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Design Of Religious Tourism Area - Putri Ayu Dewi Sekardadu Tomb - Based on Disaster Mitigation

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Abstract

This project aims to strengthen the Putri Ayu Dewi Sekardadu tomb, a religious tourism site in Sidoarjo, Indonesia, against natural calamities, particularly flooding. The study extensively researches catastrophe mitigation and architectural enhancements for religious tourism. We evaluate flood risks, examine infrastructure, and provide design solutions to improve accessibility, amenities, attraction, and ancillary services using observational research and data analysis. The study recommends combining structural improvements with community-based techniques to mitigate disasters. The findings emphasize the importance of community engagement, disaster readiness, and sustainable design in developing resilience and improving cultural tourism. By analyzing and addressing these aspects, interested parties can promote a tourism experience that can withstand natural calamities and increase cultural value.

Keywords: *Dewi Sekardadu; Religion; Tomb; Sidoarjo; Tourism Area*

Introduction

Religious tourism can be defined as travel-related. Religious tourism is a distinct sector in the tourism business that combines faith, culture, and heritage. It involves sacred excursions and spiritual quests (B. Kim et al., 2020; Madyan et al., 2015). Pilgrimage tourism is a popular type of religious travel that attracts persons looking for spiritual satisfaction by visiting sacred locations and participating in religious ceremonies (Collins-Kreiner, 2018). East Java Province is known for its many sacred relics, making it a promising destination for religious tourism. The region's temples, tombs, and mosques draw pilgrims from many locations (Mumfangati, 2007).

Nevertheless, the Putri Ayu Dewi Sekardadu tomb in Sidoarjo is confronted with a substantial obstacle caused by frequent floods, which threatens its cultural importance and the safety of visitors (as stated in Sidoarjo District Regulation No. 6/2014). The convergence of infrastructure development and environmental dangers, such as recurring tidal inundation, presents a risk to the long-term viability of religious tourism in locations prone to flooding (Rashid, 2018). The proven impact of flooding on tourism highlights the pressing requirement for comprehensive disaster mitigation policies, particularly concerning religious pilgrimage sites (Vila et al., 2019). This study seeks to fill this void by presenting novel strategies to bolster the resilience of pilgrimage sites such as the Dewi Sekardadu tomb, guaranteeing its conservation and enduring cultural importance in the face of environmental adversities.

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Literature Review

Pilgrimage Tourism

Pilgrimage tourism is a practice firmly ingrained in society's customs, religion, and beliefs. It allows individuals and groups to undertake sacred travels to respected sites such as saints' tombs and monuments dedicated to notable leaders. These excursions aim to seek blessings, find peace, and achieve spiritual fulfilment. The unique characteristics of pilgrimage sites, such as the stone kijing buildings, cupola pavilions, and exquisite Islamic embellishments, enhance their appeal and cultural importance (Anisah et al., 2023). According to Adnyana et al. (2022), achieving a tourist destination's success depends on the interaction between its attractions, ease of access, available facilities, and additional services.

Nevertheless, pilgrimage sites' susceptibility to natural and human-caused calamities presents substantial difficulties, endangering the well-being of pilgrims and the sanctity of these revered places (McLellan, 2017; Regulation of the Head of the National Disaster Management Agency Regarding General Guidelines for Disaster Risk Assessment, 2012). This study explores the critical connection between pilgrimage tourism and disaster resilience to develop new strategies to protect these valuable sites and improve their ability to adapt to changing hazards. It recognizes the increasing risk posed by environmental catastrophes and aims to safeguard these cherished sites by enhancing their adaptive capacity.

The relationship between disaster management and pilgrimage tourism has many facets, including the inherent hazards and the techniques used to assure the safety and satisfaction of pilgrims and visitors. Pilgrimage locations frequently confront obstacles due to harsh physical and climatic circumstances, which increase the likelihood of natural calamities. Korstanje et al. (2018) state that in pilgrimage tourism, various precautions are taken to decrease the risk and impact of potential calamities on both the sites and the pilgrims' safety. While the references provided mainly cover disaster mitigation in cultural tourism contexts rather than pilgrimage tourism, they shed light on disaster preparedness measures applicable to culturally significant areas (Wahyuningtyas et al., 2019). The construction of earthquake-resistant buildings and the establishment of flood defences are examples of structural mitigation. Such precautions are crucial for pilgrimage sites, which may attract enormous numbers of pilgrims and necessitate a solid infrastructure to assure their safety. Non-structural mitigation techniques including community-based approaches, including teaching pilgrims and local populations about disaster risks and preparedness; establishing early warning systems and cultivating a culture of safety and mutual assistance.

