African Journal of Hospitality, Tourism and Leisure 2025, Vol. 14 No. 5 pp. 1041-1050
ISSN: 2223-814X

Tourists' Perceptions of Weather Sensitivity, Climate Action and Tourism Resilience in Rwanda

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Abstract

The important role that tourism plays in the economic development of Sub-Saharan African countries, such as Rwanda, is under threat from frequent inclement weather events and climate change. While research interest in the impacts of climate change on the economic contribution of tourism continues to grow, few studies have examined the relationship between weather-related phenomena and tourism from the perspective of tourists. This study explores the relationship between tourists' weather sensitivity, climate action and tourism resilience. A quantitative research approach was adopted using a questionnaire to collect data from 501 tourists in Kigali, the capital city of Rwanda. The study finds that factors such as age, choice of tourism services and length of stay have an influence on weather sensitivity. Weather sensitivity was also found to positively correlate with climate action. Practical and policy implications from the study that could improve tourism resilience are proposed to tourism sector operators and tourism policy makers, notably the development of tourism products that appeal to the youth market niche and policies that promote climate action.

Keywords: tourists; tourism services; weather sensitivity; climate action; Rwanda.

How to cite this article: Acha-Anyi, P.N. (2025). Tourists' Perceptions of Weather Sensitivity, Climate Action and Tourism Resilience in Rwanda. African Journal of Hospitality, Tourism and Leisure, 14(5):1041-1050. DOI: https://doi.org/10.46222/ajhtl.19770720.692

Introduction

The significant role that tourism plays in the economic development of African countries has been widely acknowledged (Chu et al., 2024; Saayman et al., 2012; World Bank, 2023). Feuerbacher & Flaig (2025) affirm that Africa is second only to Oceania in terms of economic dependence on tourism. On its part, the World Travel and Tourism Council (WTTC) at its global summit in Kigali (Rwanda) asserted that the travel and tourism sector has the potential to boost the continent's economy by US$168BN (6.5%) and create over 18 million new jobs over the next years (WTTC, 2023). Alongside these macro-economic benefits, Ahmad et al. (2019) posit that tourism growth increases the volume and value of international trade. Moreover, previous studies have shown that tourism growth positively correlates with investment (Rasool et al., 2021), creates employment and reduces poverty (Dossou et al., 2025). However, the potential for tourism to accrue the anticipated economic benefits has increasingly come under threat from diverse sources such as health crises like the COVID-19 pandemic and the Ebola epidemic in West Africa, political tensions such as the Rwanda genocide and Anglophone crisis in Cameroon and climate-induced crises like Hurricanes, flooding and drought (Chisadza et al., 2022; Khalid et al., 2020; Nhamo et al., 2020; Manrique-de-Lara-Penate ˜et al., 2022). Han & Yang (2025) argue that weather and climate are peculiar among the exogenous shocks to tourism because of the ambiguity in their relationship with tourism destinations. Despite their unpredictable and disruptive tendencies, weather and climate have been identified as major drivers of travel (Chang et al., 2024) and cited by tourists among the motivations for destination choice (Becken & Wilson, 2013; Jeuring, 2017). The polarised nature of the relationship between weather, climate and tourism has been the subject of recent studies such as Dossou et al. (2025) who explored the relationship between tourism development, governance and carbon dioxide (CO2) emissions, Nathaniel et al. (2021) who examined how weather and climate affect tourism performance and Milbourn et al. (2025) who looked at the impacts of weather and climate change on local tourism businesses. A strand of literature has highlighted the economic benefits that destinations with attractive weather conditions have gleaned from tourism development. For instance, Wang & Tziamalis (2023) point to the fact that tourism development has led to the acceleration of human capital development, while Nguyen et al. (2020) allude to the positive effects of tourism on income distribution in Lower and upper-middle-income economies. The positive correlations between tourism and job creation have also been investigated by Garcia & Porto (2021). Another stream of literature has delved into the negative influence of weather and climate on tourism, especially on the demand and supply aspects. Dawson & Scott (2007) highlight the cost implications of inclement weather, with particular reference to ski locations. On his part, Clayton (2009) assesses the impacts of erratic weather and climate change on tourism in the Caribbean destinations.

Given the existential threat posed by weather and climate shocks on tourism, the Organisation for Economic Co-operation and Development (OECD) highlights the imperative to develop a more resilient tourism industry by giving greater attention to sustainability, safety and crisis management (OECD, 2025). The World Economic Forum (WEF) further underscores the need for ongoing studies to ascertain the resilience of the tourism sector against low-probability but high-impact events such as the COVID-19 pandemic, terrorism and natural disasters (WEF, 2024). There is significant paucity in extant research on the relationship between weather, climate and tourism, notably the need for destination-specific studies. With frequent weather-induced changes such as floods and drought impacting various destinations on the African continent, there is a need for country-based studies. Moreover, as Chang et al. (2024) point out, there is a research gap on the role of

tourism stakeholders in improving the resilience of the tourism sector against weather and climate-induced threats. The current study makes a contribution towards closing the research gaps by exploring the relationship between weather sensitivity and climate action among visitors to Rwanda and how this impacts tourism resilience. This study is guided by the following research questions: How weather-sensitive are tourists to attractions in Rwanda? How responsive are visitors to Rwanda to climate action? What do visitors' weather sensitivity and climate action say about tourism resilience in Rwanda?

