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Therapeutic Architecture Based on Environmental Analysis in Healthcare Facility Design in Surabaya

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ABSTRACT

Rapid urbanization in Surabaya has increased environmental stress and reduced green open spaces, highlighting the need for healthcare environments that support physical and psychological well-being, while therapeutic architecture offers an approach that integrates natural elements into spatial design to enhance healing experiences; this study examines the role of site-specific environmental analysis in designing a holistic healthcare facility based on therapeutic architecture at Jalan Kalisari Permai I, Surabaya, using a qualitative descriptive method with a design-based research approach combining field observation, literature review, and environmental analysis, and the findings indicate that environmental parameters such as noise levels, solar orientation, wind patterns, and vegetation significantly influence spatial design strategies, where noise distribution determines spatial zoning from public to private areas, solar and wind conditions support passive design strategies such as building orientation and natural ventilation, and vegetation is integrated as a landscape element that improves microclimate conditions and supports restorative spatial quality, leading to the conclusion that integrating site-specific environmental analysis into architectural design is essential for developing therapeutic healthcare environments and producing a context-responsive design framework that enhances environmental performance and supports user well-being in urban healthcare facilities.

Keywords: *Therapeutic Architecture, Site-Specific Environmental Analysis, Healthcare Design, Healing Environment, Spatial Design Strategies, Surabaya, Sustainable Architecture.*

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INTRODUCTION

Rapid urbanization has significantly transformed the environmental and spatial conditions of urban areas, resulting in increased environmental stress, reduced green open spaces, and a declining quality of life. In metropolitan cities such as Surabaya, these conditions contribute to higher levels of psychological stress and decreased well-being among urban communities (World Health Organization, 2021). Previous studies have shown that environmental quality has a direct relationship with human health, where exposure to natural elements can support recovery and reduce stress levels (Frumkin, 2001; Hartig et al., 2014). Furthermore, visual access to nature can accelerate healing, while natural environments play an important role in cognitive restoration (Ulrich, 1984; Kaplan & Kaplan, 1989).

Figure 1. Urban environmental problems and their impact on psychological well-being in urban areas

Source: Author's Illustration (2026)

The relationship between urban environmental conditions and human well-being is further illustrated in Figure 1, which shows how high population density, limited green open space, and increasing urban activities contribute to environmental pressure and psychological stress. These conditions highlight the need for architectural approaches that can restore environmental quality and support mental health through spatial design (Gehl, 2011).

In response to these challenges, therapeutic architecture has emerged as an approach that integrates natural elements such as light, air, and vegetation into spatial design to create healing environments. This approach emphasizes the role of architecture in influencing human health and well-being through environmental quality (Sternberg, 2009). However, in practice, the application of therapeutic architecture often lacks integration with site-specific environmental analysis. Many design solutions remain generic and do not fully respond to site conditions such as solar orientation, wind patterns, noise levels, and existing vegetation (Kellert, 2008; Salingaros, 2015).

Figure 2. Translation of site analysis into therapeutic architectural design strategies

Source: Author's Illustration (2026)

Figure 2 illustrates the translation process from site analysis into architectural design strategies. Environmental parameters such as solar orientation, wind patterns, noise levels, vegetation, and accessibility are interpreted as design inputs. These inputs are then transformed into specific strategies such as building orientation, cross ventilation, zoning systems, landscape integration, and circulation planning (Frampton, 2007).

Despite the growing application of therapeutic architecture, a significant gap remains in the integration of site-specific environmental analysis into spatial design strategies, resulting in designs that are often generic and not fully responsive to contextual conditions (Ulrich et al., 2008).

Figure 3. Conceptual framework of therapeutic design based on site analysis

Source: Author's Illustration (2026)

The conceptual framework presented in Figure 3 demonstrates how site analysis becomes the foundation for developing therapeutic architectural design. Environmental potentials and constraints are identified and translated into design responses, which subsequently shape spatial configurations (Sternberg, 2009).

Figure 4. Zoning strategy and user experience flow based on environmental conditions

Source: Author's Illustration (2026)

Figure 4 illustrates the zoning strategy and user experience based on environmental conditions, particularly noise levels. The spatial arrangement is organized from public areas at the front to private therapeutic spaces at the rear, reflecting decreasing noise intensity. The user journey transitions from active spaces to calm and restorative environments (Gehl, 2011).

