ASSESSING THE IMPACTS OF CLIMATE CHANGE ON NATURE-BASED TOURISM: A STUDY BASED ON THE WESTERN INDIAN HIMALAYAN REGION

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Abstract

The impacts of climate change on nature-based tourism in the Indian Himalayan region can be significant and multifaceted, such as changes in weather patterns, biodiversity, water bodies or water availability, infrastructure, or services, and even changes in cultural and social patterns. Eventually, the impacts of climate change on nature-based tourism in the western Indian Himalayan terrain are projected to be substantial and complex. Hence, in this research work, we explored the consequences of climate change on nature-based tourism in the Western Indian Himalayan Region (W-IHR). This research study adopts a quantitative approach, using the survey technique, to assess the impacts of climate change on nature-based tourism. We used simple random sampling and selected 264 respondents as our study sample. The statistical analysis, i.e., multiple linear regression, was employed to test the study hypothesis to reach a conclusion. According to the findings, climate change has had a negative impact on nature-based tourism. Finally, this research stated that climate change impacts nature-based tourism by degrading the nature-based tourism resource base in the Western Indian Himalayan Region (W-IHR). Due to this alteration and degradation, tourism businesses such as tour operation agencies, hotels, restaurants, etc. would also be affected by increased risks.

Keywords: *Climate Change, Impacts, Indian Himalayan Region, Nature-based Tourism, Regression Analysis*

JEL Classification: *Q54; Z32*

I. INTRODUCTION

There are different typologies of tourism in the encyclopaedias of tourism, but nature-based tourism has its own influence on people and their perceptions. Also, nature-based tourism has a substantial impact on the economy of a country or region as well as the environment (Kuenzi & McNeely, 2008). Nevertheless, the regular change in climate has a significant impact on nature-based tourism by altering its resource base (Nyaupane & Chhetri, 2009; Tervo-Kankare et al., 2018). Climate change in the Himalayas poses a consequential risk to the snow-covered peaks, headwaters of the important rivers, and flora and fauna species, which could have devastated and far-reaching effects on the region's biodiversity along with its food, water, and energy supplies. As a result, tourism associated with the Himalayan region would have sturdy consequences, especially the nature-based tourism for which the region is known to the world. Therefore, nations that are more vulnerable to the impacts of climate change need to move quickly to take measures to strengthen their resilience models against these impacts and to rapidly adapt to the shifting environment. The response of glaciers and snow cover melting in the Himalayas is also heavily influenced by climate change, which has a considerable impact on the amount of precipitation that falls across the mountain range (Singh et al., 2021). Because of this, the flow patterns of rivers that drain glaciated Himalayan catchments are altered. The melting of Himalayan glaciers will cause frequent, large floods. The faster rate of melting could cause glaciers to shrink, which could lead to a lack of water for hydropower, clean drinking water, and proper waste disposal in this region (Ives, 2004; Mir et al., 2021). These changes in the Indian Himalayan region would also eradicate the facets of a nature-based tourism resource base.

II. BACKGROUND

2.1. Climate Change

As stated by the Intergovernmental Panel on Climate Change (IPCC), the phrase "climate change" means the long-term alterations of the climate of the earth because of human actions. This alteration may include shifts in temperature, precipitation patterns, sea level, and the frequency and severity of extreme weather phenomena (Scott et al., 2016). The combustion of fossil fuels, deforestation, and various

other human-induced processes are the principal contributors to climate change that lead to increased emissions of greenhouse gases (GHGs) in the atmosphere, most notably carbon dioxide (co^2) (Scott et al., 2016) (IPCC, 2014).

The implications of climate change are extensive and include a rise in sea level, more frequent and intense heatwaves, flooding, droughts, and cyclones, in addition to alterations in ecosystems and the distribution of flora and fauna (IPCC, 2014). Climate change entails substantial social and economic consequences, especially for those with vulnerabilities in underdeveloped nations, who may encounter food and water shortages, relocation, and increased healthcare risks (IPCC, 2014). The shrinking of glaciers is one of the most substantial consequences of climate change in the Indian Himalayas (Shekhar et al., 2010). This implies that there are fewer resources of water for tourism-related activities such as rafting and skiing. Additionally, because of glacier melting, glacial lakes are developing, posing a serious risk of flooding downstream populations and tourism infrastructure (Majeed et al., 2021; Rawat et al., 2023).The availability and quality of hiking trails, along with other adventures in tourism, are also being impacted by changes in patterns of precipitation and severe weather events. Furthermore, the detrimental effects of climate change on the ecological diversity of the Himalayas are diminishing the region's attractiveness for nature-based tourism. The range and timing of plant species' blossoming and fruiting, which are crucial for drawing tourists, are changing because of the warming climate. According to Dhiman et al. (2018), changes in biodiversity and patterns of wildlife, such as a reduction in the number of snow leopards and Himalayan brown bears, are also influencing the region's enticement to nature-based tourism.

2.2. Nature-Based Tourism

Ecotourism, adventure tourism, extractive tourism, wildlife tourism, birdwatching, nature retreats, and plenty of other types of tourism are all manifestations of nature-based tourism, which is a wide spectrum of tourism that focuses on experiencing natural features first-hand (Fennell, 2014; Fredman & Tyrväinen, 2010; Mehmetoglu, 2007). Therefore, nature-based tourism is a significant part of the tourism industry and is a sector experiencing substantial growth. It is a sort of recreation that removes a person from the everyday stresses of contemporary life, bringing them into contact with the area's natural landscapes, flora, and fauna. This type of tourism involves visiting remote locations to appreciate nature (Weaver, 2001). It involves various activities such as hiking, observing birds, going on a jungle safari, camping, hunting, fishing, rock climbing, and rafting on white-water. It is one of the sub-industries within the tourist business that is growing at one of the fastest rates, and it is responsible for around 20% of all leisure activities (Elmahdy et al., 2017; Weaver, 2001).

