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Assessment of Urban Heritage Potential and Flood Resilience in the Colonial Tourism Area of Cirebon City: A Case Study of Lemahwungkuk Subdistrict

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ABSTRACT
Cirebon, a coastal city with rich colonial heritage, lacks specific regional regulations for managing strategic heritage areas, making them vulnerable to development and floods. There is no Regional Regulation that specifically regulates the management of strategic areas of cultural heritage, especially colonial heritage. The absence of this regulation makes colonial heritage areas less targeted and vulnerable to damage from development and disasters, such as floods. This study focuses on how to identify the potential of colonial heritage areas for tourism activities in *Lemahwunggu* District, Cirebon City, and support tourism that *is resilient* to flood disasters. With a *mixed-methods* approach, the analysis method used is a descriptive statistical method by presenting the results of building observation identification using *spider web* graphs, then a flood potential modeling analysis is carried out using geospatial analysis to produce a map of flood vulnerability levels. Then the two processes are triangulated through interviews with experts. The results of the analysis showed that the heritage buildings at the study location were situated in an area with a very high risk of flooding, due to the low carrying capacity of the land, characterized by low soil permeability, dense building mass, and proximity to the *Kriyan* and *Sipadu* rivers. The results of the observation of the physical feasibility of the building show that there are still buildings with a level of heavy damage and abandonment, which increases the potential for vulnerability. Developing these sites as tourism areas requires comprehensive flood risk assessment, cross-sector coordination, and improved drainage systems.

Keywords: Flood, Heritage, History, Urban Resilience.

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INTRODUCTION

Cirebon City is one of the historic cities on the northern coast of Java, which since the 15th century has had an essential role as a center of trade and the spread of Islam, after Sunan Gunung Jati established the Cirebon Sultanate (Kartika et al., 2024). Its strategic position makes this city the central node in the maritime and political economic network in the West Java region. As time went by, foreign influences began to enter the area, especially after the Treaty of Breda in 1667, which shifted British dominance in the archipelago and provided opportunities for the Dutch to expand their power. In the 17th century, Dutch power grew stronger in Cirebon through the intervention of the VOC, which was marked by the agreement on January 7, 1681, between the VOC and the Sultanate of Cirebon. This agreement limited the sultanate's authority in development matters, while the VOC was given the freedom to erect buildings on land or water without the sultan's approval, which then triggered resistance from local parties such as Pangeran Kidul. In the same year, Sultan Sepuh I built Fort Jayu

as a measure in anticipation of the threat of escape of Pangeran Kidul and Sultan Anom I, while the VOC strengthened its power by establishing Fort Bescherming and a number of defensive facilities. The entry of colonialism also had a significant impact on infrastructure development, especially in the 19th to early 20th centuries, where the colonial government opened the Semarang–Cirebon concession and implemented policies that limited the ownership of concessions by private companies. In response, NV Java Spoorweg Maatschappij (JSM) was formed to manage railway investments and support the exploitation of agricultural land, especially sugarcane. The Semarang-Cirebon line was then designated as the main route, which was further developed to the interior areas (Adriani & Nurhata, 2023).

As a port city, Cirebon is a meeting point for various cultures such as Javanese, Sundanese, Arabic, and Chinese. This intercultural interaction results in a unique and diverse cultural heritage in the form of art, architecture, cuisine, and local traditions. From the Hindu-Buddhist to Islamic periods, this acculturation process continues to shape Cirebon's distinctive identity as a multicultural and cosmopolitan city (Adriani & Nurhata, 2023; Lestari & Paryanto, 2023).

Traces of colonialism can still be seen today, especially in historical buildings such as the Prosecutor's Station, the British Building (1912), and the former American Tobacco (BAT) company. The urban structure and transportation systems built during the Dutch period, such as the railway lines and road network around the Prosecutor's Square, also show a pattern of colonial urban planning that supported the administrative and economic interests of the Dutch East Indies government (M J, 2020).

Colonialism not only left traces in the physical form of buildings and infrastructure, but also affected the social order of society, with the formation of stratification between indigenous, Chinese, and European groups. Nevertheless, the interaction between these groups gave birth to a cultural acculturation process that also enriched Cirebon's local cultural treasures. Currently, efforts to preserve colonial heritage in the city are still facing various obstacles, one of which is the lack of availability of regional regulations (Perda) that specifically regulate the zoning of strategic areas of cultural heritage, especially those related to colonial-era relics. The absence of this legal basis makes the management of heritage areas less directed and more vulnerable to threats from modern development and natural disasters such as floods. In fact, cultural heritage in the form of objects, buildings, structures, sites, and regions has essential values that must be maintained because they contain historical, scientific, educational, religious, and cultural values for future generations (Peraturan Pemerintah Republik Indonesia Nomor 1 Tahun 2022 tentang Register Nasional dan Pelestarian Cagar Budaya, 2022).

Previous studies have explored various aspects of Cirebon's cultural heritage, focusing primarily on historical, architectural, and cultural dimensions (Adriani & Nurhata, 2023; Lestari & Paryanto, 2023). However, limited research has integrated disaster risk assessment—particularly flood vulnerability—with heritage conservation in urban planning contexts. Studies such as those by Rafdi and Kusumah (2023) have addressed flood infrastructure adaptation but did not specifically link it to cultural heritage resilience. Similarly, while UNESCO (1972) and Indonesian laws (e.g., UU No. 11/2010 on Cultural Heritage) provide frameworks for preservation, they lack operational integration with disaster mitigation strategies. This research aims to fill that gap by combining spatial analysis of flood risk with heritage building assessment to support resilient tourism development.

