International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 12 Issue: 01 | Jan 2025 www.irjet.net p-ISSN: 2395-0072

Disaster Management and the Preservation of Cultural Heritage: A Case Study of the Nine Dome Mosque of Sultanate Mosque of Bengal.

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ABSTRACT

An important cultural and architectural legacy, the Sultanate Mosque of Bengal best captures the magnificence and historical relevance of the Bengal Sultanate era. Like many other historical sites, it is also vulnerable to the combined risk of natural disasters and manmade threats, both of which could seriously compromise its structural and cultural integrity. Heritage buildings like the Nine Dome Mosques in Bangladesh have great historical and cultural value. These sites show local identification and architectural inventiveness. Climate change makes these sites more prone to natural calamities. Among these natural calamities are floods and earthquakes; rising sea levels; tropical cyclones; super cyclones; storms; tidal surges; waterlogging; salinity; dampness; and other such occurrences. These natural disasters endanger the historical validity and structural integrity of certain sites. Successful preservation of such sites depends on combining more traditional conservation techniques with modern disaster risk management (DRM) strategies. This study explores different strategies for disaster risk reduction (DRR) and management from the Nine Dome Mosque as its central point. To increase the durability of cultural assets in sites vulnerable to natural catastrophes, this case study shows useful strategies including structural reinforcement, community participation, and technological integration. Examining past challenges and reaction plans helps one to emphasize these techniques. Among the suggestions are improvements in disaster readiness, encouragement of government funding, and use of modern technology developments in preservation projects together with traditional cultural knowledge.

Keywords: *Disaster management, Cultural heritage preservation, Nine Dome Mosque, Sultanate Mosque of Bengal. Architecture*

1. INTRODUCTION

Cultural heritage, encompassing tangible structures and intangible traditions, represents the collective identity of societies. Many of historical and cultural sites of Bangladesh showcase the nation's distinct architectural tradition and date back hundreds of years. Not just for their architectural and artistic qualities but also for their socio-cultural and spiritual value, historical sites including mosques, temples, and fortifications are priceless. Modern study has focused on the junction of disaster management and cultural preservation since growing natural and manmade hazards call for attention. Rich collection of these sites abounds in Bangladesh. Natural events as well as human-generated risks are progressively endangering the sites regarded as cultural legacy all throughout the world. Among the sites most likely to be damaged are historical buildings and monuments that not only reflect architectural skill but also cultural identity. Found in Bangladesh, the Sultanate Mosque of Bengal is a perfect illustration of a site that requires both immediate and long-term preservation effort to ensure its ongoing existence. Given that the mosque is a notable architectural landmark from the era of the Bengal Sultanate, it is quite important in the local cultural legacy. Among these is the Nine Dome Mosque, a 15th-century construction project in Bagerhat now identified as a UNESCO World Heritage site. It is also a great illustration of the Islamic architecture that was most common throughout the Bengal Sultanate.

Bangladesh's geographical location exposes it to regular natural disasters such floods, cyclones, and earthquakes, thereby helping one to better understand historical cultural interactions, architectural achievements, and religious history. These occurrences put great strain on historical sites, which can suffer from less structural integrity because of age and lack of modern reinforcements. Using the Nine Dome Mosque as a paradigm for cultural preservation in such surroundings, this article concentrates on preventative measures to shield it from natural disasters.

The mosque has great preservation difficulties considering the area's sensitivity to natural calamities including floods, cyclones, and earthquakes. Furthermore, industrialization and urbanization have put more pressure on efforts at cultural preservation, which emphasizes the need of having sensible disaster plans. In response, disaster risk

management (DRM) is becoming increasingly important for preservation of sites of cultural legacy.

Focusing on both the scientific and human sides of disaster risk management, this research investigates how DRM might help to preserve the cultural legacy of the Sultanate Mosque of Bengal. This study intends to establish a DRM framework that can be especially applied especially to the Sultanate Mosque, considering its particular vulnerabilities and cultural relevance by synthesizing lessons from several worldwide case studies.

2. OBJECTIVE

With an emphasis on the Nine Dome Mosque, this paper attempts to present a thorough review of practical methods for protecting cultural heritage buildings from natural calamities. In order to provide insights into the preservation of heritage sites in Bangladesh, the study will look at both the difficulties and suggested protection strategies.

