



PLANNING MALAYSIA:

Journal of the Malaysian Institute of Planners

VOLUME 22 ISSUE 6 (2024), Page 629 – 639

BIOPHILIC WORKSPACES: A COMPARATIVE STUDY OF VISUAL ATTRIBUTES IN GOVERNMENT INDOOR OFFICE ENVIRONMENTS IN PUTRAJAYA, MALAYSIA

**Nabilah Huda Zulkifli ¹, Abdul Razak Sopian ^{2*}, Fadhilzil Fariz Abdul Munir ³,
Mazlina Mansor ⁴, Wardah Fatimah Mohammad Yusoff ⁵**

^{1,2,3}Department of Architecture,

Kulliyyah of Architecture and Environmental Design,
UNIVERSITI ISLAM ANTARABANGSA MALAYSIA

³Centre of Studies for Architecture,

Department of Built Environment Studies and Technology,
College of Built Environment,

UNIVERSITI TEKNOLOGI MARA

⁴Department of Landscape Architecture,

Kulliyyah of Architecture and Environmental Design
UNIVERSITI ISLAM ANTARABANGSA MALAYSIA

⁵Department of Architecture and Built Environment,

Faculty of Engineering and Built Environment,
UNIVERSITI KEBANGSAAN MALAYSIA

Abstract

The paper examines the visual features of biophilic design patterns in indoor workspaces in government office buildings in Putrajaya. It aims to highlight and identify the biophilic elements in these workspaces. The perceived perception of biophilic design elements is recorded based on inventory lists using the author's expertise—the comfort and health of building occupants, mainly indoors, need to be considered. Visual benefits from interacting with nature, directly and indirectly, are abundant, including improving mood, thus contributing to enhanced focus and concentration. Based on the observation conducted on the indoor workspaces in the government offices in Putrajaya, Malaysia, the prevalent elements identified are the usage of natural lighting and diffused light entering from windows, especially in the cellular offices, which indirectly provides an external view outside the office. The presence of natural elements, such as potted plants and flowers, pictures of nature, botanical elements at the door, building panels, and pillars, can be seen. Biophilic design in indoor working spaces must be encouraged to cater to office users' physical and mental well-being, thus improving their performance at work.

Keywords: Biophilia, Biophilic Design Attributes, Government Office Malaysia

² Corresponding Author: arazaks@iium.edu.my

INTRODUCTION

Biophilic design integrates natural elements into the built environment, aiming to connect humans and nature, benefiting physical and mental well-being. Biophilic design can be implemented in various human environments, including indoor workspaces. Working long hours indoors could impact the mental and physical health of office occupants. Biophilic design can also be categorised as an artificial environment mimicking nature, providing similar positive effects. Applying biophilic design to working spaces can help reduce the pressure and stress of working indoors as they restore concentration, improve focus, and provide healing through sustained engagement and interactions. The therapeutic essence of nature has been proven in various studies (Khozaei et al., 2022; Hartig & Staats, 2006; McNeel, 2021; Shosha, 2021; Yassein & Ebrahiem, 2018). Nature in the built environment contributes to the users' safety, comfort and health and the long-term use of the buildings, which is one of the approaches to sustainable design practices (Aduwo & Akinwole, 2020).

LITERATURE REVIEW

Biophilic Elements and Dimension

Human well-being is highly influenced by its physical surroundings. This can also be applied to indoor spaces such as offices. The optimal surroundings necessary for a human's mental and physical survival need to be comprised of a multisensorial nature. The exposure to nature enhances healing, improves moods, and elevates focus and concentration with a sense of calm and liberation. Office settings with natural lighting, natural ventilation, and other environmental features improve worker performance, lower stress, and increase motivation. Contact with nature has been linked to cognitive functioning on tasks requiring concentration and memory (Ibrahim et al., 2021; Kellert et al., 2008). The sensory, mental, physiological, spiritual, and physical benefits of engagement with the natural environment are imperative for improving human well-being. Features that need to be examined and identified on-site are based on Stephen Kellert's Biophilic Design Principles. Kellert, in 2008, formulated dimensions and their attributes.

