes it to harsh climates. The plain in Nepal is known as Terai, are at the greatest risk of flooding, especially during the monsoon season, when heavy rainfall combines with snow and ice in the mountains and mountains [8]. The increased availability of water in recent years has increased the frequency of floods, affecting agriculture, livestock and infrastructure, reducing agricultural production and disrupting the economy [9].

OBJECTIVES

The objectives of the study are:

- (a) To study the impacts and vulnerabilities of climate change on economy of Nepal.
- (b) To examine the impact of climate change on sustainability of tourism industry of Nepal.
- (c) To study the Government plans and policies for mitigating the effects of. climate change.

METHODS AND MATERIALS

Study Area

At 147,181 square kilometers in size and 28.98 million people living there, Nepal is a small nation. Nepal boasts one of the world's richest biodiversity portfolios due to its unique geographic location. The elevation of the nation varies from 70 meters above sea level to 8,848 meters, the highest point on Earth, Mount Everest. The change in wildlife has resulted in the formation of diverse ecosystems, the world's largest mountains, lush forests full of wildlife, roaring rivers, rainforests, and glaciers. Nepal's natural resources include nature, history, cultural monuments, temples, art treasures, and festivals.

Hypothesis

H_{01} : There are no relation between tourist arrivals and gross domestic product of Nepal.

H_{1a} : There is a correlation between Nepal's GDP and the number of visitors.

Design and Approach

The design of this study was defined and used as qualitative. The research used secondary data. Several countries gather secondary data reports. Nepal Tourism Department, international publications, research articles, published articles, online papers etc.

Method of Analysis

A range of qualitative analysis methods, including descriptive, analytical content and textual analysis, were used to uncover the full spectrum of approaches to climate change and its impact on tourism industry in specific.

RESULTS AND DISCUSSION

Climate change is a result of greenhouse gas emissions from fuel consumption, deforestation, urbanization, and industrialization. Climate change is currently affecting mostly small-scale, rain-based agriculture, which is subject to large annual fluctuations. In addition to floods, Nepal also experiences periodic droughts, which have a major impact on the economy. Nepal has also experienced natural disasters caused by GLOFs. While the local damage and loss of life from these events are significant,

the consequences of historical events (in terms of deaths and damage) are also significant. This is because GLOFs occur less frequently (seven major GLOFs have occurred in the last 50 years) and are smaller in area. Agriculture in Nepal's hills and valleys is affected by soil erosion due to steep terrain and heavy rainfall, reducing soil fertility and reducing agricultural productivity. Although the damage cannot be calculated, the impact could reduce annual agricultural production by several percent [10].

In Nepal, hiking is the most popular sport. Tourism in Nepal is largely nature-based. The primary forms of tourism in Nepal include trekking, white-water rafting, mountaineering, and jungle safaris. There are many mountains, sacred places, religions, castes, traditions, religious places and adventure places. Mountains, cultural heritage, trekking routes and eco-tourism activities attract tourists. They appreciate indigenous culture, unique landscape of Himalayas and natural resources. Tourism contributes to biodiversity and renewable energy, maintains peace and stability in communities and improves income and livelihood of people who rely on tourism tour in the mountainous region. Ecotourism, coastal tourism, mountain tourism and nature tourism are closely related to security and tourism. Since most trekking activities in the Himalayas are sensitive to weather conditions, rain and fog can degrade the quality of the Himalayan trekking experience. Weather and climate affect visitors' needs, comfort, satisfaction, tourism and natural resources for tourism [11].

The projected effects of climate change in Nepal were covered in Table 1. Due to its distinct environment, which combines high altitude, intense monsoon rains, and isolation, Nepal is susceptible to natural calamities. Disasters take their toll on the poor, who are already suffering from poverty and powerlessness. Mud is caused by the rapid formation of snow and ice in the mountains during the monsoon season (June to September) and heavy rain in the highlands. Earthquakes destroy buildings and block critical infrastructure, threatening the security and economy of mountain communities [12].

Table 1. Anticipated climate change impacts in Nepal.

