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Study of Responsive Environment Aspect within The Scope of Cultural Heritage Areas: Analysis of Kotabaru Boulevard in Yogyakarta

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Abstract. The Kotabaru area of Yogyakarta is a cultural heritage site with a colonial garden city character that can still be seen in its grid pattern, boulevards, monumental vegetation, and Indis-style buildings. This study examines the quality of the responsive environment in the Kotabaru boulevard corridor, specifically Suroto Street, using the theoretical framework of Bentley, Lynch, Southworthand Shirvani. The method used is descriptive qualitative through in-depth observation, documentation, and interpretation of the theory of spatial responsiveness. The results of the study show that the corridor has high potential in terms of legibility, variety, richness, and vitality, but is still low in terms of robustness, pedestrian ways, visual appropriateness, and justice. The change in building function from colonial residences to modern commercial buildings increases vitality but weakens visual control and public space quality. Disconnected sidewalks, parking above pedestrian areas, uncontrolled signage, and changes to building facades are the main challenges in fulfilling the principles of a responsive environment in cultural heritage areas. This study produced a theoretical approach to strengthening the quality of heritage corridors by considering urban conservation, modern visual restrictions, and the improvement of pedestrian space.

Keywords: responsive environment, kotabaru, boulevard, cultural heritage area, walkability

1. Introduction

The Kotabaru area is a colonial area built in the 1920s with a garden city concept. The grid pattern, wide boulevards, green spaces, and colonial buildings with spacious setbacks make this area one of the most important urban heritage sites in Yogyakarta. Suroto Street serves as the main boulevard that shapes the identity of the area as well as a strategic public space. In the last two decades, this corridor has undergone intensive transformation through changes in land use from residential to commercial, the emergence of businesses such as cafes, clinics, private offices, and restaurants, and increased vehicle mobility. The pressure of this functional change is in line with the concept of the tourist historic city, namely the pattern of commercialisation of heritage spaces that alters the social and visual structure of an area (Ashworth & Tunbridge, 2000). This phenomenon raises questions about the quality of environmental responsiveness, especially in heritage corridors that ideally maintain visual integrity and public space comfort. Colonial heritage often undergoes transformation towards commercialisation due to urban pressure and changes in the economic value of the area (Zukin, 2010). Although studies on responsive environments, walkability, and heritage conservation have been widely conducted, research that specifically integrates these approaches within tropical colonial heritage corridors remains limited, particularly in Indonesia. Most previous studies evaluate heritage areas either from conservation perspectives or pedestrian quality separately, without examining how responsiveness and heritage integrity interact simultaneously. Consequently, there is still a lack of an integrated evaluative framework capable of assessing the responsiveness of cultural heritage corridors

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under contemporary urban pressures. This phenomenon commonly occurs in historic corridors that are strategically located economically.

The main problems in this corridor include a decline in pedestrian quality, narrowing of public space due to illegal parking, irregular facades and signage, and a weakening of the colonial visual structure. These conditions indicate the need for a study of responsive environment as a basis for analyzing the quality of cultural heritage corridors.

Previous studies on heritage corridors generally apply urban design theories separately, focusing either on visual conservation, walkability, or urban morphology. However, cultural heritage corridors are complex environments where spatial responsiveness, pedestrian experience, historical identity, and urban activity interact simultaneously. Therefore, this study integrates responsive environment (Bentley et al., 1985), Good City Form (Southworth, 1990), (Lynch, 1981), Walkability (Southworth, 1990; Gehl, 1996) and Urban Design to produce a more comprehensive evaluative framework for heritage public spaces. This integration allows the study to assess not only physical quality, but also spatial meaning, accessibility, visual integrity, and conservation performance within a single analytical structure.

Research objectives:

1. Measure the environmental responsiveness of Suroto Street based on relevant theories;
2. Identify the impact of land use transformation on the quality of public space;
3. produce an evaluation framework for responsiveness for cultural heritage area.