Dimension of Biophilic Design and its Attributes (Kellert, 2008):

- A. Environmental Features: 1) Color, 2) Water, 3) Air, 4) Sunlight, 5) Plants, 6) Animals, 7) Natural materials, 8) Views and Vistas, 9) facade greening, 10) Geology and landscape, 11) Habitats and ecosystems, 12) Fire.
- B. Natural Shapes and Forms: 1) Botanical motifs, 2) Tree and columnar supports, 3) Animal (mainly vertebrate) motifs, 4) Shells and spirals, 5)

- Egg, oval and tubular forms, 6) Arches, vaults, domes, 7) Shapes resisting straight lines and right angles, 8) Simulation of natural features, 9) Biomorphy, 10) Geomorphology, 11) Biomimicry
- C. Natural Patterns and Processes: 1) Sensory Variability, 2) Information Richness, 3) Age, change and the patina of time, 4) Growth and efflorescence, 5) Central focal points, 6) Patterned wholes, 7) Bounded spaces, 8) Transitional spaces, 9) Linked series and chains, 10) Integration of parts to wholes, 11) Complementary contrasts, 12) Dynamic balance and tension, 13) Fractals, 14) Hierarchically organised ratios and scales
- D. Light and Space: 1) Natural light, 2) Filtered and diffuse light, 3) Light and shadow, 4) Reflected light, 5) Light pools, 6) Warm light, 7) Light as shape and form, 8) Spaciousness, 9) Spatial variability, 10) Space as shape and form, 11) Spatial harmony, 12) Inside-outside spaces
- E. Place-Based Relationships: 1) Geographic connection to place, 2) Historic connection to place, 3) Ecological connection to place, 4) Cultural connection to place, 5) Indigenous materials, 6) Landscape orientation, 7) Landscape features that define building form, 8) Landscape ecology, 9) Integration of culture and ecology, 10) Spirit of place, 11) Avoiding Placelessness
- F. Evolved Human-Nature Relationships: 1) Prospect and Refuge, 2) Order and complexity, 3) Curiosity and enticement, 4) Change and metamorphosis, 5) Security and protection, 6) Mastery and control, 7) Affection and attachment, 8) Attraction and beauty, 9) Exploration and discovery, 10) Information and cognition, 11) Fear and awe, 12) Reverence and spirituality.

RESEARCH METHODOLOGY

This paper examines the biophilic design features in indoor workspaces and their physical design environment. Firstly, a desk study is conducted to study the site selection, the criteria of biophilic design in workplaces, and the method used to carry out the research. The elements of biophilic design that will be identified are adapted from Kellert's "Biophilic Design: The Theory, Science and Practice of Bringing Buildings to Life" (2008). The site selected is the government office workspaces in Putrajaya. The workspaces selected for the study are namely the Ministry of Science, Technology and Innovation (MOSTI) in Precinct 1, Palace of Justice and Perbadanan Putrajaya in Precinct 3, Ministry of Agriculture and Food Industry (MAFI) in Precinct 4, and Ministry of Tourism, Arts and Culture in Precinct 5. The method used in this study is a structured observational study where the researcher carefully observes the visual characteristics of the workspaces based on Kellert's work and relies upon the knowledge gathered from literature reviews. No intervention or amendment is made to the workspaces. The

qualitative method was used. Data analysis is done by comparison; in this context, biophilic elements from different workspaces have the same characteristics. From the results, the existing biophilic elements are presented and discussed.

ANALYSIS AND DISCUSSION

Findings from the data collection revealed that the indoor offices among the government buildings in Putrajaya are mostly comprised of environmental features, natural shapes and forms, as well as light and space. The most dominant biophilic design elements from the environmental features are sunlight, colour and indoor plants. The most prevalent elements for the natural shapes and forms are the botanical motifs, mainly leaves and natural abstract patterns on the doors and pillars, as well as arches, vaults, and domes, which can be seen in the hallway. These are primarily visible in the shared common spaces such as the lounge, waiting area, and walkway.

The cellular offices have natural lighting from the windows, whereas the open-plan offices are mostly occupied with typical bright wall colour selection and cool colour partitions. The counter service area mostly consists of botanical motifs on the pillars and furniture. Ample natural lighting is also needed in open-floor cubicle offices to allow clearer thinking and reduce movement, thus improving the workers' productivity.

