

Bringing Nature Indoors: Exploring the Impact of Biophilic Interior Design in Restaurants

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Abstract

Biophilic design is being incorporated all over the world in various spaces to invoke a connection with nature. It helps enhance ambience, mood and productivity. Natural materials, light, ventilation, indoor plants, sustainable materials are used to integrate a biophilic theme. Restaurants use this design concept by providing huge windows to allow natural light to enter; incorporate indoor plants to improve air quality, provide water features for a sense of calmness and use natural materials like wood and bamboo in furniture to promote sustainability. Integration of these elements not only enhances the dining experience for the customers but also promotes the well-being of the staff working in the restaurant. It encourages the customers to stay longer in the restaurant and visit frequently. This research paper explores the impact and influence of biophilic interior design in restaurants with the intent to enhance customer experience and well-being. Biophilic design principles incorporate natural elements into interior spaces, developing a connection with nature to improve human health, productivity and well-being. Impact of biophilic design on user psychologically and visually. The paper also explores the future implications of biophilic design for the restaurant industry, emphasizing the need for implementation of biophilic principles to create sustainable and engaging dining environments. By integrating existing literature, this research provides valuable insights for designers, restaurateurs, and researchers seeking to optimize the dining experience through biophilic interior design strategies. Key findings show that biophilic design elements like natural materials, greenery, and daylighting, contribute to creating a welcoming and harmonious dining atmosphere. Studies have demonstrated a positive connection between biophilic features and visitor duration in cafes, indicating that immersive natural environments encourage longer stays and increased engagement.

Keywords: Biophilic design, human nature connection, sustainable interiors, well being and design, indoor plants, natural light integration, indoor environmental quality

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INTRODUCTION

In today's rapidly evolving hospitality industry, the concept of biophilic interior design has become popular to enhance the dining experience for customers in restaurants and enhance the well-being of the employees as well. Biophilic design incorporates natural elements indoors to improve health, well-being, and productivity of people.

Biophilic design has the potential to blur the boundaries between indoor and outdoor spaces, creating environments that evoke feelings of tranquility, vitality, and connection with the natural world. Biophilic interiors provide sensory experiences within the restaurant by using plants,

water features, natural light and ventilation and organic materials [1].

The importance of biophilic interior design in restaurants goes beyond aesthetics, it's a comprehensive approach to design that puts the health and welfare of both employees and customers first. Research has demonstrated that exposure to natural surroundings and elements can have significant psychological benefits on people, including stress reduction, improved cognitive function, and the development of emotional well-being.

The goal of this research paper is to investigate the various effects of biophilic interior design on the dining experience, customer behaviour & perception, and sustainability results in restaurants. By synthesising literature reviews, case studies, and surveys, the paper aims to clarify the advantages of application of biophilic design principles in restaurant environments.

PRINCIPLES AND THEORIES OF BIOPHILIC DESIGN

1. *Environmental Features*: Incorporating natural elements like plants, water, and natural light into the built and constructed spaces.
2. *Natural Shapes and Forms*: Imitating organic shapes and forms found in nature, creating a visually pleasant and harmonious environment.
3. *Restorative Patterns and Processes*: Introducing patterns and processes observed in the natural world, encouraging a sense of restoration and well-being.
4. *Light and Space*: Focusing on natural light and creating open, well - ventilated spaces to enhance the experience of occupants.
5. *Place-Based Relationships*: Considering the specific context and characteristics of a location, inculcating elements that matches the locality.
6. *Evolved Human-Nature Relationship*: Recognizing and including elements that represents the connection between humans and nature over time.
7. *Biophilic Model*: This model focuses on human adaptations to the natural world, emphasizing how exposure to nature can advance health, fitness, and well-being over time.
8. *Biophilic Design*: Biophilic design celebrates the combination of urbanism, evolution, technology, and the natural environment, allowing individuals to experience the urban areas in a more holistic way [2].

Figure 1 shows the various principles of biophilic design.

