


Hailstorms Damage and Resilience-Building in South Africa's Key Tourism Destinations and Attractions

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Abstract

Hailstorm research in tourism remains scant despite growing evidence of increasing hailstorms and associated damages to destinations and attractions due to climate change. This study examined hailstorm occurrence, damage and loss, preparedness and adaptation, recovery and resilience resilience-building at the Sun City Resort in South Africa. Data was collected from a staff survey (n=131), staff interviews, guest comments, and relevant Sun City Resort secondary documentation such as storm recovery and annual reports. It emerged that the 2018 hailstorm caused significant damages, yet no effective early warning systems were in place. This led to significant economic and non-economic losses, such as damage to infrastructure, cancelled activities and negative publicity. There was also no long-term strategy towards hailstorm resilience, with the resort adopting a reactive rather than proactive approach. The study contributes to climate change-induced hailstorm research in tourism while informing tourism destination resilience-building practices. Suggestions are made linked to building back and forth better in terms of hailstorm risk preparedness by the Sun City Resort.

Keywords: Hailstorms; tourism; climate change; damage; resilience

Introduction

Hailstorms are extreme weather events induced by climate change, and such rapid and sudden events cause untold destruction with the potential to negatively affect tourism destinations and attractions (Sehgal, 2008; Van Der Bank & Van Der Bank, 2018). Hailstorms occur in various regions across the globe, yet their occurrence and severity are more pronounced in temperate and mid-latitude areas (Gupta et al., 2022), with the Mediterranean regions being particularly vulnerable (Laviola et al., 2022). The areas frequently affected by hailstorms are Central and North America, the southern parts of the Andes region in South America, Central and Southern Asia, South-East Australia, and Eastern and Southern Africa (Punge & Kunz, 2016).

Like other extreme weather events, there is evidence that global warming, which results in climate change, has altered the frequency, severity and occurrence of hailstorms. Several scholars argue that climate change has increased the incidents and severity of hailstorms (Hughes et al., 2020; Laviola et al., 2022; Martius et al., 2018; Raupach et al., 2021; Rijal, 2013; Specht, 2008; Van Der Bank & Van Der Bank, 2018) although Ni et al. (2017) and Zou et al. (2018) posit that climate change has reduced hail incidences in some regions. However, evidence shows that hailstorms are increasing in South Africa (Punge et al., 2023; Raupach et

al., 2021). There has also been a corresponding increase in loss and damage (L&D) associated with the storms (Munich, 2016), with the past decade witnessing a sharp rise in the costs related to damage brought on by extreme weather events linked to climate change (Dube et al., 2023).

Although hailstorms are less documented and may not occur as frequently as other common rapid and sudden extreme weather events such as floods, droughts, wildfires and heat waves (Specht, 2008), their impacts are perceived to be more costly and drastic (Zheng & Byg, 2014). Hailstorms have garnered significant research attention within industries such as insurance and agriculture (Martius et al., 2018). However, the tourism sector has not adequately documented hailstorms' impacts, appropriate intervention, and resilience-building measures. This scenario is a cause for concern, as hailstorms pose a significant risk to tourists and have the potential to cause damage to tourism infrastructure, particularly in destinations and attractions of global interest (Scott & Gosling, 2022).

Several studies have examined hailstorms and tourism (Canovi, 2019; Kostianaia & Kostianoy, 2021; Nacipucha et al., 2017; Peteley et al., 2017; Peteley et al., 2016; Spetch, 2008; Tanana et al., 2019; Van Der Bank & Van Der Bank, 2018). However, these studies discuss hailstorms in passing as part of climate change or extreme weather events. To our knowledge, none of the studies focused wholly on the implications of hailstorms on tourism destinations. Furthermore, there is limited research on hail damage resulting from individual hailstorm events (Punge & Kunz, 2016).

Although the media highly publicised the Sun City Resort hailstorm event of 2018, research still needs to be conducted to inform theory and practice. According to Punge et al. (2023), the hailstorm hot spots in South Africa are the interior of Kwazulu Natal, Northern and Western parts of Eastern Cape, High Veld areas of Gauteng, Central Free State, Eastern Free State and Mpumalanga. Interestingly, the current study area does not feature among the provinces and parts highlighted herein, making it an interesting case study. Given the ensuing gaps, this paper seeks to document the Sun City Resort's hailstorm-related occurrences, damage, and losses. It also seeks to examine the resort's preparedness, adaptation, recovery and resilience strategies against hailstorm-related occurrences and damages. This study will inform resilience-building in tourism destinations and contribute to the body of literature on the impacts of hailstorms as part of rapid and sudden extreme weather events on tourism.

Literature review

Trends in hailstorms as rapid and sudden climate-related events

Hail research unveiled during the Second European Hail Workshop in April 2017 in Bern, Switzerland, identified five thematic areas regarding challenges and advances in hail studies. The thematic areas included convection and hail in a changing climate, hail damage, hail damage prevention, nowcasting and forecasting (Martius et al., 2018). The size and quantity of hailstones falling within a specific timeframe, as well as the corresponding speed of the wind, are used to assess the intensity of hailstorms (Xie et al., 2010; Zhang et al., 2008). The extent of hail damage depends on the size, distribution and density of hailstones per unit area, the wind force, and the affected target's physical features (Gupta et al., 2022). Large hail (over 5cm) can cause direct and indirect injuries, such as accidents on slippery roads (Půčik et al., 2019; Tang et al., 2019).

