

Community-Based Infrastructure and Spatial Adaptation in Organic Urban Settlements: Evidence from the Code River Corridor, Yogyakarta, Indonesia

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Abstract

Organic urban settlements emerge through continuous interactions among environmental conditions, community needs, and socio-cultural values, producing distinctive patterns of spatial organization and infrastructure development. However, limited research has explored how community-driven initiatives shape spatial adaptation and infrastructure provision in organically developed urban environments. This study aims to examine the influence of cultural values and community practices on infrastructure development and spatial adaptation within an organic settlement located along the Code River Corridor, Yogyakarta, Indonesia. A qualitative phenomenological approach was employed through field observations, documentation, and in-depth interviews with local residents. The collected data were analyzed inductively to identify relationships between social values, community behavior, and the physical characteristics of the settlement. The findings reveal that the area has evolved through community-based initiatives characterized by collective action, self-help practices, and adaptive responses to environmental conditions. Spatial arrangements, building forms, circulation networks, utility systems, and landscape management have developed in accordance with topographical constraints, economic considerations, and social interactions. Community cohesion, local knowledge, and mutual cooperation emerged as key factors shaping a functional and adaptive urban environment despite the absence of formal planning mechanisms. These findings demonstrate that community-based infrastructure development and spatial adaptation are strongly influenced by local cultural values and collective behavior, contributing to the resilience and sustainability of organically developed urban settlements.

Keywords: *Adaptive Urbanism; Community-Based Infrastructure; Cultural Values*

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INTRODUCTION

Urbanization has become one of the most influential processes shaping contemporary cities and their spatial structures. Rapid urban growth has increased pressure on land availability, infrastructure provision, and environmental sustainability in many developing countries (Awuah & Abdulai, 2022; Mahtta et al., 2022; Shao et al., 2021). As a consequence, numerous urban areas have experienced the emergence of organic settlements that evolve outside formal planning frameworks. These settlements are generally characterized by incremental growth patterns, flexible spatial arrangements, and strong community involvement in shaping the built environment (Iranmanesh & Kamalipour, 2023; Kamalipour, 2023; Kamalipour & Iranmanesh, 2021). Unlike planned urban neighborhoods, organic settlements develop through continuous adaptation to environmental conditions, economic opportunities, and social needs. The resulting spatial configurations often reflect the collective experiences and local knowledge accumulated by residents over time. Urban space in such settlements is therefore not solely determined by physical planning regulations but also by social and cultural processes. Previous studies have demonstrated that the physical characteristics of urban environments are closely associated with patterns of human interaction and community practices. Understanding how these interactions influence spatial development has become increasingly important for sustainable urban management. Consequently, investigating the dynamics that shape organically developed settlements offers valuable insights into contemporary urban development challenges.

Culture plays a fundamental role in influencing how communities perceive, utilize, and transform their living environments. Cultural values are often reflected in settlement patterns, housing forms, infrastructure arrangements, and the management of shared spaces (Al Husban et al., 2021; Grundström, 2022; Suhartini & Jones, 2020). Through daily interactions and collective decision-making processes, communities continuously contribute to the production and transformation of urban space. In many organically developed settlements, infrastructure provision frequently emerges through community initiatives rather than formal institutional interventions (Bhanye, 2025; Kabue et al., 2022; Wainaina et al., 2022). Roads, utility networks, sanitation systems, and communal facilities are often established through collective action and mutual cooperation among residents (Chidambaram, 2020; Gbadegesin et al., 2020; Golfinopoulos & Koumparou, 2024). Such practices illustrate the ability of local communities to respond to spatial and environmental challenges using available resources and indigenous knowledge. Community-based infrastructure development has therefore been recognized as an important mechanism for enhancing urban resilience and adaptive capacity. Social cohesion and shared cultural values further strengthen participation in maintaining and improving public facilities within settlements. These interactions generate distinctive urban forms that simultaneously reflect environmental adaptation and socio-cultural organization. Therefore, examining the relationship between cultural values and community-driven development is essential for understanding the formation of adaptive urban environments.

