

# IMPLEMENTATION OF BIOPHILIC DESIGN CONCEPT IN LEISURE INDUSTRY: BENEFITS AND CHALLENGES

W.D.R.P. Wickrama<sup>1</sup>, K.G.A.S. Waidyasekara<sup>2</sup>, and H.C. Victar<sup>3</sup>

## ABSTRACT

*This study investigates the incorporation of Biophilic Design (BD) into the Leisure Industry (LI), with a focus on its ability to improve human well-being and economic productivity. Biophilia, a fundamental human tendency to form a bond with the natural world, has significant ramifications for architecture and recreation, especially in improving physical, psychological, and cognitive well-being. The study centres on the implementation of BD in LI facilities and assesses its importance, benefits, and challenges. The data was collected through semi-structured interviews to offer an avenue to explore the comprehensive views of 15 BD experts on its implementation in LI through this study. The results indicate that although BD has had positive effects in promoting health and environmental sustainability, there are still obstacles to its widespread adoption due to differing client expectations and a lack of awareness. The study emphasises the importance of increased education and advocacy to successfully incorporate BD principles into the LI, in order to promote a sustainable and health-focused approach to building design and leisure activities.*

**Keywords:** Biophilia; Biophilic Design; Leisure Industry.

## 1. INTRODUCTION

The natural environment is a crucial aspect of human existence, influencing physical and mental well-being (Kellert & Calabrese, 2015). However, the connection to nature has weakened since the 1800s, leading to a decline in personal identity, purpose in life, and the inherent link between humans and the natural world (Softas-Nall & Woody, 2017). The modern indoor lifestyle, characterised by sedentary lifestyles and the internet, has led to an increase in anxiety and depression (Softas-Nall & Woody, 2017), highlighting the importance of a positive connection with nature (Qadir et al., 2023).

Kellert and Calabrese (2015) maintained that the concept of biophilia stems from a recognition of human evolution, wherein over 99% of species' history, the biological development was shaped by adaptive reactions to natural rather than artificial or human-made influences. Biophilia, the natural bond humans have with nature, is reflected in BD, which creates built environments that capture its essence (Browning et al., 2014).

---

<sup>1</sup> Undergraduate, Department of Building Economics, University of Moratuwa, Sri Lanka, [wickramawdrp.19@uom.lk](mailto:wickramawdrp.19@uom.lk)

<sup>2</sup> Senior Lecturer, Department of Building Economics, University of Moratuwa, Sri Lanka, [anuradha@uom.lk](mailto:anuradha@uom.lk)

<sup>3</sup> Lecturer, Department of Building Economics, University of Moratuwa, Sri Lanka, [hasithc@uom.lk](mailto:hasithc@uom.lk)

Biophilic architecture aims to strengthen connections between inhabitants and the natural world (Ariyawansa & Perera, 2022), enhancing indoor air quality and health benefits (Qadir et al., 2023). BD challenges current approaches by providing a fresh framework for incorporating nature more fully in constructed spaces (Browning et al., 2014; Kellert, 2005; Kellert et al., 2008). When considering LI, as Mikalauskas and Kaspariene (2016) highlighted, tourism encompassing heritage and visitor attractions is one of the primary constituents of the leisure sector. The World Travel and Tourism Council's 2022 Economic Impact Research shows that the travel and tourism sector has contributed 7.6% to global GDP, a 22% increase from 2021, highlighting the significant impact of LI growth on a country's economic development (World Travel and Tourism Council [WTTC], 2022). The leisure sector encompasses various fields such as sports, recreation, health, fitness, play supervision, outdoor activities, caravanning, and gaming (Mikalauskas & Kaspariene, 2016). The recreation sector is a significant contributor to human fitness and quality of life, as it involves contact with nature (Browning et al., 2014; Kellert, 2012). Leisure is used for relaxation and enjoyment, shaping human identity, growth, health, motivations, emotions, and behaviours (Watkins & Bond, 2007). The main focus of LI is to enhance guest experience and promote well-being (Mikalauskas & Kaspariene, 2016). The physical and mental health of individuals depend on interactions with the natural world, which is a vital requirement for achieving well-being and contentment (Searles, 1960). Natural resources including fields, woods, rivers, beaches, and sunshine are essential for leisure and fun (Torkildsen, 2005). Incorporating nature into the architecture of leisure establishments is crucial, as it contributes significantly to global economic development.

Research on integrating BD in buildings has been extensive, focusing on health and well-being. However, there is a lack of research on BD in LI and construction. The lack of empirical evidence in Sri Lanka highlights the need for a holistic approach to BD, aiming to create environments that resemble nature and foster a deeper connection with the natural world. This study aims to bridge the research and industry gaps in BD implementation by assessing its importance, benefits and challenges.

## **2. LITRATURE REVIEW**

### **2.1 BIOPHILIC DESIGN CONCEPT**

Biophilia is the natural and instinctive bond that humans have with the natural world (Browning et al., 2014). BD plays a major role in crafting constructed environments that embody the essence of nature (Radha, 2022).

