7th INTERNATIONAL CONFERENCE ON TROPICAL RESOURCES AND SUSTAINABLE SCIENCE (CTReSS 7.0)
Tropical Nexus: Integrating Science, Innovation and Sustainability
12-13 August 2025

FROM NATURE TO DESIGN: THE ROLE OF NATURE CONNECTEDNESS IN SHAPING BIOPHILIC DESIGN PREFERENCES, ATTITUDE AND BEHAVIOUR

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INTRODUCTION

In an increasingly urbanized and technologically world, **human disconnection from nature** has become a **growing concern** (Zhong et al., 2024) - **reconnecting human with nature in the built environment has emerged as a critical focus** (Nijole et al., 2025; Cacique et al., 2022; Aristizabal et al., 2021).

Biophilic design approaches - benefit **human health and well-being** by enhancing psychological comfort, reducing stress, and fostering a sense of well-being (Khajehpash et al, 2024).

Many studies have demonstrated that **nature connectedness (NC) is important in developing a positive attitude and behaviour towards the environment** (Tang et al., 2025; Mohammadi et al., 2024).

As biophilic design continues to be integrated into urban planning and architecture, a growing understanding of the **connection between NC and biophilic design preferences, attitude and behaviour is vital** to foster more sustainable, health-promoting environments.

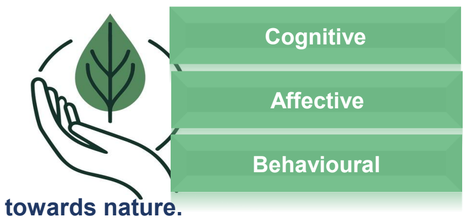
Therefore, this study **aims to investigate the relationship between NC and individuals' preferences, attitudes and behaviour towards biophilic design.**

LITERATURE REVIEW

01 Nature Connectedness

Nature Connectedness (NC) - disposition towards nature - rooted in the **biophilia hypothesis** that emphasizes the human-nature connection.

NC comprises **cognitive, affective and behavioural** psychological domains.



People who have a **strong NC have a strong tendency and affiliation towards nature.**

02 Biophilic Design

At the beginning of the 21st century, the notion of **biophilia was adapted to the built environment.**

Kellert's (2018) and Browning & Ryan's (2020) framework was used for this study.

A combination of **Nature in space (Direct experiences) and Nature Analogues (Indirect experiences).**

https://www.sciencedirect.com/science/article/pii/S2095263521000479

MATERIALS AND METHODS

Research Design

Quantitative approach - distribution of a questionnaire to 123 respondents, online.

A **pilot study, face and content validity** were also conducted to validate the instrument.

All variables were **reliable**, with values of Cronbach's alpha ranging from 0.8 to 0.9.

Questionnaire Development

Nature Connectedness	• Six constructs (nature dependence, sense of responsibility, empathy towards nature, enjoyment of nature, interest in nature activities and interest in natural places and spaces • Adapted from Mustapa et al. (2019) • Overall, 26 items
Preferences	• Nine constructs, which are natural lighting, plants, natural ventilation, view towards nature, material, texture, colour, pattern and image • Overall, 40 items
Attitude	• Nine constructs, which include attitude towards natural lighting, plants, natural ventilation, view towards nature, material, texture, colour, pattern and image. • Overall, 56 items
Behaviour	Behaviour towards Biophilic Design was measured using eight items.

Analyses

IBM SPSS Statistics Version 22

Descriptive analysis

Frequency and percentage - categorize the level of NC into low, moderate and high-level groups.

Frequency and percentage - cross-tabulation of the groups of low, moderate and high levels of NC by demographic and background characteristics.

Inferential analysis

Correlation and linear regression- examine the relationship between NC and preferences, attitude and behaviour towards biophilic design.

