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A Study on Using Biophilic Design to Connecting People with Nature

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Abstract: ***When building a structure, physical well-being, comfort, and emotional well-being are all important factors to consider. We typically neglect nature throughout the design process. For nature, there is no other option. As a result, it's crucial to think about while building a structure. In reaction to external stimuli, humans have evolved behavioral processes and problem-solving mechanisms. In this situation, architecture has complete influence over a location's character and stimulus production. The Biophilic Hypothesis argues that physical, mental, and intellectual stimulation is well-planned and delivered to the environment. The impact of biophilic design on employee health and well-being in the workplace is investigated in this study, which presents a unified paradigm for biophilic space design implementation.***
Keywords: Surrounding spaces, Psychologically, Biophilic Design, Behavioral Mechanism

I. INTRODUCTION

Lucknow is situated on the southern bank of river Gomti. Lucknow has been a city where the rays of different cultures, languages, creeds and communities merged from the Avadh syndrome and where the Indians and foreigners, charmed by its peculiar attractiveness, made their homes. They left their mark on the city. Vestiges of the past stand everywhere, whispering about the centuries that have seen Lucknow evolve from its humble origin to the bustling, living city of today. It is best known as the abode of Nawabs; for its open spaces, its picturesque setting, its gardens and beautiful medieval buildings. The city has often been described, due to its innumerable parks and open spaces, as a garden city. The post-Independence developments have, however, made it almost impossible to live up to its glorious past. The city is practically under siege and perpetually tormented by excessive pressure of population, poverty and mismanagement. Yet, it continues to be the best city of Ganga valley. (Administration, 2021)

II. HISTORICAL EVOLUTION OF ERA

Different ruling powers left their own impressions in different parts of the city through a different urban ingredient. Whereas the Nawabs gave the Bagh's, Ganj's, mosques and Imambara to the southern and western parts of the city, the Britishers gave the Cantonment and the Railway Station to the east and south which resulted in a layering process whereby the new power overlaid another fabric over the preceding one.

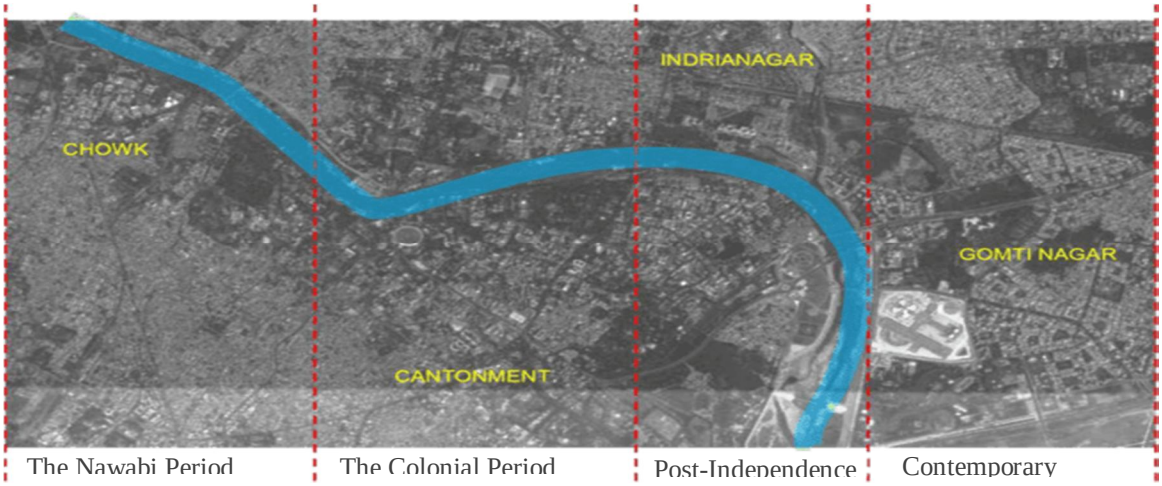


Figure 1-Map shows the Period of Lucknow (Source-Author)

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III. WHY BIOPHILIA?

A. *Environmental Features*

1) One of the most effective ways for encouraging human-nature connection in design is direct interaction with plants in and around the built environment.
2) Plants could help you to relax, feel at peace, boost your mood, and heal faster.
3) For patients, family, and staff, we provide native plant gardens, walking pathways, and a variety of sitting options, which when combined provide nature-filled environments for times of connection, meditation, and relaxation

B. *Natural Shapes And Forms*

1) From the immensity of the sky to the dense intricacy of a single leaf pattern, sound landscapes are complex on many sizes. This wide spectrum of variation satisfies our craving for the variety of shapes that we humans find appealing in nature.
2) In this library environment we created in conjunction with Frederick Fisher and Partners, the biophilic component of natural shapes and forms is well-represented. Between these two levels of architectural features within this bright location, we observe a vividness and diversity of pattern reproduced in gigantic mural artwork, balanced by a smaller repeating scale of richness of detail at the metal stair railing.

C. *Restorative Patterns And Processes*

1) According to Dr. Stephen Kellert, dealing with extraordinarily sensual and varied natural environments has always been necessary for human growth and survival, such as reacting to sight, hearing, smell, touch, and other sensory systems.
2) A prominent focal point in this outdoor respite space, which is part of a cancer treatment center's garden, allows for meditation, silence, and listening to the calming tones of wind chimes a central focal point offers reflection, stillness, and the chance to experience the soothing tones of wind chimes.

D. *Light And Space*

The many different aspects of light and spatial interactions are the emphasis of this section of biophilic design. The light shapes this LEED Platinum library in Austin, Texas, which views out over Shoal Creek and Lady Bird Lake. The building, which was created in collaboration with Lake |Flato Architects, is known as the country's most well-lit public library. More than 80% of the library's typically inhabited rooms get daylight thanks to the six-story atrium at the heart of the building. The abundance of natural light in this cultural public space results in vibrant, dynamic, and sculptural shapes.

E. *Place-Based Relationships*

This part looks at the connection between ecology and fundamental biogeographical features, as well as the role of location in providing care (e.g., mountains, deserts, estuaries, rivers, and plants). The colours and shape of the native Ocotillo tree in this contemplation space within a huge healthcare institution were influenced by the adjacent Sonoran Desert. The excellent art glass that surrounds the space echoes the light to dark green form, red flower accents, and expansive blue skies. The artwork was designed to softly and quietly diffuse sunlight while also framing the tranquil and contemplative environment with native desert colour and structure. Designs that speak to us in these ways can evoke a sense of hope and healing.