The term biophilia originates from the Greek words, 'philia', which conveys a sense of 'love of', and 'bio', which signifies 'life' (Ariyawansa & Perera, 2022). Essentially, it represents a deep affection or love for life and living organisms. Furthermore, biophilia is not limited to a single characteristic but encompasses an individual's complete physical and emotional disposition, impacting their receptivity to what is most vital and innovative in others (Maccoby & Feldman, 1972). Furthermore, numerous authors have emphasised for a significant period that biophilia represents the intrinsic human tendency to connect with the natural world, which remains crucial for the physical and mental health and overall well-being of individuals, even in the contemporary era (Wilson, 1984; Kellert & Wilson, 1993; Kellert, 1986, 2012). Biophilia, an inherent human quality, is linked to psychological health and the connection humans share with the natural world (Chen et

al., 2013). It is an instinctive and inherent human quality, that promotes a natural inclination to engage with life and the environment (Browning et al., 2014). Integrating biophilia into design, it evolves into BD, an applied scientific approach that considers the connection between humans and nature to create environments that align with human inclinations towards biophilia (Bolten & Barbiero, 2020).

## **2.2 BIOPHILIC DESIGN CONCEPT IN THE LEISURE INDUSTRY**

The LI's attributes and potential outcomes from BD implementation make the BD concept a rational choice for LI facilities, yet their impact assessment is crucial for evaluating their contributions.

The leisure sector has emerged as a major global industry, consisting of various subdivisions operating within diverse business domains (Sevil et al., 2018). Tourism represents a highly valued form of leisure, offering similar advantages such as relaxation, and both tourist and leisure experiences share comparable benefits (Lubowiecki-Vikuk et al., 2021). On the other hand, in the modern world, leisure is increasingly recognised as an integral aspect of life (Mikalauskas & Kaspariene, 2016). Furthermore, these authors stressed that leisure plays a role in shaping individuals' identities as human beings, manifesting themselves across their lifespans and becoming evident in their development, health, motivations, emotions, and behaviours (Mikalauskas & Kaspariene, 2016). Researchers are keenly interested in the types and variety of leisure activities individuals participate in while on vacation (Singharat et al., 2023). According to Mikalauskas and Kasparienė (2016), LI encompasses diverse sectors, offering employment opportunities in fields such as sports, fitness, recreation, outdoor activities, play, camping, and gaming. It is essential to consider not only people's health but their engagement, fulfilment, and utilisation of nature for meaningful leisure activities (Lubowiecki-Vikuk et al., 2021). Hence outlining prominent trends in the leisure sector, and highlighting the integration of sustainable development principles is significant and one method involves incorporating biophilia in LI.

The Biophilia hypothesis suggests that humans have a natural desire for interactions with nature, encompassing aesthetic, intellectual, cognitive, and spiritual connections (Ariyawansa & Perera, 2022). This desire can lead to benefits for human well-being and environmental conservation (Simaika & Samways, 2010). Wilson (1984) explains that this inclination is expressed in admiration for living entities, which is reflected in the positive feelings towards certain habitats, activities, and objects. Biophilic design aims to create good habitats for individuals, promoting their physical well-being, health, and overall quality of life (Kellert & Calabrese, 2015).

Contemporary living, including urban expansion, work commutes, traffic congestion, media, and the internet, has led to a disconnection from nature, negatively impacting human well-being and the ecological environment (Chen et al., 2013). This disconnect not only threatens human health and quality of life but threatens the ecological balance (Simaika & Samways, 2010). It is crucial for individuals to allocate time and resources to reconnect with nature and living organisms (Ulrich et al., 1991). Leisure activities, which involve exposure to natural elements, have a positive impact on health and well-being, yet they must also be sustainable (Chen et al., 2013). Some scholars argue that leisure contributes to both human and natural well-being, a manifestation of biophilia (Rolston III & Coufal, 1991). However, there is limited evidence on whether individuals perceive the environmental benefits of their leisure activities (Chen et al., 2013).

## 2.3 BENEFITS OF IMPLEMENTING BIOPHILIC DESIGN IN THE LEISURE INDUSTRY

Modern environmental researchers and psychologists have highlighted the advantages of incorporating nature into constructed environments (Newman et al., 2012). Meanwhile, sustaining good health relies on maintaining a balanced ecological relationship consistently (Dustin et al., 2018). Hence, the connection between humans and greenery within urban settings, known as BD, is associated with refreshing human well-being across psychology, physiology, and cognition (Kellert et al., 2008).

### 2.3.1 Health Benefits for Building Occupants

BD applications are known for reducing stress, enhancing creativity, and boosting physical and psychological health (Bolten & Barbiero, 2020). BD applications promote positive mood, relaxation, and enjoyment (Chen et al., 2013). As global urbanisation continues, these benefits will be increasingly important in shaping urban spaces, architectural designs, and interiors (Bolten & Barbiero, 2020). Designers aim to create stress-free environments by incorporating natural elements, promoting healthier lives (Kua, 2022). Studies show a strong correlation between human interaction with nature and enhanced well-being. Leisure activities also positively impact psychological, physical, and social welfare. Implementing biophilic principles has therapeutic effects, particularly in reducing stress levels among individuals (Mikalauskas & Kaspariene, 2016). In addition, according to Browning et al. (2014), BD implementation offers significant benefits in reducing stress, enhancing cognitive performance, and improving emotional well-being.

### 2.3.2 Economic Benefits

Incorporating BD aspects into built environments can have economic benefits in addition to the health benefits as summarised in Table 1 (Browning et al., 2014).