The study of colonial heritage areas is crucial for several reasons. First, the absence of clear zoning regulations for colonial heritage areas has resulted in many historical buildings being unmaintained and neglected. Without strict rules, these buildings become vulnerable to physical damage and inappropriate changes in function. Second, the great tourism potential of the unstructured colonial heritage area does not only come from management and regulatory aspects, but also from environmental factors, such as flood disasters. Third, usually, the primary focus of floods is only on the exposed population. Finally, there is no link between cultural heritage buildings and flood risk. Because floods have the potential to cause severe damage to heritage buildings, which can threaten the preservation of

cultural heritage, and currently the development of urban areas is not resilient to floods and exposure to other disasters, resulting in physical losses in the form of infrastructure damage and social and economic impacts on the community (Rafdi & Kusumah, 2023). Therefore, the first step that needs to be taken is to conduct a risk evaluation to determine which buildings are most vulnerable to flooding. The results of this study are expected not only to make an academic contribution in the field of cultural preservation and disaster risk management but also to provide practical recommendations for policymakers and communities in protecting cultural heritage from the increasingly urgent threat of flooding.

Based on this background, this study aims to identify the potential of colonial heritage areas in Lemahwungkuk District, Cirebon City. The focus of the research is directed at the development of historical tourism that is resilient to disasters, especially floods. The goals to be achieved in this study are to identify the potential of heritage areas in Lemahwungkuk District and to compile flood vulnerability maps in heritage areas that are resilient to flood disasters. This research is significant in the context of the development of colonial heritage tourism in Lemahwungkuk District, especially considering the increasing threat of flooding. Observation of colonial heritage areas and flood modeling using Geographic Information System (GIS) analysis is crucial to identify and map the level of flood vulnerability in the region. With the increasing frequency and intensity of floods due to climate change, the protection of historic buildings that are cultural heritage is critical to prevent damage that can threaten their existence.

METHOD

Types of Research

This type of research uses the Mix Method, which is a research approach that combines quantitative and qualitative methods in a series of studies with the aim of obtaining more comprehensive, valid, reliable, and objective data (Sugiyono, 2012). Using descriptive statistical methods presented with bar graphs and web spiders, conclusions were drawn using data triangulation and flood modeling with a spatial approach.

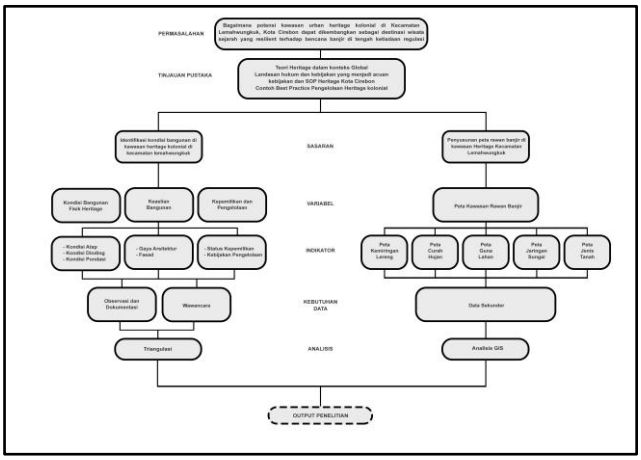


Figure 1. Research flow framework

Location and Object of Research

This research was conducted from January to June 2025. The research is located in Lemahwungkuk District, Cirebon City. The location of the study is as shown in Figure 1.