The Code River Corridor in Yogyakarta represents an example of an organic urban settlement that has developed through long-term community initiatives and environmental adaptation. Located along a riverbank characterized by complex topographical conditions, the settlement has experienced continuous transformation in response to social, economic, and environmental changes. The physical structure of the area consists of diverse building forms, self-developed infrastructure networks, communal facilities, vegetation arrangements, and adaptive responses to terrain limitations. Community members have played an important role in providing infrastructure and maintaining the functionality of public spaces throughout the settlement's development (Harun et al., 2021; Lemanski, 2020; Peng et al., 2023). The area has evolved through collective efforts that prioritize practical solutions to spatial constraints and environmental challenges. Local knowledge and shared experiences have contributed to the creation of infrastructure systems that support everyday activities and social interactions. In addition, strong social relationships among residents have facilitated collaborative actions in managing communal resources and environmental quality (Chen et al., 2025; Ruan et al., 2022; Si et al., 2022; Ssekajja, 2025). These characteristics illustrate the close relationship between social organization and physical spatial development within the settlement. The coexistence of environmental adaptation and community participation has produced a unique urban landscape that continues to evolve over time. As a result, the Code River Corridor provides an important context for investigating the interactions between cultural values, infrastructure development, and spatial adaptation.

Although previous studies have extensively examined urban morphology from the perspectives of spatial patterns, environmental performance, urban form measurement, and morphological transformation (Chen et al., 2025; Hassan et al., 2020; Zhang et al., 2023; Zhu et al., 2022), while research on informal and organic settlements has focused on self-organizing spatial structures and settlement development processes (Mottelson & Venerandi, 2020; Suhartini & Jones, 2020), and studies on community-based infrastructure have primarily addressed governance arrangements, participatory management, and infrastructure provision (Gbadegesin et al., 2020; Henshel & Ashby, 2023), the role of cultural values has generally been investigated within behavioral, environmental, and organizational contexts rather than within the built environment (Chwialkowska et al., 2020; Minkov & Kaasa, 2022; Sagiv & Schwartz, 2022). Consequently, limited empirical evidence exists regarding how cultural values influence collective community actions that subsequently shape infrastructure development, spatial adaptation, and urban morphological formation in organically developed settlements. Furthermore, the interaction between socio-cultural values, community-driven infrastructure provision, and adaptive spatial configurations remains underexplored, particularly in riverbank settlements experiencing continuous urbanization pressures. Therefore, an integrated understanding of how cultural values are translated into collective practices that influence infrastructure development and spatial adaptation is still lacking, highlighting a significant research gap in the literature on organic urban settlements.

This study aims to examine the influence of cultural values and community practices on infrastructure development and spatial adaptation within an organic urban settlement located along the Code River Corridor, Yogyakarta, Indonesia. Specifically, the study investigates how collective actions, local knowledge, and social interactions contribute to the formation of physical spatial structures and infrastructure systems. The research seeks to identify the mechanisms through which cultural values are translated into community-based development practices. It also explores how residents adapt to environmental constraints, including topographical challenges and riverine conditions. Furthermore, the study analyzes the relationship between infrastructure provision and spatial organization in a settlement that has evolved through self-managed processes. By integrating socio-cultural and spatial perspectives, this research provides a more comprehensive understanding of organic urban development. The study contributes to the literature on urban morphology, community-based infrastructure, and spatial adaptation. It also offers empirical evidence from a developing-country context where organic settlements continue to play an important role in urban growth. The findings are expected to support planners and policymakers in developing more participatory and context-sensitive urban management strategies. Ultimately, this study seeks to advance understanding of how community-driven initiatives contribute to resilient and adaptive urban environments.

METHODS

Research Design

This study employed a qualitative research design using a phenomenological approach to explore the relationship between cultural values, community-based infrastructure development, and spatial adaptation within an organic urban settlement. A phenomenological approach was selected because it enables an in-depth understanding of how residents perceive, experience, and interpret the development of their living environment. The study focused on identifying the meanings, values, and practices underlying spatial formation and infrastructure provision within the settlement. Through this approach, both physical and socio-cultural dimensions of the settlement could be examined simultaneously. The research adopted an inductive analytical perspective, allowing patterns and themes to emerge directly from field observations and participants' experiences. Such an approach was considered appropriate for investigating community-driven urban development processes that evolve outside formal planning mechanisms.