This can include preserving and sustaining local traditions and knowledge that strengthen a community's resilience to disasters. Combining structural and non-structural mitigation is critical in pilgrimage tourism to ensure pilgrims' safety and well-being and the tangible and intangible cultural legacy of pilgrimage sites. Local communities, religious organizations, and government authorities should work together to build collaborative disaster management strategies customized to pilgrimage locations' unique demands and problems (Wahyuningtyas et al., 2019). The goal of disaster mitigation is to lower the risk of disasters by developing physical infrastructure and increasing preparedness for probable dangers (Gougelet, 2016). Some actions made to reduce disaster consequences include Creating maps of disaster-prone locations, installing warning signs in high-risk areas to alert people to potential hazards and limits, Improving the skills of reaction teams, launching awareness initiatives, creating infrastructure to mitigate disaster impacts, sharing disaster preparedness information; Teaching residents about disaster management; and Relocating individuals to safer locations.

This study demonstrates that disaster mitigation efforts can be aided by developing functional structures, particularly those related to the design of pilgrimage sites, to retain their accessibility for pilgrims. Mitigation might take two forms: Structural mitigation efforts concentrate on physical interventions to reduce disaster risks, such as improving drainage systems, restoring natural river paths, relocating communities, erecting embankments, water gates, pumps, reservoirs for water level control, tree planting, infiltration wells, following building codes in residential construction, and so on; and Non-structural mitigation refers to efforts to mitigate disaster risks using non-physical techniques, such as organizational and social strategies. For example, in a flood, the government may conduct disaster risk assessments, create zoning maps, administer disaster insurance, organize disaster education and training, and impose building limits in high-risk regions.

Methodology

This study used an observational research methodology involving direct observing occurrences without interference or manipulation. This methodology allows for gathering data in its original setting, with the goal of conducting a thorough investigation of certain situations without modifying the environment or exerting any influence on the persons being studied. Observational research encompasses a range of techniques specifically developed to systematically watch and document actions or results in their natural settings to investigate links or probable causal factors (Boyko, 2013). Researchers carefully record and examine many elements of the occurrences, including factors that impact them. The study was carried out at the burial site of Putri Ayu Dewi Sekardadu in Sidoarjo, situated within a religious tourist destination.

The study revealed several crucial characteristics that significantly impact tourism: the availability of components, the level of flood danger, accessibility, facilities, and attractions.

In order to collect data, the study assessed the vertical distance of floodwaters in the tourism area surrounding the Dewi Sekardadu tomb. The directly visible variables comprised land elevation and the buffer zone. The categorization score was obtained by employing measures and interviews per the BNPB's (2012) General Guidelines for Disaster Risk Assessment. This score assesses the actual level of susceptibility to floods.

The categorization into low, medium, and high susceptibility groups was established based on the most extreme flood level ever seen in the tomb vicinity. This categorization enables the identification of regions prone to floods based on the four essential components of tourism.

Afterwards, the study evaluated the extent of the flood damage to the infrastructure and facilities in the religious tourist sector of the Dewi Sekardadu tomb. The severity of damage was classified as mild, medium, or high based on the scoring criteria that were in line with the Flood Hazard Index (see Table 1).

Table 1. Damage to infrastructure and facilities as a parameter

Depth (m)	Class	Value	Quality (%)	Score
< 0.76	Low	1	100	0.333333
0.76 – 1.5	Middle	2	100	0.666667
> 1.5	High	3	100	1.000000

Source: BNPB, 2012

The Analytic Hierarchy Process (AHP) approach was utilized to analyze the data, beginning with a scoring system to evaluate the risk and flood damage to the tourism elements in the Dewi Sekardadu tomb area. The data analysis identified the specific tourism components most influenced by floods, affecting the frequency and severity of visitor arrivals to the religious tourist site of Dewi Sekardadu tomb.