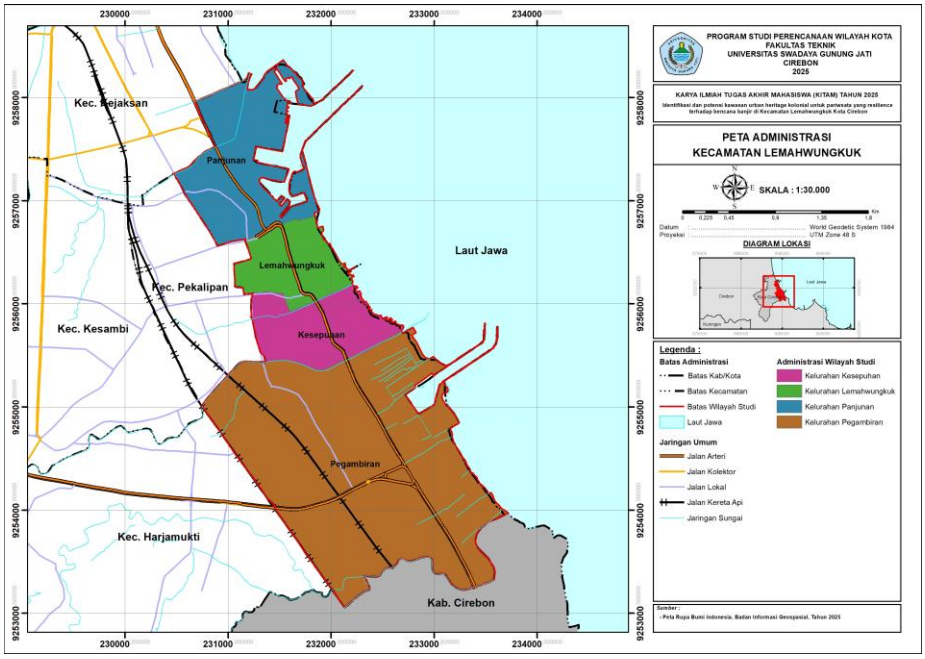


Figure 2. Administrative map of Lemahwungkuk District

The object of research in this study is a cultural heritage building located in Lemahwungkuk District, one of the five sub-districts in Cirebon City. This area spans 605.41 hectares and is situated on the northern coast of Java Island, serving as a strategic connecting route between Jakarta, Semarang, and Surabaya. The distribution of colonial heritage buildings is based on the 2022 Leiden University map, the Mayor's Decree in 2024 (SK Wali Kota Cirebon, 2024), the 2024 Cirebon City Cultural Heritage Inventory (Inventarisasi Cagar Budaya Kota Cirebon, 2024), and the Cultural Heritage Book. Thirty-eight colonial heritage buildings have been observed.

Table 1. Distribution of colonial heritage buildings in Lemahwungkuk District

Building No.	Building Name	Building No.	Building Name
1	Rumah Tahanan	20	Rumah Penjahit Jubaedah
2	Gedung PT YGT	21	Gedung Eks K.P.M. Agency
3	gudang pt pelindo	22	Masjid Agung Sang Cipta Rasa
4	Kawasan Perbankan	23	Bank Mandiri (eks.BDN)
5	Dinas Penanaman Modal	24	Gedung BAT
6	Gedung BI Baru	25	Pabrik Es Sari Petojo
7	Gedung BI Lama	26	Kantor Bank BSI
8	Kantor Telkom Akses	27	Gedung Bunder Kebumen
9	Dinas Pekim depan	28	Gudang PT. Yala Gita Tama
10	Dinas Pekim tengah	29	Gudang Bank Exim
11	Dinas Pekim belakang	30	Gudang Jalan Benteng
12	Gedung BAT Belakang	31	Gedung AVON
13	Pasar Talang Cirebon	32	Gudang PT. VTP (Banda Ghana Reksa)
14	mandiri livin park	33	Klenteng Dewi Welas Asih
15	Kantor Pos Indonesia	34	Klenteng Talang
16	SMPN 14	35	Gereja Santo Yusuf
17	SMPN 16	36	Gedung Cipta Niaga
18	Gedung Eks Hotel Horning	37	Gereja Pasundan
19	Badan Keuangan dan Pendapatan Daerah	38	Gedung Kertaniaga

Source: Data processing results, 2025

The selection of Lemahwungkuk District as the location of the research was based on several considerations, including:

1. This area is an area of the Old Town that has many historical buildings from the Dutch Colonial era, Chinese culture, and local traditions.
2. The area has been designated as a tourist area in Old Town, which provides added value due to the strategic planning and development of tourist areas.
3. The heritage area in Lemahwungkuk District is also supported by the data of a map of colonial historic buildings in 1918, sourced from the ***Dutch Town Plan of Cheribon***, thus strengthening the potential of this area as a research location.

Data Collection Techniques

This study combines primary and secondary data to obtain complete and relevant information. Primary data was collected through field observations and interviews with the local government, the Cirebon City Culture and Tourism Office, and the Cirebon City Cultural Heritage Expert Team, while secondary data was obtained from official documents, thematic maps, satellite images, and related literature. This approach is carried out to support spatial and contextual analysis in formulating the potential and strategy for the development of colonial heritage areas that are resilient to floods in Lemahwungkuk District, Cirebon City. The primary and secondary data needed include:

Table 2. List of Interview Data Needs Respondents

No.	Institution	Structural Division
1	Cirebon City Culture and Tourism Office	Kasie. History, Culture, and Museums
2	Cirebon City Cultural Heritage Expert Team	-
3	Regional Disaster Management Agency	Prevention and Preparedness Section
4	Disaster Expert Team	-

Source: Data processing results, 2025

Table 3. Assessment of the Condition of Cultural Heritage Buildings

VARIABLE	INDICATOR	DATA	SOURCE
Physical Condition of Heritage Building	Roof	Availability and Condition of the building's roof	OBSERVATION
	Wall	Availability and Condition of Building Walls	
	Foundation	Availability and Condition of Building Walls	
Authenticity of the Building	Architectural Style	Heritage building architectural style	OBSERVATIONS AND INTERVIEWS
	Facade	Front view of the Heritage building	
Ownership and Management	Ownership Status	Heritage building ownership	INTERVIEW
	Management Policy	Availability of Heritage building management	

Source: Data processing results, 2025

Table 4. Assessment of Flood-prone Areas

VARIABLE	INDICATOR	DATA	SOURCE
Flood-prone areas	Administration	Administrative boundaries of villages/sub-districts	SECONDARY DATA
	Slope	Elevation data, for topographic and slope analysis	
	Rainfall	Rainfall distribution data can be interpolated at rainfall points.	
	Land Use	Types of land cover: settlements, rice fields, forests, water bodies	
	River network	Patterns of river flows and tributaries in the study area	
	Soil Type	Soil Type Data (permeability)	

Source : (Darmawan & Suprayogi, 2017; National Disaster Management Agency, 2013; Batu & Fibriani, 2017, in Seprianto et al., 2024)

Data Analysis Techniques

Descriptive Analysis

This study employs descriptive analysis to describe the condition of cultural heritage buildings in colonial heritage areas, based on the data collected. The assessment was carried out using five variables, each of which was equipped with an indicator and measured through the Likert scale. This scale serves to assess respondents' perception of the condition of the building, with a score adjusted according to the needs of the research. This analysis is used to process the results of observations from the observation form. The data collected from observations, interviews, and documentation were concluded by triangulation. Furthermore, the results of the assessment were analyzed quantitatively and presented in the form of radar diagrams to provide a comprehensive picture of the condition and potential of cultural heritage buildings in the area.