Table 1: Economic benefits of BD

Benefit	Description	Source
Increase Productivity	Spaces designed with biophilic principles enhance productivity, contentment, and relaxation. Exposure to nature boosts workplace performance, efficiency, and profitability.	Kua, 2022; Barbiero & Berto, 2021
Improve Property Values	Biophilic design elements increase appeal to buyers and tenants, potentially raising property values and rental rates, especially in leisure facilities.	Barbiero & Berto, 2021
Reduce Energy Costs	Integration of biophilic design reduces energy costs through natural ventilation, lighting, and energy-efficient materials.	Barbiero & Berto, 2021
Increase Customer Satisfaction	Biophilic elements create inviting and comfortable spaces, enhancing customer satisfaction in businesses.	Barbiero & Berto, 2021
Improve Employee Retention	Making workplaces more appealing helps retain employees, reducing costs associated with turnover and training.	Barbiero & Berto, 2021

## 2.4 CHALLENGES IN INTERVENING BIOPHILIC DESIGN CONCEPT

Even though there are many advantages to implementing the BD concept, there are several challenges that can restrict its widespread implementation such as financial restrictions, psychological barriers, durability concerns, design restrictions and functional difficulties. The project cost can increase due to BD applications, as the expenses for environmentally sustainable designs are higher compared to conventional design approaches (Xue et al., 2019). Further, with the rigorous maintenance requirements, operational cost increases due to maintenance costs (Riley et al., 2019). In addition, persistent psychological conditions such as biophobia can threaten the long-term utilisation of a building (Estok, 2017). Cultural perceptions regarding human-nature connectedness impact the implementation of this concept in different types of buildings. Moreover, lack of evaluation tools and guidance, lack of agreed methods and lack of knowledge are the main challenges that affect the design restrictions for implementing the BD concept (Parsaee et al., 2019). Considering the durability of a building, it was mentioned that incorporating natural elements into building designs results in a reduced lifespan of building components (Riley et al., 2019). Further, land restrictions and reduction of land availability for other uses when applying the BD concept are other challenges with respect to functional difficulties (Church, 2018). The presence of animals and related complexities due to greenery applications in built environments is another challenge to overcome (Taylor, 2019) whilst legal barriers need to be considered with respect to implementing this concept in LI as a holistic approach (Littke et al., 2016). Even though these are general challenges, all these challenges affect the effective implementation of the BD concept in LI.

## 3. METHODOLOGY

A comprehensive literature review was conducted focusing on the BD concept in LI. The concept of biophilia and the importance and benefits of incorporating the BD concept in LI were identified. Accordingly, this research adopted the strategy of qualitative interview surveys to review in-depth opinions and views of experts on the implementation of the BD concept in LI. Hence, the contribution and involvement of industry professionals are essential to enhance the implementation of the BD concept in LI facilities. Especially, since LI facilities highly contribute to the economic development of a country, it is significant to explore the views, opinions, and experiences of the construction industry professionals for the enhancement of the implementation of the BD concept in LI. Hence, this study was conducted with a qualitative approach and 15 experts were interviewed to collect data through a semi-structured interview and the collected data was analysed through manual content analysis. The profile of experts is presented in Table 2.

Table 2: Respondents' profile details

Respondent	Profession	Experience (years)	
		Construction Industry	Leisure Industry
R1	Principal Architect	16-20	16-20
R2	Chartered Architect	5-10	less than 5
R3	Architect	over 20	over 20
R4	Chartered Architect	over 20	over 20

Respondent	Profession	Experience (years)	
		Construction Industry	Leisure Industry
R5	Chartered Architect	11-15	5-10
R6	Chartered Architect	over 20	5-10
R7	Principal Architect	11-15	5-10
R8	Architect	over 20	over 20
R9	Principal Architect	over 20	over 20
R10	Interior Designer	16-20	less than 5
R11	Interior Designer	over 20	over 20
R12	Principal Architect	over 20	over 20
R13	Biophilic Design Consultant	16-20	less than 5
R14	Architect	16-20	5-10
R15	Interior Architect	5-10	less than 5

All the professionals presented in Table 2 are BD experts and with their experience and expertise in this concept, their contributions have highly affected the findings of this study. These experts have been involved in many projects and conducted research to incorporate the BD concept while seeing this concept as an investment in health and economics. Further, some of the experts have implemented and consulted international projects as well.

## 4. ANALYSIS AND FINDINGS

### 4.1 LEISURE INDUSTRY AND ITS FACILITIES

The first question of the interview was designed to evaluate the interpretation of LI as per the different views of the experts in the construction industry. Accordingly, all the respondents agreed that the LI is crucial for fostering the economic growth of a country as it serves as a significant contributor to the tourism sector, providing essential sustenance and support for its growth and vitality. Even though this study focuses on enhancing this concept in overall countries, especially, R2's analysis centres on the role of the LI in the larger context of Sri Lankan tourism, mentioning that *"LI could be mostly the tourism industry in Sri Lankan standards"*. Supportively, R3 affirmed that with the reasons for the attraction of tourists to Sri Lanka (SL), stating *"LI which attracts tourists to SL is one of the biggest facilities that is available because of our environment and then occupation, a lot of people come, right?"*. This approach highlights the significance of SL's environmental and cultural heritage, emphasising why LI is more suited for the development of a country such as SL due to the inherent link between LI and its natural resources.

