IJBPAS, December, Special Issue, 2021, 10(12): 26-42

ISSN: 2277–4998

International Journal of Biology, Pharmacy and Allied Sciences (IJBPAS)

'A Bridge Between Laboratory and Reader'

www.ijbpas.com

ANALYSIS ON AWARENESS AND FACTORS INFLUENCING BIOPHILIC DESIGN TRENDS

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Received 19th Aug. 2021; Revised 20th Sept. 2021; Accepted 29th Oct. 2021; Available online 1st Dec. 2021

https://doi.org/10.31032/IJBPAS/2021/10.12.2003

ABSTRACT

In the design process, Biophilic design emerges as a solution to meet the need for comfortable accommodation while remaining in touch with nature without breaking the relationship with essence. The objective to conduct the study was to ascertain awareness of Interior Designers' and Architects' regarding Biophilic Designs and to determine the factors influencing Biophilic Designs trends. The study was descriptive in nature. Questionnaire was used to collect data from 37 architects and 30 Interior Designers of Vadodara city selected through Purposive Random Sampling Method. The present study showed that (61%) were Architect and more than one-fourth respondents were Interior Designers (39%) had field experience (60%) of less than 5 years whereas (21%) had 6-10 years of field experience and (72%) works on both residential and commercial projects. Majority of the respondents (83.11%) agreed that Biophilic design is about creating a cohesive natural environment inside and Biophilic design is a concept used within the building industry to increase occupant connectivity to the nature (80.53%), they also agreed (80.51%), that in the built environment, direct experiences of nature refer to plants, light, water any aspect that provides direct contact with green elements. Respondents (70.12%) agreed that through columns and natural based patterns, natural shapes and forms can be

achieved in architectural designs. Majority (81.80%) of the respondents agreed that Biophilic Design are creative interplay of natural lighting, spaciousness, plants, and water in a central atrium can simulate the qualities of an exterior setting in an indoor space. Respondents (88.30%) agreed that having a view of nature whilst studying/working reduces stress levels. It was observed that respondents have high extent awareness regarding first aspect of Biophilic Design i.e. Concept of Biophilic design (86.00%) and direct experience of nature in biophilic design (86.00%). Respondents (92.50%) reported that being surrounded by nature can be helpful for those who have major depressive disorder, Biophilic design is the best way to create a natural connection indoors (91.50%), walking in nature reduces anxiety as well as negative thoughts, feelings of depression and improve memory (91.50%) and for those who work-from-home, biophilic design helps with attention deficits, improves attention spans, and aids in mental restoration (89.10%) were the key factors that influenced Biophilic design trends. Majority of the respondents (82%) have implemented Biophilic design in any of the projects undertaken by the architects and Interior designs. Respondents (56%) also implemented Biophilic design in any of the projects undertaken by them at high extent Co-efficient of correlation showed significant relationship between awareness among architects and interior designers with the implementation of Biophilic designs in any of the projects undertaken by them. Consequently, designers and policy makers can use the framework of Biophilic design to transform speculative and innovative concept discourse into real-life projects and interventions in residential and commercial buildings.

Keywords: Awareness, Biophilic Design, Architects, Interior Designers, Factors

INTRODUCTION

Humans are constantly striving to improve the usability and comfort of their living and working environments, from an aesthetic to a psychological standpoint. Nowadays, urban living is typically associated with long working hours, heavy workloads, tight deadlines, and dissatisfying working environments (Facey *et al*., 2015).

Individuals always take steps to solve problems in their living spaces in terms of aesthetic, comfort, performance, and functionality through the creative design process of building. Biophilic design emerges as a solution in the design process to meet the need for comfortable accommodation while remaining in touch with nature without breaking the relationship with essence, and to do so in the developing world's limited areas (Dalay, 2020). It is a design that aims to increase human connection to nature and the natural world through the use of natural materials. Rather than relying on natural imagery or isolated aspects of nature, a biophilic

design encourages people to interact directly with nature. Biophilic design is frequently defined by its use of indigenous natural elements as well as its attention to ecosystems and weather that affect the environment around a given structure (Morrison 2021).

The word Biophilia is derived from the Greek words "bio", which means life, and "philia", which means love or admiration. The concept was first introduced by psychologist Eric Fromm. Bayraktarolu (2014) defines Biophilia as the "love for all things living". A Biophilic design focuses on the emotional side of human beings, implying that people adapt better to environments that have natural elements and design. There are many places where people spend most of their time that are built without natural light or natural materials or on principles of natural architecture. Biophilic design, on the other hand, can create a link between nature and man-made structures for the benefit of human health and well-being. In the words of Oliver Heath, "Biophilic design does not bring nature indoors." As a result, it strengthens the ties between various aspects of nature" (Topgul 2019).

Biophilic design has long been popular among architects and designers due to its inherent ability to heal, improve wellbeing, and provide occupants with a grounding connection. Nature can provide a safe haven, a sense of calm in the midst of a storm, and incorporating biophilic design into urban spaces can help city dwellers regain their trust in venturing into crowded spaces (Respira Team, 2021). “As people are stuck at home, they’re looking around their environments and asking how to replicate the feeling of the outdoors at home,” says Goldsmith, with the trends set by hospitals serving as an inspiration (Yang, 2021). “In the coming months, recognition of nature’s therapeutic value will likely grow, perhaps especially after the pandemic ends and the traumatic effects continue. Our post-pandemic challenge will not only be to preserve the last remaining natural places, but to create more of them, especially in cities and to make sure all children and adults, not just a few, receive the gifts of nature” stated by Louv, (2020). As interior designers, Biophilic Design has become almost a buzzword nowadays, and for a good reason (Pardo, 2020).

