E-BOOK OF EXTENDED ABSTRACT

THE 14TH INTERNATIONAL INVENTION, INNOVATION & DESIGN COMPETITION 2025

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Organized by:

Office of Research, Industry,
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BIORATE: A STRESS-RESPONSIVE BIOPHILIC RATING TOOL FOR MALAYSIAN INDOOR OFFICE SPACES

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ABSTRACT

The integration of biophilic design in workplace environments is increasingly recognised for its ability to enhance well-being, reduce stress, and improve productivity. This study introduces a Biophilic Design Rating Tool specifically tailored for indoor office settings in Malaysia, developed through empirical validation that involved virtual reality (VR) simulations and biometric assessments. The tool comprises 34 attributes categorised under three dimensions: Natural Environment, Composition, and Personal Experience, each further divided into subcategories such as visual and non-visual elements, spatial qualities, and psychological stimuli. Attributes are scored and weighted to classify environments into four levels of restorative quality: Certified, Silver, Gold, and Platinum. Biometric data collection involved the use of heart rate variability (HRV) and skin conductance level (SCL) to evaluate emotional and stress responses during VR-based environmental exposure using Quest 3. A total of 50 government office workers in Putrajaya participated in the testing phase, experiencing a range of simulated office environments designed with varying levels of biophilic integration. Participants' physiological responses and preference feedback were used to refine the scoring structure and weightage distribution. Findings revealed a strong correlation between higher biophilic scores and reduced stress indicators, supporting the validity of the tool. The final product is delivered as an Excel-based application, providing a practical and user-friendly method for assessing the restorative potential in indoor office environments. Designed for commercial scalability, this tool is intended for designers, consultants, and policymakers, with the potential to support national initiatives such as MyCREST and GBI Malaysia through integration into building performance evaluation frameworks.

Keyword: Biophilic Design, Restorative Environment, Rating Tool, Virtual Reality Simulation, Stress Reduction

1. INTRODUCTION

In recent years, the significance of biophilic design has grown in tandem with awareness of health-focused and human-centered architecture. As workforces spend increasing hours in indoor office environments, the impact of design elements on well-being and productivity cannot be overstated. Malaysia, through initiatives such as MyCREST and the Green Building Index (GBI), has advocated for sustainability; however, existing rating tools often lack a specific focus on the restorative and psychological aspects of indoor design. This study aims to bridge that gap by introducing a Biophilic Design Rating Tool that measures the restorative potential of interior office spaces.

2. METHODOLOGY

This study employed a two-phase methodology to develop the *BioRate* tool: (1) the development and validation of the biophilic rating model, and (2) the digital system development for application and commercialisation.

2.1 Phase 1: Development of the Biophilic Rating Model

The first phase began with a literature review to identify biophilic attributes associated with stress reduction and user preference. These attributes were refined through a focus group with experts in architecture, psychology, and sustainability. Observations were then carried out in government offices across Precincts 1 to 5 in Putrajaya to assess the presence of these elements. A questionnaire survey was conducted to gather feedback from occupants on the impact and preference for each attribute. Based on the results, a Biophilic Design Model with 34 validated attributes was developed and grouped into three main categories: Natural Environment, Composition, and Personal. The model was tested using Virtual Reality simulations created with Unreal Engine and experienced via Quest 3. Participants explored different office environments and provided feedback through semi-structured interviews. Their stress responses were also measured using Heart Rate Variability and Skin Conductance Level.

2.2 Phase 2: Development of the Rating System

Following validation, the model was translated into a digital rating system to support practical use and commercialisation. The system was developed using Microsoft Excel, chosen for its accessibility, flexibility, and familiarity among professionals. The interface includes attribute-based scoring with conditional formatting, automated calculations, certification classification (Certified, Silver, Gold, Platinum), and a user guide. This lightweight system ensures usability without requiring advanced technical skills or custom software. Future enhancements may include development into a web-based platform or mobile application for broader scalability.