Hailstorms affect multiple aspects of the tourism sector and the quality of the overall visitor experience. They can disrupt outdoor activities, making them uncomfortable or risky, resulting in disgruntled tourists and decreased tourist expenditure (Wilkins et al., 2018). Hailstorms can also destroy infrastructure such as buildings (including those accommodating tourists and workers), roads, transportation systems, and outdoor attractions (Wu et al., 2021; Půčik et al., 2019). The damage may also lead to temporary closures, restorations, and

disruptions in accessibility. Hence, this can prevent tourists from fully experiencing and enjoying their visit. The adverse impact of hail damage on natural landscapes, gardens, and outdoor places can diminish a destination's aesthetic attractiveness (Canovi, 2019). For instance, hail damage to vineyards affects wine tourism destinations (Straffelini et al., 2023).

Hailstorms can compel tourists to cancel or modify their itineraries, flight operations and transportation services (Borsky & Unterberger, 2019; Khan et al., 2020; Ngin et al., 2020). These disruptions can lead to economic setbacks for tourists and enterprises associated with the tourism industry (Rosselló et al., 2020), thereby impacting the entire tourism value chain. The L&D incurred during hailstorms also increases operating costs for tourism businesses. In hail-prone destinations, increased insurance expenses result in extra operational costs (Nacipucha et al., 2017; Vroege & Finger, 2020). A tourism resort that experiences frequent hailstorms is prone to developing a bad reputation as an unpredictable or dangerous location for visitors (Rosselló et al., 2020). This is detrimental to service industries like tourism, which depend heavily on image (Li et al., 2015). Safety concerns are also very critical to the appeal of tourism destinations (Prayag, 2022).

Hailstorms preparedness, adaptation and resilience strategies

Creating resilience in hailstorm-prone destinations is based in part on the ability of a destination to predict and have early warning systems in place. Technology-assisted analytics and modelling are increasingly critical in predicting hailstorm occurrence and impacts on tourism destinations (Wang & Wu, 2021). Some algorithms, for instance, have been developed to predict hailstorms (Prein & Holland, 2018). Adopting early warning systems provides timely alerts about imminent hailstorms, hence facilitating preparedness and response. Preparedness and response are considered a top priority for the tourism industry in dealing with climate change impacts and other natural disasters (Dube et al., 2023). They enable the implementation of precautionary measures by tourism establishments (Neußner, 2020).

Resilience also entails establishing comprehensive emergency plans that delineate the necessary measures required before, during, and after a hailstorm event. The proposed plans should include employee training, visitor safety protocols, and communication techniques (Ritchie & Jiang, 2021; Usher et al., 2020). The lack of planning and risk management strategies for rapid and sudden extreme weather phenomena, such as hailstorms, poses significant threats to tourism destinations (Tanana et al., 2019). Integrating resilience-enhancing strategies into tourism destination plans can also enhance response to hailstorms (Sheppard & Williams, 2016).

Tourism resorts are indifferent to hailstorms (Peteley et al., 2016). Contrary to existing practice, tourist resorts require proactive measures, including hail-resistant materials and designs that mitigate damage in constructing and refurbishing buildings and attractions (Tran et al., 2021). Green infrastructure, including green roofs and tree canopies, can also mitigate hailstorms by cushioning their impact (Moore, 2020). Other interventions include establishing hail-resistant vegetation that forms natural buffer zones that can alleviate the impacts of storms (Spalding et al., 2014).

Diversifying activities can serve as a strategy to counteract the damage from extreme weather events (Belle & Bramwel, 2005). Particularly, destinations reliant on outdoor attractions should incorporate some weather-independent activities to offer visitors alternatives while mitigating the impact of severe weather (Steiger et al., 2016). It is also vital to ensure that tourism businesses have sufficient insurance coverage to minimise the financial implications of damages from hailstorms (Asgary & Ozdemir, 2020; Olya et al., 2019).

Implementing safety protocols, disseminating information, and taking proactive measures to restore normalcy, minimises injuries and alleviates anxiety among tourists and the

public (Wang & Wu, 2021). Collaborating with various stakeholders during the formulation and execution of these strategies significantly enhances resilience and recovery (Daniels & Tichaawa, 2021; Pyke et al., 2021). The collaborative efforts can enhance response operations' efficacy and readiness as stakeholders draw from each other's strengths (Errichiello & Micera, 2021).

Materials and methods

This study adopted an exploratory case study research design. The Sun City Resort (Figure 1) was selected as the site for this study. It is a popular tourist resort in South Africa's Northwest Province, established in 1979. The resort comprises hotels, restaurants, world-class golf courses, conference rooms, casinos, a beach resort, a water park, and various indoor and outdoor activities. On the 15th of December 2018, a severe hailstorm hit the resort, resulting in damages caused by the direct impact of the hail, as well as the resultant flood waters (Sun International, 2022). The resort was selected due to its position as a popular tourist resort and the hailstorm occurrence. The choice was also informed by prior research where case studies were based on locations that had previously experienced extreme weather events (Jenkins & Nicholls, 2010; Nacipucha et al., 2017).

