

THE IMPACTS OF CLIMATE VARIABILITY AND EXTREME WEATHER EVENTS ON THE ADAPTIVE CAPACITY AND RESILIENCE OF TOURISM BUSINESSES

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Abstract: Climate change and resultant climatic variability impose on the tourism sector particularly on tourism businesses are significant. Their ability to adapt to these changes and reduce vulnerability is inherently linked to their adaptive capacity and their potential to build long-term resilience. This study critically investigates the impacts of climate variability and extreme weather events on tourism businesses in Cameroon, with a specific focus on the environmentally vulnerable regions of Buea and Limbe. These areas are increasingly exposed to climate-induced challenges such as heavy rainfall, flooding, landslides, and unpredictable weather patterns, all of which threaten tourism operations and long-term sustainability. Framed by the theoretical constructs of adaptive capacity and resilience, the research adopts a qualitative methodology, drawing on insights from 33 in-depth, face-to-face interviews with tourism business owners, national park managers, government tourism officials, and representatives from non-governmental organisations (NGOs). Findings reveal that climate-related disruptions have significantly affected tourism infrastructure, reduced visitor flows, and created operational uncertainties. These impacts are further intensified by weak institutional frameworks, socio-political instability, and limited access to resources for adaptation. While some tourism enterprises have implemented basic coping strategies - such as modifying operations or diversifying offerings—these responses are largely reactive, short-term, and insufficient to build robust resilience. The study underscores the pressing need for integrated and proactive adaptation planning that involves all key stakeholders in the tourism and environmental sectors. It calls for strengthened policy support, investment in resilient infrastructure, improved disaster preparedness, and targeted training for tourism operators. By capturing the lived experiences of stakeholders in a climate-sensitive and under-researched context, this research contributes to both theoretical and practical understandings of tourism resilience in the Global South. The study concludes by proposing a set of context-specific adaptation and mitigation strategies to guide policy development and inform sustainable tourism planning. It offers valuable insights for decision-makers seeking to enhance the adaptive capacity of tourism enterprises and promote long-term resilience in the face of accelerating climate change.

Keywords: climate variability, tourism businesses, adaptive capacity, resilience, Cameroon

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INTRODUCTION

The impacts of climate change on the tourism sector have recently gained significant attention (Mokhtari & Hattab, 2025; Zhang et al., 2024; Ozor et al., 2021; Hambira & Mbaiwa, 2020), particularly concerning extreme weather events and their effects on tourism destinations and stakeholders (Belias et al., 2022). The accelerated pace of climate change and associated climate variability poses a considerable threat to developing tourism sectors, especially those already challenged by various regional circumstances (Harilal & Tichaawa, 2024a). In developing countries, tourism is often viewed as a favourable and strategic pathway to socio-economic development (Novelli, 2015; Christie et al., 2014). However, due to the sector's vulnerability to external shocks, it is crucial to ensure that all aspects of the tourism value chain are prepared to withstand such shocks to build resilience and ensure long-term survival.

Extreme weather events linked to climate change, such as heavy rainfall, floods, landslides, droughts, fires, and changes in seasonality, have become increasingly common (Dube et al., 2024). These occurrences have dire consequences for the core of tourism sectors, particularly those reliant on the natural environment. They not only affect mobility—a vital prerequisite for tourism - but also pose safety risks for tourists, locals, and other stakeholders dependent on the sector for their livelihoods (Belias et al., 2022). Furthermore, damage to the natural environment and tourism-related infrastructure presents additional challenges (Southon & Van der Merwe, 2018). Addressing these issues is often unfeasible in developing country contexts, characterised by scarce resources and competing socio-economic priorities. The long-term survival of tourism sectors amidst a series of global crises has sparked a debate on building adaptive capacity and resilience for sector sustainability (see Suryawan et al., 2025; Serdeczny et al., 2024; Antonsen et al., 2022; Hartman, 2018).

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There is a strong emphasis on regenerating tourism sectors, not only for continued growth but also to strengthen responses to crisis-induced changes with minimal future disruptions. However, achieving this requires in-depth knowledge of the challenges affecting the sector, necessitating current research into various countries and sectors (see Farid et al., 2016). In this paper, external shocks refer to the impacts of climate change, specifically extreme weather events and climate variability. The focus is on examining how these factors affect tourism businesses, particularly in terms of their adaptive capacity and resilience. Tourism businesses are particularly vulnerable to extreme weather events, facing the brunt of flooding, landslides, and other detrimental impacts (Harilal & Tichaawa, 2024b). This vulnerability poses risks not only to tourism businesses but also to residents who rely on tourism for their livelihoods (Atanga & Tichaawa, 2021).

Additionally, tourists may be deterred from visiting these areas due to safety concerns, leading to a decline in tourist arrivals (Ngin et al., 2020). Extreme weather events can render areas inaccessible, crippling businesses dependent on tourist traffic (Lapointe et al., 2016). Therefore, it is crucial to investigate the effects of climate variability and extreme weather events—stemming from climate change and global warming—particularly in developing tourism destinations, from the perspective of local tourism businesses in vulnerable regions. This understanding will inform adaptive measures that businesses can implement for immediate survival, continuity of operations, and long-term resilience (Serdeczny et al., 2024). The primary contribution of this paper relates to expanding the discourse on tourism development, focusing on integrating adaptive capacity into the sector to manage the effects of the climate crisis.

