

ENHANCING DISASTER RESILIENCE IN TOURISM INFRASTRUCTURE: INTEGRATING CONSTRUCTION MANAGEMENT PRACTICES IN FLOOD-PRONE REGIONS – A CASE STUDY OF GILGIT-BALTISTAN, PAKISTAN

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Abstract

This study investigates the integration of construction management practices to enhance disaster resilience in tourism infrastructure, focusing on flood-prone regions. Using Gilgit-Baltistan, Pakistan, as a case study, the research explores how construction management principles contribute to mitigating the impact of floods on tourism infrastructure. The relevant data was gathered from the floods-affected region in G-B in 2022 and 2023. The case study analysis revealed the major disaster resilience initiatives taken by the government of Pakistan for the restoration of G-B after flood events. Moreover, the semi-structured interviews with key stakeholders from the construction and tourism departments led to valuable insights into disaster management (DM) in the region. The interview questions were designed to investigate the response of primary stakeholders during the “pre-event, prodromal, emergency, intermediate, long-term recovery, and resolution phases” of the DM. Through qualitative analysis, the study examines the preparedness, response, and recovery strategies employed by tourism stakeholders and construction professionals following flood events. Insights are gathered into the role of sustainable construction practices, stakeholder collaboration, and infrastructure resilience in minimizing vulnerabilities and facilitating post-disaster reconstruction. Findings contribute to advancing understanding of the interplay between construction management and disaster resilience in the tourism sector, with implications for policy, practice, and future research.

Keywords: *Disaster management, disaster resilience, floods, construction management, tourism infrastructure, Gilgit Baltistan.*

1. INTRODUCTION

The rapid urbanisation and ecological challenges have introduced several hurdles in Pakistan’s capacity to ensure effective flood disaster management (DM), which has enhanced the country’s vulnerability to floods (Rehman et al., 2019). Floods are regarded as the primary instrument of ecological deterioration in a region, affecting the socio-economic landscape of the region. This results in the worsening of public health, and damage to the environment (Parida, 2020). Researchers have reported that the average global temperature has been rising since 1980. The global temperature in 2022 was 0.76 °C higher than the average temperature between 1880 and 2022 (NCEI, 2022). As a result, it has led to the rapid melting of glaciers, and the generation of glacial lakes, which lead to several natural hazards, including “Glacial Lake Outburst Floods (GLOFs)”. The GLOFs cause a large volume of water to enter small river channels, leading to mass destruction (Mohanty & Maiti, 2021). Global warming is regarded as the only cause behind GLOFS, which has led to a huge melting of glaciers in the Hindukush-Karakoram-Himalaya regions of Pakistan. This region contributes more than half of the entire water flow in the Indus River System. Moreover, the sudden failures or absence of dams is another leading cause of GLOFs (Ahmad et al., 2022). Gilgit-Baltistan is a mountainous region located in the northern part of Pakistan and inhabits more than 2 million people. The region has been at the forefront of climate change hazards, such as floods (Ali et al., 2021). Flood disasters in the region between 2015 and 2022 have harmed the economy of the local community to a great extent. The consistent flood disasters have caused significant changes in the region’s economic and social landscapes. The local communities have

taken serious hits in terms of their livelihoods and well-being (Ali et al., 2023). The 2022 floods alone took the lives of 1800 people affected 33 million citizens and caused the internal displacement of 8 million people (Aljazeera, 2024). In 2023, the country was hit by another wave of recurrent floods, which was a continuation of the havoc caused in the previous year. Even after the year of 2022 floods, more than 1.5 people remained internally displaced (Akbar, 2023).

The government of Pakistan has initiated various DM programs to rehabilitate the flood-affected regions, including G-B. However, climate change concerns in the country remain unanswered, which leads to the ineffectiveness of DM for long-term risk prevention. Moreover, it is necessary to examine the role of multiple stakeholders in the improvement of flood risk management (Shah et al., 2023). Therefore, G-B is a primary tourist attraction for both domestic and foreign tourists. However, the recurrent flood events have damaged the tourism industry in the region (Jehan et al., 2023). Floods have destroyed the primary infrastructure in the region, including water channels and houses (Aslam et al., 2023). The recurrent floods damaged more than 600 houses and destroyed 52 bridges. Among public infrastructure, 22 powerhouses, approximately 50 roads, 500 irrigation units, and 78 water supply lines have been severely damaged (Times, 2022). Therefore, the present study seeks to examine the role of both the construction sector and the tourism industry in building the infrastructure resilience of flood-prone areas in G-B. The study seeks to fulfil the following objectives:

- To investigate the effectiveness of construction management practices in enhancing disaster resilience within tourism infrastructure located in flood-prone regions.
- To explore the strategies employed by tourism stakeholders and construction professionals for the mitigation of the impact of floods on tourism infrastructure.
- To identify the role of sustainable construction practices and stakeholder collaboration in minimizing vulnerabilities and facilitating post-disaster reconstruction in flood-affected areas.

Based on the disaster-management frameworks of Faulkner (2013) and Ritchie (2004), this study seeks to explore the interaction between the tourism and construction departments for effective disaster management in G-B across “pre-event, prodromal, emergency, intermediate, long-term recovery, and resolution phases”. Various studies have explored disaster management through the integration of the frameworks of Faulkner (2013) and Ritchie (2004), particularly in the recovery of tourism infrastructure (Agustan & Kausar, 2019; Ritchie & Jiang, 2019). However, the present study is novel and unique due to its focus on post-flood disaster management and infrastructure resilience in G-B, a region that has yet to be explored within the aforementioned DM frameworks. The study fills the existing gap in the DM literature concerning the DM in G-B after the havoc of the 2022 and 2023 floods by looking at the perspectives of the relevant stakeholders.

2. LITERATURE REVIEW

2.1 Disaster Management Perspective

Disaster management holds significant importance in managing disasters effectively and drive strategies for recovery and resilience in the targeted regions (Sawalha, 2020). It is a multidisciplinary approach that focuses on designing strategies to reduce the impact of disasters on tourists, infrastructures, and the community. It involves efforts for recovery and response to disasters which can be natural (earthquakes, floods, cyclones etc.) as well as man-made disasters like terrorist attacks, road accidents, environmental pollution etc. (Teh & Khan, 2021). According to (Khan et al., 2023), disaster management involves various stages including risk assessment in which the possible risk is assessed and training is provided to staff in order to tackle any uncertain situation. Governments also invest in raising awareness in general public so that they can take measures at their own ends as well. The response to a disaster needs to be quick enough to save the lives of the people and emergency services should be prepared for such situations. According to (Demiroz & Haase, 2020), recovery stage in disaster management also holds a significant place as it helps in restoring livelihood and rebuilding

infrastructure that has been affected by disasters. In doing so collaborative efforts are needed among various disciplines in order to design an approach to provide solutions for various problems as not any single body can do on its own without any collaboration. This perspective is not limited to any region rather it is a global perspective because disasters are not limited to any borders so collective efforts between international organizations in managing disasters can help in mitigating risk and recovery measures (Sawalha, 2020). Disaster management is linked with tourism and construction industries and thrives for common objective of risk assessment, resilience efforts, and design strategies that contribute towards sustainable development (Chan, Nozu, & Cheung, 2020).

2.2 Disaster Resilience on Tourism Infrastructure

Disaster resilience refers to the ability of withstanding and recovering from any uncertain events which impact people and places and proper strategies are designed in order to meet targets (Sarker et al., 2020). According to (Filimonau & De Coteau, 2020), tourism infrastructure involves transportation, accommodation, historic places etc. that needs to be facilitated in order to withstand any damage and recover from them. The strategies are made that help in minimizing cost and provide aid in recovering from loss without impacting their functions. Safeguarding the well-being of visitors is of great importance because when the tourists are aware of that they are safe when going to other places then they are more likely to revisit and invest in those regions (Jiang et al., 2021). According to (Jiang et al., 2021), the regions that work for disaster resilience enhance their reputation and build trust among tourists. By effectively managing such situations along with keeping stakeholders informed of the practices they are working on so that they can build positive reputation and among tourists, stakeholders, agencies etc. Tourism infrastructure needs to be designed in a way that it withstands the impact of natural disasters like floods, earthquakes etc. which can reduce structure damage and ensure the safety of its people. According to (Azhari et al., 2021), tourism infrastructure gains competitive advantage around the globe by showing their ability to manage risk and provide resilience after any uncertain event. Businesses try to invest in those areas which are resilient in nature so that their investment is secured and reliable. Moreover disaster resilience promote sustainable environment by designing strategies which include social, political, and economic and address the issues like reducing resources that contribute in environmental pollution and preserve the nature(Kato, 2020).