Literature review

The Rwanda tourism context

Tourism contributed Fr1.9TN (US$1.3BN) (9.8%) to Rwanda's Gross Domestic Product (GDP) and 386,000 jobs, with international visitor spend reaching Fr. 1TN (US$694 BN), representing an increase from the previous year (WTTC, 2025). While these figures represent an unprecedented contribution of tourism to the country's economy, recent forecasts indicate further record-breaking figures of Fr2.1TN (10.3%) of national GDP, 402,000 jobs (8%) of total employment, Fr1.2TN of international tourists' spend and Fr822BN of domestic tourists' spend respectively in 2026 (WTTC, 2025). These figures underscore the importance of Tourism to the economy of Rwanda. Besides economic development, tourism plays an important role in wildlife conservation in Rwanda (Meyer et al., 2021). Fleischer & Tchetchik (2005) assert that, along with many other countries in Sub-Saharan Africa, Rwanda has earmarked tourism as one of the strategic goals through which it would achieve the sustainable development goals by eradicating poverty, ending hunger and ensuring environmental sustainability. In the view of Scheyvens & Hughes (2019), Rwanda has been relatively successful in maintaining harmony between rural communities and wildlife conservationists by creating employment opportunities for local people. This track record has motivated the World Economic Forum (WEF) to describe the Rwandan Mountain Gorilla programme as a model tourism concept where high-value, low-impact tourism provides economic benefits to local people and funding for conservation (WEF, 2024). The result has seen an explosion in the gorilla population and economic development for the country. According to the Rwanda Development Board (RDB, 2024), the tourism sector achieved resilient growth in 2024, with Gorilla tourism as the main attraction, with revenue of USD200 million (an increase of 27% year on year), followed by education (16%) and visiting friends and family (5%). Most visitors to Rwanda in 2024 originated from the East African Community (1.3 million), followed by Africa (91,475), Europe (83,075) and North America (52,805) (RDB, 2024). It is against this tourism background that the current study examines the influence of weather sensitivity and climate action among visitors on tourism resilience in Rwanda.

Relating weather, climate and tourism

Tourism is a highly weather-sensitive economic sector, as most outdoor and nature-based tourism activities rely on favourable weather conditions. Scott et al. (2019) submit that limited research has been undertaken to determine the extent to which climate change and weather-related hazards restrict growth in the tourism sector and its potential to contribute to the Sustainable Development Goals (SDGs), especially in the Sub-Saharan African region. Several factors explain the vulnerability of tourism to weather-induced events such as personal security concerns, increased costs of service delivery, the state of the environment and personal comfort (Burke, Davis, & Diffenbaugh, 2018; Becken, 2019; Hall, 2019). However, as the effects of climate change become more apparent in erratic weather conditions, there is increasing urgency for studies that would lead to a better understanding of the nature of the relationship between weather, climate and tourism (Mora et al., 2018) and, importantly, propose solutions to the conundrum between the three variables (Day et al., 2012). Global warming, which is one of the major manifestations of climate change, is destroying the natural habitat of some species, drying up water and food sources and diminishing the quality of the tourism experience (Chang et al., 2024). As Becken & Wilson (2013) postulate, weather and climate affect visitors' experiences and emotions and thus shape their perceptions of destinations and regions. In their study on the use of weather information and forecasts among tourism businesses, Ayscue et al. (2015) argue that behavioural adaptation to weather conditions, which can be evident in actions such as the selection of clothing and adjustment of travel schedules, affects the choice of the destination in future.