Table 5. Descriptive Analysis Assessment Scale Table

VARIABLE	INDICATOR	RATING SCALE	DESCRIPTION	
Physical Condition of Heritage Building	Roof	1–5	1 = Very damaged, 5 = Excellent	Structural element building conditions
	Wall	1–5		
	Foundation	1–5		
Authenticity of the Building	Architectural Style	1–5	1=many modifications, 5 = Very original	The extent to which the architecture of the building remains original, or there are modifications to the building
	Facade	1–5		
Ownership and Management	Ownership Status	1-3	1 = personal 2= Private 3= Government	Whether the building is owned by the government, the private sector, or individuals.
	Management Policy	1–5	1 = none, 5 = available & applied	The existence of policies or regulations that regulate building management.

Source: Data processing results, 2025

GIS Analysis

This study uses the Geographic Information System (GIS) analysis method to map the level of flood vulnerability based on five indicators, namely administrative maps, slope, rainfall, land use, and river networks. The analysis is carried out through an overlay technique combined with scoring, where

each parameter is classified and scored according to its level of vulnerability. And all indicators are given equal weight (Seprianto et al., 2024). The result is in the form of a flood vulnerability map obtained from combining all parameters through an overlay and scoring process.

Table 6. GIS Analysis Assessment Table

Variable	Indicator	Description		
Flood Prone Map	Administration	Administrative boundaries of villages/sub-districts		
	Slope	**Slope Classification (%)**	**Description**	**Score**
		0-8	Flat	5
		>8-15	Slight slope	4
		>15-25	Moderate slope	3
		>25-40	Steep slope	2
		>45	Very steep slope	1
	Rainfall	**Rainfall Classification**	**Average Rainfall (mm/yr)**	**Score**
		Low	2001-2500	1
		Medium	2501-3000	2
		High	3001-3500	3
		Very High	>3501	4
	Land Use	**Land Use Classification**	**Score**	
		Forest	1	
		Shrubland	2	
		Dryland Agriculture / Mixed Garden / Cultivated Land	3	
		Irrigated Agriculture and Aquaculture Area	4	
		Residential Area	5	
	River Network	**Classification of Distance from the River**	**Distance from River (m)**	**Score**
		Very Safe	>500	1
		Safe	250-500	2
		Moderately Vulnerable	150-250	3
		Vulnerable	50-100	4
		Highly Vulnerable	0-50	5
	Jenis Tanah	**Classification of Soil Types**	**Infiltration**	**Score**
		Alluvial, Palnosol, Hidromorf, Grey, Lateritic	Insensitive	5
		Latosol	Slightly Sensitive	4
		Brown Forest Soil, Mediterranean Soil	Moderately Sensitive	3
		Andosol, Lateritic Grumosol, Podsol, Podsolic	Sensitive	2
		Regosol, Litosol, Organosol, Renzina	Highly Sensitive	1

Source: Data processing results, 2025

This analysis is used to determine the vulnerability of an area to flooding. The determination of flood vulnerability values involves adding up the score values of the five indicators. The score value of each indicator is calculated as follows (Hamid & Masykuroh, 2024; Wibowo, 2022).

K = Wi x Xi

Wi = Weights for the i parameter

Xi = Score for the i parameter

Furthermore, to determine the width of the interval for each class, the following method is used.

$$\text{Interval width} = \frac{\text{(Highest score – Lowest score)}}{\text{Number of Classes}}$$

RESULTS AND DISCUSSION

1. Heritage Development Feasibility Analysis

The physical aspect of the building. The wall has a score of 161, the roof of the building has a score of 159, and the foundation of the building has a score of 161; the three aspects have almost the same score. Because the main factor is that a number of historical buildings that are under the ownership of SOEs/government still maintain the originality of the design and original materials, so that the condition of the building is maintained and well protected. These buildings are used to the maximum without reducing their historical and aesthetic value.

Image: Physical aspects of the BI bank roof building

Image: physical aspect of the building – the wall of the post office

Image: physical aspects of the foundation building of the BAT Building

The colonial heritage buildings that have physical aspects such as roofs, walls, and foundations have been damaged materially. The preservation of cultural heritage buildings faces various obstacles, especially in terms of overlapping ownership, complicated and expensive repair processes, and limited government budgets. The lack of coordination between the owners, as well as the low awareness of the importance of preservation, has led to many buildings being abandoned and left in disrepair. In some cases, buildings have even been removed from cultural heritage status after being severely damaged, showing the weakness of the existing protection system. Difficulties in the coordination and leasing process resulted in the building being left in a state of disrepair. In addition, many other heritage buildings are neglected due to the time-consuming and expensive repair process, while the government can only allocate a budget for the repair of one building. This situation was further exacerbated by the owner's desire to completely overhaul the cultural heritage building, which caused the building to be left in ruin. In the end, if the cultural heritage building is not maintained and loses its traces, there will be a need to remove its status as a cultural heritage.