F. *Evolved Human-Nature Relationships*

An important linked characteristic is refuge spaces, which provide as a safe location to retire. • Refuge areas are said to be necessary for rest and relaxation (Browning et al., 2014). A tenant in their place of refuge can still have some connection to the broader world, as evidenced in this student housing neighborhood. Together, prospect and refuge in this space provide settings that increase focus, attention, and felt safety.

Browning and his fellow writers (Browning et al., 2014). Together, prospect and refuge in this space offer areas that improve concentration, attention, and perceived safety. (Browning et al., 2014). We look forward to continuing to evolve and support human-nature connections in the built environment in meaningful ways and walking this path towards a restorative future with our partners, clients, and communities.

IV. PARAMETERS

A. Form

The experience of shapes and forms characteristic of the natural world can be especially appealing. These naturalistic forms can be extraordinarily diverse from the leaf-like patterns found on columns, the shapes of plants on building facades, to animal facsimiles woven into fabrics and coverings. The occurrence of naturalistic shapes and forms can transform a static space into one that possesses the dynamic and ambient qualities of a living system.

B. Natural Ventilation

Natural ventilation is important to human comfort and productivity. The experience of natural ventilation in the built environment can be enhanced by variations in air-flow, temperature, humidity, and barometric pressure. These conditions can be achieved through access to the outside by such simple means as operable windows, or by more com-plex technological and engineering strategies.

C. Natural Light

The experience of natural light is fundamental to human health and wellbeing, enabling an orientation to the day, night and seasons in response to the sun's location and cycles. An awareness of natural light can also facilitate movement and wayfinding, and contribute to comfort and satisfaction. Beyond simple exposure, natural light can assume aesthetically appealing shapes and forms through the creative interplay of light and shadow, diffuse and variable light, and the integration of light with spatial properties. Natural light can be brought deep into interior spaces by such means as glass walls and clerestories, the use of reflecting colours and materials, and other design strategies. The experience of light in motion can be achieved through the contrast of lighter and darker areas and changes of daylight over time. (Calabresearchitects, May 5, 2015)

D. Landscape

Natural ventilation is important to human comfort and productivity. The experience of natural ventilation in the built environment can be enhanced by variations in air-flow, temperature, humidity, and barometric pressure. These conditions can be achieved through access to the outside by such simple means as operable windows, or by more com-plex technological and engineering strategies.

E. Interior

Indoor lighting and processed air have been made possible by advances in building technology and construction. The trade-off has often been the occurrence of static conditions that can be physically and psychologically debilitating interior can be designed to mimic the spectral and dynamic qualities of interior. Processed air can also simulate qualities of interior through variations in airflow, temperature, humidity and barometric pressure. (Calabresearchitects, May 5, 2015)

V. 14 PATTERNS OF BIOPHILLIC PATTERNS

NATURE IN THE SPACE	1 Visual Connection with Nature
	2 Non-Visual Connection with nature
	3 Non-Rhythmic Sensory Stimuli
	4 Thermal and Airflow Variability
	5 Presence of Water
	6 Dynamic and Diffuse Light
	7 Connection with Natural Systems
NATURAL ANALOGUES	8 Biomorphic Forms and Patterns
	9 Material Connection with Nature
	io Complexity and Order
NATURE OF THE SPACE	11 Prospect
	12 Refuge
	13 Mystery
	14 Risk / Peril

Based on the patterns of Biophilic, the study identified architectural works realized in the Lucknow region:

1) Glumac Shanghai Office
2) Kickstarter Commercial Headquarters
3) Shalimar Titanium
4) Lucknow development authority

The above-named architectural works are analysed to assess however they integrate the determinants of essential regionalism in their styles. By analysing every determinant in every of the identified regionalist works, the study makes an attempt to highlight that essential regionalism isn't a formula or a fashion, however a method that genuinely seeks to answer specific issues of an area. Moreover, by limiting itself to the Lucknow region, the study tries to indicate that despite similar site conditions thanks to close proximity, essential regionalisms ready to turn out varied architectural responses thanks to the discretion it affords architects in choice of external influences and also the final consolidation between them.

VI. CASE STUDY

A. Glumac Shanghai Office

Glumac's Shanghai office occupies the third floor of a historic building constructed in 1912 by American architect Louis Sullivan. This campus built for the Rockefeller family. Glumac and Gensler's innovative renovation of the 10,000 ft2 space is the first project in Asia to target full Living Building Challenge (LBC) certification. The reworked office blends historic building details, traditional Chinese motifs, contemporary design, and biophilic elements to create a space that celebrates the heritage of its site and ensures the comfort of its occupants.



Figure 2 -Image shows the view of how person perception (Source-Author)