Result and Discussion

The sanctuary is around 3 kilometers from the Sidoarjo Sea, surrounded by ponds and rivers. It encompasses a burial place that covers 893.3 square meters. Based on observational data, it

has been noticed that the tomb area has been filled in, leading to different heights around the site. The prayer room is at the most significant elevation of -0.20 cm, followed by the parking area and restroom at -0.25 cm. The grave area, pavilion, and rest area are located at -0.35 cm, while the entrance area and graveyard are at the lowest at -0.65 cm (refer to Figure 1).

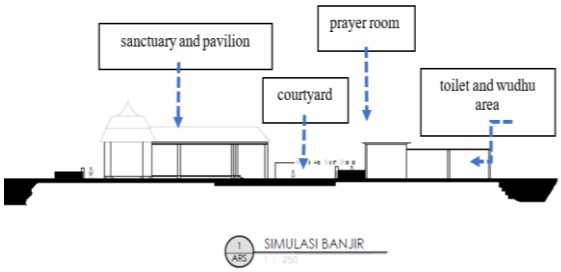
Figure 1. The location of Dewi Sekardadu's tomb
Source: Google Maps, 2023

The diverse elevations found inside the tomb region suggest an intricate topography, which could potentially affect its vulnerability to flooding. The elevated terrain in certain sections implies a level of defence against flooding, but those situated at lower altitudes may encounter heightened vulnerability. Gaining a comprehensive understanding of these elevation dynamics is essential for developing and implementing effective flood control methods.

Examining the elevation data in the tomb area yields valuable information on the site's physical features, which helps assess its susceptibility to flooding. This is consistent with prior research that emphasizes the importance of geographical characteristics in the management of flood risks (De Wrachien et al., 2011).

Figure 2. Layout Plan of the Existing Cemetery Area
Source: Author analysis, 2023

Figure 3. Flood simulation of the existing cemetery area
Source: Author analysis, 2023



In February 2023, the floodwater level reached a maximum of 73 cm, leading to a flood inundation graphic (refer to Figures 2 and 3). The flood vulnerability assessment classified the area according to the depth, which exposed different sensitivity levels (refer to Table 2). Additional examination utilizing building zones revealed certain regions with an elevated risk of flooding, with courtyards being identified as the most vulnerable (refer to Table 3). In addition, the risk of flooding is increased by the proximity to water bodies, such as rivers. Among the areas at highest risk are parking lots, bathrooms, and courtyards, as indicated in Table 4.

Table 2. Adjustment of flood vulnerability level in the cemetery area

Depth (m)	Class	Value	Quality (%)	Score
< 0.35	Low	1	100	0.333333
0.35 – 0.7	Middle	2	100	0.666667
> 0.7	High	3	100	1.000000

Source: Author analysis, 2023

Table 3. Adjustment of flood vulnerability level in the cemetery area based on building zone

No	Building Zone	Depth (m)	Grade	Score
1	Courtyard	0.73	High	1.000000
2	Tomb & Pavilion	0.00	Low	0.333333
3	Shelter	0.40	Middle	0.666667
4	Prayer Room	0.35	Middle	0.666667
5	Parking Area	0.5	Middle	0.666667

Source: Author analysis, 2023

Table 4. Classification of flood-prone levels based on distance from the river to the building at Dewi Sekardadu's tomb

No	Building Zone	Distance to Water Resource (m)	Grade
1	Courtyard	4.6	High
2	Tomb & Pavilion	16.6	Low
3	Shelter	28.1	Middle
4	Prayer Room	19.7	Middle
5	Toilet and Ablution Area	2	Middle
6	Parking Area	< 1	Middle

Source: Author analysis, 2023

The flood inundation picture and vulnerability assessment thoroughly comprehend flood danger in the tomb region. Identifying precise zones and structures susceptible to flooding makes it possible to implement focused mitigation measures. This approach maximizes the utilization of resources and efforts, ensuring the protection of vital locations.

This study's flood vulnerability assessment methodology conforms to accepted frameworks for evaluating flood risk in cultural heritage sites (UNESCO, 2018). The study provides practical insights into flood mitigation measures customized to the location's individual characteristics by classifying susceptibility according to depth and constructing zones.

