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FRAMEWORK DEVELOPMENT OF BIOPHILIC MODEL FOR CORPORATE BUILDINGS

FIZAH NOOR HASHMI[1], AHMAD KASSAB[2], FARIHA SAEED[3], ANUM SHAMSHAD[3*], AIMAN AMJAD[4]

1. LECTURER, DESIGN AND INTERIORS DEPARTMENT, UNIVERSITY OF FAISALABAD, PAKISTAN.
2. ASSISTANT PROFESSOR, DEPARTMENT OF INDUSTRIAL DESIGN, EFFAT UNIVERSITY, SAUDI ARABIA.
3. ASSISTANT PROFESSOR, DEPARTMENT OF PRODUCT & INDUSTRIAL DESIGN, UNIVERSITY OF ENGINEERING & TECHNOLOGY, LAHORE, PAKISTAN.
4. LECTURER, DEPARTMENT OF PRODUCT & INDUSTRIAL DESIGN, UNIVERSITY OF ENGINEERING & TECHNOLOGY, LAHORE, PAKISTAN.

Abstract
Environmental degradation and unorganized cities are rising issues because of a growing population in an era of fast globalization. People confronted a dilemma with denser and congested urban development, which highlighted the fragility of towns and their residents. There are no such rules that govern the general equilibrium of the ecosystem due to rising urbanization and unplanned cities. As a result, global temperatures will rise by 1.5 degrees Celsius by 2050. Rapid building has made a substantial impact on the natural world to meet the requirements of a rising population. It contributes to global warming by generating more than 30% of the world's emissions of greenhouse gases. Buildings are the largest energy consumers and equivalent to approximately 40% of all substantial energy sources for example nuclear energy, hydropower, and fossil fuels. Sustainable construction and development methods are being used to reduce negative consequences and create an environment that is more environmentally friendly. Applying biophilic design concepts in building construction to generate connections between individuals and the environment is one method of achieving sustainability. The various categories of biophilic design are identified, evaluated, and their key components discussed in this study's thorough literature research. Next, using building evaluation methods, we examine the advantages of biophilic design in attaining sustainability, including improved health, wellness, work efficiency, and revenue generation. The results help in developing a biophilic model framework that can be used by designers and architectures for a more sustainable, healthy and resilient environment in the corporate sector. In addition, by indicating the framework, knowledge gaps are discovered to spur further investigation and practical examination of biophilic design approaches.

Keywords: Biophilic Design, Sustainable Environment, Conceptual Framework, Economic Growth, Productivity, Well-being

1. INTRODUCTION

Environmental degradation and unorganized cities are rising issues because of a growing population in an era of fast globalization. We confronted a dilemma with denser and congested urban development, which highlighted the fragility of towns and their residents. There are no such unplanned cities. As a result, global temperatures will rise by 1.5 degrees Celsius by 2050. (Niranjika Wijesooriya, 2021) This finding prompted many researchers and activists to demand for action to lessen the environmental impact of human activity (Niranjika Wijesooriya, 2021). Rapid building has made a substantial impact on the natural world to meet the requirements of a rising population. It contributes to global warming by generating more than 30% of the world's emissions of greenhouse gases. (Fink, 2016). Buildings are the largest energy consumers and equivalent to, approximately 40% of all original energy sources such as fossil fuels, nuclear energy and hydro-energy (Fink, 2016). Sustainable construction and development methods are being used to reduce negative consequences and create an environment that is more sustainable (Niranjika Wijesooriya, 2021). By applying concepts of biophilic design in building construction to generate connections between individuals and the environment is one method of achieving sustainability. (Browning, 2014)

The integration of nature-based projects in structures has been an ongoing development in both the architectural and design concepts. (Terri Peters, 2020). Individuals dedicate around 90% of their time indoors, which can lead to sadness and psychological problems. (Terri Peters, 2020). Moreover, it has detrimental effects on cognitive abilities,

productivity, and well-being. (Terri Peters, 2020). Biophilic designs are being used to restore the human relationship with the outdoor environment. The term "biophilic design" is drawn from Edward Wilson's definition of "biophilia" in 1984, which identified human relationships with other parts of existence. (Pranita Pranjale, 2019)The biophilic design establishes strong links between natural and man-made surroundings, which might assist individuals in a variety of ways. (Pranita Pranjale, 2019).

Various researchers had work on incorporating biophilic design in buildings such as clinical environments, (Bekir Huseyin Tekin, 2022) applications of biophilic patterns in service space, (Chengli Song, 2022)It's effects on human well-being, (Chengli Song, 2022) productivity, (Evy M. Rahmey, 2022), cognitive aspects (Aditya Jayadas, 2022) and health, (Qinghua Lei, 2022), promoting human-nature relationship to achieve sustainability (Niranjika Wijesooriya, 2021), developing the Healthy, Sustainable and Resilient environment (HSR) model using biophilic (BD) principles (HSRBD). Despite the several applications of BD for the built environment, indexation or rating scale for the effectiveness of its application has been less understood. As indicated by Ou (2022), there exists a dearth of knowledge to address "the creation of a metric to measure these relationships (HSRBD) while considering the various measurement gauge and the spatial contexts in which it can be utilized." To ascertain whether HSRBD has international applicability, it is also necessary to investigate regional and age disparities (Ou, 2022). Likewise, Mojtaba and colleagues (2019) had highlighted that "no data in the existing literature is available regarding the design framework to follow or use in order to incorporate principles of biophilic design more effectively to achieve sustainable environment" (Parsaee, 2019). The similarity was also endorsed and recommended by various experts, researchers, and International Organizations (WHO, 2021) Based on that call for actions demands the development of a biophilic model framework to incorporate biophilic design in corporate buildings in Pakistan.