Image: Physical aspects of the building – walls and foundation of the K.PM Agency building

Image: Physical aspects of the building – roof Gedung bunder kebumen Building, Kebumen

The aspect of authenticity of the architectural style building has a score of 155, and the façade aspect has a score of 158; both aspects have almost the same score, which is a reasonably good criterion. Colonial buildings that have been designated as cultural heritage must be maintained according to applicable technical regulations, with the primary focus on preserving the authenticity of the building. Before a change in function, it is necessary to conduct a feasibility study that includes structural, functional, and architectural aspects. All forms of adjustment or renovation must be carried out carefully to preserve the historical value and original form of the building. Thus, colonial heritage buildings that have been determined must comply with the guidelines for the maintenance of cultural heritage by conducting feasibility studies that consider various factors. Any changes made must be made carefully to preserve the authenticity of the building.

Image: aspects of the authenticity of the façade building

Image: aspects of the authenticity of architectural style buildings

However, based on the map of Leiden University, which was initially a colonial heritage building, there are findings that some have completely changed into modern buildings, but the plots have not changed. Changes to historic buildings have occurred many times because, during their construction, there were no special rules governing their preservation, coupled with weak law enforcement and a lack of public awareness. The regulations on cultural heritage only came into force in 1992 and were updated into law in 2010, but their application has not been evenly distributed in various regions. In Cirebon, for example, the determination through the Mayor's Decree only began in 2001 and has not been fully used as a reference. In addition, the preservation process is often hampered by high costs and the need to use special materials that cannot be replaced carelessly because they have been regulated in the preservation provisions. So, the authenticity of the colonial heritage building has been determined in the Mayor's Decree, then the building that has been determined must follow the technical in maintaining the cultural heritage building, there must be a feasibility study not to be used as a new function, the feasibility can be from the feasibility of the structure, the feasibility of the function, or in terms of architecture because there must be an adaptation so adapt from the form, The style for adaptation, for example, must replace some elements of the building is allowed or not because when revitalizing the cultural heritage building, we must pay attention to the aspects of authenticity, so that there are not so many changes, it ends up eliminating the authenticity of the building, so the principle is prudence and maintaining the authenticity of the building.

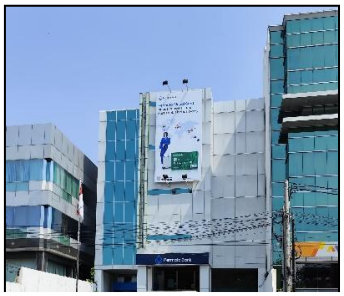


Image: modern banking building

Image: Mandiri livin park modern building

In the aspect of ownership, it has a score of 75, the lowest criterion among other elements, because of the many ownership statuses of the building, most of which are private and privately owned. Most historical buildings are owned by individuals because they belong to families or individuals from the beginning, then are inherited or sold to others. Due to limited funds, the government was unable to acquire and maintain all of these buildings, so the responsibility for maintenance fell more into the hands of private owners. Thus, the Government or public institutions do not have adequate funds to buy and maintain all these buildings. As a result, the maintenance of heritage buildings is often the responsibility of private owners, which can have an impact on the condition and sustainability of the building.

Image: private ownership aspect (Yala Gita Tama Building)

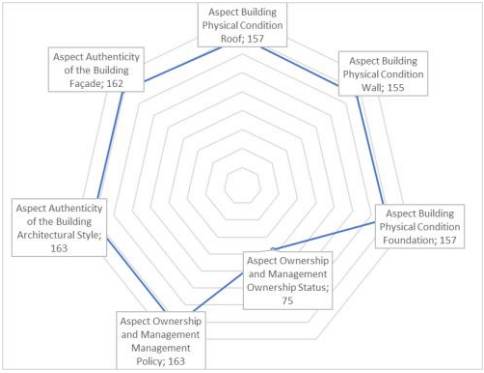
Image: private ownership aspect (BAT Building)

The management policy aspect has a score of 167, which is the highest score of the other elements. Buildings that have been designated as cultural heritage through the Mayor's Decree cannot be changed arbitrarily, because there are binding legal rules. The regulation is listed in the 2010 Law on Cultural Heritage and is further regulated technically in PUPR Regulation Number 19 of 2021 concerning the preservation of historic buildings. Thus, buildings that have been stipulated in the Mayor's Decree should not be changed carelessly, because there are policies regulated in the 2010 law and Public Works Government Regulation No. 19 of 2021, which governs the preservation of cultural heritage. This policy must be followed to maintain the authenticity and integrity of the building.

Image: policy aspects of police barracks management (rear BAT)

The scoring results that have been carried out have been produced that the aspect that has the lowest value is the aspect of building ownership which has a score of 75 with the criteria of the most buildings owned by private individuals amounting to 14 buildings, then with the requirements of government-owned buildings there are 13 buildings, and the last is the criteria for privately owned buildings which have 11 buildings. However, the aspect that has the highest score, with a score of 167, is the management policy aspect, where there is a policy that regulates the management of heritage buildings. The next element is filled by the roof and foundation, which both have a score of 157; the walls have a score of 155, followed by the façade, which has a score of 162, and lastly, the architectural style has a score of 163. After obtaining the results of the aspect scoring, a spider wave graph is made to display scores from various aspects simultaneously, and it can also be seen which aspect has the lowest value.