The design concept of the tomb area considers the repetitive problem of flooding, specifically the periodic flooding caused by tidal surges. The focus on accessibility is centered around facilitating movement, achieved by including ramps that connect essential areas such as the prayer room, pavilion, and tomb. These ramps are specifically engineered to endure flooding circumstances. Elevated buildings, resembling stilts, are used for amenities such as restrooms and ablution areas to prevent water seepage, ensuring that they remain functional even during floods. Moreover, the repairs made to the pavilion have increased its capacity to accommodate a more significant number of worshippers, thus improving the site's appeal and maximizing the use of available space (refer to Figures 5 and 6).

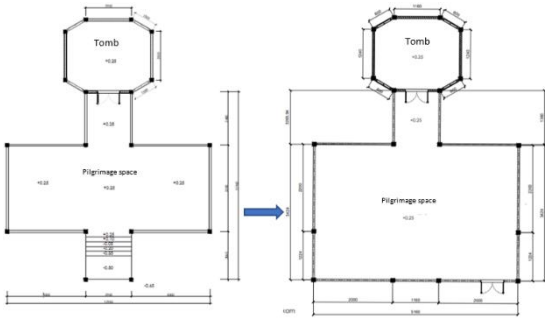
Figure 4. Flood hazard zoning based on the distance of the area to the river
Source: Author analysis, 2023

Figure 4 utilizes color-coded zones to indicate varying degrees of flood susceptibility, determined by their proximity to the river. The red zone represents regions that experience significant flooding, with water levels reaching a maximum of 70cm. The yellow zone denotes regions susceptible to flooding, where intermittent inundation occurs depending on the extent of the flood. The green zone represents regions typically unaffected by flooding and stays dry even during flood occurrences. The utilization of this zoning approach simplifies the recognition and understanding of the various degrees of susceptibility to flooding in different sections of the location, hence aiding in the development of targeted strategies to alleviate the hazards (Sowmya et al., 2015).

The proposed design interventions showcase a comprehensive strategy for mitigating floods using structural and functional aspects to improve the site's ability to withstand and recover from flooding. The architectural idea prioritizes safety and tourist experience while also recognizing the religious and cultural significance of the site. This approach

aims to promote sustainable tourism practices in areas prone to flooding.

Figure 5. Expanding plan of the Dewi Sekardadu's tomb
Source: Author analysis, 2023



The enlargement plan illustrated in Figure 5 for the tomb region of Dewi Sekardadu is a notable advancement in addressing the ongoing flooding issues encountered by the site. Expanding the pavilion/pilgrimage zone is to increase its ability to accommodate a more significant number of visitors and pilgrims, even during periods of flooding. Due to the tomb building's preservation and resistance to floods, no modifications were made. Nevertheless, repairs were carried out to enlarge the pavilion, accommodating a more significant number of worshippers comfortably.

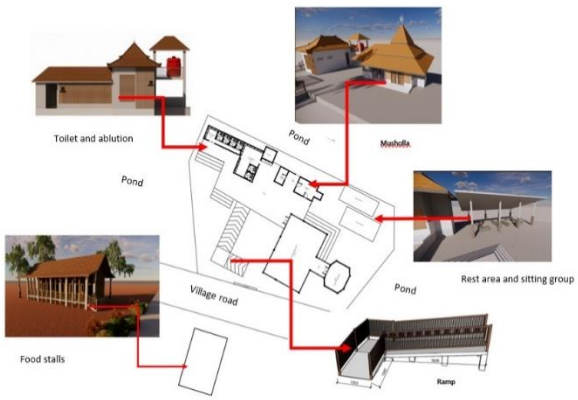
According to the original floor design and the proportions of the current building, the pavilion could hold a maximum of 110 people and had a floor surface of 70.95 square meters. The pavilion's dimensions have been enlarged to 10 by 15 meters in the altered layout, resulting in a substantial increase in capacity. It can now accommodate a maximum of 234 people, based on the standard calculation that excludes 15% of the space for circulation. The pavilion's expansion allows a more significant number of pilgrims to congregate inside, maximizing the efficient use of space and reducing the necessity of dispersing them around the courtyard, which is sometimes affected by muddy conditions or flooding.