This research has the following novelties:

1. The integration of four urban design theories (Bentley–Lynch–Southworth–Shirvani) in the context of colonial garden city areas, which is not commonly done in heritage corridor studies in Indonesia.
2. A responsive environment approach within the scope of cultural heritage areas, not just modern public spaces.
3. Analysis of tropical colonial corridors, which are characterized by large vegetation, wide boulevards, and modern commercial functions.
4. Development of a heritage corridor evaluation framework that can be applied to other colonial areas.

Literature Review

Responsive Environment in Urban Design

The concept of responsive environment was introduced by Bentley (Bentley et al., 1985) as a framework for assessing the extent to which a physical environment is able to respond to the needs, behaviors, and aspirations of its users. This principle emphasizes that a good urban space must provide opportunities for various activities, clear visual orientation, safety, flexibility, and support for a rich spatial experience. Bentley formulated six main principles permeability, variety, legibility, robustness, visual appropriateness, and richness which to this day remain the theoretical foundation of urban design in many contexts, including heritage areas. Furthermore, (Carmona et al., 2010) expand the understanding of urban space responsiveness by emphasizing that public space quality emerges from the integration of visual coherence, accessibility, activity diversity, and appropriate spatial management. Their framework strengthens Bentley's principles by positioning urban design as a multidimensional process in which aesthetic, functional, and social factors interact to shape user experience. In the context of cultural heritage corridors such as Kotabaru Boulevard, Carmona's perspective is particularly relevant because it highlights the importance of

managing spatial transitions and commercial pressures without compromising the historical identity of the area.

In the context of cultural heritage areas, the principle of a responsive environment is not only related to user comfort but also to the preservation of historical values. Responsiveness in cultural heritage areas must consider the balance between use value (the usefulness of space for the community) and heritage value (the historical value and authenticity of the area). Thus, evaluating responsiveness in cultural heritage areas such as Kotabaru cannot be separated from issues of visual preservation, control of functional changes, and conservation of colonial spatial structures.

Good City Form (Lynch, 1981)

Lynch (Lynch, 1981) developed the theory of Good City Form as an extension of Image of the City (Lynch, 1960). This theory assesses the quality of city form through six dimensions: vitality, sense, fit, access, control, and justice. Each dimension provides a more comprehensive perspective in understanding how urban space works for its users, not only physically but also socially and structurally.

In cultural heritage areas, the dimensions of sense (meaning and legibility of place) and fit (the suitability of physical space to the needs of activities) are particularly important. Both determine the sustainability of heritage character in the face of commercialization and changes in function. Meanwhile, the dimension of justice assesses the extent to which public spaces can be used fairly by various community groups, including pedestrians and vulnerable groups an issue that is relevant to Kotabaru Boulevard, which is currently disrupted by parking and commercial encroachment.

By applying this theory, research can understand whether heritage corridors such as Kotabaru Boulevard not only “look historical” but are also capable of functioning as fair, livable, and habitable public spaces.

Walkability in the Context of Colonial Public Space

Walkability is a basic concept in urban design developed by Southworth (Southworth, 1990) and popularized by Gehl (Gehl, 2010). Walkability measures the ease, comfort, safety, and quality of the walking experience in an urban environment. Factors such as sidewalk continuity, protection from vehicles, lane width, surface quality, lighting, and diversity of activities are important elements in assessing pedestrian quality.

In colonial areas such as Kotabaru, walkability is also related to the sustainability of spatial character. Historic pedestrian spaces must be preserved not only as circulation routes but also as an integral part of the colonial city structure, which was designed with boulevards and open spaces as its main elements. Thus, the loss of pedestrian quality on Kotabaru Boulevard is not merely an issue of comfort but also a form of degradation of the colonial character inherent in the area.

Walkability also influences users' perceptions of spatial reading, visual continuity, and public space comfort. Therefore, this aspect plays an important role in assessing the responsiveness of the environment in cultural heritage areas.

Jacobs (Jacobs, 1961) identifies sidewalks as the primary arena for urban social life, safety, and everyday interactions. The degraded pedestrian conditions on Suroto Street due to parking, commercial encroachment, and discontinuous walkways indicate a decline in this fundamental urban quality.