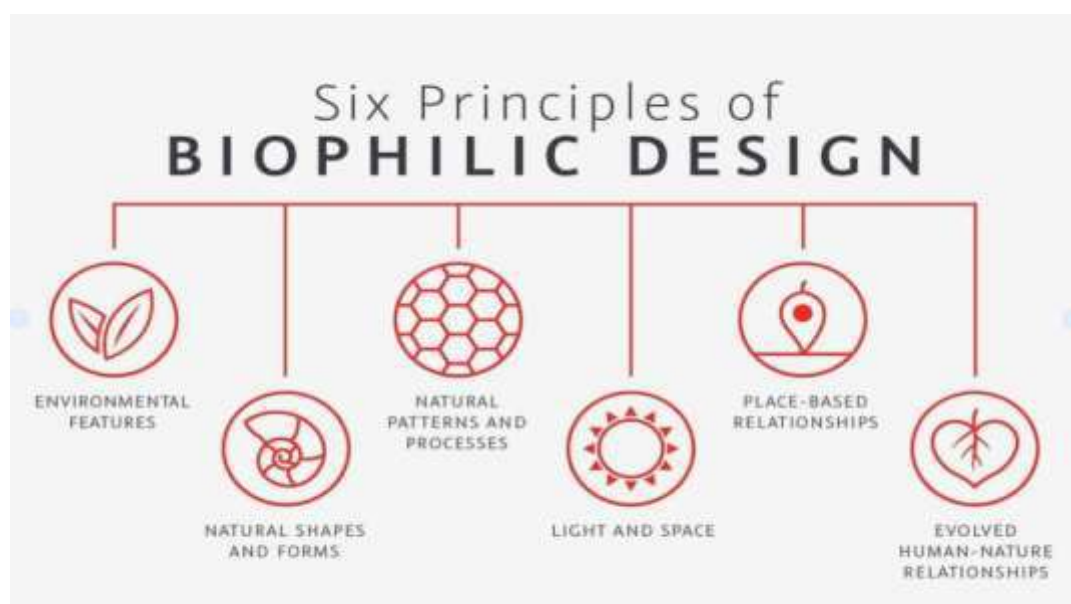


Figure 1. Principles of Biophilic Design.

RELEVANCE OF BIOPHILIC DESIGN IN INTERIOR SPACES

Biophilic design is extremely relevant in interior spaces because of its crucial impact on human well-being and quality of life. This design approach has several effects:

1. *Enhanced Well-being*: It helps improve mental health and well-being by creating environments emulating nature which has been linked to reduced stress, increase productivity, and enhance mood.
2. *Multi-Sensory Experience*: Inculcating natural patterns and indoor plants in interior spaces creates a multi-sensory experience. This sensory connection enhances the customer satisfaction.
3. *Visual Connection with Nature*: Biophilic design connects spaces to nature visually, using elements like organic shapes and water. It creates a calm and aesthetic environment.
4. *Increased Creativity*: The application of biophilic design principles, such as order, safety, complexity, and curiosity, creates a positive effect on creativity in interior spaces.
5. *Fulfilling Inherent Affinities*: The biophilic approach satisfies humans' inherent affinities towards nature, creating environments with a connection to the natural world.

In summary, biophilic design is relevant in interior spaces as it not only enhances the aesthetic appeal but also positively influences occupants' physical and mental well-being, contributing to a more holistic and sustainable approach to design [3].

APPLICATION OF BIOPHILIC DESIGN IN VARIOUS SETTINGS

1. *Urban Spaces and Architecture*: Biophilic design is applied to city environment by incorporating green spaces, natural materials, and sustainable architecture, promoting well-being.
2. *Workplaces*: In office settings, biophilic design enhances productivity and employee well-being using elements like indoor plants, natural light, and materials inspired by nature. This enables a positive work environment and reduces stress among employees.

Figure 2 and Figure 3 show the application of biophilic design in urban spaces and workplace.



Figure 2. Urban Spaces.



Figure 3. Workplace.

3. *Virtual Environments*: The concept of biophilic design is applied in virtual settings, creating immersive experiences that simulate nature through visual and sensory stimuli.
4. *Educational Spaces*: Biophilic design is fostered in schools and educational institutions to create an atmosphere which supports learning.
5. *Healthcare Facilities*: These elements help patients heal by reducing stress. Provision of nature views, natural light, and healing gardens are common features in healthcare settings to enhance the well-being of patients.

Figure 4 and Figure 5 show the application of biophilic design in educational spaces and healthcare facilities.



Figure 4. Educational Spaces.



Figure 5. Healthcare Facilities.

6. *Residential Spaces*: Biophilic design principles are applied in homes through the use of natural materials, indoor plants, and designs inspired by nature which creates an atmosphere full of harmony and peace.
7. *Public Spaces*: Parks, recreational areas, and public spaces include biophilic elements for increased relaxation, recreation, and a connection to nature [4].