Generally, the offices are occupied with potted plants and plants in the planter box that are mostly artificial for easy maintenance. There are also potted plants that are either provided by the organisation or brought to the office by the occupants. There is also an abundance of pictures and images of nature, such as flowers, oceans, and forests, mounted on the wall, giving the users an indirect experience of nature. The usage of wooden finishes for the door and ornamental patterns not only improves the visual characteristics of the office buildings but also provides the image of a professional working ethos for public servants.

The indoor workspace of the government offices lacks attributes of natural patterns and processes, place-based relationships, and evolved human-nature relationships based on the biophilic design attributes. There is no visible indication of an ecological, historical or geographical connection to the indoor office, possibly due to the nature of the focus-oriented space rather than a space of healing or a space for the community. There is also minimal to no application of natural elements such as water elements and natural materials, and façade greening is highly visible among the office buildings. This condition might be prevalent due to high maintenance and a lack of awareness of how these elements could positively affect office occupants.

The number of indoor plants is also limited in the open-plan cubicle offices. Maximising the application of plants, whether in the shapes, forms, or mimicry of vegetation, can be applied to the wall as there are limited spaces to

include the plants. More consideration of these elements is needed to improve the visual aspects of the office, as suggested by Lottrup et al. (2013). It is noted that most indoor areas do not possess sensorial characteristics such as tactile, olfactory, and auditory senses. Interior designers or planners need to explore these attributes for future indoor workspaces, especially in the government sector.

1. Palace of Justice (PoJ)

In general, the indoor office in the Palace of Justice utilises the soft nude colours as wall finishing, which could bring a sense of calm to the occupants. Pictures of the natural environment can be seen throughout the indoor spaces. Botanical flower motifs can be seen around the indoor area of the building. The biophilic design elements of 'integration of part to wholes' are present based on the colour selection of furniture, which creates a sense of spatial harmony in the compound. The use of arches can be seen in the hallway of the building, which gives off organic and fluid design characteristics.

Based on the observation, the cubicle workstations generally possess little to no application of biophilic design apart from the colour selection and artificial indoor plants. However, the employees must make optimal use of their immediate working stations. Some workspaces apply biophilic design by placing artificial or small indoor plants in their workspaces. The counter workspace, where most of the support group employees are located, has botanical motifs visible on the counter area with a strong colour selection, which can improve the mood of the workspace compared to the rest of the working spaces in the building. Indoor plants are mostly artificial; however, still provide an aesthetic function in the room. In the cellular office, sunlight enters the indoors through the window, providing a sense of serenity and energising for office users. Views and vistas can be obtained through windows, where vegetation from outside can be seen.

To maximise the impact of biophilic design on the employees, the employees may include small potted plants or place the imagery of natural environments on their work desks or immediate workspaces. Interior designers of the workstation need to consider the implementation of good colour on the cubicle, floor and the walls in the indoor office to provide a spirit of working or liveability, as the downside of indoor open floor working spaces is little to no availability of windows and natural ventilation that can improve their working conditions.



Figure 1: Biophilic Design Elements identified in working spaces in the Palace of Justice

2. Ministry of Science, Technology and Innovation

Office spaces in the Ministry of Science, Technology and Innovation building provide private office rooms with ample natural lighting and curtain shades. The artificial indoor plants can also be seen in the corner of the room. However, the open floor workspaces lack the application of environmental features that could affect the occupants' performance at work, such as water elements, access to direct sunlight, windows, natural ventilation, and natural materials. The application of biophilic design such as organic forms, arches, and botanical motifs, including environmental features such as plants, are mostly present outside the working premises such as the big halls, hallways, lounge and lobby area, which cannot directly provide a connection to nature for the working employees. Some parts of the open-floor office have windows that provide a wide outside view, but some are enclosed in the middle of the building despite the lack of physical biophilic attributes.

Open-floor cubicle offices cater to social interactions among office occupants. The natural elements of biophilic elements such as water, where they allocate an aquarium, indoor living plants and an external view of nature are present in the indoor working area. The enclosed part of the workspaces, such as the cubicle, provides the occupants with a sense of privacy and security and encourages concentration. The lack of natural features in the designated work area must be improved.

Visual biophilic features such as images of landscapes, scenes, and natural forms can be applied to the walls or desks to increase the direct connection with nature and improve the mood, thus reducing the employees' stress. The colour selection of walls can be changed to cool colours instead of warm colours to elevate positive moods for office occupants.