This is envisaged to guide the formulation of updated guidelines for the sector, considering the evolving needs of various stakeholders, including tourism business owners. Ultimately, this context-specific information may facilitate tourism development aimed at resilience and sustainable sector growth.

Theoretical grounding: Adaptive capacity and resilience of small businesses in the tourism sector

The dynamic nature of the tourism sector necessitates adaptability among stakeholders to survive various changes. The concept of adaptation, contextualised within the climate change discourse, refers to the process of adjusting to real or anticipated climate impacts, aiming to mitigate negative effects while leveraging any positive opportunities (IPCC, 2022). Adaptability, therefore, implies the extent to which reactive change can occur in response to changing climatic conditions, as well as how such change can be enacted (Hartman, 2016).

This concept aligns with the definition of adaptive capacity, which the IPCC (2022, p. 2899) describes as “the ability of systems, institutions, humans, and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences.” Parsons et al. (2018) further elaborate on adaptive capacity, highlighting critical questions that must be addressed to understand its context: adaptation to what, by whom, for what purpose, and how?

This paper uses these theoretical underpinnings to delve deeper into the impact of climate variability and extreme weather events on tourism businesses in Cameroon. By focusing on the key questions of adaptability to what and by whom (Parsons et al., 2018), the paper aims to formulate responses to the question of how. The importance of this examination is underscored by the need to continually develop the tourism sector in the country, given its strategic socio-economic significance. With many relying on this sector for their livelihoods amid various crises, it is essential to maintain its ability to support communities. This can only be achieved by ensuring that the sector is equipped to respond to various shocks, which necessitates financial resources (Serdeczny et al., 2024). Consequently, examining the adaptive capacity of sector participants is crucial to determine their ability to adapt and identify the support needed to enhance their adaptive capacity.

While this paper primarily focuses on the impacts of climate variability on tourism businesses and their adaptive strategies, it is essential to acknowledge the link to resilience. Resilience relates to maintaining a functioning system capable of withstanding shocks and recovering from disruptions, offering a longer-term perspective on the sustainable futures of tourism businesses (IPCC, 2022). In the context of a tourism destination, Hartman (2018) posits that these destinations are complex adaptive systems that must embed the ability to recover from long-term issues while reacting to shorter-term shocks. However, this presents a significant challenge for destinations, especially those in developmental phases, as they strive to adapt while developing.

Within the context of this research, the shocks that climate change and resultant climatic variability impose on the tourism sector—particularly on tourism businesses—are significant. Their ability to adapt to these changes and reduce vulnerability is inherently linked to their adaptive capacity and their potential to build long-term resilience. However, while this broader perspective is acknowledged, the scope of this paper is limited to examining the specific impacts faced by tourism businesses and their capacity to cope with these challenges. Consequently, the findings have direct implications for supporting tourism businesses in these regions to ensure the broader goal of tourism growth and development is achieved. This is particularly crucial within the local context, where research on these issues is currently lacking.

LITERATURE REVIEW

The tourism sector’s context in Cameroon – polycrisis

The concept of polycrisis—characterised by the interconnection of multiple, simultaneous crises (Penner, 2023)—significantly impacts tourism development by exacerbating vulnerabilities and complicating recovery efforts. In regions heavily reliant on tourism as a primary economic driver, the convergence of environmental, economic, and social challenges undermines industry stability. For instance, factors such as the COVID-19 pandemic, climate change, political instability, and geopolitical tensions can collectively disrupt travel patterns, diminish visitor confidence, and strain local resources (Anyanwu & Salami, 2021). In Cameroon, political unrest has heightened safety concerns, leading to a decline in international tourism (Ekah, 2019), while climate change has further degraded natural attractions crucial for tourism (Ozor

et al., 2021). Economic difficulties inherent in the context of a developing country limit local businesses' capacity to cater to visitors. This multifaceted crisis necessitates a revision of tourism strategies, embedding adaptive capacity within tourism businesses to navigate changing circumstances and recover from disruptions, ultimately fostering resilience within the broader tourism system. The interconnected nature of these crises underscores the importance of holistic approaches in tourism planning, ensuring that immediate challenges faced by stakeholders in the sector are addressed with the aim of creating long-term viability. Consequently, tourism development must increasingly incorporate adaptive frameworks that recognise and respond to the complexities of a polycrisis context (Penner, 2023), particularly in Cameroon, where these issues threaten the sector's potential as a driver of essential economic growth (Bang & Balgah, 2022). Within the context of this paper, although the impacts of the climate crisis are the primary focus, it is important to acknowledge the broader issues affecting the tourism sector, as these impacts can be inter-related, thus creating a nuanced landscape.

The tourism sector and climate change

The tourism sector is highly susceptible to the effects of climate change, especially extreme weather events (Malatyinszki et al., 2025; Lapointe et al., 2016). The severity of these impacts is amplified in destinations where tourism products and offerings are based on, or occur within, the natural environment (Manhas, 2016). The unpredictability of extreme weather events can devastate tourism-dependent local economies, either preventing tourism activities from occurring or deterring tourists from visiting these areas (Forje et al., 2021). This ultimately results in losses for businesses serving the tourism sector that rely on tourist traffic to remain profitable. Extreme weather events can disrupt tourists' travel, preventing them from reaching their intended destinations. Road networks can become inaccessible due to heavy rainfall, flooding, and mudslides - common occurrences in mountainous regions (Belias et al., 2022).