Urban Design Components (Shirvani, 1985)
Shirvani (Shirvani, 1985) introduced an urban design evaluation framework that includes eight components: land use, building form, circulation, open space, pedestrian ways, activity patterns, signage, and conservation. This framework is widely used in heritage area planning because it covers variables relevant to visual conservation and cultural heritage spatial planning.

In the context of Kotabaru, several of Shirvani's components are crucial. For example, the building form component is directly related to changes in the facades and structures of colonial buildings, which are often reengineered to suit modern business needs. The signage and activity patterns components affect the visual quality of corridors and can disrupt the continuity of colonial aesthetics. In addition, the pedestrian ways component provides a basis for evaluating the quality of sidewalks, which is currently one of the most problematic issues on Kotabaru Boulevard.

The Shirvani framework also provides a conservation perspective through the conservation component, which assesses the extent to which the historical elements of the area are preserved in the use of public space.

Typomorphology of Colonial Areas
Typomorphological studies examine urban structures through the relationship between form (morphology), function, and spatial transformation processes. According to Handinoto (Handinoto, 1996), colonial areas such as Kotabaru were designed based on the garden city principle, characterized by boulevards lined with large trees, wide building setbacks, a distinct grid pattern, and homogeneous building masses.

Typomorphological analysis is important for understanding spatial changes on Kotabaru Boulevard. When the function of buildings changed from colonial private residences to modern commercial spaces, the dynamics of activities and patterns of public space use also changed. These changes are not always in line with the original colonial principles, thus putting pressure on historical values and the quality of public space. Thus, typomorphology helps guide the analysis of spatial responsiveness so that it does not deviate from the historical context of the area.

Conservation of Cultural Heritage Areas
Feilden, Jokilehto, and UNESCO HUL Feilden (Feilden, 2003) emphasizes that the conservation of historic areas must consider the preservation of visual character, authenticity, and the integrity of architectural elements. Jokilehto (Jokilehto, 1999) adds that conservation is not merely about protecting buildings, but also maintaining the relationship between structures, landscapes, and activities that shape the identity of an area.

UNESCO, through its Historic Urban Landscape (UNESCO, 2011) approach, emphasizes the importance of integrating cultural heritage with the needs of modern cities. The HUL approach assesses areas holistically through physical, social, economic, and functional change elements. In Kotabaru Boulevard, the HUL approach helps to see the interaction between public spaces, colonial vegetation, new commercial activities, and social structural changes.

In this study, conservation theory is used to assess whether the responsiveness of public spaces preserves the historical value of the area or contributes to the degradation of its heritage character.

2. Methods

This study uses a qualitative descriptive approach to gain an in-depth understanding of the quality of environmental responsiveness in the Suroto Boulevard corridor located within the Kotabaru Cultural Heritage Area in Yogyakarta. This approach was chosen because analysis of heritage public spaces cannot be measured solely by quantitative indicators, but requires contextual interpretation of the visual, morphological, and functional phenomena that arise in the field. Qualitative research allows researchers to conduct in-depth interpretations of spatial characteristics, activity dynamics, and the connection between the historical value of the area and modern public space needs.

The research was conducted directly in the Suroto Street corridor, covering the boulevard area from north to south. All segments that played a role in the formation of the colonial boulevard structure were observed, including vegetation elements, building setback patterns, street width, pedestrian path quality, activity intensity, and changes to facades and signage. Field research was conducted through visual observation designed to capture the actual conditions of public spaces, identify physical barriers to pedestrians, and record the forms of transformation that have occurred in colonial buildings.

In addition to field observations, data collection was also carried out through photo documentation, direct visual measurements, and recording of relevant urban elements, such as sidewalk materials, lighting conditions, the presence of parking in public spaces, and patterns of space use by business actors. A morphological map of the area was compiled by interpreting the Kotabaru grid pattern, boulevard structure, presence of monumental vegetation, building rhythm, and continuity of colonial facades. Secondary data in the form of cultural heritage area maps, spatial planning policies, colonial architecture literature, and urban design theory references were used to strengthen the analysis.

