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RESEARCH ARTICLE

Factors Affecting the Perceptions of Climate Change of Ethnic Minority Communities Participating In Tourism Activities in Sapa, Lao Cai, Vietnam

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ABSTRACT

The purpose of this study is to identify the factors affecting the perceptions of climate change of ethnic minority communities engaged in tourism in Sa Pa, Lao Cai. The study used a model with 372 survey samples and the partial least squares (PLS) method, with SmartPLS 4.0 software for analysis. The results of the study show that Knowledge, Communication activities, Educational activities, Beliefs about climate change has a positive impact on the perceptions of climate change of ethnic minority communities participating in tourism activities in Sa Pa, Lao Cai in descending order. The research findings can provide a necessary foundation to assist stakeholders in proposing effective solutions to raise perceptions of climate change among these groups, thus contributing to the sustainable development of tourism in Sapa, Vietnam in the future.

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INTRODUCTION

One of the considerable challenges humanity is facing today is the issue of climate change. Its adverse effects on human life have manifested. (Metz et al., 2007; Parry, 2007; Stern & Taylor, 2007). Climate change can be caused by natural changes or by human activities. It brings new risks and exacerbates existing community vulnerabilities, creating increasing challenges to human health, safety, and quality of life. (Reidmiller et al., 2017).

According to the report of the Intergovernmental Panel on Climate Change (IPCC, 2007), Vietnam is one of the countries seriously affected by the impact of climate change. This nation is facing many challenges with increases in many extreme climate phenomena. With an estimated loss of up to 1.5% of gross domestic product (GDP) annually, climate change is negatively impacting Vietnam's socio-economic achievements, while also creating significant challenges for the attainance of Vietnam's sustainable development goals in the future.

Although various industries of agriculture, forestry, tourism, and even financial and insurance markets are affected by climate change (Kemfert, 2008), tourism is a potential threat to Ozone-caused climate change (Leal Filho et al., 2023). Among these industries, tourism is particularly vulnerable to environmental changes, so it is very susceptible to the impacts of climate change. Once a natural disaster occurs, it will reduce or lose tourism resources, causing degradation, damage, or loss of tourism infrastructure, and physical and technical facilities, affecting tour organization activities, or threatening the safety of tourists (Lương, 2015).

Tourism is defined as a social, cultural, and economic phenomenon that entails the movement of people to countries or places outside their usual environment for personal business or professional purposes (UNWTO, 2008). Sa Pa, Lao Cai are attractive destinations for domestic and foreign tourists. The burgeoning tourism industry in Sa Pa has brought about increased participation of ethnic minorities in tourism activities. It is imperative to note that the government's attention and support for the ethnic minority communities in Sa Pa stem from their concentrated living areas with challenging terrain, harsh climate, and difficulties in attracting investment and human resources. They are vulnerable and exposed to severe impacts related to extreme weather events. When participating in tourism activities, the Sa Pa ethnic minority community has encountered many difficulties due to constant rainstorms, flash floods, landslides, frost,... causing extensive damage to people and property. However, do they have perceptions of climate change?

The growing perceptions of the pressing issue of climate change is crucial for the future of humanity. Raising perceptions levels can be an essential step in improving adaptation to climate change (Mahmoodi Momtaz et al., 2020). Therefore, surveying the factors affecting the perceptions of climate change among the Sa Pa ethnic minority communities is extremely important to help promote the perceptions of this group to contribute to sustainable development in the tourism industry. There is a amount of literature studying the factors that influence perceptions of climate change such as reaseaches of Shi et al (2016), Lowe (2006); Capstick et al (2015), Poortinga et al (2019), Zeeshan et al (2021) and often focuses on farmers, students, and tourists. There is a lack of focus on the perceptions of climate change among ethnic minority communities participating in tourism activities in Vietnam. This is a crucial area that requires more attention and exploration in order to ensure a comprehensive understanding of the impact of climate change on these communities.

From the above issues, this article focuses on researching factors affecting the perceptions of ethnic minority communities participating in tourism activities about climate change in SaPa, Lao Cai, as well as offers some implications, proposes several solutions to raise the perceptions of ethnic minority communities about climate change, contributing to the sustainable tourism development of the Sa Pa National Tourist Area in the coming time.