Craig & Feng (2018) add that weather-related challenges such as floods, drought, hurricanes and storms increase the cost of doing business, especially for small and medium-sized tourism businesses. Persistent climatic and weather trends tend to aggravate the vulnerability and viability of tourism businesses, particularly in the Sub-Saharan African region, where inclement weather conditions have intensified (Monahan et al., 2016; Yu, Schwartz, & Walsh, 2009). However, Weir (2017) contends that within the tourism industry, the impacts of extreme weather events and climate change are often misunderstood, hence the need for more research to strengthen mitigation and adaptation strategies. Similarly, it has been suggested that understanding the full impacts of weather events requires delving into contexts of the occurrence, such as seasonality, timing of the event, persistence and severity of the event (Monahan et al., 2016). Rwanda and other countries in the East African Community (EAC) have experienced frequent and severe weather events, which have left many tourism-dependent communities reeling from diverse impacts. Though the impacts of adverse weather events and climate change vary among communities, studies suggest that vulnerable groups such as the poor, women and people with disabilities are disproportionately affected (Basu, 2009). Despite the inconveniences that changing weather and climatic conditions have on tourism demand and the supply environment, Chang et al. (2024) acknowledge that the two variables are major drivers of travel demand. Recent studies have revealed that a significant number of tourists attest to weather and climate as their motivation for holiday destination choice (Loehr & Becken, 2021; Milbourn et al., 2025; Scott & Gossling, 2022). Literature on tourism destination marketing confirms that weather and climate feature prominently in the promotional material of many destinations (Schwirplies & Ziegler, 2017). Ma et al. (2020) assert that weather and climate do not always trigger negative emotions, particularly because

some amount of warm weather is appreciated in cold destinations, while a change to cold weather attracts visitors to hot environments.

Tourism and climate action

The first global tourism and climate change report assessing the extent to which the tourism sector was making progress on Climate Action (CA) was delivered by the Tourism Panel on Climate Change (TPCC) in 2023 (TPCC, 2023). In its conclusion, the stocktake report revealed that none of the tourism stakeholders, "no country, no destination, and no sub-sector" (TPCC, 2023, P.2), including business practices, and visitor Behaviour. Among the critical questions that the stocktake report raises is the central question of how the tourism sector addresses these gaps in its climate responsibility going forward. Admittedly, literature on climate justice is gaining traction on the development of climate resilience (Becken & Rastegar, 2025), but critics argue that the top-down approach being propagated is fragmented and inefficient (Grove et al., 2020; Rastegar & Ruhanen, 2023). Climate resilience development (CRD) is defined by the Intergovernmental Panel on Climate Change (IPCC) as 'a process of implementing greenhouse gas mitigation (GHG) and adaptation options to support sustainable development for all'(IPCC, 2023, p.4). Here, the approach is more practical and implementable than theoretical, hence climate action blends with sustainable development. This study adopts the practical approach propagated by the IPCC (2023) in considering tourism resilience from the tourists' perspective as the willingness to minimise exposure and vulnerability to climate hazards by reducing contributions to greenhouse gas (GHG) emissions through the use of energy, water, food and transportation. Hence, tourism resilience aggregates individual decisions and actions to arrive at risk reduction, emissions reduction and ultimately sustainable development.

Tourism resilience

Literature acknowledges the lack of unanimity in the definition of the concept of resilience (Cutter et al., 2008; Meerow & Newell, 2019) despite the fact that the concept has been widely used in disciplines such as ecological systems, economy and the environment (Cochrane, 2010). Lee & Pennington-Gray (2025) argue that the absence of consensus on the definition of resilience is hardly surprising for three reasons: firstly, because the resilience concept is an abstraction, it is difficult to measure. Secondly, the subject and context of resilience often differ in context. Thirdly, resilience presupposes a baseline from which to start the measurement and indicators with which to apply the measurement. Hence, various contextual applications may require different indicators. On their part, Graveline & Germain (2022) observe that across disciplines the concept of resilience has been used to imply three capabilities: to absorb, recover from and adapt when challenges and changes emerge. Absorption is understood to mean the ability to resist shocks and disruptive forces. In a more direct and simplistic approach, Walker (2020) defines resilience as the ability to change in order not to be changed. In the context of ecological systems, Holling (1973) argues that resistance to change can undermine resilience; hence, flexibility is emphasised to the extent that it does not compromise functionality. Recovery from a crisis has also been put forth as an important trait of resilience. Explained in engineering literature, Alexander (2013) equates the ability to bounce back after a crisis or disturbance with resilience. However, psychological resilience literature considers recovery and resilience as distinct concepts in the sense that individuals with stable mental health exhibit minimal or no dysfunctionality, hence demonstrating resilience, in contrast to recovery, which refers to restoration after psychotherapy (Fletcher & Sarkar, 2013). Gunderson & Holling (2002) posit that assessing resilience is highly subjective depending on the level of analysis. Lee & Pennington-Gray (2025) observe that even though academic interest in tourism resilience is on the rise, there is still a significant gap to be filled. Most studies on tourism resilience have focused on destinations (Hall et al., 2022), while others have dwelt on economies and community resilience (Dai et al., 2019; Guo et al., 2018; Okafor et al., 2022). A strand of literature has examined how tourism contributes to resilience (Watson & Deller, 2022; Yang et al., 2021), while hospitality studies have largely focused on the resilience of individual businesses and organisations (Brown et al., 2017; Ritchie & Jiang, 2019). It is evident from literature that few studies have examined the role of stakeholders, specifically tourists in tourism resilience. The present study contributes towards filling this gap by exploring how visitors' sensitivity to weather and actions towards climate change enhance tourism resilience.