The effects of these impacts are intensified in developing destinations, where formal transportation infrastructure, such as roads and related services, is often rudimentary. In addition to preventing tourists from travelling to and participating in tourism activities (Manhas, 2016), severe weather can damage infrastructure, inhibiting businesses from operating efficiently and serving tourists, leading to further losses. In these contexts, many businesses operate in a survival mode, where their ability to recover from such damages is limited (Serdeczny et al., 2024; Njinyah & Pendet, 2021).

This is particularly true for destinations in geographically vulnerable areas, such as coastal regions or mountainous locales, which are susceptible to repeated damage from flooding, storm surges, strong winds, and mudslides (Farid et al., 2016). In the long term, the loss of tourism revenue can hinder economic recovery efforts.

The theoretical grounding and literature context

Given the discussion above, the necessity for businesses to adapt and build resilience to the impacts of climate variability is undeniable. There is an upward trend in the frequency and severity of extreme weather events, leading to increased economic losses over time (Bouwer, 2019). Many small businesses lack disaster preparedness plans, exacerbating their vulnerability and hindering recovery efforts (Coles et al., 2021). Extreme weather events profoundly and multifacetedly impact businesses in coastal areas, particularly affecting tourism industries (Zhai & Lee, 2024). Farid et al. (2016) note that coastal areas are among the most vulnerable tourism regions, as they are unprotected against the effects of sea level rise and other extreme weather events. The severity of these impacts varies by region and business type, with small businesses and highly developed coastal areas being particularly at risk (Atembe, 2024; Belias et al., 2022). Long-term trends indicate an increase in the frequency and intensity of such events, underscoring the need for improved disaster preparedness and resilience strategies, especially among small businesses (Scott et al., 2019).

Strategies to adapt to changing and somewhat unpredictable weather conditions have become essential for the long-term survival of tourism businesses, particularly those in areas susceptible to the varied impacts of extreme weather events (Parsons et al., 2018). Ultimately, the ability to adapt and maintain business continuity during inclement weather is central to resilience in the tourism sector. However, implementing these strategies can be costly for business owners, which may not be affordable (Torabi et al., 2024). The nature of periodic damage associated with extreme weather can create untenable situations for small businesses, leading to a cycle of short-term fixes rather than long-term strategic mitigation measures necessary for withstanding shocks from extreme weather.

This approach does not enhance the adaptive capacity of businesses, which is critical for those in dynamic settings to cultivate (Suryawan et al., 2025). Businesses that implement forward planning and resilience strategies are better positioned to recover from extreme weather events (Dugbartey, 2025; Ngin et al., 2020).

METHODOLOGY

The Cameroonian context

It is against this background that the current paper is set within the West African country of Cameroon. Cameroon hosts a still-developing tourism sector that has faced numerous challenges in recent years, stemming from issues related to policy, global and local crises (Harilal & Tichaawa, 2024a). The study was conducted in the South-West province, in the cities of Limbe & Buea. Limbe is a coastal city that serves as a popular local tourist destination, while Buea is a town at the foot of Mount Cameroon. These areas are tourism hotspots in the country and are geographically vulnerable to extreme weather events and climatic variability (Ozor et al., 2021). Many adventure and ecotourism activities occur in the vicinity of the mountain, specifically within the Mount Cameroon National Park. As a result of the tourism development in these towns, many locals have opened tourism businesses, offering products and services that support the industry. This has led to significant reliance on the local tourism sector's activity—operating and continually hosting tourists to sustain business

trade. However, the aforementioned crises, along with the increasing frequency of extreme weather events, have placed the local tourism industry at risk. Local tourism businesses in emerging destinations like Cameroon encounter substantial challenges in establishing themselves and becoming profitable, akin to other new enterprises.

Common obstacles faced by new business owners include limited access to financial support and services, a lack of training and skills development, and inadequate or insufficient infrastructure (Forje et al., 2021). These difficulties are exacerbated by the local context of the destination. In Cameroon, the still-developing tourism sector has encountered numerous challenges in recent years, ranging from the absence of a guiding tourism policy to direct development (Harilal et al., 2019) to the ongoing civil conflict and the repercussions of the COVID-19 pandemic, which hindered the arrival of international tourists for an extended period. Furthermore, the varying impacts of the conflict across different regions have left local tourism business owners grappling with numerous difficulties. This paper was conceptualised to examine the effects of climate variability on tourism businesses in Cameroon, specifically within the Limbe and Buea regions. The study focused on businesses located along the coastal area and those at the foot or slopes of Mount Cameroon. The vulnerability of these businesses to extreme weather events is intensified by their geographic location, highlighting an important local context in the broader conversation about tourism development issues in the region.