RESULTS AND DISCUSSION

01 Nature Connectedness Level

As in Table 1**, more than one-third (80.5%) of the respondents have a moderate level of NC**, followed by 12.2% with a high level of NC, and 7.3% with a low level of NC. The results show that most of the respondents have a moderate level of NC. This is consistent with previous studies (e.g., Mayer & Frantz, 2004), where **moderate levels of NC were typical, and only a minority showed extreme values.**

Table 1: Descriptive analysis for low, moderate and high levels of NC

CTN level	Frequency	Percentage
Low level (M <= 3.83)	15	12.2%
Moderate level (3.83 < M < 4.81)	99	80.5%
Low level (M >= 4.81)	9	7.3%

Table 2: Descriptive analysis for demographic and background characteristics

Demographic and Background		Group			
		Low	Moderate	High	
Age	20-29	13 12%	87 80.6%	8 7.4%	108 100%
	30-39	2 25%	6 75%	0 0.0%	8 100%
	40-49	0 0.0%	3 100%	0 0.0%	3 100%
	50-59	0 0.0%	1 50.0%	1 50.0%	2 100%
	60-69	0 0.0%	2 100%	0 0.0%	2 100%
Gender	Male	6 13.6%	34 77.3%	4 9.1%	44 100%
	Female	9 11.4%	65 82.3%	5 6.3%	79 100%
Grew up	Urban	5 11.9%	32 76.2%	5 11.9%	42 100%
	Suburban	6 12%	43 86%	1 2%	50 100%
	Rural	4 12.9%	24 77.4%	3 9.7%	31 100%
Living Place	Urban	5 9.6%	41 78.8%	6 11.5%	52 100%
	Suburban	7 13.7%	42 82.4%	2 3.9%	51 100%
	Rural	3 15%	16 80%	1 5%	20 100%
Residential	Bungalow	10 13%	62 80.5%	5 6.5%	77 62.6%
	Flat	0 0.0%	0 0.0%	2 100%	2 100%
	Apartment	1 7.1%	13 92.9%	0 0.0%	14 100%
	Condominium	3 10%	16 80%	1 5%	20 100%
	Other	3 15%	16 80%	1 11.1%	20 100%

As in Table 2, demographic and background differences by demographic groups show that **NC varies** slightly by **age, gender, upbringing, and residential background.**

These findings support that **there are various factors that can influence NC** (Collado et al., 2013; Zhang et al., 2014).

02 Attitude & Preferences towards Biophilic Design

As shown in Table 3, participants have the **most positive attitudes towards elements in the Nature in Space category, especially Natural Lighting, View towards Nature, and Natural Ventilation**. These elements are directly perceived and experienced, which may account for their stronger impact on individuals' psychological responses. The presence of **Plants also ranked high, highlighting the importance of visible natural features in built environments**. In contrast, **attitudes towards Nature Analogues such as Colour, Material, and Image were moderately positive** but scored lower overall.

This suggests that **people respond more favorably to direct encounters with nature than to symbolic or artificial representations, an observation supported by Kellert's (2008) biophilic design theory.**

Table 3: Mean and Standard Deviation for Attitude towards Biophilic Design

Biophilic Elements	Minimum	Maximum	Mean	Std. Deviation
Nature in Space				
Natural Lighting	1.00	5.00	4.3194	.64021
Plants	1.00	5.00	4.2285	.69312
Natural Ventilation	1.00	5.00	4.2822	.72416
View towards Nature	1.00	5.00	4.2938	.70989
Nature Analogues				
Material	1.00	5.00	4.0685	.74171
Texture	1.00	5.00	3.9686	.81524
Colour	1.00	5.00	4.1789	.76025
Pattern	1.00	5.00	3.9710	.77730
Image	1.00	5.00	4.0755	.78637

As shown in Table 4, participants **favoured Nature in Space, like View towards Nature, Natural Lighting, and Plants, over most Nature Analogues.** However, **Material from the Nature Analogues category scored higher** than expected, possibly due to **its tactile and visual presence** in design environments. Interestingly, Colour received the lowest mean score, suggesting that while colour schemes inspired by nature exist in biophilic design, they may not significantly affect personal preference. These results further indicate that **authentic nature experiences, such as light, air, and views, are prioritized over mimetic or symbolic features in both attitude and preference.**

