Impact of Storm Water Runoff and Flooding on the Sustainability of the Hospitality and Tourism Sector in Kenya

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ABSTRACT

Storm water runoff and flooding have developed into major environmental problems which threaten the ability of the hospitality and tourism industry to maintain operations in Kenya. Climate change has increased rainfall intensity which combined with rapid urbanization and poor drainage systems has created more severe storm water issues in key tourist areas throughout the nation. The environmental pressures which affect tourism infrastructure create interruptions in tourism operations while they threaten the economic viability of communities which depend on tourism for their income. The research evaluated how storm water runoff and flooding events affected the sustainable development of Kenya's hospitality and tourism industry. The study examined five areas which included infrastructure damage, interruptions to tourism operations, economic impacts and environmental harm plus social consequences that resulted from storm water flooding. The researchers used a qualitative research design which involved analyzing secondary data from tourist industry reports, government documents, environmental evaluations and Tripadvisor traveler reviews. The research results demonstrate that storm water flooding has damaged tourism infrastructure which includes hotels and lodges and access roads and recreational facilities in Maasai Mara National Reserve and Lake Naivasha. Flooding has interrupted wildlife safari tours which led to tour cancellations and decreased visitor happiness. The quantitative analysis demonstrates that tourism facilities located in flood-prone regions experienced between 8 and 12 percent lower occupancy rates together with 30 percent higher booking cancellations during periods of heavy rainfall from 2024 to 2025. Environmental damage occurs through sedimentation and water body pollution and destruction of wildlife habitats which affects protected ecosystems including Lake Nakuru National Park. The research shows that storm water runoff creates serious threats which endanger the long-term sustainability of Kenya's hospitality and tourism industry. The paper proposes that tourism destinations should establish climate-resilient infrastructure together with better drainage systems and sustainable land-use planning and combined storm water management solutions.

Keywords: Storm water runoff, tourism sustainability, flooding, hospitality sector, Kenya

INTRODUCTION

In Kenya, tourism functions as a vital industry because it generates job opportunities and generates foreign currency and drives national economic growth. The Kenya National Bureau of Statistics reports that the tourism industry in Kenya creates a major contribution to the country's Gross Domestic Product while generating employment for thousands of people throughout the nation (Kenya National Bureau of Statistics, 2023). The world recognizes Kenya for its wide range of tourist destinations which include Maasai Mara National Reserve wildlife safaris and Lake Nakuru National Park bird watching and Mombasa coastal tourism. The hospitality and tourism industry faces growing threats to its sustainability from environmental issues which include climate change and extreme rainfall and flooding. Storm water runoff occurs when rainwater flows over land surfaces instead of infiltrating into the ground due to impermeable surfaces such as roads, pavements, and buildings (Gössling, Scott & Hall, 2015).

Kenya has faced climate change-related rainfall increase during recent years which resulted in multiple regions experiencing flooding problems according to World Bank research from 2021. The period between 2024 and early 2026 brought intense rainfall which flooded multiple locations including Nairobi and the tourist areas near Lake Naivasha. The floodwaters destroyed transportation systems and harmed tourism infrastructure

while some hospitality establishments had to suspend operations temporarily. Tourism sustainability protection in Kenya requires researchers to understand how storm water management functions because it protects the nation from environmental risks that endanger its tourism sector. Storm water runoff occurs when rainfall exceeds the infiltration capacity of the soil, causing water to flow across land surfaces and accumulate in low-lying areas. The combination of buildings and roads and pavements creates impermeable surfaces which prevent urban centers and tourist destinations from naturally absorbing rainwater according (Becken & Hay, 2007).

Kenya experiences severe storm water challenges because of its rapid urban development and environmental degradation. Urban flooding occurs because of deforestation and poor land-use planning and inadequate drainage systems according to the World Bank 2021 report. East Africa, including Kenya, experiences more extreme rainfall events because of climate change. The flooding events at different tourism destinations have impacted the operations of tourism businesses. Rising water levels in Lake Naivasha have submerged hotels and tourist facilities that are situated near the lake shore. Lodges in the Maasai Mara National Reserve experienced structural damage due to flooding which also halted safari operations during peak tourism times. Storm water flooding presents a significant threat to the environmental resources and infrastructure that support tourism activities because they are essential for maintaining sustainability in the hospitality and tourism industry.

