

## A Review of Biophilic Design Concepts in Hotel Architecture

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### Abstract

*Incorporating natural materials and features into the built environment is the goal of the creative approach known as biophilic design, which aims to link people with nature through architecture and interior design. The premise of the theory is that people are naturally drawn to nature and that spending time in nature can improve productivity, well-being, and general quality of life. It has been demonstrated that biophilic architecture design can convey a healthy environment, lower stress levels, and promote a sense of serenity for people residing in it. This is because the design uses natural materials and natural analogies patterns to create a connection between humans and the natural world. This study looks into the application of biophilic design ideas in hospitality environments. This study aims to investigate if, in the context of hotels, including biophilic design improves guest emotional responses, perceived quality, and behavioral intentions. The results of this study showed that biophilic designs produced more favorable emotional and behavioral reactions than the standard design using the scenario-based experiment. Furthermore, patrons thought hotels with biophilic decor were of higher caliber. The goal of biophilic design is to incorporate natural aspects into the built environment to improve overall guest experience, comfort, and well-being. It is based on the human connection to nature. Site inspections, management interviews, and visitor surveys are a few of the data collection techniques used in hotels. The results provide important insights for architects, designers, and hoteliers looking to build more sustainable and guest-centric settings by illuminating the challenges, advantages, and consequences of using biophilic design in a hospitality context.*

**Keywords:** Biophilic Design, Hotel, Nature, Hospitality, Sustainable Architecture.

### Introduction

A design concept known as "biophilic design" promotes the utilization of natural processes and systems in the creation of constructed environments. The application of biophilic design concepts to urban architecture has garnered significant interest in recent times owing to its capacity to augment environmental sustainability, human health, and well-being. The incorporation of natural components and patterns into the built environment, known as biophilic design, presents prospects for the creation of environments that promote cohesion, comfort, and efficiency. The present study aims to investigate the application of biophilic design ideas in a thriving urban area distinguished by swift development and cultural heterogeneity. Although people are inherently connected to nature, the idea of biophilic design is predicated on the idea that, in contemporary culture,

people seldom engage with the natural world. Humans need to be in nature, and biophilic design satisfies this desire. Numerous studies have also demonstrated the health advantages of incorporating natural systems and characteristics into constructed environments. People can get several advantages from integrating natural systems into the built environment, including better health and well-being, increased social interaction, environmental sustainability, and financial value. Access to natural light, greenery, and other natural systems have been connected to better physical and mental wellness. It has been demonstrated that being around greenery improves relaxation and general well-being while lowering stress, anxiety, and sadness. Interaction with natural components in the built environment, like indoor plants and vistas of the outdoors, has been linked to increased productivity and cognitive performance. According to studies, spending time in nature can improve one's capacity for creativity, focus, and problem-solving, which can improve performance at work and in the classroom.

The literature on environmental psychology, which has a long history of investigating the possible therapeutic advantages of exposure to nature and natural components as suggested by environmental restoration theory, will be the main emphasis of this paper's examination of the data supporting biophilic design. The essay also addresses how people react differently to the natural world. More empirical research on the effects of commercial landscapes that intentionally include natural components in their constructed settings is needed, according to published literature. With an emphasis on resource conservation and energy efficiency, environmentally sustainable design has so far been the main approach to this problem (Balaban and de Oliveira, 2017; Ingrao et al., 2018). This has caused a significant shift in favor of sustainable techniques. According to de Gaulmyn and Dupre (2019), biophilic design is distinguished by the use of a predetermined set of criteria in the form of a "design framework."

Therefore, this research aims to investigate if, in the context of hotels, the use of biophilic design improves guest emotional responses, perceived quality, attitude, and behavioral intentions. This study provides hoteliers with an understanding of the effects of biophilic designs on visitor responses, even while stakeholders in the lodging industry continue to plan, build, alter, and control a hotel's atmospheric design.

### **Statement of the Problem**

The lack of knowledge and comprehension among stakeholders—including legislators, developers, architects, and the general public—about the significance and possibilities of incorporating natural systems into urban and architectural design is one of the main issues. A lack of understanding regarding the advantages of green infrastructure and biophilic design could prevent funds from being invested in these strategies and maintain customs that value man-made components above natural ones. It is crucial to address the adoption of biophilic design and green infrastructure because the built environment sector's

fragmented and siloed decision-making processes make it difficult to integrate natural systems holistically into urban planning and development.

