



# Mainstreaming biophilic design in residential development in Jakarta: a study with a multi-level perspective

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## Abstract

In the UN's sustainable development program (Sustainable et al. for 2030), it is determined that sustainable cities and communities are one of the goals for achieving in 2030, namely goal no 11. By 2050, the world's urban population will double, making urbanization the most transformative change of the 21st century (UN-Habitat, 2017). It is undeniable that a big city like Jakarta is a city with a high population density. Human life in urban areas increasingly reduces human opportunities to interact with the natural environment, which decreases a person's general well-being (Feandri, 2016). The research will be carried out on reorganizing the city by involving natural elements through a Biophilic Design theoretical approach, a theory that utilizes human nature to be happy to be close to nature (Browning et al., 2014). This theory is claimed to improve its inhabitants' mental and physical health and direct people to take care of the environment on a larger scale.

**Keywords:** biophilic design; community; residential development; sustainable development;

## 1. Introduction

Various scientific studies have been carried out to look at the correlation between the level of overcrowding in urban systems and levels of stress. (Okkels et al., 2018) said that the pattern of unstructured urbanization, as is often the case in developing countries, impacts the population's mental health. An overview conducted by (Hoare et al., 2019) shows that the scientific community has mapped out how various components of urban life, such as lifestyle, light pollution and noise pollution, are factors for the mental health of urban residents. How improve the mental health of urban communities in cities that are already very crowded is a challenge in itself. The COVID-19 pandemic has created an urgency to review the design of human living spaces. The World Health Organization (2020) says that the risk of transmission of the coronavirus increases in closed spaces, where designing a good ventilation system can be a solution.

Based on a statement from Miller & Spoolman (2016), isolation from nature can cause stress, anxiety, depression, irritability, difficulty dealing with change, and excess weight. Biophilic design, one of the principles of which is to enlarge natural components in human living spaces, can improve the mental health conditions of urban communities (Browning et al., 2014). The studies that have been conducted show the various benefits of applying biophilic design to humans. A study by Xue et al. (2019) stated that biophilic design benefits the human body, especially in exposure to natural scenery and airflow, so it is good for the respiratory system. Gray & Birrell (2014) said that applying biophilic design in office space could improve the performance of its workers, increase morale and encourage collaborative behavior. In Indonesia, Felly & Susanto (2020) conducted a study on applying

biophilic design principles in nursing homes in Cibubur and saw a correlation with a reduced risk of dementia. [Gillis & Gatersleben \(2015\)](#) have summarized the various benefits of implementing biophilic design and said that these benefits come from the increased exposure of humans to elements of the natural environment, both directly and indirectly.

Humans and their environment, both the natural environment (animals, plants) and the built environment, have a strong interaction because humans and their environment are in one ecosystem. Miller & Spoolman (2016) states that an ecosystem is a collection of organisms in a certain area that interacts with each other, biotic and abiotic environment and energy. [Bruntland \(1987\)](#) also mentioned that humans who cannot adapt to the patterns that exist on planet Earth, namely clouds, oceans, greenery and soil, have damaged the basic systems on Earth. Seeing the opinions of environmental experts mentioned above, it cannot be denied that humans and their environment cannot stand alone. Disturbance to one element will disrupt other elements. The interactions that occur between the elements in each of these ecosystems must be maintained in such a way as to achieve equilibrium.

Cities grow as a response to human inability to adapt to natural patterns. A city is a built environment that continues to experience growth, especially its population. Cities grow in two ways, first, naturally, as a result of birth rates that are greater than death rates and secondly, due to urbanization from village to city in search of work, food, education, better opportunities, and freedom from religious, racial, and political conflicts (Miller & Spoolman, 2016).

Human ecology studies the relationship between humans and their environment ([Rosyani, 2019](#)). Another opinion says that human ecology is a scientific discipline examining human interactions with their natural environment and culture as an intermediary ([Abdoellah, 2017](#)). Both of these opinions show that humans cannot be separated from nature as part of the ecosystem. Studying the interactions between humans in ecosystems means also studying the interactions of human social systems with ecosystems and other ecosystems ([Rosyani, 2019](#)). The social system is everything related to humans, population, psychology and all social organizations.

Throughout their life journey, humans have gone through many experiences, including those related to interactions with the natural environment. Experience that has been stored becomes information that underlies humans to react or anticipate events that will occur ([Kaplan, 1995](#)). Another theory states that contact with nature brings many advantages, even if the contact is limited, both in time and frequency ([Zelenski & Nisbet, 2014](#)). One of the benefits is increased happiness ([Zelenski & Nisbet, 2014](#)). When humans understand that closeness to nature increases happiness and health, humans will always try to protect nature ([Zelenski & Nisbet, 2014](#)).

The term biophilia was first popularized by Edward O' Wilson in 1980. Biophilia refers to a condition in which humans tend to always relate to life and natural processes to express their biological needs and become an important factor in their physical and mental development ([Kellert, 1993](#)), thus encouraging us to affiliate with other life ([Wilson, 1986](#)). It is a pity that, in increasingly modern conditions, human closeness to nature is decreasing. This is increasingly felt in big cities like Jakarta. This opportunity to close human relations with nature can still be done by incorporating the theory of biophilia into the artificial environment around humans.

The design process by incorporating the theory of biophilia is known as biophilic design. Biophilic design is a process that restores the human position as a biological organism, prioritizing mental and physical health in a context appropriate to the environment ([Browning et al., 2014](#)). Biophilic design can reduce stress levels, increase cognitive abilities and creativity, improve health, and accelerate recovery, which is very important for today's urbanites ([Browning et al., 2014](#)).