Nature-based tourism (NBT) is the sector of the tourism business that is expanding at the quickest rate. NBT often involves vacations to wilderness areas and national parks in poor countries, which is where most of the world's biodiversity can be found (Elmahdy et al., 2017; Loucks et al., 2001). The rapid expansion of NBT as a form of tourism has garnered attention as a distinct subset of the tourism industry. Specifically, shifts in the structure of international demand, increasing levels of education, and growing interest in and sensitivity to environmental problems all contribute to an increase in the demand for travel that is centred on natural settings and nature-based tourism/ecotourism. Although the concept of nature-based tourism has only been around for a very short period of time, however the activities that are included in this classification have been around for a very long time. Megan and Wood (2002) assert that nature-based tourism is crucial for regulating the activities carried out in natural regions and fragile ecosystems in accordance with its guiding principles (Megan & Wood, 2002; Provalova et al., 2019).

NBT plays a significant role in sustainable development. It has the potential to contribute to key global accords and frameworks, such as the 2030 Agenda for Sustainable Development, and it can also assist in the fight against poverty, the expansion of the economy, and the preservation of biological diversity. These are all areas in which it can make a difference. Because of NBT's unique ability to protect wildlife and ecosystems while simultaneously fostering economic development and job creation, developing countries interested in aligning their respective interests may find the use of NBT an attractive choice. This is because of NBT's singular capacity to do all these things simultaneously.

Therefore, "non-traditional tourism" refers to all forms of tourism that use natural resources have not been developed to their full potential. The desire to enjoy wildlife or natural surroundings that have not been developed motivates NBT. A successful venture in natural-based tourism (NBT) requires both the capability to generate and promote tourism that are based on the protected areas (PA) assets and the capability to maintain the quality of these assets for future usage. These are both necessary components of successful natural-based tourism (NBT) ventures.

2.3. Economic Relevance of Nature-Based Tourism

Tourism currently accounts for more than 10% of the global GDP, with more than half of it spent on leisure, recreation, and vacations or holidays. According to the Travel Industry Association and Ritchie and Goeldner (2007), the nature-based tourism sector accounts for around 20% of all leisure activities (Goeldner & Ritchie, 2007). It is important to mention here that nature-based tourism grew 10%–30% annually, as compared to 4.3% for other tourist sectors

(TIES, 2003) (Nyaupane & Chhetri, 2009). Therefore, nature-based tourism is an important tourism subsector for developing nations. Moreover, nature-based tourism has the potential to be a significant source of income for local communities, which frequently reside in remote areas and have few opportunities to lift themselves out of poverty. (Arman et al., 2022).

The Environment and Natural Resources Global Practice (ENR GP) of the World Bank assists countries in maximising the potential of nature-based tourism through integrated landscape approaches that more effectively manage multiple land-use options and multiple revenue streams for governments and communities. These approaches are provided as part of the World Bank's mission to reduce poverty and boost shared prosperity in developing countries. In mountainous and coastal regions, a variety of interventions were laid down, including pollution control, landslides and rockfalls hindering, avoidance of coastal erosion and avalanches, conservation of coral reefs and other marine ecosystems, flash flood management, and sustainable sand fishing management, to preserve the integrity of tourism assets. The best way to protect tourist destinations in natural settings is to look at their carrying capacity (the largest number of visitors may visit a tourist site at the same time without detrimental impacts on the physical, economic, or socio-cultural aspects of the environment or declining visitor satisfaction) (World Bank, 2019;World Bank Group, 2015).

Practically any change in the observable aspects of the climate has the potential to influence businesses tied to tourism negatively (Scott et al., 2012). These kinds of businesses include hotels, restaurants, tour operation businesses, etc. at attractions that may be affected by climate change. Under these conditions, there is a strong possibility that both the quality of nature-based tourism and the quantity of visitors will decline.

2.4. Related Literature on Climate Change, Nature-Based Tourism, The Himalayas, and Their Interactions

Climate change has a substantial impact on the tourism sector (Armstrong, 2010). This may prompt travellers to flee their native countries in quest of more desirable destinations. Additionally, it may prompt people to visit areas with climates that are conducive to certain forms of tourism, such as locations with snow for winter sports tourism or pleasant temperatures for nature-based tourism (Rosselló-Nadal, 2014). In any case, it may influence travellers to go outside to more appealing places. Climate change may have a detrimental impact on the tourism economy globally (Rosselló-Nadal, 2014; Scott et al., 2012). These consequences may include changes in accessibility and ease levels and regional or seasonal shifts in popular tourist destinations.

The climate is an essential factor in the success or failure of nature-based tourism, and it has the power to attract or repel visitors (Gómez Martín, 2005). Additionally, it has the potential to directly influence the choice of recreation by reducing the amount of time and space available for tourists to participate in a variety of activities (Scott et al., 2007). The amount of precipitation, the temperature, the type of clouds, the density of the fog, the speed of the wind, and the humidity are all examples of climatic features. These attributes have an impact on nature-based tourism in a variety of ways, including how pleasant a person's vacation will be. When the climate is pleasant and there are few challenges to traverse, a region will see an increase in the number of tourists (Beniston, 2003).

