ARCHITECTURAL AND ERGONOMIC SOLUTIONS FOR THE APPLICATION OF FLORISTIC ELEMENTS IN PUBLIC BUILDINGS INTERIORS (ON THE EXAMPLE OF CAFES AND BARS)

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Abstract: *This article examines the architectural, spatial, and ergonomic solutions of integrating floristic elements into the interiors of public buildings, particularly cafes and bars. In the context of modern urbanization, the growing demand for ecological and biophilic approaches in the HoReCa sector (hotels, restaurants, and cafes) determines the main direction of this research. Within the framework of the study, the influence of floristic compositions on functional zones, circulation flows, and the characteristics of human visual perception was analyzed using comparative analysis, the grafo - analytical method, case study, and design modeling methods. The results show that the placement of plants in interior spaces performs not only an aesthetic function but also important engineering and architectural roles, such as optimizing the microclimate, ensuring acoustic comfort, and visually zoning the space. The article formulates generalized principles for the development of floristics, enabling the application of sustainable and climate - adaptive solutions in interior design. The proposed comprehensive model can serve as a practical guideline for architects and designers.*

Keywords: *public buildings, interior floristics, biophilic design, architectural ergonomics, spatial composition, phytodesign, microclimate optimization, design modeling.*

INTRODUCTION

In contemporary architectural and design practice, the creation of ecologically sustainable and psychologically comfortable environments within public building interiors has become increasingly significant (Ryan et al., 2014). The rapid pace of urbanization and the burgeoning use of synthetic materials have intensified the human innate need for natural environments. This shift necessitates the strategic integration of floristic elements within public catering establishments, specifically in the interiors of cafes and bars (Kellert, 2018). The relevance of this research lies in the fact that modern interior floristics is no longer viewed merely as a decorative tool but as a sophisticated functional - spatial system that organizes space, regulates microclimates, and positively influences visitor behavior (Ryan et al., 2014). The effective formation of such a system requires a scientific approach grounded in architectural and ergonomic solutions.

The main objective of this study is to scientifically substantiate architectural, design, ergonomic solutions for the development of floristics in cafe and bar interiors and develop a model of spatial - compositional optimization. To achieve this goal, a series of interrelated tasks were established. The first task involves analyzing advanced global practices in the architectural planning and utilization of plants within modern cafe and bar interiors

(Söderlund & Newman, 2015). The second task is to examine the ergonomic and climatic parameters of plant placement in interiors, including their interaction with insolation, humidity, and ventilation systems. The third task focuses on developing comprehensive ergonomic solutions for floristic integration based on the acquired data. While modern public buildings - specifically the internal environments of cafes and bars - serve as the object of this research, the subject matter comprises the architectural, design, and ergonomic patterns of integrating floristic elements within these spaces.

The scientific novelty of this work lies in its pioneering approach to researching the implementation of floristics in cafe and bar interiors as a unified systemic model, intricately linked with architectural ergonomics, visual navigation, and climate-adaptability factors. Furthermore, a matrix evaluating the impact of plants on spatial circulation is proposed (Elshaer et al., 2025). The practical significance of the study is that the developed ergonomic solutions and parameter tables will serve as a scientifically - grounded methodological guide for architects, interior designers, and phytodesigners during the design or reconstruction of cafes and bars. This, in turn, contributes to enhancing both the economic and ecological efficiency of these facilities (Tekin et al., 2025).