Implication of disaster resilience on tourism infrastructure comes up with its own challenges including inadequate resources and infrastructure in which there are minimum financial and human resources that can be trained to mitigate risk and perform roles for resilience (Kamarudin et al., 2020). Moreover, climate changes are also a threat to tourism infrastructure as the extreme weathers influence the structures. Although strategies can be made in order to enhance resilience including training of tourism stakeholders so that they are well prepared to face challenges and take measures to reduce their impact. Similarly warning systems can also be installed in buildings in order to inform tourists and other stakeholders of any forecasted event and so that timely response can be managed (Elms et al., 2019).

2.3 Construction Management Practices in Flood Prone Regions

Construction management practices hold significant importance in flood prone regions as they ensure that the designed infrastructures are capable of managing floods and can easily withstand the challenges. According to (Lyu et al., 2019), the stakeholders need to do proper working in order to access the sites on which the construction is taking place and prefer those sites that are away from flood areas but in most regions finding the site which is free of flood is difficult so in that case site evaluation needs to be done to design proper measures to mitigate risks. Similarly due to advancement in technology there are building materials available that are flood resistant and design the building using those advanced techniques that can help in minimizing the loss due to flood (Hemmati et al., 2020). Constructing buildings above the ground level can help in reducing flood risk as the buildings are elevated after assessing the flood levels in specific area which can be obtained from past reports and news. Moreover,

effective management of water can also help in reducing water from entering into local community and design a proper mechanism to store the water. According to (Li et al., 2019), designing proper drainage systems can help in storing water and keeping it away from developed areas hence reducing the loss. The buildings in affected areas can be provided with plans in order to response to any flood warning or the actual situation and train their workers accordingly where they can provide emergency services in evacuating the building and perform safety measures. These workers and staff can be provided with training in contacting with local agencies in any uncertain situation in order to get first response in flood emergencies (Munawar et al., 2021). Since it's a collaborative effort and no single body can solely help in eliminating the risk so the local community should be educated regarding risk assessment and how can the play their part during those situations and can be prepared for any emergency and they should be motivated to participate in voluntary programs in order to help their community in hard times as the tourists are new to the place and they are not as much aware of the situations as the local residents are (Šakić Trogrlić et al., 2019). These construction management policies can help in minimizing the impact of floods on infrastructures and contribute towards public safety.

2.4 Integration of Construction Management Practices on Tourism for Disaster Resilience

Integration of construction practices can impact tourism as well disaster resilience and it needs serious considerations which includes assessing the potential risks of disasters and the infrastructure which involves assessment of buildings, roads, and bridges. Disaster management plans are designed on the basis of this assessment (Guo et al., 2020). Tourism infrastructure can enhance disaster resilience through collaborating with government agencies and private sector as well as international organizations in order to drive resources and expertise of people for construction of disaster prone buildings and promoting tourism in those areas and managers of the buildings can facilitate those initiatives which are ultimately helping them achieve their goal (Saja et al., 2019). Moreover, implementation of proactive maintenance programs and inspections helps in monitoring the infrastructure and safety plans. Managers of the building overview the maintenance practices and repair the structure where needed and not only this the up gradation of technology and systems can result in effective management of infrastructure and contributes in the provision of best practices to the tourists (Stanitsas et al., 2021). According to (Nowogońska & Mielczarek, 2021), the constructed buildings which are present at tourist places need renovation with the advanced technology and material so that the risk of the disaster can be minimized and safety measures are provided for tourists and government should also make sure that the set standard are met in the region where the buildings are constructed and they should send their own team for inspection in order to avoid any risk and security of tourists is made sure. It involves designing processes and utilizing expertise to increase resilience of disasters in infrastructures and it also enhance the region's capacity to withstand any uncertain event and recover from that.

3. RESEARCH METHODOLOGY

3.1 Research Gap and Objectives

The methodological design of this study seeks to help fill the research gap in the post-disaster sustainable development literature by investigating resilience-building strategies in tourism destinations. This study examines disaster management through a case analysis of the 2022 and 2023 floods that influenced several regions in Pakistan, including G-B.

