# Analysis of Biophilic Architecture Concepts Application in the "Kebun Pak Budi" Edu-tourism Building

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**ABSTRACT**

Modern urban development often targets urban areas. however, it is crucial to integrate principles that ensure sustainable growth. These principles include economic growth, environmental conditions, community support, and technology implementation. Urban areas based on education should be developed in urban areas, such as Purwosari, to provide a unique atmosphere. However, the concept of biophilic, based on space and facilities, is also important. The "Kebun Pak Budi" urban area in Purwosari aims to develop the potential of urban areas by utilizing existing facilities. Biophilic concepts can help maintain the conditions of use, such as reducing stress and reducing water pollution, through long-term interaction with the environment, education, and research. The application of biophilic in urban areas can lead to positive environmental benefits, such as natural ventilation and dynamic communication.



**Keywords: Biophilic Architectural; Purwosari Village; Travel Education.**

## 1. Introduction

The development of a modern rural economy primarily targets tourism villages. However, four key principles must be implemented to ensure that the development of tourism villages achieves long-term sustainability and supports the creation of new tourist attractions. These principles are: (1) Economic viability, (2) Support from natural environmental conditions, (3) Community integration, and (4) Technological implementation in development.

Educational nature-based tourism generally thrives in urban areas, offering the pristine beauty of rural landscapes combined with traditional decorations designed to enhance the rural atmosphere in cities. Tourism stakeholders in the Purwosari region have adopted this concept to create a similar ambiance, complemented by biophilic principles evident in the spaces and facilities provided.

The "Kebun Pak Budi" educational eco-tourism destination was established within local plantation areas in Dusun Canggi, Sekarmojo Village, Purwosari District. This destination features unspoiled natural beauty, enhanced with modern facilities to improve visitors' experiences. Situated at the foothills of Mount Arjuna and only about 2.5 kilometers from the Purwosari highway, it is easily accessible. The strategic placement of "Kebun Pak Budi" in a rural area aims to develop the natural potential of the region, which is predominantly characterized by fruit

plantations, especially durians. The initiative also strives to implement sustainable eco-tourism, which is expected to improve the welfare of the surrounding community.

The biophilic design concept is highly suitable for application in natural tourism areas. Referring to its principles, design patterns, goals, and benefits, biophilic design can help restore users' mental conditions, such as reducing stress and relaxing fatigued muscles, through direct interaction with nature, including auditory and visual experiences. The application of biophilic principles in tourism areas integrates natural elements with architectural features, ensuring a balanced correlation between indoor and outdoor spaces. This approach is anticipated to deliver numerous benefits, such as comprehensive natural ventilation and dynamic diffuse lighting.

*2.1. Biophilic Approach*

In the biophilic design approach, natural elements are utilized as the primary medium to integrate nature into buildings. The presence of natural elements within built environments is considered capable of enhancing health and well-being, acknowledging humanity's inherent connection to nature (Putri & Subekti, 2022). The goal of biophilic design is to translate the concept of biophilia into the design of built environments, fostering a beneficial relationship between humans and nature within modern buildings and landscapes (Kellert et al., as cited in Sumartono, 2015).

A renowned German psychologist, Erich Fromm, first introduced the term "biophilia" in 1964. The Greek word "biophilia" is derived from two roots: bio, meaning "life," and philia, meaning "love." Later, Harvard University biologist and Pulitzer Prize winner Edward O. Wilson popularized the term in 1984, defining biophilia as humanity's innate desire to connect with all forms of life ("Love Life"). By integrating natural materials, natural features, and organic forms into the design of built environments, biophilic design provides opportunities for individuals to work in healthy spaces, reduce stress, and support overall well-being.

Furthermore, biophilic design aims to create environments that promote human health, well-being, and prosperity within modern settings. It seeks to ensure that built environments provide not only functional spaces but also restorative and enriching experiences for those who inhabit them (Kellert et al., as cited in Abdullah, 2020).