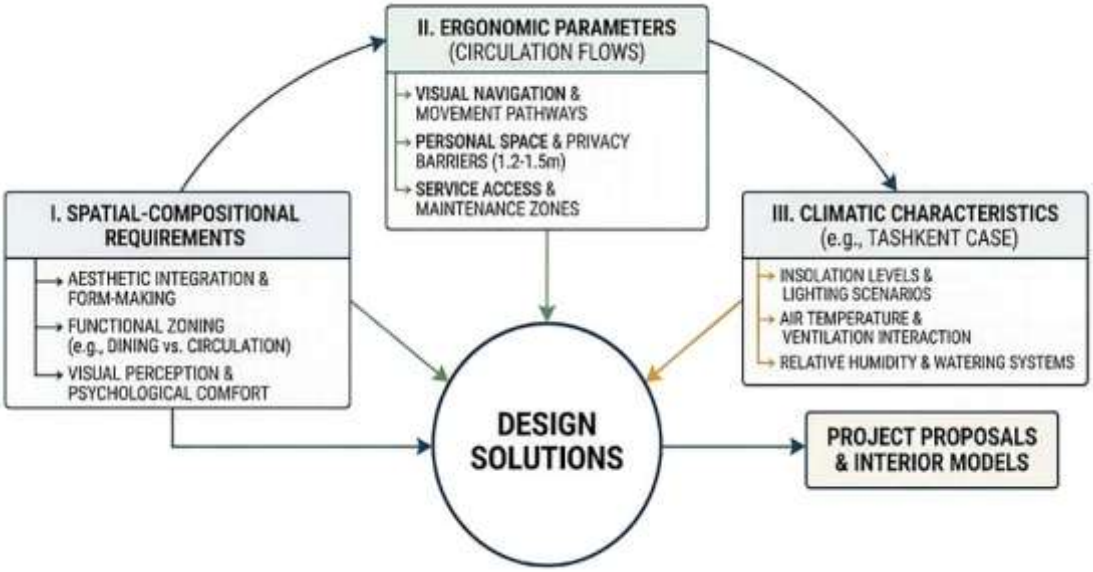

Figure 1. Conceptual framework of floristic integration in public building interiors.

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METHODS

To fully achieve the set goals and objectives and to reach objective conclusions, the research methodology was developed based on a comprehensive approach. Comparative analysis was utilized as one of the primary methods. This approach allowed for the comparison of interior solutions in modern cafes and bars with various planning structures, including open - plan layouts, traditional closed - room systems, and transformable spaces. During the analysis, the visual capacity of the facilities, the positioning of plants relative to

light sources, and the degree of obstruction in service zones were evaluated (Kim & Lee, 2022). Existing research substantiates the positive impact of natural elements on human psychological state, general well - being, and spatial perception; thus, their integration into daily functional spaces, including public interiors, is regarded as a critical research direction (Beatley, 2011).

To accurately assess spatial relationships, the graph - analytical method was employed. This method enabled the mapping of movement trajectories (transit zones) for both visitors and staff on interior drawings and diagrams, the identification of primary viewing angles (isovists), and the mathematical and geometric calculation of the role of phytocompositions in correctly directing these flows. For instance, the following formula for compactness/circularity was applied:

$$C = \frac{4\pi A}{P^2}$$

C (Compactness/Circularity): The shape's compactness coefficient, ranging from 0 to 1. A value closer to 1 indicates a more centralized field of view, free from obstructions.

A (Area): The surface area of the viewing field (isovist), representing the total area visible to a person from a specific point through the plant arrangements.

P (Perimeter): The perimeter of the viewing field, representing the total length of the boundaries (walls, plants, and other obstacles) of the line of sight.

This formula quantifies the "visual quality" of the space. It is possible to see how the lines of movement and the ratio of the visual fields to the zones of vegetation are allocated. Additionally, the case study method was utilized to conduct an in - depth study of successful international and local projects. This involved examining the interior environments of cafes

and bars in regions with arid and hot climates, analyzing facilities that integrate xerophytic plants and automated irrigation systems (Sovocool, Morgan, & Bennett, 2006). In these

objects, the interaction between air circulation systems and floristic walls (phytowalls), moisture retention levels, and acoustic absorption coefficients were studied empirically. In the final stage, design modeling was applied. Based on all the analytical data obtained, an experimental model of an optimal cafe interior was created within a

Figure 2. Analysis of the use of plants for zoning in cafe interiors.

three - dimensional (3D) BIM (Building Information Modeling) environment (figure 2). During the modeling process, furniture ergonomics, the anthropometric dimensions of plant containers, lighting scenarios, and the vegetation requirements of the plants were unified into a single compositional system, allowing for the visual verification of theoretical hypotheses (Deniz & Cavka, 2024).