According to the book ‘The practice of biophilic design’ by Kellert and Calabrese's (2015) the benefits of contact with nature often depend on repeated experience, the successful application of biophilic design necessitates consistently adhering to certain basic principles. These principles represent fundamental conditions for the effective practice of biophilic design. These includes:

1. Biophilic design requires repeated and sustained engagement with nature.
2. Biophilic design focuses on human adaptations to the natural world that over

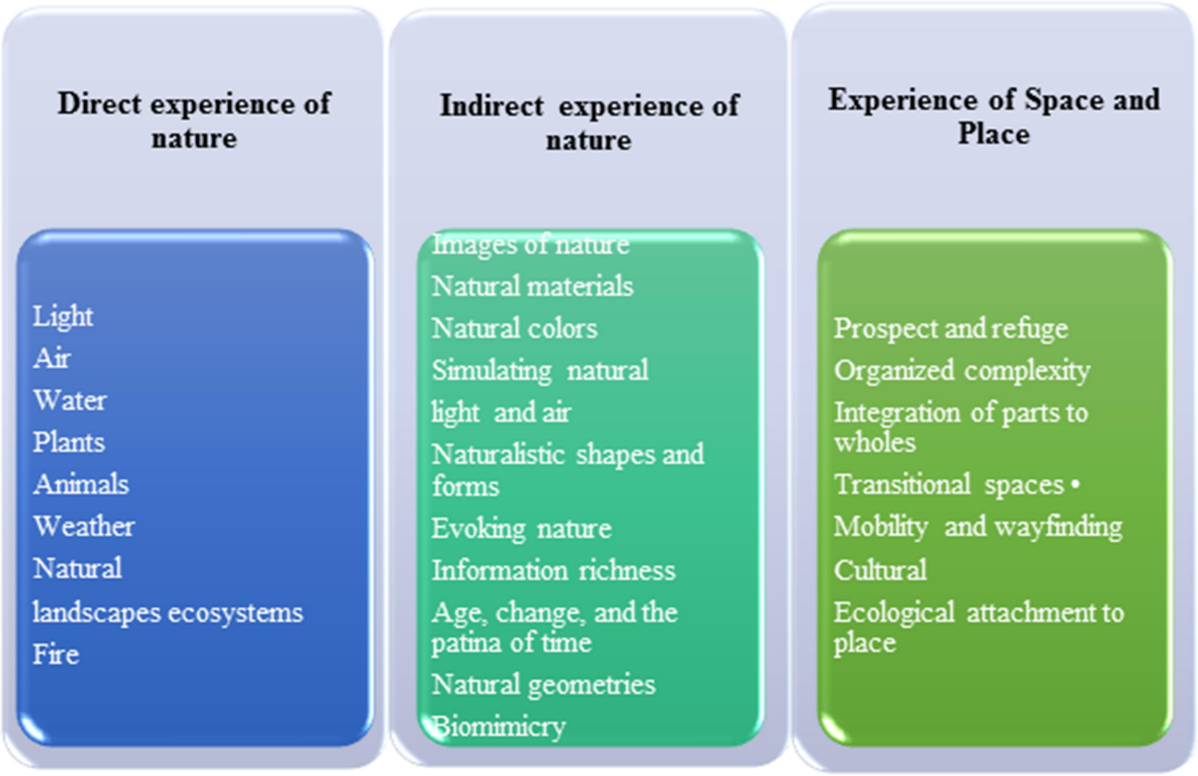
evolutionary time have advanced people's health, fitness and wellbeing.

3. Biophilic design encourages an emotional attachment to particular settings and places.

4. Biophilic design promotes positive interactions between people and nature that encourage an expanded sense of relationship and responsibility for the human and natural communities.

5. Biophilic design encourages mutual reinforcing, interconnected, and integrated architectural solutions.

Kellert and Calabrese's (2015) stated that in biophilic design framework, there are three types of nature experiences are grouped together as the basic categories (1) directly experience of nature, (2) indirect experience of nature, and (3) experiencing space and place.



Source: Kellert, S. and Calabrese, E. 2015. The Practice of Biophilic Design. www.biophilic-design.com

Being in direct contact with nature is described as the direct incorporation of natural light, air, flora, animals, and natural scenery in artificial spaces. Rather than directly experiencing nature, indirectly experiencing nature refers to representing and/or giving the appearance of nature in spaces through figurative means, such as landscape paintings and other nature-themed works of art, natural colours, and natural materials, and natural shapes. Due to the obvious presence of visual transitions between space and nature, humans can experience space and connect with nature Kellert and Calabrese's (2015).

Soderlund and Newman (2015) found that there was a strong human psychological and physiological rationale for an innate human-nature connection. Terrapin Bright Green (2021) described the incorporation of Biophilic design into the workplaces, health clinics, schools, and neighborhoods has significant health and economic benefits. Building managers can keep higher rents; companies are more likely to see increased productivity of employee salaries and benefits; healthcare providers and patients can benefit financially from faster recovery rates; and schools can benefit from improved student performance and reduced absenteeism.

Oliver Heath Designs (2020) described that by incorporating direct or indirect elements of nature into the built environment have been demonstrated through research to reduce stress, blood pressure levels and heart rates, whilst increasing productivity, creativity and self-reported rates of well-being which totally relevant the present situations like Covid-19 pandemic. There have been numerous studies over the last 35 years on the benefits to the built environment through improving a connection to nature. It was observed that in office places productivity can be increased by 8%, rates of well-being up by 13%, increases in creativity, with reduced absenteeism and presence. In hospitality sector guests willing to pay 23% more for rooms with views of 'Biophilic elements'. In education spaces rates of learning 20-25% increased, improved test results, concentration levels and attendance, reduced impacts of ADHD. In healthcare spaces, post-operative recovery times decreased by 8.5%, reduced pain medication by 22%. The presence of vegetation & landscaping has been found to increase average rental rates on retail spaces with customers indicating they were willing to pay 8-12 % more for goods and services. Homes can become more calming & restorative, with 7-8 % less crime attributed to areas with access to nature and can command an increase of 4-5% in property price. By considering this framework, the present study has been conducted to as ascertain awareness of Interior Designers' and Architects' regarding Biophilic Designs and factors influencing Biophilic design.

Statement of the problem: The present study aimed to ascertain awareness of Interior Designers' and Architects' regarding Biophilic Designs and to determine the factors influencing Biophilic design.

OBJECTIVE OF THE STUDY:

i. To ascertain awareness of Interior Designers' and Architects' regarding Biophilic Designs.
ii. To determine the factors influencing Biophilic design trends.

METHODOLOGY

Descriptive design was used in the present study. Questionnaire was used to collect data from 37 architects and 30 Interior Designers of

Vadodara city selected through Purposive Random Sampling Method. The questionnaire contained 3 sections viz. first section was related to background and work related information of the respondents. The second section elicited the statements about awareness regarding Biophilic designs. The awareness scale consisted 32 statements related to concept and experiences and benefits of Biophilic designs. It had 3 point continuum for the responses, 'Agree', 'Undecided', and 'Disagree'. All the statements were Positive. The third section consist factors influencing Biophilic design trends and the respond structure was 'Agree', 'Undecided', and 'Disagree'.