The principle objective is to investigate the basic elements for a healthy, sustainable, and resilient environment for corporate buildings in Pakistan. The secondary aim of this research is scrutinizing the elements in accordance with biophilic design principles to create a healthy, ecologic and durable environment in an operational way. These aims prompted the author of this research to propose a conceptual design framework for designers and architects. The framework will include an approach for providing designers with a layout of how biophilic design model principles will be achieved.

2. **METHODOLOGY**:

The research model below depicts a roadmap to achieve research aims. The research model consists of 4 major phases from identification of research gap, defining the problem, planning and implementation of design study and extracting the results in the form of a framework. The research objectives can be effectively achieved using qualitative method of research design.

The research approach used in this study was qualitative that included thorough literature reviews. A thorough examination of the literature will be conducted to better identify the biophilic design paradigm, its guiding principles, and workable implementation strategies. A thorough and balanced viewpoint on the economic gains of biophilic design in the modern workplace to produce comprehensive gains in both wellness and work efficacy was obtained by the results literature reviews. Then, by evaluating the elements in co-relation with fundamental sustainability parameters a framework will be developed that can be utilized by designers, policy makers, and architects, for making the corporate sector more healthy, productive and resilient.

3. LITERATURE REVIEW:

In the past ten years, there has been a surge in devotion to reclaiming nature, motivated by an attraction with an affection for nature, as well as desires to improve health, welfare, recurrence and adaptability (Weijie Zhong, 2022). The connection between 'nature' and architecture has an extensive background. Vitruvius, the Roman architect, highlighted the response to weather in housing developments and water reliance in the earliest existing text in European architectural philosophy, Ten Books on Architecture. Landscape architecture evolved more in the nineteenth century. Contemporary architects investigate living alongside the environment through a wider spectrum of techniques. Furthermore, many notable contemporary projects depict coexistence with the environment. Frank Lloyd Wright's Fallingwater invites ecology by placing the built environment, particularly the laterally enlarged flowing terraces, within natural environment. The 1960s were also a revolutionary era in architecture. In their designs, Ugo La Pietra, Mario Bellini, Alberto Rosselli, Superstudio, 9999, Archizoom, and other experimental architects have commented on the harmful effects of contemporary developments on the realm of nature. Even though nearly all the artworks were exploratory and pictorial in nature, environmental awareness created a change in the importance of the human and environment interaction. (Weijie Zhong, 2022)

The obsession with 'nature' needs to be viewed in context of individual-caused ecological concerns and burgeoning ecological organizations. 'Nature' was researched and related to a variety of environmental challenges during the 1980s and 1990s. New global concerns for example environmental Deterioration, depletion of and degradation of biodiversity occurred, as well as remedies to these challenges became described within the need for sustainable growth (Leach, 2010). The Brundtland Report, published in 1987, popularized the notion of environmentally friendly development (Nations, 1987) and was further elaborated through the Agenda 21 (UN, 1992) and the 17 Sustainable Development Goals (SDGs) (Nations, Transforming our world: The 2030 agenda for sustainable development., 2015). The 2018 Intergovernmental Panel on Climate Change (IPCC) report reaffirmed the looming implications of environmental degradation, providing substantial proof that temperatures around the world will rise by at least 1.5 degrees Celsius by 2050 (Niranjika Wijesooriya, 2021). These disclosures sparked a worldwide reaction from scientists. Environmentally (or sometimes, ecologically) sustainable design (ESD) refers to the area of design and architecture that adheres to the concepts of environmental consciousness and energy conservation. The ESD parameters were rigorously examined, and it was discovered that such criteria resulted in a loss of relationship between humans and nature since aspects of humanity were overlooked (Istiadji, 2018).

According to recent studies, human-nature connection (HNC) is a crucial criterion when developing environmentally friendly and pleasurable structures, based on the notion that, despite spending 90% of our time within the house, humans are truly outdoor creatures (Baker, 2006). The design method known as biophilic design (BD) is being used to restore the human-nature connection (HNC) and to meet the requirements of humans.

The significance of user opinion and social environment in design results has been further highlighted by recent studies. Asghar et al. (2019) showed that heritage, customs in society, and situational awareness have a significant impact on how users engage with created settings and products, highlighting the necessity of user-focused and adaptive design frameworks. These results bolster the idea that biophilic design is a perceptual and cognitive technique that improves adoption and wellness in built spaces rather than just an ornamental technique. (salman Asghar, 2019)

Biophilic design (BD) is becoming more widely acknowledged as an approach for bridging the gap between humans and nature (Gillis, 2015). The notion of biophilic design encourages the use of natural processes and systems in architectural design. Nature within the The word "space" (7 patterns: visual association with the natural world, faux-visual relationship with nature, faux-rhythmic sensations, heat the flow of air variation, the existence of water, changing and disperse light, conjunction with organic systems); Natural Alternatives (three disciplinne: biomorphic shapes, substance conjunction with nature, difficulty and arrange); and The natural world of the the space (four patterns: the future, shelter, enigma, danger/peril) (Kellert, 2015)

Biophilic design has gained popularity in the building business across around the globe over the past few years. There are two building rating systems (Kellert S. R., 2008) having their origin in the United States but are being recognized across the globe which includes The new WELL Building Standard integrates biophilic design principles through the Biophilia Prerequisite and Biophilia Optimizing, while the Living Building Challenge successfully incorporates the idea through the Biophilia Agenda (Gillis, 2015). The goal of those grading systems is to integrate environmental components and procedures into the constructed environment, providing humans with essential interaction with environment (Kellert S. R., 2008)

