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Jurnal Asiimetrik: Jurnal Ilmiah Rekayasa dan Inovasi is published regularly every **two times a year**, in **January** and **July**. This journal publishes research-based scientific articles, case studies, review articles, engineering and innovations that cover both theoretical and practical as well as their development. The topics of scientific articles published cover the fields of Architecture, Civil Engineering, Industrial Engineering, Informatics Engineering, Mechanical Engineering and Electrical Engineering.

SUMMARY. Utama et al. review the use of pneumatic linear transfer systems in modern manufacturing industries that focus on efficiency, productivity, and flexibility. The study employed the VDI 2221 method, a structured design approach, and pneumatic technology to design and construct a multi-speed pneumatic linear transfer system. **Purba et al.** created the Finite Element Analysis (FEA) method and the Cowper-Symonds strain rate model to study how high chromium white cast iron (HCCI) wears away at three different impact angles. They also compared it to other materials like 6061-T6 aluminum, GH4720Li superalloy, and annealed stainless steel. Meanwhile, **Natalia et al.** developed the most effective forecasting method for PT. XYZ, a manufacturing company, using the Distribution Requirement Planning (DRP) technique and a time series plot of each DC demand. **Taufiqurrohman et al.** conducted research on green open spaces as infrastructure, which significantly improves the quality of life for urban residents and contributes to the sustainability of urban growth, particularly in Nusantara Capital City. **Rahmalina et al.**, utilized the exploratory factor analysis method to specifically design wheelchairs for individuals suffering from cerebral palsy disabilities. The research findings reveal six fundamental requirements for wheelchair design: primary features, comfort, standard compliance, robust materials, ergonomics, unique features, ease of use, and design. **Surojo et al.** conducted research on the optimization of spare parts inventory for Cummins diesel engines, utilizing the min-max stock method. The objective of this research is to improve inventory control by categorizing spare parts into slow, medium, and fast-moving components and addressing maintenance issues that impact performance. Meanwhile, **Anggara et al.** investigated the flap's geometry to enhance the hydrodynamic performance of the Oscillating Wave Surge Converter (OWSC) device. The Boundary Element Method (BEM) uses numbers to model the flap in three dimensions. This makes it easier

to test the Oscillating Wave Surge Converter (OWSC) device's features and how well it works. **Prabowo et al.** conducted a study to investigate the impact of water depth variations on the performance of the seabed-installed OWSC device. The variation in depth was tested at four different depth variations using the boundary element method-based numerical method. **Naufal et al.** used computational methods to conduct research on the flow structure within pipes, utilizing single and double orifice plates. **Akmal et al.**, on the other hand, tested the performance of the banana slicer machine frame with load variations and frame materials, such as low alloy steel, structural steel, stainless steel, aluminum alloy, and cast iron, to find the best material. The results indicate that low alloy steel is the most suitable material due to its low total deformation, equivalent stress, and strain energy, which contribute to its high stiffness and load efficiency. **Susanto et al.** conducted research on vertical housing using an architectural approach and a biophilic design concept, aiming to address housing needs by incorporating a natural atmosphere into the space and creating a comfortable environment for its inhabitants.

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The Vertical Residence Based on Biophilic Architectural Design Concept (Case Study: Taman Anggrek Residence Apartment West Jakarta)

Hunian Vertikal Berbasis Konsep Desain Arsitektur Biofilik (Studi Kasus: Apartemen Taman Anggrek *Residence* Jakarta Barat)

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Abstract

Vertical housing represents a viable and effective option for residential solutions. Various efforts have been made to reintegrate the relationship between humans and the buildings they inhabit. Biophilic design represents a contemporary approach to reconnecting organic life with constructed spaces. This study aims to explore the architectural strategy of biophilic design as a solution to housing needs, focusing on integrating natural elements into living spaces to create a comfortable environment for residents. The investigation utilizes qualitative approaches, incorporating observation and data gathering, to discern the biophilic requirements of apartment inhabitants. The framework of 14 patterns of biophilic design, aimed at improving health and well-being within built environments, acts as a standard for evaluating the implementation of these patterns. The objective is to implement biophilic design in communal living spaces, considering the users of the building, the functions of the spaces, and utilizing knowledge, experience, and user requirements as a foundation for evaluation.

Keywords: biophilic design, vertical housing, vertical residence, green open space, Taman Anggrek Residence.