FINDINGS OF THE STUDY:

The findings of this study presented in figures and graphs which contained the key information about the most important outcomes of an analysis.

i. **Background Information:** This Section contains Personal Information about the Respondents. The information is about their Age (in years), Gender and Educational Qualification was ascertain.

Lucid examination of the **Figure 1** showed that less than three-fourth (71%) of the respondents are of age group of below 30 years of age. More than one half of the respondents were male. Less than two-third of the respondents (65%) were graduated. Furthermore, more than one-third (36%) of the respondents had monthly income between Rs. 25,001 to 50,000 monthly and less than one-third (30%) of the respondents were earning less than 25,000 per month.

ii. **Work related information:** This section deals with the information regarding the work or profession of the respondents including profession of respondents, field experience in years and projects undertaken to design (residential or residential and commercial both).

Eloquent analysis of data in **Figure 2** presented that less than two-third of the respondents (61%) were Architect and more than one-third respondents (39%) were Interior Designers. Around three-fifth of the respondents (60%) had field experience of less than 5 years followed by respondents (21%) had 6-10 years of field experience. Furthermore, less than three-fourth of respondents (72%) had undertaken both residential and commercial projects.

iii. **Awareness regarding concept of Biophilic Design:** In this section respondents were asked to state their awareness regarding concept of Biophilic Design. There were 5 statements in this sections where the responses were "Agree", "Undecided" and "Disagree".

The **Figure 3** represented that majority (83.11%) of the respondents agreed that Biophilic design is about creating a cohesive natural environment inside and Biophilic design is a concept used within the building industry to increase occupant connectivity to the nature (80.53%). Less than one-third (32.06%) of

respondents were undecided that Biophilic design is related to landscaping only. More than one-half (49.35%) of the respondents disagreed that Biophilic design is about adding a few plants to space. More than one-half (55.62%) of the respondents disagreed that Biophilic design is related to landscaping only.

iv. Awareness about Direct Experience to Nature: This section contained 5 statements reflecting Direct Experience to Nature as one of the aspect of Biophilic design. The responses were "Agree", "Undecided" and "Disagree".

Eloquent analysis of data **Figure 4** showed that majority (80.51%) of the respondent agreed that in the built environment, direct experiences of nature refer to plants, light, water any aspect that provides direct contact with green elements. Almost one-third (32.46%) of the respondent were undecided that incorporating an indoor river or adding natural airflow to a building will not help in bringing the natural ambiance Indoors. Whereas, more than one-fourth (25.97%) of the respondent disagreed that incorporating an indoor river or adding natural airflow to a building will not help in bringing the natural ambiance indoors.

v. Awareness about indirect Experience to Nature: In this section respondents were asked about indirect experience to nature as one of the aspect of Biophilic design. There were statements in this section where the responses were "Agree", "Undecided" and "Disagree".

Articulate analysis of data in Fig showed that more than two-third (70.12%) of the respondents agreed that through columns and natural based patterns, natural shapes and forms can be achieved in architectural designs. More than one – third (37.66%) of the respondents were undecided that the effective Biophilic application of colour should generally favour muted "earth" tones characteristic of soil, rock, and plants. Also Negligible (9.09%) of respondents disagreed that indirect experience of nature include pictures and artwork and other ornamental designs inspired by shapes and forms occurring in nature and artificial light can be designed to mimic the spectral and dynamic qualities of natural light

vi. Awareness regarding Experience of Space and Place: In this section respondents were asked about to state their opinion about awareness regarding third aspect i.e. experience of space and place. There were statements in this section where the responses were "Agree", "Undecided" and "Disagree".

Data in **Figure 6** showed that majority (81.80%) of the respondents agreed that Biophilic Design are creative interplay of natural lighting, spaciousness, plants, and water in a central atrium can simulate the qualities of an exterior setting in an indoor space. More than three-fourth (77.90%) of the respondents agreed that a room with good thermal and airflow variation feels active, alive, invigorating, and relaxing is

related to Biophilic design. Less than two-fifth (33.70%) of the respondents were undecided that a space with a good prospect condition feels open and freezing, yet imparts a sense of safety and control, particularly when alone or in unfamiliar environments. Moreover, more than one-third (36.30%) of the respondents disagreed that a room with a strong Non- visual connection to nature feels light and balanced.

vii. **Awareness regarding Benefits of Biophilic Design:** In this section Respondents were asked to state their opinion about awareness regarding Benefits of Biophilic Design. It contained information regarding Environmental, Health and Economic Benefits of Biophilic Design.

Eloquent analysis of data fig exemplified that majority (88.30%) of the respondents agreed that having a view of nature whilst studying/working reduces stress levels and (85.70%) Biophilic design enhances creativity and clarity of thoughts. More than one–third (40.2%) of the respondents were undecided that plants are extremely cost-effective and offer both Biophilic and aesthetic advantages and it improve air quality and Biophilic design can require an upfront investment; it pays dividends in the long run, both environmentally and financially. Also negligible (6.6%) of respondents disagreed that Being in contact with nature improve concentration.

viii. **Extent of awareness of Interior designers / Architects regarding various aspects of Biophilic design:** An attempt was made to find out the extent of awareness of Interior designers / Architects regarding various aspects of Biophilic design. The responses were "Agree", "Undecided" and "Disagree". Where the scores of 3, 2, 1 were ascribed for the positive statement. While the scores were reversed for the negative statements. The possible maximum and minimum scores were divided in 3 categories having equal interval. High scores indicated high extent of awareness of Interior designers / Architects regarding various aspects of Biophilic design.

The **Figure 8** depicted that majority (85.72%) of the respondents have high extent awareness regarding first aspect of Biophilic Design i.e. Concept of Biophilic design. In the next aspect it was seen that majority (85.72%) of the respondents have high extent awareness regarding direct experience of nature in biophilic design. More than three-fourth (77.92%) of the respondents have high extent awareness regarding indirect experience of nature in biophilic design. Around three-fourth of the respondents (75.32%) have high extent awareness regarding experience of space and place. Also, majority (89.61%) of the respondents have high extent awareness regarding the benefits of Biophilic design.