METHODS

This study employed a qualitative approach, conducting face-to-face interviews with purposively selected key informants, including ecotourism government officials and representatives, botanical and national park management, non-governmental organisations involved in the (eco)tourism sector, and tourism-related businesses in Limbe and Buea. Table 1 below provides a description of each informant group and the rationale for their inclusion in the study. The qualitative method was chosen to provide detailed insights into the challenges faced by business owners due to extreme weather events and climate variability, as well as the adaptive measures these businesses have implemented to mitigate impacts. This approach facilitated triangulation of results among stakeholders and with existing literature (Santos et al., 2020). Data collection took place from March to July 2024, resulting in a total of 33 interviews. The interviews were audio recorded and transcribed verbatim to enable thematic content analysis. This analysis method is widely used in tourism research as it allows for the examination of texts, such as interview transcripts (Nunkoo, 2018). The analysis was conducted using qualitative analysis software, Atlas.ti, which assisted in managing the generated themes.

Table 1. Key informant groups interviewed

Key informant group	Description of informant and rationale for inclusion	Number of respondents
Ecotourism government officials and representatives, botanical and national park management	Ecotourism government officials at various levels (national and local) are directly involved in the ecotourism sector, particularly in the formulation and implementation of strategic policies. Their insights provide a context-specific narrative that is vital for this study, given the differing contexts (i.e., coastal and mountainous regions) and the associated impacts of extreme weather. Understanding the role of government in managing extreme weather impacts and in helping businesses become more adaptive and resilient was essential for this study.	5
NGOs	NGOs are key stakeholders in the ecotourism sector due to their connections with both government and local stakeholders. They often act as intermediaries, assisting with policy implementation and supporting local business owners through capacity building and the creation of beneficial social networks. Their multifaceted insights into the impacts of climate variability and extreme weather on ecotourism and businesses are crucial to this study.	4
Local tourism businesses	Local tourism businesses are vital stakeholders, given their significance in the operation of the tourism sector and the focus of this paper. A diverse range of businesses, including accommodation, restaurants, arts and crafts, retail, tour operators, and transport services, were included. Business owners provided insights into the impacts of climate variability and extreme weather on their operations, as well as the measures they have implemented to enhance adaptability and resilience. The study also explored their needs regarding increasing adaptive capacity and resilience, which is crucial for ongoing planning and management within the tourism sector.	24
Total: 33		

RESULTS

Impacts of extreme weather events on the ecotourism sector

Impacts on the physical environment (including changes in seasons)

The results indicate a significant impact of extreme weather events on the tourism sector, particularly within the ecotourism subsector. The susceptibility of this subsector is linked to the geographical location of ecotourism activities and attractions. For example, ecotourism activities occur within national parks or along coastal regions near Mount Cameroon. Heavy rains in mountainous areas often lead to landslides and flooding in lower-lying regions, similar to areas situated near rivers, streams, or the coast. Flash flooding is common, posing serious safety hazards to residents, workers, and visitors. One popular ecotourism site, the Limbe Botanical Gardens, which features a river running through it, frequently experiences dangerous flash floods. The conservator of the gardens noted:

Yes, the effect of climate change has affected ecotourism. Due to climate change, seasons do not adhere to the usual calendar, making ecotourism scheduling difficult. While it is challenging to assess species changes, the habitats and ecosystems have been altered, rendering some very fragile and unstable. (Park management 1)

A government representative from the tourism ministry and an NGO confirmed similar observations:

As a result of climate change, weather conditions have altered, with increased rainfall. Heavier rains have caused landslides and floods, resulting in roads leading to ecotourism sites becoming blocked, rendering them impassable and reducing visitor numbers. (Government official 3)

Considerable changes in species populations have been noted due to climate change. In some areas, invasive exotic species are replacing native species (habitat loss). Some animals are migrating due to a lack of food, shelter, and security in an unstable ecosystem. (NGO 1)

Impacts on ecotourism stakeholders

The impacts extend to several stakeholders in the local tourism value chain, including local residents and workers in the sector, the attractions themselves, and tourists. Similar instances have been observed in the Mount Cameroon National Park, where the mountain is home to many endemic species of flora and fauna, making it a desirable location for activities such as hiking and safaris. However, landslides caused by heavy rains and subsequent flooding lead to fatalities among animals and render the area unsafe for both residents and tourists. A park management representative and local business owner stated:

Due to climate change, there is degradation of areas causing animal species dispersal, and plant species are being buried or washed away. This has negatively affected ecotourism as sites become less attractive. (Park management 4)

Ecotourism has been impacted by climate change. Heavy rainfall leads to flooded beaches and riverbeds, making it difficult for tourists to see animals, as they migrate in search of more stable habitats. When plants are submerged, they become invisible to tourists. In some regions, roads become impassable, while in others, drought caused by climate change results in the death of animal and plant species. Consequently, the number of species declines due to either excessively dry seasons or heavy rainfall. There is no need to promote such areas to eco-tourists because there is nothing to see (Business owner 9)

Weather, locals and tourist safety, and the impact on travel decisions

The impact of extreme weather on tourist safety is closely related to these findings. Tourist safety is well-documented as a crucial component of a successful tourism sector, heavily influencing tourists' decisions to visit an area. The unpredictability of extreme weather events has made it difficult for tourists to feel assured of their safety. Moreover, the damaging effects of heavy rain, floods, heatwaves, droughts, and general changes in average seasons have resulted in less aesthetically pleasing environments—an important feature of tourism attractions—which also factors into tourists' decision-making. Business owners have noted this, as illustrated by the following statements:

