



# Study on the Application of Biophilic Architecture in the Design of Creative Industry Center Buildings

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**Abstract.** The era of globalization has made it easier for the Indonesian people to access various information that has changed the way people view the education system, especially in the creative industry sector. Creative industries are industrial products that go through the process of developing creative ideas to produce innovative products. But the problem that often occurs is that there are no creative ideas due to the unsupportive atmosphere of the space. Biophilic architecture creates areas that can help everyone focus, improve physical and mental health, improve mood, help reduce stress, provide a positive physiological response, arouse curiosity, refresh memory and problem-solving skills, and need exploration. The method used in this study is a descriptive analysis method with a qualitative approach, with the initial step of collecting data in physical, non-physical data, and application development regulations through observation of the design site and literature review. This study aims to find out how the application of biophilic designs in creative industrial buildings creates a creative environment and optimizes human needs for green open spaces based on theoretical studies. This research will produce design concepts that can be input for the Medan city government.

**Keywords:** biophilic architecture; creative industry; creative space

Received 15 January 2022 | Revised 30 January 2022 | Accepted 8 February 2022

## 1 Introduction

The Indonesian nation is now entering the 21<sup>st</sup> century. The era of globalization, which is full of challenges and new problems, requires Indonesian human resources to become high-quality human beings for the benefit of life [1]. The age of globalization has also had a positive impact on the ease with which the Indonesian people can access a variety of information that changes the public's perspective on the education system in Indonesia, especially in the creative industry sector.

Based on the Presidential Regulation of the Republic of Indonesia Number 72 of 2015, there are 16 sub-sectors of creative economics, namely: Applications and Game developers; Architecture;

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Design interior; Visual communication design; Product design; Fashion; Films, animations, and videos; Photography; Crafts; Culinary; Music; Publishing; Advertising; Performing Arts; Fine arts, and; Television and radio [2]. The creative industry is currently very popular with young people in Indonesia, especially in Medan, which reaches 2,279,894 people, with the highest number being in the age group of 20-24 years.

The Indonesian Creative Economic RPJP states that creative industry activities contributed a value of 185 trillion rupiahs to Indonesia's gross domestic product in 2010, with an average growth of 5 percent per year in 2010-2013 [3]. The competitiveness of the creative industry in Indonesia only has an average of 4.4 out of 10, so efforts to accelerate the development of the creative sector are very much needed. The main strategic assets and firm factors driving regional economic growth are knowledge and creativity [4]. Providing well environment for developing creativity is always related to the quality of the exchanges and life experiences of the people involved [5]. The Indonesian government knows that the creative economy and the creative industry are the country's economic revival to compete in achieving ASEAN and global economic advantages [6].

The problem that often occurs to creative industry activists is that creative ideas do not appear due to an unsupportive environment. A creative environment is needed to be supported by infrastructure in the form of creative space to create innovative ideas. Creative industry activists also tend to prefer innovative, diverse, and tolerant places because creative people work in various disciplines and culture-based industries [7]. Creative space must be beautiful, give the impression of happiness and create a good atmosphere. According to Borrup, creative space is also an embodiment of space that can stimulate user creativity [8]. Some essential aspects in designing creative spaces: comfort, openness, accessibility, tolerance, and diversity. The city of Medan is in a strategic location seen from the geographical conditions rich in natural resources. It is also part of the Malacca Strait shipping lane, making the city of Medan an entry point for export/import activities that support the sustainability of this creative industry sector. However, the placement of functions in the open space is still lacking; the existing open space becomes a shopping center or other commercial building, resulting in a habit for City residents to choose a shopping center as a weekend destination. Studies reveal that contact with nature is beneficial for all human beings, regardless of age, gender, race, or ethnicity, and the existence of nature should be available to all city dwellers, not just those living on the edge of parks and open spaces [9]. Biophilic design involves a group of people who recognize a need to change their approach to city design by bringing nature into the urban design that reflects shared needs beyond personal interests [10]. Biophilic architecture emerged to eliminate the gap between modern architecture and the human need to connect with nature [11].