Furthermore, overall majority (85.71%) of the respondents have high extent awareness regarding Biophilic design.

ix. Factors influencing Biophilic design trends: This section contains information about the various factors that influence Biophilic design trends. This section's response structure is "Disagree," "Undecided," and "Agree."

x. The **Figure 10** illustrated that majority of the respondents (92.50%) reported that being surrounded by nature can be helpful for those who have major depressive disorder. Respondents stated that Biophilic design is the best way to create a natural connection indoors (91.50%) and walking in nature reduces anxiety as well as negative thoughts, feelings of depression and improve memory (91.50%) followed by for those who work-from-home, Biophilic design helps with attention deficits, improves attention spans, and aids in mental restoration (89.10%). Respondents indicated that Biophilic designs serves a visual connection to nature and natural elements helps to purify air around home or workplaces (86.20%).

xi. Implementation of Biophilic designs by the Architects and Interior designers: This section concerns whether the architects and interior designers implementing biophilic design in any of the projects undertaken by you.

Data represented in **Figure 10** showed that majority of the respondents (82%) have implemented Biophilic design in any of the projects undertaken by the architects and Interior designs. However, **Figure 11** indicated that respondents implemented Biophilic design in any of the projects undertaken by them at high extent (56%), at moderate level (38%) and at low extent (6%).

xii. Co-efficient of correlation showing relationship: This section includes the coefficient of correlation to know the relationship between the variables.

Computation of co-efficient of correlation indicated that there is no significant relationship between awareness and the factors influencing Biophilic trends among architects and interior designers. Whereas, co-efficient of correlation showed significant relationship between awareness among architects and interior designers with the implementation of Biophilic designs in any of the projects undertaken by them.

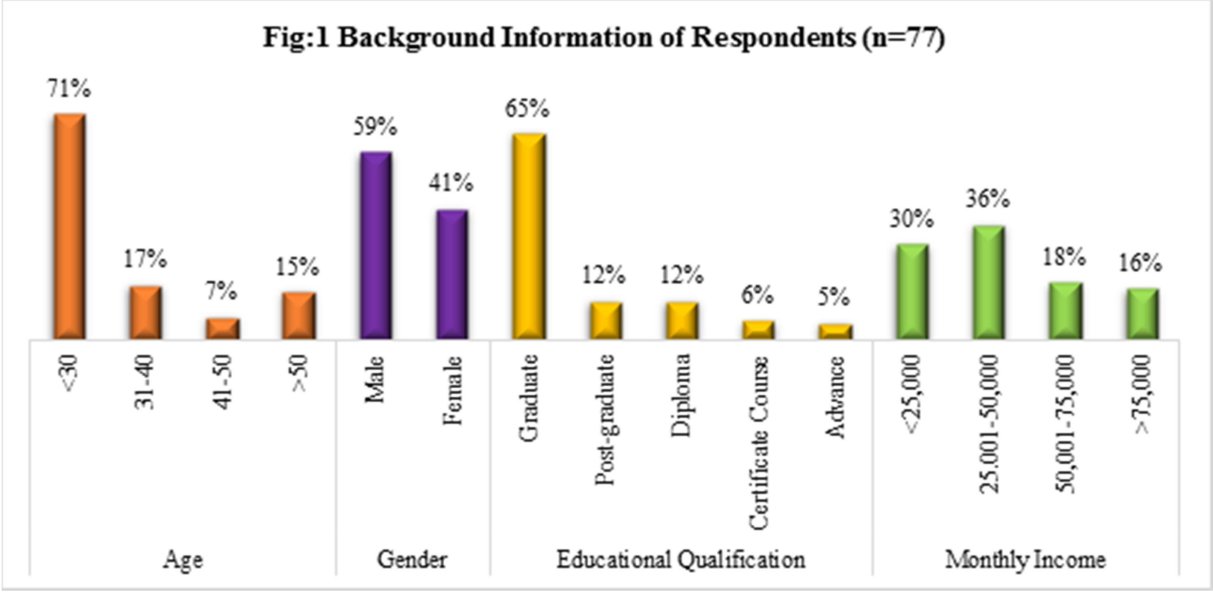


Fig:1 Background Information of Respondents (n=77)
71%
17%
7%
15%
59%
41%
65%
12%
12%
6%
5%
30%
36%
18%
16%
<30
31-40
41-50
>50
Male
Female
Graduate
Post-graduate
Diploma
Certificate Course
Advance
<25,000
25,001-50,000
50,001-75,000
>75,000
Age
Gender
Educational Qualification
Monthly Income

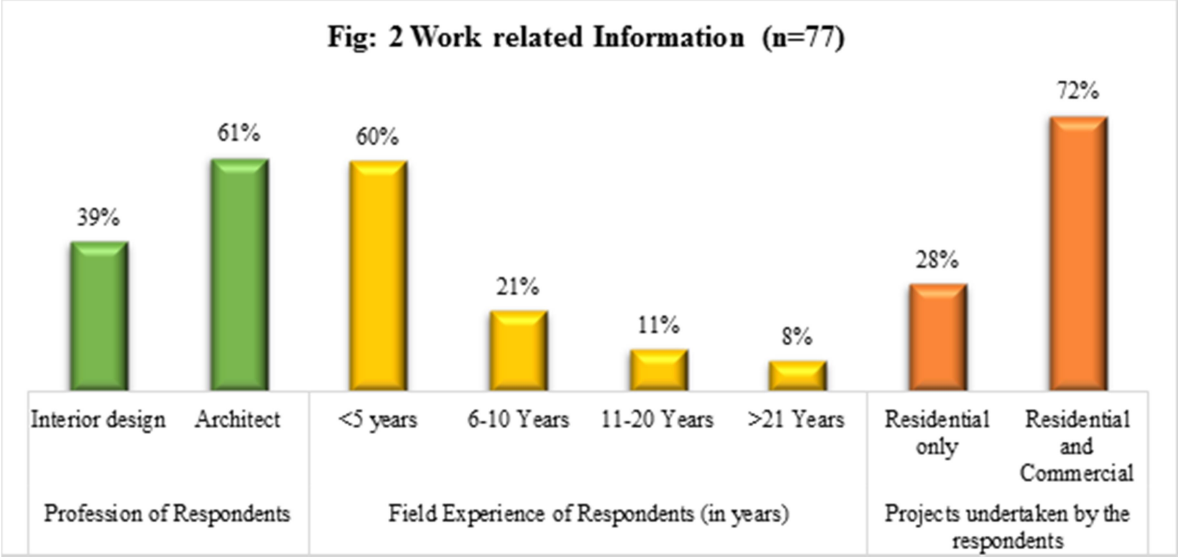


Fig: 2 Work related Information (n=77)
39%
61%
60%
21%
11%
8%
28%
72%
Interior design
Architect
<5 years
6-10 Years
11-20 Years
>21 Years
Residential only
Residential and Commercial
Profession of Respondents
Field Experience of Respondents (in years)
Projects undertaken by the respondents