Figure 6 and Figure 7 show the application of biophilic design in residential and public spaces.

8. *Retail Environments*: Stores and commercial spaces use biophilic design to improve the shopping experience of customers & consumers. A warm and welcoming atmosphere is created using water features and greenery.

9. *Restaurants & Hospitality*: Biophilic design is used in restaurants to create welcoming and relaxing atmospheres making the dining experience immersive and positive.

Figure 8 and Figure 9 show the application of biophilic design in retail spaces and restaurants.



Figure 6. Residential Spaces.



Figure 7. Public Spaces.



Figure 8. Retail Spaces.



Figure 9. Restaurant & Hospitality.

HOW BIOPHILIC DESIGN INFLUENCES CUSTOMER PERCEPTION AND BEHAVIOUR IN RESTAURANT SPACES

1. *Enhanced Well-being:* The use of natural elements, such as plants and greenery, fosters a sense of connection to nature, contributing to improved mood and reduced stress levels. Customers perceive the restaurant environment as more welcoming and pleasant.
2. *Positive Emotional Responses:* Natural elements evoke feelings of comfort and relaxation, leading to a more enjoyable dining experience. Positive emotional responses can contribute to customer satisfaction and loyalty [5].
3. *Extended Duration of Stay:* Biophilic design applications, such as incorporating greenery and natural materials, can influence customers to spend more time in a restaurant.
4. *Increased Satisfaction and Relaxation:* Biophilic elements contribute to increased customer satisfaction by creating a visually appealing and harmonious atmosphere. The incorporation of natural light, patterns, and materials enhances the overall dining experience, making customers feel more relaxed and content.

PSYCHOLOGICAL THEORIES ON THE CONNECTION BETWEEN NATURE AND WELL-BEING

1. *Self-Determination Theory (SDT):* SDT suggests that exposure to nature satisfies basic psychological needs, including autonomy, competence, and relatedness, leading to enhanced psychological well-being.
2. *Biophilia Hypothesis:* Humans have a connection and need for nature. Interacting with nature is believed to contribute positively to mental health and well-being.
3. *Attention Restoration Theory (ART):* ART, developed by Rachel and Stephen Kaplan, suggests that exposure to nature allows the brain to recover from cognitive fatigue caused by directed attention, leading to improved focus, mood, and well-being.
4. *Psych evolutionary Theory:* This theory proposes that humans have evolved in natural environments, and the preference for nature is deeply rooted in our evolutionary history. Spending time in nature is thought to align with our evolutionary adaptations, positively impacting well-being.
5. *Stress Reduction Theory:* Developed by Roger Ulrich, this theory suggests that nature has stress-reducing effects. Mental health is improved in such an environment.
6. *Positive Psychology:* Positive psychology emphasizes factors that contribute to a fulfilling life, and nature is recognized as a key element. Engagement with nature is associated with positive emotions, life satisfaction, and overall well-being. Figure 10 shows the connection between humans and nature.

RESEARCH APPROACH AND DATA COLLECTION METHODS

My research approach adopts a mixed methods methodology which aims to gather comprehensive insights into the integration of biophilic elements in restaurant interiors.

1. *Quantitative Methods:* In this method, patterns and trends are identified through numerical data.

In my research, quantitative data will be collected through surveys distributed to restaurant patrons and owners. These surveys will assess factors such as customer satisfaction, perceived ambience, and willingness to revisit based on the presence of biophilic design elements.

2. *Qualitative Methods:* Qualitative methods focus on understanding the experiences, perceptions, and motivations of individuals through in-depth interviews and observations. Qualitative data in my study will be gathered through semi-structured interviews with restaurant designers, managers, and customers. These interviews will explore subjective experiences, emotional responses, and preferences regarding biophilic design features [6].
3. *Mixed Methods Approach:* The mixed methods approach allows for a comprehensive exploration of the research topic by integrating both quantitative and qualitative data. By combining survey data with interview transcripts and observational insights, my research aims to provide a nuanced understanding of how biophilic interior design influences the restaurant environment and customer experience.