Therefore, this study aims to analyze site characteristics and translate them into design strategies for holistic healthcare facilities based on therapeutic architecture in Surabaya (Kaplan & Kaplan, 1989).

This research contributes by proposing a context-responsive design framework that integrates site analysis with therapeutic architectural principles. It demonstrates how environmental parameters can be systematically translated into spatial strategies to support healing environments in urban contexts such as Surabaya (Ulrich et al., 2008; Sternberg, 2009).

METHOD

This study employs a qualitative descriptive approach with a design-based research orientation to analyze site conditions and formulate architectural design strategies for a holistic healthcare facility based on therapeutic architecture. This approach enables the integration of environmental analysis with spatial design considerations in order to create a healing environment that supports both physical and psychological well-being (Creswell & Creswell, 2018; Ulrich et al., 2008). The qualitative approach is appropriate for exploring spatial relationships and environmental responses in architectural design (Groat & Wang, 2013).

The research site is located at Jalan Kalisari Permai I, Mulyorejo District, Surabaya. The site is situated within a residential area characterized by relatively low noise levels, adequate accessibility, and the presence of existing vegetation. These environmental characteristics indicate the potential of the site to be developed as a therapeutic healthcare environment that promotes comfort and well-being (Gehl, 2011; Kellert, 2008).

Data collection in this study is conducted using multiple methods to ensure comprehensive analysis. Field observation is carried out to directly assess site conditions such as solar exposure, wind direction, noise levels, vegetation, and surrounding environmental characteristics. Direct observation is essential for understanding real environmental performance in spatial analysis (Groat & Wang, 2013). In addition, a literature review is used to establish theoretical foundations related to therapeutic architecture, healing environments, and environmentally responsive design (Sternberg, 2009; Kaplan & Kaplan, 1989). Secondary data analysis is also conducted, including maps, satellite imagery, and spatial planning documents, to support the understanding of site context and urban conditions (Yin, 2018).

The study focuses on key environmental variables that influence spatial quality and user comfort, including solar orientation, wind patterns, noise levels, accessibility, vegetation, and microclimate. These variables are selected based on their relevance to environmental performance and their contribution to the creation of therapeutic architectural spaces (Kellert, 2008; Salingaros, 2015).

Data analysis is conducted using descriptive and interpretative methods. Each environmental variable is evaluated to identify site potentials and constraints. The results of this analysis are then translated into architectural design strategies through a design-based approach, including spatial zoning, building orientation, natural ventilation, and landscape integration. This process emphasizes the relationship between environmental conditions and spatial configuration, ensuring that the design responds contextually to the site while supporting the principles of therapeutic architecture and evidence-based design (Ulrich et al., 2008; Frampton, 2007).

FINDING AND DISCUSSION

RESEARCH RESULT

Implementation of Therapeutic Architecture

in this study is realized through the integration of site environmental analysis and spatial design strategies. The findings indicate that environmental conditions directly inform architectural responses in shaping a healing-oriented spatial system (Sternberg, 2009; Ulrich et al., 2008).

Key environmental parameters identified in this study include solar orientation, wind patterns, noise levels, vegetation, and accessibility. These parameters function as the primary basis for determining spatial organization and design responses (Frampton, 2007; Gehl, 2011).

Site Environmental Conditions

The site located at Jalan Kalisari Permai I, Surabaya shows several measurable environmental conditions. Noise levels are higher at the front area and decrease toward the rear. Solar exposure is higher on the western side of the site. Wind flows predominantly from east to west. Vegetation is present across several site areas and contributes to microclimate conditions. Accessibility is concentrated at the front edge of the site connected to the main road (Badan Pusat Statistik, 2023; World Health Organization, 2021).