RESULTS

As a result of the analyses and design modeling processes conducted within the scope of this research, several key architectural - spatial patterns for developing floristics in public building interiors were identified. A primary finding is that the vertical and horizontal distribution of plants in the interior directly influences the psychological comfort and visual perception of visitors (Söderlund & Newman, 2015). Specifically, it was demonstrated that phytocompositions with heights ranging

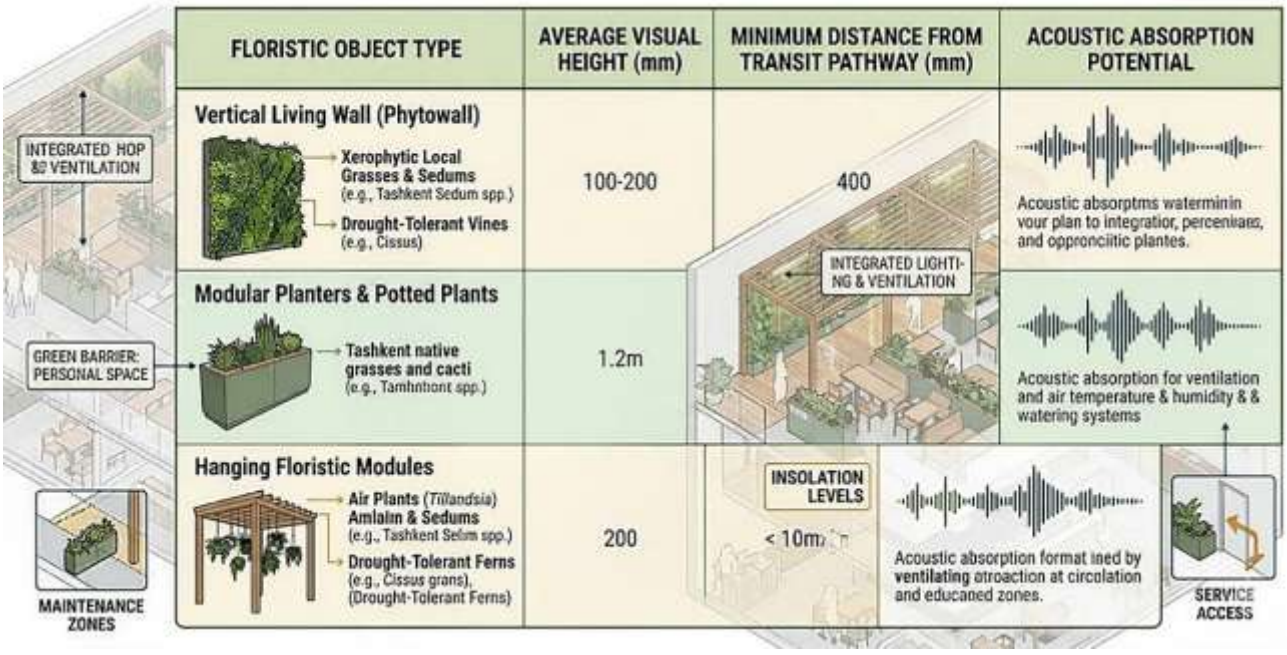

Figure 3. Architectural - ergonomic parameters for integrating indoor plants.

from 1.2 to 1.5 meters act as effective visual barriers in open - plan cafes and bars, creating a sense of privacy while ensuring that natural light and airflow are not obstructed. During the research, a specialized system of parameters for the placement of floristic elements was developed. This system encompasses plant dimensions, light requirements, minimum distances for maintenance zones, and safety and ergonomic requirements (Ryan et al., 2014). The acquired data were systematized into a specialized analytical table,

categorized by precise measurements and functional zones. This figure 3 serves as a normative specification for architects.

Comparative analysis results revealed a stark contrast between traditionally finished cafe interiors and those enriched with floristic elements based on targeted biophilic design principles. Notably, acoustic analyses showed that vertical greenery (phytowalls) and suspended floristic structures are capable of absorbing 20 - 25% of sound waves reflected from hard surfaces within bar and cafe areas (Jain & Janakiram, 2016). This significantly enhances acoustic comfort in high - noise public environments. Furthermore, a comparison diagram of movement trajectories confirmed that transit corridors delineated by plants are more effective and aesthetically appealing for regulating customer flow compared to mechanical barriers (Ryan et al., 2014).

