



IJRASET

International Journal For Research in
Applied Science and Engineering Technology



INTERNATIONAL JOURNAL FOR RESEARCH

IN APPLIED SCIENCE & ENGINEERING TECHNOLOGY

Volume: 10 Issue: VIII Month of publication: August 2022

DOI: <https://doi.org/10.22214/ijraset.2022.46441>

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A Comparative Analysis of Biophilic Approach in Building Design

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Abstract: Today's growing modern cities become a cause for a greater number of environmental issues like global warming, earthquake, urban heat effects, and pollution, which ends in environmental degradation. People are spending a large part of their life in a confined environment, henceforth we need to consider their perspective in those spaces and bring sustainable ideas in it. As a designer and architect, we play a major role in implementing the nature-based approaches like biophilic design in our projects to create awareness among people about sustainable built forms. This becomes a connecting component between humans and nature on an infrastructure level and becomes more effective physically and mentally for the human life to live in. This study reviews the various outcomes in different climatic zones, its advantages and its well-being in environmental behavior. This ideology would work efficiently and adaptable to its surrounding environment and helps solve environmental issues in today's world.

Keywords: Biophilic, Sustainable, Nature, Human life, Environment

I. INTRODUCTION

The biophilic building generates an intensive connection with the human mind and body. There are various patterns and methods for implementing these kinds of concepts in our buildings in a way that enhances the human-nature relationship. These concepts can be implemented on walls, roofing systems, interior spaces as green pockets, nature-inspired forms and characteristics, green roofs, walls, etc.

The city's rapid urbanization is deploying today's environment through modernized constructions and technologies. One of the outcomes of urbanization would be excluding nature from the living environment. The denser urban fabrics also reduce the green spaces and technological advancement separates people from Mother Nature. So, this disconnection of nature creates Bio phobic conditions in people and fear of living. In their day-to-day busy schedules, they need some refreshing space to revive their mind and well-being. Seasonal changes influence people's comfort towards nature and improve the mental ability of children.

Bringing natural elements into a life-giving space (Nature in Space) would justify the concept of Biophilic design which creates a terminology for connecting humans and space. This approach mentioned above will help create and innovate various design ideologies as a potentially positive impact on our environment.

II. METHODOLOGY

The research methodology involves the analysis of various Biophilic architecture buildings in different climatic zones, which helps in understanding its impact and their advantages on occupant's life in the surrounding environment.

III. BIOPHILIC APPROACH

This Biophilic design is classified into three broad categories; they are Nature in the Space, Natural Analogues, and Nature of the Space; these are the basic framework to implement a biophilic design in the environment that enriches the biodiversity of the place. The relationship between nature, humans and the design of the built environment benefits the humans by creating an experience of biophilia in building design applications.^[1]




Table 1:Biophilic Patterns (Source: Created by authors)^[1]

| Typologies | Patterns | Description |
|---------------------|-----------------------------------|---|
| Nature in the Space | Non-Visual Connection with Nature | By implementing a sense of touch, motions, hearing, smell, and taste stimulus creates a positive impact on human minds. |

| | | |
|---------------------|---------------------------------|--|
| | Non-Rhythmic Sensory Stimuli | Natural patterns that are pleasing to the sensory and last for a short period and it is analyzed periodically e.g. chirping of birds, leaves rustling, the scent of eucalyptus in the air. |
| | Thermal & Airflow Variability | Change in temperature, humidity levels, airflow, and things that depict nature. |
| | Presence of Water | A place that is enhanced by the presence of water by hearing, touching & views the water. |
| | Dynamic & Diffuse Light | Different natural lights and shadows from trees, plants, etc. that vary with time will create a pleasing natural environment. |
| | Connection with Natural Systems | Natural processes like seasonal and temperature changes naturally connect people with nature. |
| Natural Analogues | Biomorphic Forms & Patterns | Incorporating different textures and arrangements of different patterns at different levels that exist in nature. |
| | Material Connection with Nature | Designing with materials and elements that are less processed and depict the local life and sense of the place. |
| | Complexity & Order | Providing sensory information that holds the spatial gradation that confront in nature. |
| Nature of the Space | Prospect | Creating an uninterrupted view from a distance for observation and planning. |
| | Refuge | Designing an enclosed space that is separated from the activity spaces that should not create a cramped environment. |
| | Mystery | Creating a space with views that are partially hidden will create a curiosity in the people to explore the space. |
| | Risk/Peril | Thrilled experience combined with well-grounded safety measures. |