2. Theoretical framework and research model

2.1. Climate change

So far, scientific evidence shows that since the beginning of the industrial era, human activities have led to a notable rise in greenhouse gas emissions into the atmosphere (IPCC, 2007). The increase in these gases has generated an upsurge in the amount of heat from the sun trapped in the Earth's atmosphere leading to the greenhouse effect and contributing to climate change (UNFCCC. 2007)

United Nations Framework Convention on Climate Change defines: “Climate change is a change in climate due to human activities that directly or indirectly change the composition of the global atmosphere and observed natural climate fluctuations over comparable periods” (Secretariat, 1992). Climate change manifests through many different characteristics. The main elements of climate change include increased global average temperature, changes in cloud cover and precipitation, melting ice caps and glaciers, and reduced snow cover; and increases in ocean temperatures and ocean acidity – due to seawater absorbing heat and carbon dioxide from the atmosphere (UNFCCC. 2007). Climate change is one of the paramount challenges that humanity faces today because of its obvious negative impacts on human life (Metz et al., 2007b).

Vietnam is currently among the six countries most affected by climate change. According to the IPCC (2007) if sea levels rise by 100cm, Vietnam could lose 40,000 km2 of land, which is 12.1% of the total existing land area, potentially resulting in about 17 million deaths and displacing a million people. Climate change is the main factor causing storms, floods, inundations, flash floods, and landslides, accounting for 87 - 91% of natural disasters, affecting 70% of the population, causing about 1 - 1.5 billion in damage percentage of GDP, seriously threatening the implementation of hunger eradication, poverty reduction, and Vietnam's sustainable development goals. The Ministry of

Natural Resources and Environment reported that extreme climate events have caused economic losses totaling 10 billion USD from 2011 to 2020.

Table1: Industry and subjects affected by climate change in mountainous and midland areas

Geographical Region	Impact of Climate Change	Impacted Industry	Subject Vulnerable
Mountainous and midland areas	• Experiencing increased floods and landslides • Facing more extreme weather phenomena • Witnessing rising temperatures and drought • Enduring severe cold and harmful cold	• Food security • Transportation • Health, public health • Service business, trade and tourism	• Mountainous population, ethnic minorities • Elderly people, women, children

Source: Vietnam Institute of Meteorology, Hydrology and Environment (2011), Ministry of Natural Resources and Environment (2020)

2.2. The perceptions of climate change

The increasing perceptions of climate change are closely tied to the future of humanity. It is part of overall environmental perceptions, which can be defined in various ways. Shahid (2012) believes that the ecological perceptions of individuals and organizations indicate their response to the negative impacts of the surrounding living environment. According to Ziadat (2010), environmental perceptions are a form of knowledge that can develop through the human cognitive process. Therefore, it can be argued that environmental perceptions are a result of education and can be cultivated through the educational system. Partanen-Hertell et al (1999) argued that environmental perceptions begin when people perceive disadvantages and obstacles in the surrounding environment. People's level of perceptions due to the impact of different socio-economic conditions such as education level, age, gender, and social circumstances...

In light of the forecasted rapid and complex impact of climate change on Vietnam, particularly in places like Sapa, it is crucial to proactively raise perceptions among people, especially ethnic minority communities, and encourage their participation in tourism activities. This will help mitigate the socio-economic impacts on provinces, and cities in Vietnam.

2.3. Ethnic minority communities participating in tourism activities

Sa Pa is situated at an altitude of 1,600 meters above sea level in the northwest of Vietnam. It has been recognized as a National Tourist Area since December 2017. As of 2020, Sa Pa town covers an area of 681.37 km^2, with a population of 81,857 and a population density of 120 people/km^2. Regarding tourism exploitation and development, in 2023, the total number of visitors to tourist attractions in Sa Pa reached 3.68 million, an increase of 105% compared to the 2023 plan and equal to 145% in 2022. The town is experiencing a steady rise in tourist numbers, leading to an extended development in hotels, restaurants, and tourism-related businesses, as well as a growing variety of tourism services. To achieve the above results, Sapa has made efforts to promote the advantages of its unique natural conditions, especially the diverse culture that has evolved from the many ethnic minorities living in the area, such as the H'Mong, Dao, Tay, Giay, and Xa Pho (Phu La). These ethnic groups, with their unique cultures, have become a significant factor contributing to creating a distinctive appeal, attracting tourists, and fostering community tourism.