Climate change negatively impacts the natural resources upon which the tourism business relies, which in turn has a trickle-down effect on the industry (Scott et al., 2007). Any alteration to the Himalayan climatic features might reduce the perceived allure of the region's natural surroundings, which could have a detrimental effect on tourism. The growth rate of visitors to the area may decline consequently. Tourism will suffer worldwide swings, with conditions improving throughout many temperate zones and worsening in many subtropical and tropical zones, according to global and regional assessments based on climate indices and statistics (Hamilton & Tol, 2007). The aforementioned changes are predicted to have an impact on the expense of travel globally. There is evidence that tourism may decline by a substantial chunk in climate-impacted destinations. This is especially concerning given that tourism contributes significantly to the foreign exchange earnings of developing countries as well as the significance of biodiversity preservation globally as these countries' direct and indirect dependency on nature-based tourism (Scott et al., 2012)

In the west, the impacts of climate on tourism were initially researched in the 1980s, even though past models of demand for tourism hardly took climate into consideration. By the 2000s, it had taken centre stage in academic tourism literature (M. Ali et al., 2022; Hamilton & Tol, 2007; Scott et al., 2012). In 1997, Koenig and Abegg's research on the possible implications of climate change on tourism, which dates to the 1990s, predicted a loss of snow predictability for ski slopes in the Swiss Alps. These were some of the earliest assumptions about the latent impacts of a changing climate on tourism. On the other hand, in underdeveloped countries, not much research has been conducted regarding tourism that is centred on nature or that takes place in protected areas (national parks and wildlife sanctuaries) while taking climate change into account. Rosselló-Nadal (2014) employed an assortment of quantitative and qualitative

methodologies to investigate the possible implications of climate change and its influence on natural settings for tourism (Rosselló-Nadal, 2014). The references section of this article contains details regarding these studies. Hamilton et al. (2005) found evidence of a quadratic (inverted U) association between tourism and climate (Hamilton et al., 2005). People tend to choose conditions that are mild or comfortable. Therefore, because of climate change, protected areas may face a greater range of threats, including a fluctuating demand for nature-based tourism. Maximum protected area systems such as national parks and wildlife sanctuaries rely directly on tourism revenue or government funding, which is partly leveraged by the protected areas' significance to the tourism industry. Regarding tourism, the consequences of climate change on demand for nature-based tourism, including park visitation, could vary significantly by region.

In the Himalayas, it is projected that climate change may considerably influence water supplies, and the higher-than-average temperature rise may significantly impact the cryosphere of the region (S. N. Ali et al., 2023; Satti et al., 2023) which may alter the natural tourism resource base. One of the Himalayas' essential development sectors, nature-based tourism, could be the region's economic locomotive if it were designed and executed in accordance with the tenets of sustainability enshrined in the United Nations' Sustainable Development Goals (SDGs).

The Himalayas, the globe's youngest and most fragile mountainous range, are settled in India, Nepal, and Bhutan, and some areas lie in Pakistan and Tibet (China). The Himalayas are also divided into four regions: Karakoram, Western Himalaya, Central Himalaya, and Eastern Himalaya. It spreads across 13 states and union territories: Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Assam, and West Bengal, spread out over 2500 km.

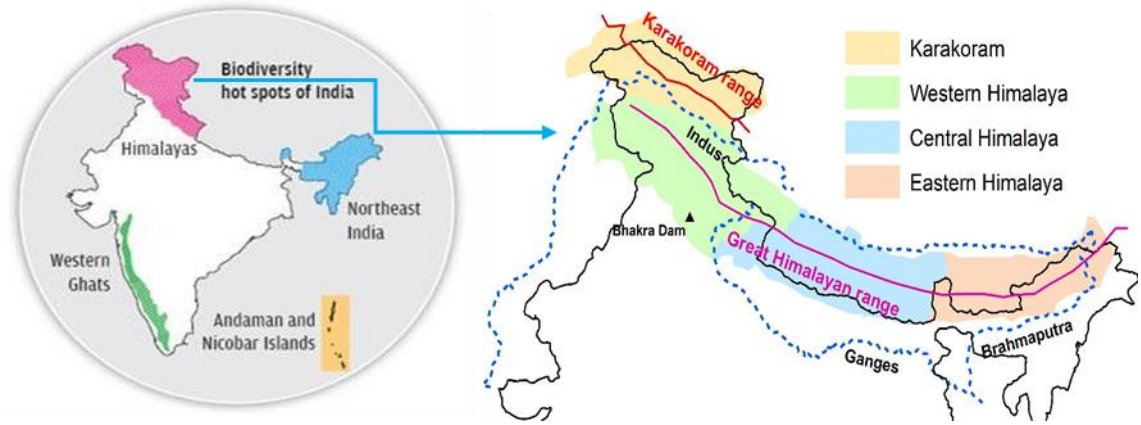

Figure 1: India's Biodiversity Hot spots and various regions of the Himalayas (Source: Kulkarni et al. (2018))

However, the western part of the Indian Himalayas is spread within four states, namely Jammu and Kashmir, Himachal Pradesh, Uttarakhand, and Ladakh. The Himalayas are visited by a vast number of tourists because tourism in the Himalayas is mostly nature-based, with tourists drawn to the region for its breath-taking scenery and unusual flora and fauna. The natural setting of the Himalayas has retained a unique appeal for humanity since the dawn of time. Its elegant nature attracts and fascinates many curious individuals, adventurers, and travellers, contributing to the region's popularity as a nature-based tourism destination. Its diverse ethnic and religious importance (cultural and religious tourism) also contributes to the region's attraction as a tourist destination.

Climate change has numerous consequences for the tourism industry in the Himalayan region, the types of which may vary depending on the tourist destinations and the associated activities. The Himalayan hills and the Tibetan plateau in Asia are both high-altitude regions undergoing continuous climate change impacts. This includes glacial lake outbursts, glacier flooding, and glacier melting. The glacier coverage in the Himalayan ranges has been diminishing, and has also experienced a decline in the amount of intense and variable precipitation (Sah et al., 2023). Similarly, the Indian Himalayas have reportedly experienced a rapid eradication of snow covering in recent years, resulting in a halt of snow-based tourism activities in low and mid-lying areas. Global travellers travel for various reasons, including nature-based tourism, sports, recreation, religious sites, medical and health-related activities, and many others in Himalayan states. Therefore, tourism in this area may serve a variety of sociocultural, economic, and ecological goals.