IV. COMPARATIVE STUDY

Table 2: Comparative study (Source: Created by authors) [2] [3] [4][5][6]

| | | | | |
|-------------|---|---|--|---|
| Description |  |  |  |  |
|-------------|---|---|--|---|

| | East gate center | The Gherkin | Parkroyal Pickering | Glumac shanghai office |
|-----------------|---|---|--|--|
| Location | Zimbabwe | London | Singapore | China |
| Area | 31,600Sq.m(340140 sq. ft) | 47,950 Sq.m(516,100 sq. ft) | 29,812 Sq.m (320,890 sq. ft) | 929 Sq.m (10,000 sq. ft) |
| Building Height | 9 Floors | 180m (41 floors) | 89m (15 floors above ground) | 1 Floor |
| Architect | Mick Pearceo | Foster + Partners | WOHA | Louis Sullivan |
| Approach | Biomorphic | Biomorphic | Biophilic | Biophilic |
| Typology | Shopping complex, Office Building | office building | Hotel | office building |
| Green Rating | Green Building Council of South Africa (GBCSA) certified | LEED Platinum | BCA Green Mark Platinum | LEED Platinum |
| Climate | Subtropical climate | Humid continental climate | Tropical climate | Temperate Monsoon Climate |
| Concept | Natural analogues-Biomorphic Forms & Patterns (Termite Hill) – They have a ventilation core at the center which is inspired from the termite mound to keep the building cool as a result of stack effect. | Natural analogues-Biomorphic Forms & Patterns (Venus’s flower basket sponge) – The structural system and form which are replicated water sponge gives the same structural ability system in air | Nature in the space- Visual Connection with Nature - Hanging garden features in the back façade creates a pleasant Naturalistic style to the building. Natural analogues-Biomorphic Forms & Patterns, Complexity & Order - Textured contoured spaces create a natural form to that place. Nature of the space - Risk/Peril – The complex form creates a risk feel with the moment of excitement sensation. | Nature in the space- Visual Connection with Nature - Shanghai office is designed with curative views with elements of natural living systems which improves productivity. Natural analogues-Dynamic & Diffuse Light, Connection with Natural System - Differing light intensities and shadow changes from time to time create a natural environmental feel inside the building. Nature of the space - Biomorphic Forms & Patterns- Textured contoured spaces creates a natural form to that place. |
| Inference | By replicating the cooling tower concept it saves more energy compared to other commercial sectors and has low environmental impact. | This glass sponge typology which has an exoskeleton round structure provides stiffness and diverts forces from strong currents and creates a natural ventilation system. | It provides recuperative experiences for the guests as well as for its residents; it is a visual treat that depicts the Singaporean culture and ecology of the place. | Glumac Shanghai office design assists people to explore the benefits of biophilic design in the built environment and helps to promote human health and ecological balance. |



V. CONCLUSION

The blending of natural strategies in all scales of an urban infrastructure balances the built structure and the surrounding environment's sustainability. The incorporation of these biophilic concepts satisfies both the aesthetic importance and functionality of that space. Using this typology in the building will also reduce the negative impact on the environment such as carbon footprint, waste emission, and pollution, and safeguard nature for the upcoming generations to live in. Incorporating green spaces, water elements, plants, and natural materials would be a comforting habitat for peaceful and a healthy life. Growing urban lifestyle affects the physical and mental health of a person, so the process should be a supportive format for the physical and psychological well-being of a person. Bringing the outdoor spaces inside helps in stress relief, improves mental health, and makes them live happier and healthier. So, merging the natural elements in the buildings makes the city and its surroundings a pleasant environment.

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