Figure 3. Spider web graph analysis results (radar graph)



Source: Data processing results, 2025

After creating a spider web to assess a total of 38 heritage buildings from 7 aspects, a bar chart is made to determine which buildings have an above-average value. The average score obtained is 27; there are several buildings with the highest score of 33, while the lowest score is 7 in building number 21. The building assessment can be seen in the picture below.

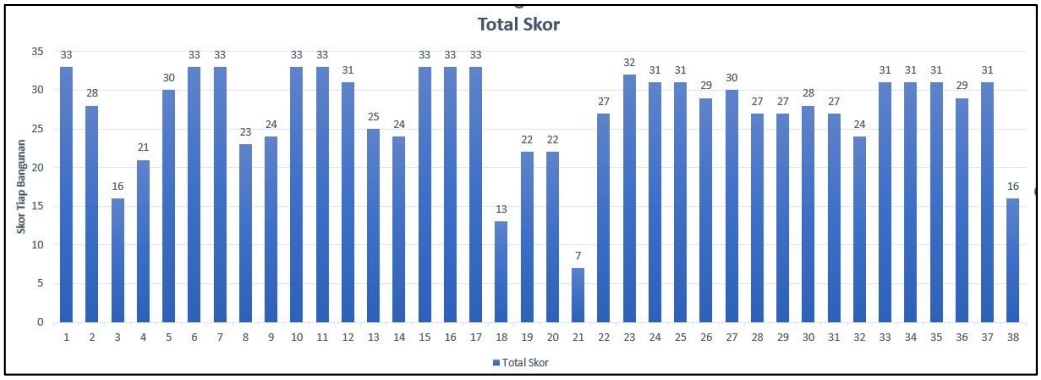


Figure 4. Bar chart analysis results

Source: Data processing results, 2025

2. Heritage Resilience Analysis Against Flooding

In this analysis, it was carried out by testing each of the five indicators, and the result was in the form of the level of flood vulnerability, after the level of flood vulnerability was obtained and then projected with *a Figure Ground* map of buildings in the Lemahwungkuk sub-district, including

Heritage buildings. The level of flood vulnerability in an area is influenced by various physical environmental factors, including slope, rainfall, land use, distance from rivers, and soil type. The slope of the slope determines the speed of surface water flow, where sloping areas tend to cause water to stagnate, while on steep slopes, water flows quickly into lowlands and potentially causes flash floods. In addition, rainfall plays a vital role because the higher the intensity and distribution, the greater the volume of water that enters the soil surface and increases the potential for surface runoff. Another factor that also affects land use is that areas with a dominance of settlements, commercial areas, and industries have a higher risk of flooding due to the many impermeable surfaces that inhibit infiltration, in contrast to rice fields, forests, or green open spaces that have better infiltration capabilities. The distance of an area to the river is also decisive, because areas adjacent to river flows are more susceptible to overflow when water discharge increases. Finally, soil type also affects flood susceptibility, where fine-textured soils such as clay and alluvial soils have low absorption and are easily saturated with water, so they are more at risk of inundation, especially in lowland areas. 5 (five) indicators can be seen in the figure below.

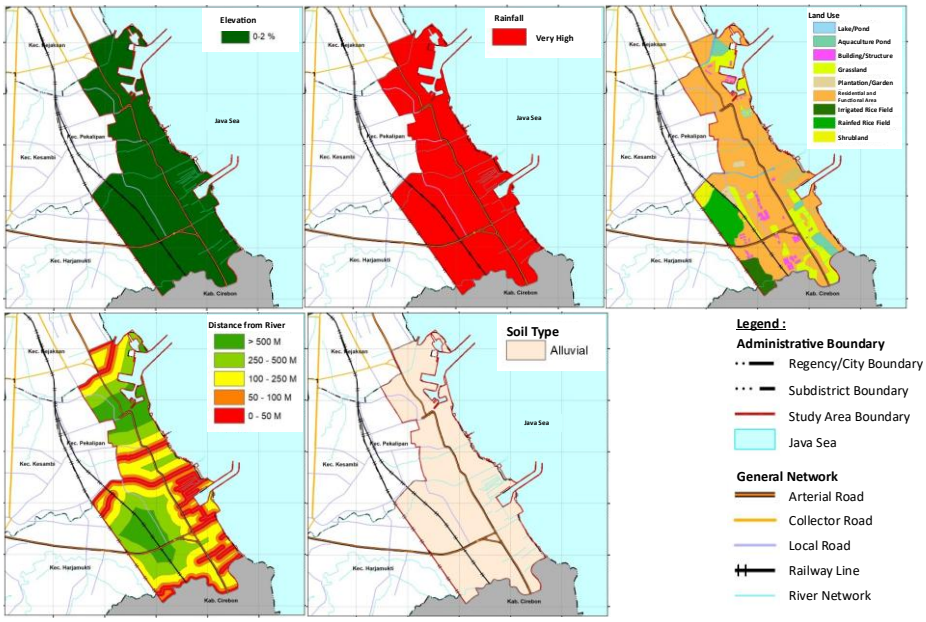


Figure 5. Secondary data on the Flood Prone Level
Source: Data processing results, 2025

Based on the results of the analysis in Lemahwungkuk District on 5 five physical indicators of the region, Lemahwungkuk District has a high level of flood vulnerability. This area is dominated by slopes with a slope of 0–2%, which are classified as very flat and allow water to be more easily flooded. In addition, rainfall in this area is very high, with a value of more than 3,500 mm per year spread evenly throughout the sub-district, thus increasing the volume of surface water that must be accommodated. This condition is exacerbated by the dominance of land use in the form of settlements and activity areas, which reach around 68.66% of the total area, which generally has a watertight surface, and increases surface runoff. The total land use in the Lemahwungkuk sub-district can be seen in the table below.