3.2 Study Area

Floods in 2022 and 2023, considered one of the deadliest floods, occurred in June 2022 and July 2023 respectively. The districts of Astore, Diamer, Ghanche, Ghizer, and Nagar, were the most affected regions in G-B (Aslam et al., 2022; Ilyas et al., 2024; Iqbal et al., 2023; Moazzam et al., 2022). The locations of these districts are indicated by the map shown in Figure 3.1.

Figure 3.1: Administrative districts in G-B

Source: (OCHA, 2022)

The 2022 floods alone took the lives of 22 people belonging to the G-B region (Kawoosa et al., 2022).

3.3 Research Design

This study is exploratory and has adopted a qualitative design and a case study approach to gather data related to disaster management and destination rehabilitation. The data for case study analysis was collected from published secondary resources, including journal articles, newspaper articles, and reports published by “National Disaster Management Authority (NDMA)”. Face-to-face interviews with construction professionals and local tourism stakeholders’ experience in the 2022 and 2023 floods in G-B provided their perspectives on the mitigation strategies used to rehabilitate the region. The interview questions were based on the frameworks of disaster management developed by Faulkner (2013) and Ritchie (2004) as shown in Table 3.1. The framework has previously been adopted in several existing studies (Chan, Nozu, & Cheung, 2020; Chan, Nozu, & Zhou, 2020; Filimonau & De Coteau, 2020).

Table 3.1: Interview Questions

Phase in disaster process	Anatomy of a disaster	Questions
Pre-event	Actions taken to prevent the disaster	What preventive measures and strategies are typically implemented in your region to mitigate the risk of flooding and protect tourism infrastructure?
Prodromal	A disaster is about to take place	How do construction professionals and tourism stakeholders prepare for an impending flood event in terms of securing the tourism infrastructure?
Emergency	Disaster hits and needed actions	What immediate actions are taken by construction professionals and tourism stakeholders once a flood disaster occurs in G-B?
Intermediate	Strategies to fulfil short-term needs;	How might construction professionals and tourism stakeholders contribute to the short-term

	immediate restoring actions	restoration of G-B after a flood disaster? Which party is the most important?
Long-term recovery	Long-term rehabilitation.	What long-term rehabilitation efforts are undertaken for rebuilding the tourism infrastructure following a flood disaster in G-B?
Resolution	post-mortem Normalcy restored; improvement in conditions	How do things in G-B things turn to normal after a flood disaster and what improvements are made to enhance the resilience of the region against flood disaster?

3.4 Data Collection Process and Analysis

The primary data collection process consisted of interviewing the respondents from the fields of disaster management, civil engineering, architecture, and tourism management.

Table 3.2. shows the profile of each respondent.

Table 3.2: Profiles of respondents

Interviewee Codes	Field	Position/Title	Age	Gender	Experience
A1	Disaster Management	Disaster Management Specialist	45	Male	15
A2	Civil Engineering	Senior Civil Engineer	40	Male	12
A3	Civil Engineering	Structural Engineer	38	Female	10
A4	Architecture	Principal Architect	42	Male	15
A5	Tourism	Tourism Development Specialist	35	Female	8
A6	Disaster Management	Disaster Recovery Coordinator	50	Male	20
A7	Civil Engineering	Construction Manager	48	Male	18
A8	Architecture	Urban Planner	37	Female	10
A9	Tourism	Destination Manager	41	Male	14
A10	Disaster Management	Emergency Response Planner	43	Female	12

Primary data was analysed based on the thematic analysis of Braun and Clarke (2012) as shown in Figure 3.2.



Figure 3.2: Phases of thematic analysis

4. RESULTS

4.2.1. Findings from the Case Study Analysis

Various national and international organisations have been introducing initiatives to build flood resilience in the infrastructure of G-B for the last few years. The “Ministry of Climate Change and Environmental Coordination” (MOCC) in Pakistan has a “Glacial Lake Outburst Flood”, under which, the “Gilgit-Baltistan Environmental Protection Agency (GB-EPA)” has been playing an active role in implementing a robust climate change strategy and the relevant action plan in G-B (GBEPA, 2023). The MOCC scaled up its “Reducing Risks and Vulnerabilities from GLOF in Northern Pakistan” (GLOF-I) project by introducing the continuation of this project, GLOF-II (MOCC, 2023). The project has four objectives regarding the resilience of climate change infrastructure as shown in Table 4.1.