Climate change has affected ecotourism. Climatic extremes damage ecosystems, creating imbalances. Some species cannot survive, leading to migration or extinction. This negatively impacts ecotourism as attractive species are no longer present, causing tourists to prefer alternative destinations. (Business owner 1)

Climate change has affected ecotourism, as evidenced by the unpredictable nature of the weather. Forecasts made by experts are often not realised, leaving tourists confused and limiting recommendations for return visits. (NGO 3)

Consequently, infrastructure is frequently damaged during these events, including roads, transport hubs, and buildings - all essential for the functioning of the tourism sector. This results in areas and attractions becoming inaccessible in the aftermath of extreme weather events, posing an additional challenge for stakeholders. This sentiment is echoed by a tourism business owner and a local government official who were interviewed:

Good roads, security, and favourable weather conditions are essential for ecotourism to thrive here. The friendly nature of the inhabitants in this village is also important, as they depend on tourism for their livelihoods. (Government official 1)

Unpredictable weather is a major handicap to tourism, especially since the main road to this forest is an unpaved road that deteriorates due to changes in weather. (Business owner 4)

Thus, the cycle of extreme weather effects, leading to unsafe and unattractive conditions for tourists, results in decisions not to travel due to these conditions, ultimately impacting locals' ability to sustain their livelihoods. Some of the attractions of ecotourism include community involvement and local economic development. When an area is developed with these principles at its core, crises can have profound risks, affecting all stakeholders in the local tourism value chain.

Impacts of changing weather on business operations

The cumulative effect of unfavourable and extreme weather conditions on ecotourism is overwhelmingly negative, with a domino effect compromising the livelihoods of locals who rely on the tourism sector. In many cases, the incidence of extreme weather events has led to the closure of numerous tourism businesses, particularly small ones that lack the capacity to implement mitigation measures. Business owners interviewed noted the negative impacts of extreme weather on safety, particularly concerning flash floods and infrastructure damage.

"The heavy rain causes flooding; sometimes, the water that comes down the mountain destroys many businesses and makes it unsafe." (Business owner 3)

Given the day-to-day survival context in which most tourism businesses operate, the negative impacts of extreme weather events often render businesses inoperable. They struggle to cope with immediate effects such as floods, heavy rain, heatwaves, and changes in typical weather patterns, all of which lead to reduced tourist flow to the region. Ultimately, this results in unprofitable businesses, where the costs of remaining operational outweigh any potential profits. Tourism business owners expressed the following sentiments regarding this:

My business has crumbled because of this [the extreme weather]; there is insecurity, and my standard of living has dropped significantly. (Business owner 12)

In terms of climate change, the seasons are changing... it has affected the business a lot. There is no tourism during that period. I also run a craft shop, but I had to close the craft shop as well because who am I going to sell to? (Business owner 5)

The effect of climate change has had a very serious negative impact on ecotourism in this area. During the rainy season, we experience significant flooding, restricting the movement of people and tourists. It also results in a very filthy beach. Tourists cannot visit and enjoy local seafood. The local restaurants at the beach temporarily go out of business. There is no movement within the community due to flooding, and all local businesses come to a halt until after the flood. (Business owner 11)

These quotes highlight the definitive impacts of extreme weather events on the tourism sector in the region, significantly affecting tourism businesses. Some resultant challenges, such as changes in seasons, cannot be controlled. However, with adequate information, the tourism products offered by businesses can be modified to suit these new seasonal patterns. Additionally, especially for those businesses entirely reliant on the functioning of the tourism sector, once the full effects are understood, plans for business and livelihood diversification can be strategised and implemented. For example, one business owner lamented how heavy rainfall destroyed machinery essential for providing products to customers.

"There is a lot of runoff from the mountain, and sometimes it causes flooding that destroys many businesses. For instance, when there was flooding from heavy rainfall, it destroyed my [ice-cream] machine, which I need to provide my service to customers." (Business owner 3)

Adaptive measures adopted by businesses

Many of the adaptive measures adopted by businesses focus on alternative energy generation, such as using gas or wood for fuel, generators, or solar panels to supply electricity. Additionally, most businesses have acquired water storage tanks to combat constrained supply, especially during drought periods. One business owner explained:

"My business is not just affected during the rainy season, but during the dry season too. Being in a mountainous area, drought leads to a significant lack of water...the only solution is to bring in large water tanks and ensure that I collect as much water as possible during the rainy season." (Business owner 7)

In some cases, business owners have relocated their businesses to areas less vulnerable to flooding and landslides or that are more accessible to potential customers, especially when roads become impassable. In terms of the adaptive strategies that businesses feel are necessary, diversification of product offerings to accommodate changes imposed by extreme weather events and climate change, as well as the development of impact management plans, are preferred. However, developing effective impact management plans and being able to implement them requires business support (including financial input) and capacity building. This need is underscored by a business owner who noted:

Increasing collaboration and transparency towards development will go a long way. A platform should be formed to identify problems and explore solutions for the issues facing the ecotourism sector. (Business owner 2)