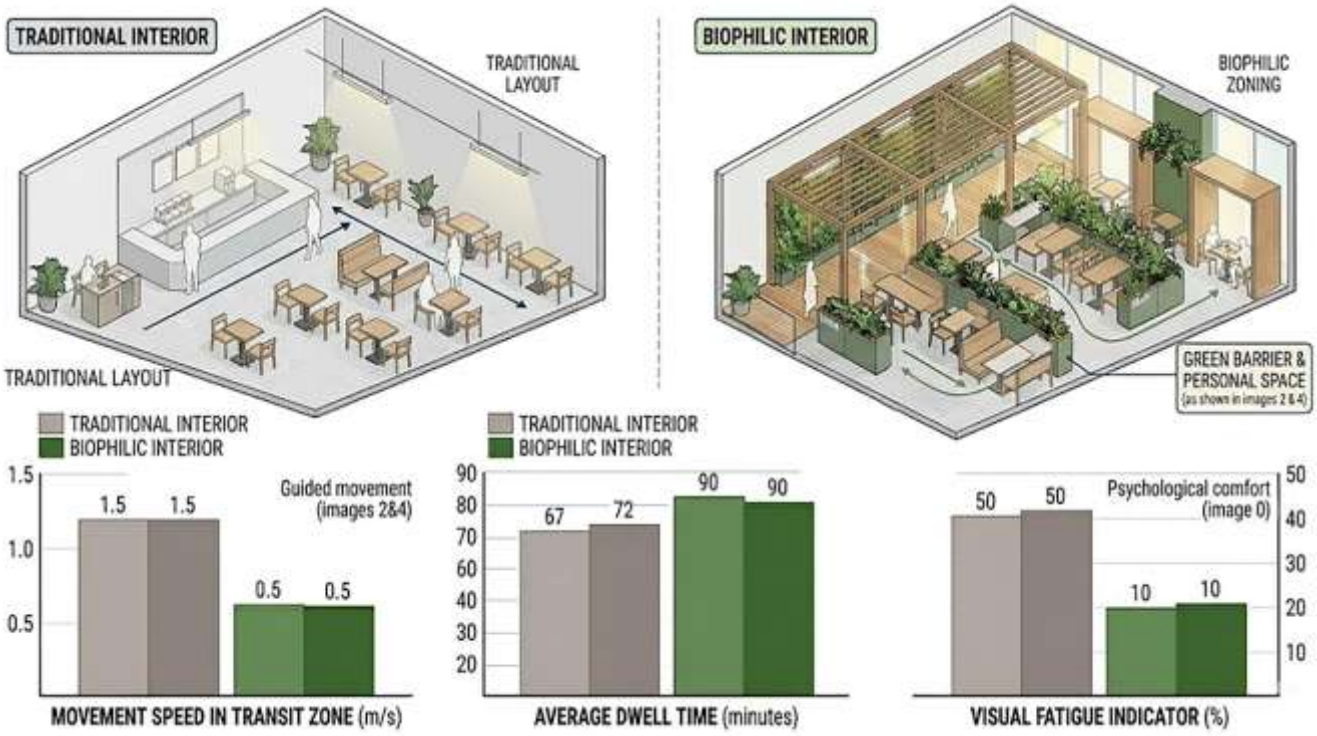

Diagram 1: Comparative assessment of client circulation and dwell time in traditional vs. biophilic cafe interiors.

Design conclusions formulated through modeling highlighted the necessity of transitioning to modular systems for floristic integration. Instead of stationary, heavy planters, mobile floristic modules - connected to engineering networks (drip irrigation, drainage) and easily repositionable toward the compositional centers of the interior as well as ceiling - structures, allow for a flexible cafe space (Elshaer et al., 2025). Visualization results indicate that such an approach maximizes both visual aesthetics and operational ergonomics. These solutions were designed using plants native to the local flora (succulents, local grasses), taking into account the specific climatic characteristics of the site (Tekin et al., 2025).