Table 7. Land Use Area of Lemahwungkuk District.

No	Land use	Area (Ha)	Percentage (%)
1	Lake/Pond	1,71	0,24
2	Aquaculture Pond	20,14	2,83
3	Building/Structure	16,27	2,29
4	Grassland	85,92	12,09
5	Plantation/Garden	7,86	1,11
6	Residential and Functional Area	487,92	68,66
7	Irrigated Rice Field	23,48	3,30
8	Rainfed Rice Field	47,09	6,63
9	Shrubland	12,05	1,70
10	River	8,18	1,15
TOTAL		710,62	100,00

Source: Data processing results, 2025

In terms of distance, most of the Lemahwungkuk area is close to the river flow, so it is prone to overflow when the river discharge increases. In addition, the type of soil that dominates this area is alluvial soil, which is a type of sedimentary soil with a fine to medium texture that is easily saturated with water and is generally formed in lowlands. This soil characteristic increases the risk of inundation due to its low infiltration ability. Overall, the results of the analysis show that the combination of these physical conditions causes the Lemahwungkuk District to have a high potential for flood vulnerability.

GIS Analysis Results (Flood vulnerability level map)

The flood-prone level map is carried out by giving a score to each indicator that has been determined beforehand, after giving a score, the weight of each indicator is given. This score and weight will be multiplied so that the result of the multiplication is obtained, this result will later be used in GIS analysis by way of Overlay (overlap) on each result of multiplication between the score and the weight and then summed each of the results between the score and the weight, so that a flood-prone level map is obtained as a picture.

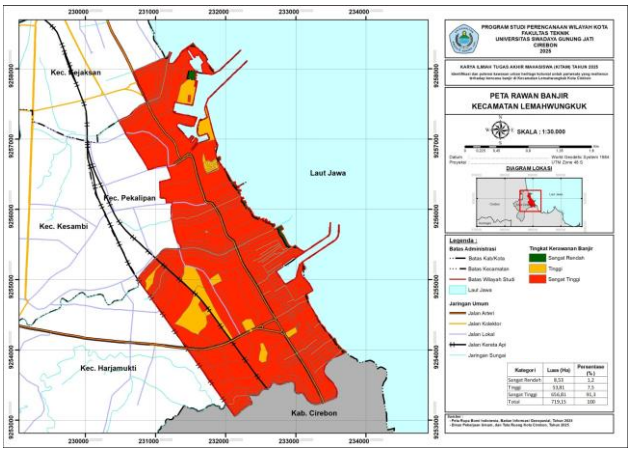


Figure 6. Flood Prone Level Map

Source: Data processing results, 2025

From the picture, it is found that there are only 3 (three) categories of flood prone in Lemahwungkuk District, namely Very Low covering an area of 8.53 Ha or 1.2% of the total area of Lemahwungkuk District, High category covering an area of 53.81 Ha or 7.5% of the total in

Lemahwungkuk District, and the last is the Very High Category covering an area of 656.81 Ha or 91.3% of the total area in Lemahwungkuk District. It can be concluded that the level of flood vulnerability in Lemahwungkuk is dominated by a very high level of flood disasters.

The results of the distribution of 38 colonial heritage buildings are in locations prone to flooding, the results of the scoring of the mapping of colonial heritage buildings are very high in terms of vulnerability and not *resilience,* if the colonial heritage area is to be used as tourism there will be a rise of visitors that can have an impact on the colonial heritage building. To overcome this, preventive efforts and policies are needed to minimize these vulnerabilities. Floods that occur in Cirebon can come from various sources, such as water flows from upstream areas, high rainfall, or sea tides (rob). One of the main factors that exacerbates this condition is massive development that reduces the ability of the soil to absorb water. To preserve historic buildings, collaboration between regions, improvement of drainage systems, and water control measures such as river dredging and the construction of infiltration wells are needed. On the other hand, the management of tourist visits must also be considered, because too many visitors can endanger the structure of old buildings, so the number needs to be regulated according to the condition of each building. The importance of knowing the causes of flooding in Cirebon City. Floods come from various factors, such as water flow from upstream areas (Kuningan), high rainfall, and tides (rob) in coastal areas. Uncontrolled development activities have also worsened the condition by reducing the soil's ability to absorb water. On the other hand, waterways such as the Kriyan River and the Sipadu River experience siltation due to sedimentation, so it is necessary to carry out routine dredging, especially during the dry season. Flood management requires cross-regional collaboration and strengthening water catchment systems such as infiltration wells, biopores, and embankments. To maintain the preservation of heritage buildings, it is necessary to regulate the number of visitors so as not to damage the structure of the building, with adjustments based on the physical condition of each building.