CONSTRAINTS TO THE ADOPTION AND IMPLEMENTATION OF ADAPTIVE MEASURES BY BUSINESSES

Cost constraints and affordability considerations

Business owners acknowledged that while there are potential loan products available to facilitate the replacement or rebuilding of infrastructure, the overall cost makes them inaccessible to some. One participant elaborated: *"Recently, EcoBank created a special fund for female entrepreneurs, facilitating loans and projects for them. The government is trying, but the taxes that have been imposed are exorbitant." (Business owner 4)*

These cost constraints also affect businesses attempting to plan and prepare for weather-related challenges, thereby influencing business resilience and adaptive capacity. As one business owner noted: *"I needed a refrigerated tank for my business, but it was expensive, even though he [the supplier] told me we could arrange payments through a bank loan. It was too costly at the end of the day. That has been my major challenge." (Business owner 6)*

Inaccessible social networks for business support

Another challenge related to affordability and accessing loans, which impacts businesses trying to enhance their adaptive capacity, is that loans are often not fully accessible without social connections. Furthermore, they can become inaccessible due to the various documents required from government ministries. Consequently, those in urgent need of loans are unable to secure the funds. The following quotes illustrate this point further:

"The system that has been put in place to give loans or grants to young entrepreneurs is not working, because those of us who actually deserve it don't get it. People want to take their brother and sister... because they know somebody who knows somebody... there is so much corruption." (Business owner 8)

"There are documents that need to be issued by the Ministry of Health [for food businesses]. You can go to the Ministry, get oriented on who is in charge, and they will send you back to another person." (Business owner 5)

Lack of Knowledge to Inform the Formation and Implementation of Adaptive Strategies

A crucial factor in planning for and overcoming these challenges is the availability of reliable climate-related information. However, this is a significant challenge in the Cameroonian context due to the absence of a comprehensive weather monitoring system. Without such a system, there is uncertainty regarding when and how severely extreme weather events will occur, hindering effective planning.

DISCUSSION

The results indicate that the tourism sector indeed faces numerous challenges due to changing weather patterns, extreme weather events, and seasonality. In line with this, Hambira & Mbaiwa (2020) express similar sentiments, noting that the interaction between changing weather and alterations in the behaviour and habitats of fauna—both integral aspects of tourism offerings—has a definitive impact on tourism within a region. Additionally, Belias et al. (2022) similarly noted the impact of changing weather patterns on various aspects of the tourism value chain, emphasising the necessity for specific weather conditions for particular tourism experiences and products. Consequently, this impact affects the core of the tourism product, and the businesses built around these offerings. Furthermore, the statement that “weather makes it difficult to travel” implies that changing weather and extreme weather events have multiple complex impacts on the tourism sector overall, from affecting tourism offerings to reducing mobility within the region (Lapointe et al., 2016). Business owners interviewed highlighted this issue, which is echoed in the literature, especially regarding the vulnerability of these regions to floods and landslides. Attractions often have to close due to safety concerns (Ngin et al., 2020). When considered cumulatively, these impacts are devastating across multiple facets of the local tourism sector, ultimately jeopardising the core of business operations (Craig & Feng, 2018). Given that these businesses are generally survivalist in nature (Njinyah & Pendat, 2021), such impacts can threaten their ability to remain open and viable. Ozor et al. (2021) reiterate this, noting that Cameroon experiences extreme impacts of climate variability, affecting multiple sectors, including tourism. This creates a domino effect within society, resulting in significant social and economic vulnerabilities.

The ability of businesses to remain open and viable is underscored by the theoretical underpinning of this paper—the notion of adaptive capacity and longer-term resilience. The threats posed by extreme weather events and climatic variability are dynamic, necessitating that businesses build the capacity to rapidly acclimatise when these events occur or in anticipation of induced changes (Bang et al., 2019). However, another challenge faced by business owners and stakeholders is the lack of reliable climate data to inform what needs to change and how. This is due to the absence of a climate information system in the country, which could provide reliable data to inform policy, guidelines, and strategy amendments to mitigate the impacts of climate variability (Ozor et al., 2021). Ultimately, this information is crucial for business owners to understand in order to make their businesses more adaptable and resilient in the long term, especially as concerns about business operations emerged as a worry for them given the unpredictability and damaging nature of extreme weather on businesses located in geographically vulnerable areas.

The nature of tourism activities in the study areas is largely nature-based and ecotourism-focused, located along the coastline or at the base of or on the slopes of Mount Cameroon. The physical geography of these areas makes them particularly susceptible to the impacts of extreme weather events, especially heavy rainfall and strong winds (Dube et al., 2024; Evariste et al., 2018). These impacts can lead to landslides, flooding, and damage to infrastructure (Atanga & Tichaawa, 2021), rendering areas inaccessible and unsafe for tourists. Similarly, these conditions are unsafe for business owners to operate in. Often, unsafe conditions can become prolonged, particularly when infrastructure damage renders tourism businesses unable to afford repairs, especially in cases of repeated damage. Given the constraints faced by the tourism sector in the country (Harilal et al., 2019), the impact of extreme weather on tourist safety has a significant negative effect on businesses and their ability to remain open and viable.