Table 4.1: GLOF II objectives; Source: (GBEPA, 2023)

Objective I	“To make laws to ensure climate resilient infrastructure and create an awareness on the importance of infrastructure resilience.”
Responsibility	“Works Department”, “Local Government & Rural Development Department” (LG&RDD), “Gilgit Development Authority (GDA)”, “Skardu Development Authority” (SDA), Municipal Committees (MC’s), District Administration and Councils, Civil Society
Time frame	2023-2026
Strategy	Implementing codes and laws and running public awareness campaigns to raise awareness on infrastructure resilience.
Objective II	“To enhance climate resilience of existing public and private sector building infrastructure.”
Responsibility	Works and Education Department, GB
Time frame	2023-2030
Strategy	Ensuring the climate resilience of the existing public, private, NGO, and community infrastructure through upgradation.
Objective III	“To undertake GB’s hazard zoning to identify low-risk areas for future use.”
Responsibility	Works Department, LG&RD Department, GBDMA, Public, NGOs, Private departments, Research institutes
Time frame	2023-2033
Strategy	Hazard mapping, zoning, and identification of the areas with low risk
Objective IV	“To promote the construction of climate resilient infrastructure and housing in rural areas.”
Responsibility	LG&RD Department

Time frame	2023-2033
Strategy	Encouraging construction of climate-resilient public and private infrastructure in public areas prone to climate hazards like floods.

GLOF II is also responsible for effective disaster management in G-B. It has advised the “Gilgit-Baltistan Disaster Management Authority (GBDMA)” to implement action plans to raise public awareness regarding effective disaster management. It includes awareness campaigns for vulnerable regions on mass media to strengthen the collaboration between the stakeholders involved. The department is also responsible for improving the mechanisms of flash floods and GLOF response to reduce the related damage (GBEPA, 2023). In addition, early warning systems were also introduced in G-B to enhance the region’s resilience to floods (Nagri, 2023). Moreover, according to the “Development of National Flood Protection Plan-IV” (NFPP-IV), the proposed structural interventions for flood management in G-B include the construction of flood management bodies across hilly torrents, establishing measures for GLOF, and allocation of appropriate funds for supporting restoration activities after floods and for procuring flood management equipment. The government has allocated Rs 10000 million to the NFPP-IV for the identification of vulnerable areas in G-B and other flood-prone regions. Moreover, Rs 1,380 million has been allocated for the training of flood management staff (WCAP, 2015). After the havoc caused by the floods of 2022, the GBDMA launched the “Disaster Risk Management Plan (DRMP)” 2023 to inform the relevant stakeholders about the significance and urgency of disaster risk management in G-B. The plan was supported by “The International Centre for Integrated Mountain Development” (ICIMOD) and the “World Wildlife Fund-Pakistan” (ICIMOD, 2023). In 2022, the government introduced the “Resilient Recovery, Rehabilitation, and Reconstruction Framework (4RF)” to rehabilitate and reconstruct disaster-hit areas (Rehmat et al., 2023). Moreover, the rehabilitation of flood-hit areas in G-B was crucial to restoring tourism in the region. For instance, Bubar village in District Ghizer, previously damaged by floods in 2022 was rehabilitated in 2023. 62 new houses were constructed for the rehabilitation of the community by incorporating smart and sustainable infrastructure to enhance the region’s resilience to floods in future (Dawn, 2023).

4.2.2. Findings from the Interviews

4.2.2.1. Stakeholders in the Disaster-Management Process

The pre-disaster phase entails a period concerned with preventing the impact of disaster and mitigation planning, which is regarded as more significant than the post-disaster recovery. The interviewees believe that disaster preparedness in G-B regarding floods includes actions, such as sharing experiences (A1), maintaining the supply of electricity and communication channels, drill exercises, and evacuation demonstrations (A2, A3, A4). Moreover, it also includes the provision of authentic and timely information to tourists (A5). In addition, the tourism development specialists introduce plans to reduce the reliance of tourism on flood-prone regions by promoting various tourist destinations, which includes the development of tourism infrastructure in non-hazardous regions (A6). Interviewees also associated much significance with the role of awareness and education in ensuring collaborative efforts between the tourism sector and the local community for building (A10). However, initiating these efforts would require more robust financial support from the government of Pakistan (A1, A4).