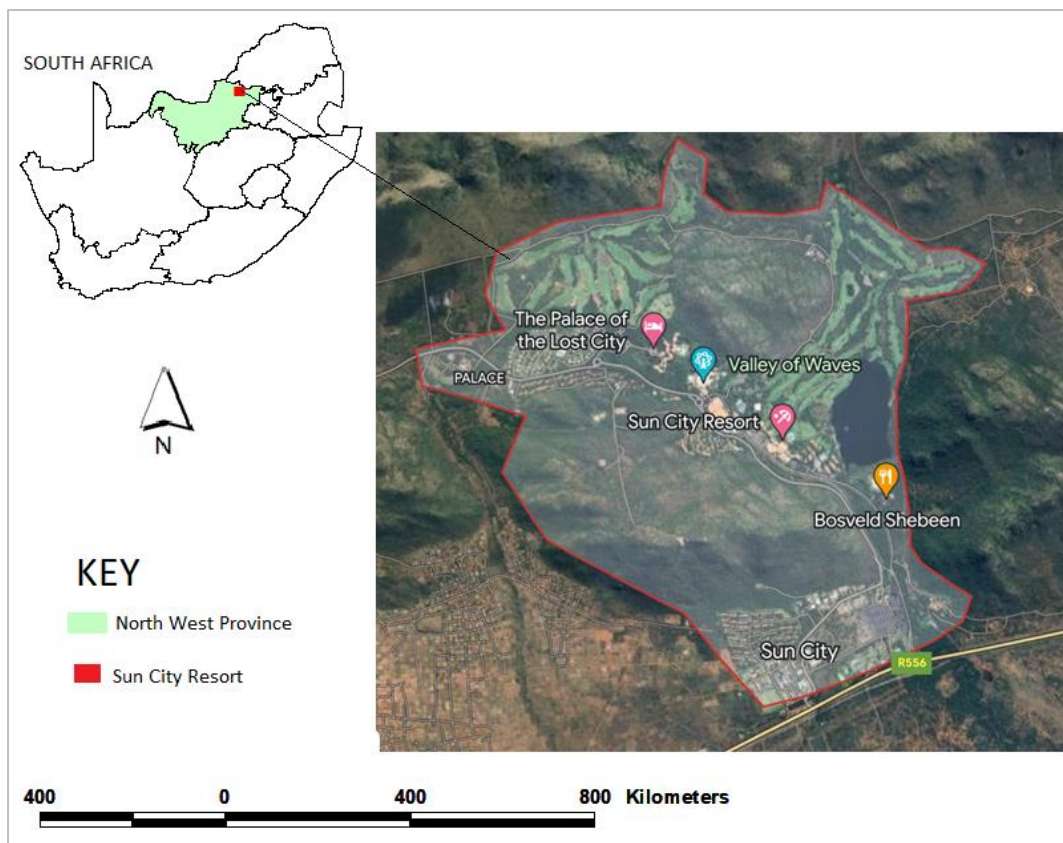


Figure 1: Location of the Sun City Resort

Data was collected from a staff survey, staff interviews, guest comments from public news websites, and the Sun City Resort documents, including the storm recovery report, annual reports and other publicly available documents on various platforms. A total of 163 staff were sampled to complete an online survey administered face-to-face as uploaded onto Question Pro in September 2023. Among those considered as staff by this study were independent

contractors working for Sun City Resort. From the 163 staff sampled, 131 (80.04%) completed the survey. The Question Pro platform was used for further analysis.

Six staff (R1 to R6) comprising management and other cadres present during the 2018 hailstorm were also interviewed. The semi-structured interviews were administered to capture participants' primary experiences and the subsequent actions implemented. Semi-structured interviews were preferred because they allowed in-depth probing (Altinay & Paraskevas, 2015). Guest comments captured the reactions of tourists and the public during the incident. These comments were (labelled twt1 to twt22) for anonymity and ease of reference. The search term “Sun City 2018 hailstorm” was used to access the comments. Only comments appearing on newspaper websites were used, as these were already in the public domain and were open access. The search stopped when no new information emerged. Secondary data from the Suncity storm recovery report and the Sun City Annual Report served to collaborate with the primary data. The subsequent data was then subjected to thematic analysis.

Results and discussion

Four themes aligned with the study objectives emerged from the collated data. These were hailstorm occurrence, damage and loss, preparedness and adaptation, as well as recovery and resilience. However, before getting into details on these findings, the next section presents the demographics from the Sun City Resort staff survey.

Demographics of survey respondents

About 77% of the respondents were general staff. This was followed by about 8.46% of respondents being independent contractors working for Sun City Resort. Further details are presented in Figure 2.