## Objectives of the Study

1. The objective of the paper is to examine the use, materials, and advantages of biophilic design concepts in hotel architecture.
2. Determine the gaps in knowledge and common misunderstandings that could prevent biophilic design and green infrastructure techniques from being widely adopted.
3. Examine effective case studies and industry best practices for implementing green infrastructure and biophilic design in urban development projects.

## Literature Review

The earliest man-made constructions exhibit elements of nature, and societies all over the world have discovered methods to incorporate nature into their dwellings and public areas. It has been studied scientifically for decades and lyrically for millennia. Therefore, biophilic design is not a novel concept; rather, it is the systematization of human instinct on what constitutes a conducive environment for people. Effective biophilic design incorporates natural elements in a way that is both rejuvenating and inspirational, all while maintaining the space's essential utility. The methods used to strike this balance may vary depending on the needs of specific user groups, types of buildings, or geographic areas, but the science guiding the state of a healthy space is still largely dependent on human response.

## Biophilic Design

Psychoanalyst Erich Fromm popularized the term "biophilia" in the 1960s. In the *Anatomy of Human Destructiveness*, Fromm used the term "biophilia" and defined it as "the passionate love of life and of all that is alive." In the built environment, biophilic design promotes the use of natural processes and elements as design inspiration. Thus, biophilic design proposes that integrating natural components into constructed settings could enhance their restorative qualities. The literature review examines people's attitudes and beliefs toward both natural and built habitats (with a particular emphasis on biophilia), as well as their behaviors, feelings, and experiences within them. The review presents a specific environmental psychology perspective on biophilic design. The findings of a seminal Swedish study by psychologist Arne Öhman demonstrate our species' innate propensity to react to environmental forces and stimuli. The participants in this study were subliminally shown images of firearms, frayed electrical wires, snakes, and spiders. The images of snakes and spiders that were subconsciously shown to almost all of the study participants elicited an adverse response, although the handguns and exposed electric wires elicited little reaction. The study's findings highlight and advise caution about the relevance of our innate tendencies to react to nature in the contemporary world. The results

show that our evolved responses to nature still have an impact on us. Still, they also suggest that some of these responses may have become "vestigial," meaning that while they were useful in the distant past for humans, they are now largely irrelevant in today's built environment and are likely to atrophy over time.

The breadth of the findings across a wide range of sectors - work, education, health, recreation, housing, and community - supports the claim that contact with nature still has a profound impact on human fitness and quality of life, even though the data is limited and the research is frequently methodologically weak. The advantages of spending time in nature frequently depend on repetition. Humans may have a natural desire to identify with nature, but this biological tendency, like many other aspects of what makes us human, must be fostered and cultivated to become useful. Our species has been able to transcend its biological limitations and become unique and creative both as individuals and as a society because people rely on experience and learning. This ability to pick up new skills and make decisions, though, has two drawbacks. It can inspire wise and original decisions, but it can also result in disastrous actions. When it comes to biophilia, we have two options: we can embrace our innate inclinations to connect with nature, or we can distance ourselves from it and weaken our bonds with it.

Today, one of the biggest barriers to having a positive experience of nature is the dominant paradigm for the creation and design of the built world. This is particularly troublesome because, even though humans may have evolved in the natural world, 90% of our time is now spent indoors in artificial environments, which is the "natural habitat" for modern humans. People's health and fitness continue to depend on positive interactions with nature, yet finding such interactions in today's developed world can be extremely difficult. The prevalent methodology in contemporary architecture and landscape design mostly views nature as a challenge to be conquered or as a minor and unimportant factor. Numerous studies have looked into the interaction between biophilic elements and the natural world. According to research, adopting biophilic patterns in healthcare and healing settings and adopting perspectives on the natural world have a favorable effect on people's well-being, lower stress and pain levels, and speed up patients' recuperation from illness and surgery.

As a result, there is a growing gap between people and nature in the constructed environment, which is evident in the lack of appropriate natural light, ventilation, materials, flora, views, and naturally occurring shapes and forms, as well as in generally positive interactions with the natural world. A large portion of today's built environment lacks sensory input to the point where it occasionally reminds one of the desolate cages of an antiquated zoo.