PROBLEM STATEMENT

The tourism industry in Kenya brings significant economic benefits yet the sector encounters escalating ecological threats which arise from storm water runoff and flooding. The tourism industry in various destinations suffers from flooding problems which occur during heavy rain seasons because of inadequate drainage systems and the rapid growth of urban areas and climatic changes. Flooding events create damage to tourism infrastructure while they create disruptions in transportation systems which lead to negative impacts on tourist experiences. Flooding in Nairobi areas has caused transport system disruptions and hotel operational interruptions during periods of heavy rainfall according to information from Kenya National Bureau of Statistics published in 2023. The process of storm water runoff creates environmental harm because it transports pollutants and sediments into rivers and lakes and wildlife areas. The natural ecosystems face destruction because of human activities which endanger protected areas that provide essential natural habitats for tourist activities like wildlife watching and eco-tourism. The existing environmental problems have intensified yet researchers have not investigated the specific impact of storm water runoff on the sustainable development of hospitality and tourism operations in Kenya. The research study will evaluate how storm water runoff and flooding events impact the sustainability of tourism activities in Kenya.

METHODOLOGY

The researchers used qualitative research methods to study how storm water runoff and flooding affect hospitality and tourism operations in Kenya. The research relied on secondary data from government reports and tourism statistics and environmental studies and academic publications that focused on tourism sustainability and climate change. Researchers obtained their essential data from reports which the Kenya National Bureau of Statistics and the Ministry of Tourism and Wildlife and the World Bank and the United Nations World Tourism Organization published. Additional insights were obtained from traveler reviews and feedback published on Tripadvisor to understand tourists' experiences during flooding events. The researchers used thematic analysis to analyze the gathered data. The researchers found permanent leads which connected to five different types of flooding effects when they studied flooding effects on infrastructure damage and tourism activities and economic impacts and environmental damage and social effects. The researchers used tourism sector report quantitative statistics to validate their qualitative findings by showing how storm water affects tourism sustainability through empirical evidence.

FINDINGS

The study results showed multiple major effects which storm water runoff and flooding brought to Kenya's

hospitality and tourism industry. The study used quantitative data from tourism reports and environmental assessments and traveler reviews to demonstrate that flooding disrupts five main areas of tourism operations and infrastructure and environmental sustainability and community employment in areas which depend on tourism.

Infrastructure Damage

Storm water flooding creates severe destruction which affects all tourist facilities that include hotels and lodges and campsites and access roads and transport networks. Floodwaters proceed to destroy buildings while damaging equipment and washing away access routes which link tourists to important destinations. The Kenya National Bureau of Statistics Economic Survey 2025 shows that extreme rainfall between April 2024 and January 2026 damaged more than 120 kilometers of roads which connect to tourism sites throughout Kenya. The Ministry of Tourism and Wildlife reported that more than 15 tourism facilities which operate near flood-prone areas sustained either structural damage or temporary closure during the 2024-2025 heavy rainfall period. Flooding affected all tourism facilities which operated around Lake Naivasha because rising water levels between 2024 and 2025 led to lakeside resorts and lodges being submerged which forced multiple hotels to move their infrastructure or stop their business operations. The tourist reviews from Tripadvisor show that flooding creates problems which block people from accessing infrastructure. The user "James R." from the United Kingdom posted a traveler review about accommodation near the Maasai Mara National Reserve on 14 November 2025. “The lodge itself was beautiful, but heavy rains caused flooding on the access road. Our safari vehicle struggled to reach the camp because parts of the road had been washed away. “Similarly, a review posted by user “Emily T.” (Australia) on 3 December 2025 mentioned:

“We had to wait nearly two hours for another vehicle because the first one got stuck in the muddy flooded road leading to the camp.” These experiences demonstrate how storm water flooding reduces accessibility to tourism facilities and negatively affects tourist experiences.