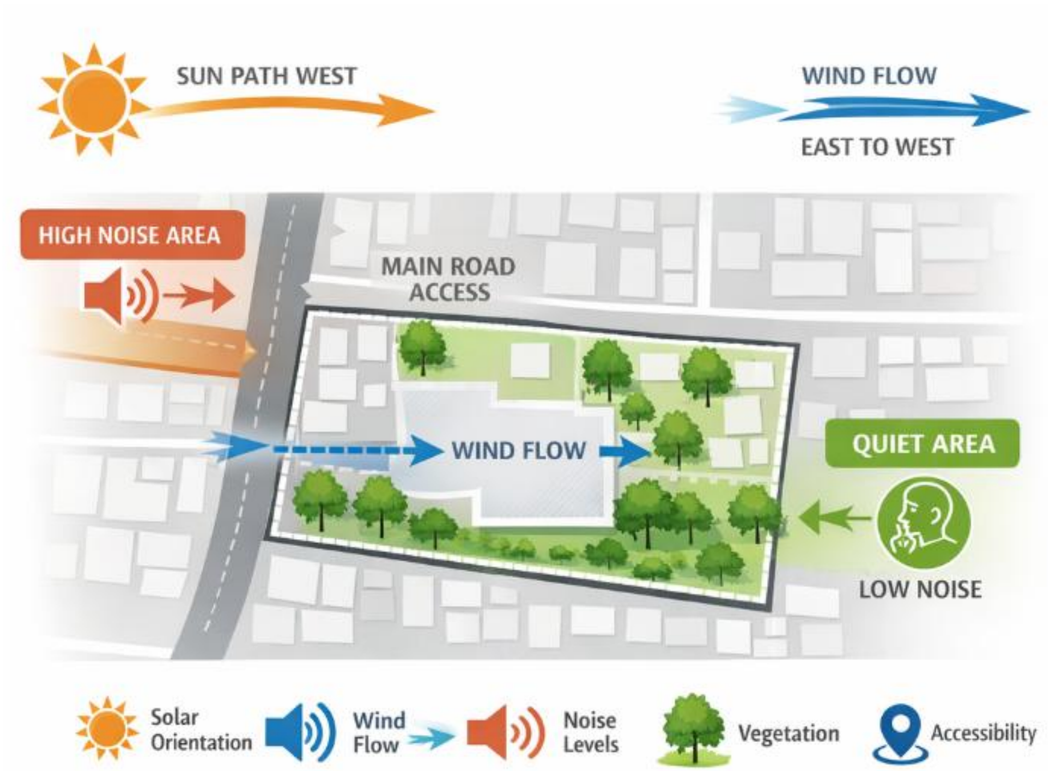

Figure 5. Site Environmental Analysis of Jalan Kalisari Permai I, Surabaya
Source: Author's Illustration (2026)

Environmental Parameters and Design Translation

The analysis identifies five main environmental parameters that are translated into spatial design responses. Solar orientation is addressed through building orientation and shading devices. Wind direction is utilized for natural ventilation strategies. Noise distribution determines zoning patterns. Vegetation is integrated into green spatial components. Accessibility defines circulation and entrance hierarchy (Kellert, 2008; Salingaros, 2015).

Figure 6. Translation of Environmental Analysis into Architectural Design Strategies
Source: Author's Illustration (2026)

Table 1. Environmental Parameters and Design Responses

Environmental Parameter	Site Condition	Design Response
Solar Orientation	High exposure on west side	Building orientation and shading devices
Wind Direction	East–west airflow	Natural cross ventilation
Noise Level	High front, low rear	Public–semi-private–private zoning
Vegetation	Existing green areas	Integration of landscape elements
Accessibility	Front main access	Entrance hierarchy and circulation system

Source: Author's Analysis (2026).

Spatial Zoning Structure

The spatial zoning is organized based on noise level distribution across the site. The front area functions as a public zone, the middle area as a semi-public zone, and the rear area as a private therapeutic zone. This zoning pattern is derived from the environmental gradient of noise intensity (Ulrich, 1984; Ulrich et al., 2008).

Figure 7. Zoning Strategy Based on Environmental Conditions and Noise Levels
Source: Author's Illustration (2026)

Vegetation Distribution

Vegetation is distributed across the site and integrated into the spatial system as a supporting environmental component. The presence of vegetation contributes to microclimate regulation and spatial comfort within the site (Kaplan & Kaplan, 1989; Hartig et al., 2014).

Accessibility and Circulation Pattern

Accessibility and circulation follow a structured hierarchy from the main entrance toward inner site zones. The circulation system separates public, semi-public, and private areas to support functional spatial organization (Gehl, 2011).

Integrated Design Output

The final result shows that site environmental parameters directly determine spatial configuration and design strategies. The integration of solar exposure, wind direction, noise distribution, vegetation, and accessibility results in a structured spatial system that supports therapeutic healthcare design objectives (Sternberg, 2009; Ulrich et al., 2008).