Tourism has been subdivided into geographical locations and physical environmental elements to explore the relationship between tourism and climate change based on several research findings (Aygün

Oğur & Baycan, 2023). Climate is intrinsically tied to geography, and geographic location directly impacts how climate varies across geographical regions. Each site has been affected by a distinct set of climate-related issues due to the unique nature of the climate change index. Each climate effect has a consequence, along with specific cases in diverse terrains. Since mountain places are often calmer, the natural scenery is more widespread, and temperatures are typically lower in the mountains, mountain tourism is popular among individuals who reside in urban regions and lead hectic city lives. According to the statistics division of the Ministry of Tourism, Govt. of India, approximately 100 million tourists visited Indian Himalayan Region (IHR) states annually during the pre-covid five years (see table 1).

Table1: Tourist arrivals trends in the Indian Himalayan Region (IHR) states (2011-2015)

Indian Himalayan States	2011	2012	2013	2014	2015	**Total**	Five Years Average (Round-off)
Arunachal Pradesh	237,980	322,378	136,307	341,178	357.772	**1395,615**	279,123
Assam	4,355,885	4,528,950	4,702,165	4,848,239	5,516,565	**23,951,804**	4,790,361
Himachal Pradesh	15,089,406	16,146,332	15,129,835	16,314,400	17,531,153	**80,211,126**	16,042,225
Jammu & Kashmir	13,143,124	12,505,924	13,703,247	9,525,021	9,203,584	**58,080,900**	11,616,180
Manipur	135,083	135,290	142,581	118,268	149,429	**680,651**	136,130
Meghalaya	672,307	685,567	698,042	725,133	759,192	**354,0241**	708,048
Mizoram	62,832	64,993	64,177	69,124	67,403	**328,529**	65,705
Nagaland	27,471	38,404	38,942	61,092	67,385	**233,294**	46,658
Sikkim	576,055	585,027	608,447	611,593	743,502	**3,124,624**	624,924
Tripura	365,561	369,626	371,439	387,935	398,058	**1,892,619**	378,523
Uttarakhand	26,070,907	26,951,884	20,038,811	22,093,281	29,602,820	**124,757,703**	24,951,540
West Bengal	23,470,238	23,949,815	26,792,530	50,405,330	71,682,950	**196,300,863**	39,260,172
Total	**84,206,849**	**86,284,190**	**82,426,523**	**105,500,594**	**136,079,813**	**494,497,969**	**98,899,593**

Source: Ministry of Tourism, Government of India

It is worth noting that the population of the Indian Himalayan Region (IHR) states is roughly 60 million, due to the considerably larger moving population, and all-inclusive impacts on the Indian Himalayan Region (IHR) are projected to be very high. Therefore, this large number of tourists visiting IHR states works as a catalyst in the climate change process, which may finally lead towards the eradication of aesthetic, physical, and thermal comfort for nature-based tourism. Hence, the nature-based tourism destinations in the Himalayan region may lose their attractiveness gradually.

After evaluating a wide range of relevant research reviews, it has been observed that most of the literature on tourism, or nature-based tourism, and climate change written by tourism enthusiasts is available in the western world context. But there are a few studies that are close but not quite identical; these studies are based on the European Alps, the American Andes, and the American Rockies, but not on the Indian Himalayas. Therefore, this study has examined the impacts of climate change on nature-based tourism

in the Western Indian Himalayan Region (W-IHR) and filled the research gap.

III. STUDY OBJECTIVE

As discussed in the previous section, there is a lack of research studies on the impacts of climate change on nature-based tourism, especially in the western Himalayan region of India. To the authors' knowledge, no relevant study has been found regarding climate change and nature-based tourism in this context. Therefore, it is a necessity for such studies to find out the impacts of climate change on nature-based tourism and its associated consequences at the destination level. The primary purpose of this study is to fulfil such needs. Consequently, the primary research question that the authors sought to answer in this investigation is: What are the effects of climate change on nature-based tourism destinations in the Western Indian Himalayas Region (W-IHR)?

The available research on the consequences of climate change associated with nature-based tourism does not provide enough evidence to check out the impacts of climate change on the Indian Himalayan Region (IHR); therefore, the objective of the study is to study the effects of climate change on the nature-based tourism resource base in the Western Indian Himalayan Region (W-IHR).

3.1. Conceptual Model and Study Hypothesis

The study's conceptual model is shown in Figure 2. The authors proposed an integrative assessment of the research hypotheses while considering the climate change and nature-based tourism attributes from the relevant literature. The model emphasises the impacts of climate change (an independent variable) on the nature-based tourism resource base (a dependent variable), as well as possible relationships between climate change's composite facets, viz., aesthetic, physical, and thermal (all facets are subsets of the independent variable), and implications for the nature-based tourism resource base (the dependent variable's attributes). In the conceptual model, which is centred on climate change, the effects of three variables, i.e., aesthetic, physical, and thermal (subsets of climate change), and a nature-based tourism resource base are hypothesised. The model incorporates seven crucial implications of climate change to investigate the impacts on nature-based tourism resource base in the western part of the Indian Himalayan region (W-IHR). Hence, the formulated hypothesis is: Ha: Climate change has impacted the nature-based tourism resource base in the Western Indian Himalayan region (W-IHR).