Temperature	Significant rise in temperature: (a) 0.5 to 2.0 °C by 2030; (b) 1.3 to 3.8 °C by 2060; (c) 1.8 to 5.8 °C by 2090. Increase in the number of days and nights considered hot by current climate standards. Highest temperature increases during the months of June to August and at higher elevations.
Precipitation	Wide range of mean annual precipitation changes: (a) -34 to + 22% by the 2030s; (b) -36 to + 67% by the 2060s; (c) -43 to 80% by the 2090s. Increase in monsoon rainfall towards the end of the century: (a) -14 to 40% by the 2030s; (b) -40 to + 143% by the 2060s; (c) -52 to + 135% by the 2090s.
Runoff	Higher downstream flows in the short term, but lower downstream flows in the long term due to retreating glaciers and snowmelt and ice-melt. Shift from snow to rain in winter months. Increased extreme events, including floods, droughts and GLOFs.

Source: Figures for anticipated changes in temperature and precipitation (NCVST 2009 and Mc Sweeney, 2008)

Droughts are more common in Nepal, especially in the winter months and in the Western Terai Plains, which are already very dry due to the late arrival of the monsoon. Nepal has been impacted by climate change and will continue to be impacted in numerous ways, including its position. An essential component to take into account when assessing the effects of climate change is vulnerability. The poor have limited access to resources and few avenues to earn income, and their livelihoods are often shaped by laws, policies, and practices over which they have little or no control. Nepal's public health system

is particularly vulnerable to climate change and variability due to the prevalence of malnutrition, diarrhoea, and infectious diseases. Direct impacts include changes in carbon dioxide, precipitation, and temperature. Indirect impacts include impacts on water availability and seasonality, changes in organic matter, soil erosion, changes in pests and diseases, introduction of pathogens, and reduction of arable land due to expansion of drylands and changes in local hydrology. At the global level, these impacts are expected to cause major crop damage, although to a lesser extent. It will affect livelihood and sustainability of the farmers [13].

Table 2 depicted the international visitor's arrivals in Nepal. It has found that highest number of travellers arrives in Nepal from the SAARC nations. Travellers from India in Nepal are far ahead than any other country. Indian can travel Nepal without any visa. They can enter Nepal through road and air. It is widely accepted that climate change has a significant impact on the mountain cryosphere, affecting local, regional and global resources.

Table 2. International Visitors Arrivals in Nepal.

Area	2024*	2023	Change	Area	2024*	2023	Change
Asia (SAARC)	35223	35269	0.2	Asia (Others)	12590	9934	26.7
Europe	9946	9737	2.1	Oceania	1938	1480	30.9
Americas	6367	5269	20.8	Others	6089	5116	19.0
Gulf	566	448	26.6	TOTAL	72719	67153	8.3

Source: <https://www.nepaltravellinginthehimalayas.com/>, Note: *Tourist arrivals up to August.

Mountain ecosystems provide important livelihoods, food security, health and culture, yet they still face climate challenges that lead to serious climate change problems. These mountain communities face challenges that limit their ability to sustain themselves due to low incomes and lack of resources to accommodate more people in the village. While migrant wages increase to provide additional income, returns to agriculture are diminishing as members of families affected by climate change seek employment in urban or low-lying areas. Given that mountain communities are often remote and rugged, outdoor recreation and tourism can provide opportunities for expanding businesses, creating jobs and income for residents. Monitor seasonal weather patterns, including the annual monsoon rains, that are influenced by the Himalayas. This results in large variations in rainfall across seasons, regions and years in the country.

Table 3 discussed the revenue from multiple sources in tourism industry of Nepal. It has found that aggregate revenue from multiple sources are increasing continuously, but was declined during 2020-2021 due to the corona virus pandemic. The advantage of mountain tourism is that it attracts different visitors throughout the year with various activities such as climbing, hiking, cycling and snow sports (skiing, snowboarding, sledding). Mountain tourism is one of the climate-sensitive tourism types (Kubokawa et al., 2014).