Figure 4. Mobile floristic module system based on ergonomic requirements.

DISCUSSION

The interpretation of the results indicates that the application of floristics in the interiors of public buildings is not merely a decorative process but a complex spatial - engineering solution that must be integrated from the earliest stages of architectural design. Our findings regarding the impact of plants on circulation flows, the acoustic environment, and visual perception fully support and expand upon modern biophilic design theories (Ryan et al., 2014).

A comparison of our research results with international studies - specifically S. Kellert’s biophilic design principles (Kellert, 2018) and the greening practices of HoReCa facilities in Singapore and Scandinavia - revealed significant similarities and differences. While international practice often relies on high - tech climate control systems to support intensive tropical floristics, our model prioritizes a cost - effective and sustainable approach based on xerophytic plants and flexible irrigation systems suited for arid climates and limited resources (Tabb & Deviren, 2017). From both an economic and operational perspective, this approach is better aligned with local conditions.

At the same time, it is important to acknowledge certain limitations of this study. The research did not provide a detailed analysis of the economic costs associated with plant maintenance, nor did it fully explore the integration of Artificial Intelligence - based microclimate control systems (IoT) with interior floristics (Tekin et al., 2025). These factors directly influence the operational phase of the architectural environment and represent vital topics for future research. Nevertheless, the ergonomic and spatial parameters developed in this study serve as a universal baseline model for planning cafes and bars in any region.

CONCLUSION

The primary conclusions drawn from the research results indicate that for the successful development of floristics in the interiors of cafes and bars, it must be embraced as an integral component of the architectural project. It has been proven that plants can be effectively utilized to divide spaces into functional zones, mitigate acoustic discomfort, and manage visitor transit flows. During the design process, the ergonomic dimensions of floristic objects and their compatibility with engineering communications must be strictly considered (Ryan et al., 2014).

Future research directions should focus on merging interior floristics with digital technologies, specifically exploring architectural solutions for monitoring plant health using smart sensors and transmitting this data to automated Building Management Systems (BMS) (Tekin et al., 2025). The finalized framework of principles developed in this study enables the systematization of the design process.