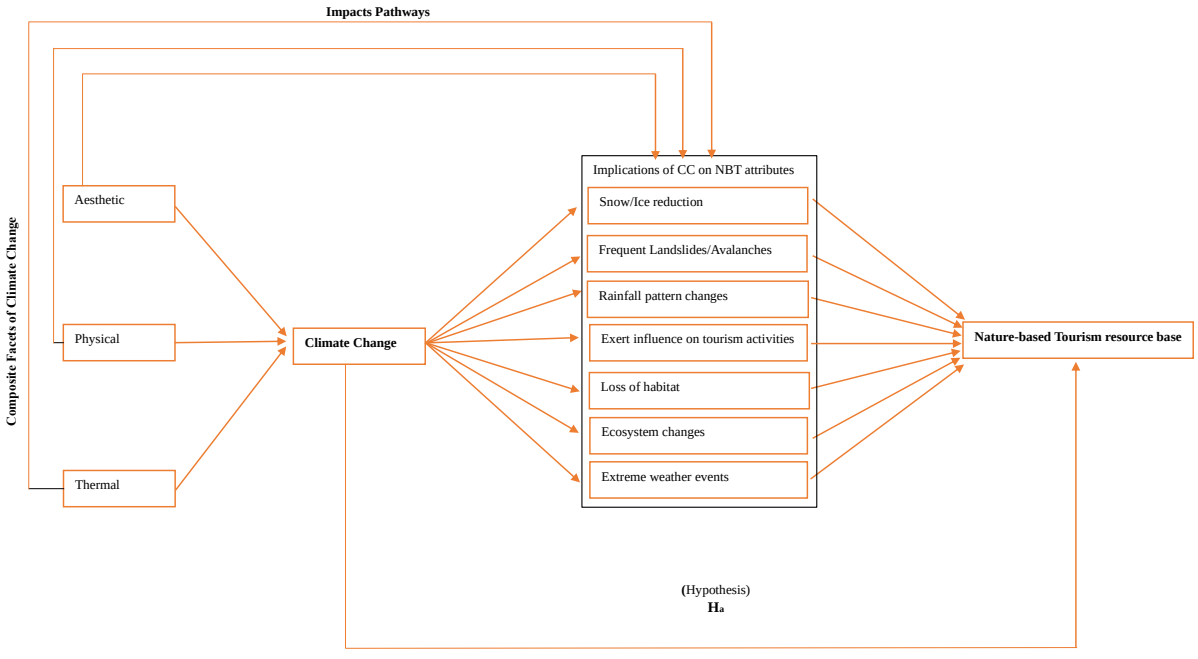

Figure 2: Conceptual Model and Study Hypothesis (Source: Authors' Own)

CC: Climate Change, and NBT: Nature-based Tourism

IV. METHODS AND MATERIALS

The authors conducted an on-site visitor survey to analyse tourists' responses to changing climate and environment' implications on the nature-based tourism resource base. The survey instrument, i.e., the questionnaire, was specifically distributed to tourists, tourism service providers, and tourism professionals found at tourist attractions and leisure areas of the Western Indian Himalayan Region (W-IHR). The collected data was analysed through quantitative techniques discussed below.

4.1. Study Area

The Indian Himalayas lie in the north and northeast of India at a latitude of 22° N. The extended location of the study area is shown in Figure 1 in the background section of this article. The Himalayan region is rich in vegetation and wildlife and supplies water to a large portion of the Indian subcontinent. Tourism is one of the biggest industries in the region. The Himalayas' tourism business is primarily oriented towards nature-based tourism; therefore, the region's various terrain makes it possible to engage in a widespread assortment of outdoor leisure and tourism activities. According to the statistics division of the Ministry of Tourism, Govt. of India, approximately 100 million tourists visited Indian Himalayan Region (IHR) states yearly during the pre-covid five-year period (see table 1), the majority of whom came from outside the Himalayan states. However, the authors chose the western part of the Indian Himalayan Region as an area of study for this research because it was not feasible and reliable to conduct a study across the entire Indian Himalayan Region within a short span of time and with limited resources.

4.2. Sampling, Instrument, and Data Collection

The authors employed an on-site, simple random sampling design to collect responses from tourists, tourism service providers, and tourism professionals in the four states of the Western Indian Himalayan Region (W-IHR), viz., Jammu and Kashmir, Himachal Pradesh, Uttarakhand, and Ladakh. Nature parks, trekking and hiking trails, historical and religious attractions, waterfalls and lakes, rivers aside and beautiful byways, and local establishments (such as camping/accommodation sites, restaurants, and coffee cafes) were among the potential sampling sites. During the time frame of December 23, 2022, to April 16, 2023, sampling was done at each location over a different span of time. A printed survey questionnaire was used to collect the data from tourists, tourism service providers, and tourism professionals. The survey questionnaire included questions about general climate change concerns to assess the respondents' understanding of the theme of the study as a check of reliability.

Items in the questionnaire were designed after reviewing relevant literature and consulting with experts. In November and December 2022, we conducted a pilot test of the questionnaire with 65 visitors to Himachal Pradesh and Uttarakhand. Pilot study respondents were asked to fill out the questionnaire as well as provide feedback or suggestions on its structure, language, length, etc. In the end, to finalise the questionnaire, the experts' consultation was also incorporated. On a five-point Likert-type scale, visitors were asked to rate the most affected climate facets (an independent continuous variable) for tourism on a scale of 1–5. 1 = "Very Low", 2 = "Low", 3 = "Unsure" (can't say), 4 = "High", 5 = "Very High". The implications or consequences of climate change on nature-based tourism resource base were measured using a continuous variable where 1 = "Not Affected", 2= "Little Affected", 3= "Unsure" (Can't say), 4 = "Affected,", 5= "Highly Affected." In the different sections of the questionnaire, general climate concerns were also rated by respondents on a 5-point Likert scale.