B. Plan

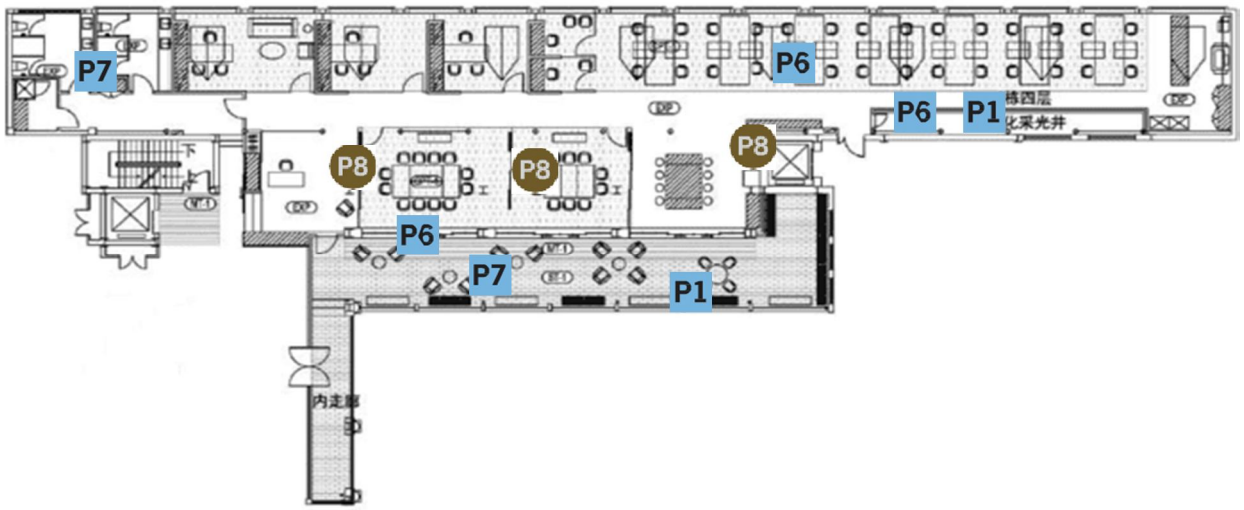
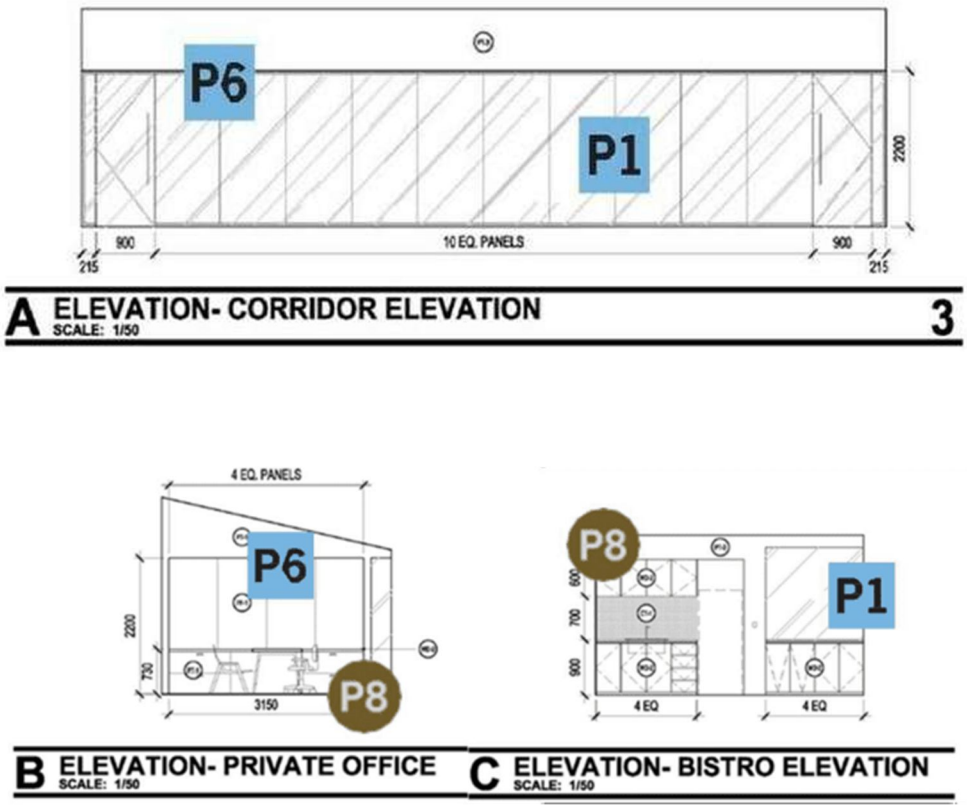


Figure 3 -Floor Plan of Glumac Shanghai (Source-Shangaioffice)

C. Elevation



1 Visual Connection with Nature
2 Non-Visual Connection with nature
3 Non-Rhythmic Sensory Stimuli
4 Thermal and Airflow Variability
5 Presence of Water
6 Dynamic and Diffuse Light
7 Connection with Natural Systems
8 Biomorphic Forms and Patterns
9 Material Connection with Nature
10 Complexity and Order
11 Prospect
12 Refuge
13 Mystery
14 Risk / Peril

Figure 4 -Elevation of Glumac Shanghai (Source-Shangaioffice)

VII. KICKSTARTER COMMERCIAL HEADQUARTERS

Kickstarter is a global crowd funding platform whose mission is to help bring creative projects to life. When looking for a new building that captures the heart of the company's culture, Kickstarter chose a former pencil factory in Brooklyn, NY. Designed by local architect Ole Sondresen, the commercial office fills out the entire 29,000 ft2 space, including a large green roof. "The existing building was deep, dark and partially below grade, which meant it had very little daylight or potential for fresh air." Ole Sondresen noted, "The solution was to carve out a courtyard, a very 'renaissance palazzo' idea, as this building is surrounded by industrial buildings. It was in need of a sense of interior relief for the user to connect to the outside."



Figure 4—Image shown the façade of Kickstarter Commercial Headquarters (Source: In habitat)