In addition, an expert from the USA, R9 simply identified LI as *"Places people go away from home to rest, restore, experience, enjoy with family plus friends to explore beyond their everyday life"* and supportively, R4 generally defined LI as *"An industry which provides facilities for "switch off", "action" and "togetherness"*. Further, R12 mentioned, *"They are the places for human leisure comforts, the comforts need for relaxation"*. Strengthening the statements of R4, R9 and R12 together, an expert from Italy, R13 further affirmed by stating that LI includes services that provide *"entertainment, relaxation and enjoyment for individuals, families or other groups"*. The

same opinion has been repeatedly maintained by many respondents. Furthermore, this collective pool of views was enriched, adding more valuable insights by R8, commenting, “Leisure facilities predominantly focus on providing relaxation, recreation, resting, entertainment, psychological healing, leisure sports facilities etc. under the main sector of tourism, hospitality or entertainment facilities” while identifying those facilities as “business facilities”. From the term “business facilities”, it elaborates that these facilities highly contribute to the economic growth of a country.

In addition to that, some other respondents provide additional insights into the definition and extent of the LI, indicating that it includes diverse activities and facilities. R13 mentioned that LI encompasses a broad range of activities and facilities that “cater to people’s recreational and free-time pursuits”. Supportively, R14 identified LI as quite a broad concept which includes many activities, commenting, “When I say leisure, it’s not just accommodation. So, it will mainly be thing that whatever the activities we do for leisure, right? So, for me, leisure is quite a broad of different kinds of activities we used for not like usual work. So, it’s generally the opposite of work”. The diverse perspectives of the respondents from different nations regarding the interpretation of LI demonstrate an intricate combination of opinions, expectations, and suggested approaches, highlighting the significance of LI for human beings in different aspects as discussed.

In addition, LI facilities can be categorised into different segments considering the experience that humans can gain by engaging in those activities provided by various facilities. In brief, based on the views of all the experts, Figure 1 summarises the leisure facilities.

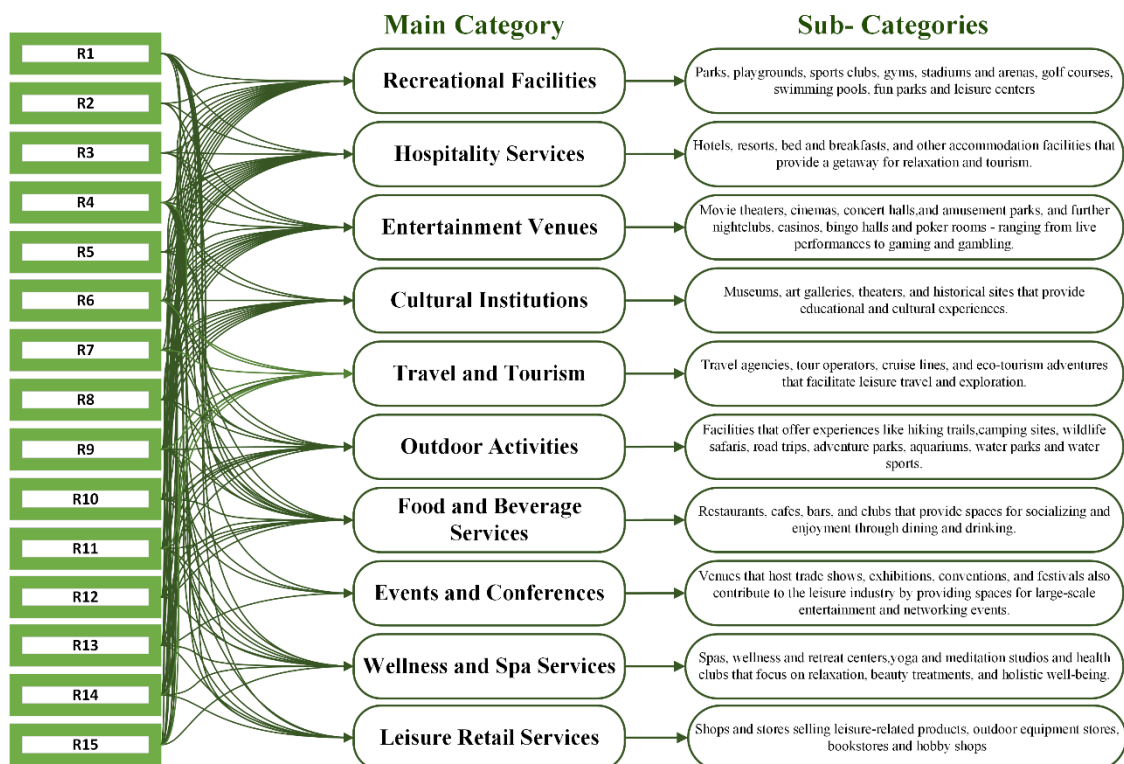


Figure 1: LI facilities



## 4.2 IMPLEMENTATION OF BIOPHILIC DESIGN IN THE LEISURE INDUSTRY

According to R4 and R7, implementing the BD concept in SL is not a novel phenomenon and it is something which has been done in past decades. As per the architectural view of R7, *“From 500 years ago or even 1000 years ago, the way we have done buildings, the way we have adapted nature to our benefits has always been in line with BDs”*. R7 and R4 pointed out a mud house as an example, *“It is absolutely biophilic, like there is nothing that goes against nature in that particular setup. That’s just general living”*.