For the prodromal phase, the construction professional and tourism specialists were of the view that the flood-prone regions in G-B required material support and excavation equipment for securing critical tourism destinations and excavating people from flood-prone regions (A2, A9). The construction professionals have an even bigger responsibility as they have to secure vulnerable structures and collaborate with the flood response team in the area (A3, A7). Construction professionals also inspect the tourism infrastructure for their potential vulnerabilities and collaborate with the tourism sector to ensure the security of the infrastructure as well as that of the visitors (A4, A5, A9). On entering the

emergency phase, the tourism activities in G-B were completely suspended and the attention of the stakeholders was primarily directed towards locating and evacuating people for implementing the rescue operations. The tourism industry in G-B had to take a serious hit due to the floods in 2022 and 2023. The factors that emerged as significant determinants of emergency in G-B during floods were the infrastructure resistance to floods (A5), the availability of information (A7), and substantial communication channels (A9).

After the stabilisation of the natural disaster, the destination reaches the intermediate phase, where all relevant stakeholders use their capacities to implement some solutions and respond to deal with the short-term recovery of flood-hit regions (A6, A8). In the most affected districts, including Diamer and Ghizer, the GBDMA and GBEPa played a significant role in providing short-term recovery support (A1, A9). The rehabilitation of the region was the primary goal of the stakeholders involved. Most of the actors involved prioritised the recovery of tourism destinations on a priority basis to sustain tourism in the region (A5, A9, A10). Moving towards, the long-term recovery phase, the interviewees mentioned the long-term actions taken by MOCC and GBEPa. It included building infrastructure resilience and strategic planning for restoring tourism in the region (A2, A4, A9, A10). The interviewees emphasised redesigning tourism infrastructure to enhance their flood resistance and introducing resilient construction mechanisms (A6, A8). Moreover, interviewees also highlighted the potential of sustainable tourism development for promoting environmental restoration as well as the recovery of tourism infrastructure (A5, A10). However, most of the infrastructure in G-B remains in need of recovery. Nonetheless, the tourism sector has to be restored as G-B is a significant tourist attraction in Pakistan (A5, A9). More than 11000 climbers from foreign countries visited G-B in the summer season of 2023 (Nagri, 2024). Interviewees also suggested that a more robust connection and collaboration between the tourism sector, construction specialists, disaster management department, and civil society would help in a speedy recovery of the region (A2, A8, A10). Finally, the resolution phase lies beyond the flood recovery of G-B. Some of the interviewees thought that the resolution phase was just a “resumed” pre-flood phase in the region (A4, A7, A9, A10). However, some of the interviewees highlighted the governmental and international initiatives to enhance sustainable practices and flood resilience in the region (A3, A8). GLOF II was praised for its comprehensive focus on flood resilience and resistance in G-B (A1, A6). Interviewees thought that sustainable construction practices and sustainable destination management can only be made possible through effective collaboration between communities and stakeholders involved (A3, A5, A6). This will lead to an effective disaster management system and elevate the quality of tourism in the region (A1, A8).

4.2.2.2. Actions for Flood Disaster Management Process and Infrastructure Resilience

The analysis also included the examination of actions for flood disaster management as reported by stakeholders. According to the frequencies of each action, “communication, survival, and adaptability” were the most mentioned actions in the interviewees’ responses. On the other hand, “flexibility, organization’s structure, situation awareness, and human resources” were mentioned only once throughout the interviews. Moreover, participants highlighted three categories of actions starting from the earlier three phases of disaster management (e.g., “survival, learning, agility, management of vulnerabilities”), moving towards the later stages (e.g., “financial resources, disaster-management strategies, strong leadership, innovation, management strategies”). Finally, the third category included those actions, which were deemed relevant in every phase (e.g., “communication, collaboration, planning”). Based on the aforementioned classification of actions for disaster management as proposed by Filimonau and De Coteau (2020), Table 4.2 presents the actions proposed by the participants against each component.