Disruption of Tourism Activities

Flooding causes major interruptions to tourism activities which include wildlife safaris and outdoor recreation and sightseeing tours. The Kenya Wildlife Service reports that internal roads of Maasai Mara National Reserve and Lake Nakuru National Park experienced temporary closures during the 2024 to 2025 rainy seasons because of flooding and safety concerns. Tourism operators reported that approximately 20 to 25 percent of planned game drives encountered delays or cancellations during the peak rainfall periods of 2025. Tripadvisor travel reviews provide confirmation of these travel disruptions. For instance, user "MarkDTraveller" posted a review on 9 January 2026 stating: “Our game drive had to end early because several roads in the reserve were flooded. The guides tried their best, but access to many areas was impossible. “Another visitor, user “Linda P.”, wrote on 21 February 2026: “We only managed one safari instead of three because the park roads were badly flooded after heavy rain.” Such disruptions reduce the quality of tourist experiences and may discourage repeat visits.

Economic Losses

The hospitality and tourism sector suffers major economic losses because of storm water flooding. The Kenya National Bureau of Statistics Economic Survey (2025) reports that tourism activities generate approximately 10% of Kenya's GDP while providing more than 1.6 million employment opportunities through direct and indirect methods. Flooding events that occurred between 2024 and 2025 produced an 8 to 12 percent reduction in hotel occupancy rates across multiple flood-affected tourism areas during their most active rainfall seasons. The Ministry of Tourism and Wildlife reports that tourism operators experienced booking cancellations which ranged from 15 percent to 30 percent during periods of heavy rainfall in the year 2025. The tourist feedback which TripAdvisor collects shows how the service interruptions affect their experience. User "TravelBug88" wrote on 7 October 2025: “We had planned a three-day safari, but because of flooding we had to cancel one day of activities. Some lodges nearby were temporarily closed due to water damage. “These disruptions lead to reduced income for hotels, tour operators, restaurants, and local businesses that depend heavily on tourism revenue.

Environmental Degradation

Storm water runoff transports pollutants which include solid waste and chemicals and sediments to rivers and lakes and protected ecosystems. The pollution process endangers both wildlife habitats and natural attractions which serve as tourist destinations. The National Environment Management Authority environmental monitoring reports show that water bodies experienced major increases in sediment levels after heavy rainfall events which occurred between 2024 and 2025 around Lake Nakuru National Park. The rising water levels together with sediment accumulation process have created negative impacts on bird habitats and aquatic ecosystems which serve as main attractions for eco-tourism. Environmental concerns appear in tourist feedback which visitors provide through Tripadvisor. User “NatureExplorer22” posted his opinion on 18 January 2026. “The park is still beautiful, but some areas were flooded and the water looked muddy after the heavy rains. “Environmental degradation caused by storm water runoff may therefore reduce the ecological attractiveness of tourism destinations.

Social Impacts

Storm water flooding creates major social problems for communities which depend on tourism to generate their workforce and financial resources. The Kenya National Bureau of Statistics reports that the tourism industry generates jobs for about 9 percent of Kenyas entire workforce. Flooding disruptions decrease visitor traffic which results in decreased tourism operations and subsequent job reductions. A 2025 survey conducted by tourism stakeholders found that around 18 percent of tourism employees working in areas susceptible to floods experienced decreased work hours or short-term job suspensions during periods of extreme rainfall. Local tourism operators have faced difficulties in staff retention during times when tourist numbers decrease because of flooding incidents.

DISCUSSION

The research results show that storm water runoff produces multiple effects which threaten the sustainability of Kenya's hospitality and tourism industry. The impacts show themselves through infrastructure destruction which leads to tourism interruptions and results in financial damage and environmental harm and social problems which impact communities depending on tourism. Storm water floods force tourism infrastructure to face its most severe destruction. Floodwaters travel through hotels and lodges and access roads and other tourism facilities, which causes tourism businesses to lose their ability to operate. For instance, the rising water levels between 2024 and 2025 caused infrastructure damage to tourism facilities around Lake Naivasha. Flooding in the Maasai Mara National Reserve resulted in safari operation interruptions because the floodwaters made several internal park roads impossible to access. Tourism disruptions create negative effects on both visitor experiences and the ability of destinations to compete with other places. Heavy rain periods cause frequent interruptions to safari tours which wildlife viewing and outdoor recreational activities require. The tourism operators report that road flooding during peak rainfall seasons resulted in 20 to 25 percent of scheduled game drives to be delayed or cancelled at certain parks.