Study Area

The study was conducted in an organically developed settlement located along the Code River Corridor in Pogung Kidul, Yogyakarta, Indonesia. The settlement occupies a riverbank environment characterized by irregular topography, limited land availability, and gradual spatial expansion. The area was selected because it represents a distinctive example of community-driven urban development that has evolved through self-organized infrastructure provision and continuous environmental adaptation. Over several decades, residents have developed housing, circulation networks, utility systems, and communal facilities through collective initiatives and local decision-making processes. The settlement therefore provides an appropriate context for

examining the interactions between cultural values, infrastructure development, and spatial adaptation.



Figure 1. Study Area

Participants and Data Sources

The study utilized purposive sampling to identify participants who possessed substantial knowledge regarding the historical development, infrastructure provision, and spatial transformation of the settlement. Participants included long-term residents, community leaders, property owners, and individuals directly involved in the development and management of local infrastructure. Primary data were obtained through observations and in-depth interviews, while secondary data consisted of maps, settlement documentation, photographs, and relevant administrative records. The combination of multiple data sources enabled a comprehensive understanding of both physical and socio-cultural aspects of the settlement.

Data Collection

Data collection was conducted through field observations, documentation, and semi-structured in-depth interviews. Observations focused on the physical characteristics of the settlement, including building configurations, circulation networks, infrastructure systems, vegetation patterns, topographical conditions, and river-related spatial adaptations. Photographic documentation was used to support field observations and provide visual evidence of settlement characteristics. Semi-structured interviews were conducted to explore residents' perceptions, experiences, and decision-making processes related to settlement development. Interview topics included settlement history, infrastructure provision, land use decisions, environmental adaptation strategies, and community participation. The flexible interview format allowed participants to elaborate on issues considered important from their perspectives. Data collection continued until sufficient information was obtained to explain recurring patterns and themes relevant to the research objectives.

Data Analysis

The collected data were analyzed using inductive thematic analysis. The analysis began with data familiarization through repeated review of field notes, interview transcripts, and visual documentation. Subsequently, meaningful units of information were identified and coded according to recurring concepts related to cultural values, community practices, infrastructure development, and spatial adaptation. Similar codes were then grouped into broader thematic categories that reflected relationships between socio-cultural factors and physical spatial outcomes. Themes were continuously refined through comparison across multiple data sources to ensure analytical consistency. The final stage involved interpreting the relationships among identified themes and developing an integrated understanding of how community-driven processes influence urban spatial formation within the settlement.

Trustworthiness

To enhance the credibility and trustworthiness of the findings, data triangulation was employed by comparing information obtained from observations, interviews, and documentary sources. Methodological triangulation enabled the validation of findings across different forms of evidence. In addition, member checking was conducted by discussing preliminary interpretations with selected participants to ensure that the findings accurately reflected their experiences and perspectives. Continuous comparison among data sources further strengthened the reliability and consistency of the analytical process.

Research Procedure

The research was conducted through a series of sequential stages designed to capture both the physical and socio-cultural dimensions of the settlement. The first stage involved a preliminary field survey to identify the characteristics of the study area and establish an initial understanding of settlement conditions. This stage also included a review of relevant literature concerning urban morphology, community-based infrastructure, spatial adaptation, and organic settlement development. The second stage focused on direct field observations to document physical elements of the settlement, including buildings, circulation networks, infrastructure systems, vegetation patterns, topographical features, and river-related spatial characteristics. Findings from the observations were used to guide the development of interview themes and identify potential participants. The third stage consisted of conducting semi-structured in-depth interviews with selected participants who possessed extensive knowledge of the settlement's development history, infrastructure provision, and community practices. Interview data were collected to explore residents' perceptions, experiences, cultural values, and decision-making processes related to spatial development and environmental adaptation. During the fourth stage, observational data, interview transcripts, photographs, and supporting documents were organized and systematically reviewed. The collected information was then coded and categorized according to recurring concepts and emerging themes. The final stage involved thematic interpretation and synthesis of the findings. Relationships among cultural values, community actions, infrastructure development, and spatial adaptation were examined to develop a comprehensive understanding of the settlement

formation process. Themes generated from the analysis were compared across multiple data sources to ensure consistency and analytical rigor. The resulting interpretation was subsequently used to explain how community-driven practices contribute to the development of adaptive and resilient urban environments within organically developed settlements.