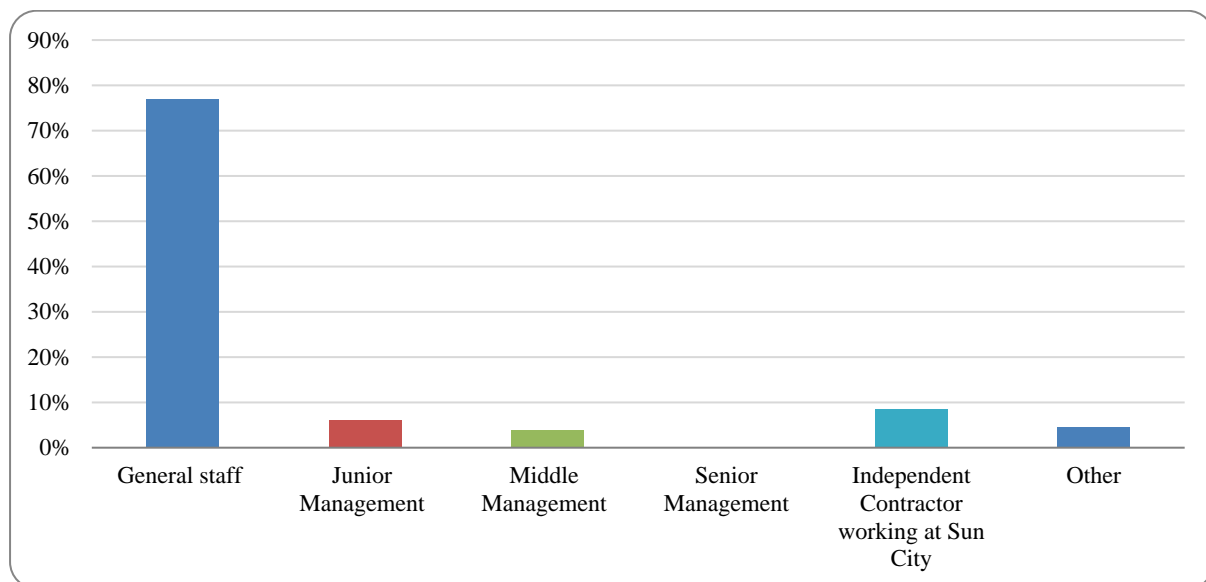


Figure 2: Survey respondents by designation

As for the period of employment at the Sun City Resort, an estimated 45.38% had been there for less than five years, with those having worked for 5-10 years taking up 30%. Respondents that had worked for Sun City Resort for 20 or more years took up 11.54%, while 6.92% of the respondents had clocked 11-15 years. The remaining 6.15% of respondents had been employed for 16-20 years.

Hailstorm occurrence

The respondents were asked to indicate climate extreme events that posed the most imminent threat at Sun City Resort, of which hailstorms were among the options presented. This rapid and sudden extreme weather event was ranked as the highest threat, with 22.37% of the respondents indicating as such. The remaining threats are shown in Figure 3.

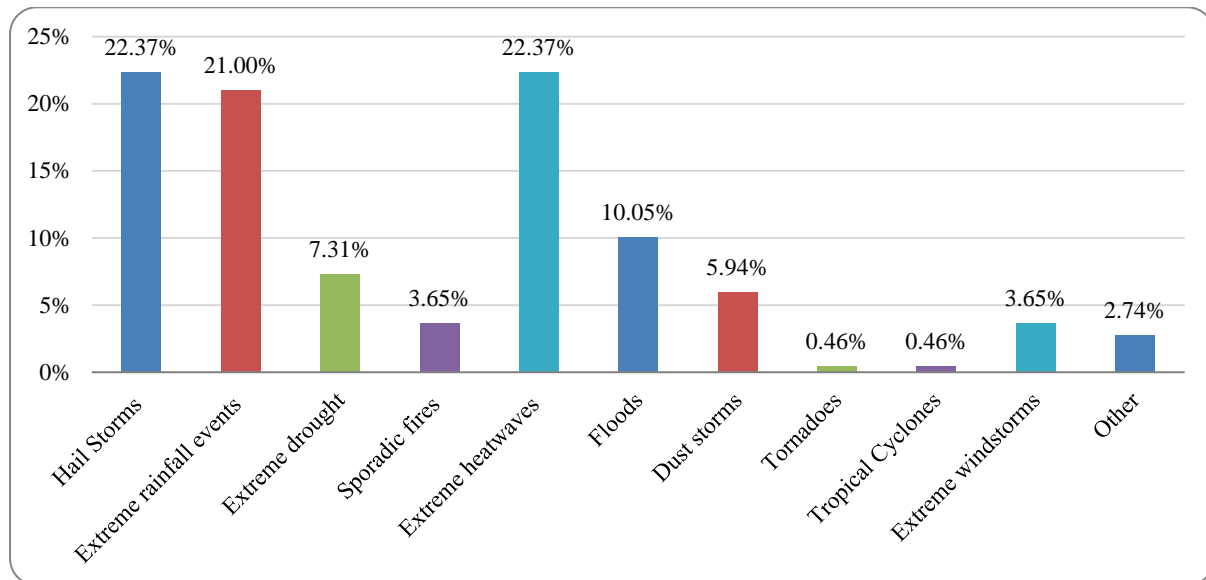


Figure 3: Threats of sudden and rapid weather extremes

A follow-up question asked respondents to indicate extreme weather events that had occurred at the Sun City Resort in the past five years. Once again, hailstorms were ranked highest, with 29.06% of the respondents concurring. Extreme rainfall events and extreme heatwaves followed hailstorms. It was evident that hailstorms constitute a significant concern for this popular international and local destinations.