Table 4: Mean and Standard Deviation for Preferences towards Biophilic Design

Biophilic Elements	Minimum	Maximum	Mean	Std. Deviation
Nature in Space				
Natural Lighting	1.80	5.00	4.2228	.73114
Plants	1.00	5.00	4.0268	.90247
Natural Ventilation	1.00	5.00	3.8482	.89753
View towards Nature	1.80	5.00	4.2520	.79169
Nature Analogues				
Material	1.40	5.00	4.1837	.86521
Texture	1.00	5.00	3.8103	1.01723
Colour	1.00	5.00	2.9526	1.01929
Pattern	1.29	5.00	3.9315	.87975
Image	1.40	5.00	3.8927	.82672

03 Correlation between Nature Connectedness with Attitude, Preferences and Behaviour towards Biophilic Design

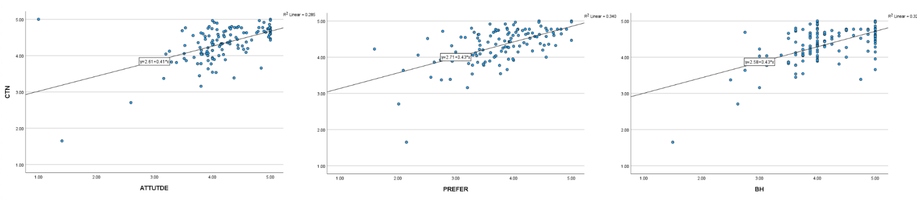


Figure 1, 2, 3: The Scatter Plot between NC and Attitude, Preference and Behavior towards Biophilic Design

Table 5: Correlation Analysis for NC and Preferences, Attitude and Behaviour towards Biophilic Design

		Attitude	Preferences	Behaviour
Nature Connectedness	Pearson Correlation	.534**	.583**	.572**
	Sig. (2-tailed)	<.001	<.001	<.001
	N	123	123	123

The correlation analysis showed a significant, **positive relationship between NC and attitudes, preferences, and behaviour toward biophilic design** ($p < .001$). Pearson correlation coefficients ranged from $r = .534$ to $r = .583$, indicating moderate to strong associations. Regression analysis confirmed these associations.

This suggests that **individuals who feel more connected to nature are also more likely to value, prefer, and engage with biophilic elements in their surroundings.**

This finding **supports and builds on earlier research showing that connection to nature affects how people perceive and interact with the natural world** (Lin et al., 2017; Tang et al., 2025). When people feel connected to nature, they are not only more likely to act in ways that help the environment but also to prefer natural settings and design elements.

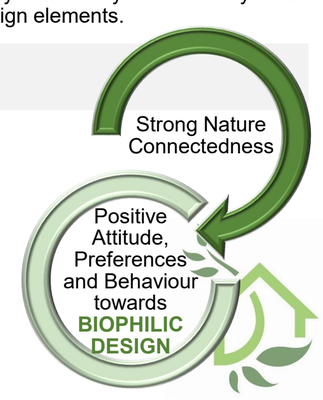
CONCLUSION

Highlights the **important role of NC in shaping people's views and engagement with natural elements in built environments.** People with a **stronger NC are more likely to have positive preferences, attitudes and behaviour regarding nature**, greater appreciation for biophilic design. This, in turn, can help **create healthier, more sustainable, and supportive environments.**

Need **to develop a strong connection to nature through various initiative - direct nature experiences, social experiences, and learning experiences, especially during childhood.**

Future research should investigate how different types of nature exposure and other factors affect NC in various age groups, cultures, and settings.

This study makes a **significant contribution to the body of knowledge on NC role in shaping biophilic design preferences, attitude and behaviour.**



NC works as a cyclical relationship. When people feel more connected to nature, they are more likely to support biophilic design. In return, being exposed to biophilic design strengthens their connection to nature.