### 4.2.1 Importance of Biophilic Design in Leisure Industry

R7 affirmatively stated, *“BD concept in LI is prominent and it is a very active element in this particular sector since it gives a value for sure to the experience of the occupants who are living in LI facilities”*. In addition, R12 identified BD as an essential component for LI. Supporting the views of R7 and R12, R8 asserted that this implementation contributes to the enhancement of the positive impact on users’ efficiency, health and well-being. Further, R8 pointed out that this is a must to implement in the modern world, highlighting the importance of *“enhancing our intrinsic human connection to the natural environment which has been forgotten or kept in isolation in the modern busy lifestyles”*.

Indeed, R2 asserted *“I personally think if somebody is going to build something there, we are destroying the atmosphere. So, if we want to minimise the impact that we do to architecture, we can implement those biophilic strategies. So, we can harm the environment in a minimal manner by using BD”*, convincing the importance of implementing this concept in the built environment to mitigate the damages to the natural world. According to R15, *“Nature-inspired designs, such as incorporating natural light, plant life, and organic materials, can create a more inviting and rejuvenating atmosphere”* instead of destroying it. More to the point, R5 identified this as a very good approach and highlighted the prevention of nature for the future stating, *“If we could be able to run a BD concept into a leisure field, then we can say accommodate less running cost in all of this as well as more nature, preventing the more nature for the future”*.

In addition, R3 indicated *“BD in the LI is going to play a big role in the future because again the world is moving towards sustainable practices”*, showing the connection between the BD concept and sustainability. Similarly, R4 conceded and strengthened the opinion of R3, mentioning, *“Now the trend is about nature, the worldwide... No more buildings and concrete. If you go for the biophilic concepts and the zero energy concepts and the sustainable concepts, we can sell ourselves. In the world-wide, now the setting point is sustainability. Biophilic directly addresses sustainable architecture”*.

Additionally, R6 revealed the importance of connecting with nature in LI, stating, *“People come for relaxation and enjoyment. Especially enjoyment of the place involves the nature and the context around it, right? The views, sky, landscape, sea, everything. So, it’s very important to integrate the internal building spaces through views and in different ways”*. With that, it is very clear that the implementation of BD in LI is significant as per the views of all the respondents.



#### 4.2.2 Benefits of Implementing Biophilic Design in Leisure Industry

R15 believes “The implementation of BD in LI facilities is highly beneficial since it does not only improve aesthetic appeal but also promotes well-being and relaxation, which are key components in leisure spaces”. Further, R6 emphasised the benefits for the occupants in leisure facilities with the embodied essence of nature mentioning, “Nature can do wonders and even it stimulates brain and then it’s good for health as well”. Repeatedly all the respondents were stated that BD is intended to connect people to the natural environment and to each other to promote a “healthier world”. These opinions further validate the health benefits highlighted in the literature findings. As a summary, the benefits of implementing BD in LI mentioned by all the respondents are presented in Figure 2.