Figure 8. Integrated Design Framework of Therapeutic Architecture
Source: Author's Illustration (2026)

DISCUSSION

The findings of this study indicate that integrating site-specific environmental analysis into architectural design plays a crucial role in forming therapeutic environments. The translation of environmental parameters such as solar orientation, wind patterns, noise levels, vegetation, and accessibility into spatial strategies demonstrates a strong relationship between environmental responsiveness and user well-being (Sternberg, 2009; Ulrich et al., 2008).

The zoning strategy based on noise distribution highlights the importance of controlling environmental stressors in therapeutic architecture. The spatial organization into public, semi-private, and private zones reflects a structured response to environmental intensity, where quieter areas are prioritized for healing functions. This gradual spatial transition contributes to psychological stability and emotional comfort for users, in line with the theory that reduced environmental stressors improve recovery and well-being (Ulrich, 1984).

These findings are consistent with previous studies on restorative environments. Kaplan and Kaplan (1989) emphasize that exposure to natural environments supports cognitive restoration and stress recovery, which aligns with the integration of vegetation and healing gardens in this study. Similarly, Hartig et al. (2014) confirm that interaction with natural elements contributes to psychological well-being. The application of passive design strategies such as natural ventilation and building orientation is also supported by Frampton

(2007) and Gehl (2011), who highlight the importance of climatic responsiveness and human-centered spatial design in improving environmental quality.

In addition, the integration of vegetation as a healing element strengthens the restorative quality of the environment. Green spaces and visual access to nature contribute to stress reduction and cognitive restoration, making vegetation an essential component in therapeutic architectural design (Kaplan & Kaplan, 1989; Hartig et al., 2014). This is reflected in the incorporation of healing gardens and preservation of existing vegetation within the site.

The application of natural ventilation strategies based on wind patterns further enhances environmental comfort. Cross ventilation improves air quality and reduces reliance on mechanical systems, contributing to a more sustainable and comfortable healing environment. Similarly, building orientation in response to solar exposure improves thermal comfort and energy efficiency, which are essential in tropical architectural design contexts (Gehl, 2011).

Despite these positive outcomes, the study has limitations. The analysis is restricted to a single site in Surabaya, which limits the generalizability of the findings. In addition, the study relies on qualitative environmental observation without quantitative simulation tools such as thermal or airflow analysis, which may affect the precision of environmental performance evaluation (Yin, 2018).

Overall, the findings suggest that therapeutic architecture is most effective when grounded in a comprehensive understanding of site conditions and translated into spatial design strategies. This approach not only enhances environmental performance but also supports the psychological and physiological needs of users. Therefore, future research is recommended to incorporate quantitative simulation methods and expand the application of this approach to different urban contexts and building typologies (Salingaros, 2015; Kellert, 2008).

CONCLUSION

This study demonstrates that the integration of site-specific environmental analysis into architectural design is essential in creating therapeutic environments for holistic healthcare facilities. The analysis of key environmental parameters—such as solar orientation, wind patterns, noise levels, vegetation, and accessibility—shows that these factors can be effectively translated into spatial design strategies that enhance environmental quality and user well-being (Ulrich et al., 2008; Sternberg, 2009).

The main findings indicate that noise-based zoning is a critical strategy in organizing spatial hierarchy, where therapeutic areas are placed in quieter zones to support psychological comfort and reduce environmental stress. In addition, natural ventilation strategies based on wind patterns improve indoor air quality and reduce reliance on mechanical systems, while solar-responsive building orientation enhances thermal comfort and energy efficiency (Ulrich, 1984; Kellert, 2008; Salingaros, 2015).

Furthermore, the integration of vegetation as a healing element contributes significantly to stress reduction, relaxation, and cognitive restoration. This supports restorative environment theory, which emphasizes the importance of natural elements in enhancing psychological well-being (Kaplan & Kaplan, 1989; Hartig et al., 2014). The spatial configuration, which gradually transitions from public to private zones, further supports a structured user experience that enhances the overall healing process (Gehl, 2011).

This study contributes to architectural knowledge by proposing a context-responsive design framework that links site environmental analysis with therapeutic architectural principles. The framework highlights how environmental parameters can be systematically translated into spatial strategies to support healing environments, particularly in dense urban contexts such as Surabaya (Frampton, 2007; Ulrich et al., 2008).

However, the study is limited to a design-based approach and has not been validated through post-occupancy evaluation or empirical user experience assessment. Therefore, future research is recommended to evaluate the effectiveness of the proposed design through environmental performance simulation and user-based studies to strengthen the application of therapeutic architecture in real-world conditions (Yin, 2018).

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