With the rapid development of tourism in Sapa, an increasing number of ethnic minorities have been drawn to participate in tourism activities. As a result, their income and quality of life have improved. For example, in Cat Cat village, out of a population of 360, 112 people (31.2% of the population) are

involved in tourism activities. Similarly, in Ly Lao Chai village with a population of 516, 102 people from 22 households (out of a total of 28 households) are engaged in tourism activities.

Figure 1: Ethnic minority communities in Sa Pa
Source: https://baodantoc.vn/; https://daibieunhandan.vn/; https://tuoitrethudo.vn/

The tourism activities in which ethnic minority communities participate are very diverse, with the emergence of new types of activities to meet the needs of tourists. Some notable activities include providing accommodation services for tourists, offering home accommodations (homestay), providing directions for tourists, offering transportation services (such as by motorbike or with porters), selling souvenirs (like brocade, jewelry, and local crafts), and performing traditional arts.

However, the Mekong Development Research Institute (MDRI), in collaboration with Oxfam Vietnam, revealed the conclusions of the publication "Impacts of Climate Change and Disasters on Multidimensional Inequality in Vietnam." that ethnic minority groups are vulnerable. It points out that these groups are more severely affected due to higher poverty rates, living in areas prone to natural disasters and extreme weather, and limited access to education and training, which hinders their ability to adapt to climate change.

2.4. Research model

The perceptions of climate change among ethnic minority communities participating in tourism activities is crucial for sustainable tourism development in Sa Pa and Lao Cai. Building on previous research models, Poortinga et al (2019) propose that perceptions about climate change are influenced by Human values (Self-transcendence, Self-enhancement, Conservation), Political orientation, Demographics (Gender, Age, Level of education, European regions). The authors collected data from different parts of Europe to investigate potential differences in the impact of these factors on climate change perceptions. Zeeshan et al (2021) examined factors affecting students' perceptions of climate change because this is a group of people who are considered to reflect the culture of the community because they can absorb experiences from their parents, relatives, friends, and teachers,... The study identified gender, type of school, levels of education, and rural versus urban backgrounds as crucial factors impacting students' perceptions of climate change. Other authors studying this topic include Aksit et al (2018); Freije et al (2017), García Vinuesa et al (2022); Cornejo et al (2024).

Mahmoodi Momtaz et al (2020) focused on the influence of belief, and knowledge about climate change on farmers' perceptions of climate change. This study aims at the agricultural sector because it is one of the economic sectors most vulnerable to climate change, which will make increasing agricultural output very difficult in the future. Also in the field of agriculture, Rokhani et al (2020) identified factors affecting farmers' perceptions of climate change in developing and developed countries and took Ghana and Switzerland as case studies. Foguesatto & Machado (2021) argue that socioeconomic and psychological factors shape farmers' perceptions of climate change.

In the field of tourism, numerous studies have examined how various stakeholders, including tourists (Moreno, 2010; Tervo-Kankare et al., 2013; Dube et al., 2018), tourism businesses (Brouder & Lundmark, 2011), tourism operators (Saarinen & Tervo, 2006), managers (Wolfsegger et al., 2008; Luthe, 2009). However, there is a lack of research on the factors influencing climate change perceptions among ethnic minority communities engaged in tourism. The authors aim to explore the factors that could potentially enhance the climate change perceptions of ethnic minority communities involved in tourism, with a focus on knowledge, beliefs, communication activities, and educational activities.