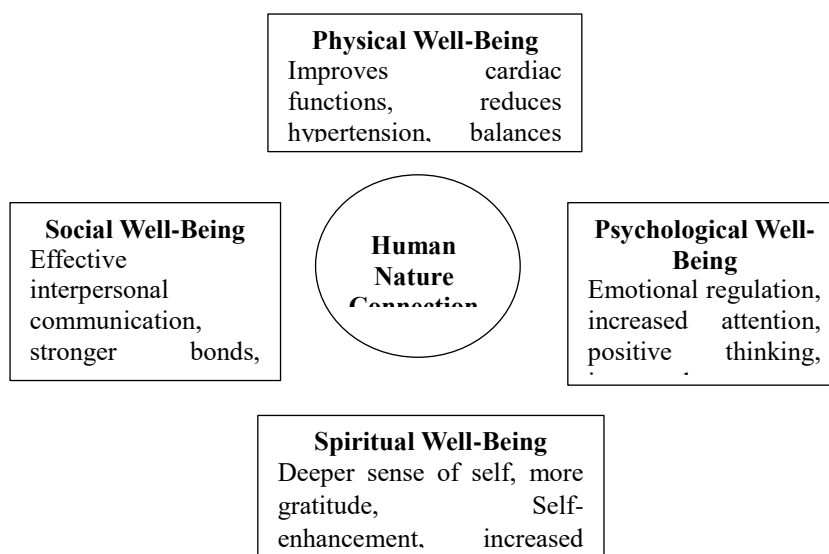


Figure 10. Human Nature Connection.

BIOPHILIC ELEMENTS IN RESTAURANTS

1. *Use of Natural Materials:* Utilizing materials like wood, stone, and clay provides a tactile and visual connection to the nature, fostering a sense of warmth in the restaurant's design.
2. *Incorporating Greenery and Plants:* Use of indoor plants, vertical gardens, or potted plants within the restaurant space provides a refreshing ambience. Greenery enables improved air quality and a sense of vitality.
3. *Emphasizing on Natural Light:* Huge windows and skylights help connect indoor to nature by allowing natural light to pass through. It creates an inviting atmosphere and also reduces the dependency of artificial lighting.
4. *Integrating Water Features:* Incorporating elements like water fountains or indoor water features introduces the calming effect of water, creating a soothing and peaceful atmosphere for diners.
5. *Exploring Natural Colours and Textures:* Choosing a colour palette inspired by nature, such as earthy tones and greens, along with textures of natural materials, fosters a harmonious and calming design scheme.
6. *Installing Biophilic Art and Murals:* Incorporating nature-inspired artwork, murals, or graphics on walls connects the restaurant to nature visually.
7. *Providing Outdoor Seating and Views:* Providing outdoor seating areas or spaces with scenic views allows diners to enjoy the benefits of outdoor settings and creates a relaxed environment.
8. *Incorporating Local Identity Elements:* Including design elements inspired by the local environment, culture, or region establishes a stronger connection with the surroundings, creating a unique and authentic dining experience [7]. Figure 11 shows the elements of biophilic design.



Figure 11. Biophilic Design Elements.

USE OF INDOOR PLANTS AND GREENERY IN RESTAURANT INTERIORS

1. *Enhancing Ambience:* Indoor plants connect indoors with nature and create a positive and welcoming environment. The presence of greenery contributes to a calming effect, making customers feel more relaxed during their dining experience.
2. *Positive Impact on Customer Decisions:* Studies indicate that restaurants designed with indoor plants have a positive effect on customers' decisions, influencing their choices and potentially increasing overall satisfaction.
3. *Mood Enhancement:* Greenery helps improve mood, increase productivity, and promote creativity. It creates an environment that is refreshing and aesthetic and enhances the dining experience.
4. *Healthy Climate:* Indoor plants play a role in creating a healthy climate within closed restaurant spaces. They improve the air quality to a great extent and improve the health of staff as well as customers.
5. *Transforming Ambiance:* Thoughtful use of plants and greenery can transform a restaurant's ambiance, bringing the outdoors indoors.
6. *Contemporary Design Elements:* Indoor plants provide a natural, simple, and contemporary design element for bars, clubs, and restaurants. They contribute to a modern aesthetic, aligning with current design trends [8].

Figure 12 shows the benefits of indoor plants.



Figure 12. Benefits of Indoor Plants.