### **Attributes of Biophilia**

Within the discourse surrounding Edward O. Wilson's concept of biophilia, Stephen R. Kellert stands out as a significant individual whose contributions have had a significant

impact on our comprehension of humans' intrinsic bond with the natural world. An in-depth analysis of the many facets of biophilia is provided by Kellert's groundbreaking research, which reveals the complex web of characteristics that influence how we interact with the natural world. We are ready to explore the core of what it means to be human about our surroundings as we set out to explore Kellert's characteristics of biophilia (Kellert, 2012). Fundamentally, biophilia captures the innate connection that exists between people and nature—a primordial inclination that cuts across cultural divides and the ages of human history. Kellert outlines a framework of biophilic qualities that clarifies the various ways in which we are drawn to and enhanced by the natural environment, drawing on findings from psychology, ecology, and anthropology. These characteristics act as benchmarks for us as we work to create surroundings that uplift the human soul and promote a deep sense of well-being.

We encounter basic problems regarding the nature of our being and our place in the web of life as we make our way through Kellert's maze-like features of biophilia. Why do we have such a deep respect for the natural world? What attitudes, goals, and sense of identity are shaped by biophilia? What effects does biophilia have on how our towns, cities, and residences are designed? These inquiries invite us to set off on a voyage of exploration, delving into the depths of our shared awareness in pursuit of responses that speak to the core of what it means to be human.

By analyzing its characteristics in-depth, we shall solve the puzzles surrounding our innate affinity for the natural world. We stand a chance to discover important truths about the human condition and the persistent connection that binds us to the environment as we delve deeper into the prism of biophilia. This framework's central concept is based on a cooperative, multidisciplinary investigation including all of the project's major players. The handbook included a wide range of possible options for the exploration team as well as typical activities that can capture various facets of biophilic design considerations.



Figure 1. Attributes of biophilia (Source: Kellert, 2014)

This diagram outlines the three primary elements of the Design framework—the Direct experience of nature, the Indirect experience of nature, and the Experience of space and place—and adds context for its application to hotel design by drawing on relevant literature.

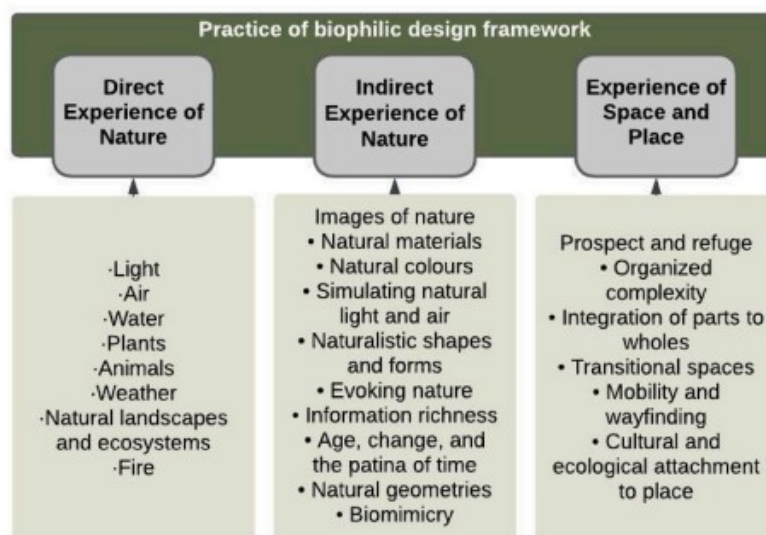


Figure 2. Biophilic design framework (Source: Kellert, 2014)

#### Terrapin Bright Green: 14 Biophilic Patterns of Design

The comprehensive framework known as the "14 patterns of biophilic design" (Browning et al., 2014) was created by the USA-based design consultancy business Terrapin Bright Green, which specializes in BD. There are 14 patterns total, divided into three groups. Seven patterns have to do with nature in a location, and some of them involve direct natural elements that enhance users' sensory experiences in the constructed environment. Three patterns make up Natural Analogues, which uses fabrics, furniture, fittings, and ornamentation to realize symbolic natural components with colors, textures, and patterns. Using data from studies, they offer an impression of the natural equivalent. This framework's most important feature is that it offers examples of design approaches that could be applied to produce biophilic patterns in the built environment.

Every pattern is detailed with design considerations, including sample concepts for features that are created or simulated as well as those that exist naturally. For instance, Pattern 6's "dynamic and diffuse light" section provides information on how to construct different seasonal lighting schemes.