Table 3. Revenue from Multiple Sources in Tourism Industry of Nepal

Year	Camping	Cruises	Hotel	Package Holidays	Vacation Rentals	Total
2017	0.13	0.23	118.20	99.44	48.10	266.10
2018	0.28	0.24	125.30	112.40	51.81	290.03
2019	0.43	0.26	132.60	126.20	55.68	315.70
2020	0.43	0.06	64.64	53.54	28.30	146.97
2021	0.48	0.03	80.04	102.70	28.43	211.68
2022	0.44	0.16	119.30	134.50	53.92	308.62
2023	0.48	0.25	142.20	173.90	72.73	389.56
2024*	0.53	0.27	157.40	203.60	83.00	444.80

Source: <https://www.statista.com/outlook/mmo/travel-tourism/nepal>, Note: Revenue in million USD. and *Tourist arrivals up to August.

Weather is both a protector and a limiter of recreational activities because certain conditions form the basis of certain activities and interests (snow for skiing, beautiful glacier landscapes). Climate change will change the demand or quality of weather, as well as the suitability of the place for activities, the type of tourism behaviour. Weather might also influence last-minute decisions about travel or alter existing plans. As climate change accelerates, most economists believe that warmer weather and longer summers will lead to an increase in summer mountains. Summer travel safety may increase in some parts of the mountains but may affect others.

Mountains may also gain appeal by providing heat escape to nearby cities damaged by global warming. These changes reflect the interaction between climate and biodiversity crises that directly affect summer activities in the mountains. Both tourism and climate change add stress to already stressed waters in the mountains. In addition to its impact on biodiversity and natural resource use, nature-based tourism is also at risk from climate change. Parts of the mountain tourism industry will face increased fire risk due to climate-induced fires due to dry weather and cold weather, while mountain tourism will suffer from smoke that affects visitors' health or visibility or blocks access for safety reasons. The frequency of extreme weather events in summer and winter indicates the type and impact of economic processes that will be more common in the future, suggesting the need for change.

Glacier tourism is an imperative nature tourism with great potential in the world. However, the glacier landscape and environment are greatly affected by global warming. Glacier tourism is an important nature tourism with great potential in the world. However, the glacier landscape and environment are greatly affected by global warming. Warming climate is accelerating the melting and retreat of glaciers, with major economic and social impacts. The findings show that some glacier areas are declining in beauty or attractiveness, while others are facing decline or even extinction. Mountain glaciers are less sensitive to climate change, so as temperatures rise slightly, glaciers are melting and shrinking, and some glacier landscapes are even at risk of extinction.

Global warming is directly affecting the beauty and quality of glacier landscapes and is also affecting the development of mountain glacier tourism. Rising temperatures and altered rainfall patterns may be factors in the growth in waterborne diseases like cholera. Vector-borne neglected tropical diseases such as dengue fever, malaria, Japanese encephalitis and kala-azar as well as diarrheal diseases such as cholera will spread to higher altitudes and the highest elevations. Floods and earthquakes in the Terai and foothills are also likely to occur in the Himalayan region. Climate change may also increase the burden of non-communicable diseases such as cancer, which affect food availability, food insecurity and malnutrition. Therefore, the fact that Nepal, the fourth most affected country by climate change, faces a higher risk of infection than other countries cannot be ignored. Water restrictions can lead to human conflicts and their consequences such as war, poverty, migration and epidemics. Accessibility problems of wildlife-wildlife interactions can lead to disease transmission. Thus, a country with rich biodiversity and climate diversity will face a serious climate crisis.

Climate change can positively or negatively affect holiday options. Climate change is putting more pressure on environmental systems in many travel destinations. Nepal, people are experiencing hot and dry winters as climate change reduces water supply. It encourages tourism by reducing the problems of winter trekking but also causes the beauty of the region to be lost. Hotel owners are greatly affected by water shortage. Trekking and mountaineering tourism in Nepal has been negatively affected by climate change. Heavy rain and snowfall pose a threat to climbers, hikers and tourists. Climate change is reducing the snowfall problem in winter, increasing the number of visitors in the short term. This will have a detrimental long-term impact on the tourism industry. Rising temperatures will cause rapid melting of ice and snow in the mountains, harming animals and plants. It will reduce the beauty of Nepal's hills and mountains. The impacts on tourism may also affect the living standards of local people who depend on tourism for their livelihood as shown in Table 4. Techniques for mitigation and adaptation are needed to handle climate change. Early warning systems should be installed on trekking routes in Nepal to reduce tourist deaths due to bad weather conditions.