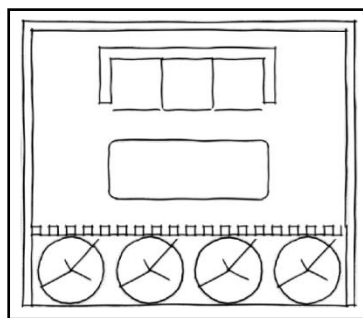
Based on the existing problems, this biophilic architecture study aims to determine how the biophilic design in the creative industry center building functions as a forum for creative

economic activities and public open space for sharing socializing. And become a means of education for the local community.

## 2 Literature Review

### Biophilic Architecture

The biophilic design comes from 'biophilia,' which means an innate biological connection between humans and nature [12]. According to Beatley, Humans need contact with nature to be healthy, happy, and productive [13]. Browning also outlines design considerations to support the success of the benefits generated by biophilic architecture that is, designing layouts and furnishings to amplify the view desired and avoid obstructing visual access when in a sitting position (Figure 1), prioritizing diversity of vegetation, providing the possibility of activities close to green spaces, prioritizing natural sounds, applying materials that support airflow and thermal conditions, landscapes and interactive design allows many activities to occur, applying patterns to 2 or 3 areas or dimensions as diversity but do not use excessive shapes and patterns, material quantities and natural colors based on the desired function of the space, providing corridors to support good visibility spacious, using a drop ceiling to give the impression of security, slowly curved corners exposing the next area, dramatic and dark shadows surprise the user, adding a slightly dangerous element but still paying attention to user safety, as found in The Denver Art Museum lays a stone above the corridor with pedestals only on either side (Figure 2).



**Figure 1** layout and placement of furniture give a view to the outer space



**Figure 2** Denver art museum

Patterns in biophilic design incorporate various strategies into the built environment, namely nature in space, the analogy of nature, and nature of space [12]. Nature in space discusses the direct presence of the physical form of nature in an area or place. The implementation of the natural strategy in space can be seen in table 1.

**Table 1** Implementation of natural strategies in space

Nature in Design	Considerations
Visual connection with nature	Prioritizing real-world conditions over a simulation. Layout design and furnishings to amplify the desired view. Avoid blocking visual access when in a sitting position.
Non-visual connection with nature	Prioritize natural sound.
Non-rhythmic sensory stimulation	Integrated with the landscape. Choose plants that attract bees/butterflies.
Thermal variability and airflow	Application of materials that support the flow of air under thermal conditions.

Nature analogies discuss organic, non-living, and indirect flavors of nature. The implementation of the natural analogy strategy can be seen in table 2.

**Table 2** Implementation of natural strategies in space

Natural Analogy	Design Considerations
Biomorphic shapes and patterns	Apply patterns to 2/3 planes or dimensions for greater variety and frequency of exposure. Avoid excessive use of shapes and patterns.
Material connection with nature	The number of natural materials and colors is based on the desired function of the space. Real material.
Complexity and form	Prioritize the art and material selection, architectural expression, and landscape schemes that pay attention to geometry and hierarchy.

The nature of space discusses the spatial configuration in nature. These include the innate human curiosity to see beyond the world around them, the human attraction to slightly dangerous or unknown things, and sometimes phobias. The implementation of the spatial nature strategy can be seen in table 3.

**Table 3.** Implementation of the spatial nature strategy

Space Nature	Design Considerations
Prospect	Building orientation. Place the stairs in buildings with transparent facades. Balcony. Open space layout.
Seclusion or shelter	Use a lower ceiling. Implement mezzanine.
Mystery	Presents a curved corner that slowly shows the next side of the room. Dramatic, dark shadows that give rise to surprises.
Risk/danger	Incorporating extreme elements but still paying attention to user safety.