PSYCHOLOGICAL AND AESTHETIC IMPACT OF PLANTS ON CUSTOMERS

Psychological Impact

- *Emotional Response*: Research suggests that the appearance, shape, and colour of indoor plants significantly affect people's emotional and physiological responses. Plants evoke positive emotions, reduce stress levels, and enhance mood.
- *Stress Reduction*: It contributes to a calming effect, promoting relaxation and well-being among customers.
- *Mental Fatigue*: Ornamental plants help in recovery from mental fatigue, enhance creativity, and favourably impact individuals' moods, fostering a positive atmosphere in restaurant environments.

Aesthetic Impact

- *Enhanced Ambiance*: Plants add a natural touch and enhance the ambiance of restaurant interiors. They create a refreshing atmosphere.
- *Visual Appeal*: Well-maintained indoor plants contribute to the visual appeal of restaurant spaces. They add texture, colour, and depth to the environment, making it more visually interesting and appealing to patrons.
- *Aesthetic Harmony*: Properly placed plants create a sense of harmony and balance in restaurant interiors. They complement the décor, furnishings, and overall design theme, elevating the aesthetic quality of the space [9].

Figure 13 shows the customer perception and behaviour in restaurant.

ANALYZING THE BENEFITS OF INCORPORATING NATURAL LIGHT AND VENTILATION

1. *Enhanced Well-being*: Natural light exposure has been linked to improved mood, increased productivity, and better mental health. Adequate ventilation ensures fresh air circulation, reducing the risk of indoor air pollutants and promoting respiratory health.
2. *Energy Efficiency*: By letting in more natural light, less artificial lighting is used during the day, which saves energy and lowers utility bills. Energy can be saved by using effective ventilation techniques to control interior temperature and lessen the need for heating and cooling systems.
3. *Visual Comfort*: Natural light creates a more comfortable and visually pleasing environment compared to artificial lighting. It makes the space more inviting.
4. *Health Benefits*: Exposure to natural light stimulates the body's production of vitamin D, which is essential for bone health and immune function. Ensuring adequate ventilation promotes a healthier indoor environment by mitigating the growth of mould and moisture.
5. *Improved Productivity*: It has been demonstrated that exposure to natural light improves cognitive function and concentration, which boosts output and improves performance in work and study settings.

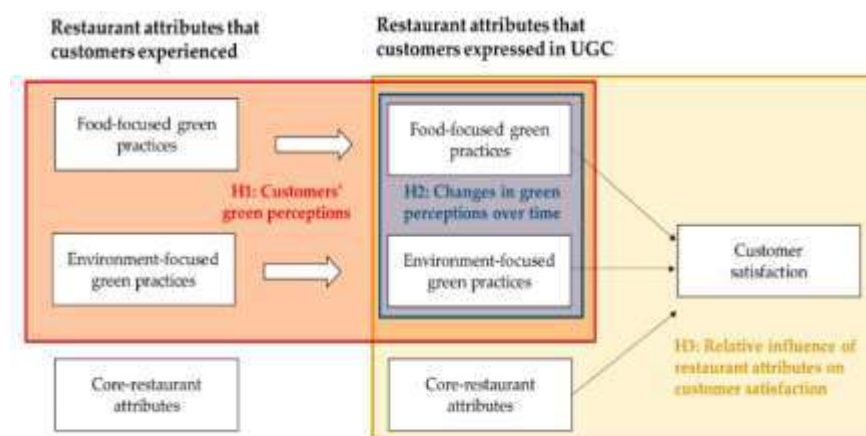


Figure 13. Customer Behaviour.

TACTILE AND VISUAL ASPECTS OF MATERIALS IN RESTAURANT DESIGN

Wood

Incorporation of wood in furniture, flooring, and decor elements brings warmth, makes customer feel relaxed and adds natural texture to the restaurant space.

- *Tactile Aspect:* Wood offers a variety of tactile experiences, from the smoothness of polished surfaces to the rough texture of distressed or reclaimed wood.
- *Visual Aspect:* Wood brings warmth and natural beauty to restaurant interiors, with its grain patterns, knots, and natural hues creating visual interest and a sense of coziness.

Figure 14 shows the use of wood in furniture and interiors of a restaurant.

Stone

Stone accents in walls, countertops, and decorative features add earthy tones and rugged textures.

- *Tactile Aspect:* Stone surfaces can vary in texture, from smooth to rough, providing tactile stimulation and a sense of solidity.
- *Visual Aspect:* Stone elements add a rugged and earthy aesthetic to restaurant interiors, with their natural patterns and colours creating visual depth and richness.