## 2. Methods

The chosen research approach is a desk study where the research location is in Jakarta with a qualitative approach. The research will use a multi-level perspective analysis tool, in which there are three analysis levels: the micro or niche level, the meso or regime level and

the macro or landscape level. The main thesis of the multi-level perspective is that transitions to sustainability in a system result from regime changes caused by interactions with niche and landscape aspects (Papachristos et al., 2013). Using this analytical tool, the research is expected to show the possibility of applying biophilic design in urban living space design by identifying niche, regime, and landscape aspects.

The multi-level perspective says that the transition to sustainability goes through three main processes (Geels & Schot, 2007). First, at the micro or niche level, momentum is built within the system through knowledge reproduction and support from influential actors. Then, some changes put pressure on the regime at the macro or landscape level. Finally, at the meso or regime level, destabilization occurs, creating space for mainstreaming knowledge or innovations originating from the niche level.

### 3. Results and Discussion

Jakarta is experiencing rapid population growth, with a population density of 16,704 people/km<sup>2</sup> (Sectoral et al. of DKI Jakarta Province, 2019). Very high density makes it quite difficult for Jakarta residents to obtain housing. Limited land, coupled with the high demand for this land for development, has led to high land prices in Jakarta. Density and expensive land prices cause the growth of vertical housing, such as flats, flats, apartments, and the like.

In addition to encouraging vertical housing growth, this condition encourages peri-urbanization and urbanization by city dwellers to peri-urban areas. Peri-urban is an area directly adjacent to a city (Merriam-Webster, 2020). In Jakarta, this peri-urban area is known as Jabodetabek. Peri-urbanization has succeeded in making the Jabodetabek area grow very rapidly, along with all the impacts on the environment. Over the last 3 decades, the private sector has succeeded in converting more than 300,000 Ha of village land into a new city in the peri-urban area of Jakarta (Winarso et al., 2015).

At the multi-level, the regime is defined as the locus of common practices and rules of the game that either support or hinder established actors concerning the system (Geels, 2014). In the context of this scientific paper, the regime can be identified as the general rules of the game in the development of residential areas in Jakarta and the interactions between the dominant actors. The pattern of developing residential areas in Jakarta follows economical principles, with profit as the main motivation. The high and continuing rise in housing prices in Jakarta has not dampened demand. On the other hand, the amount of available land in Jakarta is very limited, so residential development patterns must be carried out efficiently to match limited supply with high demand.

A niche is a locus capable of carrying out sustainable innovations (Geels, 2014). By viewing biophilic design as a sustainable innovation, niche aspects can be represented by interactions between the main actors in reproducing and popularizing knowledge about biophilia. Proponents of biophilia see that biophilic design can be applied to improve the interaction of living space residents with their natural environment (Kaffah et al., 2020). At the project planning stage, this can be implemented in several ways, including creating mass forms that respond to nature, making windows and openings sufficient for lighting and air exchange, using shading or grilles on the side exposed to Western sunlight, and providing landscape elements. On certain floors and making green skin or plant walls (Kaffah et al., 2020; Revell & Anda, 2014).

However, this biophilic design can also improve the condition of existing housing. One concept that can be applied is window framing or gardening (Atria & Achmad, 2014). This activity is carried out using hydroponic techniques. Apart from presenting plant elements in space, this activity also forces the occupants to open windows periodically when caring for the plants so that air circulation and contact with the occupants occur. Other interventions that can be carried out on existing residential interior units can be carried out by using materials that contain natural elements, such as wood and natural stone or using natural colors, such as earthy tones (brown), water tones, sky (blue), and tree tones (green), and shades of sunlight, fire, and flora (orange).

Biophilic design can transform into a biophilic city in a wider spatial scope. Applying the principle of biophilia within the scope of the city will align the metabolism of the urban

environment to reflect natural environmental patterns better, thereby increasing resilience (Beatley & Newman, 2013). Nkubiyaho (2020) states that biophilic cities have many natural elements which care about protecting, improving and caring for nature and always trying to establish good relations with nature in general. There are several indicators present in a biophilic city, namely:

- a. Biophilic design in infrastructure in public spaces: percentage of green open spaces, presence of plant and water elements, diversity of flora and fauna
- b. Lifestyle and biophilia: frequency of outdoor activities, visits to city parks, frequency of walking trips, membership in environmental care communities
- c. Biophilic knowledge: the number of people who care about nature and are familiar with common plant and animal species.

Production of knowledge about biophilia, which can be seen from the increasing attention

#### 4. Conclusions

SDGs goal number 11 and the current world conditions hit by the COVID-19 pandemic make us realize that health is a necessity. Health and improved quality of life can be achieved by restoring harmony between humans and nature. Biophilic design, as one of the momentum currently at the niche level, must continue to be encouraged for its application to improve residents' quality of life and overall environmental sustainability. This encouragement will only occur with policies from stakeholders in Jakarta and at the central level. Making various policies, such as government regulations alone, is only enough if it is accompanied by supervision and firmness in its implementation. Dissemination of biophilic design to the community must also be continuously carried out so that its application is not only on a city scale but starts from the residential scale as the built environment closest to humans.

Mainstreaming of biophilic design, through applying the main principles and concepts in residential design or urban area management, should be supported by scientific studies to measure its impact. Further research can also investigate the correlation between the application of the biophilia concept in dwellings, such as good air circulation and exposure to sunlight, with the risk of contracting COVID-19. Further research is important to do to maintain the momentum of biophilic design as a niche in a multi-level perspective.

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