From the staff interviews, the study findings reveal that the 2018 hailstorm's onset was sudden, taking the employees and guests by surprise. The following sentiments support this: *“Oh, that storm, I was here when it started happening. We saw a funny cloud, and said, Oh, this is dangerous and then ran away”* (R5). *“And to think the weather was so nice just moments before the storm.”* (tw11).

Additionally, the hailstorm created significant damage that evoked shocked reactions from those who witnessed it first-hand. One respondent said, *“Everywhere was waterlogged. I have never seen anything like that before”* (R5). The sentiments from guests also implied the same:

“Disastrous” (tw7); *“#climate change is real”* (tw9); *“#Sun City is falling apart right in front of our eyes”* (tw14); *“Hael storm in sun city”* (tw17). *“One of the Worst Hailstorms in Sun City”* (tw19).

These findings are in tandem with Zheng and Byg (2014), who argued that hailstorms have a sudden onset and devastating effects. The sudden occurrence does not give room for reactive measures, hence the need to be proactive. However, as evidenced by the comment below, some of the guests felt that the hail added to the aesthetic appeal of the resort in the sections that were not damaged. *“The unexpected hailstorm added delight to many, creating the ambience of a white Christmas”* (tw18). The findings also imply that tourism resorts can make the best of a bad situation in cases of a hailstorm occurrence. The findings are supported by Sehgal (2008), who states that not all climate change impacts are negative.

Damage and loss from hailstorms

The survey results reveal significant impacts of the 2018 hailstorm (Figure 4 and Figure 5). Figure 4 shows that the most significant damage from the 2018 hailstorm was noticed on hotel infrastructure (39.43%) and the golf course (16.35%). However, there was additional damage, including vehicles and the landscape.

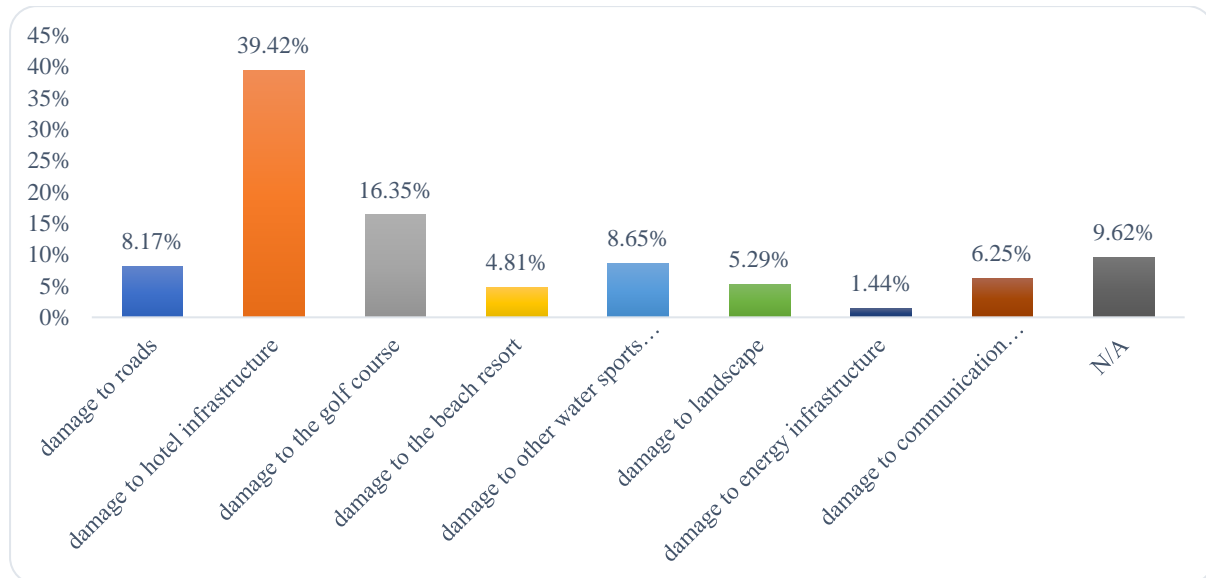


Figure 4: Hailstorm damage to the Sun City Resort facilities

From the Sun City storm recovery report, damages occurred at the Sun Central family and entertainment precinct, the Sun Central Convention Centre, 200 rooms at the Soho Hotel, the Palace 20 rooms, Cabanas 109 rooms, Cascades Hotel 40 rooms, and the Vacation Club 92 rooms. Of these, 120 rooms were severely damaged, requiring replacing carpets, skirting, painting, wallpaper, and electric wiring. The direct impact of hail and resultant flash floods caused the damage. The following sentiments further exemplify the damage to infrastructure: “Some of the hotel rooms and conference rooms were badly damaged” (R2). “The roof and ceiling had the most damage. The water came through into the rooms. The ones on the ground floor.” (R3). “Visitors are checking out because their rooms are flooded. The reception roof has also collapsed” (twt16).

The hailstorm also destroyed the vehicles parked within the resort, some of which belonged to the guests. Concerning this, one of the tweets stated: “Vehicles submerged in hail like snow” (twt19).

Figure 5 from survey results shows that golfing (15.24%), safari and wildlife (14.02%) and beachgoing (12.02%) were most affected by the hailstorm. Other activities that were also significantly affected include site seeing (10.06%), zip lining (10.06%) and hot air ballooning (8.54%). It was evident that outdoor activities were more affected than indoor ones. These findings are similar to those by Wilkins et al. (2018) on disruptions to outdoor activities caused by hailstorms.