Clay

- *Tactile Aspect:* Clay surfaces can vary from smooth to textured, providing tactile diversity and a sense of craftsmanship.
- *Visual Aspect:* Clay elements introduce rustic charm and organic textures to restaurant interiors, with their earthy tones and handcrafted feel adding character and authenticity.



Figure 14. Use of Wood in Interiors.

Natural Fabrics

- *Tactile Aspect:* Natural fabrics offer various tactile sensations, from the softness of cotton to the texture of woven fibres, enhancing comfort and inviting touch.
- *Visual Aspect:* Natural fabrics contribute to a cozy and inviting atmosphere, with their subtle textures and organic patterns complementing the overall design scheme.

Concrete

Concrete elements in flooring or structural elements create a modern yet natural look.

- *Tactile:* Concrete offers a cool, smooth texture that can vary based on its finish, such as polished, brushed, or textured.

- *Visual:* Its raw, industrial appearance adds a modern and minimalist aesthetic to spaces, with its subtle variations in colour and texture adding visual interest.

Figure 15 shows the use of concrete in interiors of a restaurant.



Figure 15. Use of Concrete in Interiors.

Porcelain Tiles

Porcelain tiles in various patterns and designs mimic natural textures like wood or stone while offering durability and easy maintenance.

- *Tactile:* Porcelain tiles can have a smooth surface that feels cool to the touch, they offer versatility in tactile experience.
- *Visual:* They come in a wide range of colours, patterns, and finishes, allowing for diverse design possibilities. A polished look is created by reflection of light on glossy surface whereas matte surfaces make the appearance softer.

Figure 16 shows the use of porcelain tiles in interiors of a restaurant.

Brass

Brass or bronze accents in fixtures, lighting, and decorative elements to add warmth and visual interest.

- *Tactile:* Brass has a smooth and lustrous texture, offering a luxurious feel when touched. Bronze is denser and heavier, providing a substantial feel when handled.
- *Visual:* Its warm golden hue adds elegance and sophistication to interiors, adding character and depth. It has a great use in decoration because of its rich brown colour.

Walnut Wood

Traditional walnut wood for furniture pieces or decorative elements creates a cozy and inviting atmosphere.

- *Tactile:* Walnut wood has a smooth surface with pronounced grain patterns, offering a tactile experience that combines warmth and elegance.
- *Visual:* Its colour varies from brown to purplish black, giving it a luxurious appearance.

Figure 17 shows the use of wood in interiors of a restaurant.

Retrofitted Interiors

- The plan was to make the most of the open space so that it could be used in any season because Pune has excellent weather. It has an ambience with zen like tranquillity.

- The restaurant is powered by solar energy and features high ceilings, furniture made from reclaimed teak and sheesham wood, a bar, large and small plants and macramé chandeliers. A skylight illuminates the restaurant. Figure 19 shows the retrofitted interiors of Tsuki restaurant.



Figure 16. Use of Porcelain in Interiors.



Figure 17. Use of Wood in Interiors.

CASE STUDY

Tsuki Restaurant, Pune, India

- It is located in Pune, Maharashtra. It has a seating space for 60 with a bar and live kitchen.

Project information
Name of Project: Tsuki
Project Type: Hospitality
Location: Pune
Site Area: 2500 sqft.
Year: 2022
Design Firm: Spiro Spero
Principal Designer: Keith Menon
Design Team: Mehzabin Khakhariawala, Abdeali Jamali, Sagar Pawar, Deepika Malik, Karan Unadkat
Photographer: Ritesh Ramaiah

Figure 18 show the biophilic interiors of Tsuki restaurant in Pune.



Figure 18. Tsuki Restaurant.

Muted Tones

- The muted and minimal tones of the restaurant elevate the foliage and highlight the greenery & other design elements.
- In keeping with the natural pale look of the space, the designer has tried to ensure that all base colours of fabrics were neutral. Screen printed fabrics in two tones with floral and leaf patterns.
- The furniture and fabrics are arranged in a way that they blend with the foliage.

Figure 20 shows the muted tones in interiors of Tsuki restaurant.



Figure 19. Retrofitted Interiors in Tsuki Restaurant.



Figure 20. Muted Tones in Tsuki Restaurant.