Figure 2: The present biophilic design attributes in the Ministry of Science, Technology and Innovation

3. Ministry of Tourism, Arts and Culture

In the Ministry of Tourism, Arts and Culture building, the office layout area is divided into rather typical settings in which private offices are placed in the outer part of the floor plan while open floor offices are placed at the centre of the building. In the private office, the provision of the windows allows natural lighting to enter the workspace, providing a sense of calm and focus. Indoor plants are also present in the room, suggesting the need for beauty and colour vibrancy in a workspace. In an open-place cubicle workspace, the use of bright colours for the walls and partition provides a sense of repetition and monotonousness; thus, the application of a variety of biophilic elements is crucial to increase work performance.

The spatial harmony and integration of parts to the whole can be felt and seen in the counter area. The visual biophilic design characteristics identified in the office buildings are mostly in the same colour palette: the warm earth tone such as brown, beige and green. The repetitive elements, such as organic forms and botanical motifs, bring a sense of security to users and the space occupants. In general, indirect natural elements such as pictures, artificial plants as decorations, and floral motifs on doors provide visual experiences for the users.

Visual biophilic design characteristics identified in the workstations, such as warm earth tones and visible imagery of natural environments, such as pictures of scenery, water elements and sculptures, provide a sense of spirit to the office employees. Improvement in physical or direct connection towards nature needs to be highlighted, such as the application of green walls or small-scale water elements that could improve the work motivations for the employees.

Nabilah Huda Zulkifli, Abdul Razak Sopian, Fadhlizil Fariz Abdul Munir, Mazlina Mansor, Wardah Fatimah Mohammad Yusoff
Biophilic Workspaces: A Comparative Study of Visual Attributes in Government Indoor Office Environments in Putrajaya, Malaysia



Figure 3: The visual attributes of biophilic design identified in the government office in the Ministry of Tourism, Arts and Culture

4. Perbadanan Putrajaya

The most prominent visual characteristic of biophilic design in Perbadanan Putrajaya is the application of the natural environment inside and outside the building. There are outdoor landscapes with colourful water features and soft landscapes outside the building, as well as a view of the lake and surrounding area with available windows. However, it can mostly be enjoyed by private office employees. Pictures with nature images can be seen on the private office wall. The use of wooden wall finishes resembles tree bark colours, providing a warm tone to the room that could give a sense of concentration. Multiple work desks encourage social interaction that makes workers productive. In the counter service area, the application of cool colours resembling water and sky with botanical motifs and suitable lighting provides a sense of relaxation for the occupants. In the open plan offices, the usage of moss green colour for the partition that resembles leaf colours provides a sense of calm. The imagery of abstract paintings that resemble nature, ample outside view with wide windows and abundant natural lighting encourages the feeling of extension from the outside into inside spaces. These elements could improve mood and mental focus for the occupants.

Restoring mental health and improving employee productivity are important as they are interrelated. Providing sensorial connectivity with nature by emphasising visual characteristics such as green walls, potted plants, or water elements indoors, especially near or at immediate workstations, can elevate concentration and improve the moods of the employees. Too many natural elements in the offices could create an uncomfortable working environment; thus, an optimal volume is required.



Figure 4: Visual biophilic design characteristics exhibited by the Perbadanan Putrajaya office.

5. Ministry of Agriculture and Food Industry

The cellular office in the Ministry of Agriculture and Food Industry has operable windows with blinds that allow the sunlight to come in. The application of huge wallpaper with greenery mounted on the wall of the open-plan cubicle office is also identified. The partition of the cubicle with a cool colour selection provides a sense of calm and reduces the stress of the office occupants. In the indoor workspaces, the images of nature and potted plants are present, stimulating and reducing the office occupants' stress. The botanical motifs, such as leaves in the window panel of the cellular office, are implemented. Some parts of the indoor workspace have huge windows where the office occupants are able to see and enjoy the scenery, especially from the high-rise buildings. In general, the visual biophilic design elements are visible in the immediate working spaces, especially in private cell offices, such as the application of botanical motifs, for example, the leaf motifs, tree trunk motifs, and flower motifs. Biophilic design elements such as real potted plants, artificial plants, and water elements are also present in the lounge and hallways, which could bring a sense of calm to the employees who are walking by the area. Aquatic animals, such as bee shrimp in the aquarium or arapaima sp. in large aquariums, have attractive visual features that can be implemented in the working area.