Extreme weather has definitively impacted tourism businesses, placing pressure on business owners to remain viable. This challenge is not unique to Cameroon, as extreme weather has been identified as a threat to the survival of tourism businesses globally (Southon & Van der Merwe, 2018). Business operations are often stalled during inclement weather, and interviewed business owners emphasised the severity of the impacts of extreme weather on their operations. The effects of flooding, landslides, and other extreme weather events resulting from climate change have been widely documented in various contexts (Gössling & Scott, 2025; Mihigo & Lukenangula, 2023; Dube et al., 2024; Atanga & Tichaawa, 2021; Southon & Van der Merwe, 2018). Additionally, these impacts lead to increased operational costs for businesses, with the prices of tourism products and services rising (Hambira & Mbaiwa, 2020). It is vital to consider the implications of this for business owners, particularly as owning a business constitutes a primary source of income or livelihood strategy (Harilal & Tichaawa, 2018). Recurring negative impacts of extreme weather events on business owners, combined with reduced profitability, increase the risk of businesses failing to remain viable (Njinyah & Pendant, 2021). This diminishes the resilience and adaptive capacity of business owners.

As Suryawan et al. (2025) note, the adaptive capacity of local ecotourism businesses is linked to factors such as income and education, which stem from awareness and information sharing. Thus, as previously mentioned, although many of the businesses in the local tourism sector in the case study regions are small and micro enterprises, being survivalist in nature, they form the backbone of the local tourism economy (Njinyah & Pendat, 2021). Without these businesses, the ability to successfully host tourists is compromised. Furthermore, there is a lack of reliable climate-specific information available in the country, which hampers information sharing (Ozor et al., 2021).

Therefore, in addition to developing climate action plans from the national level downwards, it is crucial to focus on equipping businesses to become adaptable to sudden climate-related changes and resilient to these changes in the long term, as this is key to the survival and viability of the local tourism sector.

With the increased incidence of crises, the focus of tourism sectors has shifted towards embedding adaptive capacity, enabling stakeholders to swiftly adjust to sudden changes triggered by shocks within the system, while also fostering long-term resilience (Suryawan et al., 2025; Gaki & Koufodontis, 2025; Ngin et al., 2020). Developing adaptive capacity and long-term resilience, particularly for tourism businesses in this context, requires significant contributions from various stakeholders, including education, capacity building, leveraging social networks for collaboration, and,

importantly, financial support. The additional strain of context-specific problems adds another layer of stress to businesses, rendering them vulnerable (Njinyah & Pendant, 2021). In Cameroon, beyond the impacts of Covid-19, certain regions are suffering from the ongoing geopolitical crisis (Harilal & Tichaawa, 2024a) and the effects of extreme weather events (Evariste et al., 2018). This directly affects access to areas, thereby impacting the profitability and economic viability of tourism businesses. In response, businesses have attempted to implement disaster management plans, indicating that owners plan to incorporate adaptive capacity into their operations in light of potential crises. However, despite these plans, it has become evident that rebuilding or replacing damaged infrastructure, or enhancing existing infrastructure, poses significant challenges for businesses (Hambira & Mbaiwa, 2020), particularly in terms of affordability. These challenges highlight the need for greater context-specific support for small businesses, such as leveraging existing social networks embedded in local culture to strengthen their resilience in the face of unpredictable crises (Harilal & Tichaawa, 2024b; 2023). The process of applying for and obtaining support must be simplified, as this directly affects businesses' ability to enhance their adaptive capacity in response to various crises.

The preceding discussion sheds light on the impacts of climate variability and extreme weather events on tourism-related businesses in geographically vulnerable areas. While understanding these impacts is crucial, it is equally important to comprehend the adaptive measures adopted by businesses. As noted by Dube et al. (2024), building adaptive capacity and ultimately resilience is essential, but it is also vital to ensure that the measures implemented are not maladaptive. Furthermore, Ajieh (2021) emphasises that, within the Cameroonian context, empowering business owners through education and training is crucial, enabling them to respond to emerging challenges and reduce threats to their business survival. Within the context of this study, exploring the current measures in place provides essential information that contributes to the overall narrative of this paper. Gaining insight into the measures implemented by business owners can inform specific policy strategies to formally assist the sector in becoming more resilient and reducing the acute vulnerability of business owners through targeted support (Nyiauwung et al., 2022).

Regarding the specific adaptive measures adopted by surveyed businesses, a common thread is that these measures are mostly add-ons to existing operations. Consequently, business operations have largely been preserved, with adaptation measures focused on ensuring continuity. Interestingly, while having a disaster management plan in place to address extreme weather impacts is acknowledged as necessary and feasible, it has not been widely adopted. This can be linked to the scarcity of real-time and reliable information needed to inform appropriate plans (Ozor et al., 2021). Hoogendoorn & Fitchett (2018) further emphasise the need for this information to inform the formulation of adaptive strategies that reduce the vulnerability of businesses in the sector.