2.1 Objectives of the Research:

- **To Identify Risks and Threats**: Analyzing both natural and anthropogenic hazards including human activity and climate change-induced disasters that affect the Nine Dome Mosque and other Sultanate-era mosques in Bengal would help one identify them.
- **To Evaluate Preservation Techniques**: Examine conventional conservation techniques and evaluate their success in maintaining architectural and cultural integrity of historical structures such as the Nine Dome Mosque.
- **To Explore Disaster Risk Reduction (DRR) Strategies**: Investigate contemporary DRM techniques, including structural reinforcements, community involvement, and technical developments, to guarantee the longevity and sustainability of cultural legacy sites: modern DRM approaches include structural reinforcements, community involvement, and technological developments
- **To Develop Integrated Preservation Plans:** Suggest a framework combining new DRM techniques with traditional knowledge to reduce hazards and improve the long-term mosque preservation.
- **To Enhance Community and Government Participation**: Emphasize the need of community involvement, official assistance, and financing in the maintenance of historical buildings and disaster control initiatives.
- **To Document and Share Best Practices**

3. LITERATURE REVIEW

- **Historical Preservation Efforts for Heritage Sites:** The United Nations Educational, Scientific, and Cultural Organization (UNESCO) has established a number of agreements and guidelines that emphasize the importance of incorporating cultural assets into disaster risk management procedures (UNESCO, 2010). The framework recommends a multidisciplinary approach in acknowledgement of the need for cooperation between conservationists, lawmakers, engineers, and local residents in order to conserve heritage treasures. Following this principle is crucial for places like Bangladesh's Nine Dome Mosque, which is constantly threatened by the existence of environmental and climatic vulnerabilities.
- **The Nine Dome Mosque:** The Nine Dome Mosque, which is an example relic from the Sultanate period in Bengal and exemplifies mediaeval Islamic architecture, is significant both historically and culturally by virtue of its presence. It is a reflection of the combination of Persian, Arabic, and indigenous architectural traditions, and it was constructed during the reign of Sultan Nasiruddin Mahmud Shah (1435–1459). A symbol of Bengal's Islamic heritage and socio-political history, the mosque is significant not only for its architectural significance but also for its role as a symbol.
- **Threats to Cultural Heritage Sites in Bangladesh:** In Bangladesh, the following are threats to cultural heritage sites: Floods, cyclones, and earthquakes are only some of the natural calamities that Bangladesh is extremely vulnerable to because of its geographical position. As a result of waterlogging, saline intrusion, and severe rains, the Nine Dome Mosque has sustained significant damage, according to the findings of scientific studies. In addition, the degradation of

the site is made worse by artificial threats, such as urbanization and tourism that is not regulated. According to a research published by ICOMOS (2018), the vulnerabilities of heritage sites can be broken down into three distinct categories: structural, environmental, and socio-economic. These issues are exemplified by the Nine Dome Mosque, which has been neglected in terms of basic maintenance and has not received adequate community awareness, both of which contribute to its degradation. The implementation of specific disaster management methods is necessary in order to address these multiple hazards.

- **Disaster Management Strategies for Heritage Preservation in Bangladesh**: The implementation of disaster management strategies for the preservation of heritage in Bangladesh Frameworks for effective disaster management incorporate mitigation, readiness, response, and recovery into their operations. When it comes to the protection of heritage sites, the first step that should be taken is risk assessment. In the case of the Nine Dome Mosque, structural evaluations that make use of non-invasive technology such as ground-penetrating radar and laser scanning can uncover problems without inflicting any additional harm. Reinforcing structures with materials that are compatible with the original fabric is a common component of post-disaster recovery techniques.

4. THE CONTEXT OF CULTURAL HERITAGE PRESERVATION IN DISASTER-PRONE AREAS

4.1 Vulnerability of the Sultanate Mosque of Bengal

The Sultanate Mosque may be found in the very center of Bengal, which is a region that had a well-deserved reputation for being particularly susceptible to natural disasters. As a result of the strong monsoon rains, the region is subject to seasonal flooding, and there is also the possibility of cyclones and storms occurring. Even though they occur less frequently, earthquakes still pose a substantial risk, particularly in areas where conventional building practices might not be adequately prepared to withstand the effects of seismic activity.

Stone and brick were one of the conventional building elements that were utilized in the construction of the Sultanate Mosque, which was completed during the Bengal Sultanate period (about the 15th century). These materials have become less durable over the course of time, particularly as a consequence of the high humidity, flooding, and temperature variations that are typical in the region. Additionally, the foundation of the mosque is susceptible to erosion as a result of water surges and soil displacement. This is because the foundation was not constructed to deal with the threats of floods that are present in modern times. In addition, the elaborate carvings and decorations that are seen on the walls and doors of the mosque are susceptible to being harmed by water infiltration and excessive moisture content, both of which can lead to degradation.