Sustainability

- It is a highly sustainable place as it is solar powered and the furniture is made of teak and sheesham wood.
- Water hyacinth reed lamps blend with the natural ambience. They have used a lot of macramé to make the two chandeliers over the private dining area. Fabric is used in the ceiling which creates a soft and warm environment.

Figure 21 shows the sustainable interiors of Tsuki restaurant.

The Japanese Charm

- *Tsuki*: means the moon in Japanese. As a result, the diner is exposed to the sky so that, when necessary, it can enjoy the moonlight or sunshine. An area is made ventilated by the skylight.
- Being able to see the sky, the light pouring in and moving at different angles as the sun rises and sets or even a glimpse of the moon – all of that adds to the charm of the space.

Figure 22 and 23 show the Japanese charm of Tsuki restaurant.

PATTERNS AND TRENDS EMERGING BASED ON EXISTING LITERATURE

1. *Rising Interest and Research Focus*: There is a noticeable increase in interest and research focus on biophilic design's impact on the hospitality industry. Researchers and practitioners alike recognize the potential of biophilic elements to enhance the overall dining experience in restaurants.
2. *Impact on Customer Experience*: Studies emphasize the significant influence of biophilic design on customer experience and satisfaction in restaurants.
3. *Duration of Stay*: Research suggests that biophilic design applications influence the duration of stay in cafes and restaurants. By creating environments that mimic natural settings, patrons are inclined to linger longer, contributing to increased revenue opportunities for businesses.
4. *Restorative Effects*: There is growing evidence indicating the restorative benefits of biophilic design, particularly in workplace environments. These findings underscore the potential of biophilic elements to mitigate stress, improve well-being, and boost productivity among employees [10].
5. *Design Patterns and Applications*: The concept of biophilic design is articulated through various patterns and applications, both for interior and exterior environments. These patterns provide a framework for designers and architects to create spaces that foster a deeper connection with nature, catering to the innate human desire for biophilic experiences.



Figure 21. Sustainability.



Figure 22. Japanese Charm.



Figure 22. Japanese Charm.

PRACTICAL IMPLICATIONS FOR RESTAURANT OWNERS AND DESIGNERS

1. *Increased Sales Potential:* Incorporating biophilic interior design elements can lead to a significant impact on sales in restaurants and cafes. Restaurant owners should consider integrating natural materials, plants, and ample daylight to create inviting spaces that attract customers and encourage longer stays.
2. *Enhanced Customer Experience:* Biophilic design aims to make people feel comfortable and at ease in interiors, contributing to an improved customer experience. By creating environments that evoke a connection with nature, restaurant owners can enhance guest satisfaction and loyalty.
3. *Stress Reduction and Well-being:* Reduces stress and takes care of the emotional well-being. Designers should focus on incorporating natural elements such as greenery, natural light, and views of nature to create calming and restorative environments for diners.
4. *Positive Health Impacts:* Restaurant owners and designers should leverage this knowledge to prioritize biophilic elements in their establishments to promote overall well-being among patrons.
5. *Strategic Design Choices:* Indoor plants, natural light and natural views improve dining experience. Designers should strategically integrate biophilic design principles into the layout and ambiance of restaurants to create inviting and memorable spaces.

SUMMARY OF EXISTING RESEARCH ON APPLICATION OF BIOPHILIC DESIGN IN RESTAURANTS

1. *Sense of Place:* Integrating biophilic elements like plants and natural materials creates a sense of place, making customers feel more connected to the environment.
2. *Organic Design Examples:* There are numerous examples of successful biophilic design in restaurants and cafes worldwide, showcasing organic elements and zero waste concepts.
3. *Benefits:* Biophilic interiors offer benefits such as improved short-term memory and self-reported well-being, as evidenced by studies cited in Cognition Today.
4. *Design Frameworks:* Researchers propose biophilic design frameworks, detailing strategies and advantages for incorporating natural elements into restaurant architecture and interiors.

5. *Case Studies*: Numerous case studies showcase successful integration of biophilic elements in restaurant interiors, aligning built environments with human innate desires and enhancing overall experience.
6. *Architectural Integration*: Architects often use greenery, water features, and natural materials to seamlessly integrate biophilic elements into restaurant interiors, creating harmonious spaces.