Materials and methods

This study employed a quantitative research approach in collecting data from visitors to key attractions in Kigali, the capital city of Rwanda. The city of Kigali was chosen as the central site for data collection because it is the major entry point for international tourists to the country. According to TripAdvisor (2025), the major tourist attractions in Kigali include the Kigali Genocide Memorial, Niyo art gallery, Kigali cultural village, Kimironko Market, and Kigali Convention Centre, among others; hence, these tourist hubs constituted the data collection points. The study instrument was a questionnaire constructed in four parts, with section A requesting demographic information from the respondents, section B asking for descriptive information on travel choices among the respondents, section C focusing on weather sensitivities and the last section collecting information on climate action among the respondents. The questionnaire development followed an extensive review of literature on weather sensitivity, climate action and tourism resilience, and in particular, previous studies by Becken and Wilson (2013), Chang et al. (2025), Craig & Feng (2018), Day et al., (2012), Loehr & Becken, (2021), Milbourn et al., (2025), Scott & Gossling, (2022). Strict protocols on research ethics were observed during the data collection exercise in line with the ethical clearance certificate obtained prior to engaging in the study. In this regard, visitors to the selected study sites were randomly approached and asked if they would be willing to take part in the study. Those who accepted to participate, who explained their rights to anonymity and freedom to withdraw from the study without hesitation. With the ethical considerations duly observed, respondents were

then handed the questionnaire that had been prepared in English. Prior to the fieldwork, the twelve fieldworkers had been trained in Kigali from the 12th to the 28th of April 2023. The training was on understanding the questionnaire and the respect of ethical research norms and protocols. Data collection for the study lasted from the 1st of May 2023 to the 30th of June 2023. Of the 700 questionnaires distributed, 553 were completed and returned, translating to a response rate of 79%. However, further scrutiny of the returned questionnaires revealed that 52 either had multiple responses in some questions or were not fully completed, so the 36 were discarded. This resulted in a final response rate of 71.5%.

Results

Descriptive statistics

Respondents' demographic profiles and travel choices are presented in Table 1 below and elaborated thereafter.

Tables 1: Demographic characteristics of respondents

Variable	Description	Frequency	Percentage
Gender	Male	261	52.1
	Female	228	45.5
	Other	12	2.4
Origin of tourists	Domestic	24	4.8
	International	477	95.2
Age	18 – 24	125	25.0
	25 – 34	199	39.7
	35 – 44	100	20.0
	45 – 54	58	11.6
	55 – 64	14	2.8
	65+	5	1
Employment status	Unemployed	121	24.2
	Pensioner	19	3.8
	Self-employed	130	25.9
	Private sector employee	173	34.5
	Public servant	58	11.6
Education level	No formal qualification	4	.8
	Primary school certificate	1	.2
	High school certificate	77	15.4
	Diploma	131	26.1
	First degree	223	44.5
	Postgraduate degree	65	13
Transport choices	Car	183	36.5
	Bus	251	50.1
	Train	2	.4
	Other	61	12.2
Accommodation choices	Family	68	13.6
	Friends	125	25.0
	Hotels	247	49.3
	Other	61	12.2
Party choices	Single traveller	200	39.9
	Party of 2	88	17.6
	Party of 3	75	15
	Part of 4	66	13.2
	Party of 5	31	6.2
	5+	41	8.2
Number of nights staying	1	42	8.4
	2	82	16.4
	3	79	15.8
	4+	289	59.5
Group dynamics	Lone traveller	157	31.3
	Family	60	12.0
	Friends	184	36.7
	Social group	59	11.8
	Professional group	41	8.2
	TOTAL	**501**	**100**

Information in Table 1 reveals that most of the respondents are males (52.1%), with the females following closely at 45.5%. However, the percentage of international tourists (95.2%) far outweighs that of local visitors (4.8%). It is interesting to observe that most of the respondents (39.7%) are youth in the 25-34 years age group, followed by those in the 18-24 years (25%) age group, employed in the private sector (34.5%) and self-employed (25.9%). Equally notable is the high percentage of respondents educated with first degrees (44.5%) and Diplomas (26.1%). These descriptive analysis highlights key defining characteristics of the respondents who participated in the study.

Analysis of variance (ANOVA)

The next section uses Analysis of Variance (ANOVA) to explore the data for statistically significant differences between selected demographic groups on weather sensitivity. In this study, the analysis examines the statistical relationships between the groups based on gender, age groups and travel choices (transport, accommodation and length of stay) with regard to weather sensitivity.

ANOVA on weather sensitivity based on gender

The purpose of the analysis of variance in this case was to find out if there are statistically significant differences among the three gender groups that the respondents identified with regarding weather sensitivity. The findings are captured in Table 2 below.