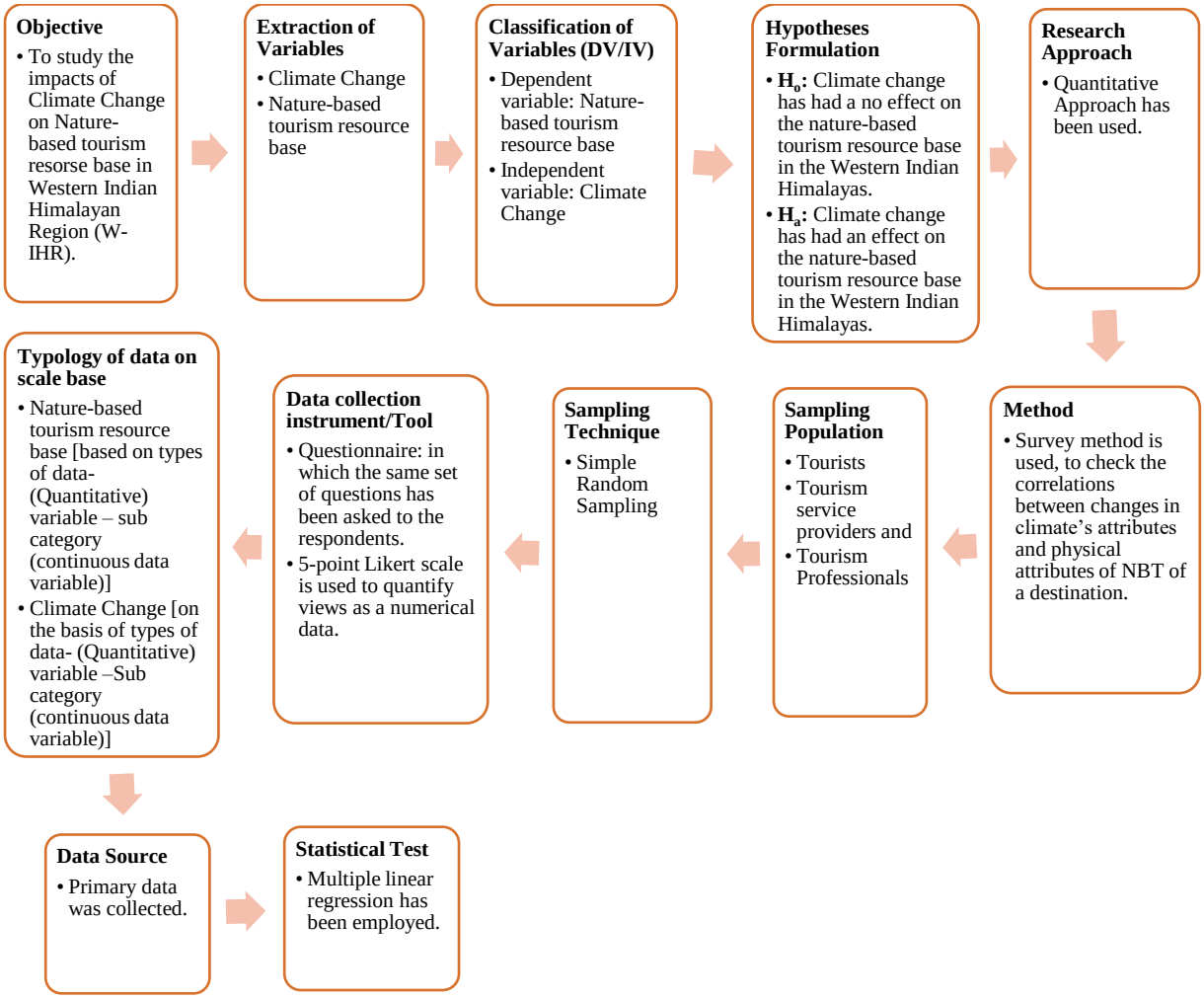

Figure: 3. Methodology flow-chart of the study (Source: Authors' Own)

4.3. Statistical Analysis Overview

The analysis was performed using IBM SPSS 24.0. Multiple linear regression was employed to examine the association between the predictors, or independent variables (aesthetic, physical, and thermal), the composite facets of climate change, and the outcome, or dependent variable (nature-based tourism resource base), because there are three independent and one dependent variables in the model, and all three independent variables and one dependent variable were measured at a continuous scale. Hence, there was a need for the study to employ multiple linear regression to assess the above-mentioned relationship between the variables. The mean, standard deviation, and range were calculated for all variables. Before performing the multiple linear regression, the assumption of normality was met as the values of kurtosis and skewness for all variables fell within the permissible range of -2 to +2. Tolerance and VIF values for all variables fell within the permissible range of 0.1–0.9 and 1–10, respectively, indicating that the collinearity assumption was also fulfilled. The specific t-tests for each independent variable were employed to inspect the model.

V. RESULTS AND DISCUSSION

The outcomes of this study's statistical analysis, based on the data collected from the respondents, are presented in the following section. In this section, the authors also presented a discussion regarding the statistical findings of the study. The data was initially entered into an Excel spreadsheet before being imported into SPSS 24.0 edition. Thus, SPSS software analysed the results of the study. The sample size for the research study is 264 (n=264). Using Cronbach's alpha (α) value for performing a reliability analysis, the data were evaluated for internal consistency. The data are summarised using descriptive statistics, and variables are stated as the mean accompanied by the standard deviation (mean ± SD). Regression analysis is

employed to find the correlation between independent and dependent variables, i.e., climate change (aesthetic, physical, and thermal) and nature-based tourism resource base.

5.1. Respondents' Demographics

The demographics of the survey respondents (Table 2) were diverse and presented a thorough comprehension of the sample. Regarding gender, almost 60 percent of men and 40 percent of women participated in the survey. Most of the respondents were Indian, comprising 92 percent of the sample size. The remaining 8 percent of participants were from various countries. The married respondents made up the majority with 62.5 percent, while singles and others (including divorced, separated, etc.) were 36.4 percent and 1.1 percent, respectively. The respondents' ages ranged widely, with the majority falling between the ages of 30 and 45, with a percentage of 36. There were also respondents under the age of 30 (23.9 percent) and over the age of 60 (19.7). Respondents came from a widespread range of backgrounds (see Table 2). Respondents' education levels ranged from metric and below through undergraduate and master's degrees; however, 41.3 percent of respondents were graduates, and 34.4 percent had master's and above degrees. 37 percent of respondents reported an annual family income ranging between ₹ 5 lakhs and ₹ 10 lakhs. However, some respondents reported annual incomes above ₹ 30 lakhs, providing a diverse income sample. In sum, the demographics of the respondents provide a rich and complex picture of the sample population, facilitating a more precise interpretation of the survey findings.