Table 4. Calculating Linear Regression between Gross Domestic Product of Nepal's Tourist Inflow.

Year	Gross Domestic Product	Number of tourist
2012	21.7	803,092
2013	22.16	797,616
2014	22.73	790,118
2015	24.36	538,970
2016	24.52	753,002
2017	28.97	940,218
2018	33.11	1,173,072
2019	34.19	1,197,191
2023	40.91	1014876

Source: Nepal Tourism Statistics, Ministry of Culture, Tourism & Civil Aviation, 2023, Note: GDP in billion USD.

The Table 5 shows that R square is found to be 0.542085521, showing, that the degree of relation between the independent variable X, i.e. arrivals of tourists, and the dependent variable Y, i.e. gross domestic product. Table 6 shows that p value (0.023696823) is less than critical value at 5% level of significance ($p < 0.05$), therefore we will reject the null hypothesis-1. So, it is concluded that there is relation between tourist arrivals and gross domestic product in Nepal.

Table 5. Summary Output.

Regression Statistics	
Multiple R	0.736264573
R Square	0.542085521
Adjusted R Square	0.476669167
Standard Error	4.845529528
Observations	9

Source: Compiled by the authors

Table 6. ANOVA Analysis.

	df	SS	MS	F	Significance F
Regression	1	194.5646607	194.5646607	8.286697245	0.023696823
Residual	7	164.3540948	23.47915641		
<i>Total</i>	<i>8</i>	<i>358.9187556</i>			
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	
Intercept	7.405615769	7.358686906	1.006377342	0.347747424	
Number of tourists	2.32263E-05	8.06842E-06	2.878662406	0.023696823	

Source: Compiled by the authors

INITIATIVES OF GOVERNMENT

Nepal has initiated many activities to reduce climate change risks and create a climate protection system to help society stay safe from the effects of climate change and reduce the impact of climate change on people, property and natural resources. Nepal is extremely susceptible to the consequences of climate change, and according to a recent Asian Development Bank research, the country's yearly GDP will drop by 2.2% by 2050 as a result of the phenomenon. As part of its long-term plan to lead green development and fortify itself against climate change and other threats to its development objectives, Nepal embraced the Green, Resilient, and Inclusive Development (GRID) approach in 2021. Local governance is vital to security and development through full execution and plays a key role in converting the GRID plan into action. Assert a commitment to augment hydropower investment during the next ten years and attain net zero emissions by the year 2045.

Nepal has begun developing the necessary regulations, such as the National Climate Change Policy 2019, Solid Waste Management Policy 2022, Forest Regulations 2022 and Land Use Regulations 2022. However, implementing this change process and investing in the main phase is only the beginning. There is a need to make public spending more efficient, maximize security and development benefits, and engage in sustainable practices. Communities in the Everest region can better help prepare for and protect against the impacts of global warming by developing and implementing adaptive strategies, such as water management plans and projects. Reduce risk to nature. In the Everest region of Nepal, protection efforts against the effects of global warming are important. This includes increasing the carbon absorption capacity of ecosystems such as forests, wildlife, wetlands and glaciers, protecting wildlife and habitats to maintain biodiversity practices and sustainable development; changing.

Encouraging social practices such as reducing waste and reducing the carbon footprint of visitors can help reduce the environmental impact of tourism. Tourism practices include reducing waste and reducing the carbon footprint of visitors. This may include actions such as reducing the use of single-use plastics and promoting low-cost transportation options. Protecting the ice mass and ensuring that people living under the ice have stable water can help reduce some of the negative effects of global warming. This might be accomplished by putting policies into place that restrict pollution and trash in the vicinity of the glaciers. Nepal has set up a number of programs to ensure that climate finance flows to projects and regions.