Table 2: ANOVA on weather sensitivity based on the gender of respondents

Weather sensitivity description	Gender							
	Male N1=261		Female N2=228		Other N3=12			
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	p-value	t
Rain or precipitation	3.39	1.1	3.31	1.1	3.75	1.0	.34	.004
Sunshine	3.30	1.1	3.29	1.0	3.67	1.2	.50	.003
Wind	3.20	1.0	3.14	.8	3.67	1.3	.18	.007
Floods or chances of flooding	3.89	1.2	3.89	1.0	4.17	.9	.70	.001
Cold conditions	3.19	1.0	3.21	.9	3.50	1.4	.56	.002
Wetness	3.13	1.0	3.11	.9	3.58	1.0	.25	.005
Heatwave or chances of heatwaves	3.98	.8	4.00	.8	4.42	.6	.23	.006
Heavy rains	3.71	1.0	3.74	1.0	4.18	.9	.33	.004
Storms or strong winds	3.97	1.0	4.00	1.0	4.33	.9	.48	.003
Average weather sensitivity	3.52		3.52		3.91		0.39	0.003

Statistical significance = 0.05

Evidence from the ANOVA results presented in Table 2 reveals that there are no statistically significant differences among the respondents based on gender, considering that all p-values are above 0.05 (Pallant, 2013, p. 262). This means that any differences observed between the groups could have been merely coincidental.

ANOVA on weather sensitivity based on age groups

In preparation for this ANOVA, the respondents were placed into groups according to their indicated age groups as follows: N1 – 18-25 years, N2 - 26-35 years, N3 – 36-45 years, N4 – 46-55 years, N5 – 56-65 years, and 65+ years. Results of the ANOVA on weather sensitivity between age groups are presented in Table 2 below.

Table 3: ANOVA on weather sensitivity based on the age groups of visitors

Weather sensitivity description	Age groups (in years)													
	(18-25) N1=125		(26-35) N2=199		(36-45) N3=100		(46-55) N4=58		(56-65) N5=14		65+ N6=5			
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	p	t
Rain or precipitation	3.48	1.0	3.31	1.0	3.30	1.18	3.41	1.2	3.14	1.5	3.60	1.9	.69	.006
Sunshine	3.33	1.0	3.44	1.0	3.08	1.1	3.09	1.2	3.36	1.0	4.40	.89	.01	.030
Wind	3.16	.98	3.18	.96	3.12	.97	3.31	1.0	3.14	.77	3.80	1.6	.62	.007
Floods or chances of flooding	3.85	1.0	3.96	1.0	3.85	1.2	3.95	1.2	3.79	1.2	3.20	1.6	.65	.007
Cold conditions	3.23	.89	3.30	.97	3.00	1.0	3.14	1.0	3.36	.92	3.20	1.4	.21	.014
Wetness	3.07	1.0	3.14	.96	3.09	.91	3.26	.96	3.21	.57	3.60	1.1	.71	.006
Heatwave or chances of heatwaves	3.86	.88	4.08	.83	3.98	.83	4.02	.88	4.07	.82	4.40	.89	.30	.012
Heavy rains	3.76	.96	3.87	.97	3.57	.97	3.62	1.1	3.43	1.2	3.2	1.6	.08	.019
Storms or strong winds	4.01	1.0	4.01	.91	4.02	.91	3.90	1.3	3.93	1.2	3.40	1.1	.80	.005
Average weather sensitivity	**3.52**		**3.58**		**3.44**		**3.52**		**3.49**		**3.32**		**0.45**	**0.011**

Statistical significance = 0.05

Even though overall, the data does not indicate statistically significant differences across age groups as the p-value of 0.45 is above the threshold of 0.05 (Pallant, 2013), it can be observed that the older respondents (N6 – 65+ years) recorded consistently higher sensitivity scores and have a statistically significant score (p=0.01) on their sensitivity to sunshine conditions, albeit with minimal effects of (t=0.03) (Cohen, 1988, pp. 284–7). The three analyses of variance below examine the data for statistically significant differences across weather sensitivity based on travel choices made by the respondents. The analysis scrutinises choices made with regard to transport, accommodation and length of stay.

ANOVA on weather sensitivity and choice of transport

In performing this ANOVA, the modes of transportation used by the respondents to arrive at the attraction were coded as N1- by car, N2- bus, N3 – train, and N4 – other. The purpose of the analysis was to examine if there are statistically significant differences in the respondents' perceptions of weather sensitivity based on their choice of transportation. The findings are presented in Table 4 below.