Fig: 3 Awareness regarding Concept of Biophilic Design

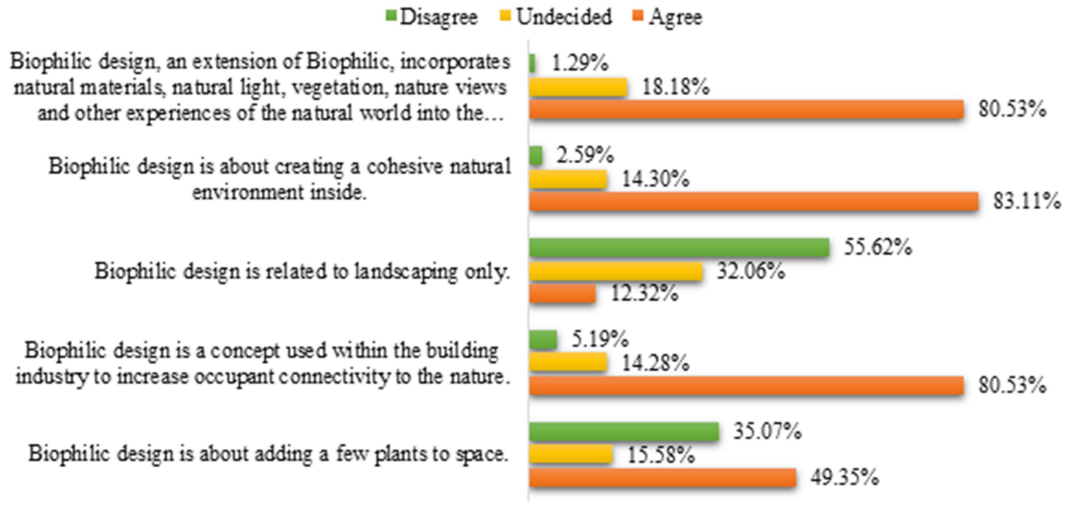
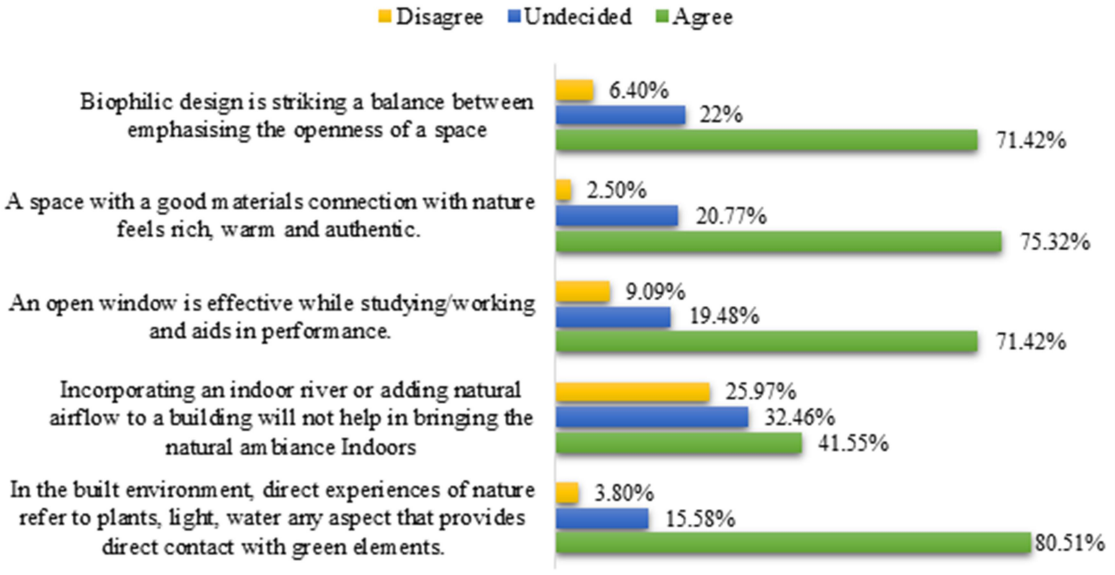


Fig: 4 Awareness about Direct Experience to Nature



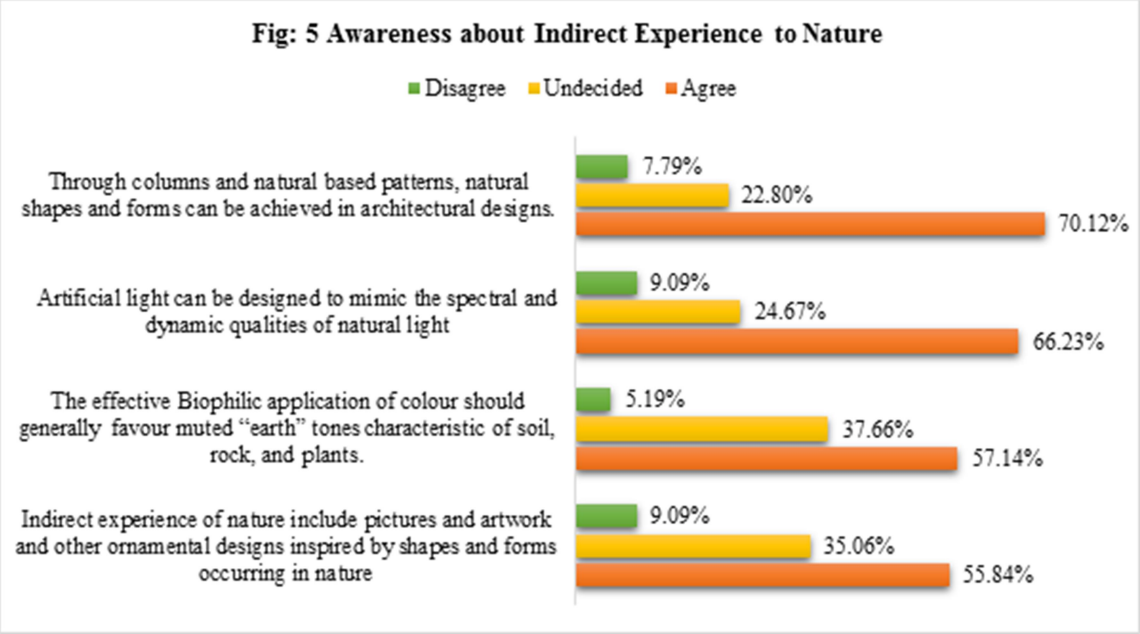


Fig: 5 Awareness about Indirect Experience to Nature
Disagree
Undecided
Agree
Through columns and natural based patterns, natural shapes and forms can be achieved in architectural designs.
7.79%
22.80%
70.12%
Artificial light can be designed to mimic the spectral and dynamic qualities of natural light
9.09%
24.67%
66.23%
The effective Biophilic application of colour should generally favour muted "earth" tones characteristic of soil, rock, and plants.
5.19%
37.66%
57.14%
Indirect experience of nature include pictures and artwork and other ornamental designs inspired by shapes and forms occurring in nature
9.09%
35.06%
55.84%