Awe was one of the new patterns under the "nature of the space" that was developed further. This has to do with "stimuli including other biophilic patterns that leash a change in perception and defy an existing frame of reference." However, the framework also lacks precise instructions on how to evaluate if the BD goals it established have been met. This framework provides a thorough explanation of how biophilic design can be used to promote health and well-being in the built environment. It contains a thorough explanation of the

advantages of biophilic design for health and welfare, supported by scientific data. While there is some brief instruction on how to evaluate the design implications during the occupation phase, there is no information on how to analyze the design stage. Furthermore, it is unclear how the three categories and fourteen patterns relate to environmental issues and sustainability. Therefore, this framework's utility as a self-assessment tool is limited since it lacks advice on the evaluation process, even if it is based on comprehensive research of the benefits that nature delivers to buildings and is synthesized with architectural design theory and practice.

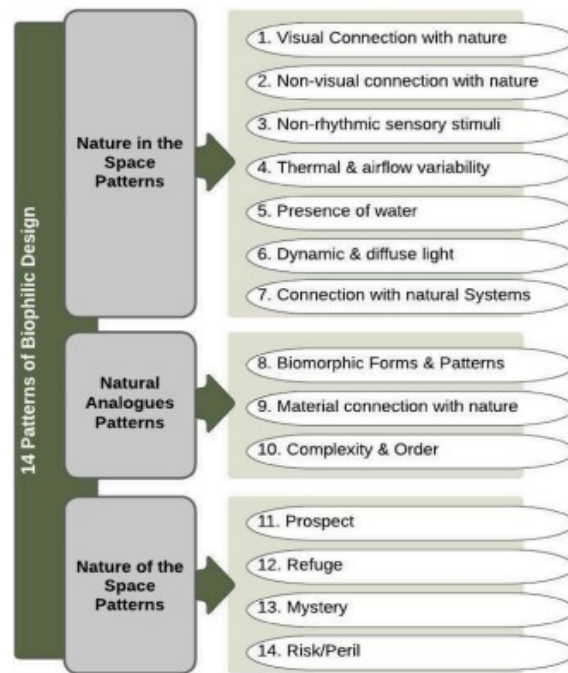


Figure 3. Terrapin biophilic framework (Source: Kellert, 2014)

**Natural Materials**

Another biophilic feature that contributes to this experience is natural materials, but little attention has been paid to this feature in scholarly studies from a psychological standpoint. The scant study indicates that the kind and quantity of material matter for the perceived quality and preference of restorative care (Ingrao et al, 2018). Wood, natural stone finishes, and bamboo are some of the most common materials implemented when applying biophilic principles.

Wood: Because of its inherent warmth, texture, and aesthetic appeal, wood is one of the most widely used biophilic materials. It can be utilized to provide a sense of connectedness to natural environments in a variety of applications, such as furniture, wall cladding, flooring, and architectural elements (Hong et al, 2022).

Natural Stone: Stone, which includes slate, granite, and marble, provides strength, genuineness, and a feeling of being near the natural world. To create a sense of stability and grounding, natural stone treatments can be used on floors, walls, counters, and facades in both indoor and outdoor areas (Silalahi et al., 2020).

Bamboo: Bamboo is a biophilic material with inherent warmth, flexibility, and texture that is fast regenerative and sustainable. It lends an organic charm to interior spaces when utilized for flooring, wall panels, furniture, and ornamental accents (Andreucci et al., 2021).

### **Biophilic Design in Hotels**

The commodity that hotels offer, a bed for the night, frequently sums up their activities, making it challenging for customers to discern between different hotels. To create unique experiences for their visitors, hotels are continuously adding new services and facilities. Since services are intangible, customers frequently search for indicators to help them determine a company's capabilities.

A paradigm change is occurring in the field of hospitality design as more and more hotels are embracing the ideas of biophilic design. Based on people's natural inclination to interact with nature, the biophilic design aims to bring the outside indoors by creating comfortable, reviving spaces. This essay explores the rapidly changing field of biophilic design in hotels, looking at its essential components, effects on the visitor experience, and potential future applications in the hospitality industry. The idea of smoothly incorporating natural components into the built environment is the foundation of biophilic design. As the foundation of biophilic architecture, utilizing natural light is the first step in this integration. Hotels that use this strategy make use of large windows, skylights, and open atriums to let light pour in from the outside, giving the rooms a feeling of warmth and space. In addition to saving energy, natural light improves mood and energy levels, creating the ideal environment for a wonderful visitor experience.

