

“Biophilic Architecture-Importance and Advantages”

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Abstract - Human mind has intricate link with the nature which has been established over ages. Today with rapid urbanization, dense built forms and designs have isolated us from nature by drawing opaque walls and restricting the natural environment to remain out. Emotional and spiritual sensory satisfactions are obtained by close relation and identification of place in which people live. The interplay and identification generate the spirit of the place. Biophilic design establishes the relationship between nature, human biology and design of the built environment.

Biophilic design is an innovative way of designing the indoor and outdoor spaces which reflect and makes us feel with our senses, the presence of nature nearby. These innovative designs help to increase the productivity & creativity and decrease stress level by creating happy and healthy work environment. **This paper aims to study the “Green Elements of Biophilic Architecture” that improves the indoor and outdoor environment in terms of aesthetics, quality of work environment and urban form.** This fusion of nature into the built form creates a spirit of place through elements of Biophilic design giving identity to space where nature and man made objects co-exists.

Key Words: ecology, green facade, green building, Urban landscape, human comfort, micro climate

1. INTRODUCTION

This Biophilic Design in Architecture is an emerging concept in Architecture that relates to human health, ecology and sustainability. It tries to integrate part of Architectural formation with building material, healthy architectural spaces, location, topography, local vegetation, and micro & macro climate. The interpretation and final implementation of Biophilic architecture has a regional dimension with regard to environment and culture. It offers an exciting opportunity to achieve environmental, moral, social and economic benefits.

The positive environmental impact or Biophilic designs evolve beneficial contact between people and nature in modern buildings. Biophilic design studies the impact of environmental qualities such as light, color, space, shape, air, material and vegetation on human psychology and physiology. By applying this knowledge designers can manipulate/create spaces to improve the human experiences that occur when interacting with these qualities.

1.1 GREEN BUILDING ELEMENTS

The green building elements in terms of Biophilic design may be thought of as an external covering element that consists of a thin layer of living vegetation covering or enveloping the built mass in exterior and interior. This living vegetation is not heavy and easy to maintain. These light weight systems are durable and beautiful and provide insulation to solve important urban problems. This vegetation protects the buildings from direct solar radiation, thus increasing the Thermal performance of the buildings and also improving the air quality of the indoor and outdoor environment. The green cover can be achieved on roof top, façade (vertical gardening) and interiors. It produces a positive effect on health and ecology. The green roof cover and green façade directly affects the inhabitants feeling of comfort and aesthetic of the buildings. Thus this introduced green cover of Biophilic design contributes to maintain a balance between human (built environment) and environment (nature).

1.2 POSITIVE EFFECTS OF GREEN BUILDINGS ELEMENTS

The positive effects of green buildings are:-

- a. Altering the micro-climate.
- b. Reducing roof top temperature(solar heat gain)
- c. Filtering of dust from air.
- d. Reducing the Urban heat(cooling effect in summer and warming effect in winters)
- e. Increasing water retention capacity
- f. Reducing Urban Island effect.
- g. Reduced power consumption.
- h. Relieving the damage on ecology.
- i. Reducing the air borne pollution.
- j. Protection against UV radiation.
- k. Improving the aesthetical quality of environment.

1.3 VEGETATION AND PLANT LIFE ON GREEN BUILDING ELEMENTS

Plant selection and size depends on the depth of the growing medium and local climate. There is a deep impact when the leaves are thick and dense. Generally low growing plants are used when the depth of growing medium is shallow say restricted up to few centimeters. If the growing medium is deep say several centimeters deep then shrubs and small trees can also be grown.

Indoor plants contribute to at least 75% of Indoor Environmental Quality (IEQ) Criteria*

Table -1: *Criteria list: NSW Gov. Workplace Guidelines, 2010. +Overseas studies; ++ O/S & UTS studies

SNO.	IEQ CRITERION	INDOOR PLANTS
1	AIR POLLUTION MITIGATION	Reduce all types of UAP++; healthy plants do not contribute to unhealthy mould spore concentrations++
2	LOW EMITTING MATERIALS	Absorb toxic emissions — VOCs etc.++
3	VENTILATION EFFECTIVENESS	Increase effectiveness; remove CO2 /replace with O2 ++; & lower indoor particulate levels
4	LIGHTING	OK for Plants? — OK for staff also++
5	NOISE	Absorb & buffer noise+
6	VEIEWS	Add aesthetics & calming greenery; lower stress++
7	THERMAL COMFORT	Not directly influenced — but tend to stabilise Humidity in human comfort zone, so could have unquantified effects here+
8	SYSTEMS CONTROLLABILITY	Not directly influenced — but stabilisation of temperature and humidity (as well as enhanced CO2 reduction) could lower air-con. energy consumption