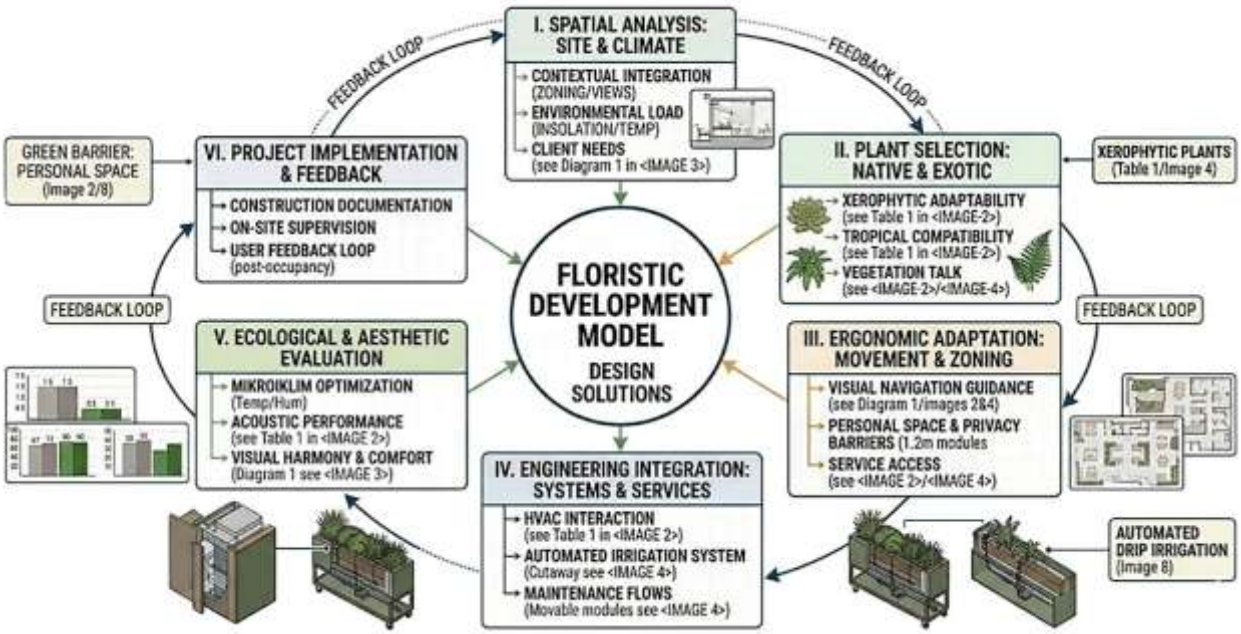

Figure 4. Architectural design principles scheme for floristic development in public buildings

Based on these findings, several practical recommendations are offered to architects and designers. First, during the interior planning phase, it is essential to develop a specialized insolation map for plants and select flora species according to the angles of light incidence (Kim & Lee, 2022). Second, to ensure that installed phytowalls or horizontal planting modules do not become ergonomic obstacles for customers and service staff, the inclusion of protective buffer zones for circulation corridors is highly recommended (Jain & Janakiram, 2016).

REFERENCES:

Ryan, C. O., Browning, W. D., Clancy, J. O., Andrews, S. L., & Kallianpurkar, N. B. (2014). Biophilic design patterns: emerging nature-based parameters for health and well-being in the built environment. *ArchNet-IJAR: International Journal of Architectural Research*, *8*(2), 62. Biophilicdesign-patterns.pdf

Kellert, S. R. (2018). *Nature by design: The practice of biophilic design*. Yale University Press. ThePracticeofBiophilicDesign.pdf

Jain, R., & Janakiram, T. (2016). Vertical gardening: A new concept of modern era. *Commercial Horticulture, 10*(3), 527-536. 39_Commercial Horti.pmd

Tabb, P. J., & Deviren, A. S. (2017). The greening of architecture: A critical history and survey of contemporary sustainable architecture and urban design. *Sustainable Cities and Society, 35*, 301-318. The greening of architecture: A critical history... - Академия Google

Deniz, Z. B., & Cavka, B. T. (2024). A systematic literature review on biophilic hotel design. *Kent Akademisi, 17*(5), 1453-1472. Kent Akademisi » Submission » A Systematic Literature Review on Biophilic Hotel Design

Sovocool, K. A., Morgan, M., & Bennett, D. (2006). An investigation of the water-savings potential of xeriscaping in the United States. *Journal - American Water Works Association*, *98*(2), 82-93. An in-depth investigation of Xeriscape as a water conservation measure - Sovocool - 2006 - Journal AWWA - Wiley Online Library

Söderlund, J., & Newman, P. (2015). Biophilic architecture: a review of the rationale and outcomes. *AIMS Environmental Science, 4*(6), 950-969. Biophilic architecture: a review of the rationale and outcomes

Kim, W. J., & Lee, T. K. (2022). Greenness index and preferences for interior landscapes in residential spaces. *Sustainability, 14*(3), 1456. Greenness Index and Preferences for Interior Landscapes in Residential Spaces | MDPI

Tekin, B. H., Tunahan, G. I., Disci, Z. N., & Ozer, H. S. (2025). Biophilic design in the built environment: Trends, gaps and future directions. *Buildings, 15*(14), 2516. Biophilic Design in the Built Environment: Trends, Gaps and Future Directions | MDPI

Elshaer, I. A., Azazz, A. M. S., Zayed, M. A., Ameen, F. A., Fayyad, S., Fouad, A. M., & Fathy, E. A. (2025). Environmental design innovation in hospitality: A sustainable framework for evaluating biophilic interiors in rooftop restaurants. *Buildings, 15*(19), 3474. Environmental design innovation in hospitality: A... - Академия Google

Beatley, T. (2011). *Biophilic cities: Integrating nature into urban design and planning*. Island Press. Biophilic Cities: Integrating Nature into Urban Design and Planning | Springer Nature Link