## **Creative Space**

Creative people as creative industry activists tend to prefer places that are innovative, diverse, and tolerant; to create a creative mindset. The existence of public space as a place where various daily activities and activities take place allows the formation of a creative mindset [14]. The more accessible access to public spaces, the more people who visit, the more creative ideas there are. There are several essential aspects to consider when designing a creative space:

### **Convenience**

Creativity is closely related to comfort. It is difficult to develop creative ideas when in an uncomfortable, noisy, and disorganized environment. Therefore, the convenience of public spaces is the initial capital of efforts to create a creative environment in urban areas [7].

### **Openness**

In his book "Cities and The Creative Class," Richard Florida reviews the tendency of creative people to work in spaces that provide an open feel. In this case, public space must present open space, easily accessible and not monotonous [12].

### **Accessibility**

The ease of accessing creative spaces supports the creation of suitable public spaces. The easier it is for people to access creative areas, the better these creative spaces will be. Therefore, creative spaces are placed in strategic locations and pay attention to public access to creative areas.

### **Tolerance**

The existence of a public space that collects various activities, can produce different thoughts and ideas [15]. Tolerance between users of public space will create a harmonious atmosphere, so public space must ensure that no domination and discrimination occurs among the community.

### **Diversity**

The diversity of activities in the public space is a critical aspect of the public space to support various creative activities that do not seem rigid and monotonous. It is more dynamic and provides facilities for residents to carry out their activities.

### 3 Research Methods

This study uses a descriptive analysis method with a qualitative approach. The initial step is to collect data in the form of physical, non-physical data, and application development regulations through observation of the design site, either through direct field surveys or online through the google maps website and related websites with valid sources. Data collection was carried out by researchers visiting the project site, exploring the area around the site, then collecting data at the project site. Researchers also collect data through the google earth website to browse both places and regions around the site. Some factual data are sun orientation; wind direction; temperature; humidity; access and circulation; land use regulations; average land prices; applicable development regulations, site size; street names; road widths; road dividers; sidewalks; parking regulations; and the presence of historic buildings/parks.

Data collection through field situation analysis activities directly or online through google maps on the data collection method. The data obtained are then observed and analyzed by looking for problems and seeing the potential at the project location. After that, the researchers conducted data collection and analysis. The researchers reviewed the issues and prospects at the project location and then linked them to the requirements and theories obtained through literature studies or comparative studies on the creative industry center building project and biophilic architectural themes. After a re-examination, the researchers found several prospects applied when designing the creative industry center building. Some of the possibilities generated can change over time. Researchers find problems and other potentials, where this process occurs during the development of design ideas through concept exploration carried out.

### 4 Analysis and Discussion

#### Description of the research area

The area to be studied is on the outskirts of the canal, located on Kanal Raya Street in Medan Amplas District, Medan City, North Sumatra, Indonesia. The site has a total land area of  $\pm 15.924\text{m}^2$  (Figure 3).



Figure 3 research sites

### Development intensity regulations that apply to the project site and its surroundings

Based on Appendix X and Appendix XI of Medan City Regional Regulation Number 2 of 2015 concerning Detailed Spatial Planning and Medan City Zoning Regulations 2015-2035, it is known that some development intensity regulations that apply to project locations, namely the type of activity that can be built are a commercial service, the coefficient the maximum building base is 70%, the maximum building floor coefficient is 10, the minimum green base coefficient is 20%, the maximum building height is 15 floors, the minimum building width and length are 8m and 15m, respectively, and the minimum floor area is 150m<sup>2</sup>.