In light of these considerations, the Sultanate Mosque is not only a monument of cultural significance, but it is also one that is always in danger of being destroyed by natural calamities. Understanding these dangers and putting into action solutions that are shown to be effective in minimizing potential damage should be the primary focus of preservation efforts.

4.2 Nine Dome Mosque of Sultanate Mosque of Bengal

There are 4 nine dome mosques have been found in the coastal belt of Bangladesh. They are located in Bagerhat, Barishal, Khulna and Faridpur. The Nine Dome Mosque is an iconic structure in Bangladesh, known for its distinctive architecture featuring nine domes, slender pillars, and intricate terracotta designs. Constructed by Khan Jahan Ali in the mid-15th century, it remains a significant symbol of Islamic heritage in the region. (Table 01) (Fig 1-4)

Mosque Type	No.	Name of the Mosque	Location	Built Year
Nine Dome Mosque	01	Kasba mosque	Barisal	Mid 15th Century
	02	Masjidkar mosque	Khulna	Mid 15th Century
	03	Bagerhut mosque	Bagerhut	Mid 15th Century
	04	Shatoir mosque	Faridpur	1481

Table 01

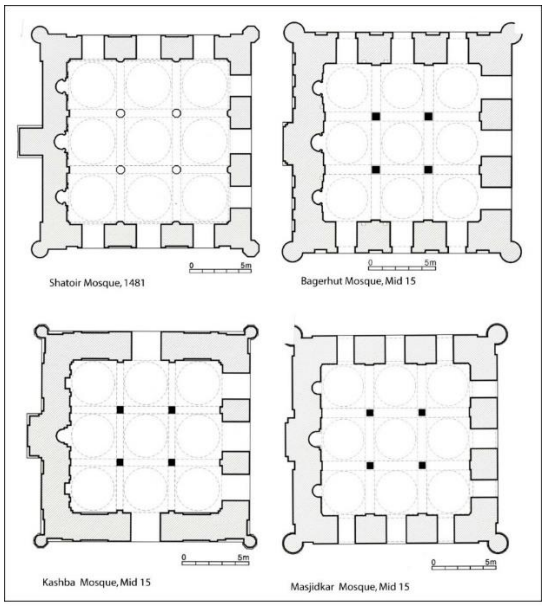

Fig-1: 4 Nine square mosques in the corpus (Hassan, 2007).

Fig-2: Masjidkar mosque, Koyra, Khulna (https://www.jagonews24.com/country/news/845631)

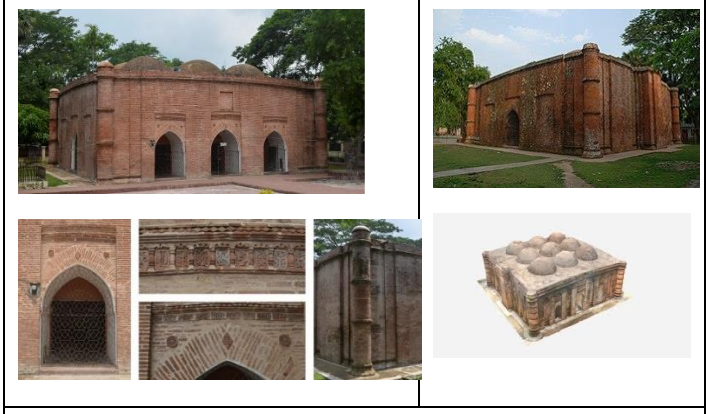

Fig-3: Kasba mosque Barishal (https://study-research.net/kasba-mosque-gauranadi/cultural-heritage/)

Fig-4: Bagerhut mosque Bagerhut (https://www.cholozai.com/location/nine-dome-mosque-bagerhat)

4.3 The Importance of Cultural Heritage Preservation

The conservation of cultural assets encompasses not only the maintenance of physical edifices but also the safeguarding of the intangible cultural identity linked to those locations. Cultural heritage sites, such as the

Sultanate Mosque, possess profound emotional and historical importance for local populations, frequently symbolizing centuries of religious, architectural, and social evolution. The destruction of these sites would result in the eradication of essential cultural narratives, artistic expressions, and traditions that link previous generations to the contemporary day.

In addition to its cultural significance, these sites substantially enhance local economies, chiefly via tourism and education. Visitors to the Sultanate Mosque come to enjoy its architectural grandeur and to establish a link with the history and culture it reflects. As thus, the preservation of the mosque serves both cultural and financial goals.

Policies for disaster management that stress the protection of cultural assets help to preserve the intangible benefits connected to these locations thereby guaranteeing their continuation in teaching, motivating, and unifying communities.