***SDGs*:**

Abstrak

Hunian vertikal dinilai sebagai salah satu alternatif hunian yang praktis dan efisien. Berbagai upaya dilakukan untuk menggabungkan kembali hubungan antara manusia dan bangunan sebagai tempat yang mereka huni. Desain biofilik sebagai teori rekoneksi terbaru, yang menggabungkan kehidupan organik ke dalam lingkungan binaan secara esensial. Tujuan penelitian ini adalah untuk mengkaji pendekatan arsitektur melalui konsep perancangan biofilik untuk memecahkan permasalahan kebutuhan hunian dengan membawa suasana alam kedalam ruang sebagai tempat yang nyaman bagi penghuninya. Menggunakan metode kualitatif dengan mengamati dan mengumpulkan data untuk mengetahui kebutuhan penghuni apartemen terkait aspek-aspek biofilik. Tolok ukur yang digunakan dalam menganalisis penerapan pola desain biofilik dilakukan melalui kajian teori 14 *patterns of Biophilic Desain improving health & well-being in the built environment*. Hal ini untuk mengetahui penerapan desain biofilik terhadap fasilitas hunian bersama berdasarkan pengguna bangunan, fungsi ruang, dimana pengetahuan, pengalaman, dan kebutuhan pengguna juga akan digunakan sebagai dasar pengukuran.

Kata Kunci: desain biofilik, hunian vertikal, tempat tinggal vertikal, ruang terbuka hijau, Taman Anggrek *Residence*.

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1. INTRODUCTION

Vertical housing is an urban solution due to the limitations of urban land which is also a product of technological developments (Sabaruddin, 2018). At the beginning of the industrialization decade, vertical housing was provided as a product in the housing industry and was mass-built with a simple spatial form that prioritized its function, structure and use (Sabaruddin, 2018). The high rate of urbanization in DKI Jakarta has resulted in an increase in the population. According to Nurani and Jatmiko, in 2019 the population of DKI Jakarta from 2010 to 2018 experienced an increase of 1.07%, from 9.6 million people to 10.4 million people (Nuraini and Jatmiko, 2015). Population density drives high housing needs.

Apartments are one of the vertical residences that have been widely encountered today. Apartments are considered one of the practical and efficient housing alternatives. One of the obstacles to vertical housing development is changing the cultural aspect of living in landed houses that are converted into vertical life (Bachtiar *et al.*, 2019). Indonesians are used to living in landed houses (Hapsari, 2018). As time goes by with the increasing need for housing in the city of Jakarta, the increasingly urgent demand for housing also affects people's vertical living habits. This research focuses on the area of facilities and vertical residential units that are related to nature.

Taman Anggrek Residence Apartment is in the city center and is strategically able to accommodate residents' activities. Activities carried out by apartment residents apart from being a place to live or live comfortably, are also built in the form of communal spaces that all residents can use. One of them is the clubhouse facilities that can be used by all residents, including green open areas. The application of the concept of biophilia or known as biophilic design in architecture shows the importance of humans in relation to nature to survive in the modern era (Ryan *et al.*, 2014; Hady, 2021; Tabassum and Park, 2024). This study discusses 14 biophilic design patterns in vertical residential buildings based on space zoning that have different characteristics, spatial functions and behavior patterns of space users (Nurzamni and Marlina, 2019). Design recommendations that refer to the comfort and mental health of building users by following a biophilic design pattern and implemented based on functional zoning and space utilization in vertical housing. The 14 approaches of biophilic design patterns in vertical residential buildings are based on space zoning that have different characteristics, spatial functions and behavior patterns of space users.

This study aims to examine the architectural approach through the concept of biophilic design to solve the problem of residential needs by bringing the natural atmosphere into the space as a comfortable place for its occupants. This study tried to find out the application of biophilic design to shared residential facilities based on building users, and spatial functions, where knowledge, experience, and user needs will also be used as a basis for measurement.

2. METHODOLOGY

This study uses qualitative research methods. This study identifies and describes the actual elements of biophilic design found at the time of data collection to understand user needs related to biophilic aspects. The data collection methods used are literature studies, interviews and observations (Creswell and Creswell, 2023). Interviews were conducted with 10 residents and users of the building who live in the Daffodil and Calypso residential towers with an average age of 30 years who have different activities.

Observations were taken place in open areas and residential buildings. Furthermore, field data was analyzed by comparing to the theory of 14 patterns of Biophilic Design, Visual connection with nature, non-visual connection with nature, non-rhythmic sensory stimuli, thermal and airflow variability, presence of water, dynamic & diffuse light, connection with natural system, biomorphic forms & patterns, material connection with nature, complexity & order, prospect, refuge. Mystery, risk/peril, for improving health & well-being in the built environment (Ryan *et al.*, 2014).