Biophilic design can also be found in the internal construction sector. For example, the integration of organic and ecologically friendly components within medical centres and hospital environments has been extensively studied in the academic field (Bekir Huseyin Tekin, 2022). The scientific evidence suggests that incorporating biological principles into medical facilities and therapeutic environments improves one's overall health, minimises anxiety and discomfort, and improves the recovery of individuals from illness and surgeries (Bekir Huseyin Tekin, 2022). As a result, the American Institute of Architects recommends it as an architectural principle for medical and health care institutions. Because organisations and working environments can be unpleasant places to work, efficiency is essential. As a result, BD has attracted an array of professionals for office and work environment design. It is also used in the design of academic residential properties and business environments for the same reason (Maryam Mollazadeh, 2021). Several studies undertaken by various researchers over the past few years have discovered numerous benefits to human well-being as a result of reconnecting with nature, which have been described in a number of articles of research (Chengli Song, 2022), (Aditya Jayadas, 2022) (Qinghua Lei, 2022), (Niranjika Wijesooriya, 2021). Taken together, the research suggests that BD can be used to achieve the goals of healthy, sustainable, and resilient settings. A model called as the Healthy, Resilient, and Sustainable Environment (HSR) was established for assessing the BD as an approach to design for a sustainable, healthy, and adaptable atmosphere (Ou, 2022).

This investigation does not aim to give a thorough overview of all the various ways that biophilic design elements might be incorporated into structures for real-world applications. However, a quick summary of its main elements ought to enhance understanding of the concept and its possible uses in professional settings. According to Browning et al., (2014) the three primary groups of biophilic design were developed because of numerous researchers' attempts to classify various biophilic design trends, in “14 Patterns of Biophilic Design" published by Terrapin Bright Green.

3.1. Natural Space:

Aquatic elements, reactive illumination, vegetation, courtyards and ventilation from the outdoors are examples of indoor-use natural components. It also entails making it possible for inhabitants to connect with the outside environment from inside, which can often be achieved by offering panoramic views or access to clean air via movable screens or sliders. (Browning, 2014)

3.2. Natural Analogues:

This characterizes circumstances where individuals have an experience of nature that is not immediate or accurate. This involves using organic substances and artistic or architectural components that either mimic or depict the forms and shapes prevalent in the nature. Similar positive physiological responses can be elicited by their natural counterparts as by direct interaction with the environment. (Browning, 2014)

3.3. Nature of the Space:

Because people are biologically adapted to different sorts of landscapes, the way spaces are arranged, and their intrinsic qualities can cause them to react in particular ways. The best environmental circumstances for humans, based on current research, are designed to resemble the grassland environment, which is characterized by broad spaces with sporadic tree groupings. These environments give people a "prospect," which is the capacity to see a wide range of environments, as well as a "refuge," which is the ability to be in places that make one feel comfortable and secure. (Browning, 2014).

3.4. Rating Systems for Biophilia Design:

To promote, encourage, and evaluate biophilia design within buildings, three grading systems have been developed: Living Building Challenge (LBC), LEED, and WELL Building Certification.

- The WELL certification credit necessitates a comprehensive assessment of the layout to ensure a viable life in a defined living environment.
- LEED is the building's certification for ecological sustainability and beauty, and it provides experimental scores for solutions that address issues that bring people and nature together. The WELL is comprised of ten indicators: sunlight, activity, climate control, sound, resources, the environment, water, food, thoughts and community. As a result, designers should at least specify how biophilia components will be incorporated into the project.
- The Living Building Challenge Certificate (LBC) is given out by the International Living Future Institute (ILFI). It is the world's strictest green building standard.

Location, power, water, wellness, joy, resources, equity, and aesthetics are among the effective standards that are part of LBC. Each is distributed into various circumstances and incorporates biophilic design approach to enhance general happiness and efficiency in architecture.

The three accreditation grades are platinum, gold, and silver, which differ in their ability to meet the standards. The actual level is specified during the effectiveness certification procedure, which all projects must complete before receiving approval. Biophilia is evaluated on two levels by the accreditation. While Biophilia Two employs a numerical approach to biophilia design, Biophilia One adopts a method that is more qualitative. Each of these certificates highlights the requirements for biophilia design in its three primary domains and the 14 biophilic design trends via 9 key goals, as indicated in table 1: (Mohammed, 2023)

Table 1: Major Goals of three grading systems

The three grading categories' major goals are to include the biophilic concept into them.
Using the ecological concept
To adhere to the green design concept and establish LEED, WELL, and LBC requirements
To attain efficiency, health, happiness, and balance with the environment.
To encourage and enhance living and working spaces to foster a relationship with nature.
To benefit from airflow and sunlight.
Expertise in renewable resources
Use of plants in design and development.
Stay away from carbon emissions, volatile materials, and sources of electromagnetic contamination

3.5. Assessing the Implication of Biophilic Design on People in Different Project Categories:

The following are the most noteworthy instances of biophilia across various building categories to maintain and promote its ongoing advancement and to encourage the inclusion of the remaining biophilia types and patterns due to its advantages and measurable advantages on users' mental and physical well-being:

Healthcare Centers:
Numerous clinical studies have shown how living in such a setting can boost the body's defenses and internal nervous system, both physiologically and emotionally, especially in those who are ill (P. Roös, 2018). Help hospitalized patients recuperate by providing windowed room that looks outside into an outdoor area (Newman, 2017). Additionally, well placed plants and other natural manifestations in the same space can serve the same purpose and more. Furthermore, the same function and more can be accomplished by carefully arranging plants and other organic substances in close proximity to one another. Thus, biophilic bio-design may reduce fatigue and stress. Sunshine advantages and the standard of outlook after surgery have been available in hospitals since the 1980s. (Gatersleben, 2015). Imagine these advantages in a hospital or school setting, where using landscapes and reducing the need for medications can lower stress levels. To provide their employees with a replenishing space and help them recuperate from their lengthy and demanding shifts, certain medical facilities are investing in biophilia design in the context of the coronavirus. Workers can escape from stress and loudness (Putrino, 2020).
Educational Institutes:
Biophilic educational environments can enhance healthy growth throughout childhood. Learners who engage with nature during their studies demonstrate improved concentration and enhanced memory (Peters, 2020). The biophilic perspective suggests that the human mind finds it easier to interpret physical characteristics and sensory patterns. In 2019, assessments were conducted on students in grades three to six (Moghaddami, 2019). The subsequent findings were observed in natural light: students' annual performance in mathematics and reading assessments was 20% higher; they performed better on tests when presented with appealing natural views; and the quality of those views included a direct line of sight to the outdoors, allowing them to perceive daylight, acknowledge the passage of time, observe people's movements, and witness the ongoing activities outside.
Organizational Units and Workplaces:
The sunshine and views experiment produced a greater memory capacity and fewer health complaints among the 201 individuals who were tested in the work environment of offices and call centers. This research of 101 call center employees found that their work speed increased from 7% to 12%, and productivity increased from 10% to 25%. Therefore, biophilic design incorporates vistas, clean air, panoramas, and sunlight to increase performance, minimize fatigue, and improves stimulation. Additionally, it is linked to lower rates of absence from the workplace. (Ryan, 2014). This connection between efficiency and design awareness is further supported by scientific studies on ecological and supportive design. According to longitudinal assessments of user-focused design processes, environments created with users' psychological, cognitive, and socioeconomic needs in mind result in long-lasting gains in overall health, productivity, and satisfaction. The case for incorporating biophilic practices into commercial environments to improve long-term efficiency at work has been reinforced by such information. (Graham E. Torrens, 2022) Amazon and other large corporations use biophilia design in their offices and headquarters. One of the most exquisite examples of this type of design approach is its headquarters in Washington. To create a peaceful and suitable workspace for problem-solving and increasing productivity, it has three balls with enormous glass domes, a private garden with 400 different kinds of flora both indoors and out, waterfalls, and birds. Compared to people who work in buildings with windows, those who work in office settings without natural light are more likely to decorate their workspaces with window-related accents. This claim is supported by the fact that workers try to compensate for the lack of natural materials (Heerwagen, 1986). Similar negative effects on creativity and creative production are caused by a workplace lacking windows, having too many gray walls, and/or having little greenery or other natural elements. Conversely, it has been discovered that adding factors like plants and sunlight to work surroundings increases employee satisfaction by 15%, fosters their creativity by 15%, and increases productivity by 6%. (Barnaby Jude, 2024) It is essential to consider the biophilic approach's function in societies, which promotes healing and efficiency, in order to properly and safely realize and activate it through homogeneity.
For the strategy of biophilic design to advance and flourish, the following 3 stages of environmentally friendly ecological design are necessary as indicated in the given table:

Table 2: Phases of Sustainable Design

No	Level	Concept	Result
First	Environmental Preservation	Minimizing harmful impact on surroundings	Preserving energy and materials, economic validity
Second	Human Health Design	Reducing detrimental influence on wellness, productivity, and overall happiness	Improving work and living environment
Third	Biophilia Design Approach	Increasing the positive impact on environment	Focusing on strengthening the

			beneficial link between humans and the natural world

According to Table 2, a lot of people define biophilia design as a strategy that can satisfy our basic wants by connecting us to life and its essential functions. It relies on incorporating nature and its components both indoors and out in urban settings. It establish a lasting link between ecology and built environment, that leads to the fundamental relationship between ecology and individuals, as well as the natural inclination to look for methods to establish connections with ecosystems as a means of existence. Environment is a powerful architectural component that truly affects people's lives, enhancing mental and physical well-being and elevating happy feelings while diminishing negative ones. (Moghaddami, 2019)

4. Pakistan: its Climatology, Environment, and Economical Loss:

Pakistan's terrain is diverse, with sandy deserts, barren plateaus, fertile plains, and divided uplands in the south, and high mountains with picturesque valleys, snow-capped summits, and eternal glaciers in the north. The country's southern region is home to mangrove swamps, beaches, and lagoons. Pakistan is also threatened by pollution and land degradation because of its diverse environment, dense population, and one of the highest rates of population increase in the area. Given that the nation's economy depends on its natural resources, these environmental issues must be resolved. These difficulties fall into two major categories: 1. a mix of population expansion and poverty that results in overuse of natural resources, and 2. the mainly uncontrolled rise in urbanization and industrialization, which has contaminated the air, water, and land. Both the lack of access to affordable, clean energy and this environmental damage disproportionately harms the poor. Therefore, the main environmental threats facing Pakistan are deforestation, desertification, salinity, excessive grazing, soil erosion, and overflow from agriculture, waste from factories, and untreated wastewater can all pollute water. Additionally, the majority of the population lacks access to drinkable water due to the scarcity of natural freshwater supplies. (Rehan, 2025)