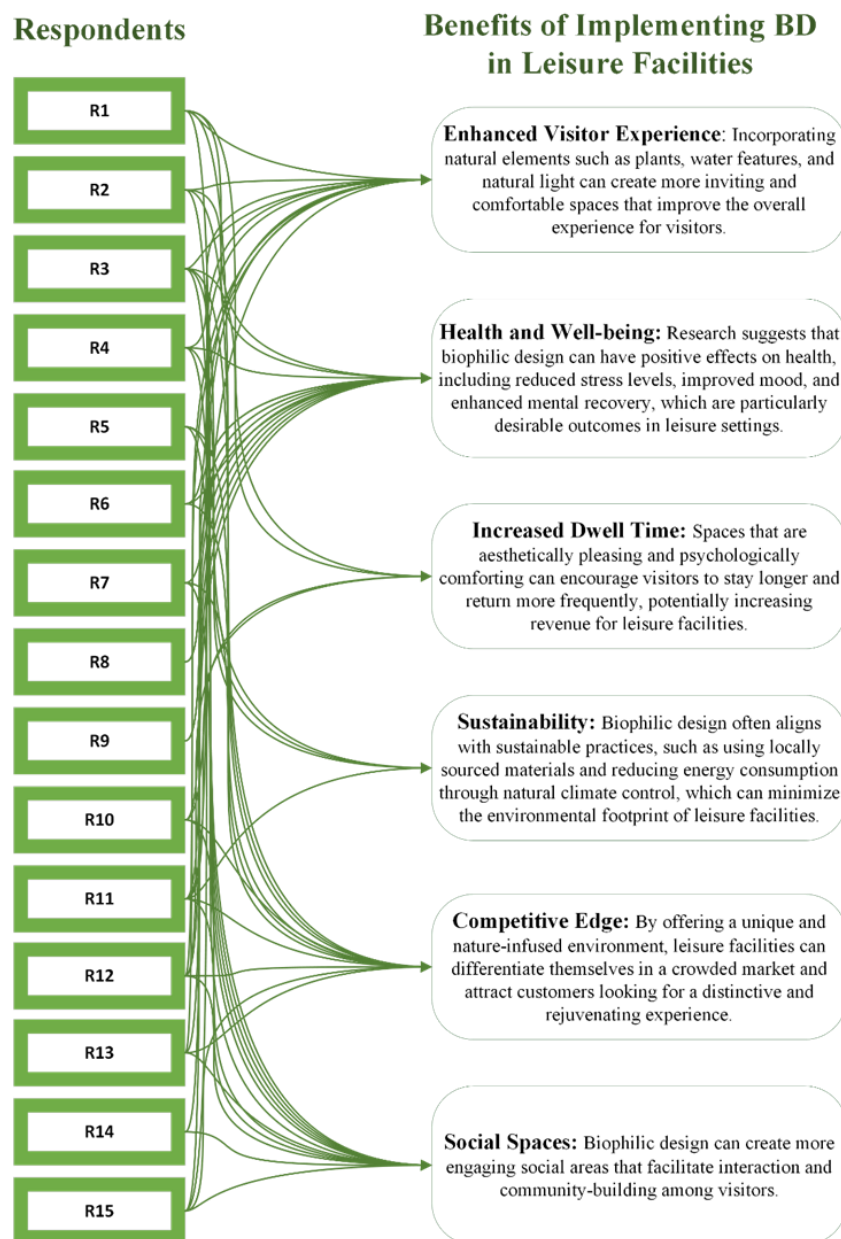


Figure 2: Benefits of implementing BD in LI

Especially, all these benefits were highlighted by R11, while other experts highlighted some of these benefits. As per the respondents' views, mainly six benefits have been identified and among them, enhanced visitor experience, increased dwell time, competitive edge, and social spaces, indirectly contribute to the economic benefits of the BD-implemented LI facilities. Therefore, the literature findings are further validated through the data collected through the interviews.

#### 4.2.3 Challenges in Implementing Biophilic Design in Leisure Industry

Nevertheless, the discussion directed to practical obstacles that the architects are facing in designing these facilities. There is a requirement for greater knowledge and instruction regarding the advantages of implementing the BD concept. Because, as per the opinion of R2, there is a need for a change in client expectations towards more environmentally friendly luxury. R2 as a Sri Lankan expert faced for the interview mentioned this issue, especially directing to the Sri Lankan clients indicating that,

*“So, the problem is satisfying the client. As architects we face, they don't get it. That's the awareness and their thinking pattern is more or less focused towards the luxury finishes. They are focusing on giving their customers high luxury and comfortable experience. Because they usually see those kinds of projects in other countries. They don't know about our strengths and all. That's the main reason for us to be here. How to make the maximum use of nature, they don't think about that. They just want to have luxury things. Actually, Maldives and Bali, they do design for their strengths. So that's why they are a success in the industry. However, because of the strength we have. We can go into the depth of this concept in SL.”*

In addition to that, R12 highlighted the lack of awareness of the BD concept, mentioning,

*“When we say BD, most of the people, even some architects, believe that it is all about planting trees, adding water features, etc. but exactly BD is not that. From the term biophilic, it says the love for living beings, but when we say BD, it is embodying the essence of nature. It can be done naturally or artificially. For example, artificially we can incorporate the shapes of the natural elements to the building elements or else we can make an environment artificially where people can feel like they are in a jungle, under the sea, etc. For that we have to make that environment artificially. It is not only planning trees and all...So, this is a critical challenge that needs to be looked in to”*

More to the point, according to R12, *“BD is a way of implanting natural organ in an artificial organ. For instance, giving intensities of natural lighting even for the places where we do not have access to get natural sunlight”*.

Moreover, R4 indicated *“The implementation of BD concept in LI will depend on the 'feeling', needed to be generated in that environment in different leisure facilities”*. Furthermore, R6 supported this idea stating, *“Through any architecture, we have to address the mindset of people who are living there”*. In addition, R6 introduced a new term to the discussion which is 'phenomenological experience' explaining it as,

*“Phenomenological experience is, when you go to a place, you feel something, you know, it's, there is ambience in that place, even in nature. So how do you integrate, or how do you take the essence of that ambience into your piece of architecture, piece of building? How do you integrate the ambience of, of nature*

*around a building into the building? Yeah... And then how do you connect inside and outside, poetically and with the pattern?"*

Further, the significance of conducting interviews with architects emerges as the optimal method for data collection in this study, as emphasised by R8. According to R8, "As designers of the built environment, 'architects' have to have a thorough understanding of this concept and understanding of how to incorporate them carefully to enhance the quality of life of the users by taking nature's inspirations".

To address the mindset of the people through BD, first the issues mentioned by R2 should be addressed which is to increase the awareness of the architects regarding this concept, since they are the designers to be addressed the mindsets of people. Among the challenges identified in the literature findings, lack of awareness of the BD concept was identified as the main challenge to implementing this concept as highlighted by the views of all the respondents.

To sum up this section, the responses together create a vision for a LI that is closely connected to the principles of BD. As R15 specifically stated, "This approach aligns perfectly with the LI's goal to provide escapes and relaxation opportunities for its clients". The respondents, with their varied perspectives, describe BD as a perfect approach that has the potential to redefine the LI.