Data analysis was conducted through theoretical readings referring to four main frameworks, namely Bentley's Responsive Environment, Lynch's Good City Form theory, Southworth's walkability indicators, and Shirvani's urban design components. These four theories were chosen because they provide a comprehensive evaluative toolkit for assessing the quality of public spaces, ranging from physical, visual, accessibility, and comfort aspects to historical harmony. The results of field observations were then compared with the parameters offered by each theory to assess the level of responsiveness of the Suroto Street corridor. In addition, typomorphological analysis was used to understand how colonial structures influenced the formation of the boulevard's character and how changes in land use affected the visual integrity of the area.

The analysis process was carried out in stages, starting from the identification of existing physical conditions, the interpretation of space quality based on theory, to the synthesis between theories to produce a comprehensive understanding of environmental responsiveness in heritage corridors. All findings were then integrated to formulate a responsiveness evaluation ceiling that not only applies to Kotabaru Boulevard but is also relevant to other cultural heritage areas in Indonesia. Thus, this research methodology not only produces a description of conditions, but also provides a conceptual contribution to the development of an evaluative framework for heritage public spaces.

3. Discussion

Overview of Kotabaru Boulevard and the Context of the Cultural Heritage Area
Kotabaru Boulevard with Suroto Street as its main axis is the most prominent urban space element in the colonial structure of Kotabaru, Yogyakarta. This corridor was designed with a

garden city concept that emphasizes wide boulevards, continuous vegetation, long vistas, and buildings arranged with spacious setbacks. As part of a cultural heritage area, Kotabaru Boulevard holds historical value that is not only evident in the architecture of the buildings but also in the colonial spatial patterns that are still visible, especially through the presence of large trees that form natural shade along the corridor. However, the current condition of Kotabaru Boulevard faces significant challenges due to changes in land use, commercialization pressures, and the growth of urban activities. Author's documentations shows that only one house still functions as a residence, while other buildings have been converted to commercial uses such as cafes, beauty clinics, restaurants, private offices, co-working spaces, and service providers. This transformation strengthens the vitality of the area, but on the other hand, it puts high pressure on public spaces, especially sidewalks and pedestrian paths.

Condition of Pedestrian Paths and Walkability Challenges

Pedestrian paths are the most critical element in assessing the responsiveness of a space. Based on field observations, the condition of the pedestrian paths on Suroto Street shows irregularities in terms of width, material, and continuity. At many points, the sidewalks are dominated by parked motor vehicles both cars and motorcycles which obstruct the movement of pedestrians. In addition, there are obstacles in the form of plant pots, café chairs, billboards, and utility poles that block part of the walking path. These conditions indicate that the principles of continuity and comfort in walkability (Southworth, 1990) are not being met. Public spaces that should provide a sense of safety and comfort for pedestrians have instead become areas of conflict between vehicles, business activities, and the daily mobility needs of residents. Uneven night lighting in several segments of the boulevard further exacerbates safety conditions. The following is a table of pedestrian path conditions:

Table 1. Condition of Suroto Street Sidewalk (Author, 2025)

Segment	Condition	Width	Obstructions	Continuity	Remarks
North	Poor	80–100 cm	Motorcycle parking	Not continuous	Not accessible for persons with disabilities
Central Boulevard	Moderate	120–150 cm	Utility poles	Disconnected	Requires surface leveling
Commercial Center	Poor	< 80 cm	Café chairs, potted plants	Not continuous	Conflict between activities and pedestrian space
South	Moderate	100–140 cm	Car parking	Separated	Insufficient lighting

These conditions indicate that the quality of pedestrian facilities on Kotabaru Boulevard does not meet the standards of an inclusive and responsive heritage public space. In the context of Good City Form (Lynch, 1960) the aspects of fit the suitability of space to user needs and justice equitable access to public space have significantly declined. Conflicts over the use of pedestrian space due to parking and commercial activities are a common pattern in heritage areas under high urbanisation pressure (Litman, 2020).