Between 1972 and 2017, 4.8% and 1.6%, are the growth rates of Pakistan’s GDP and TFP respectively. The TFP and GDP growth rates in the 1980s and 1990s were 2.8% and 6%, respectively, and 0.33% and 4%, respectively. With corresponding average yearly growth rates of 1.3%, 3.9%, 4.7%, and 8.1%, labor productivity increased by 45%, 191%, 263%, and 360% in China, India, and Pakistan between 1990 and 2018. While the capital-output ratio in the region increased or stayed the same, Pakistan's decreased from a peak of 3 in the 1970s to 1.6 in 2018. As a result, throughout the past 50 years, Pakistan continues to have the region's lowest average TFP and GDP growth rates. Pakistan's low productivity growth has impeded sustainable economic progress, and its byproducts include several socioeconomic issues. (Sattar, 2025)

5. Development of Framework to incorporate Biophilic Design in Corporate Sector of Pakistan:

As described earlier, incorporation of biophilic design is one of the ways to minimize the broader issues of economy, environmental degradation and climatology of Pakistan especially the corporate sector. Based on the above literature review, groundwork for a conceptual framework which is most suitable for the corporate sector, correlation with sustainable design approach, economic advancements, and design parameters by extracting insights based on past research can be achieved. This is an attempt to incorporate significant elements of biophilic design in corporate buildings and environments to get desirable results in the form of a conceptual framework.

To connect constructed habitats to the natural world, both inside and outside of them, to support and improve the three biophilia classifications in their layout and equipment. To maximize health, well-being, user comfort, productivity, and mood, it is important for men to establish an affiliation with ecology and all of its manifestations in these intricately designed spaces.

Research demonstrating how design perspective and semantic comprehension influence the experience of users lends additional credence to the suggested approach. According to research by Asghar et al. (2019), frameworks that take into consideration the fundamental goals of biophilic design cultural awareness, visual understanding, and users involvement boost the efficacy of design. By taking these factors into account, the framework is guaranteed to be flexible, inclusive, and useful in the socioeconomic and cultural context of Pakistan's business sector. (Graham E. Torrens, 2022)

5.1. Essential Elements for Biophilic Model:

According to literature following are the 10 essential elements that can be incorporated in corporate buildings as stated by browning et all (2014), Moghaddami (2019), Barnaby Jude (2024):

Natural Light, Natural Views, Indoor Plants, Natural Materials, Aquatic Elements, Biophilic Illuminations, Outdoor Spaces, Biophilic Patterns, Wildlife Habitat, and Thermal Consolation shown in figure.

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Figure 1: Elements of Biophilic Design

~~5.3.~~5.2. Relation with Biophilic Design Categories:

These 10 elements are related to the three major groups of biophilic design stated as nature of space, nature analogies, nature in space. Elements such as outdoor spaces, biophilic patterns, thermal consolation, and wildlife habitat came under the category of nature of space as these elements allow humans to connect with nature contributing to their well-being and enhancing productivity. Likewise, using natural materials, incorporating aquatic elements, and using illuminations based on natural theme falls under the category of nature analogies. Natural light, Indoor Plants, Natural Views came under the term of nature in space.

The core objective of all these elements is the same of making the environment healthy, sustainable and productive as shown in the figure.

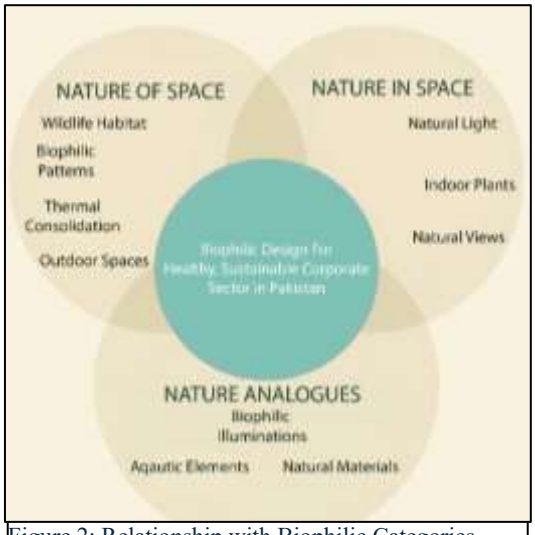

Figure 2: Relationship with Biophilic Categories

The classification of these elements along with major biophilic categories and design considerations for using these elements in the corporate sector in given in the tabular form as follows:

Table 3: Classification of Elements in accordance with BD Categories

Elements	Biophilic Design Categories	Design Considerations
Outdoor Spaces	Nature of Space	Incorporating Rooftop Gardens, parking lots and Courtyards
Natural Materials	Nature Analogies	Using Wood, Stone, Recycled Natural Waste Material

Aquatic Elements	Nature Analogies	Water Walls, Fountains, Water Planters, Wall Aquariums
Biophilic Patterns	Nature of Space	Nature inspired Wallpapers and textures
Biophilic Illuminations	Nature Analogies	Artworks such as Nature based paintings, 3d illusion nature inspired Sculptures, Hallways
Natural Light	Nature in Space	Large Scale sunroofs, Window Panels, Glass doors
Thermal Consolidation	Nature of Space	Thermal Materials for furniture
Indoor Plants	Nature in Space	Workstation plants and Larger Plant pots
Natural Views	Nature in Space	Outdoor Landscapes through Windows
Wildlife Habitat	Nature of Space	Aquariums, Bird Houses

~~5.4.~~5.3. Relation with Building Rating:

The elements described above in 3 major categories have a strong relationship with building rating systems (Well, LBC and LEEDS) focusing on five major objectives such as Indoor Environmental Quality, Balancing Ecosystem, Minimum Energy Consumption, Renewable Material Usage, Design Innovation. Each element came under one of these five major objectives as shown in figure:

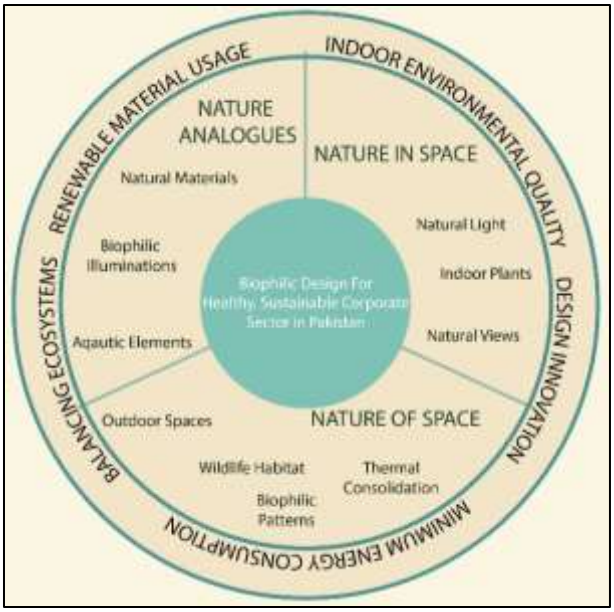

Figure 3: Relationship with Building Rating System

The classification of these elements along with objectives and purpose for using these elements in the corporate sector is given in the tabular form as follows:

Table 4: Classification in accordance with Building Rating System

Elements	Building Rating Objective	Purpose
Outdoor Spaces	Balancing Ecosystems	Improve physical and mental health
Natural Materials	Renewable Material Usage	Use of local materials, low cost and maintenance
Aquatic Elements	Indoor Environmental Quality Balancing Ecosystems	Helps in maintaining low temperature and sensory stimulation
Biophilic Patterns	Design Innovation	Reduce Stress and evoke sensory stimulations

Biophilic Illuminations	Design Innovation	Cultural biodiversity and helps in lessen the work frustration
Natural Light	Indoor Environmental Quality	Minimize cost, improve circadian rhythms
Thermal Consolidation	Minimum Energy Consumption	Maintain temperatures ultimately reduces cost consumption
Indoor Plants	Indoor Environmental Quality	Reduce stress and Anxiety
Natural Views	Balancing Ecosystems	Sustaining Biodiversity
Wildlife Habitat	Balancing Ecosystems Design Innovation	Ecological Balance

~~5.5.~~5.4. Relation with Economy and Environment:

These elements are related to economic and environment parameters such as energy efficacy, human well-being, productivity, Space Optimization, Cost Savings, and Adaptability. Each element came under one of these six major parameters as shown in figure:

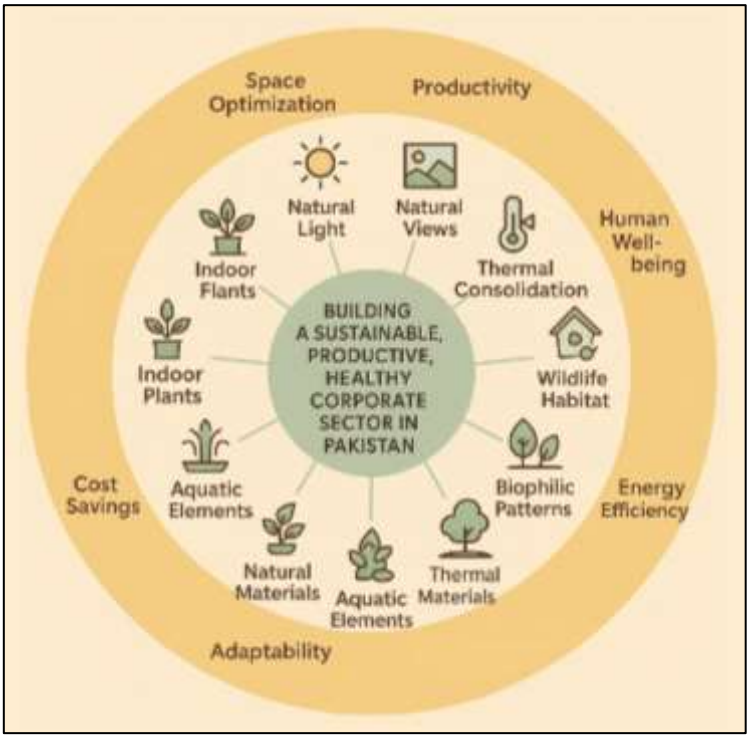

Figure 4: Relation with Economy and Environment

The classification of each element according to these parameters and how they contribute to sustainability is given in the tabular form as follows:

Table 5: Classification in accordance with Economy and Environment

Elements	Economic and Environment Parameters	Sustainable Contribution
Outdoor Spaces	Space Optimization Productivity	Improve physical and mental health by providing space for relaxation and social interactions
Natural Materials	Cost Savings	Use of local materials helps in lowering costs. Also, result in reduce carbon emission
Aquatic Elements	Human Well-being Adaptability	Helps in maintaining low temperature and quickly adapts to environment space

Biophilic Patterns	Space Optimization Human Well-being	Reduce Stress and non-invasive interventions
Biophilic Illuminations	Adaptability	Cultural biodiversity and can easily adjust to new space if require
Natural Light	Energy Efficacy Cost Savings	Minimize cost, improve circadian rhythms
Thermal Consolidation	Energy Efficacy	Maintaining temperatures reduces energy consumption
Indoor Plants	Productivity	Reduce stress and Anxiety
Natural Views	Human Well-being Productivity	Sustaining Biodiversity and helps people lower their stress levels
Wildlife Habitat	Space Utilization	Support interaction and enhance environment