## 5. CONCLUSIONS

The research aim was met by conducting a comprehensive literature review and an expert survey with construction industry professionals. Human connection to nature is an essential value that has progressively weakened since the 1800s. As a result, the requirement for a positive connection with nature remains crucial for human health and well-being. Biophilia is the natural and instinctive bond that humans have with the natural world. BD has played a role in crafting built environments that capture the essence of nature. Incorporating natural elements indoors not only enhances the indoor environment and air quality but also leads to numerous health, well-being, psychological, cognitive, and behavioural advantages. BD can be implemented in different industries and LI is one of the most significant industries, which plays a role in shaping the identity as humans, evident in human growth, health, motivations, emotions, and behaviours across the lifespan which enhance physical and mental well-being. The findings of the study evident that BD is a great concept to implement in LI. Most of the respondents have the opinion that BD is a natural creation inside the buildings, while only a few respondents interpret it in the most correct way that BD is a concept to capture the essence of natural elements inside the buildings naturally or artificially. BD implementation in LI promotes a healthier world with fun for human beings while it considerably contributes to global economic development. However, as raised by the respondents, the major challenge for BD implementation is the lack of awareness of the BD concept among the construction industry professionals, clients and the building occupants.

## 6. REFERENCES

Ariyawansa, D. N., & Perera, N. G. R. (2022). The Role of biophilic design in hotel architecture: A case study of Heritance Kandalama, Sri Lanka. *15th International Research Conference - FARU 2022*, 214–223. <https://doi.org/10.31705/FARU.2022.24>

- Barbiero, G., & Berto, R. (2021). Biophilia as evolutionary adaptation: An onto-and phylogenetic framework for biophilic design. *Frontiers in Psychology*, 12, <http://dx.doi.org/10.3389/fpsyg.2021.700709>
- Bolten, B., & Barbiero, G. (2020). Biophilic design: How to enhance physical and psychological health and well-being in our built environments. *Visions for Sustainability*, 13, 11–16. <http://dx.doi.org/10.13135/2384-8677/3829>
- Browning, W., Ryan, C., & Clancy, J. (2014). 14 Patterns of biophilic design: Improving health & well-being in the built environment. *Terrapin Bright Green*. <https://www.terrabinbrightgreen.com/wp-content/uploads/2014/09/14-Patterns-of-Biophilic-Design-Terrapin-2014p.pdf>
- Chen, H. M., Tu, H. M., & Ho, C. I. (2013). Understanding biophilia leisure as facilitating well-being and the environment: An examination of participants' attitudes toward horticultural activity. *Leisure Sciences*, 35(4), 301–319. <http://dx.doi.org/10.1080/01490400.2013.797323>
- Church, S. P. (2018). From street trees to natural areas: Retrofitting cities for human connectedness to nature. *Journal of Environmental Planning and Management*, 61(5-6), 878-903. <https://doi.org/10.1080/09640568.2018.1428182>.
- Dustin, D., Zajchowski, C., Gatti, E., Bricker, K., Brownlee, M. T., & Schwab, K. (2018). Greening health: The role of parks, recreation, and tourism in health promotion. *Journal of Park & Recreation Administration*, 36(1). <http://dx.doi.org/10.18666/JPRA-2018-V36-I1-8172>
- Estok, S. C. (2017). Material ecocriticism, genes, and the phobia/philosophy spectrum. *Neohelicon*. 44(2), 297-313 <https://doi.org/10.1007/s11059-017-0395-8>.
- Kellert, S. (2005). Building for life: Designing and understanding the human-nature connection. *Bibliovault OAI Repository, the University of Chicago Press*, 24(2). [https://www.researchgate.net/publication/40777405\\_Building\\_for\\_Life\\_Designing\\_and\\_Understanding\\_the\\_Human-Nature\\_Connection](https://www.researchgate.net/publication/40777405_Building_for_Life_Designing_and_Understanding_the_Human-Nature_Connection)
- Kellert, S. (2012). *Birthright: People and nature in the modern world*. Yale University Press. <http://dx.doi.org/10.12987/9780300188943>
- Kellert, S. R. (1986). Social and perceptual factors in the preservation of animal species. *The preservation of Species*. Princeton: Princeton University Press, 50-73. <https://doi.org/10.1515/9781400857869.50>
- Kellert, S., & Calabrese, E. F. (2015). *The practice of biophilic design*. [www.biophilic-design.com](http://www.biophilic-design.com)
- Kellert, S., Heerwagen, J. H., & Mador, M. L. (2008). *Biophilic design: The theory, science, and practice of bringing buildings to life*. John Wiley & Sons, Inc.
- Kellert, S., & Wilson, E. O. (1993). *The biophilia hypothesis*. Washington Island Press.
- Kua, M. (2022). *Biophilic Escapism: Designing the Hotel Mojave*. [https://digitalscholarship.unlv.edu/cgi/viewcontent.cgi?article=1043&context=arch\\_grad\\_capstones](https://digitalscholarship.unlv.edu/cgi/viewcontent.cgi?article=1043&context=arch_grad_capstones)
- Littke, H., Yang, J., & Desha, C. (2016). Becoming biophilic: Challenges and opportunities for biophilic urbanism in urban planning policy. *Smart and Sustainable Built Environment*, 5(1), 15-24. <https://doi.org/10.1108/SASBE-10-2015-0036>.
- Lubowiecki-Vikuk, A., Dąbrowska, A., & Machnik, A. (2021). Responsible consumer and lifestyle: Sustainability insights. *Sustainable Production and Consumption*, 25, 91-101. <https://doi.org/10.1016/j.spc.2020.08.007>
- Maccoby, E. E., & Feldman, S. S. (1972). Mother-attachment and stranger-reactions in the third year of life. *Monographs of the Society for Research in Child Development*, 37(1), 1-86.
- Mikalauskas, R., & Kasparienė, J. (2016). Holistic approach about leisure industry. *Transformations in Business & Economics*, 15(2), 723–740. [https://www.researchgate.net/publication/311670264\\_Holistic\\_approach\\_about\\_leisure\\_industry](https://www.researchgate.net/publication/311670264_Holistic_approach_about_leisure_industry)
- Newman, P., Hargroves, K. C., Desha, C., Reeve, A., Moham, A. A. M. M. O., Bucknum, M., & Beatley, T. (2012). *Can biophilic urbanism deliver strong economic and social benefits in cities? An economic and policy investigations into the increased use of natural elements in urban design*. <http://dx.doi.org/10.13140/RG.2.1.2137.2886>