Table 2: Respondents' demographics

Category	Sub-Category	Frequency (N)	Percent (%)
	Male	160	60.6
Gender	Female	104	39.4
	Other	0	0
Nationality	Indian	243	92
	Other	21	8
Marital Status	Single	96	36.4
	Married	165	62.5
	Other	3	1.1
Age Range	<30	63	23.9
	30-45	95	36
	46-60	54	20.4
	>60	52	19.7
Occupation	Service	63	23.9
	Professional	84	31.8
	Self-employed	55	20.8
	Student	53	20.1
	Unemployed	9	3.4
Education	Matric & below	21	8
	Senior Secondary	43	16.3
	Graduate	109	41.3
	Master & above	91	34.4
Annual Family Income in lakhs	< ₹5	66	25
	₹5 - ₹10	100	37.9
	₹10 - ₹30	53	20.1
	>₹30	45	17

5.2. Statistical Results

Descriptive statistics of dependent variables (nature-based tourism resource base) and independent variables (climate change (aesthetic, physical, and thermal)) are presented in the below table 3. The physical variable has a high mean of 4.49 with standard deviations of 0.82, while comparing to the nature-based tourism resource base variable has a low mean of 4.36 and a standard deviation of 0.83.

Table 3: Descriptive statistics

	N	Mean	SD	Minimum	Maximum
Aesthetic	264	4.46	0.67	1.00	5.00
Physical	264	4.49	0.82	1.00	5.00
Thermal	264	4.39	0.77	1.00	5.00
Nature-based Tourism resource base	264	4.36	0.83	1.00	5.00

SD- Standard Deviation

Assumptions: Test of Normality, Table 4 represents the test of normality for both independent and dependent variables by using the Shapiro-Wilk Test and Kolmogorov-Smirnov Test. The main benefits of the Shapiro-Wilk Test are that it can be used for both small (less than 50) and large sample sizes (above 2000) (Mishra et al., 2019). If the p-value is higher than 0.05 (P>0.05), means data is deviated from a normal distribution and if the p-value is less than 0.05 (P<0.05), means the data is normally distributed. From the below table results, the p-values for all the variables are less than 0.05, and the sample size is above 50 (n=264). Therefore, we may conclude that the data is normally distributed.

Table 4: Test of Normality

	Kolmogorov-Smirnov			Shapiro-Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
Aesthetic	.279	264	.000	.686	264	.000
Physical	.284	264	.000	.640	264	.000
Thermal	.262	264	.000	.665	264	.000
Nature-based Tourism	.258	264	.000	.720	264	.000

Multi-collinearity Test: Table 5 depicts the test for multi-collinearity based on the independent and dependent variables. The below findings reveal that variance inflation factor (VIF) and tolerance were calculated, and the results confirmed that the structural model was free from multicollinearity. Based on the coefficients output collinearity statistics, variance inflation factor (VIF) values obtained were less than 2 in this case. However, VIF values may vary between 1 and 10 (towards 1 it indicates that variables are not correlated and towards 10 it indicates that variables are highly correlated) (Dormann et al., 2013; O'Brien, 2007). Tolerance values must be greater than 0.2; however, in this model, all the variables have values greater than 0.2. Therefore, it may be concluded that there are no multicollinearity signs in the model.

Table 5: Multi-collinearity Test on Impacts of Climate Change on Nature-based tourism resource base

	Unstandardized Coefficients		T value	P value	Collinearity Statistics	
	Beta	SE			Tolerance	VIF
(Constant)	0.399	0.250	1.595	0 .112		
Aesthetic	0.131	0.061	2.144	**0.033***	.690	1.449
Physical	0.464	0.056	8.301	**0.000****	.551	1.814
Thermal	0.301	0.060	5.018	**0.000****	.543	1.840

Dependent Variable: Nature-based Tourism resource base, ***p<0.05, **p<0.01***

Reliability Analysis: The Cronbach's alpha (α) value suggests the following references about the data. (Tavakol & Dennick, 2011): "If a = 0.9 – Excellent, If 0.7 5 a <0.9 – Good, If 0.6 = a < 0.7 – Acceptable, If 0.5 ≤ a < 0.6 – Poor, If a < 0.5 – Unacceptable". The value of Cronbach's alpha indicates the degree of internal consistency in the data that was collected.

Table 6: Reliability Analysis

	No. of items	Mean	SD	Cronbach's Alpha	Status
Aesthetic	3	4.46	0.67	0.871	**Good**
Physical	7	4.49	0.82	0.987	**Excellent**
Thermal	6	4.39	0.77	0.976	**Excellent**
Nature-based Tourism resource base	7	4.36	0.83	0.947	**Excellent**

Each variable's internal consistency was assessed using Cronbach's alpha (α). Table 4 displays the results of the reliability analyses and the descriptive statistics for each variable. The values for each variable's Cronbach's alpha (α) vary from 0.871 to 0.987, which indicates that each variable has a high degree of internal consistency.

Factor Analysis: Table 7 reveals the factor analysis of climate change and nature-based tourism. A factor analysis is performed on the sixteen items. Principal component analysis reduces the total number of items from sixteen to three. Physical, thermal, and aesthetic factors constitute the final three.

Table 7: Factor Analysis

	Factor			% of variance
	1	2	3	
Physical				**66.342**
Ice	.924			
Air quality	.922			
Severe weather	.914			
Ultraviolet radiation	.896			
Snow	.881			
Rain	.869			
Wind velocity	.850			
Thermal				**79.725**
Long wave radiation		.925		
Metabolic rate		.911		
Humidity		.876		
Integrated effects of air temperature		.869		
Solar radiation		.846		
Wind		.793		
Aesthetic				**89.392**
Day length			.915	
Sunshine/cloudiness			.872	
Visibility			.710	

- Seven statements were loaded under factor one, with loading ranging from 0.850 to 0.924. Hence it is named "Physical".
- Six statements were loaded under factor two, with loading ranging from 0.793 to 0.925. Hence it is named "Thermal".
- Three statements were loaded under factor three, with loading ranging from 0.710 to 0.915. Hence, it is named "Aesthetic".