Due to a high number of occupants in an open plan floor workspace, the interior designers need to maximise or optimise the connection to nature; visually could act as a direct experience with nature, could improve and restore the mental health of office occupants as the view towards nature outside, the provision of sunlight or daylighting is limited. The brief interaction with nature, whether indirect exposure to it, such as by its colour, mimicry, or derivation, is important to humans, even if it is in a small amount

Nabilah Huda Zulkifli, Abdul Razak Sopian, Fadhlizil Fariz Abdul Munir, Mazlina Mansor, Wardah Fatimah Mohammad Yusoff
Biophilic Workspaces: A Comparative Study of Visual Attributes in Government Indoor Office Environments in Putrajaya, Malaysia



Figure 5: Ministry of Agriculture and Food Industry workspaces displayed a strong embodiment of biophilic design applications.

CONCLUSION

Based on the observation, it can be noted that natural elements can be utilised through indirect experiences of nature such as pictures, colour selections and artificial implementations that could provide almost similar effects to the actual natural environment. Integrating biophilic elements into indoor workspaces allows the occupants to become adaptable to their surroundings while managing stress and long hours of working at the office. The application of biophilic design and biophilic interior architecture in government offices needs to be celebrated and promoted in indoor workspaces, which evidently have many positive impacts on office occupants. These elements not only provide aesthetic functions but also improve the mood and reduce stress so that the occupants can perform better at work. The robust lifestyle and pressured workloads in the government sector have made the indoor environment hostile towards its occupants. Office designs in the public sector are direly lacking natural and sensorial implementation from the biophilic design, which could mainly be rooted in cost, maintenance issues and space considerations that do not cater to human factors. Comfort and health should be the main factor in designing human spaces.

ACKNOWLEDGEMENT

The authors acknowledge the Ministry of Higher Education (MoHE) for funding this research under the Fundamental Research Grant Scheme (FRGS) with reference code FRGS/1/2021/SSI02/UIAM/01/1. In addition, the authors would like to thank the Ministry of Science, Technology, and Innovation (MOSTI), the Palace of Justice, Perbadanan Putrajaya, the Ministry of Agriculture and Food Security (KPKM), the Ministry of Tourism, Arts, and Culture (MOTAC), and other government ministries and agencies for allowing the research to be conducted on their property.

REFERENCES

- L. Lottrup, P. Grahn and Stigsdotter, *Landscape and Urban Planning*, 110, 5-11 (2013).
- Kellert S. R. (2008) Dimensions, Elements, and Attributes of Biophilic Design. *Biophilic Design: The Theory, Science, and Practice of Bringing Buildings to Life*. John Wiley and Sons, Inc.
- Ibrahim, Ismi & Khairuddin, Rizal & Abdullah, Azli & Amin, Izzati & Wahid, Julaihi. (2021). Analysis of Biophilic Design in Communal Space of an Office Building. Case Study: Pertubuhan Arkitek Malaysia (PAM) Centre. AIP Conference Proceedings. 2347. 1. 10.1063/5.0052824.
- Aduwo E. B., Akinwale O. O., Okpanachi P. O. (2021) Assessing workers' productivity through biophilic design as a measure of sustainability in selected office buildings in Lagos state, Nigeria IOP Conf. Ser.: Earth Environ. Sci. 665 012047
- Khozaei F., Carbon C. C., Nia M. H., Kim M. J. (2022) Preferences for Hotels with Biophilic Design Attributes in the Post-COVID-19 Era Buildings 2022, 12, 427. <https://doi.org/10.3390/buildings12040427>
- Hartig, T.; Staats, H (2006). The need for psychological restoration as a determinant of environmental preferences. *J. Environ. Psychol.* 2006, 26, 215–226.
- McNeel, J.R. (2021) From Cure to Healing: Rethinking the Nature of Cure within a Redecision Perspective. *Trans. Anal. J.*, 51, 216–225.
- Shosha, M. (2021) Forest Bathing Therapy: The Healing Power of Nature. *Int. J. Psychiatry Res.* 2021, 4, 1–2.
- Yassein G., Ebrahiem S. (2018). Biophilic Design in the Built Environment to Improve Well-Being: A Systematic Review of Practices. *Journal of Urban Research*, Vol. 30, oct 2018

Received: 6th July 2024. Accepted: 5th September 2024