GAPS IN BIOPHILIC INTERIOR DESIGN LITERATURE

1. *Limited Focus on Psychological Impact*: While some studies explore the impact of biophilic elements like natural plants on psychological comfort, there is a scarcity of comprehensive research on how various biophilic design elements affect emotional well-being and cognitive function.
2. *Application in Diverse Settings*: Existing literature often focuses on specific environments such as restaurants, hotels, or retail stores, leaving a gap in understanding the applicability and effectiveness of biophilic design principles across diverse interior spaces like healthcare facilities, educational institutions, and offices.
3. *Quantitative Measurement Tools*: Although there is acknowledgment of the benefits of biophilic design, there is a lack of standardized assessment tools to quantitatively measure its effectiveness. Developing such tools can facilitate objective evaluations and comparisons of different biophilic design implementations.
4. *Consumer Perception Studies*: While studies explore consumer responses to biophilic design in various settings, there's a gap in understanding how these perceptions influence behaviour, purchase decisions, and brand loyalty.
5. *Integration with Sustainable Design*: The intersection of biophilic design with sustainable practices warrants further exploration. Understanding how biophilic design can contribute to energy efficiency, resource conservation, and overall sustainability goals in interior design remains underexplored.

RECOMMENDATIONS FOR OPTIMIZING BIOPHILIC DESIGN IN RESTAURANT SPACES

1. *Abundant Use of Natural Materials*: Incorporate natural materials such as wood, stone, and bamboo in restaurant interiors to establish a strong connection to nature.
2. *Create Biophilic Focal Points*: Introduce biophilic focal points like indoor gardens, living walls, or water features to serve as centrepieces that enhance the ambiance and natural appeal of the space.
3. *Hanging Plants for Vertical Greenery*: Utilize hanging plants to introduce vertical greenery, adding visual interest and a touch of nature to the restaurant environment.
4. *Integrate Live Edge Furniture*: Incorporate live edge furniture, which features natural, raw edges, to bring a rustic and organic feel to the restaurant setting.
5. *Embrace Outdoor Elements Indoors*: Bring elements from the outdoors inside by incorporating features like large windows, skylights, or open-air seating areas to allow natural light and views of nature.
6. *Consider 14 Patterns of Biophilic Design*: Explore the 14 patterns of biophilic design, such as visual connection with nature, non-rhythmic sensory stimuli, and presence of water, to inform design choices and create holistic biophilic environments.

LIMITATIONS AND AREAS FOR FUTURE RESEARCH

1. *Limited Scope*: The study primarily focuses on the theoretical aspects of biophilic design in restaurants. Future research could involve more extensive field studies and case analyses to provide empirical evidence of the design's effectiveness.
2. *Context-Specific Challenges*: Biophilic design implementation may vary based on geographical, cultural, and economic factors. Future research should delve deeper into how these variables influence design choices and outcomes in different restaurant settings.

3. *Measurement and Evaluation*: The lack of standardized metrics for assessing the impact of biophilic design on restaurant experiences poses a challenge. Future studies could develop robust evaluation frameworks to measure the psychological, emotional, and behavioural responses of patrons to biophilic interventions.
4. *Long-Term Effects*: there is limited research on its effects in long term. Future longitudinal studies could investigate how biophilic elements contribute to sustained customer satisfaction, loyalty, and financial performance over time.
5. *Cost and Feasibility*: Incorporating biophilic elements into restaurant design may be cost-prohibitive for some establishments. Future research should explore cost-effective strategies and scalable solutions to make biophilic design more accessible to a wider range of restaurants.

CONCLUSION

Research indicates that implementing biophilic elements enhances the dining experience, increases visitor satisfaction, and potentially influences the duration of stay. It contributes to a more inviting and relaxing ambiance, which can positively impact customer perceptions and behaviour. Economic benefits also exist, as it has been linked to increased revenue and customer spending.

It discusses the elements of biophilic design, such as natural materials, greenery, and natural light, which create a harmonious and inviting ambiance for diners. It also investigates the psychological and emotional effects of biophilic design on restaurant staff and customers, highlighting its potential to improve mood, reduce stress, and increase satisfaction.

Biophilic design not only makes the space aesthetic but also promotes sustainability through ecofriendly practices. Moreover, the research highlights the potential of biophilic design to positively impact different facets of human experience, ranging from health and education to work and leisure.

Incorporating biophilic principles into design practices can lead to innovative solutions that prioritize user comfort, creativity, and resilience in the face of environmental challenges. As such, the broader implications of this research extend beyond individual projects to shape the future of architecture and design, emphasizing the importance of harmonizing human habitats with the natural world.

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