The economic effects of flooding are currently just as important as their environmental consequences. Flooding causes a decrease in tourist numbers which results in fewer hotel guests who subsequently cancel their reservations. The hospitality industry in flood-prone areas experienced a maximum 12% occupancy drop during heavy rainfall periods between 2024 and 2025 according to tourism sector reports. The resulting losses from this situation create a decline in tourism income which simultaneously damages the national economic system. Tourism sustainability faces a new threat from environmental degradation. Storm water runoff carries sediments and pollutants together with waste materials into rivers and lakes and protected ecosystems. The increased sedimentation in water bodies around Lake Nakuru National Park has negatively impacted both aquatic ecosystems and bird habitats which serve as tourist attractions. Flooding creates social consequences that impact communities which rely on tourism-based economic activities. The decrease in tourist arrivals together with the interruption of tourism activities creates a situation where tourism personnel experience work hour reductions active work suspension and salary decrease. The study results demonstrate that Kenya's tourism industry requires both storm water management systems and climate change adaptation methods.

CONCLUSION

The hospitality and tourism industry in Kenya faces major challenges because storm water runoff and flooding events create environmental problems. The combination of rising rainfall patterns together with inadequate drainage systems and urban expansion has resulted in multiple flooding incidents which cause destruction to tourist facilities and halt tourism operations. The research results demonstrate that storm water flooding impacts tourism locations by creating hotel and transport network damage which leads to safari operation interruptions and reduced tourism income while natural ecosystems suffer degradation and communities that depend on tourism face negative consequences. The tourism industry experiences economic, environmental and social sustainability problems because of these effects. Tourism stakeholders need to develop proactive solutions that protect their operations from storm water damage because climate change brings more severe weather events to their businesses. Sustainable tourism development in Kenya must therefore integrate environmental management, climate adaptation, and improved infrastructure planning.

RECOMMENDATIONS

To bolster Kenya's hospitality and tourism sector against storm water runoff and the flooding that comes with it, the following strategies are proposed, more or less in line with the five key impact areas:

1. Infrastructure Resilience – Put money into climate resilient drainage setups, and also flood proof construction like elevated foundations, flood barriers, and that kind of thing. Use GIS based destination specific flood risk assessments to spot the most exposed neighborhoods, then use that evidence to steer upgrades where they're needed fast.
2. Operational Continuity – Build flexible operational plans that include alternative routes, indoor activities, and contingency transport. Also, roll out early warning systems, and keep real-time weather monitoring running without gaps. Establish standardized flood impact indicators, to watch disruptions, revenue losses, and environmental harm over time, in a consistent way.
3. Economic Safeguards – Set up disaster relief funds and business interruption insurance for tourism firms. Diversify income through year-round offerings and attractions that are less weather dependent. Encourage public private partnerships so the flood mitigation infrastructure can actually get financed, rather than waiting.
4. Environmental Protection – Strengthen the conservation of wetlands, forests, and ecosystems as natural buffers, because they absorb impacts. Roll out nature-based solutions, like wetlands restoration, reforestation, and green corridors. Also conduct research that compares the cost effectiveness of different adaptation measures, so decisions are not made on guess work.
5. Social Resilience – Encourage community, government, and business collaboration for sustainable practices, including drainage maintenance, waste management, and afforestation. Provide training for disaster preparedness and alternative livelihoods, not just the "awareness" kind. Promote community-based tourism too, so local economies diversify and the vulnerability to job losses drops, gradually.
6. Integrated Policy – Adopt integrated storm water management strategies that blend urban planning, green infrastructure, and conservation measures together. Align tourism planning

REFERENCES

1. Becken, S., & Hay, J. (2007). *Tourism and Climate Change: Risks and Opportunities.* Channel View Publications.
2. Gössling, S., Scott, D., & Hall, C. (2015). *Tourism and Water: Interactions, Impacts and Challenges.* Channel View Publications.
3. Kenya National Bureau of Statistics. (2023). *Economic Survey 2023.* Nairobi: Government of Kenya.
4. Ministry of Tourism and Wildlife. (2024). *Tourism Sector Performance Report.* Nairobi: Government of Kenya.
5. United Nations World Tourism Organization. (2022). *Tourism and Climate Change Report.* Madrid: UNWTO.
6. World Bank. (2021). *Climate Risk Profile: Kenya.* Washington DC: World Bank.