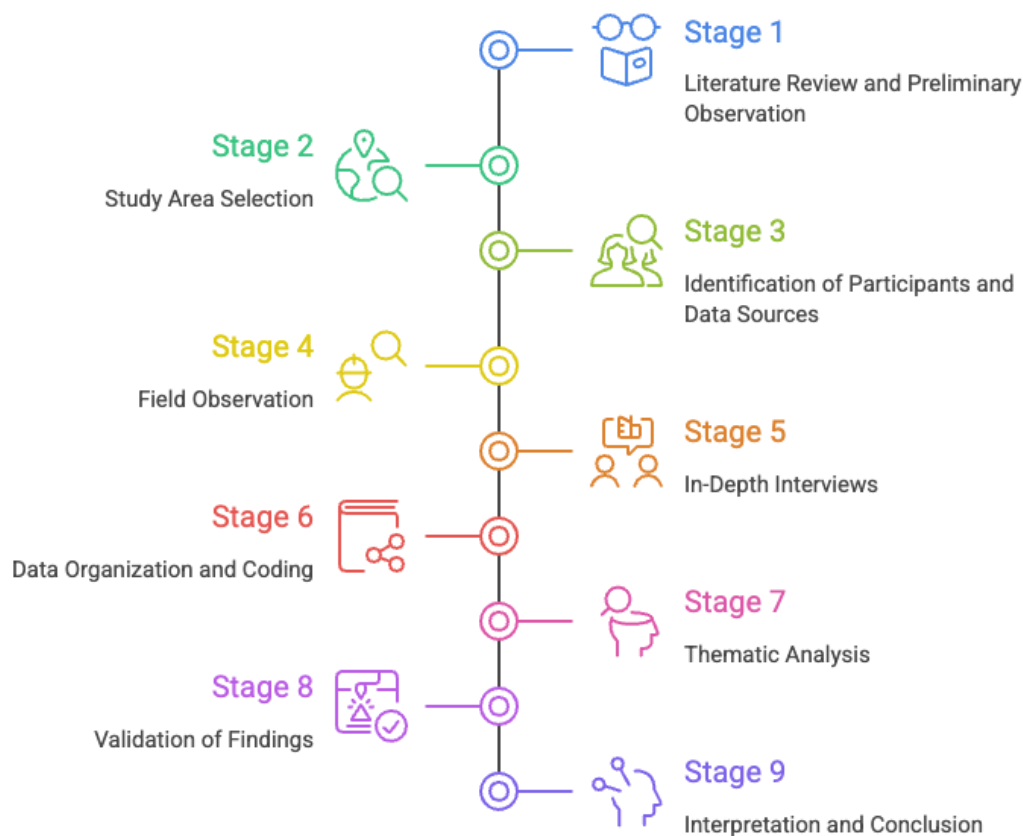


Figure 2. Research Method flow

Figure 1. The research procedure consisted of nine sequential stages designed to systematically explore the relationships among cultural values, community-based infrastructure development, and spatial adaptation within an organic urban settlement. The first stage involved conducting a literature review and preliminary observations to establish the theoretical foundation of the study and identify key issues related to urban morphology, organic settlements, spatial adaptation, and community participation. The second stage focused on selecting the study area, namely the organic settlement located in Pogung Kidul along the Code River Corridor, Yogyakarta, based on its distinctive characteristics as a community-developed riverbank settlement. The third stage involved identifying key participants and supporting data sources through purposive sampling, including long-term residents, community leaders, and individuals actively involved in settlement development. The fourth stage consisted of direct field observations to document the physical characteristics of the settlement, including building configurations, circulation networks,

infrastructure systems, vegetation patterns, topographical conditions, and river-related environmental features. Subsequently, semi-structured in-depth interviews were conducted to explore residents’ experiences, perceptions, cultural values, and collective practices associated with infrastructure provision and spatial adaptation. Following data collection, the sixth stage involved organizing and coding interview transcripts, field notes, photographs, and documentary materials to identify meaningful information units and recurring concepts. The seventh stage employed inductive thematic analysis to examine patterns and relationships among cultural values, community actions, infrastructure development, and spatial adaptation. To ensure the credibility and trustworthiness of the findings, the eighth stage involved validating the results through data triangulation and member checking by comparing information obtained from multiple sources and confirming interpretations with selected participants. Finally, the validated findings were synthesized and interpreted to develop a comprehensive understanding of how cultural values and collective community actions contribute to infrastructure development and adaptive spatial formation within organically developed urban settlements.