### Territory restrictions

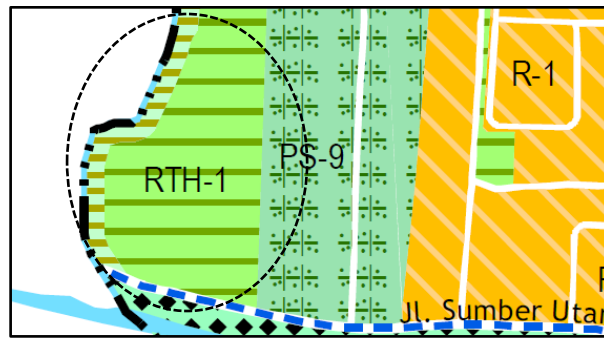
The research location is bordered by the Sumber Utama Street corridor on the east side, bordered by vacant land on the north side, Jalan Kanal Raya on the south side, and vacant land. Highway Canal Corridor with building demarcation line regulations based on Appendix X and Appendix XI of Medan City Regulation Number 2 of 2015 concerning Detailed Spatial Planning and Zoning Regulations of Medan City for 2015 – 2035, which is 10m, and Jalan Sumber Utama corridor with regulations the building demarcation line is 1.5m (Figure 4).



**Figure 4** existence of research area boundaries

### Land use regulations

Based on the map data of the Detailed Spatial Planning of Medan Amplas District, the land allotment on the Deli Riverbank area in West Medan District as a trading area. In the map of the Detailed Spatial Planning of the West Medan District in 2015-2035, the surrounding area is a border area of the Deli River. Based on the Detailed Spatial Planning map data of Medan Barat District, the project location is an area that functions as a trading area (Figure 5).



**Figure 5** land-use allocation based on RDTR

### **Accessibility on-site to sub-districts and or cities**

The project location can be accessed directly via Jalan Kanal Raya by private or non-private vehicles. Users can access the site via Jl. STM, after this, follow Jl. Canal Raya to be able to access the site. The design location has a distance of  $\pm 8$  km from the Zero Point of Medan City or the Old City Hall Building.

### **Architecture at the project site and its surroundings**

The area around the project site has a pattern of arrangements that resemble each other, with geometric shapes such as squares dominating. The buildings around the site consist of a 1-story residential house and a 3-story shop house (Figure 6).



**Figure 6** residential buildings and kiosks as high as 1 and 3 floors

### **A view of the project site and its surroundings**

The west and south sides of the research location have positive values, which are vacant land and canals as potential water elements. The north side view is a negative value is the house of residents with their backs to the site so that what is visible in the area behind the residents' homes (Figure 7).





**Figure 7** view from the research site

The problem that often occurs is that there are no creative ideas due to the unsupportive atmosphere of the room. A comfortable physical space can facilitate creative ideas that arise. Biophilic design is a basic human need to always connect with nature. That's why the flames of the fire and the crashing of the waves, and the nature view can enhance human creativity. The biophilic design creates a space that can help everyone to focus; improves physical and mental health; raises mood; helps reduce stress; provides a positive physiological response; arouses curiosity; refreshes memory and problem-solving skills, and fulfills basic human needs for the environment; namely exploration through architectural patterns.

The waterfront area as a part of the city with geographical-natural water potential forms a transitional boundary between water areas and waterfront areas, and it is an area with enormous potential in developing a unique environment in creating the identity of a city. However, unregulated regional development will also be a big problem. As is the case with the canal area on Jalan Kanal Raya, which is currently the location for research, land use is still not optimal.