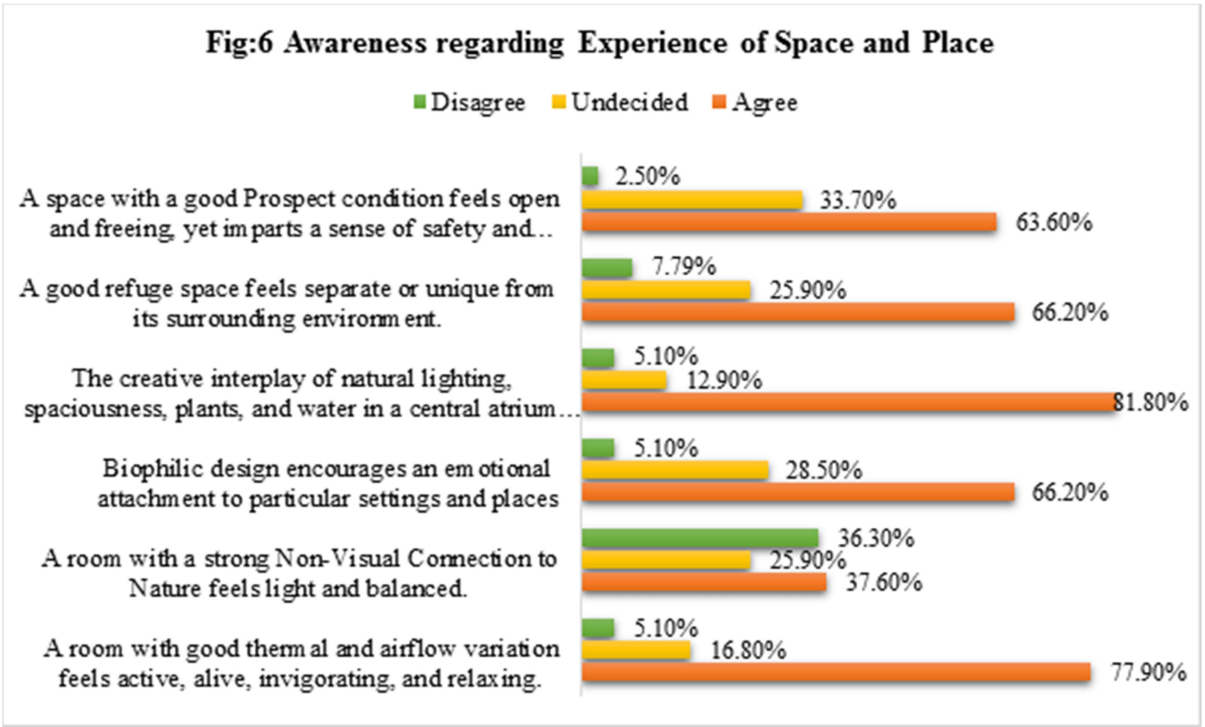


Fig:6 Awareness regarding Experience of Space and Place
Disagree
Undecided
Agree
A space with a good Prospect condition feels open and freeing, yet imparts a sense of safety and...
2.50%
33.70%
63.60%
A good refuge space feels separate or unique from its surrounding environment.
7.79%
25.90%
66.20%
The creative interplay of natural lighting, spaciousness, plants, and water in a central atrium...
5.10%
12.90%
81.80%
Biophilic design encourages an emotional attachment to particular settings and places
5.10%
28.50%
66.20%
A room with a strong Non-Visual Connection to Nature feels light and balanced.
36.30%
25.90%
37.60%
A room with good thermal and airflow variation feels active, alive, invigorating, and relaxing.
5.10%
16.80%
77.90%