~~5.6.~~5.5. Conceptual Framework of Biophilic Model:

The elements are identified and their relationship with biophilic categories, building rating system, and economic and environmental parameters have shown in the above-mentioned sections: 5.1, 5.2., 5.3 and section 5.4 respectively. Conceptual framework includes all these elements and their relationship with other main aspects. The following table contains these elements and how they are interconnected with major domains showing their role in development of sustainable, healthy corporate sector in Pakistan:

Table 6: Conceptual Framework showing elements and their co-relation

Sr No	Biophilic Element	Biophilic Domain	Design Consideration	Building Rating Objective	Economic and Environmental Parameters	Role in Healthy, Productive and Sustainable Corporate Sector
1	Outdoor Spaces	Nature of Space	Incorporating Rooftop Gardens, parking lots and Courtyards	Balancing Ecosystems	Space Optimization Productivity	Improve physical and mental health by providing space for relaxation and social interactions
2	Natural Materials	Nature Analogies	Using Wood, Stone, Recycled Natural Waste Material	Renewable Material Usage	Cost Savings	Use of local materials boosts local industry, minimize import dependency and results in lowering cost. Also, result in reduce carbon emission
3	Aquatic Elements	Nature Analogies	Water Walls, Fountains, Water Planters, Wall Aquariums	Indoor Environmental Quality Balancing Ecosystems	Human Well-being Adaptability	Helps in providing sensory relief, maintaining low temperature and quickly adapts to environment space
4	Biophilic Patterns	Nature of Space	Nature inspired Wallpapers and textures	Design Innovation	Space Optimization Human Well-being	Reduce Stress, evoke calming sensations and non-invasive interventions
5	Biophilic Illuminations	Nature Analogies	Artworks such as Nature based paintings, 3D illusion nature	Design Innovation	Adaptability	Islamic motifs and textures have soothing effects helps in

			inspired Sculptures, Hallways			productivity enhancement by releasing the frustration. Cultural biodiversity and can easily adjust to new space if require,
6	Natural Light	Nature in Space	Large Scale sunroofs, Window Panels, Glass doors	Indoor Environmental Quality	Energy Efficacy Cost Savings	Effective way to lower the electricity bills that ultimately save costs. Improve well-being and stable mood
7	Thermal Consolidation	Nature of Space	Thermal Materials for furniture	Minimum Energy Consumption	Energy Efficacy	Pakistan has extreme temperature range; thermal consolidation helps in minimizing HVAC dependence
8	Indoor Plants	Nature in Space	Workstation plants and Larger Plant pots	Indoor Environmental Quality	Productivity Human well-being	Boost local nurseries and plant industry, helps in cleaning air quality and maintaining health
9	Natural Views	Nature in Space	Outdoor Landscapes through Windows	Balancing Ecosystems	Human Well-being Productivity	Improve mood, release stress, helps in productivity
10	Wildlife Habitat	Nature of Space	Aquariums, Bird Houses	Balancing Ecosystems Design Innovation	Space Utilization	Ecological Balance, Support interaction and enhance environment

Figure 5 shows the conceptual framework, that includes the primary ten elements within three biophilic major categories, the implementation strategies/design considerations and how these elements contribute towards sustainability being within the building rating objectives and economic parameters aiming at one main objective to build a sustainable, healthy, and productive corporate sector as follows:

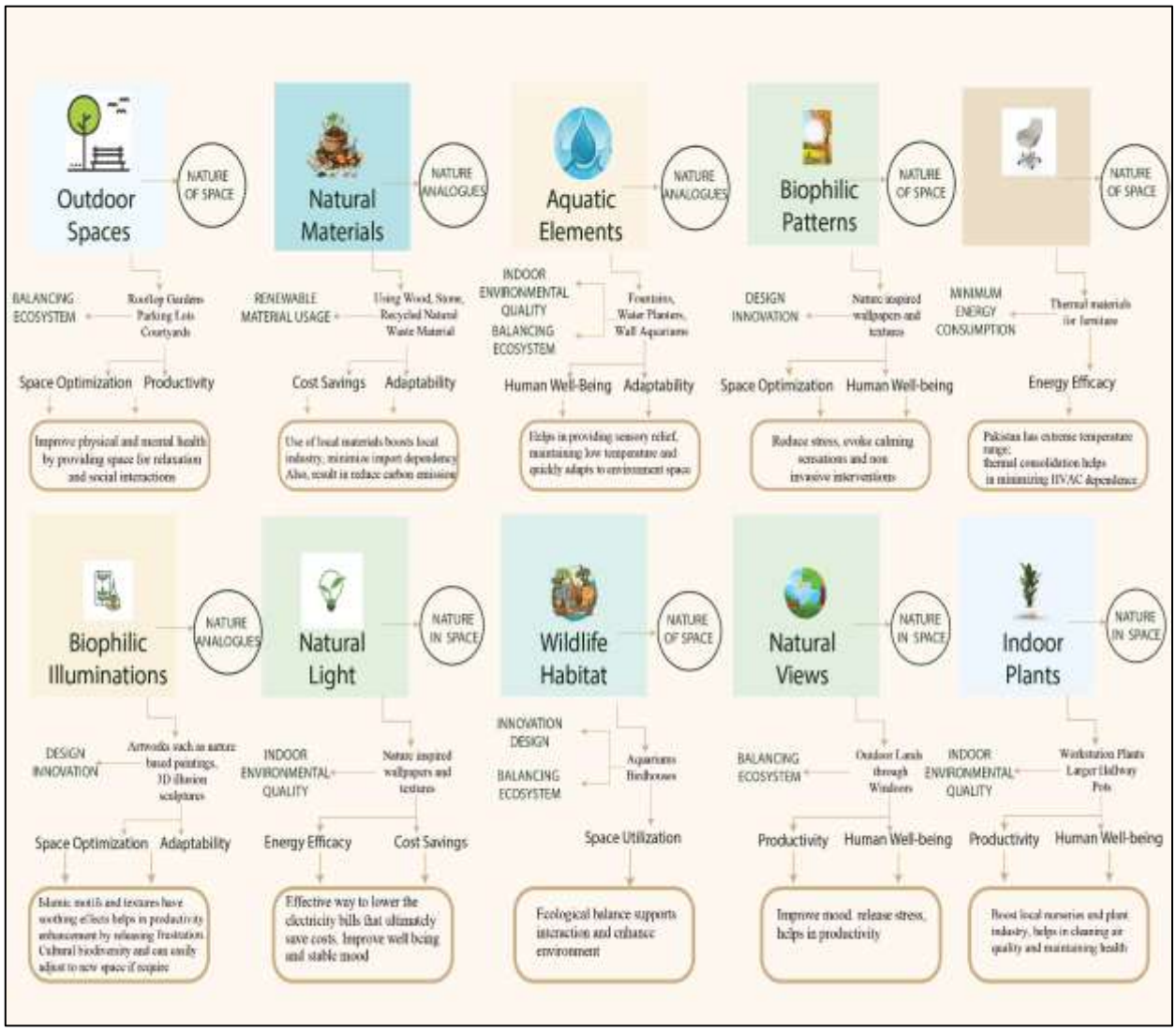

Figure 5: Conceptual Framework

6. RESULTS AND DISCUSSIONS:

One of the most crucial future directions for developing spaces for people toreside and function while engaging in daily activities in the world is biophilic design. Because of its significant influence, the building's resistance to illness is strengthened, a safe and healthy working environment is created, future adaptability and versatility are attained, and it is integrated into workstations of the future. The secret to creating high-quality, risk-averse environments that improve efficiency, wellness, and user pleasure will be biophilia. Therefore, methods for establishing natural surroundings and incorporating them with medical practices to assist our pulmonary and defense mechanisms stand out. Additionally, forming habits encourages the capacity to recover, which is a critical component and a pressing necessity in a world of health crises.

By creating a set of design factors as well as execution strategies required to accomplish each of the 14 patterns of biophilia, the study developed a conceptual framework, as shown in figure 5, that aims to integrate the elements of biophilic design extracted from these patterns into buildings and spaces. By using the suggested design considerations listed in Tables 3 and 6 to move toward a comprehensive biophilia design, a human might therefore restore his lost link with ecology and enhance his sensory engagement within it. Given Pakistan's economic crises and low corporate sector productivity over the last 50 years, the application of such frameworks not only raises productivity but also fosters the growth of domestic industry, which lowers imports. Furthermore, as figure 4 illustrates, the framework is consistent with economic characteristics that suggest a beneficial impact. Long-term living is made possible by built

surroundings, which also improve productivity, well-being, and health. These three levels serve as the foundation for fully achieving each of the nine shared goals of the three grading systems (LBC, WELL, and LEED), as indicated in table 1. These goals assist and direct a designer and enable biophilia to be accepted in many project categories that align with the most important worldwide rating systems. In order to preserve and improve health and lessen or alleviate stress and emotional difficulties, biophilia design relies on the ability to promote self-treatment using rehabilitative surroundings that restore a pleasant mood.

In addition to providing design considerations and implementation methodologies, Table 7 provides a comprehensive overview of the elements and their relationships to biophilic categories, building rating systems, economic aspects, and environmental protection objectives.

An emerging sustainable area of creative research called "bio-design" incorporates genuine elements of living or extinct organisms as well as their functions. Furthermore, it can be challenging to reallocate living things into new settings with different characteristics. It can be replicated more accurately and swiftly. In a similar vein, proponents of bio-design view it as a means of creating more sustainable objects and products that develop, multiply, and eliminate harmful materials while blending in with the environment.

7. **CONCLUSION**:

The conceptual framework for implementing biophilic design in Pakistan's corporate sector was the primary finding. Therefore, the way to achieve the sustainable design concept that balances with nature is to advance and order the nine major shared aims of the three different evaluation methods that support the biophilic approach. Additionally, human efficiency, wellness, and psychological well-being will all be maximized. These measures include repairing the damaging consequences of isolation, reestablishing this bond, and bridging the gap between humans and nature. Based on the results of the three methods employed to carry out the study, the framework for implementing the biophilia design was developed and formulated. This framework comprises ten components that align with biophilic design and sustainability, offering design plan and factors. It also defines and demonstrates its three groups and ten patterns for creating design alternatives and serve as a guide for designers who plan to create, construct, enhance, or furnish built environments using the suggested model going forward. As a result, the study looked at the idea, function, and history of biophilia—the ongoing discussions about how to make people happier in their homes and workplaces. The ideas for a project involving architecture and urban planning that uses biophilia both inside and outside were discussed and examined. The concept of biophilia was examined and understood as a sustainable biodesign strategy. Following that, prior assessments of the effects of biophilia design on users were gathered and examined in accordance with the different project categories. Furthermore, the applicability of integrating the biophilic strategy into architecture and criteria for design for all the various components of indoor as well as outdoor projects will determine upcoming designs recommendations. This will be an essential aspect of design to create a better existence presently and, in the years, to come.

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