5. RISK ASSESSMENT AND PREVENTIVE MEASURES

5.1 Site-Specific Risk Assessment

It is imperative to conduct a comprehensive risk assessment of the Nine Dome Mosque in order to comprehend its distinctive vulnerabilities. This incorporates structural analysis to pinpoint vulnerable areas, including foundation issues, weathered materials, and fractures.

i. The use of digital modelling and Geographic Information Systems (GIS) to monitor structural integrity and map environmental hazards.

ii. The process of examining historical earthquake and flood data to establish risk levels and potential future hazards.

5.2 Structural Reinforcement

i. Strengthening the foundation with materials fit for the mosque's original design will help to improve resistance against water intrusion and seismic activity.

ii. Protective Roofing and Drainage Systems: Covering the mosque from strong rain and humidity with weatherproof layers Furthermore helping to avoid water gathering around the construction are better drainage systems.

iii. Applying protective coatings on terracotta designs will help to guarantee historical authenticity by shielding them from humidity and degradation.

5.3 Developing a Disaster Management Plan

The mosque has to create a site-specific disaster management plan. This covers plans for many kinds of calamities, giving building integrity and moveable objects top priority.

i. Training local communities and volunteers in emergency response to save historical sites after natural disasters helps to ensure their preservation. This includes teaching them fundamental methods for artefact stabilization and damage documentation.

ii. Frequent Drills and Emergency Plans: Organizing frequent drills with government officials, local employees, and emergency responders. Fast reaction guaranteed by clear protocols helps to reduce harm in an emergency.

5.4 Response Strategies During Disasters

Immediate Activation of Plans: In the event of a natural disaster, getting the disaster management plan into action as quickly as possible is absolutely necessary.

i. The Removal of Artefacts and Documents: If there is sufficient time, it is necessary to remove significant artefacts and historical documents that are stored within or around the mosque and relocate them to more secure locations. Action lists that are prioritized ensure that the most important items are secured first.

ii. Documentation of Damage: The process of recording the first damage through the use of fast documentation technologies such as photography or 3D scanning. This information is helpful in guiding restoration efforts after a disaster. In the event of a natural disaster, getting the disaster management plan into action as quickly as possible is absolutely necessary.

iii. Temporary Stabilization: In situations when the structure has been compromised, it is necessary to establish emergency stabilization procedures in order to prevent any more damage from occurring until a complete restoration can be carried out.

6.RECOVERY AND POST-DISASTER RESTORATION PLAN

6.1 Planning for Damage Assessment and Restoration

Following a disaster, extensive damage assessment is done to identify the required restoration strategy.

i. **Multidisciplinary Team**: Engaging architects, engineers, historians, and conservators will help to product thorough repair plan idolization the historical relevance of the mosque.
ii. **Methods of Restoring:** Restoring the mosque with conventional materials and procedures guarantees that the repairs complement its historical authenticity. Resilience must be added to balance historical truth in ethical issues.

7. CHALLENGES IN HERITAGE PROTECTION FOR THE NINE DOME MOSQUE

7.1 Funding Constraints

Getting sufficient money for the preservation of the mosque is one of the key challenges. Recommended fixes consist in:

i. Working with private companies and charities, public-private partnerships help to fund initiatives for preservation.
ii. International Grants and UNESCO help making use of help from various international agencies emphasizing the preservation of legacy including UNESCO.

7.2. Legislative and Policy Issues

The present heritage policies of Bangladesh might not sufficiently address the special requirements of DRR for cultural assets. Strengthening laws to include heritage preservation in national disaster management systems guarantees ongoing protection.

7.3 Advice for Conserving the Nine Dome Mosque

i. **Enhanced Government and Community Involvement**: For historical monuments, the government and local community should actively participate in disaster preparedness and reaction.
ii. **Advanced Training Programs:** Stabilizing artefacts and controlling structural integrity are among the skills particular to cultural site management during disaster that local officials and volunteers should learn.
iii. **Constant Monitoring and Technological Integration**: Frequent updates of disaster management strategies and application of technology to track changes in the surroundings

8. CONCLUSION

The preservation of cultural heritage sites such as the Sultanate Mosque of Bengal requires the implementation of disaster risk management as a vital component. When contemporary scientific approaches are combined with traditional conservation practices, it is possible to protect the mosque from the dangers that are posed by natural calamities while yet preserving the cultural relevance of the building. The purpose of this study is to create a comprehensive framework for disaster management that can be applied to the Sultanate Mosque. The framework was developed by drawing on lessons learnt from global case studies. The Sultanate Mosque may be conserved for future generations by conducting an efficient risk assessment, taking measures to mitigate the risk, and engaging the community. This will ensure that the mosque continues to serve as a symbol of Bengal's rich cultural history.

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