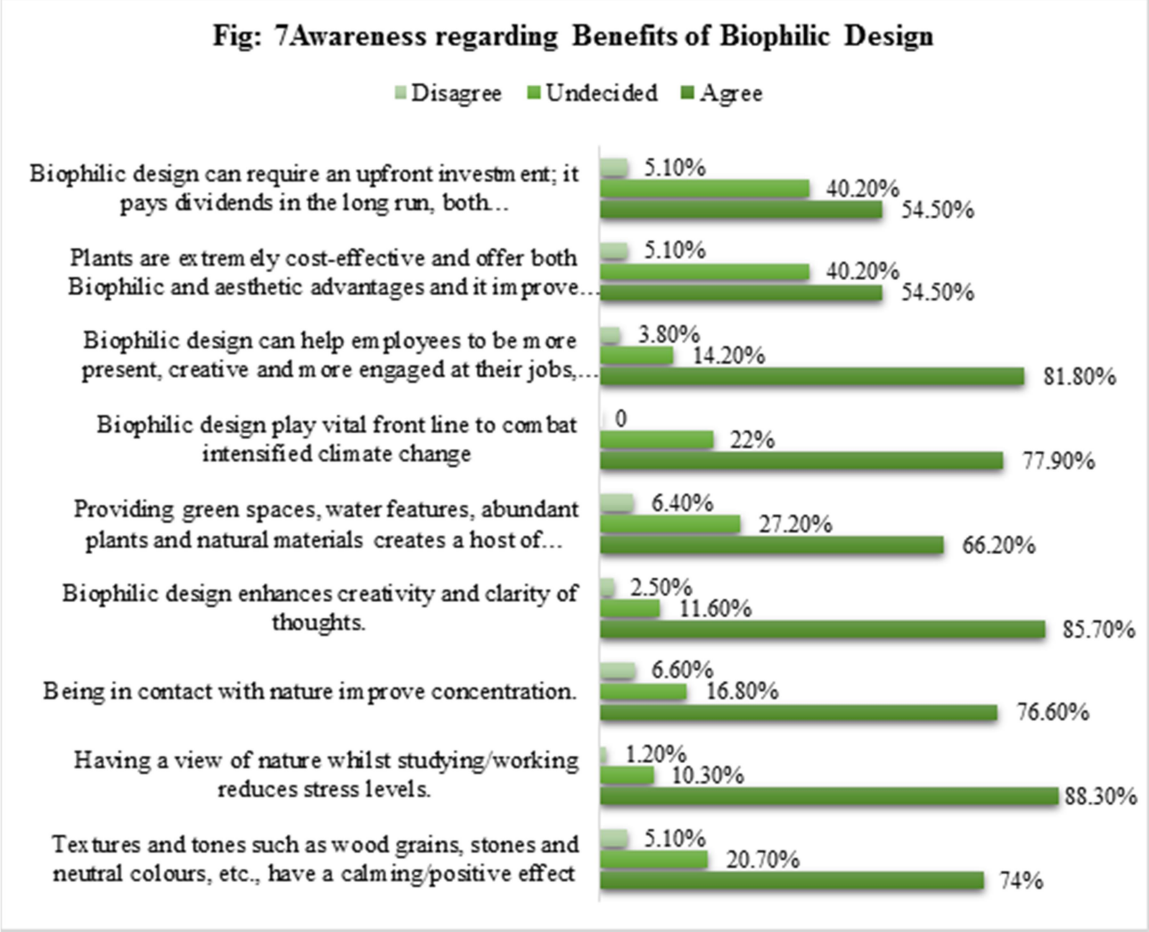


Fig: 7Awareness regarding Benefits of Biophilic Design
Disagree
Undecided
Agree
Biophilic design can require an upfront investment; it pays dividends in the long run, both...
5.10%
40.20%
54.50%
Plants are extremely cost-effective and offer both Biophilic and aesthetic advantages and it improve...
5.10%
40.20%
54.50%
Biophilic design can help employees to be more present, creative and more engaged at their jobs,...
3.80%
14.20%
81.80%
Biophilic design play vital front line to combat intensified climate change
0
22%
77.90%
Providing green spaces, water features, abundant plants and natural materials creates a host of...
6.40%
27.20%
66.20%
Biophilic design enhances creativity and clarity of thoughts.
2.50%
11.60%
85.70%
Being in contact with nature improve concentration.
6.60%
16.80%
76.60%
Having a view of nature whilst studying/working reduces stress levels.
1.20%
10.30%
88.30%
Textures and tones such as wood grains, stones and neutral colours, etc., have a calming/positive effect
5.10%
20.70%
74%

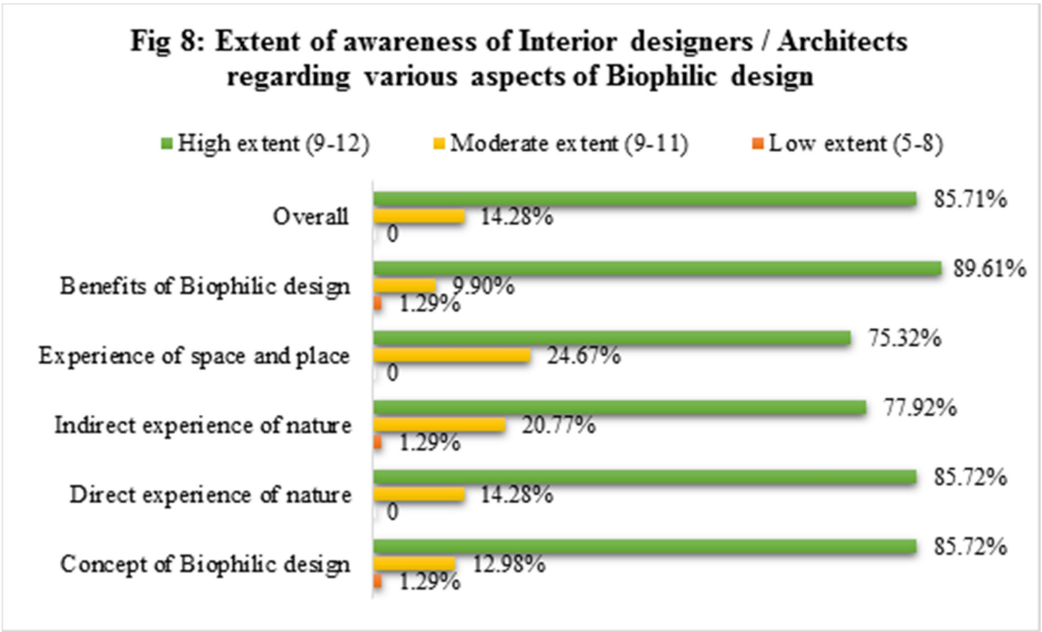


Fig 8: Extent of awareness of Interior designers / Architects regarding various aspects of Biophilic design
High extent (9-12)
Moderate extent (9-11)
Low extent (5-8)
Overall
85.71%
14.28%
0
Benefits of Biophilic design
89.61%
9.90%
1.29%
Experience of space and place
75.32%
24.67%
0
Indirect experience of nature
77.92%
20.77%
1.29%
Direct experience of nature
85.72%
14.28%
0
Concept of Biophilic design
85.72%
12.98%
1.29%