RESULT AND DISCUSSIONS

Building Morphology and Spatial Organization

The findings indicate that the physical morphology of the Pogung Kidul settlement has evolved through an organic development process strongly influenced by environmental conditions and residents’ socioeconomic needs. Buildings are predominantly distributed along circulation routes and river corridors, creating an irregular spatial pattern that differs from formally planned urban neighborhoods. Most residential units are oriented toward local roads to enhance accessibility, while several structures face the river to maximize environmental comfort and visual quality. The dominant building functions include private residences and boarding houses, reflecting the strategic location of the settlement near Universitas Gadjah Mada. Over time, a gradual transformation from purely residential use to mixed residential-commercial functions has occurred, particularly through the conversion of houses into rental accommodations. Building forms generally exhibit simple and functional characteristics, with minimal ornamentation and a preference for practical spatial arrangements. Variations in building size and configuration are largely associated with differences in plot dimensions and topographic constraints. Residents have continuously adapted building designs to maximize the use of available land while maintaining structural feasibility. These findings suggest that the settlement morphology is the result of continuous adaptation to both environmental limitations and emerging economic opportunities.

Table 1. Characteristics of Building Morphology

Morphological Aspect	Observed Characteristics
Building Orientation	Predominantly aligned with roads and river corridors
Main Functions	Residential houses and boarding houses
Architectural Style	Minimalist and functional
Building Height	One to two stories

Environmental Adaptation Through Vegetation and Topography

Environmental adaptation emerged as a significant factor influencing the physical structure of the settlement. The results show that existing vegetation has been preserved whenever possible and integrated into the spatial organization of the neighborhood. Large trees are generally retained unless they directly interfere with building foundations or essential infrastructure. Vegetation serves multiple functions, including environmental protection, thermal regulation, visual enhancement, and spatial demarcation. In several locations, rows of trees function as informal markers separating circulation paths from river edges, effectively replacing conventional signage systems. The settlement also demonstrates considerable adaptation to complex topographic conditions. Buildings have been positioned and designed according to variations in slope and elevation, resulting in diverse construction strategies across the area. Some residents adjusted building footprints to fit available terrain, whereas others adopted structural reinforcement systems to overcome steep gradients. These adaptive responses illustrate the community’s capacity to coexist with challenging environmental conditions while maintaining settlement functionality.

Table 3. Environmental Adaptation Strategies

Environmental Feature	Adaptation Strategy
Vegetation	Preservation of mature trees
River Edge	Vegetative buffering and spatial separation
Steep Slopes	Flexible building placement
Limited Land	Incremental expansion and structural adaptation
Climate Conditions	Natural shading and ventilation

Cultural Values and Collective Spatial Practices

The findings further reveal that cultural values play a central role in shaping the spatial characteristics of the settlement. Collective action, mutual respect, social solidarity, and self-reliance were consistently reflected in residents’ decisions regarding land use, infrastructure provision, and environmental management. The limited presence of commercial signage despite the widespread existence of boarding houses and small businesses suggests a high degree of social familiarity among residents. Economic activities operate within a community context characterized by interpersonal trust and strong neighborhood relationships. Residents also demonstrated a strong sense of ownership toward communal spaces and environmental resources, particularly the Code River. The river functions not only as a source of water and sanitation support but also as a social space that accommodates daily activities and community interaction. Furthermore, collective efforts to maintain environmental quality and improve communal facilities illustrate the integration of cultural values into spatial practices. These findings indicate that the physical environment of Pogung Kidul is inseparable from the social and cultural systems that underpin its development. Consequently, the settlement can be understood as a manifestation of contemporary culture-based urban morphology in which spatial forms emerge through continuous interactions between environmental conditions, social behavior, and shared cultural values.

Overall, the results demonstrate that the morphology of Pogung Kidul RT 1 has evolved through the dynamic interaction of physical environmental conditions, community-based infrastructure development, and culturally embedded social practices. Rather than being shaped by formal planning mechanisms, the settlement has developed through locally negotiated processes that prioritize adaptation, collective action, and efficient resource utilization. These interactions have produced a distinctive form of organic urban morphology characterized by resilience, environmental responsiveness, and strong community cohesion.