Table 4. ANOVA on weather sensitivity based on transport choices

Weather sensitivity description	Transport choices									
	Car N1=183		Bus N2=251		Train N3=3		Other N4=65			
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std dev.	p	t
Rain or precipitation	3.54	1.0	3.15	1.1	3.50	.70	3.66	1.0	<.001	.037
Sunshine	3.40	1.1	3.29	.97	4.00	.00	3.09	1.2	.189	.010
Wind	3.25	.98	3.10	.93	4.00	1.4	3.28	1.0	.194	.009
Floods or chances of flooding	4.32	.89	3.54	.1.1	3.00	1.4	4.12	1.1	<.001	.110
Cold conditions	3.32	1.0	3.13	.87	4.00	1.4	3.17	1.0	.148	.110
Wetness	3.30	.91	3.04	.97	3.50	.70	3.02	1.0	.025	.019
Heatwave or chances of heatwaves	4.35	.73	3.73	.85	4.00	1.4	4.08	.88	<.001	.110
Heavy rains	4.01	.92	3.56	1.0	3.00	1.4	3.69	1.1	<.001	.043
Storms or strong winds	4.28	.80	3.69	1.1	2.50	.70	4.38	.89	<.001	.098
Average weather sensitivity	3.77		3.35		3.5		3.61		0,062	0.06

Statistical significance = < 0.05

Results of the ANOVA in Table 4 indicate that even though overall, there is no statistically significant difference between groups based on the mode of transport used, as the score of 0.062 is above the 0.05 threshold, there are however noticeable statistically significant differences on specific weather sensitivity items such as sensitivity to rain (<.001), floods, (<.001), wet weather (0.025), heatwaves (<.001), heavy rains (<.001) and storms (<.001). Post hoc comparisons indicated that car and "other" users consistently reported higher sensitivity to adverse weather conditions compared with bus users, whereas train users showed lower sensitivity. Nonetheless, results of the group using trains should be treated with caution, given the small sample size (n=3). A zoom in on all the findings suggests that mode of transport plays a significant role in shaping sensitivity to certain extreme weather conditions, particularly precipitation-related factors, but not to general conditions such as sunshine, wind, or cold. To further gain perspective on the relationship between travel choices and weather sensitivity among the respondents, an ANOVA was conducted to examine differences in weather sensitivity across accommodation choices. The findings are reported in Table 5 below.

Table 5. ANOVA on weather sensitivity and choice of accommodation

Weather sensitivity description	Accommodation choices									
	Family N1=68		Friends N2=125		Hotels N3=247		Other N4=61			
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std dev.	p-value	t
Rain or precipitation	3.38	.93	3.45	1.0	3.26	1.2	3.57	1.1	.161	.010
Sunshine	3.32	.74	3.26	1.0	3.30	1.1	3.43	1.1	.788	.002
Wind	3.24	.88	3.08	.97	3.24	.98	3.10	1.0	.418	.006
Floods or chances of flooding	3.66	.95	3.86	1.1	3.87	1.1	4.36	.70	.003	.027
Cold conditions	3.26	.90	3.05	.94	3.23	.99	3.35	1.0	.171	.010
Wetness	3.07	.99	2.98	.97	3.23	.94	3.10	.99	.120	.012
Heatwave or chances of heatwaves	3.71	.99	3.82	.97	4.11	.78	4.28	.58	<.001	.046
Heavy rains	3.74	.90	3.59	1.0	3.70	1.0	4.18	.82	.003	.028
Storms or strong winds	3.74	.89	3.95	1.0	3.97	1.1	4.43	.74	.002	.030
Average weather sensitivity	3.45		3.44		3.54		3.75		0.18	0.019

As noted with the findings on transport options, the findings of the ANOVA on weather sensitivity and accommodation choices revealed statistically significant group differences for floods (p=.003), heatwave (p=.001), heavy rains (p=.003) and storms (p=.002). However, the overall score (p=0.18) and other weather conditions did not indicate statistical significance with accommodation groups. An overall view of the findings suggests significant differences between the groups. The final analysis of variance examined the differences in weather sensitivity across the length of stay, with the groups ranging from one night (N1), 2 nights (N2), 3 nights (N3) and more than 4 nights (N4). The results are presented in Table 6 below.

Table 6. ANOVA on weather sensitivity and length of stay (No. of nights)

Weather sensitivity description	Nights staying									
	1 night N1=42		2 nights N2=82		3 nights N3=79		4+ N4=289			
	Mean	Std Dev.	Mean	Std Dev.	Mean	Std Dev.	Mean	Std dev.	p-value	t
Rain or precipitation	3.24	.85	3.40	1.0	3.37	1.0	3.36	1.1	.893	.001
Sunshine	3.45	.86	3.71	.76	3.66	.93	3.08	1.1	<.001	.067
Wind	3.00	.93	3.21	1.0	3.30	.83	3.17	.98	.425	.006
Floods or chances of flooding	4.07	.46	4.28	.65	3.94	1.0	3.76	1.2	.002	.030
Cold conditions	3.40	.88	3.58	.82	3.43	.90	3.02	1.0	<.001	.058
Wetness	3.05	.93	3.30	.10	3.08	.95	3.11	.94	.341	.007
Heatwave or chances of heatwaves	3.98	.51	4.32	.62	4.01	.87	3.92	.94	.003	.028
Heavy rains	4.10	.57	4.25	.66	3.84	1.0	3.52	1.1	<.001	.079
Storms or strong winds	3.95	.85	4.24	.69	3.97	.84	3.93	1.1	.107	.012
Average weather sensitivity	3.58		3.81		3.62		3.43		0.19	0.032