*2.2. Principles of the Biophilic Approach*

The biophilic approach is divided into three main principles: (a) Nature in the Space, (b) Natural Analogues, and (c) Nature of the Space (Browning et al., 2014).

*a) Nature in the Space*

The Nature in the Space principle addresses the direct visible or invisible presence of nature within the building or construction environment. This encompasses the inclusion of vegetation, water, animals, breezes, sounds, scents, and other natural elements (Browning et al., 2014). This principle comprises seven biophilic design patterns:

a. Visual Connection with Nature;
b. Non-Visual Connection with Nature;
c. Non-Rhythmic Sensory Stimuli;
d. Thermal & Air Flow Variability;
e. Presence of Water;
f. Dynamic & Diffuse Light;
g. Connection with Natural Systems (Browning et al., 2014).

*b) Natural Analogues*

The Natural Analogues concept involves the intentional use of natural elements. Objects, materials, colors, shapes, and patterns inspired by nature can be translated into artworks, ornaments, furniture, and decorations

(Browning et al., 2014). This principle includes three biophilic design patterns:

a. Biomorphic Forms & Patterns;
b. Material Connection with Nature (natural materials);
c. Complexity & Order (Browning et al., 2014).

*c) Nature of the Space*

The Nature of the Space principle addresses the configuration and qualities of space, aiming to evoke feelings similar to those experienced in natural settings (Browning et al., 2014). This principle includes four biophilic design patterns:

a. Prospect;
b. Refuge;
c. Mystery;
d. Peril/Risk (Browning et al., 2014).

## 2. Material and Methods

This research was conducted using qualitative research methods based on the collection of secondary and primary data obtained. Among the main steps of the research conducted are:

### *2.1. Data Collection Method*

Data were collected in two ways:

a. Secondary Data: Acquired through a review or study of related literature, including research, articles, or supporting materials, to serve as a foundation for the literature study.
b. Primary Data: Obtained through direct field studies, where the author conducted observations and analyzed factual conditions in the field.

### *2.2. Data Analysis Method*

A qualitative descriptive method was employed for data analysis. The biophilic approach was applied to evaluate the spatial components and building facilities.

### *2.3. Data Analysis Presentation Method*

The results of the analysis were presented using tables that outline the principles of the biophilic architectural approach. These tables were utilized to assess the object and correlate its application within the building.

## 3. Results and Discussions

The results and discussion provide an explanation of the biophilic architectural design patterns and how they can be applied to the Edu-Tourism Kebun Pak Budi building in Pasuruan. It includes images that show how this approach has been implemented within the building. The Edu-Tourism Kebun Pak Budi building in Pasuruan applies 14 biophilic architectural approaches, which are identified as follows:

### *3.1. **Visual Connection with Nature***

This pattern emphasizes the user's view of nature, either directly or indirectly.

(Source: Personal Documentation, 2024)
Figure 1. Cottage Area

This pattern is applied in the cottage area, where the front features a mini garden that provides a soothing view. This creates a direct visual connection with nature, offering users an immersive experience in the space.

### *3.2. Non-visual Connection with Nature*

This pattern relies on spatial perceptions linked to nature, beyond the human sense of sight. This pattern is observed in the garden of the stilt house. Various types of plants, from small to large, are present in this area. When in this location, one can hear the sounds of nature, such as bird chirps and the splashing of water in the pond. Additionally, the scents of different flowers and plants fill the air, creating a sensory experience that feels akin to being in the great outdoors.

(Source: Personal Documentation, 2024)
Figure 2. Garden Area near the Stilt House

### *3.3. Non-rhythmic Sensory Stimuli*

This pattern relates to the unpredictable nature of the environment, often unnoticed by the user but capable of capturing their attention. This pattern is felt in the outdoor seating area, where openings facing a planter with medium-sized Calathea lutea plants allow users to observe the movements of the plants as they sway in the breeze.