Discussion

The findings demonstrate that the morphology of the Pogung Kidul settlement has emerged through a continuous process of spatial adaptation rather than formal urban planning interventions. The irregular arrangement of buildings, circulation networks, and infrastructure reflects a form of organic urban development shaped by environmental constraints and residents' practical needs. This observation is consistent with the work who argued that informal settlements often exhibit highly adaptive spatial structures that evolve through locally negotiated processes rather than centralized planning mechanisms (Mottelson & Venerandi, 2020). Similarly, described self-organizing settlements as systems governed by locally generated rules that gradually produce coherent urban forms (Suhartini & Jones, 2020). The present study extends these findings by demonstrating that spatial adaptation is not solely a response to physical constraints but is also influenced by socio-cultural considerations embedded within community practices. Unlike many studies that primarily emphasize physical morphology, the findings reveal the importance of collective decision-making in shaping settlement configuration. The orientation of buildings, the utilization of limited land resources, and the adjustment of structures to topographic conditions illustrate a dynamic interaction between environmental opportunities and social priorities (Jiang et al., 2025; Ochoa et al., 2024; Surya et al., 2021). These characteristics indicate that urban morphology in organic settlements should be understood as a socio-spatial process rather than merely a physical outcome (Alnaim & Noaime, 2024; Nezhadmasoum & Vehbi, 2025; Noaime & Alnaim, 2025; Suhartini & Jones, 2020). Consequently, the findings contribute to a more holistic understanding of how adaptive urban forms emerge through the interaction of environmental, social, and cultural factors. This perspective broadens conventional interpretations of urban morphology by emphasizing the significance of community agency in shaping spatial transformation.

Another significant finding concerns the central role of community-based infrastructure development in shaping the physical and functional characteristics of the settlement. The establishment of roads, electricity networks, public lighting, and sanitation facilities through collective action demonstrates the capacity of local communities to address infrastructure needs independently. This finding supports previous research, who emphasized that community-based infrastructure systems are often sustained through shared governance and collective responsibility (Gbadegesin et al., 2020). Argued that community-based infrastructure represents an alternative

model of urban development that prioritizes local participation and social ownership. The results of the present study further reveal that infrastructure development serves not only functional purposes but also strengthens social cohesion and collective identity. Infrastructure projects became platforms for negotiation, cooperation, and mutual assistance among residents. Such findings reinforce the argument that infrastructure should be viewed as both a physical and social construct within community-developed settlements. In contrast to conventional planning approaches that often separate technical and social dimensions, the infrastructure systems observed in Pogung Kidul evolved through the integration of both aspects. This integration contributed to the creation of a resilient settlement capable of responding to changing environmental and socioeconomic conditions. Therefore, community participation emerges as a critical factor influencing both infrastructure sustainability and urban adaptability.

The findings also highlight the importance of environmental adaptation as a key driver of settlement development. The preservation of mature vegetation, the strategic use of natural features as spatial markers, and the adjustment of building configurations to topographical conditions demonstrate a high level of environmental responsiveness among residents. These observations are consistent with studies emphasizing the role of environmental adaptation in shaping urban morphology and settlement resilience. That urban form can significantly influence environmental quality and livability (Hassan et al., 2020), while demonstrated that morphological characteristics directly affect local environmental performance (Yang et al., 2021). However, the present study provides a different perspective by showing that environmental adaptation is not solely a technical response but is closely connected to local knowledge and cultural practices. Residents did not merely modify the environment to accommodate development; instead, they adapted development practices to fit existing environmental conditions (Egerer et al., 2021; Scott et al., 2020; Sinay & Carter, 2020). This approach contrasts with many contemporary urban development models that prioritize large-scale environmental modification. The findings suggest that community-based environmental adaptation can produce sustainable outcomes while minimizing ecological disruption. Consequently, the study supports the growing recognition of adaptive urbanism as a framework for understanding environmentally responsive settlement development. The integration of ecological awareness into everyday spatial practices therefore represents an important dimension of sustainable urban morphology.