The existence of indoor vegetation is essential to the biophilic hotel experience. Hotels are turning their interiors into lush, botanical getaways, with features like cascading ferns in lobby atriums and verdant living walls. Indoor plants have more benefits than just aesthetics; they reduce pollutants and enhance the well-being of visitors by improving the quality of the air. In addition, the auditory and visual elements of flowing water, like waterfalls and fountains, enhance the overall sensory experience by evoking feelings of peace and tranquility.

Apart from incorporating natural materials and textures, biophilic hotels also evoke a sense of harmony with their surrounding environment. A physical link to nature, warmth, and authenticity is imparted to places through the predominant use of wood, stone, bamboo, and rattan in furnishings and decor. Not only do these materials provide hotels with a unique feeling of place, but they also appeal to travelers who value sustainability and genuine experiences. Biophilic design can be used in the hospitality sector by offering large windows, plants, water features, or views of the outdoors. A hotel can satisfy a visitor's desire for a sense of connection to nature by incorporating biophilic elements into the physical surroundings. Therefore, biophilic design may encourage positive attitudes, quality perception, emotional states, and behavioral reactions in the area. Therefore,



including biophilic design aspects in a hotel's layout will help it stand out from the competition and provide an operational benefit.

The capacity of biophilic design in hotels to provide a feeling of well-being and community among visitors is essential to its success. As visual reminders of the natural world, nature-inspired art and décor pique people's interest and delight. In keeping with visitors' increasing emphasis on holistic health and self-care, wellness services including spas, yoga studios, and meditation areas offer opportunities for rest and renewal. In addition to improving the visitor experience, hotels that use biophilic design concepts also support larger environmental and social goals. Eco-conscious hospitality is exemplified by biophilic hotels, which prioritize sustainable materials, energy-efficient systems, and responsible stewardship of natural resources. This encourages guests to take care of the environment. In summary, biophilic design honors the innate bond between people and the natural environment and is a revolutionary approach to hotel architecture and interior design. By adopting biophilic concepts, hotels are redefining the visitor experience and designing spaces that are health-promoting for the body, mind, and soul. As biophilic design in hotels advances, it has the potential to completely transform hospitality by providing visitors with a haven where the embrace of nature calls them at every step.

### Methodology

The review methodology employed in this study is a critical review in line with Grant and Booth's review typology (2009). The study of the literature looks at people's beliefs and attitudes about the built and natural environments (with a focus on biophilia), as well as their actions, emotions, and experiences within them. A particular environmental psychology viewpoint on biophilic design is presented in the review. This paper aims to be a starting point for discussions on the implementation of biophilic design; setting more reliable quantitative and qualitative parameters when necessary; pinpointing areas in which further research is required; and proposing possible techniques and instruments to take variables into account and monitor or measure efficacy. All of this is done to help us better incorporate biophilia's advantages into our design interventions. Some of the limitations encountered while employing this methodology are listed below:

1. There is a dearth of both high-quality and high-volume literature on the subject. The scope of the literature review may be constrained by the paucity of published research in certain new or specialist fields of study.
2. Some pertinent material might not be available or be out of date because of copyright restrictions, paywalls, or language obstacles. This may make it more difficult for the researcher to access and incorporate into the review all relevant papers.
3. It can be difficult and subjective to evaluate the included literature's quality and dependability. It can be challenging to appropriately analyze and synthesize

findings from different studies since they may use different methodologies, sample sizes, and research designs.

### **Discussions and Findings**

Studies indicate that despite living in contemporary, urbanized surroundings, humans possess an innate, evolutionary inclination to react favorably to nature. Throughout millennia of human evolution, our innate love for the natural world has deepened, a phenomenon known as biophilia. Throughout human history, our capacity to survive and flourish in natural settings has been essential to our existence. Consequently, we have evolved reactions to sunlight, vegetation, water, and other aspects of the natural environment on a cognitive, emotional, and physiological level. It has been repeatedly demonstrated that being in nature provides several psychological advantages, such as lowered stress levels, happier moods, better cognitive performance, and stronger emotions of well-being. The healing properties of natural settings and our innate connection to them are the sources of these beneficial effects. Engaging in natural activities can cause physiological reactions, including decreased heart rate, blood pressure, and stress chemicals like cortisol. These physiological alterations suggest that nature has a calming and revitalizing impact on the body, which strengthens our natural inclination to seek out and interact with it (Lyu et al., 2019).