Statistical significance = 0.05

Though statistical significance is not evident in the values seen across a number of weather conditions such as rainy conditions (p=.893), windy conditions (p=.425), wetness (.341) and stormy conditions (.107), there is, however indication of statistically significant differences across other items: sunshine (<.001), floods (.002) cold conditions (<.001), heatwave (.003), and heavy rains (<.001). These differences are significant and attest to the fact that the length of stay has an influence on perceptions of weather sensitivity among the respondents.

Pearson correlation analysis

It was deemed necessary to explore the data further in order to ascertain the nature of the relationship between weather sensitivity and climate action. Pearson correlation was considered the appropriate application to conduct the analysis. This necessitated that the data be submitted to a reliability test to ascertain its suitability. The results of the data on weather sensitivity produced a Cronbach's Alpha coefficient score of .74, while the Cronbach's Alpha coefficient score for climate action was .70, thus confirming the reliability of the data sets (Field, 2013) for a Pearson's correlation test. The essence of the Pearson correlation analysis was to put a spotlight on the association between weather sensitivity and climate action. The results are shown in Table 7 below.

Table 7. Pearson's correlation coefficient score between weather sensitivity and Climate Action

correlation			
		Weather sensitivity score	Climate Action score
Weather sensitivity score	Pearson correlation	1	,209**
	Sig. (2-tailed)		<,001
	N	501	501
Climate Action score	Pearson correlation	,209**	1
	Sig. (2-tailed)	<,001	
	N	501	501

**. Correlation is significant at the 0.01 level (2-tailed).

Correlation between Weather Sensitivity and Climate Action (N = 501)

Variable	1	2
1. Weather sensitivity	—	.21**
2. Climate action		—

Note. Values are Pearson correlation coefficients.
p < .001. ** indicates correlation is significant at the .01 level (2-tailed).

Results of the Pearson product-moment correlation presented in Table 7 indicate a small but statistically significant positive correlation between weather sensitivity and climate action, r(499) = .21, p < .001. This finding suggests that individuals with higher levels of weather sensitivity were more likely to report greater engagement in climate action behaviours.

Discussion

The purpose of this study was to explore the relationship between weather sensitivity, climate action and tourism resilience as perceived by tourists in Rwanda. Tourism features prominently as an instrument of socio-economic development in many developing countries, including Rwanda. Even though weather and climate are major pull factors for tourists, recent extreme weather events have necessitated research to find out how tourists perceive such weather events and take climate action, on the one hand, and explore the implications of this for tourism resilience, on the other. The following observations arise from the findings of this study. From a demographic perspective, there is diversity among tourists in Rwanda who participated in this study. There is near parity between male and female participants, and a small group who identify as "other". The large youth base among the respondents suggests a promising future for the country's tourism sector if that demand segment is sustained. This finding resonates with the Rwandan policy drive to pursue inclusive and diversified tourism practices (Rwanda Development Board, 2024; Turizihiwe et al., 2025). The fact that more than fifty per cent of the respondents arrived by bus, are staying for four nights, and close to fifty per cent are using hotel accommodation, suggests the practice of responsible tourism among the visitors who participated in the study. Arriving on buses instead of using individual cars reduces the impact of their travel on the environment (Wan et al., 2025). It is also supported by Makuyana & Du Plessis (2025) that staying for four nights or more in hotels increases the value of tourists' spending and the tourism impact on the local economy. This study also asserts that perceptions of weather sensitivity are gender neutral, as evidenced by the statistically nonsignificant results of the analysis of variance on gender. Gender, therefore, seems to have no influence on perceptions of weather sensitivity. However, findings of the current study differ from previous studies (Dossou et al., 2025; Ranucci et al., 2024), which found that women are disproportionately affected by adverse weather.