3. RESULTS AND DISCUSSION

The application of biophilic design can be applied in various aspects of architectural design. In this study, it was identified that the concept of biophilic design prioritizes the incorporation of natural elements from the outdoor space and integrating them into the indoor space. Based on Figure 1, indoor spaces that are directly connected to the outside space, both through openings and directly exposed, are located in zone one (1) and zone two (2) located on the lower floor, as well as category one (1) in zone three (3) which is a residential tower with the characteristics of a space located on the lower floor.

Figure 1. Taman Anggrek Residence zoning.

The zoning and category are based on the findings of biophilic elements that can be applied to Taman Anggrek Residence. Explanations and findings of biophilic architectural patterns are described in the diagram.

Taman Anggrek Residence is a residential building combining plant elements and large trees with shady leaves. The physical aspects obtained from the Taman Anggrek Residence Apartment include several supporting facilities surrounded by dense green trees which creates a healthy and fresh microclimate for farmers. Open spaces and indoor gardens are the hallmarks of the design, with small waterfalls, greenery, and a soothing selection of colors. The space in the clubhouse is designed with large windows that allow natural light to enter and a soothing view of the outside. Nature in the space and Natural Analogues Patterns, this principle has points that are applied in design (Browning, Ryan and Clancy, 2014; Hady, 2021). These points are the visual and non-visual relationship with nature, the regulation of temperature and air flow in the room or building, the presence of water elements in the design, lighting settings, and the relationship between the building and the natural system (Paradise, 2015).

Figure 2. Apartment Taman Anggrek Residence.

The identification of the application of biophilic design in Taman Anggrek Residence includes the integration of natural elements into the design space (see Figure 2). This design creates a more environmentally friendly, comfortable and healthy environment for residents (see Table 1). Natural lighting is maximized with large windows. The exterior design considers the use of greenery around the building, as an aesthetic as well as an air pollution filter (Kim *et al.*, 2019). The natural scenery is also reinforced with spacious gardens and good access to open spaces.

Identification of the application of biophilic design principles of Taman Anggrek Residence based on zones and functions as well as the activities of its residents include several supporting facilities surrounded by dense green trees, this creates a healthy and fresh microclimate for farmers (see Table 2). Open spaces and indoor gardens are the hallmarks of the design, with small waterfalls, greenery, and a soothing selection of colors. This design creates a more environmentally friendly, comfortable and healthy environment for residents. Natural lighting is maximized with large windows. The exterior design considers the use of greenery around the building, as an aesthetic as well as an air pollution filter.

Table 1. Application of biophilic design principles of Taman Anggrek Residence Apartment.

No	Biophilic Design Principles	Application	Benefit
1	Visual connection with nature	Waterfall, fishpond, swimming pool, rooftop garden and garden	Lowers pressure and heart rate, Improves mental health (Biederman and Vessel, 2006), Increase happiness (Barton and Pretty, 2010)
2	Non-visual connection with nature	The aroma of plants, natural ventilation and tree plants invites birds and insects	Reduces cognitive fatigue and helps with motivation (Jahncke, 2012)
3	Thermal and airflow variability	Interesting plant arrangements and patterns on the facade of the building that are rhythmic and attractive	Impacts heart rate, blood pressure, and increases a sense of attention and exploration (Browning, Ryan and Clancy, 2014)
4	Thermal and airflow variability	Natural lighting, circulation of open corridor plan and regulating orientation and opening in the building	Increases concentration, room enjoyment and has a positive impact on comfort, well-being and productivity (Browning, Ryan and Clancy, 2014)
5	Presence of water	Fountain pool, fishpond, outdoor pool, indoor pool and visual access to train	Positive responses, especially auditory and visual reactions to the presence of sound and the presence of water can reduce stress (Alvarsson, Wiens and Nilsson, 2010)
6	Dynamic and diffuse light	The use of skylight and large aperture for the spread of natural lighting and reduce the use of artificial light (lamps)	Increased visual comfort changes in sunlight transition that affect body temperature and heart (Putra, 2023)
7	Connection with natural system	Incorporating natural light by creating openings on the roof (skylight) that are more effective to illuminate the room so that it can connect the interior and exterior with natural system so that users can interact directly with nature	Improving the atmosphere that has an impact on a positive response (Browning, Ryan and Clancy, 2014)
8	Biomorphic farms & patterns	Imitation of natural shapes and patterns in club house buildings and in green open areas	Increasing proximity to the natural environment (Browning, Ryan and Clancy, 2014)
9	Material connection with nature	The use of natural materials and elements in architectural design is wood materials applied to furniture in club houses and natural stone materials in green open areas	Improves performance in creativity and improves user comfort (Browning, Ryan and Clancy, 2014)
10	Complexity & order	The vegetation arrangement including the trees and plants within the pattern, select and organizes the vegetation, topography, soil conditions and climate to create an attractive and comfortable visual environnment	Positive impact on response and psychology (Kopytin and Rugh, 2017; Hinz, Rim and Lusebrink, 2022)
11	Prospect	A dynamic space that not only offers functional benefits and connection to the environment combining a walkway over the fountain pool at the level of the third floor with one side covered by a glass barrier can offer a viewpoint to observe the environment from a higher vantage point	Reduce boredom, stress and increase comfort (Browning, Ryan and Clancy, 2014)
12	Refuge	Strategically positioning the space as a relaxation area overlooking the scenery and can create an environment that offers a sense of tranquility, inspiration, and connection with nature	Improves concentration, attention and perception of security (Browning, Ryan and Clancy, 2014)