A. Plan

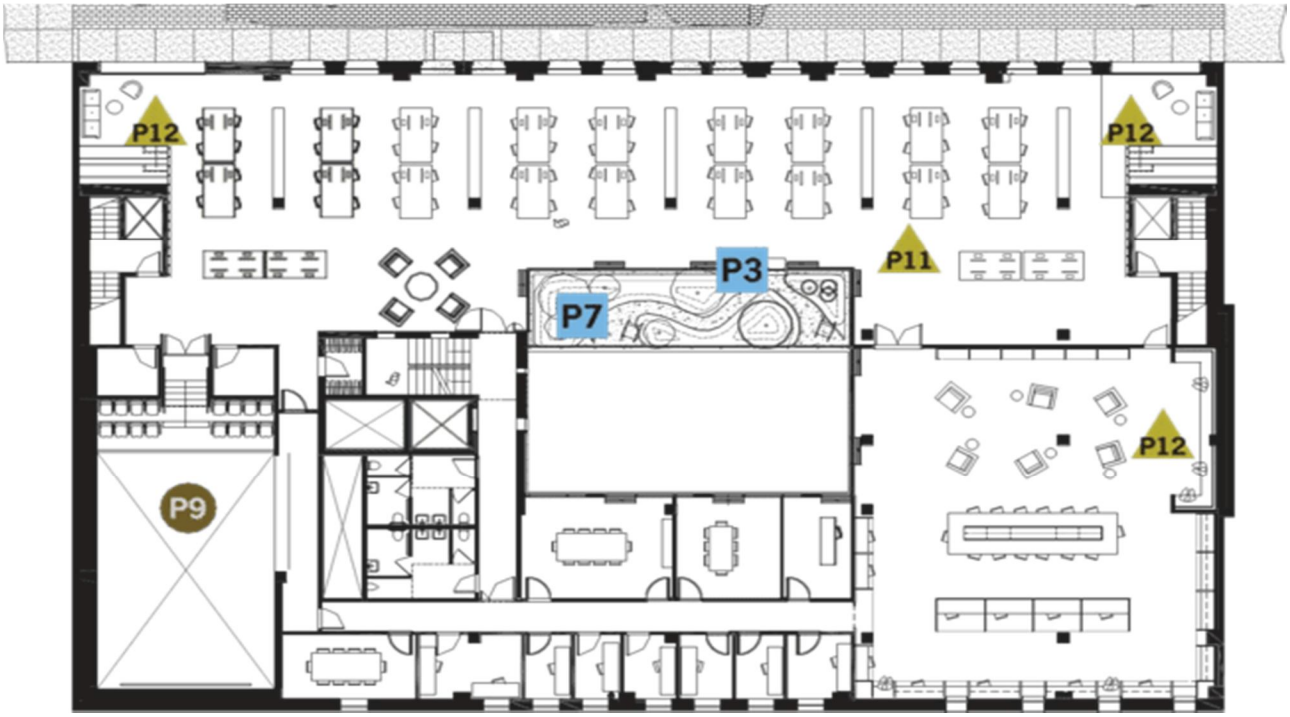


Figure 6 -Floor Plan of Kickstarter Commercial Headquarters (Source: In habitat)

B. Elevation

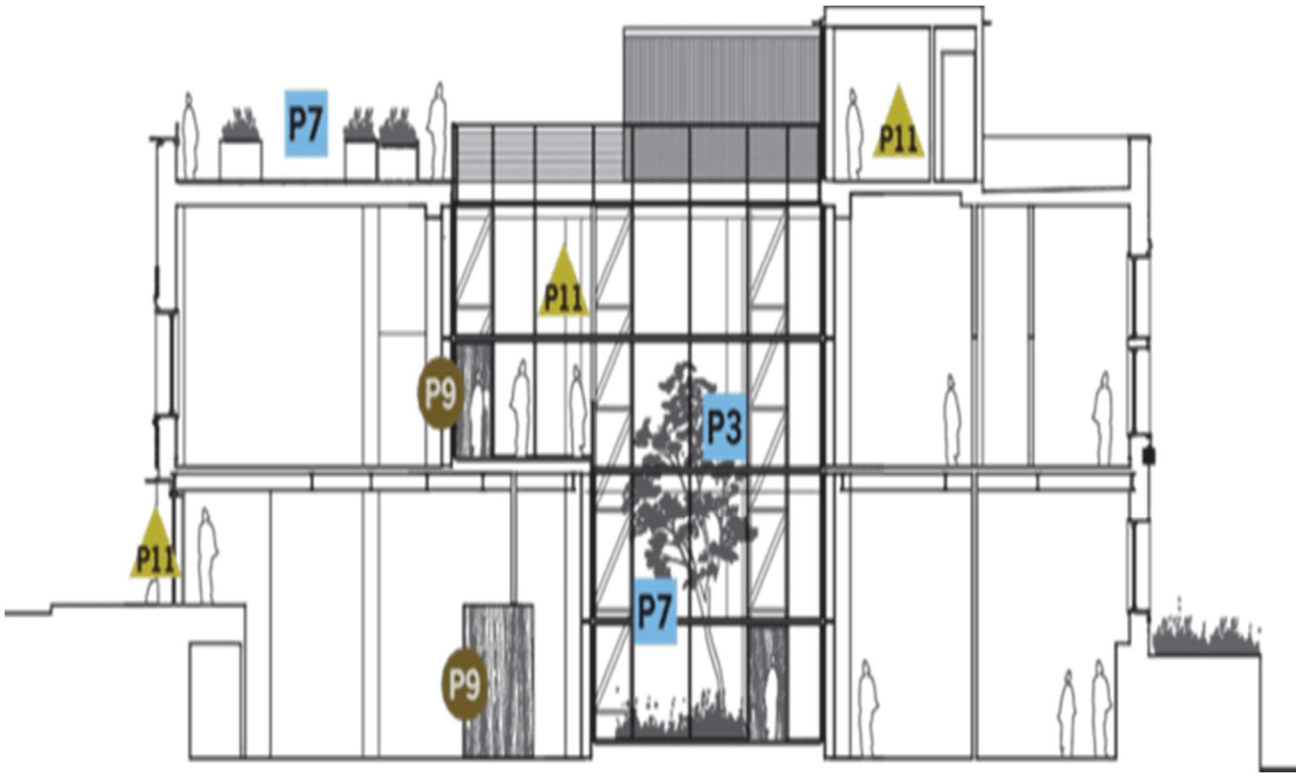


Figure 7 -Elevation of Kickstarter Commercial Headquarters (Source: In habitat)



PARAMETERS	CASE STUDY 1	CASE STUDY 2
	GLUMAC SHANGHAI OFFICE	KICKSTARTER COMMERCIAL HEADQUARTERS
FORM	It has a simple rectangular form	It has a square shaped form.
NATURAL VENTILATION	Large windows and spacious corridors are provided for natural ventilation	Glass walls with open central OTS are provided
NATURAL LIGHT	Windows, doors, glass walls are provided for natural light	Large windows, direct sunlight through windows in cabins
LANSCAPE	Trees, flower plants and gardens.	Garden, terrace garden
INTERIOR	Indoor plants, green walls, wallpapers, wooden furniture	Green walls with scenery wallpapers, violent colours for fresh mind and local material used in interior

Table 1 -Comparative analysis of Case study 1 & 2 (Source: Author)

PARAMETERS	PATTERNS	CASE STUDY 1	CASE STUDY 2	INFERENCES
A. FORM	3. Non–Rhythmic Sensory Stimuli	None	Direct view of native landscaping on each floor	We have to focus on direct view that how to make direct connection with landscape
	8. Biomorphic Forms and Patterns	Cloud shaped elements used on entry door	Fractal pattern with pine finishes	Natural patterns used in indoor spaces and also the same patterns are used in furniture too.
	9. Material Connection with Nature	Wood used in interior and furniture is also made by wood	Doors, details and seating's are made up of wood	Wood is very good and natural material which can be used in interiors for many different uses.
	10. Complexity and Order	None	Library bookshelves	Any design which looks very clean in shape and makes a order that will make any space look good.
	14. Risk/Peril	None	View from third floor in to courtyard	Anything which looks little dangerous like double heighted ceiling and many more designs.
B. NATURAL VENTILATION	4. Thermal and Airflow Variability	Windows and doors	Garage glass door	Glass gives you a very open view to outside and it is a good source to use in walls, door for thermal variability.