Waterlogging in the Cirebon heritage area generally occurs due to high rainfall for approximately three hours, but the impact is limited, and the water usually recedes quickly. The lack of special precautions and the lack of reports from the owners of cultural heritage buildings are obstacles to handling them. Therefore, it is essential to collaborate with the Culture and Tourism Office to unite heritage building data to support more targeted and efficient flood management. Thus, the occurrence of flooding in the Cirebon colonial heritage area was caused by the high volume of water and rain that lasted about 3 hours. Inundation usually occurs in the Investment Office area and will recede in about 1 hour. The lack of preventive measures and the absence of reports from the owners of cultural heritage buildings have made flood management less than optimal. Therefore, synergy is needed between cultural heritage owners and the Cirebon City Culture and Tourism Office to integrate heritage data to strengthen flood mitigation efforts in the area.

Image: The location of the Cultural Heritage building where inundation often occurs

In the analysis of the level of flood disaster vulnerability of all *Heritage buildings* in the colonial area, which is at a very vulnerable level, this is strengthened by the statement from all parties that there has been a flood of shipments at the location of the Keraton cultural heritage which is not the domain

of this study, but it shows that there is already a potential that the flood is likely to occur in the Colonial Heritage Area in Lemahwungkuk District. From this, if the potential is seen, it needs to be studied again, even though in Lemahwungkuk District, it has indeed become a concern of the Cirebon City BPBD, but it still only studies the exposed population.

According to the Disaster Expert, if this potential is seen, then it is necessary to conduct studies that also lead to mitigation efforts for Heritage buildings. Because so far the data in Cirebon City itself has not been integrated with each other, namely, cultural heritage data and the Flood Disaster Risk Assessment, the two datasets already exist but have not been integrated. Therefore, studies in the field of disaster have actually discussed a lot about how to mitigate heritage buildings. To formulate the proper mitigation measures, the main thing that needs to be done is to first recognize the types of risks and potential threats that may occur, so that preventive measures can be adjusted to the conditions and needs of the building.

As for the Cultural Heritage building for the use of Tourism, what is suitable is, it is not limited to what kind of tourism activities, because the ownership of cultural heritage buildings is different, but what is necessary is that if the building is used for what activities, it must go through a technical study of the use of cultural heritage buildings first, whether it is suitable or not, or must be limited in activities. Any change plan for the cultural heritage building must be based on the results of a technical study and approval from the Cultural Heritage Expert Team. This study describes specific areas that should not be modified or added to the elements. All preservation actions must follow the guidelines and recommendations that have been set to maintain the authenticity and historical value of the building. So as a result of the use of the cultural heritage building, if it occurs in a Flood Disaster-Prone Area, there must be a deeper study in relation to flood disasters, this is strengthened by the triangulation process of an interview with one of the resource persons of the Disaster Expert Team who emphasized the importance of risk analysis and comprehensive preparedness in the preservation of heritage buildings in disaster-prone areas.

Mitigating the risk of heritage buildings from flooding needs to begin with identifying the potential and level of vulnerability of buildings. Efforts such as the construction of water retaining walls, the provision of SOPs, water pumps, and the readiness of human resources must be prepared. Because buildings cannot be changed carelessly, cross-sector coordination is needed, including BPBD, PUPR, and asset managers, to maintain sustainability and ensure accessibility, especially if it functions as a tourist attraction. So that it can be concluded, mitigation of heritage buildings in flood-prone areas needs to begin with the identification of risks and potential threats, such as the type of flood (inundation or immersion) and the resilience of buildings to it. Technical efforts such as the construction *of retaining walls* must consider the function and historical value of the building so that it is not damaged or loses its meaning. Preparedness is also essential, including the existence of SOPs, water pumps, contingency plans, and trained human resources. If the building is to be used as a tourist attraction, then access must be ensured to be safe from flood disturbances. Because this mitigation involves many aspects, cross-sector coordination is needed between BPBD, the Public Works Office, government asset managers, and other related agencies so that flood management and heritage protection can run optimally.

CONCLUSION

Based on the results of the research analysis, this study shows that the analysis of colonial heritage buildings includes several important aspects, namely the physical aspects of the building (such as roof, walls, and foundations), aspects of the authenticity of the buildings (including architectural styles and facades), aspects of ownership status, and aspects of management policies. From the results of the analysis, it can be concluded that the management policy aspect has the strongest score in the preservation of heritage buildings, while the element of building ownership status has the weakest score.

These findings emphasize the importance of effective policies in the management of heritage buildings for the development of colonial heritage areas. However, colonial heritage areas are located in regions that have a very high level of flood vulnerability, so this will result in exposure. On the other hand, the identification of the potential of colonial heritage areas can be used as tourism areas to revive colonial heritage areas, by looking at the score of building aspects that are suitable for use. Researchers have developed tourism development strategies that are *resilient* to floods, such as: 1) Utilizing colonial heritage areas with *resilient commercial functions* by paying attention to feasibility studies, technical studies, and utilization studies, for example, such as cafés, museums, hotels, and others. 2) Limiting visitors to some colonial heritage buildings, because it can affect the structure of the building if the building bears more weight. 3) Drainage maintenance and drainage additions will be very effective if there is drainage maintenance around the heritage area. 4) Routine river dredging, especially in the *Kriyan* and *Sipadu* rivers, because these rivers have a significant influence on the colonial heritage area. This study emphasizes the need for a more effective and comprehensive flood management strategy in order to ensure optimal protection of colonial heritage areas, so as to prevent damage to the physical aspects of colonial heritage buildings located in areas of very high flood vulnerability, in order to be able to utilize them as *resilient* colonial heritage areas against flood disasters. This research is expected to receive special attention to be appropriately used, considering the identification of colonial heritage tourism potential.

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