Land Use Change and Its Impact on Heritage Structure

Land use change is a dominant phenomenon on Kotabaru Boulevard. Based on our observations of Suroto Street, this corridor, which was originally a row of colonial houses, is now dominated by rapidly developing commercial functions. This change has given the area a boost of vitality, but it has also led to visual changes that are not entirely in line with the colonial character. The following table shows the changes in land use:

Table 2. Changes in Land Use on Suroto Street (Author, 2025)

Previous Function	Percentage	New Function	Percentage	Impact
Residential	±80%	Residential	±5%	Colonial character weakens
Colonial institution	±10%	Public office	±25%	Increased vitality
Small-scale commerce	±10%	Modern commercial	±70%	Pressure from signage & parking

Walkability Analysis on Kotabaru Boulevard

Walkability is an important indicator of the responsiveness of public spaces. Walkability is a fundamental element of human-scale cities (Gehl, 1996). On Kotabaru Boulevard, the level of walkability is relatively low even though the corridor has a supportive physical structure, such as wide open spaces and shade from vegetation. The main problems lie in the continuity, safety, and comfort of pedestrian paths. The walkability analysis is presented in the following table:

Table 3. Walkability Evaluation of Suroto Street Corridor (Author, 2025)

Indicator	Value	Explanation
Connectivity	High	Kotabaru grid network
Continuity	Low	Discontinuous sidewalks
Land-use mix	High	Diverse functions
Safety	Low	Sidewalk parking & minimal lighting
Comfort	Low	Physical obstacles & slippery when raining
Human-scale	Medium	Large vegetation helps

The table indicates that Kotabaru Boulevard possesses strong spatial connectivity due to its colonial grid structure. However, pedestrian experience remains weak because continuity, safety, and comfort are disrupted by parking encroachment and physical obstacles. These findings suggest that spatial morphology alone is insufficient to create a responsive pedestrian environment without proper public space management.

Evaluation Based on the Responsive Environment Principle (Bentley et al., 2012)

The analysis shows that Kotabaru Boulevard has partial responsiveness, but not comprehensive responsiveness. High potential exists in permeability because the colonial grid pattern allows for good mobility; variety due to a dynamic mix of functions; and legibility through the long boulevard vista.

However, robustness the ability of public spaces to accommodate various activities is very low due to narrow sidewalks and obstructed parking. Visual appropriateness is also low due to signage, banners, and facade changes that are not in line with colonial aesthetics.
The Bentley evaluation table is as follows:

Table 4. Responsive Environment Evaluation (Bentley) (Author, 2025)

Indicator	Value	Explanation
Permeability	High	Kotabaru grid
Variety	High	Diverse functions
Legibility	High	Vistas and vegetation
Robustness	Low	Public spaces not flexible
Visual Appropriateness	Low	Inappropriate signage
Richness	Medium–High	Rich vegetation, non-homogeneous façades

The evaluation demonstrates that the corridor retains high permeability and legibility, yet lacks robustness and visual appropriateness. This imbalance indicates that although the original colonial structure remains readable, current commercial transformations reduce the flexibility and visual coherence of public space.

Evaluation Based on Good City Form (Lynch, 1981)
When viewed from the perspective of Good City Form, Kotabaru Boulevard shows high vitality due to commercial activity and diversity of function. However, the sense is weakened because the colonial facades are beginning to be covered by modern elements, and the fit is low because the pedestrian space does not suit daily mobility needs. Control and justice are at a low level because the use of public space benefits vehicles and commercial enterprises more than pedestrians.

Table 5. Good City Form Evaluation (Author, 2025)

Dimension	Assessment	Explanation
Vitality	High	Dense commercial activities
Sense	Medium	Colonial identity disrupted
Fit	Low	Sidewalks not supportive
Access	Medium	Vehicle access dominant
Control	Low	Parking occupies public space
Justice	Low	Not inclusive for pedestrians

The findings show that economic vitality in Kotabaru Boulevard has increased significantly, but this growth is not accompanied by spatial justice and pedestrian oriented accessibility. As a result, the corridor functions actively as a commercial space but less effectively as an inclusive public environment.