Table 2 - Inferences analysis of Case study 1 & 2 (Source: Author)

C. NATURAL LIGHT	6. Dynamic and Diffuse Light	Large glass walls,doors and windows	Courtyard, sunroom provided for dynamic and diffuse light	We can preserve dynamic and diffuse light from widows,doors and glass walls
	7. Connection with Natural Systems	Engage with local waste, water	Green roof and rainwater collection in courtyard	This pattern basically focuses on how to collect rain water and many more natural elements to further use.
	13. Mystery	View of plants from long hallway	None	Create any mysterious place in a building can make any space look good.
D. LANDSCAPE	1. Visual Connection with Nature	Indoor plants and garden	You can see outside from every corner of building	Indoor plants, or visually connection with nature from the building.
	5. Presence of Water	None	Water retention courtyard and downspout	We can give fountains or waterfall in building to give a sense of water presence.
	11. Prospect	long distance view from the patio	green roof provide prospect conditions with focal ranges greater than 20 feet	Views from a long distance which makes a focal point.
E. INTERIOR	2. Non–Visual Connection with Nature	odour of indoor plants	grasses, edible berries	replica of natural elements in indoor spaces
	12. Refuge	Movable partitions	high-backed chairs	Comfortable spaces which makes spaces big y removing partitions.

Table 2 - Inferences of Case study 1 & 2 (Source: Author)

VIII. SHALIMAR TITANIUM

The Shalimar Group was created in 1985 and is based in Lucknow, India. In Lucknow, it is well-known for its luxury home builders. The group's footprints include real estate, property management, various allied services, civil construction, imports and exports, and glass production, with an ever-growing and expanding corporate portfolio that is gradually establishing itself as a significant Business Conglomerate. Shalimar, having been founded on the principles of knowledge, competent management, and transparency, is well positioned to contribute to and profit from the growth and development of each of these businesses.

A. Floor Plan

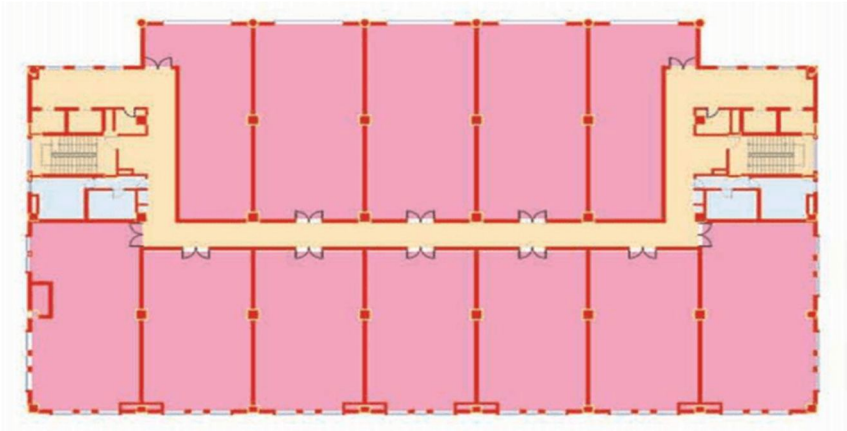


Figure 8 -Floor Plan of Shalimar Titanium (Source: Shalimar co.in)

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IX. LUCKNOW DEVELOPMENT AUTHORITY

As part of the Uttar Pradesh Urban Planning and Development Act of 1973, the Lucknow Development Authority (LDA) was established in 1974. Throughout Lucknow's metropolitan zones, the Lucknow Construction Authority (LDA) has excelled in land management and acquisition, housing development, and physical and social infrastructure. Land use, physical infrastructure, healthcare, and the living environment are among the development initiatives on which LDA's professional social scientists, engineers, and planners have been engaged in Lucknow. The Lucknow Development Authority has taken on a number of initiatives in the city's main areas, including infrastructure development. The Lucknow Development Authority has contributed to the city's growth and development.