Based on the overview of the studies, the authors propose a research model

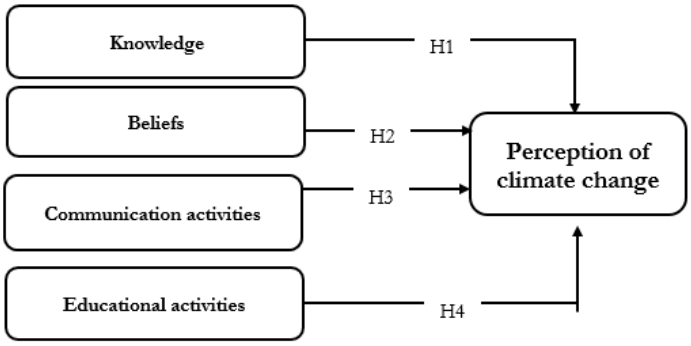

Figure 2: Model of factors affecting the perceptions of climate change of ethnic minority communities participating in tourism activities in Sa Pa

The research hypotheses proposed are:

H1 – Knowledge of climate change has positively impacted the perceptions of climate change among ethnic minority communities participating in tourism activities in Sa Pa

H2 – Beliefs in climate change have positively impacted the perceptions of climate change among ethnic minority communities participating in tourism activities in Sa Pa

H3 – Communication activities on climate change have positively impacted the perceptions of climate change among ethnic minority communities participating in tourism activities in Sa Pa

H4 – Educational activities on climate change have positively impacted the perceptions of climate change among ethnic minority communities participating in tourism activities in Sa Pa

The authors measured the independent variable Knowledge using five observations, Beliefs using six observations, Communication activities using three observations, and Educational Activities using five observations. The dependent variable, Perceptions of climate change, was measured using three observations. Each observation was measured on a 5-level Likert scale. The observed variables and scales are shown in the table below.

Table 2: Observations and scales of the research model

Variable	Abbreviated name	Items	Reference	Scales
Knowledge	HB1	Understanding of the concept of climate change	(Nguyễn et al., 2023)	1= Absolutely disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Absolutely agree
	HB2	Understanding of manifestations of climate change	(Shi et al., 2016)	
	HB3	Understanding the causes of climate change	(Shi et al., 2016)	
	HB4	Understanding of negative consequences/impacts of climate change	(Shi et al., 2016), Anh et al (2023)	
	HB5	Understanding of measures to limit and adapt to climate change	Anh et al (2023)	

Belief	NT1	I firmly believe that climate change is happening	(Arbuckle et al., 2015)	1= Absolutely disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Absolutely agree
	NT2	I believe there is enough evidence to show that climate change is happening	(Arbuckle et al., 2015)	
	NT3	I believe that climate change is happening and will mainly change the natural environment	(Arbuckle et al., 2015)	
	NT4	I believe that climate change is happening and is mainly driven by human activities	(Arbuckle et al., 2015)	
	NT5	I am worried about the impact of climate change on local tourism activities	(Poortinga et al., 2019)	
	NT6	The severity of climate change threatens your current business activities	(Lowe, 2006)	1= Not at All Serious, 2= not very Serious, 3= somewhat Serious, 4= very Serious, 5= extremely Serious
Communication activities	TTTT1	There are slogans, banners, and images about environmental protection and climate change mitigation in the press and mass media.	(Nguyễn et al., 2023)	1= Absolutely disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Absolutely agree
	TTTT2	There are slogans, banners, and images about environmental protection and climate change mitigation in visual propaganda and mobile propaganda programs (banners, loudspeaker trucks, mobile propaganda teams).	(Nguyễn et al., 2023)	
	TTTT3	There are slogans, banners, and images about environmental protection and climate change mitigation in popular seminars and training sessions on climate change issues	(Nguyễn et al., 2023)	

Educational activities	HĐGD1	Knowledge about the negative consequences/impacts of climate change is mentioned in the educational activities you participated in.	(Nguyễn et al., 2023)	1= Absolutely disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Absolutely agree
	HĐGD2	Knowledge about the manifestations of climate change is mentioned in the educational activities you participated in.	(Nguyễn et al., 2023)	
	HĐGD3	Knowledge about the causes of climate change is mentioned in the educational activities you participated in.	(Nguyễn et al., 2023)	
	HĐGD4	Knowledge about the negative consequences/impacts of climate change is mentioned in the educational activities you participated in.	(Nguyễn et al., 2023)	
	HĐGD5	Knowledge about respond, adapt, and limit climate change is mentioned in the educational activities you participated in.	(Nguyễn et al., 2023)	
Perceptions of climate change	NTTS1	I encourage others to participate in environmental protection activities	(Zeeshan et al., 2021)	1= Absolutely disagree, 2= Disagree, 3= Neutral, 4= Agree, 5= Absolutely agree
	NTTS2	I am willing to take part in environmental protection activities	(Zeeshan et al., 2021)	
	NTTS3	I strive to minimize my impact on climate change	(Zeeshan et al., 2021)	