Relationship between Climate Change and Nature-based Tourism resource base: The results of a correlation analysis are shown in Table 8, which illustrates the association between climate change and the nature-based tourism resource base. The findings shown in Table 8 reveal that the nature-based tourism resource base had a substantial positive linear association with aesthetic (r = 0.482, p 0.01), physical (r = 0.697, p 0.01), and thermal (r = 0.633, p 0.01) variables. Therefore, climate change and nature-based tourism resource base are significantly correlated.

Table 8: Relationship between Climate Change and Nature-based tourism resource base

	Aesthetic	Physical	Thermal	Nature-based Tourism resource base
Aesthetic	1			
Physical	.499**	1		
Thermal	.509**	.639**	1	
Nature-based Tourism	.482**	.697**	.633**	1

p<0.01

Table 9 reveals the association between climate change and nature-based tourism resource base. The significance value (p-value<0.01) reveals that nature-based tourism resource base is dependent on climate change. The R2 number reveals how much of the overall variance in the dependent variable is explained by the independent variable, i.e., the nature-based tourism resource base's overall variance caused by climate change. In addition, climate change (physical, thermal, and aesthetic) may be able to explain 55% of the variance in nature-based tourism resource base (R^2 value =0.553).

Table 9: Impact of Climate Change on Nature-based tourism resource base

	Unstandardized Coefficients		R Square	T value	P value
	Beta	SE			
(Constant)	0.399	0.250	0.553	1.595	0 .112
Aesthetic	0.131	0.061		2.144	**0.033***
Physical	0.464	0.056		8.301	**0.000****
Thermal	0.301	0.060		5.018	**0.000****

*Dependent Variable: Nature-based Tourism resource base, **p<0.05, **p<0.01***

Also, the beta coefficients (β) of physical (0.464), thermal (0.301) and aesthetic (0.131) are positive. Which means that the changes in the independent variables, i.e., climate change (aesthetic + physical + thermal), by one unit bring the change in the dependent variable, i.e., nature-based tourism resource base, by 0.464 (physical), 0.301 (thermal), and 0.131 (aesthetic) units. It reveals that if climate change increases in value, then it will lead to increased nature-based tourism resource base degradation in the Western Indian Himalayan Region (W-IHR). Hence, there is an association between climate change's composite facets, i.e., aesthetic, physical, and thermal, with a nature-based tourism resource base. Eventually, the authors accepted the Alternative Hypothesis (Ha) based on the outcomes of this analysis, which is associated with a higher degradation rate of nature-based tourism resource base with increased climate change.

VI. CONCLUSION

It is possible to forecast variations in visiting patterns at nature-based tourism destinations, both spatially and temporally, based on analysis associated with degradation of the nature-based tourism resource base and composite facets of climate change. In this research, the authors examined the impacts of climate change on the nature-based tourism resource base in the Western Indian Himalayan region (W-IHR), a primarily nature-based tourism region. The authors explained 55% (R2 value =0.553) of the variance in nature-based tourism resource base due to climate change facets, i.e., physical, thermal, and aesthetic, using a multiple linear regression analysis. The analysis results gave strong evidence to reject the null hypothesis and accept the alternative hypothesis that climate change had impacted nature-based tourism resource base. All three facets of climate change, i.e., physical, thermal, and aesthetic, were significant predictors (independent variables) of the study, and had contributed to nature-based tourism resource base degradation in W-IHR. This study adds to the growing body of valuable literature on climate change impacts on nature-based tourism in the Western Indian

Himalayan Region. Due to this degradation and alteration, tourism businesses such as tour operation agencies, camping sites, hotels, restaurants, etc. would also be affected by increased risks. To ensure the sustainability of the tourism business in the W-IHR, adaptation and mitigation techniques are needed to counteract the consequences of climate change on nature-based tourism. These key aspects may be thought of as: addressing the causes of climate change, manipulation of biological and ecological adaptation, geoengineering as albedo management, and solar radiation management, etc., and protection of biota and ecosystems may be used for awareness and adaptation, and mitigation strategies. The author's findings may contribute to tourists, tourism service providers, tourism professionals, and governments to reduce the detrimental impacts of climate change on nature-based tourism in the Western Indian Himalayan Region and other nature-based tourism destination regions using visitor management systems. Policy must be designed in a sustainable way to encourage adherence to regulations controlling the management of natural and cultural resources in nature-based tourism regions; otherwise, the local tourism economy of the region and the natural and cultural resources of tourism would be impacted further in the future in W-IHR and other nature-based tourism destinations.

VII. LIMITATIONS AND FUTURE RECOMMENDATIONS

The study's geographic scope is limited to the Western Indian Himalayan area, which restricts the generalizability of the results to other nature-based tourism regions. The research solely focused on one form of tourism, i.e., nature-based tourism, and the sample may not be typical of all tourists, tourism service providers, and tourism professionals that visit the area, as they may be visited because of religious and cultural tourism. The study collected data for a brief period, which might not have been long enough to indicate the long-term effects of climate change on nature-based tourism. The sample might have been skewed by tourists who tended to be more environmentally conscientious or more likely to recognise the consequences of climate change. Finally, the analysis may not have considered all pertinent variables that could influence nature-based tourism, which unlocks the door to confounding variables that might have impacted the outcomes.

To further understand how climate change affects nature-based tourism, future studies should expand their geographic scope. Future research should also involve a more varied sample of respondents to better reflect the range of opinions and experiences to be found among those who choose to visit and associate themselves as tourism service providers and tourism professionals with the Indian Himalayan region. To further understand how climate change affects nature-based tourism, future research might integrate more possible variables and meteorological data. Lastly, future research may investigate the effects of climate change on other types of tourism, such as religious tourism, cultural tourism, etc., to gain a more in-depth and comprehensive understanding of the potential consequences of climate change on the tourism industry.

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