A. Floor Plans

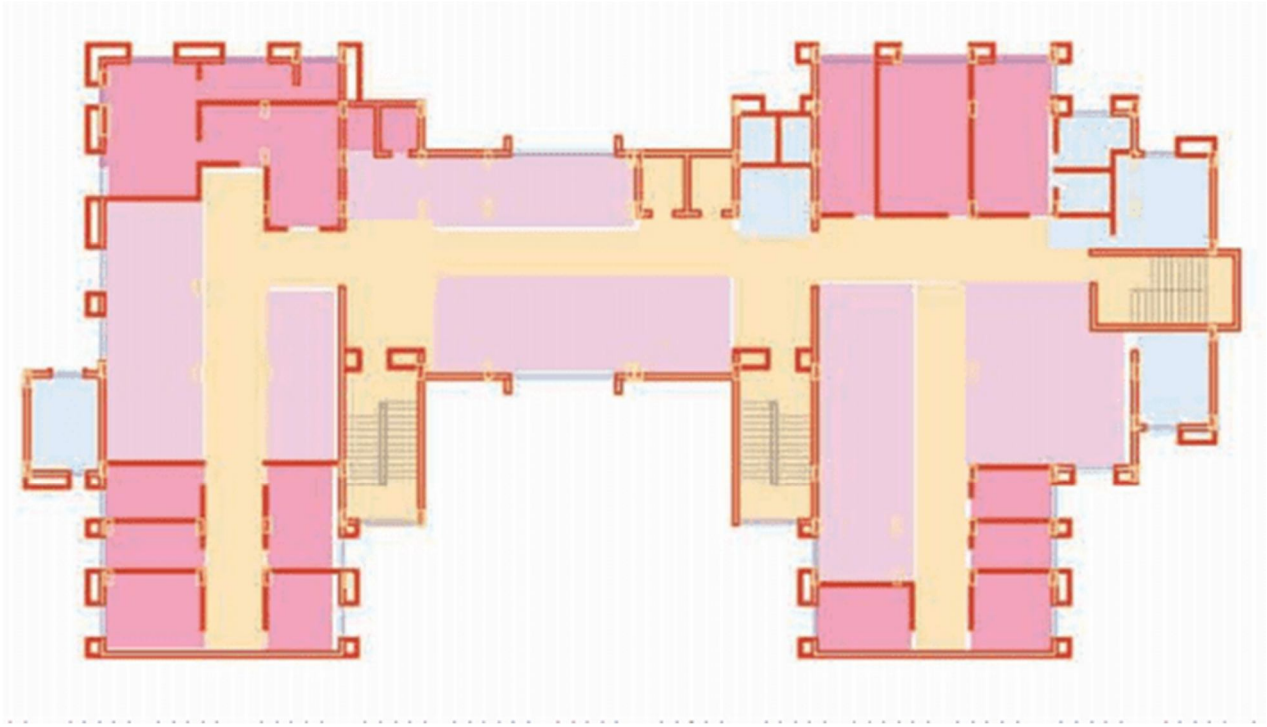


Figure 9 -Floor Plan of Lucknow Development Authority (Source: Lucknowdevlopmentauthority.in)

PARAMETERS	PRIMARY STUDY 1	PRIMARY STUDY 2
	SHALIMAR TITANIUM	LUCKNOW DEVELOPMENT AUTHORITY
A. FORM	It has a simple rectangular form	It has a geometrical shaped form.
B. NATURAL VENTILATION	Large windows and spacious corridors are provided for natural ventilation but these are not connected to cabins	Glass walls are provided but these are not fullfilling peoples need
C. NATURAL LIGHT	Windows, doors, glass walls are not connected directly to cabins	Large windows, direct sunlight is not reachable to cabins
D. LANSCAPE	Terrace garden is provided for employees	
E. INTERIOR	Indoor plants, wooden furniture	Wooden furniture

Table 3 – Comparative Analysis of Primary study 1 & 2 (Source: Author)

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PARAMETERS	PATTERNS	PRIMARY STUDY 1	PRIMARY STUDY 2	INFERENCES
A. FORM	3. Non–Rhythmic Sensory Stimuli	71% people are agree to have non - rhythmic sensory stimuli in their place.	93% people are agree to have non - rhythmic sensory stimuli in their place.	Most of the people want non-rythmic sensory in their workplaces fo better comfort.
		29% people are agree to have non - rhythmic sensory stimuli in their place.	7% people are agree to have non - rhythmic sensory stimuli in their place.	
		0% people are agree to have non - rhythmic sensory stimuli in their place.	0% people are agree to have non - rhythmic sensory stimuli in their place.	
		0% people are agree to have non - rhythmic sensory stimuli in their place.	20% people are agree to have non - rhythmic sensory stimuli in their place.	
	8. Biomorphic Forms and Patterns	20% people are agree to have a biomorphic forms and patterns.	67% people are agree to have a biomorphic forms and patterns.	Most of the people want biomorphic forms and patterns in their workplaces fo better comfort.
		46% people are strongly agree to have a biomorphic forms and patterns.	27% people are strongly agree to have a biomorphic forms and patterns.	
		27% people are disagree to have a biomorphic forms and patterns.	6% people are disagree to have a biomorphic forms and patterns.	
		7% people are strongly disagree to have a biomorphic forms and patterns.	0% people are strongly disagree to have a biomorphic forms and patterns.	
	9. Material Connection with Nature	60% people are agree to have a material connection with nature.	20% people are agree to have a material connection with nature.	Most of the people want non-rythmic sensory in their workplaces fo better comfort.
		20% people are strongly agree to have a material connection with nature.	27% people are strongly agree to have a material connection with nature.	
		20% people are disagree to have a material connection with nature.	33% people are disagree to have a material connection with nature.	
		0% people are strongly disagree to have a material connection with nature.	20% people are strongly disagree to have a material connection with nature.	
	10. Complexity and Order	60% people are agree to have a complexity and order.	25% people are agree to have a material complexity and order.	50% people want complexity and order in their workplaces for better comfort and 50% people don't want complexity and order in their workplaces.
		27% people are strongly agree to have a complexity and order.	0% people are strongly agree to have a complexity and order.	
		13% people are disagree to have a complexity and order.	50% people are disagree to have a complexity and order.	
		0% people are strongly disagree to have a complexity and order.	25% people are strongly disagree to have a complexity and order.	
	14. Risk/Peril	27% people are agree to have a risk factor in their place.	6% people are agree to have a risk factor in their place.	Most of the people don't want risk factors in their workplaces.
		27% people are strongly agree to have a risk factor in their place.	7% people are strongly agree to have a risk factor in their place.	
		33% people are disagree to have a risk factor in their place.	20% people are disagree to have a risk factor in their place.	
		13% people are strongly disagree to have a risk factor in their place.	67% people are strongly disagree to have a risk factor in their place.	