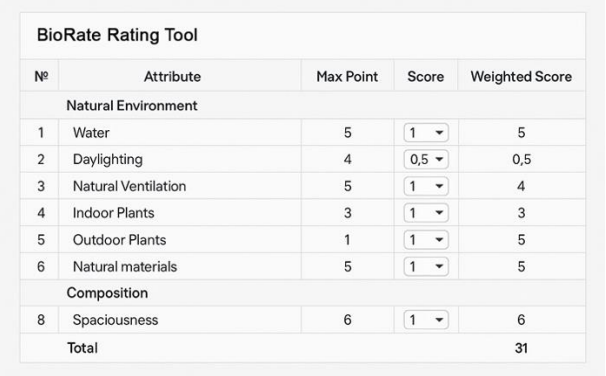
3. FINDINGS

Table 1 confirmed that the Natural Environment contributed the highest score (39%), primarily due to visual elements such as water, daylighting, ventilation, and plants. Composition accounted for 30%, with emphasis on spaciousness, spatial variety, and natural light. Personal aspects made up 31%, led by cognitive elements such as beauty, chromotherapy, and refuge, followed by sensory and place attachment elements. These results highlight that visual natural features and psychological comfort are the most impactful in creating restorative indoor office spaces. The findings were used to determine the weight and structure of each attribute in the final rating tool.

Table 1 Overview of Assessment Categories and Scores in the Biophilic Rating Tool

Area of Assessment		Point Score
Natural Environment (39 marks)	Visual: Water, Daylighting, Natural Ventilation, Indoor Plants, Outdoor Plants, Meteorology, External View of Nature, Natural materials	31
	Non-Visual: Adaptation of Nature Colour, Actual Nature Motifs and Patterns, Imitations of Nature Motifs and Patterns, Artificially Generated Natural Features (wind, lights), Organic and Fluid Forms	8
Composition (30 marks)	Form: Form Harmony, Fractal Geometry, Organised Complexity, Integration of Parts to Whole	7
	Order: Area of Emphasis	6
	Space: Spaciousness, Interplay of Natural Light, Spatial Variety, Space Harmony, Transitional Space	17

Personal (31 marks)	Sensory: Utilising Vision (Sight) to Experience Nature, Utilising Old Factory (Smell) to Experience Nature, Utilising Auditory (Hear) to Experience Nature, Utilising Tactile (Touch) to Experience Nature	10
	Cognitive: Attraction and Beauty, Curiosity and Enticement, Prospect and Refuge, Chromotherapy	17
	Ecological and Cultural Connection to Place, Geographical Connection to Place	4
	TOTAL SCORE	100



BioRate Rating Tool

№	Attribute	Max Point	Score	Weighted Score
	Natural Environment			
1	Water	5	1	5
2	Daylighting	4	0,5	0,5
3	Natural Ventilation	5	1	4
4	Indoor Plants	3	1	3
5	Outdoor Plants	1	1	5
6	Natural materials	5	1	5
	Composition			
8	Spaciousness	6	1	6
	Total			31

Figure 1: BioRate interface showing how users score biophilic attributes and view the total result

Figure 1 illustrates a sample interface of the BioRate tool, showcasing key biophilic attributes, their maximum points, user scores, and weighted outputs. Users select 0, 0.5, or 1 based on presence levels. The system auto-calculates total scores to determine certification levels. Designed for clarity and ease of use, the tool supports practical application and commercialisation

4. CONCLUSION

The BioRate tool provides a validated and structured method for assessing the restorative quality of indoor office environments. Findings from Stage 1 highlight the importance of visual nature and cognitive comfort, while Stage 2 demonstrated how the model can be applied through a simplified Excel-based system. This tool supports practical use in design evaluation and certification, with potential integration into national frameworks like MyCREST and GBI Malaysia. Future development may include web-based or mobile platforms to expand accessibility and commercial reach.

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REFERENCES

Kellert, S. R., Heerwagen, J. H., & Mador, M. L. (2008). *Biophilic design: The theory, science, and Practice of bringing buildings to life*. Wiley.

Malaysia Green Building Index. (2021). *GBI assessment criteria for non-residential new construction (NRNC)*. Retrieved from https://www.greenbuildingindex.org

Zulkifli, N. H., Sapian, A. R., Abdul Munir, F. F., Mansor, M., & Mohammad Yusoff, W. F. (2024). Biophilic workspaces: A comparative study of visual attributes in government indoor office environments in Putrajaya, Malaysia. *Planning Malaysia, 22*(6), 629–639.

Abdul Munir, F. F., Sapian, A. R., Zulkifli, N. H., Mansor, M., & Ibrahim, P. H. (2024). Biophilic design elements preferences among government officers in Putrajaya, Malaysia. *Planning Malaysia, 22*(6), 567–577.

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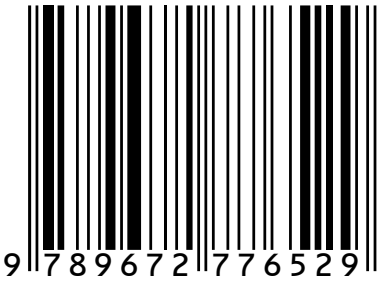

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