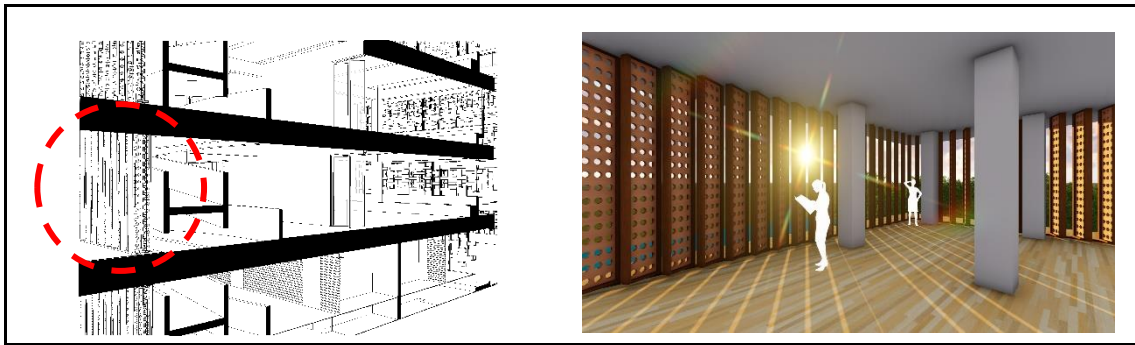
## **Design Concept**

### **Basic concepts**

The building concept follows biophilic design patterns that expressly represent the relationship between humans as users and nature's existence by still paying attention to the essential aspects when designing a creative space, namely comfort, openness, accessibility, tolerance, and diversity. According to Borrup, creative space is also an embodiment of space that can stimulate user creativity.

### **Visual connection with nature**

A hollow massif wall with wood material is arranged diagonally so the building users can feel the potential of natural scenery (Figure 8).



**Figure 8** massive wall use

### **Non-visual connection with nature**

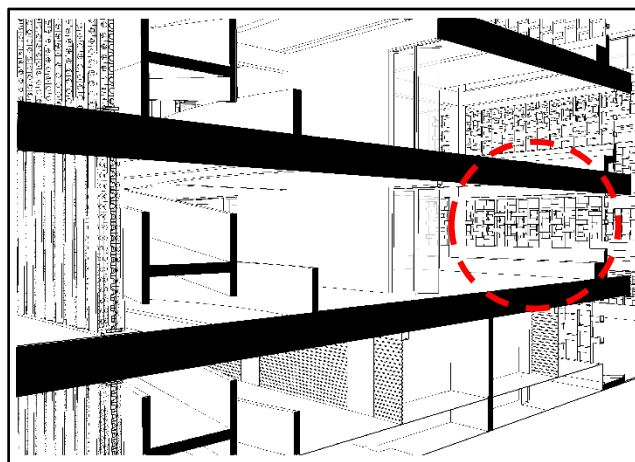
Using the inner court as an element that activates stimulation of the senses of touch and smell. Incorporating vegetation into buildings provides an environment that can help reduce stress and improve physical and mental health (Figure 9).



**Figure 9** inner court

### **Non-rhythmic sensory stimulation**

On one wall of the building, the creative spaces use a planter box as a medium for conveying the faint aroma of wood and plants into the facility (Figure 10).



**Figure 10** planter box

### Water element

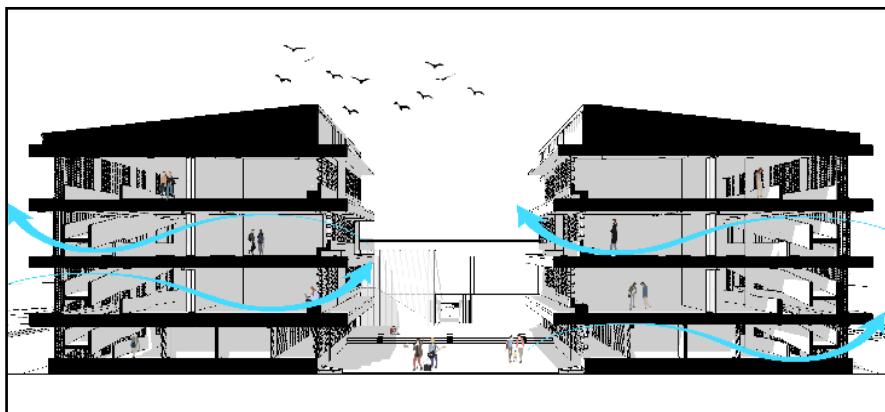
The presence of a mini oasis in the amphitheater area enhances the space experience and raises the mood of visitors (Figure 11).