The interview responses also indicated damage to the landscape and related outdoor activities. The Gary Player and Lost City golf courses were damaged, necessitating temporary closure. The damage is illustrated by the sentiment below:

“The hailstorm eroded most of the soil and bridges, that water was so high, remember the bridge is below, but the water overpowered the bridges. The drainage system was damaged, 6 holes were closed. The course was closed down, it took 3 months to repair the damage”.

The hailstorm further disrupted operations at the resort, resulting in closures, cancellations of bookings and evacuation of affected guests as evidenced by the following: *"Sun Central closed for about a month"* (R3) and *"Conference rooms were closed for some time"* (R2).

The study's findings are in tandem with extant literature on the damages from hailstorms. These range from damaged infrastructure (Púčík et al., 2019; Wu et al., 2021), accidents on slippery surfaces (Púčík et al., 2019; Tang et al., 2019), and destruction of outdoor spaces (Canovi, 2019; Straffellini et al., 2023). These damages often result in economic losses for tourists and tourism establishments (Nacipucha et al., 2017; Rosselló et al., 2020; Vroege & Finger, 2020). Insurance can mitigate these damages (Asgary & Ozdemir, 2020; Botzen et al., 2010; Olya et al., 2019).

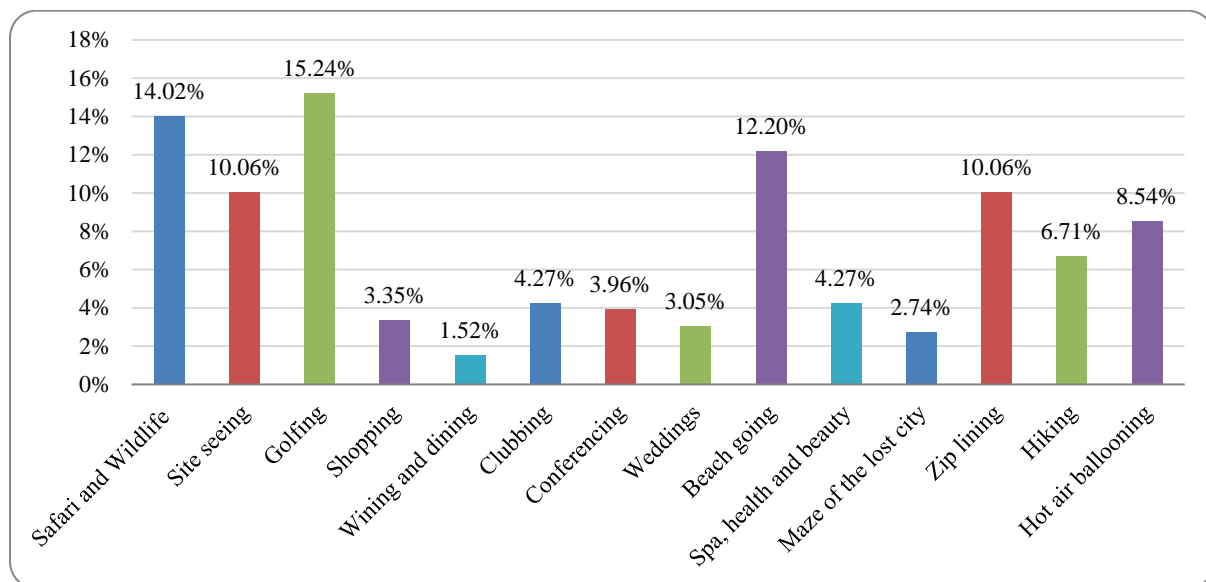


Figure 5: Hailstorm damage to the Sun City Resort activities

Other than economic losses, the Suncity hailstorm also caused non-economic losses. According to the Sun City storm recovery report, two guests slipped on the floor and were injured. They were, however, treated at the resort’s clinic and referred to nearby hospitals for further care. The hailstorms also caused anxiety, frustration, and disappointment among the guests, as illustrated by the comments below:

“#Sun City....Brought the family for a weekend break, and we are having the worst time” (tw15).

“My first experience at Sun City, y'all. I am in tears” (tw20). *“So, what happens now as I booked to arrive at Sun City on the 26th of December”* (tw22).

Negative sentiments such as the ones below have the potential to tarnish the reputation of a tourist destination.

“This is not the kind of experience one expects from such an establishment” (tw15). *“We were here on Saturday...what mayhem. People wanted to get on buses whilst half stampeding others”* (tw11)

Non-economic losses arising from hailstorms have also been identified in the literature, such as guest frustrations (Wilkins et al., 2018), safety concerns (Púčík et al., 2019; Scott et

al., 2019; Tang et al., 2019), poor destination image (Rosselló et al., 2020) and cancellation or modification of itineraries (Borsky & Unterberger, 2019; Khan et al., 2020; Ngin et al., 2020).

Preparedness and adaptation towards hailstorms

The study revealed challenges in managing hailstorms at the Sun City Resort, showing that not much was done regarding preparedness for hailstorms as a potential disaster. Figure 6 shows the challenges associated with effectively managing hailstorms at Sun City Resort. While 32.86% of the respondents could not pick any challenges, about 21.43% identified the lack of staff training on handling hailstorms as a critical challenge. This was followed by the lack of early warning systems and the lack of technical expertise.