3. RESEARCH METHODOLOGY

3.1. Collecting primary data

The authors developed a survey form based on an established research framework. We conducted pilot interviews with ten individuals from ethnic minority communities (H'Mong, Dao, Tay, Giay, Xa Pho) who participated in tourism activities in Sa Pa. The purpose of pilot interviews was to ensure that the interviewees thoroughly understood each question. The interviews were conducted face-to-face and lasted an average of 15 minutes. Any flaws in the questionnaire were revised to ensure that the survey questionnaire was of the highest quality for research purposes. In order to address limitations related to education level and the ability to read the Kinh people's language of some ethnic minorities in Sapa, a self-filled questionnaire was utilized. During the interview, the authors provided a brief introduction to the research content and purpose. The use of self-filled questionnaires has resulted in a high response rate and comprehensive information provided.

We obtained a sample size of 380 from two sources. The first source is a list of ethnic minority communities from the local authorities. The remaining source is a list of employees from tourism companies in the area. From these lists, the authors randomly selected 400 samples. After contacting the respondents, 20 of them were no longer participating in tourism activities. The official survey was then conducted with 380 respondents. Out of the 380 questionnaires issued, 372 (97.9%) were collected and will be used for analysis in the next step.

3.2. Collecting secondary data

Secondary data is collected from reports from agencies such as the People's Committee of Lao Cai Province, the Department of Culture - Sports and Tourism of Lao Cai Province, People's Committee of Sa Pa town, Sa Pa Department of Culture and Information, Institute of Meteorology, Hydrology and Environment and Ministry of Natural Resources and Environment. In addition, the article also collects secondary data from books, research articles, and other topics.

3.3. Data analysis methods

This study utilized the partial least squares (PLS) analysis method, using SmartPLS 4.0 software. We assessed scale quality, reliability, convergence, discriminant validity, and the PLS-SEM technique to test the proposed hypotheses.

4. RESEARCH RESULTS

4.1. Sample characteristics

The survey was carried out in key tourism areas in Sapa, Lao Cai in 2023. Specifically, six destinations consisting of Lao Chai, Ban Lake, Thanh Phu, Ta Phin, Thac Bac, and Sin Chai Village that have a significant number of ethnic minority communities who participated in tourism activities were selected. The demographic characteristics of the sample include gender, age, ethnicity, education level, travel experience, and average monthly income.

Table 3: Descriptive statistics of the study sample

Respondents		**Frequency**	**Percentage (%)**
Gender	Male	158	42.1
	Female	217	57.9
Age	Under 30 years old	84	22.4
	30 - 50 years old	217	57.9
	Above 50 years old	74	19.7
Ethnicity	H'Mong	139	37.1
	Dao	104	27.7
	Tay	57	15.2
	Giay	53	14.1
	Phu La	22	5.9
Level of education	Illiterate school	30	8.0
	Primary school	110	29.3
	Secondary school	82	21.9
	high school	90	24.0
	Above	63	16.8
Experience	Under 10 years	209	55.7
	10 - 30 years	159	42.4
	Above 30 years	7	1.9
Income	Under 5 million VND	30	8.0
	From 5 to 15 million VND	282	75.2
	From 15 to 25 million VND	47	12.5
	Above 25 million VND	16	4.3

Source: Research team's analysis results

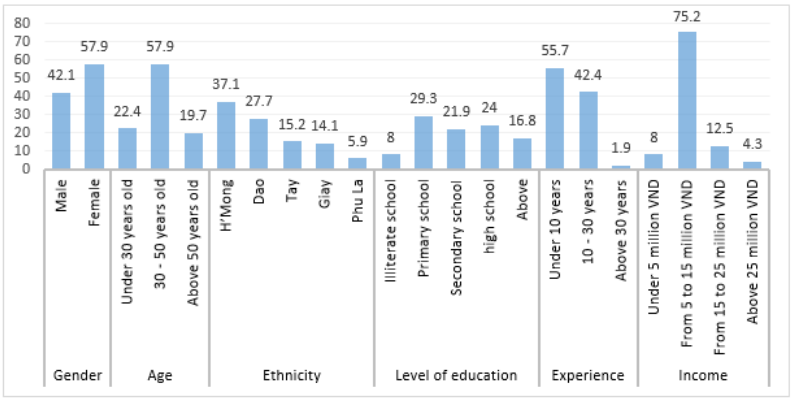

Figure 3: Personal Data of Respondents (Percentage)