**Figure 11** mini oasis in the amphitheater

### Thermal variability and airflow

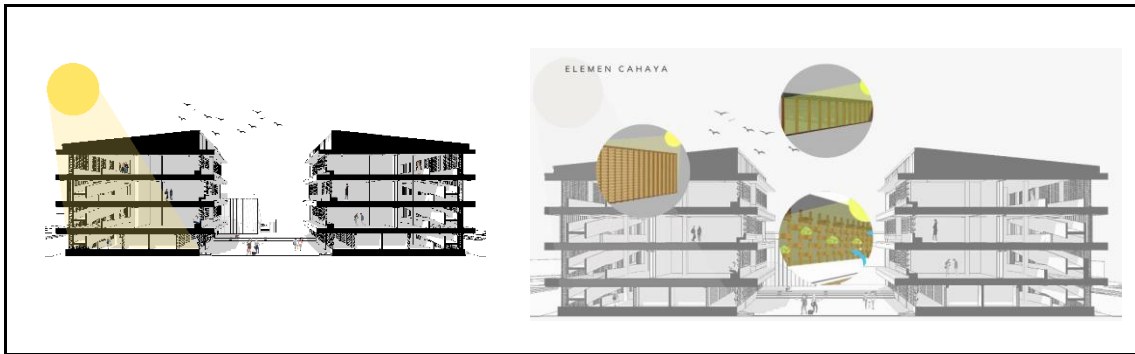
The creative industry center building uses a hollow massif wall so that air circulation occurs appropriately and the air quality of the building is healthier. Massive walls on the left and right sides of the building maximize cross-air circulation in the building (Figure 12).



**Figure 12** air circulation in buildings

### Light element

Massive walls maximize the natural light that enters the building. Several features are used to enter natural light into the building, namely the hollow massif walls on the right and left sides of the building and windows on the sidewalls of the roof of the building (Figure 13).



**Figure 13** natural light in buildings

### Connection with natural system

Natural conditions that constantly change according to climate and seasons can also increase user awareness of natural properties. This Creative Industry Center uses pine forests (Figure 14) and flower gardens (Figure 15) which change color and fall according to the seasons.



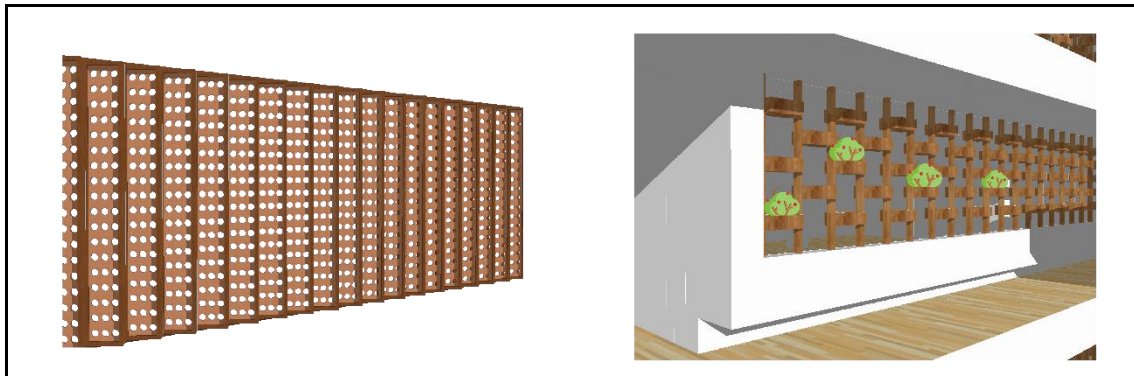
**Figure 14** pine forests



**Figure 15** flower gardens

### Material connection with nature

Applying materials and elements from nature in the form of dominant wood on massive walls. Natural ingredients produce a positive physiological response (Figure 16).



**Figure 16** wood material on the hollow massive wall (left) and planter box (right)

## 5 Conclusion

The problem that often occurs to creative industry activists is that creative ideas do not appear due to an unsupportive environment. It takes a creative environment supported by infrastructure in the form of creative space because the physical presence of space can facilitate the activity of turning ideas into actual innovative products. Biophilic architecture emerged to close the gap between modern architecture and the human need to connect with nature. The biophilic design pattern has a wide range of applications for both interior and exterior, is flexible and adaptive, allowing for functionally appropriate implementation without compromising health and well-being.

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