There is evidence in this study to suggest that age is a factor in weather sensitivity, albeit without attaining statistical significance. Older individuals reported higher sensitivity scores compared to younger persons. In their studies on age and extreme weather events and weather-driven transportation earthwork, respectively, Dehghani et al. (2023) and Briggs et al. (2023) found age to be an influencing factor. Transportation is central to tourism as people move from their places of permanent residence to attractions in other destinations. This study revealed that when grouped according to the mode of transportation used, statistically significant differences emerged with regard to weather sensitivity among the respondents. These differences could be noticed across weather conditions flooding, wet conditions, heatwaves, heavy rains and storms. A study by Christensen et al. (2024) agrees with this finding but equally argues that the mode of transportation is less influential on weather sensitivity when it is air-conditioned. Similarly, the type of accommodation selected during the visit revealed statistically significant differences with weather sensitivity on weather conditions associated with floods, heatwaves, heavy rains and storms. However, Gössling & Lund-Durlacher (2021) argue that the quality of accommodation and management efficiency can reduce the vulnerability of accommodation to weather impacts and reduce the sensitivity of tourists to climate impacts. The study also found statistically significant differences among respondents between the length of stay and weather sensitivity. It was observed that the length of stay influenced perceptions of weather sensitivity on weather conditions such as sunshine, floods, cold conditions, heatwaves and heavy rains. Respondents who stayed longer (4+ nights) demonstrated less weather sensitivity than those who stayed for fewer nights. In their study on length of stay and international tourism in South-western Norway, Jacobsen et al. (2018) found that visitors stayed for short periods when they had concerns about the conditions at the destination. Adongo et al. (2017) also found that weather conditions had a significant influence on tourists' length of stay at a destination. Finally, a Pearson's correlation analysis to explore the relationship between weather sensitivity and climate action among the respondents revealed a positive correlation between the two variables. Hence, respondents who were more sensitive to weather conditions tended to report higher climate action scores.

Conclusions

Faced with frequent and severe weather and climate-induced shocks, the tourism sector is required to be resilient in order to survive. The following conclusions emanate from this study on how visitors' weather sensitivity and climate action relate to tourism resilience in the Rwandan context. Diversified demand is an important aspect of tourism resilience (Lee & Pennington-Gray, 2025). The visitor analysis presented in this study supports the conclusion that tourism in Rwanda can be described as relatively resilient based on the inclusivity of gender, age groups and other demographic considerations. Still, from a demand perspective, the resilience of the tourism sector is evident in the range of services demanded by the visitors, notably in the use of hotel accommodation, the length of stay, and the use of bus transportation. A long period of stay in hotels potentially means more income injection in the local economy, hence a significant contribution to tourism resilience. The analysis reveals a

predominantly youthful visitor profile for Rwandan tourism, which supports the assertion of resilience in the sector. There is potential for return visits if the visitors' interest is sustained. The positive covariation between weather sensitivity and climate action supports the conclusion that there is great potential for tourism resilience. The fact that respondents who rate weather sensitivity highly equally align with greater climate action indicates the potential for climate mitigation, which could boost tourism resilience.

A number of practical and policy implications derive from the findings of this study for tourism industry practitioners and stakeholders, and policymakers in the public sector. The following implications from the study could be instrumental in fostering the resilience of the tourism sector in Rwanda and communities with similar characteristics around the world. Firstly, for managers and tourism operators, the study provides empirical evidence to support the development of tourism products that could appeal to the youth tourism niche. This would strengthen the resilience of the tourism sector, as the large proportion of visitors in this age group suggests the need to harness and even grow the segment. The second implication that tourism operators could draw from this study relates to the potential gains in climate action that could accrue from investment in quality air-conditioned transportation. Evidence in this study indicates that most participants used bus transport, and literature by Lee & Pennington-Gray, (2025) indicates that air-conditioning could mitigate weather sensitivity among visitors. From a policy perspective, this study offers implications for the opportunity to foster tourism resilience through climate action by implementing environmentally friendly policies. This is evident in the positive correlation between weather sensitivity and climate action. In other words, weather sensitivity seems to be prompting visitors towards taking climate action.

This study has provided valuable insights into how tourists' perceptions of weather sensitivity and climate action affect tourism resilience. However, some limitations of the study are noteworthy. One of the limitations of the study is that data was collected only in the Rwandan capital city of Kigali. Therefore, generalisation of the findings to other parts of the country should be done with caution. In addition, the views analysed here are those of the 501 respondents who agreed to follow the ethical guidelines and completed the research instrument in full. Perceptions of other tourists in Kigali at the time of the study are not included. In addition, the use of a quantitative research tool in the form of a questionnaire required that participants restrict their responses to the options on the questionnaire. It is important to note that respondents did not have the opportunity to elaborate on their responses. Despite these limitations that necessitate caution in generalising the findings of the study, important insights on the relationship between weather sensitivity, climate action and tourism resilience have been explored and actionable implications presented. It is therefore recommended that future studies on this topic or study area expand the scope of data collection to other tourist hubs in Rwanda. This study further recommends that future research consider including a qualitative component so respondents could have the opportunity to explain their responses.

Acknowledgement
Support from the Walter Sisulu University Directorate of Research is acknowledged.

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