4.2. Evaluating the measurement model

The author meticulously assessed convergence by scrutinizing the factor loadings of each factor and computing the Cronbach's Alpha coefficient (CA), composite reliability (CR), and average variance extracted (AVE) of each factor variable. The compelling results of this rigorous analysis are showcased in Figure 4 and the detailed statistical table below.

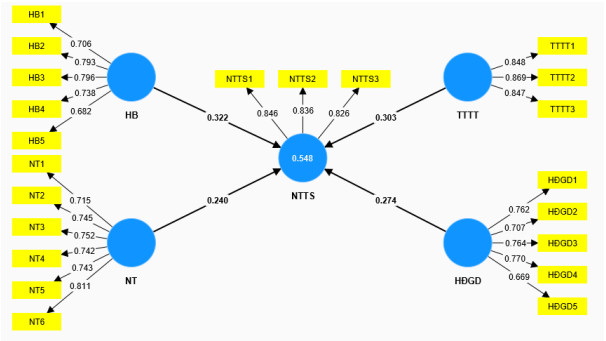

Figure 4: Results of estimating the reflective measurement model
Source: Research team's analysis results

4.3. Assessing internal consistency reliability

The following data analysis results demonstrate strong internal consistency reliability (see Table 4). Based on the reliability indexes measured through Cronbach's Alpha coefficient and the combined reliability coefficient of the latent concepts, all values fall within the recommended threshold by Hair et al. (2019), ranging from 0.784 to 0.846. This indicates that our measurement model successfully achieves internal consistency reliability, meeting the requirements for both Cronbach's Alpha coefficient and composite reliability.

Table 4: Results of internal consistency reliability assessment

	Cronbach's alpha	Composite reliability (rho_a)	Composite reliability (rho_c)
HB	0.800	0.819	0.861
HĐGD	0.787	0.792	0.854
NT	0.846	0.848	0.886
NTTS	0.784	0.784	0.874
TTTT	0.818	0.833	0.891

Source: Research team's analysis results

4.4. Evaluating convergence

The analysis of the variance for each variable reveals strong convergent validity, with all the Average Variance Extracted (AVE) values for the underlying concepts surpassing 0.5 (Table 5). Ranging from

0.541 to 0.731, these values clearly meet the criteria for convergent validity. Consequently, the scales in the model, as tested with the official sample, confidently exhibit the necessary convergent validity.

Table 5: Results of average extraction variance analysis

	Average variance extracted (AVE)
HB	0.554
HĐGD	0.541
NT	0.565
NTTS	0.699
TTTT	0.731

Source: Research team's analysis results

4.5. Evaluating the discriminant validity

In Table 6, it's evident that the constructs demonstrate discriminant validity as the square root of the Average Variance Extracted (AVE) surpasses the correlation coefficients between the off-diagonal latent variables. Furthermore, as per Garson (2016), the Heterotrait-Monotrait (HTMT) coefficient should be less than 1 for discriminant validity, and according to Henseler et al. (2015), it should ideally be below 0.850. Table 7 reinforces these findings, with all HTMT coefficients falling below 0.850, the highest being only 0.636. These compelling results lead to the conclusion that the scales used in the research model exhibit robust internal consistency reliability, convergence, and discriminant validity. Consequently, all five scales for these latent constructs were included in the structural equation model analysis.