1.4 INDOOR PLANTS: -

- a. Reduce indoor air pollution
- b. Reduce workplace illness

- c. Reduce sick-leave absences
- d. Reduce stress and negativity
- e. Do not create unhealthy mould problems
- f. Raise performance & productivity Improve job satisfaction
- g. Enhance business image with potential clients
- h. Improve school performance & patient wellbeing
- i. Contribute to meeting at least 75% of Indoor Environmental Quality (IEQ) criteria

1.5 GREEN ADVANTAGE OF BIOPHILIC ARCHITECTURE

A. ENERGY SAVING CONCEPT: Energy efficiency can be assessed through Heat management on the different components of buildings. This heat management is achieved by introducing green cover in exterior, thus reducing direct solar heat gain. The critical role of Green building components is to insulate, conserve and hold back a change in energy flux, between inside and outside. High level of thermal comfort and lower level of heat losses are achieved in passive Biophilic architecture through a compact system of insulations. Green building elements provide environmental and human health benefits by altering the urban island effect, lowering the pollution level and improving the overall aesthetical environment of the city.

B. HUMAN COMFORT AND HEALTHY PERFORMANCE: Studies show that hobby activities conducted in natural environment help people to handle stress. The building surrounded by gardens and parks fetch higher market value. People inhabiting the rooms/spaces facing/housing visual connectivity with nature show higher energy level of occupants and less sick leaves. Indoor plant presence increases productivity, performance, job satisfaction, by >10%, measured by:-

- 1) Faster times to complete computer tasks
- 2) Creative task performance
- 3) Sorting and editing tasks
- 4) Attention capacity
- 5) Job satisfaction (on all 10 criteria tested)
- 6) Promotes good office relationships

C. **AMELIORATE OF LOCAL MICRO- CLIMATE:** A green building element has significant impact on heat gain and loss of a building, humidity, air quality and absorbed/reflected heat to the surrounding. Green building elements control the urban island effect due to the increased vegetation they bring through the Urban landscape. Plants cool the surrounding environment by absorption of solar radiation and humidifying the air. They can play a vital role in reducing the green house gas emissions adapting Urban Areas.

D. **INDOOR PLANT PRESENCE IMPROVES BUSINESS IMAGE:** show workplace plants give perception that the company is:-

- a. Trustworthy
- b. Warm and welcoming
- c. Stable and balanced
- d. Patient and caring
- e. Concerned for staff wellbeing
- f. Provide a healthier, cleaner atmosphere

2. GREEN BIOPHILIC DESIGNS- ARCHITECTURAL BENEFITS

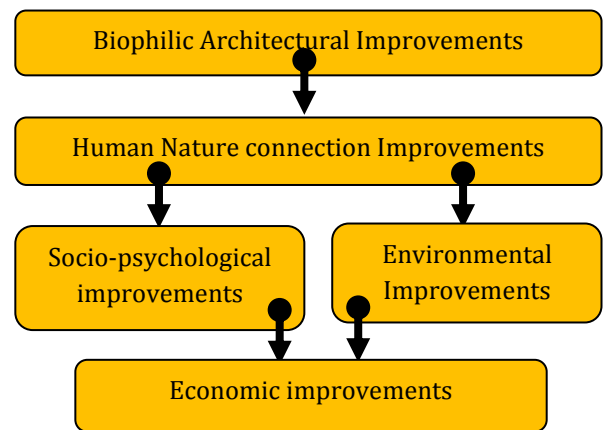
The architectural benefits are as follows: -

- a. Utilize available outdoor area (External Landscape) – Short break in between long continuous sessions of working hours helps the people to increase their concentration on work and relieve stress.
- b. Access to natural light and views of the outside- Natural light and outdoor views have significant impact on productivity and well being of the occupants.
- c. Design includes/accommodate plant life in the indoors- Biophilic designs try to include plant life in the workplace which increases oxygen levels and subsequently improve concentration levels and decrease mental fatigue.
- d. Biophilic designs give space- Biophilic designs give staff space and choice and avoid over crowded and noise. It introduces a sense of calmness in the environment.

2 GREEN BIOPHILIC DESIGNS- ECONOMIC BENEFITS

The economic benefits from Biophilic designs are: -

- a. Health and healing
- b. Decreasing violence and crime
- c. Increased worker productivity
- d. Increased property value and employee attraction
- e. Increased rental potential
- f. Increased liveability- enabling higher density and reduced footprint.



BIOPHILIC ARCHITECTURAL BENEFIT FLOW

3. CONCLUSION

The scope of Biophilic architecture is rapidly growing. The fundamental concept of improving space quality and work environment is achieved by Human-nature connection in daily urban life. The green aspect of Biophilic Architecture has multiple benefits like improving productivity, creating sustainable built environment, reducing pollution and energy consumption with increased economic benefits. It is suggested that designers, developers, planners and Government agencies should realize the importance of Biophilic design at initial level to harvest maximum benefit at implementation stage.

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