(Source: Personal Documentation, 2024)
Figure 3. Outdoor Seating

### *3.4. Thermal & Air Flow Variability*

This pattern is associated with fluctuating air flows and temperatures, much like natural conditions. The pattern is applied in the restaurant area, where large openings allow air to flow inside and function as sources of light and heat, helping to regulate the indoor temperature.

(Source: Personal Documentation, 2024)
Figure 4. Restaurant Area

### *3.5. Presence of Water*

This pattern incorporates water elements within the building to create a calming and comfortable atmosphere for its users.

(Source: Personal Documentation, 2024)
Figure 5. Restaurant Area

The café area of the building displays this pattern with a decorative water feature near the entrance. This design enhances the spatial experience, uplifting the mood of those who pass through.

### *3.6.* ***Dynamic & Diffuse Light***

This pattern is related to the movement of sunlight, as perceived in the natural environment. The pattern is applied in the indoor canteen area, where each side of the building has windows that allow light to enter. With each passing hour, the angle of the incoming sunlight shifts due to the movement of the sun. Additionally, the varying sizes and orientations of the openings cause the light entering to differ significantly, creating a remarkable experience for the users.

(Source: Personal Documentation, 2024)
Figure 6. Canteen Area

### *3.7.* ***Connection with Natural Systems***

To facilitate user interaction with nature, this pattern connects materials to natural systems that are constantly changing. The use of wood materials in the cottage exemplifies the "Connection with Natural Systems" pattern. As a natural material, wood undergoes weathering over time, reinforcing this connection.

(Source: Personal Documentation, 2024)
Figure 7. Cottage Materials

### *3.8.* ***Biomorphic Forms & Patterns***

This pattern focuses on providing elements that fill and shape space, encouraging forms that are inspired by nature, both in motifs and in structure. 'This pattern is evident in the staircase area of Kebun Pak Budi's lobby. The space features elements such as seating and stairs, with the staircase seats designed to resemble the shape of natural stone.

(Source: Personal Documentation, 2024)
Figure 8. Lobby Stairs

### *3.9.* ***Material Connection with Nature***

To achieve a spatial experience connected to nature, this pattern emphasizes the exploration of the characteristics and materials derived from nature in the components that form and fill the space.

(Source: Personal Documentation, 2024)
Figure 9. Gazebo

This pattern is evident in the gazebo, where the walls are constructed from wood, serving as a space-forming element. The warm-toned ceiling creates a calming atmosphere for those inside. Furthermore, the railing of the gazebo is also made from natural wood.

### *3.10.* ***Complexity & Order***

By applying fractal geometry (repetitive) shapes and sensations to a building, this pattern makes users experience a space that produces positive reactions in the brain and psychology. This principle is based on many studies that have shown the relationship between fractal geometry in nature and art and architecture.

(Source: Personal Documentation, 2024)
Figure 10. The repeating pattern of the Cottage

This pattern can be seen at a glance in the shape and color of the buildings in this cottage area. The pattern on the building forms a widened triangular line, then spaced out and made repetitive with the next build

### *3.11.* ***Prospect***

This pattern offers a wide view from a distance, creating a sense of security. The expansive views provided from elevated points, such as the top of stairs or viewing platforms, allow users to experience a sense of openness while still feeling secure in their surroundings.

(Source: Personal Documentation, 2024)
Figure 11. Wide View of the Viewing Deck

### *3.12.* ***Refuge***

This pattern is used in the design of spaces that are closed or limit the view from outside to inside to make users feel safe. One example of this pattern is the lobby area, which is designed in a closed manner and limits the view from the outside. This can be seen from the exterior of the building which is more closed than other buildings.

(Source: Personal Documentation, 2024)
Figure 12. View towards the Lobby

### *3.13.* ***Peril / Risk***

This pattern invokes a sense of danger and risk but allows users to feel safe while experiencing excitement and curiosity. The viewing deck allows users to look down into the garden or the space below, offering a sense of being in a natural valley. While the deck provides a thrilling view, safety railings ensure that users are secure.