Table 4.2: Actions for disaster resilience as reported by interviewees; Adapted from: (Filimonau & De Coteau, 2020)

Action for Flood Management in Gilgit-Baltistan	Description
Communication	Share authentic and reliable information regarding floods; disseminate governmental advice; establish public communication channels; post the latest updates on online platforms; provide the latest statistics; introduce a robust information management system; translate information foreign tourists; establish information-sharing stations (8)
Survival	Manage the accommodation of evacuees; ensure the availability of food water and first aid; ensure the safety of tourists and local community; rescue people from flood-prone regions; and provide shelter (5)
Management strategies	Exhibit effective administration; during flood response and recovery; enhance service quality; incorporate sustainable practices; and launch flood management plans (5)
Collaboration	Establish collaboration between stakeholders; design networks to connect regions for coordinating flood management activities (2)
Learning	Learn from past flood disasters; introduce emergency manuals; educate people on disaster prevention; and arrange workshops for tourist specialists (4)
Adaptability	Arrange mock drills; adapt tourism models for flood mitigation; build flood-resilient infrastructure; introduce transportation for disasters; look for safer areas for tourism; and use flood-resistant construction material. (6)
Planning	Design flood management policies and develop recovery plans based on sustainability principles (2).
Agility	Provide real-time updates and resume transport after flood (2).
Management of vulnerabilities	Ensure an effective flood resilience of infrastructure; reduce economic deterioration due to floods; provide mental health mitigation channels and promote proactive measures (4).
Financial resources	Ensure the provision of financial support to recovery programs; allocate budget for disaster management initiatives (2).
Disaster-management strategies	Introduce risk management practices; introduce flood risk and disaster mapping (2).
Strong leadership	Boost people's morale; take charge of the flood response initiatives (2).
Innovation	Introduce flood-resilient tourism infrastructure (1).
Culture	Protect the local cultural heritage and sites during floods (1).
Flexibility	Prepare flexible emergency shelters (1).
Organization's structure	Establish a flood recovery and response unit in G-B (1).
Situation awareness	Give real-time updates of on-site damage; understand the situations of tourists (2).
Human resources	Support the frontline flood recovery and response staff (1).

5. DISCUSSION

The present study aimed to understand the enhanced disaster resilience within the infrastructure of tourism. For this purpose, the researcher has also explored the integrated management of construction practices within the flood prone regions. For ensuring the flood resilience in the flood prone areas, it is

important to design effective and informed strategies. The researcher has integrated the case study methodology and the findings from interview to draw meaningful and adequate results. The case study analysis depicted the concentrated efforts by the national and internal organizations. The purpose behind this is to address the flood resilience in Gilgit Baltistan (G-B) Pakistan. Results have depicted those initiatives including “Glacial Lake Outburst Flood Projects (GLOF-II and GLOF-11)” (GBEPA, 2023) which have been led by the Ministry of climate change and environmental coordination. However, it has been implemented by the “Gilgit Baltistan Environmental Protection agency” so that the resilience of infrastructure can be enhanced along with the disaster management capabilities (GBEPA, 2023). The strategies observed in this regard involves enacting laws for the resilience of infrastructure, upgrading the existing building, hazard zoning and promotion of climate-resilient construction. Furthermore, the findings also depicted that the development of National Flood Protection Plan-IV allocates significant funds for measures of flood management along with the training programs. However, the disaster management plan supported by the international organizations including ICIMOD and WWF-Pakistan underscores the urgency of preparedness towards disaster. In this regard, the rehabilitation efforts post flood involves resilient recovery, rehabilitation, and the framework of reconstruction. In this regard, the efforts directed towards building resilience for future events of flood can be observed along with restoring the economic activities such as tourism in the region.