Evaluation Based on Urban Design Components (Shirvani)

Shirvani provides a clear technical analysis of the quality of area planning. On Kotabaru Boulevard, the aspects of open space and activity patterns are still quite strong, but other components such as pedestrian ways, signage, and conservation show the greatest degradation. In many colonial areas, uncontrolled signage has proven to be a major cause of visual incoherence (Ashworth & Tunbridge, 2000; Orbasli et al, (2008)).

Table 6. Evaluation of Urban Design Components (Shirvani) (Author, 2025)

Component	Evaluation	Explanation
Land Use	Declining	Extreme commercialization
Building Form	Diverse	Some modern façades disrupt
Circulation	Poor	Vehicle domination
Open Space	Good	Strong vegetation
Pedestrian Ways	Poor	Fragmented
Activity Patterns	Good	Intense activities
Signage	Poor	Uncontrolled
Conservation	Weak	Visual element inconsistency

The dominance of weak scores in pedestrian ways, signage, circulation, and conservation indicates that the primary challenges of the corridor are not related to spatial structure, but rather to the management and control of visual and public space elements.

Integrated Responsiveness Framework for Heritage Corridors

Based on the integration of Responsive Environment theory (Bentley et al., 1985), Good City Form (Lynch, 1981), walkability principles (Southworth, 1990; Gehl, 1996) Urban Design Components (Shirvani, 1985), typomorphological analysis, and conservation theory (Feilden, 2003) (UNESCO, 2011), this study formulates an integrated Cultural Heritage Area Responsiveness Framework. The framework was developed through comparative synthesis between theoretical indicators and field findings observed in Kotabaru Boulevard. Rather than focusing solely on physical preservation, the framework emphasizes the relationship between spatial responsiveness, pedestrian quality, visual integrity, activity dynamics, and governance mechanisms within heritage corridors.

Table 7. Integrated Responsiveness Framework for Cultural Heritage Corridors (Author, 2026)

Dimension	Main Focus	Key Indicators
Historical Structure	Colonial spatial legibility	Vista, vegetation, grid
Accessibility	Spatial connectivity	Permeability, access
Pedestrian Comfort	Walkability quality	Continuity, safety
Visual Suitability	Heritage visual harmony	Signage, façade control
Activity & Vitality	Functional dynamics	Variety, activity pattern
Spatial Governance	Public space regulation	Parking control, conservation

Synthesis of Analysis: Responsiveness Challenges in Cultural Heritage Areas

The results of the analysis show that Kotabaru Boulevard has high responsiveness potential, but its actual responsiveness quality is low in key aspects. Historically, this corridor was designed as a colonial boulevard that was responsive and pedestrian friendly. However, social transformation and commercialization over the past 10–15 years have shifted the orientation of the area towards the interests of vehicles and commercial enterprises, rather than public space.

This incompatibility is relevant to the conservation principles of Feilden & Jokilehto, which emphasize that cultural heritage areas must be preserved in their physical and social context. The transition occurring on Kotabaru Boulevard tends to obscure its colonial identity, weaken visual harmony, and diminish the quality of public space as a cultural element.

Overall, Kotabaru Boulevard does not fail as an urban space, but it fails to maintain its heritage character within the dynamics of modern urbanism due to weak control over public space and visual elements. Similar conditions have been identified in many historic urban corridors worldwide, where commercialization and tourism pressures gradually reduce pedestrian quality and visual coherence in heritage environments. Studies in heritage cities such as George Town, Penang and Historic Cairo also demonstrate that inadequate regulation of signage, parking, and adaptive reuse often weakens the balance between economic vitality and heritage integrity. Therefore, the challenges observed in Kotabaru Boulevard reflect broader global issues in managing responsive public spaces within historic urban landscapes.