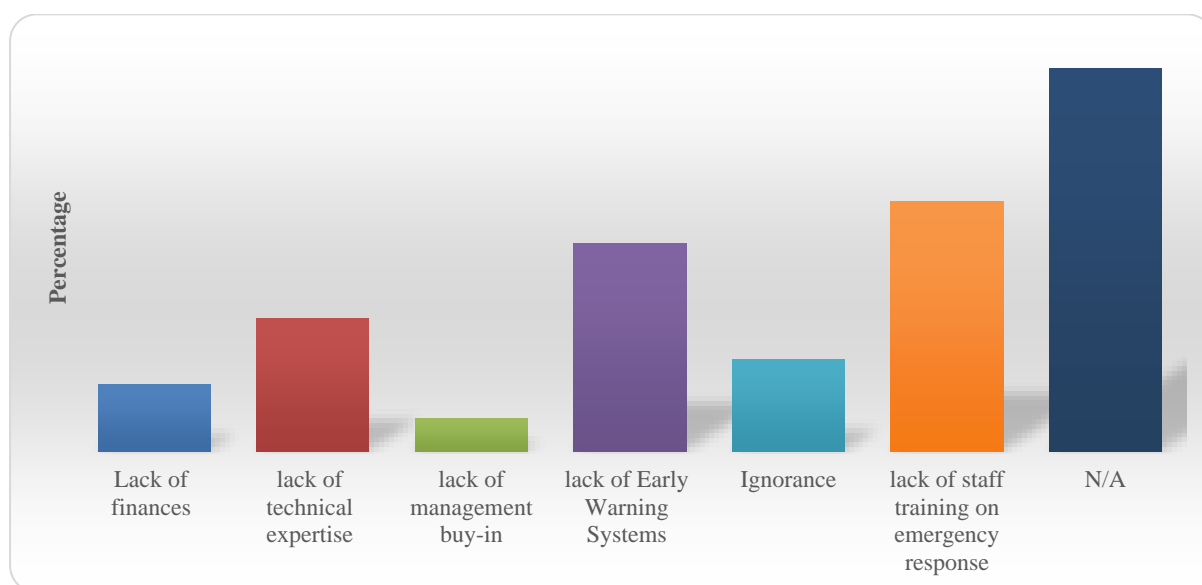


Figure 6: Challenges associated with effective response to hailstorms

From the interviews, the respondents felt it was a rare occurrence, having had no other incident since 2018. Therefore, the resort had not implemented any infrastructure changes nor put in place any other measures. Some of the infrastructure was deemed old and may not have been fortified for extreme weather events like hailstorms. One respondent remarked:

“Infrastructure is 45 years old, though with various upgrades along the way” (R1)

The significance of staff training and early warning systems have also been highlighted in extant literature. Ritchie and Jiang (2021) and Usher et al. (2020) stressed the need for training and capacity building for staff on disaster management. Neußner (2020) advocated for early warning systems that informed of the incoming threat and were user-friendly. Other preparedness and precautionary measures included visitor safety protocols and communication techniques (Ritchie & Jiang, 2021). In the long term, resilience should be integrated into destination planning (Sheppard & Williams, 2016). Lack of plans and risk management threatens tourism destinations (Tanana et al., 2019). In terms of adaptation, Tran et al. (2021) proposed that tourism resorts use hail-resistant material for construction and refurbishments. In the case of Sun City Resort, this is an intervention that needs to be considered during future renovations. Other studies suggested using green infrastructure to cushion against hail impact (Moore, 2020; Spalding et al., 2014). Hail-resistant vegetation, for instance, can act as buffer zones around golf courses.

Recovery and resilience strategies from hailstorms

The Sun City Resort responded quickly to the hailstorm aftermath, as revealed by the study.

“The cleaners tried to clean up everything quickly, especially on the outside. The inside took time” (R3). And *“a brilliant job, well done to all, from cleaners to top management.”* (tw2)

Other recovery measures from the Sun City recovery report included redeploying emergency teams, instituting clearance services, turning back guests, evacuating affected guests, constantly updating the guests and the public, and advising guests with prior bookings to check before reporting to the resort. The findings indicate that the initial recovery efforts were commendable. However, the lack of preparedness limited the degree to which the resort could respond and accommodate all the guests, leading to customer dissatisfaction. It also led to stress and extra work for staff overwhelmed by the situation. This is supported by survey data (Figure 7), where 24.11% of the respondents indicated that hailstorms led to increased workloads, increased stress (19.86%), and reduced revenue (28.37%). The remaining 27.66% of the respondents were not sure of the impact.