Table 2. Identification of biophilic design principles of Taman Anggrek Residence by zone.

	14 Patterns	Zone Owen (Third Floor Park)	Zone Two (Geen Open Area)	Zone Three (Residential Tower)		
				Low Floor	Middle Floor	Upper Floor
1	Visual Connection with Nature	✓	✓	✓	-	-
2	Non-Visual Connection with Nature	✓	✓	-	-	-
3	Non-Rhythmic Sensory Stimuli	✓	✓	-	-	-
4	Thermal & Airfolw	✓	✓	✓	✓	✓
5	Presence of Water	✓	✓	-	-	-
6	Dynamic and diffuse light	✓	✓	✓	✓	✓
7	Connection with natural system	-	✓	-	-	-
8	Biomorphic farms & patterns	-	✓	-	-	-
9	Material connection with nature	✓	✓	✓	✓	✓
10	Complexity & order	-	✓	-	-	-
11	Prospect	-	✓	-	-	-
12	Refuge	-	✓	-	-	-
13	Mystery	-	-	-	-	-
14	Risk/Peril	-	-	-	-	-

The natural scenery is also reinforced with spacious gardens and good access to open spaces. The implementation of biophilic design still cannot be fully implemented. This is because the characteristics of vertical housing are practical housing with limited space. In addition, there is a need for a large area to be able to apply the entire biophilic design pattern. The application of biophilic hypotheses to architectural design means that artificial structures (buildings) and the natural environment exist in harmony and balance. The explanation and findings of the biophilic architectural pattern are described in the Figure 3.

The design of this apartment is not planned to apply a biophilic concept but has prioritized the incorporation of natural elements from the outdoor space and integrating them into the indoor space. But the implementation of biophilic design still cannot be fully implemented, so the design or design must be planned and communicated carefully.

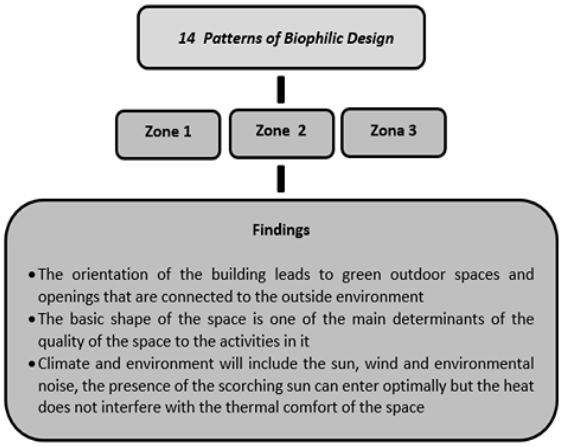

Figure 3. Findings of aspects studied.

The design of the application of vegetation in the terrace area of residential units can be done to contribute to building energy savings by providing natural insulation. In addition, vegetation in the exterior area is a form of response to climatic conditions in the surrounding environment.

4. CONCLUSION

Architectural design theory in Taman Anggrek Residence apartment as a residence with a biophilic design approach that is implemented into interior and exterior elements to provide a natural atmosphere by utilizing natural elements such as vegetation and processing materials used.

The implementation of biophilic design still cannot be fully implemented. This is because the characteristics of vertical housing are practical housing with limited space. In addition, there is a need for a large area to be able to apply the entire biophilic design pattern. The application of biophilic hypothesis to architectural design means that artificial structures (buildings) and the natural environment exist in harmony and balance. The essence of the biophilic design concept is to create a building with a space in which interaction with nature is intertwined as a basic human need. Therefore, the impression of environmental friendliness is not spared from the concept of green, so the design or design must be carefully planned and communicated with human and natural elements.

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