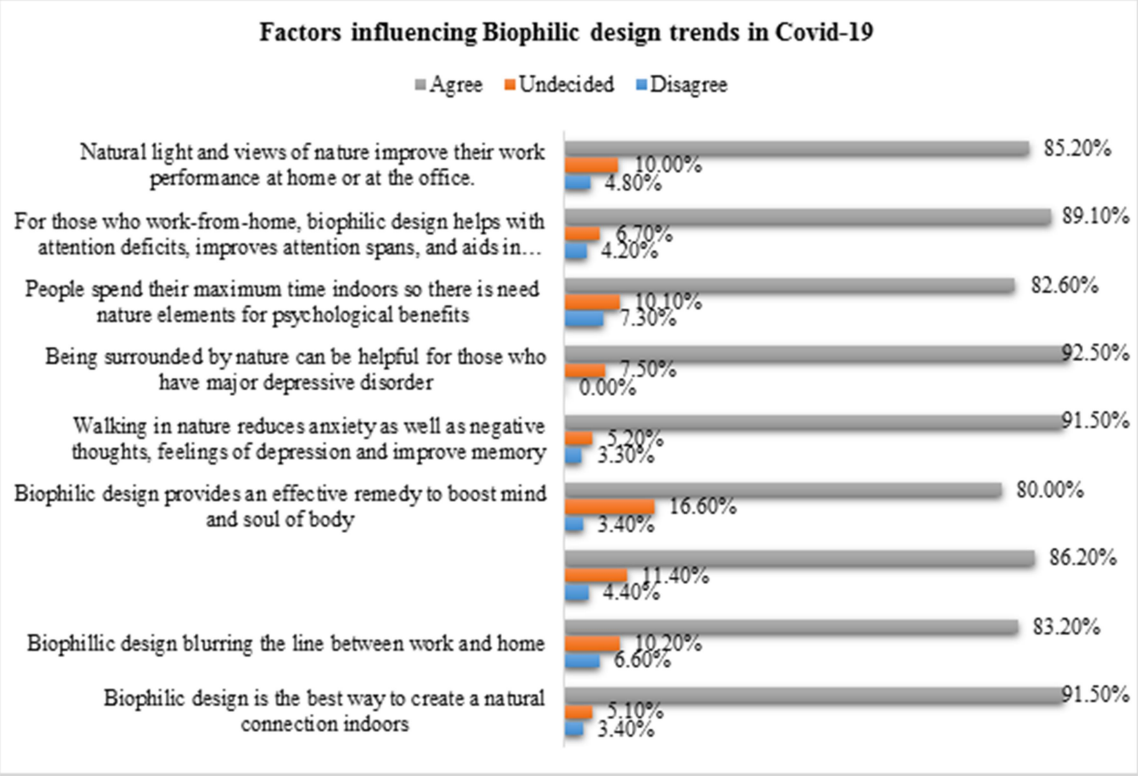
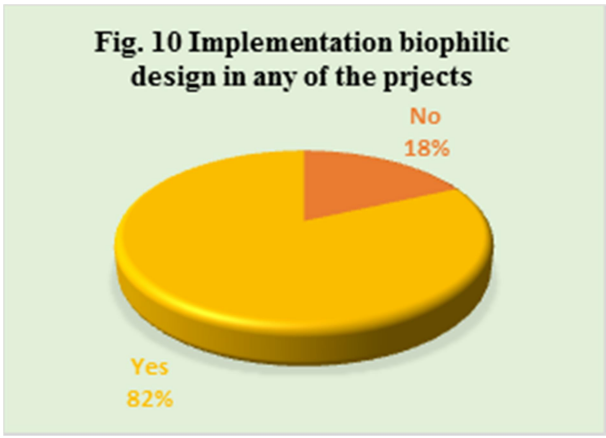
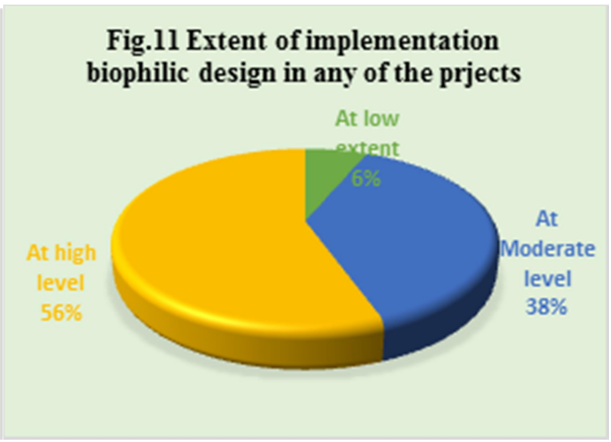


Figure 9





	Variables	n	r-value	Level of Significance
1.	Awareness with Factor influencing Biophilc Trends	77	0.186	NS
2.	Awareness with Implementation Biophilic design in any of the projects	77	0.250*	S

Correlation is significant at the 0.05 level; S- Significant; NS- Not Significant

CONCLUSION AND IMPLEMENTATION

According to the present study, respondents were Architect and were Interior Designers and had field experience of less than 5 years followed by respondents had 6-10 years of field experience and works on both residential and commercial projects. Majority of the respondents agreed that Biophilic design is

about creating a cohesive natural environment inside and Biophilic design is a concept used within the building industry to increase occupant connectivity to the nature. Majority of the respondent agreed that in the built environment, direct experiences of nature refer to plants, light, water any aspect that provides direct contact with green elements. Respondents agreed that through columns and natural based patterns, natural shapes and forms can be achieved in architectural designs and Biophilic Design are creative interplay of natural lighting, spaciousness, plants, and water in a central atrium can simulate the qualities of an exterior setting in an indoor space. Majority of the respondents agreed that having a view of nature whilst studying/working reduces stress levels. Majority of the respondents have high extent awareness regarding first aspect of Biophilic Design i.e. Concept of Biophilic design. In the next aspect it was seen that respondents have high extent awareness regarding direct experience of nature and benefits of Biophilic design. Furthermore, overall majority of the respondents have high extent awareness regarding Biophilic design. Biophilic design is the best way to create a natural connection indoors and walking in nature reduces anxiety as well as negative thoughts, feelings of depression and improve memory and those who work-from-home, Biophilic design helps with attention deficits, improves attention spans, and aids in mental restoration were the key factors that influenced Biophilic trends. Respondents (56%) also implemented Biophilic design in any of the projects undertaken by them at high extent. Co-efficient of correlation showed significant relationship between awareness among architects and interior designers with the implementation of Biophilic designs in any of the projects undertaken by them. The findings revealed that the more architects and interior designers who are aware of biophilic design, the more they use it in their projects.

It is reasonable to conclude that direct exposure to indoor spaces with landscape design or other natural elements has a massive influence on mental and physical health, making this Biophilic design concept ideal for the current situation. Biophilic Designs enhance access to natural environment in interior space like natural air, light and helps avoid artificial system. Hence, the Biophilic designs may also helpful cope up with the situations like ongoing Covid-19 pandemic. The present study encourages the architectural and interior design projects to employ Biophilic designs ranging from workplaces and retail areas to hotels and residential buildings. In the market customers wellbeing should be prioritized to build the environment. Companies at the forefront of workplace design, such as Apple, Google, and Amazon, are heavily investing in Biophilic Design elements, as principles have been shown

to improve worker concentration, engagement, and cognitive ability, as well as to attract and retain employees in the "talent war"(Oliver Heath design, 2020). Consequently, designers and policy makers can use the framework of Biophilic design to transform speculative and innovative concept discourse into real-life projects and interventions in residential and commercial buildings. According to the findings of this study, people-oriented buildings contribute to a community's economic and social improvement by integrating environmental approaches into the purposeful design.

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