Cultural values emerged as one of the most influential factors shaping spatial organization and infrastructure development within the settlement. Values such as mutual cooperation, social trust, collective responsibility, and community solidarity were reflected in both physical arrangements and development practices. Previous studies have acknowledged the importance of cultural values in influencing human behavior and environmental decision-making (Chwialkowska et al., 2020; Sagiv & Schwartz, 2022). However, most of these studies have focused on behavioral or organizational contexts rather than the built environment. The present findings contribute to the literature by illustrating how cultural values are translated into tangible spatial outcomes through collective actions and community-led initiatives. The limited reliance on formal regulations,

combined with the strong emphasis on social relationships, enabled residents to coordinate development activities effectively. This process resulted in a settlement environment characterized by flexibility, adaptability, and social cohesion. The findings therefore support the argument that culture functions as an underlying mechanism influencing spatial behavior and urban development processes. Moreover, the study demonstrates that cultural values can act as informal governance systems that guide infrastructure provision, environmental management, and land-use decisions (Barry & Kingwill, 2020; Krawchenko & Tomaney, 2023; Wijesinghe & Thorn, 2021). These insights broaden existing understandings of the relationship between culture and urban morphology by highlighting the role of shared values in shaping community-driven spatial transformation.

The most important contribution of this study lies in its integrated explanation of the relationships among cultural values, community-based infrastructure development, spatial adaptation, and urban morphology. Previous research has generally examined these themes separately, focusing either on physical urban form, infrastructure governance, environmental adaptation, or cultural influences. The findings of this study demonstrate that these dimensions are closely interconnected and collectively influence the formation of organic urban settlements. Cultural values provide the normative foundation for collective action, collective action facilitates infrastructure development, and infrastructure development supports adaptive spatial transformation (Bertacchini & Gould, 2021; Neef et al., 2023; Orchard et al., 2020; Yazar & York, 2023). This interconnected process ultimately produces a distinctive urban morphology characterized by resilience, flexibility, and environmental responsiveness (Eldesoky & Abdeldayem, 2023; Mabrouk et al., 2024; Makvandi et al., 2024; Sartorio et al., 2021). The proposed perspective extends existing urban morphology literature by incorporating socio-cultural and infrastructural dimensions into the analysis of settlement formation. It also contributes to discussions on community-based urban development by emphasizing the importance of local knowledge and collective practices in shaping urban environments. Furthermore, the findings offer practical implications for planners and policymakers seeking to promote more participatory and context-sensitive urban development strategies. Recognizing the role of culture and community participation may enable the design of planning approaches that are more compatible with the realities of organically developed settlements. Therefore, the study provides both theoretical and practical contributions to contemporary debates on sustainable urban development and adaptive settlement planning.

Implication

The findings of this study have important theoretical and practical implications for understanding the development of organic urban settlements in rapidly urbanizing environments. From a theoretical perspective, the study contributes to the urban morphology literature by demonstrating that the formation of urban space cannot be fully explained through physical and environmental factors alone. Instead, cultural values, collective actions, and community participation play a central role in shaping spatial organization and infrastructure development. The study further advances the concept of community-based urban development by illustrating how social cohesion

and local knowledge can function as informal governance mechanisms that guide settlement transformation. The integrated relationship identified among cultural values, infrastructure provision, and spatial adaptation provides a more comprehensive framework for interpreting the evolution of organically developed settlements. From a practical perspective, the findings suggest that urban planning policies should recognize and incorporate locally embedded practices rather than relying exclusively on top-down planning approaches. The success of community-driven infrastructure development observed in the study area indicates that resident participation can significantly enhance the effectiveness, sustainability, and adaptability of urban interventions. Furthermore, the findings highlight the importance of preserving local cultural values and social networks as strategic assets for strengthening urban resilience. Environmental adaptation practices identified in the settlement also demonstrate the potential of community-led approaches to support sustainable land use and resource management. These insights may assist planners, policymakers, and local governments in designing development strategies that are more responsive to local contexts and community needs. The study additionally provides evidence that informal and organic settlements possess valuable adaptive capacities that can contribute to broader urban sustainability objectives. Ultimately, the findings support the development of participatory, culturally sensitive, and environmentally responsive planning models capable of fostering resilient and sustainable urban communities.