Table 6: Evaluating the discriminant validity using Fornell and Larcker criteria

	HB	HĐGD	NT	NTTS	TTTT
HB	**0.744**				
HĐGD	0.224	**0.735**			
NT	0.258	0.171	**0.752**		
NTTS	0.518	0.441	0.455	**0.836**	
TTTT	0.241	0.178	0.281	0.497	**0.855**

Source: Research team's analysis results

Table 7: Evaluating the discriminant validity using HTMT criteria

	HB	HĐGD	NT	NTTS	TTTT
HB					
HĐGD	0.274				
NT	0.308	0.207			
NTTS	0.636	0.558	0.551		
TTTT	0.297	0.216	0.323	0.609	

Source: Research team's analysis results

4.6. Evaluating the SEM structural model

The results Figure 5 conclusively demonstrates that all direct relationships between variables are statistically significant, and every single research hypothesis is undeniably accepted at the 95% confidence level (with P values of all relationships lower than 0.05). This solidifies the robustness of our findings and reinforces the significance of our research.

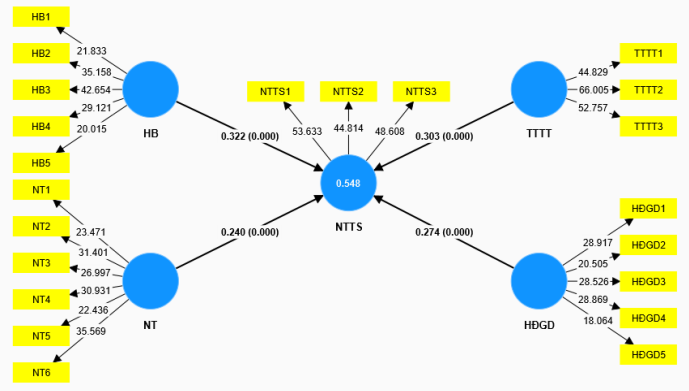

Figure 5: SEM structural model estimation results

When evaluating the endogenous structure, the R2 coefficient is used. Additionally, the change in the R2 value resulting from the removal of an exogenous variable is expressed through Cohen's impact measure, known as the impact coefficient f^2 (Table 8). This measure is utilized to assess the significance of the omitted variable in relation to the endogenous variable.

Table 8: SEM structural model estimation results

	Original sample (O)	Standard deviation (STDEV)	P values	Conclusion Hypothesis	Effect size f^2	Degree of influence
HB -> NTTS	0.322	0.045	0.000	Accept	0.201	Average influence
HĐGD -> NTTS	0.274	0.042	0.000	Accept	0.154	Average influence
NT -> NTTS	0.240	0.043	0.000	Accept	0.112	Small influence
TTTT -> NTTS	0.303	0.040	0.000	Accept	0.179	Average influence

Source: Research team's analysis results

Table 9: Assessing model quality through the R-square index

	R-square	R-square adjusted
NTTS	0.548	0.543

Source: Research team's analysis results

If the f^2 falls between 0.15 and 0.02, it suggests that the exogenous variable has a modest impact on the endogenous variable. A range of 0.35 to 0.15 indicates a moderate impact, and f^2 of 0.35 or higher signifies a substantial impact (Cohen, 1988). Conversely, if f^2 is less than 0.02, it is considered to have no impact at all.

Table 10: Multicollinearity test results – external model

	VIF
HB1	1.492
HB2	1.714
HB3	1.618
HB4	1.536
HB5	1.453
HĐGD1	1.483
HĐGD2	1.436
HĐGD3	1.624

HĐGD4	1.700
HĐGD5	1.382
NT1	1.433
NT2	1.662
NT3	1.988
NT4	1.579
NT5	1.730
NT6	2.221
NTTS1	1.705
NTTS2	1.631
NTTS3	1.584
TTTT1	2.005
TTTT2	1.789
TTTT3	1.738

Source: Research team's analysis results

Table 11: Multicollinearity test results – internal model

	VIF
HB -> NTTS	1.140
HĐGD -> NTTS	1.081
NT -> NTTS	1.143
TTTT -> NTTS	1.136

Source: Research team's analysis results

The findings clearly demonstrate that the variance magnification factor (VIF) confirms the absence of multicollinearity between the predictor variables. This is supported by the results of the multicollinearity testing in both the external model (Table 10) and the internal model (Table 11). With all coefficients falling within an acceptable range and VIF coefficients below 3, it is evident that the structural model is free from multicollinearity (Hair et al., 2019).