Table 3 – Comparative Analysis of Primary study 1 & 2 (Source: Author)

C. NATURAL LIGHT	6. Dynamic and Diffuse Light	27% people are agree to have a Dynamic and Diffuse Light	20% people are agree to have a Dynamic and Diffuse Light	Most of the people want dynamic and diffuse light in their workplaces for better comfort.
		67% people are strongly agree to have a Dynamic and Diffuse Light	80% people are strongly agree to have a Dynamic and Diffuse Light	
		0% people are disagree to have a Dynamic and Diffuse Light	0% people are disagree to have a Dynamic and Diffuse Light	
		6% people are strongly disagree to have a Dynamic and Diffuse Light	0% people are strongly disagree to have a Dynamic and Diffuse Light	
B. NATURAL VENTILATION	4. Thermal and Airflow Variability	63% people are agree to have a thermal and Airflow Variability.	67% people are agree to have a thermal and Airflow Variability.	Most of the people want thermal and Airflow Variability in their workplaces for better comfort.
		31% people are strongly agree to have a thermal and Airflow Variability.	33% people are strongly agree to have a thermal and Airflow Variability.	
		6% people are disagree to have a thermal and Airflow Variability.	0% people are disagree to have a thermal and Airflow Variability.	
		0% people are strongly disagree to have a thermal and Airflow Variability.	0% people are strongly disagree to have a thermal and Airflow Variability.	
	7. Connection with Natural Systems	53% people are agree to have a connection with Natural Systems.	20% people are agree to have a connection with Natural Systems.	Most of the people want connection with Natural Systems in their workplaces fo better comfort.
		47% people are strongly agree to have a connection with Natural Systems.	67% people are strongly agree to have a connection with Natural Systems.	
		0% people are disagree to have a connection with Natural Systems.	6% people are disagree to have a connection with Natural Systems.	
		0% people are strongly disagree to have a connection with Natural Systems.	7% people are strongly disagree to have a connection with Natural Systems.	
	13. Mystery	33% people are agree to have a mysterious place in their built environment.	7% people are agree to have a mysterious place in their built environment.	Most of the people don't want mysterious place in their workplaces.
		7% people are strongly agree to have a mysterious place in their built environment.	13% people are strongly agree to have a mysterious place in their built environment.	
		53% people are disagree to have a mysterious place in their built environment.	60% people are disagree to have a mysterious place in their built environment.	
		7% people are strongly disagree to have a mysterious place in their built environment.	20% people are strongly disagree to have a mysterious place in their built environment.	

Table 3 – Comparative Analysis of Primary study 1 & 2 (Source: Author)

D. LANDSCAPE	1. Visual Connection with Nature	80% people are agree to have a visual connection with nature.	73% people are agree to have a visual connection with nature.	Most of the people want visual connection with nature in their workplaces for better comfort.
		20% people are strongly agree to have a visual connection with nature.	27% people are strongly agree to have a visual connection with nature.	
		0% people are disagree to have a visual connection with nature.	0% people are disagree to have a visual connection with nature.	
		0% people are strongly disagree to have a visual connection with nature.	0% people are strongly disagree to have a visual connection with nature.	
	5. Presence of Water	73% people are agree to have a presence of water.	13% people are agree to have a presence of water.	Most of the people want presence of water in their workplaces for better comfort.
		7% people are strongly agree to have a presence of water.	40% people are strongly agree to have a presence of water.	
		20% people are disagree to have a presence of water.	27% people are disagree to have a presence of water.	
		0% people are strongly disagree to have a presence of water.	20% people are strongly disagree to have a presence of water.	
	11. Prospect	40% people are agree to have a prospect.	27% people are agree to have a prospect.	Most of the people want prospect in their workplaces for better comfort.
		60% people are strongly agree to have a prospect.	73% people are strongly agree to have a prospect.	
		0% people are disagree to have a prospect.	0% people are disagree to have a prospect.	
		0% people are strongly disagree to have a prospect.	0% people are strongly disagree to have a prospect.	
E. INTERIOR	2. Non–Visual Connection with Nature	67% people are agree to have a Non–Visual Connection with Nature.	100% people are agree to have a Non–Visual Connection with Nature.	Most of the people want Non–Visual Connection with Nature in their workplaces for better comfort.
		33% people are strongly agree to have a Non–Visual Connection with Nature.	0% people are strongly agree to have a Non–Visual Connection with Nature.	
		0% people are disagree to have a Non–Visual Connection with Nature.	0% people are disagree to have a Non–Visual Connection with Nature.	
		0% people are strongly disagree to have a Non–Visual Connection with Nature.	0% people are strongly disagree to have a Non–Visual Connection with Nature.	
	12. Refuge	80% people are agree to have a refuge place in their built environment.	34% people are agree to have a refuge place in their built environment.	Most of the people want refuge areas in their workplaces for better comfort.
		20% people are strongly agree to have a refuge place in their built environment.	53% people are strongly agree to have a refuge place in their built environment.	
		0% people are disagree to have a refuge place in their built environment.	13% people are disagree to have a refuge place in their built environment.	
		0% people are strongly disagree to have a refuge place in their built environment.	0% people are strongly disagree to have a refuge place in their built environment.	

Table 3 – Comparative Analysis of Primary study 1 & 2 (Source: Author)

PARAMETER	PATTERNS	COGNITIVE FUNCTIONING	PSYCHOLOGICAL COMFORT	PHYSICAL COMFORT
FORM	Non–Rhythmic Sensory Stimuli	Observed & quantified behavioural measures of attention & exploration		Positively impacted on heart rate, systolic blood pressure & sympathetic nervous system activity
	Biomorphic Forms and Patterns		Observed view preference	
	Material Connection with Nature	Improved creative performance	Improved comfort	Reduced diastolic blood pressure
	Complexity and Order		Observed view preference	Positively impacted perceptual & physiological stress responses
	Risk/Peril		Induced strong pleasure response	
NATURAL VENTILATION	Thermal and Airflow Variability	Positively impacted Concentration	Improved perception of temporal & spatial pleasure	Positively impacted comfort, well- being & productivity
NATURAL LIGHT	Dynamic and Diffuse Light			Positively impacted circadian functioning increased visual comfort
	Connection with Natural Systems		Enhanced positive health responses shifted perception of environment	
	Mystery		Induced strong pleasure response	
LANDSCAPE	Visual Connection with Nature	Improved mental engagement/ attentiveness	Positively impacted attitude & overall happiness	Lowered blood pressure & heart rate
	Presence of Water	Improved concentration & memory restoration. Enhanced perception & psychological response	Observed preferences & positive emotional response	Reduced stress increased feeling of tranquility, lower heart rate &blood pressure
	Prospect	Reduced boredom, irritation, fatigue	Improoved comfort & perceived safety	Reduced stress
INTERIOR	Non–Visual Connection with Nature	Positively impacted on cognitive performance	Percieved improvements In mental health & tranquility	Reduced systolic blood pressure & stress hormones
	Refuge	Improved concentration,attention & perception of safety		