- Parsaee, M., Demers, C. M., Hebert, M., Lalonde, J. F., & Potvin, A. (2019). A photobiological approach to biophilic design in extreme climates. *Building and Environment*, 154, 211-226. <https://doi.org/10.1016/j.buildenv.2019.03.027>.
- Qadir, G., Wijesooriya, N., Brambilla, A., & Alonso-Marroquin, F. (2023). Improving the indoor environment through an indoor green curtain system. *Buildings*, 13(5). <https://doi.org/10.3390/buildings13051307>.
- Radha, C. H. (2022). Biophilic design approach for improving human health in the built environment. *International Transaction Journal of Engineering, Management, & Applied Sciences & Technologies*, 13(9), 1–12. <https://doi.org/10.14456/ITJEMAST.2022.188>.
- Riley, B., De Larrard, F., Malécot, V., Dubois-Brugger, I., Lequay, H., & Lecomte, G. (2019). Living concrete: Democratizing living wall. *Science of The Total Environment*, 673, 281-295. <https://doi.org/10.1016/j.scitotenv.2019.04.065>
- Rolston III, H., & Coufal, J. (1991). A Forest ethic and multivalued forest management. *Journal of Forestry*, 89(1), 35-40. <https://api.mountainscholar.org/server/api/core/bitstreams/c046d81a-78f4-4f3e-bec1-8b90fb796796/content>
- Searles, H. (1960). *The nonhuman environment in normal development and in schizophrenia*. International Universities Press.
- Sevil, J., García-González, L., Abos, A., Lanaspá, E. G., & Solana, A. A. (2018). Which school community agents influence adolescents' motivational outcomes and physical activity? Are more autonomy-supportive relationships necessarily better? *International Journal of Environmental Research and Public Health*, 15(9), 1875. <https://doi.org/10.3390/ijerph15091875>
- Simaika, J. P., & Samways, M. J. (2010). Biophilia as a universal ethic for conserving biodiversity. *Conservation Biology*, 24(3), 903-906. <https://doi.org/10.1111/j.1523-1739.2010.01485.x>
- Singharat, W., Kraiwani, T., Sonsuphap, R., & Shaengchart, Y. (2023). The sharing economy in a developing economy: The perspective of the leisure business. *Corporate Law & Governance Review*, 5(2), 27-34. <http://dx.doi.org/10.22495/clgrv5i2p3>
- Softas-Nall, S., & Woody, W. D. (2017). The loss of human connection to nature: Revitalizing selfhood and meaning in life through the ideas of Rollo May. *Ecopsychology*, 9(4), 241–252. <https://doi.org/10.1089/eco.2017.0020>.
- Taylor, D. E. (2019). College students and nature: Differing thoughts of fear, danger, disconnection, and loathing. *Environmental Management*, 64(1), 79-96. <https://doi.org/10.1007/s00267-019-01172-9>.
- Torkildsen, G. (2005). *Leisure and recreation management* (5th edition). <http://ndl.ethernet.edu.et/bitstream/123456789/49085/1/24..pdf>
- Ulrich, R. S., Simons, R. F., Losito, B. D., Fiorito, E., Miles, M. A., & Zelson, M. (1991). Stress recovery during exposure to natural and urban environments. *Journal of Environmental Psychology*, 11(3), 201-230. [https://doi.org/10.1016/S0272-4944\(05\)80184-7](https://doi.org/10.1016/S0272-4944(05)80184-7)
- Watkins, M., & Bond, C. (2007). Ways of experiencing leisure. *Leisure Sciences*, 29(3), 287–307. <http://dx.doi.org/10.1080/01490400701259985>
- Wilson, E. O., (1984). *Biophilia*. Harvard University Press.
- World Travel and Tourism Council. (2022). *Global tourism economic impact report*.
- Xue, F., Gou, Z., Lau, S. S. Y., Lau, S. K., Chung, K. H., & Zhang, J. (2019). From biophilic design to biophilic urbanism: Stakeholders' perspectives. *Journal of Cleaner Production*, 211, 1444–1452. <https://doi.org/10.1016/j.jclepro.2018.11.277>.