The choice to substitute stairs with access ramps demonstrates a proactive strategy to tackle accessibility concerns, especially in instances of flooding when staircases may present safety hazards or become unattainable (K. Kim et al., 2023). Ramps offer a comprehensive and utilitarian method of transportation for all individuals, including those with disabilities or limited mobility. This modification enhances visitors' experience, fosters inclusiveness, and guarantees that the site stays accessible to a broad spectrum of individuals.

This redesign conforms to the established principles of disaster-resilient architecture, prioritizing integrating accessibility elements and flood mitigation methods into building design (Mannucci et al., 2022). The design improves the site's flood resistance by adding access ramps and expanding the pavilion. Additionally, it creates a more inclusive and welcoming environment for visitors.

Moreover, the expansion plan highlights the significance of considering the requirements of religious pilgrims and visitors while developing disaster risk management plans for cultural heritage sites. The study conducted by Wahyuningtyas et al. (2019) highlights the significance of community involvement and inclusive planning procedures in the development of efficient strategies for disaster prevention. By engaging stakeholders in the planning process and emphasizing the safety and accessibility of tourists, the expansion plan enhances the long-term viability of Dewi Sekardadu's tomb as a religious tourism attraction.

Figure 6. Design of the Dewi Sekardadu's tomb
Source: Author analysis, 2023



The use of flood-resistant design components in religious heritage sites corresponds to the emerging patterns in disaster-resilient architecture

(Mannucci et al., 2022). The proposed design idea showcases advanced methods for reducing flood hazards in cultural heritage environments by integrating traditional building techniques with current advances.

Essentially, the holistic design strategy combines flood mitigation methods with the preservation of religious and cultural importance, guaranteeing the long-term sustainability and ability to withstand the environmental difficulties of Dewi Sekardadu's tomb'.

The suggested design approach emphasizes the significance of maintaining a balance between heritage conservation and catastrophe risk reduction measures. It highlights the necessity of employing adaptable techniques to safeguard endangered cultural assets. The study's proactive approach to mitigating flood risks contributes to the broader discussion on sustainable heritage management in response to climate change impacts.

The study's findings highlight the importance of interdisciplinary collaboration in creating efficient flood mitigation methods for cultural heritage sites (ICOMOS, 2019). The proposed design concept is a collaborative effort involving architects, engineers, heritage specialists, and local communities to ensure the preservation of Dewi Sekardadu's tomb for future generations.

Conclusion

Religious tourism, specifically pilgrimage tourism, has substantial cultural and spiritual importance, drawing travellers from distant places to destinations such as the Dewi Sekardadu tomb in Sidoarjo Regency, East Java Province. Nonetheless, the ongoing issue of tidal floods threatens both the cultural importance of these monuments and the well-being of pilgrims. This study sought to tackle this problem by presenting innovative approaches to strengthen the resilience of pilgrimage sites, explicitly focusing on the Dewi Sekardadu tomb as a case study.

After an extensive analysis of existing literature, it became clear that pilgrimage sites are vulnerable to the dangers of natural disasters. This highlights the pressing requirement for well-designed disaster prevention measures that specifically address the distinctive characteristics of these cultural landmarks. The study examined structural and non-structural methods of reducing the impact of potential hazards on pilgrimage sites. It emphasized the significance of combining these approaches to protect the sites and guarantee the safety and welfare of visitors.

Using observational research techniques, the study evaluated the susceptibility of the Dewi Sekardadu tomb to flooding and identified specific places prone to flooding. The flood vulnerability assessments and damage evaluations offered valuable insights into the site's risk profile, which informed the creation of specific mitigation solutions.

The suggested architectural interventions, including raised walkways, flood-resistant buildings, and enhanced facilities, provide a comprehensive flood prevention strategy while maintaining the place's cultural and religious importance. The design concept showcases a progressive approach to catastrophe resilience in cultural heritage locations by combining traditional building techniques with modern advancements.

The study's results highlight the significance of interdisciplinary cooperation and community involvement in creating successful flood prevention plans for pilgrimage sites. By implementing the suggested design changes, everyone involved can guarantee the enduring viability and adaptability of the Dewi Sekardadu tomb, safeguarding its cultural heritage for future generations. This proactive strategy for disaster resilience safeguards rich cultural assets and promotes sustainable practices in managing heritage in response to climate change problems.

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