The study's other key finding is that, despite our inherent inclination for the outdoors, people's interactions with built surroundings are becoming more and more disconnected from the natural world. This is due to the fast rate of urbanization and industrialization. Human populations are becoming more and more urbanized, which has led to the growth of constructed environments that are defined by restricted green spaces, concrete jungles, and dense infrastructure. The trend toward urban living has diminished chances for face-to-face interaction with the natural world and produced settings that frequently lack natural components. Modern technology, such as computers, smartphones, and indoor entertainment systems, has promoted sedentary lives and indoor activities that limit outside participation, which has further contributed to the disconnection from nature. In addition to causing habitat loss, pollution, and deforestation, human activity has also weakened natural ecosystems and reduced the amount of unspoiled, pristine natural areas. The integration of natural components and biophilic concepts are frequently subordinated in favor of economic, practical, and efficient design in manmade environments, such as buildings, neighborhoods, and cities. The distance between humans and the natural world is made worse by this artificial disconnection from nature. The integration of natural components and biophilic concepts are frequently subordinated in favor of economic, practical, and efficient design in manmade environments, such as buildings, neighborhoods, and cities. The distance between humans and the natural world is made worse by this artificial disconnection from nature (Ardiani, et al., 2019).

Even in the context of modern, urbanized living situations, the research supports the idea that people have an innate tendency to respond positively to nature, which has significant

consequences for our well-being and quality of life. In general, the literature draws attention to the widening gap that exists between humans and nature in artificial environments, highlighting the significance of fostering a new relationship between humans and nature to support both environmental sustainability and holistic well-being. To develop healthier, more resilient, and harmonious living environments, efforts to close this gap through biophilic design, green infrastructure, and environmental protection are crucial (Ghaziani et al., 2021).

## Conclusion

By establishing distinct patterns, we hope to offer a framework that allows any variable to be altered with regionally suitable and user-centered biophilic design, with the necessary care, rather than trying to produce cookie-cutter solutions for human-centric design. Understanding what best fits a space's specific programmatic requirements and target user base will lead to appropriate solutions. Understanding if this is true for different ecosystem types and interpretations of "nature," how much nature is required to define a state, and what elements lead to long-lasting beneficial health benefits are also necessary.

The literature reviewed here is a component of an expanding body of work that documents the health effects of exposure to nature. Since the area of biophilic design is still relatively new, there is a need for further research because some features of biophilia are intrinsically hard to measure. It can be difficult to monitor and gauge the effectiveness of biophilic patterns, metrics, and parameters. This is because there are a lot of variables, baselines are changing, the built and natural surroundings are unpredictable, and certain data collection techniques are very intrusive.

The built environment can have a positive, neutral, or negative effect on a person, as this review of the evidence demonstrates. Reactions may vary depending on the user's baseline health, the frequency and length of the experience, sociocultural norms and expectations, the user's prior experiences, and how the person interprets and processes the experience. Implementing biophilic design patterns and making them widely accessible could aid in putting the individual back at the center of the design process while maximizing the financial advantages of nature in the built environment. There will be a growing need for biophilic design as more people live in metropolitan areas worldwide.

Knowing this structure is helpful when creating a framework for biophilic design, whether for hospitality or other purposes. It will enable the strategies mentioned to individually tailor each level based on the specific conditions. The ramifications of these strategies for practices could vary. The development methodologies that have been found could be employed in design studios to assist students in creating their frameworks for biophilic design.

## Recommendations

- The lesson for design acknowledges that while the area being used has a utilitarian purpose, biophilic techniques that incorporate images of nature are essential in its incorporation since they place a higher emphasis on the experience and mood the space provides.
- It should always be remembered that visitor opinions and feedback are quite valuable while designing hotels. An important stage in the life cycle of an architectural project and a crucial sign of its success is the post-occupancy review. In this type of facility, where the visitor experience and subsequent return business from guests are essential to the hotel's overall viability, this element requires greater attention.
- Visitors are more receptive to a direct encounter with nature than they are to an engagement with it indirectly or with space and location. It is possible to design environments and experiences with multiple biophilic framework elements in mind a memorable experience is largely dependent on how biophilic design features are used in a space's design hierarchy.

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