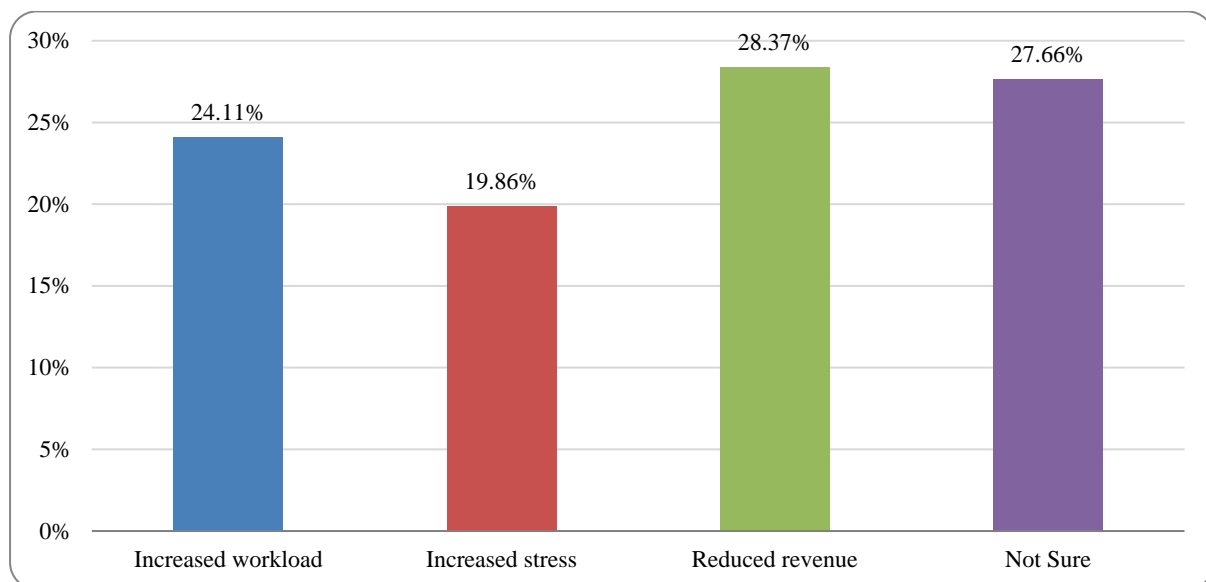


Figure 7: Impact of hailstorm on staff

It was also evident that deliberate long-term strategies are lacking. Respondents revealed that the hailstorm incident seemed to have been forgotten and no long-term plans were in place to address future incidents; *“Nothing has changed”* (R2) and *“I do not think so, there are no major infrastructure changes”* (R3). Peteley et al. (2016) concur with the sentiment that tourism resorts adopt passive and indifferent adaptation towards hailstorms. As advanced by Spetch (2008), tourism destinations treat hailstorms as uncommon occurrences that do not require intervention.

It is, however, noteworthy that Sun City Resort has embraced some green practices, which mitigate carbon emissions that, in the long run, cause climate change. Climate change has been known to increase the occurrences and intensity of hailstorms (Hughes et al., 2020; Laviola et al., 2022). These green practices include the adoption of energy-saving measures and solar energy. These practices significantly reduce the carbon footprint within tourism destinations, as evidenced by one of the interview respondents who said, *“With the solar project, we have significantly reduced energy consumption”* (R6). There are also plans to reduce the resort's carbon footprint by embracing electric vehicles, as most of the transportation

at the resort uses diesel fuel. The following statement exemplifies this, “*We are looking at the transition to electric vehicles. Currently having only four electric vehicles. All other shuttles are diesel, all buses are diesel, some of the golf carts are diesel*” (R6). The switch to electric transportation, primarily powered by renewable energy such as solar, would be a sound strategy that will create resilience in the long run. As Markowska et al. (2023) and Westin et al. (2018) proposed, electric vehicles are a promising mitigator of climate change in tourism.

Conclusions and implications

In conclusion, the study demonstrates that hailstorms are sudden on-set events that cause economic and non-economic losses to tourism destinations. The ensuing damage disrupts visitor experiences, affects tourism businesses, and, by extension, affects the surroundings. Consequently, tourism destinations require a proactive approach towards hailstorm resilience rather than a reactive approach. This has destination management implications in the form of both short-term and long-term strategies. Short-term strategies address response and recovery. They include investing in technology-enhanced early warning systems to counter the sudden onset of hailstorms and insurance. They also include developing emergency preparedness plans, safety protocols, staff training and diversifying tourism products. Specifically, promoting weather-independent activities after a hailstorm helps fast-track recovery. Providing accurate and timely communication is also critical during and after the hailstorm occurrence.

Long-term strategies comprise adaptative and mitigation strategies that should be mainstreamed into long-term destination plans. These include investing in hailstorm-resistant infrastructure, including green infrastructure. Other than cushioning against direct hail impact, the green infrastructure will contribute to carbon mitigation in the long run. Other carbon reduction measures, such as using green energy initiatives, adopting electric vehicles, and initiating carbon offset projects, are also significant to resilience-building. Additionally, tourism destinations should forge effective stakeholder collaborations and partnerships. Destinations can leverage stakeholders' strengths to mobilise quick and effective responses during a crisis. For instance, community engagement is critical in garnering support during weather-induced crises when extra help is required in recovery efforts. Partners such as the weather services are very important in developing an early warning system.

Apart from its contribution to destination management practices, this study also has implications for theory as it contributes to knowledge on hailstorm occurrence, damage, recovery and resilience within tourism resorts. The present study was limited to Sun City Resort. Consequently, the researchers recommend that future studies cover a broader scope targeting other tourist attractions. Future studies could also be extended to examine how hailstorms affect communities and other stakeholders in tourism destinations.

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