5. DISCUSSION AND IMPLICATIONS

Developing a perceptions about the issue of climate change is urgent and is an essential effort to improve the ability to adapt to climate change. Results show that all four factors have positive impacts to varying degrees on the comprehensive perceptions of climate change of ethnic minority communities participating in tourism activities in Sapa to contribute to responding to climate change. In the proposed model, the level of influence of the factors on the perceptions of climate change is respectively Knowledge (β=0.322), Communication activities (β=0.303), Educational activities (β=0.274), Belief (β=0.240).

The knowledge about climate change has a significant impact on how ethnic minority communities engaging in tourism activities in Sapa perceive climate change. The higher their knowledge, the stronger their perceptions of climate change. Overall, these communities have a basic understanding of the environment and climate change, but it is not yet specialized in the context of tourism. Therefore, enhancing their knowledge of climate change will lead to an improved perceptions. Trawöger (2014), Shi et al (2016), Mahmoodi Momtaz et al. (2020), (Nguyễn et al., 2023)

Communication activities have the second-biggest impact on the perceptions of climate change among ethnic minorities engaging in tourism activities in Sapa. In the past few years, social staff and experts have used communication activities to raise the perceptions of ethnic minority communities about climate change. Communication activities include direct talks, and mass media like newspapers, radio, and the internet. In addition, social staff and experts can create leaflets and pocket documents with mainly visual images to distribute to ethnic minorities. It's important to note that

communication activities should respect the ethnic minority communities's culture and use ethnic languages. These findings align with the research results of Nguyễn et al (2023).

The third most impactful factor in raising the perceptions of climate change among ethnic minority communities engaging in tourism activities in Sapa is educational activities. Social staff are involved in organizing training sessions to increase perceptions about climate change and its effects on ethnic minority communities. They also provide guidance on how ethnic minority communities respond and adapt to natural disasters and how to prevent and mitigate the impact of climate change. Experts organized guidance sessions for people to review and build sustainable livelihood plans and healthcare plans to foster a better understanding of climate change and the necessity of sustainable tourism development. Anh et al (2023) also reached a similar conclusion in their study

The belief in climate change has a marginal impact on the perceptions of climate change among ethnic minority communities engaged in tourism activities in Sapa. This finding strongly supports the conclusion about the influence of the belief on a perceptions of climate change, as discussed in the studies by authors Arbuckle et al (2015), Le Dang et al (2014), Mahmoodi Momtaz et al (2020). Sapa has long been experiencing extreme weather phenomena such as storms and excessive rain, leading to erosion, flash floods, and damage to rice and crops. Many landslides pose serious threats, disrupting traffic. Therefore, ethnic minority communities in Sapa believe that the climate is changing. This belief only has a negligible impact on their perceptions of climate change.

Theoretical implications

The study examines four hypotheses demonstrating that certain factors positively impact the perceptions of climate change among ethnic minority communities attending tourism activities in Sapa. This research adds new insights to previous studies that only focus on how tourists in Vietnam perceive climate change. The results highlight the influence of knowledge and belief in climate change, communication activities, and educational activities on raising perceptions about climate change. This study fills a gap in tourism research by addressing the impact of these factors on ethnic minority communities attending tourism activities in Sapa

Managerial implications

Sapa in Vietnam continues to attract a large number of tourists, both domestic and foreign. In addition to the natural beauty, the vibrant cultural heritage of the ethnic minorities, passed down through generations, has been a unique attraction for Sapa tourism for 120 years.

With the purpose of developing sustainable tourism in Sapa, local authorities need to create policies that raise perceptions among ethnic minority communities attending tourism activities. These communities are not only the subjects and beneficiaries of these efforts but also play a key role in preserving the environment and landscape, which are essential for current and future generations. Policies should focus on improving the knowledge of ethnic minority communities, promoting communication activities, and providing educational initiatives on climate change.

Limitations and Research in the future

While the study has successfully achieved its goals, it's important to acknowledge the existing limitations. The study's sample size is restricted in terms of the diversity of tourism subjects, as it solely focused on surveying ethnic minority communities in Sapa. This limitation hinders our ability to draw comprehensive insights about the entire country. Consequently, it is imperative for future studies to broaden the research sample to encompass other regions of Vietnam, ensuring a more comprehensive and representative understanding of the nation's tourism landscape.

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