4. Conclusion

The results of the study on Kotabaru Boulevard in Yogyakarta show that this heritage corridor has very strong spatial potential based on its colonial structure, which has been in place since the early 20th century. The garden city character, strict grid pattern, monumental vegetation, long boulevard vista, and rows of colonial buildings form the foundation of a rich public space with a strong visual identity. However, an in-depth analysis using the theories of Bentley, Lynch, Southworth, Shirvani, as well as typomorphological and conservation

approaches, shows that this potential is not fully realized in the existing conditions.The quality of the responsive environment on Kotabaru Boulevard is partial: some aspects are in good condition, while others have deteriorated. Principles such as permeability, legibility, richness, and variety are high thanks to the established colonial structure and the dynamics of growing commercial activity. However, the most essential aspects of public space quality, such as robustness, fit, justice, pedestrian ways, and visual appropriateness, show a significant decline. Suroto Street is experiencing commercialization pressure, the growth of modern signage, changes in facades, and the use of sidewalks as parking spaces, which disrupts pedestrian mobility.

From the perspective of Good City Form, Kotabaru Boulevard shows strong vitality but lacks sense and fit due to uncontrolled visual changes and the loss of safe pedestrian functions. Access to public spaces is more favorable for vehicles than for pedestrians, resulting in a decline in the aspect of justice. Meanwhile, from Shirvani's perspective, the components of land use, circulation, signage, pedestrian ways, and conservation are the areas that require the most attention in order to comply with the principles of cultural heritage area management.

Synthesis of Findings

This study concludes three main points:

1. Kotabaru Boulevard has strong historical and morphological potential but is not supported by responsive public space quality.

The rich colonial patterns and elegant boulevard vistas are still visible, but they are not managed in accordance with the principles of responsiveness and conservation.

2. Uncontrolled commercialization is a major factor in the decline in the quality of public space.

Land use changes, signage invasion, and space conflicts between vehicles and pedestrians have led to a loss of pedestrian quality and visual appropriateness.

3. The absence of a specific responsiveness evaluation framework for cultural heritage areas.

This has resulted in spatial management issues being more sectoral in nature and not comprehensively considering aspects of heritage responsiveness.

Scientific Contribution (Novelty) of the Research

This research provides novelty in the field of urban studies and area conservation, namely:

(1) Multi-theory integration to assess cultural heritage area responsiveness
Combining Bentley's theory (responsive environment), Lynch's theory (good city form), Southworth's theory (walkability), Shirvani's theory (urban design components), colonial typomorphology, and UNESCO-HUL results in a more comprehensive analysis.

(2) Development of a responsiveness evaluation model for cultural heritage areas
This study formulates six dimensions of cultural heritage area responsiveness that can be used as a framework for analyzing other colonial cities.

(3) Case study of Kotabaru Boulevard as a concrete example of tropical colonial space transformation
Empirical findings from Kotabaru form the basis for the development of evaluative indicators that can be applied to other cultural heritage areas in Indonesia.

(4) Refining the concept of “responsiveness-heritage”
This study fills a rarely discussed research gap: how the responsiveness of modern public spaces is measured in cultural heritage spaces with strong historical value.

Cultural Heritage Area Responsiveness Framework (6 Dimensions)

This study also formulates a Cultural Heritage Area Responsiveness Framework consisting of six dimensions: historical structure, accessibility, pedestrian comfort, visual suitability,

activity and vitality, and spatial governance. The framework provides an evaluative tool for understanding how heritage corridors respond to contemporary urban pressures while maintaining historical integrity.

Implications of Cultural Heritage Area Responsiveness Ceilings

This framework can be used to:

- assess the quality of colonial corridors throughout Indonesia;
- develop heritage area evaluation indicators for local governments;
- serve as an analytical tool for academics to understand the dynamics of colonial space transformation;
- form the basis for developing non-technical, conceptual design guidelines.

In other words, this research is not only relevant to Kotabaru, but has a much broader scope of contribution.

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