Findings from the interviews also highlights the comprehensive approach implemented by the stakeholders in Gilgit Baltistan (G-B) towards the management of disaster and resilience of infrastructure. The researcher has designed interview questions based on six distinct phases in the disaster process. The main actions involved in this regard includes different stages of disaster management. It involves from pre-disaster preparedness to the long-term efforts of recovery. In this regard, communication has been observed as an important factor. Research by Forsyth et al. (2023) also depicted that the communication barriers can influence the preparedness of flood or other natural calamities. It focuses on the dissemination of timely and important information by focusing on the tourists and establishing effective channels of communication. The survival measures involve accommodation, water, food, and the provision of first aid which are prioritized during emergencies. The management strategies focus on effective administration, enhancement of service and the inclusion of sustainable practices. The collaboration among stakeholders have also been highlighted for the coordinated activities of flood management. Research by Perrone et al. (2020) also depicted that collaborative efforts plays an important role in the flood risk management. Similarly, O’Donnell et al. (2018) also highlighted that stakeholder’s collaboration is important for effective flood risk management. In this regard, learning from previous disasters, adaptability through mock drills and the development of resilient infrastructure. Moreover, the strategic planning based on the principles of sustainability are also underscored as essential components. Results also depicted some important factors such as allocation of financial support, disaster mapping, strong leadership, innovative designs of infrastructure and the preservation of cultural heritage are also highlighted. Furthermore, for effective management of flood different factors such as organizational structure, flexibility, awareness of situation and support of human resource are considered as the significant elements for effective management of flood disasters (Rodríguez-Espíndola et al., 2018). In a nutshell, the findings of interview also highlighted a need for collaborative approach in which diverse stakeholders are involved. In this way, the flood resilience can be enhanced and sustainable tourism development in G-B can also be ensured.

6. Research Implications

The present study holds numerous theoretical and practical contributions. Theoretically, the present study enhances the theoretical understanding of disaster resilience within the infrastructure of tourism. For this purpose, effectiveness of construction management practices has been investigated which is a valuable addition to the growing body of literature. By assessing the role of construction management practices in fostering disaster resilience, the present study extends the existing theories of disaster

resilience. This study also enhances the theoretical understanding regarding the way proactive construction strategies can mitigate the influence of floods on the infrastructure of tourism. Moreover, the present study is also effective as it highlights the importance of sustainable construction practices in minimization of vulnerabilities and facilitation of post-disaster reconstruction. By identifying the role of sustainable construction practices as a contributor of improving disaster resilience, this research contributes to the theoretical framework of sustainable development in the disaster-prone areas. Present research also emphasizes the role of stakeholder collaboration in mitigating the impact of flood on the infrastructure of tourism. Through exploring the strategies implemented by the stakeholders of tourism and construction professionals, the importance of community engagement has been highlighted in this research. It contributes to the theoretical understanding of community resilience.

The practical implications of this study also hold equal importance. The findings of this study can inform the development of policies and processes of decision-making that aims to increase disaster resilience in the flood prone areas. In this way, this study provides practical recommendations for the policy makers, so that they can integrate measures of risk reduction due to disaster within the tourism development plans and projects of infrastructure. This study also provides practical insights regarding the construction professionals who are involved in designing, planning, and managing the projects of tourism infrastructure in the areas which are flood prone. In this way, this study provides guidelines for the implementation of resilient construction techniques and strategies. The findings of this study can also inform the capacity building initiatives and training programs that seeks to enhance the resilience of tourism infrastructure in flood prone areas. In this way, the theoretical and practical implications of this study contribute to the advancement of knowledge and practices in different aspects concerning the development of tourism infrastructure in the flood-prone regions such as Gilgit Baltistan Pakistan.

7. Research limitations and future indications

The present study also holds a few shortcomings. This study may involve a potential for bias or subjectivity within the qualitative data that have been collected through interviews. Despite of the efforts undertaken to maintain objectivity and neutrality, the interpretation of interview responses might be influenced through the perspectives and experiences of interviews. Moreover, the findings gained through interview can also potentially limit the generalizability of the findings. Utilization of secondary qualitative data from the case studies may involve challenges regarding reliability and validity of the data. This is because it might rely on the existing information that might be outdated or incomplete. Future researchers can address these limitations through the implementation of mixed-method research approach. Future researchers can conduct qualitative interviews and quantitative observations or surveys. In this way, a comprehensive understanding can be ensured regarding the effectiveness of construction management practices. In this way, the disaster resilience can be improved within the tourism infrastructure in flood prone regions. Furthermore, longitudinal studies can also be conducted to assess the long-term impact of sustainable construction practices and collaboration of stakeholders on the resilience of tourism infrastructure with the passage of time.

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