CONCLUSION

Nepal's economy and people's livelihoods are heavily dependent on climate. Climate change affects a significant amount of the nation's GDP. Current climate change and extreme weather conditions have caused major disruptions and economic losses in Nepal. These include floods, but also changes in rain-fed agriculture (rain-fed agriculture, soil erosion, drought) and reduced summer energy production. Adaptation can mitigate the effects of climate change, but it comes at a cost. Significant resources will be needed to address current changes and prepare for future climate change. The economy is mostly small-scale agriculture and, largely dependent on rainwater. Water is key for energy production in Nepal, as hydroelectric power plants generate 90 percent of electricity.

Rainfall has a significant impact on electricity production and affects the flow of water in rivers (i.e., those without reservoirs) as well as in reservoirs. During the dry season, water flow is not sufficient to power all facilities, causing serious disruptions in service and exacerbating existing needs. In developing countries like Nepal, losses and disasters are occurring, and it is important to understand how to measure and solve this problem at the national and subnational level. The nation is face many security risks and are affected by climate change, losses and damages are already occurring. Tourism is the key industry for earning foreign currency and income of large number of local people. Climate change will negatively effect on agriculture, industry and service sector. The arrival of tourists would decrease as a result of global warming, endangering the livelihood of millions of people who work in the tourism industry. In Nepal, the number of tourists and the country's GDP are positively correlated.

Nepal's 2019 Nationally Determined Contribution and Climate Change Policy highlights the need to develop and execute strategies to minimize severe weather conditions, as well as to conduct research on losses and damages related to the impact of climate change. It lists the loss and damage cooperation and assistance programs: early warning system; safety insurance, such as risk insurance, and air safety department.

REFERENCES

1. Kubokawa H, Inoue T, Satoh M. Evaluation of the tourism climate index over Japan in a future climate using a statistical downscaling method. *Journal of the Meteorological Society of Japan*. Ser. II. 2014;92(1):37-54.

2. Khadka D, Neupane S, Sharma B, Dixit S, Wagle PC, Thapa L, Bhujel A. Ecotourism Potential of Tinjure Milke Jaljale Area: A Rhododendron Capital of Nepal. *Journal of Tourism & Adventure*. 2019 Oct 15;2(1):40-60.
3. Kunwar RR, Ulak N. Tourism and Hospitality: Academia and Industry Interface. *Journal of Tourism & Adventure*. 2023 Sep 19;6(1):104-39.
4. Kunwar RR. Extreme sport: understanding the concept, recognizing the value. *Journal of Tourism & Adventure*. 2021 Nov 7;4(1):89-123.
5. Roman M, Wiśniewski A, Bhatta K, Królak S, Trzcinka M, Togaymurodov E. Poles' perceptions of extreme and adventure tourism. *Journal of Tourism & Adventure*. 2022 Oct 10;5(1):1-22.
6. Kunwar RR, Adhikari A. A Study of Pilgrimage Tourism in Halesi, Khotang, Nepal. *Journal of Tourism & Adventure*. 2022 Oct 10;5(1):97-129.
7. Sanders D, Laing J. In the line of fire: the challenges of managing tourism operations in the Victorian Alps. *Tourism Review International*. 2009 Dec 1;13(4):223-36.
8. Sharma R. Tourism and Community Perception: Quest of Sustainability from Happiness Paradigm. *Journal of Tourism & Adventure*. 2021 Nov 7;4(1):1-23.
9. Shivakoti A. Women in tourism and hospitality-A case study of bhaktapur. *Journal of Tourism & Adventure*. 2022 Oct 10;5(1):79-96.
10. Bishwakarma KR, Basnet Y. Potentialities and promotion of tourism in dailekh district, Nepal. *Journal of Tourism & Adventure*. 2018 Dec 3;1(1):68-85.
11. Bhandari L. Approaches to Local Community Participation in Tourism Development. *Journal of Tourism & Adventure*. 2022 Oct 10;5(1):44-61.
12. Acharya S. Buddhism and Tourism: A General Review. *Journal of Tourism & Adventure*. 2022 Oct 10;5(1):62-78.
13. Aryal C, Maharjan KK. Assessment of ecotourism potential of koshi tappu wildlife reserve, Eastern Nepal. *Journal of Tourism & Adventure*. 2018 Dec 3;1(1):48-67.