Limitation and Suggestion for Further Research

This study has several limitations that should be considered when interpreting the findings. First, the research was conducted within a single organic urban settlement located in the Code River Corridor, Yogyakarta, which may limit the transferability of the findings to other urban contexts with different environmental, social, and cultural characteristics. Second, the qualitative phenomenological approach emphasizes participants' experiences and perceptions, resulting in rich contextual insights but limiting the ability to generalize the findings across broader populations. Third, the study primarily focused on the relationships among cultural values, community-based infrastructure, and spatial adaptation, while other potentially influential factors such as governmental policies, economic investment patterns, demographic dynamics, and land tenure systems were not examined in depth. Fourth, the analysis was based on observations and interviews conducted during a specific period, which may not fully capture the long-term evolution of settlement morphology and community practices. Future research should therefore expand the geographical scope by comparing multiple organic settlements across different urban and regional settings. Comparative studies would provide a deeper understanding of how varying cultural, environmental, and institutional conditions influence community-driven spatial development. Future investigations may also incorporate mixed-methods approaches that combine qualitative inquiry with spatial analysis, geographic information systems, and quantitative assessments to strengthen the robustness of findings. Longitudinal studies are particularly recommended to examine how infrastructure systems, cultural practices, and spatial configurations evolve over time in response to urbanization pressures. Further research should also explore the role of formal planning institutions and policy interventions in shaping interactions between community

initiatives and urban governance structures. In addition, examining the influence of economic transformation, migration, and technological change may provide a more comprehensive explanation of settlement adaptation processes. Finally, future studies could develop and test conceptual models that integrate cultural values, infrastructure provision, environmental adaptation, and urban morphology to advance theoretical understanding of community-based urban development in rapidly changing cities.

CONCLUSION

This study concludes that the development of the organic urban settlement in the Code River Corridor, Yogyakarta, is the result of a dynamic interaction among cultural values, community-based infrastructure development, and spatial adaptation processes. The findings demonstrate that the physical morphology of the settlement has evolved incrementally through community initiatives rather than formal planning interventions. Building configurations, circulation networks, infrastructure systems, and environmental management practices have emerged in response to both physical constraints and the changing socioeconomic needs of residents. The study further reveals that community participation has played a fundamental role in the provision and maintenance of essential infrastructure, contributing to the functionality and resilience of the settlement. Environmental adaptation, particularly in relation to topography, vegetation, and riverine conditions, has enabled residents to utilize available resources while maintaining the ecological integrity of the area. In addition, cultural values such as mutual cooperation, social trust, collective responsibility, and solidarity have significantly influenced spatial decision-making and development practices. These values function as informal governance mechanisms that facilitate coordination, cooperation, and long-term settlement sustainability. The findings also indicate that urban morphology within organic settlements cannot be fully understood through physical or environmental perspectives alone, as social and cultural dimensions are equally important in shaping spatial outcomes. By integrating cultural values, infrastructure development, and spatial adaptation into a single analytical framework, this study provides a more comprehensive understanding of community-driven urban transformation. The research contributes to the advancement of urban morphology and community-based development literature by highlighting the interconnected nature of social, cultural, and physical processes. Furthermore, the study demonstrates the capacity of organically developed settlements to generate adaptive and resilient urban environments through locally embedded knowledge and collective action. Ultimately, the findings underscore the importance of recognizing community-driven practices and cultural assets as valuable resources for promoting sustainable, inclusive, and context-sensitive urban development.

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AUTHORS CONTRIBUTIONS STATEMENT

Siti Munawarah Panggabena contributed to conceptualization, methodology, investigation, field observation, data collection, formal analysis, data curation, visualization, writing original draft preparation, project administration, and corresponding author responsibilities. Indah Marlina Ardianti contributed to conceptualization, methodology, supervision, validation, formal analysis, interpretation of findings, writing review and editing, and manuscript refinement. Park Eun Ha contributed to methodology, validation, data interpretation, visualization, language editing, and writing review and editing. Tri Hartono contributed to investigation, data validation, supervision, project administration, funding acquisition, writing review and editing, and final manuscript approval. All authors contributed substantially to the conception and design of the study, critically reviewed the manuscript for important intellectual content, approved the final version of the manuscript, and agreed to be accountable for all aspects of the work.

CONFLICT OF INTEREST

The authors declare that there is no conflict of interest regarding the publication of this manuscript. All contributions were conducted independently and without any financial, commercial, or institutional influence that could be perceived as a potential conflict. The research was carried out solely for academic and professional purposes.

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