Table 4 – Effect Of Biophilic Design On Psychological & Physical Comfort (Source: Author)

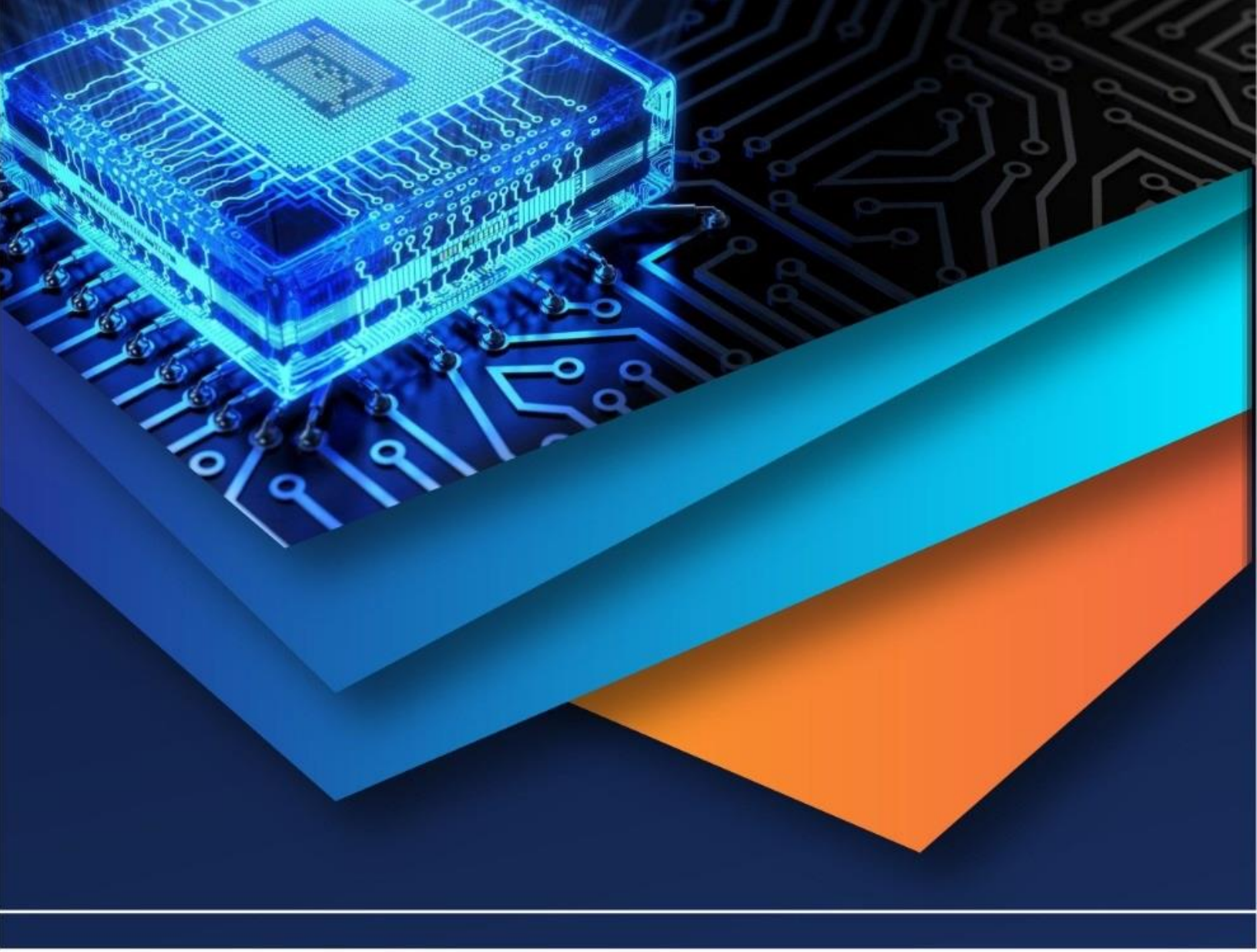
X. CONCLUSIONS

The characteristics of a biophilic design are more of a strategy than a list of requirements. Rather than being a formula, biophilic design is a strategy that may be tweaked and used at many levels based on the location and circumstance. Only the issue of upkeep is a significant component that must be addressed if Biophilic design is to be properly implemented. Case studies can be used to demonstrate that the design is the product of a preferred method rather than a budget or space constraint. While most schools place a premium on energy efficiency and ventilation, sensory stimulation in the classroom and proximity benefits are sometimes overlooked. The site's location is crucial, but it isn't the most important factor to consider when creating a biophilic habitat. Components that support natural elements in interiors may help to create a biophilic environment when employed to create a kinesthetic experience. While having all of the Biophilic design elements in place isn't required, having one or two of them successfully executed can boost the space's pleasure and productivity. Combining biophilic qualities with technology and enhanced infrastructure is also critical. Integration of these aspects is required for the successful design of the school's learning environment. Biophilic design has the ability to connect the workplace with nature on the street, in the neighborhood, and at the community/city level, according to this research. The case studies all focused on strategies for ensuring that biodiversity can thrive in urban settings, demonstrating that the issue isn't whether cities have enough green space or are too congested, but rather how these places can be biophilic, allowing people to connect to our basic desire for connection. Our city should not be considered as a destination to be visited just on special occasions, but as a part of everyday life where one may be soothed, delighted, comforted, refreshed, inspired, or regenerated by nature. Architects, landscape architects, and designers are clearly incorporating biophilic ideas into their work, but planners and urban designers appear to be trailing behind. One of the outcomes is that subtle design aspects are highlighted, which may assist urban planners figure out what else has to be addressed while designing a framework. Current experiments might look into and analyses the effects of each biophilic quality on people, as well as establish a case study evidence foundation for biophilic design in urban design efforts. Across the study, it became clear that Biophilia has a lot of potential to be investigated in the perspective of architecture. Due to the fact that various studies have been conducted to support the connection with people and its influence on health including well, there is a gap between the results and practical guidance and recommendations. The study gives a framework or scientific technique for turning theoretical notions into real recommendations, but it doesn't go into great depth about how to use it throughout the design process. Governments, planners, and designers must embrace the notion and adapt it to their respective domains, evaluating its relevance and developing a modified framework that brings it closer to execution.

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