(Source: Personal Documentation, 2024)
Figure 13. View Deck from the Lobby

These design patterns are effectively applied to various areas of the Edu Wisata Kebun Pak Budi building, enhancing the overall experience and connection between users and nature.

### *3.14.* **Research Findings**

**Table 1. Results of the Analysis on the Application of the Biophilic Architecture Approach at the Building of "Kebun Pak Budi"**

| No | Biophilic Architecture Approach Principle | Kebun Pak Budi |
|---|---|---|
| | **Nature in the Space** | |
| 1 | Visual Connection with Nature | ✓ |
| 2 | Non visual connection with nature | ✓ |
| 3 | Non rhythmic sensory stimuli | ✓ |
| 4 | Thermal & air flow variability | ✓ |
| 5 | Presence of water | ✓ |
| 6 | Dynamic & diffuse light | ✓ |
| 7 | Connection with natural systems | ✓ |
| | **Natural Analogues** | |
| 8 | Biomorphic Forms & Patterns | ✓ |
| 9 | Material connection with nature | ✓ |
| 10 | Complexity & order | ✓ |
| | **Nature of the Space** | |
| 11 | Prospect | ✓ |
| 12 | Refuge | ✓ |
| 13 | Mystery | |
| 14 | Peril / Risk | ✓ |

(Source: Personal Documentation, 2024)

The research findings indicate that 13 out of the 14 principles of the Biophilic. Architecture Approach have been applied in the Pak Budi Garden Edu-tourism building. With these results, the proximity of visitors to nature will increase productivity and is expected to provide a sense of security and comfort for visitors.

## 4. Conclusion

Kebun Pak Budi Edu-tourism building has implemented 13 out of the 14 biophilic architecture approach patterns, based on the analysis and discussion of how these patterns are applied to the space-forming elements and facilities (Table 1). The building incorporates nearly all of the biophilic architecture approach patterns. Of the 13 patterns, such as

the application of visual connection with nature on the building, it provides a large opening in the building to make it easier to see the atmosphere of the plantation around the building. The application of the presence of water by presenting a swimming pool and water park that makes visitors cool. The application of thermal and airflow variability in cottage buildings provides easy air circulation in the building. In addition, the application of connection materials with nature also aims to create a closer relationship between buildings and nature. However, there is one pattern that does not meet the design criteria set by the principles and patterns of the approach. This pattern is *Mystery*, which refers to the creation of curiosity about the unknown spatial experience, leading to a sense of wonder for the users of the space. This pattern has not been applied at the building's entrance, which prevents users from feeling compelled to explore what the building holds.

Therefore, this study concludes that the Kebun Pak Budi Edu-tourism building has adopted the Biophilic Architecture Approach, utilizing 13 out of the 14 principles of this approach.

## References

[1] Browning, W.D. (2014), Biophilic Design Patterns Emerging Nature-Based Parameters for Health and Well-Being in the Built Environment, International Journal of Architectural Research, 8(2),62-76.
[2] Browning, W., Ryan, C., & Clancy, J. 14 Patterns of Biophilic Design. New York: Terrapin Bright Green, LLC, 2014. Carmona, et al.
[3] Kellert, S. R., & Calabrese, E. F. (2015). The Practice of Biophilic Design. www.biophilic-design.com
[4] Kellert, S. R., Heerwagen, J.H. & Mador, M.L. (Eds.). (2009). Biophilic Design: The Theory, science, and practice of bringing building to life. Hoboken, NJ: Johne Wiley&Sons,Inc.
[5] Sumartono. 2015. 'Prinsip-Prinsip Design Biophilic'. PRODUCTUM Jurnal Desain Produk (Pengetahuan Dan Perancangan Produk) 1 (1): 15–21.
[6] Wilson, E.D. (1984). Biophilia. Cambrigde, MA, USA: Havard University Press.