For example, as highlighted in interviews with business owners, the cost of implementing adaptation measures is a significant hurdle, maintaining their vulnerability in the uncertain situation created by the climate crisis. Thus, strategies aimed at providing financial support are recognised as a crucial aspect of enhancing businesses' adaptive capacity (Parsons et al., 2018). This supports Gaki & Koufodontis (2022) and Hartman's (2018) view that adaptive capacity and resilience are interrelated concepts operating within a complex system. Therefore, businesses must be enabled and supported in various ways to effectively respond to sudden shocks resulting from extreme weather events while building the capacity to cope with and recover from long-term issues (Suryawan et al., 2025). In line with the findings of this research, product and service diversification, along with the timing of offerings, has emerged as a popular method of increasing businesses' adaptive capacity and long-term resilience. This approach is supported by various scholars, who note that diversification within business offerings is essential for embedding adaptive capacity and resilience (De Yta-Castillo et al., 2025; Hartman, 2016; Christie et al., 2014).

To ensure that business owners can implement adaptive measures and are informed about what would benefit their businesses, it is essential to draw on the concept of collaboration. This would enable the strong sense of community and social networks to be leveraged, encouraging business owners to support one another. Furthermore, employing strong intermediaries, such as NGOs, can facilitate interaction between businesses and government, making the latter aware of the changing needs of businesses and assisting them in accessing available aid.

Practical implications

This paper, viewed through the lens of adaptive capacity and resilience, coupled with the context-specific challenges faced by the tourism sector and businesses in recent years, provides nuanced insights into several important implications for the short- and long-term survival of the sector.

Firstly, for immediate and short-term survival, it is crucial that appropriate support is provided to businesses to maintain continuity. Secondly, the collection of relevant and reliable information is key to formulating appropriate policies and guidelines, which can inform strategies to reduce businesses' vulnerability to these threats. Additionally, linked to reliable information, the sharing of knowledge and education for business owners is vital for increasing their ability to become adaptive and resilient in the longer term. Thirdly, while some businesses are implementing strategies to enhance their immediate adaptive capacity, others face cost constraints that hinder such efforts.

Targeted support for these businesses must be carefully considered and provided to strengthen the overall tourism sector in the country. This leads to the fourth, particularly important contextual point that emerged from the findings – the informal economy is a vital component of the tourism sector, intrinsically linked to its functionality. The nuances associated with informality need to be leveraged to achieve some of the previous points, contributing to the creation of an adaptive and resilient sector, which aligns with the theme of this special issue: 'recovery and resilience in tourism planning and development: sustainable pathways for transforming tourism in Africa.'

Theoretical contributions

While scholarly discourse on tourism development in Central Africa has increased in recent years (see Harilal & Tichaawa, 2024a; 2024b; 2023; 2018; Ozor et al., 2021; Evariste et al., 2018), research addressing key issues related to building resilient sectors (see Torabi et al., 2024; Senbeto, 2022; Njinyah & Pendat, 2021; Scott et al., 2019; Hartman, 2018) tends to be limited within the Central African context. Given the immense tourism potential of countries in Central and West Africa, it is vital that research also focuses on these regions. This need has become increasingly urgent in light of the various crises that have impacted the core tourism offerings and continue to do so (Ekah, 2019).

Hence, the significance of this paper lies in its investigation of the impacts of climate variability and extreme weather events on tourism businesses in Cameroon, viewed through the lens of adaptive capacity and its connection to long-term resilience. This perspective allows for the consideration of immediate, short-term, and longer-term factors, as well as recent and current situational contexts, concerning the future direction of the sector.

Ultimately, within a resource-constrained environment that relies on tourism as a strategic pillar for economic development, it is essential to develop a robust adaptive capacity framework for tourism businesses to ensure their survival and prosperity amidst a changing climate, particularly for the more vulnerable segments of the sector.

As this research was confined to two specific regions in the country—a coastal area (Limbe) and a mountainous region (Buea)—it is recommended that the scope be broadened to include larger and more diverse areas within Cameroon. This expansion will facilitate a more accurate understanding of the full impact of climate variability and extreme weather events on tourism businesses and aid in the development of a framework for integrating adaptive capacity within these businesses and the sector as a whole.

CONCLUSION

The exacerbated rate of climate change, driven by anthropogenic activities, has undeniably resulted in a global climate crisis. When viewed against the backdrop of uneven socio-economic development across different regions, developing or less developed countries tend to bear the brunt of the crisis due, in part, to their limited capacity to cope with the resultant extreme weather events. It is evident that climate variability, particularly in terms of extreme weather events, has severely impacted tourism businesses in the case study regions.

These impacts are amplified by the geographic vulnerability of these areas, necessitating measures to increase the adaptive capacity of businesses and, ultimately, the tourism sector as a whole. Given the overall state of Cameroon's tourism sector, which has been afflicted by a series of crises, regenerating the sector has become a key challenge.

Thus, the findings of this study contribute to the understanding of the impacts of climate variability and extreme weather events on tourism businesses and how to enhance their adaptive capacity (and long-term resilience) in the face of these challenges. The main limitation of this study is its confined geographic scope, as data were collected exclusively from the Limbe and Buea regions due to constraints related to time and resources.

Although these areas are particularly susceptible to climate variability, the findings may not adequately represent other regions in Cameroon that experience varying environmental, social, and economic conditions.

Expanding the study to encompass additional ecological zones could provide a more comprehensive understanding of regional vulnerabilities and adaptive strategies within the country's tourism sector.

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