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Relationship between green architecture and urban ecology

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Abstract
Global warming and Climate change are among the major challenges in the 21st century. Rapid urbanization is a major reason for this. Urban sprawl and the emergence of urban clusters are problems faced by any city. This in turn creates an impact on the micro-scale climate of that area. Urban heat island is a major problem resulting from this. It adversely affects urban ecology and creates public health damage. Heat islands increase both overall electricity demand, as well as peak energy demand. Green architecture and cool pavements are the best methods to reduce the heat of the urban regions. Green architecture is an architecture that seeks to minimize the negative environmental impact of buildings by efficiency and moderation in the use of materials, energy, development space, and the ecosystem at large. Green building offers us an opportunity to save energy, reduce waste, cut down on greenhouse gas emissions. Efficient ventilation helps to increase efficiency, energy conservation, and cure health problems. It also improved air quality and reduced stress in occupants living in those buildings. Many reports revealed about green roofs reduce both the surface temperature and air temperature of the urban area during the daytime and green roofs absorb heat and filter the air, keeping the temperature low. Green architecture helps to balance our urban ecology. Green building is also known as sustainable or high-performance building. Green architecture is re

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Introduction

Every human activity creates various adverse effects on our environment. Urbanization refers to the population shift from rural to urban areas, the corresponding decrease in the proportion of people living in rural areas, and how societies adapt to this change. Urban sprawl and the emergence of urban clusters are problems faced by any city. This in turn creates an impact on the micro-scale climate of that area. Rapid urbanization is one of the factors to cause urban problems. It adversely affects our urban ecology and public health. Urban heat island is a big problem facing many cities. Pollutants in the air in urban environments create more precipitation and it leads to higher, temperatures. Modification of infrastructure of buildings and land surfaces. The important factor is waste heat generated from energy consumption. One of the important mitigations is green architecture, it gives careful consideration to designing energy-efficient and eco-friendly houses and buildings.

Green architecture

Green architecture is one of the strategies that can be used to enhance sustainability, according to Ragheb *et al*. (2016). [13] They discussed the advantages of green structures, such as a well-planned passive solar home or a highly energy-efficient structure that can drastically reduce the amount of power consumed for lighting and heating fuel. They stated that new building technologies—specifically, ICT automation and new materials—help to improve the building process' sustainability and safeguard inhabitants' health. By encouraging the economical use of water, energy, and other resources, green architecture helps ecosystems. Additionally, it makes use of sustainable energy sources like solar power. materials that are ecological, moral, and non-toxic.

Green building designs focus on increasing the efficiency of resources like energy, water, and building materials. They also found green building tool is a second-generation assessment tool and it provides common and verifiable criteria so that people can strive for higher environmental standards. They revealed green architecture provides a solution to the energy problem that could be eco-friendly and cost-effective in the metropolitan cities of Pakistan like Karachi, Lahore, Islamabad, and other growing urban areas in Pakistan. They also suggested students should be educated and should be encouraged to design green buildings (Aslam et., al (2012).[1] According to Masi *et al*. (2015), [8] one way to reduce drinking water waste for applications where the necessary quality may be lower is through green design. According to their research, three distinct green architectural solutions—such as roof wetlands, green roofs, and green walls—as well as rainwater and treated greywater are applied in three different countries—Tanzania, Italy, and India.

According to Masood *et al*. (2017), [9] the majority of buildings have issues including increased energy use. Energy consumption is required for cooling purposes, which also contributes to the quick use of energy. Inappropriate building construction techniques result in the production of waste energy. Good ventilation and natural lighting are provided by green architecture, which may be utilized by a variety of applications and environmental processors to reduce energy consumption and promote eco-friendliness. In order to promote green architecture and constructive building designs, they recommended the creation of environmental laws. According to Yuan *et al*. (2017), [18]

bionic green architecture and bionic building energy efficiency are crucial components for achieving sustainable building development. They examined the uses and typical examples of bionic green architecture and bionic building energy efficiency. Building energy consumption is reduced and the internal thermal condition is improved with the aid of solar energy construction technology. They claimed that using lotus leaves, polar bear fur, and other organic plants and animals as bionic construction materials enabled the structures to actively adapt to their surroundings. They proposed researching biological systems' mechanisms, which when paired with contemporary construction technologies, increases the energy efficiency of buildings. Eyup (2013) [4] reported finance is one of the most important issues in ecology. Green architecture provides both environmental and economical benefits to the environment. It saves people's money and gains more energy and another saving is cost savings during the design phase. They also reported that the exploration of green architecture should be supported by the field of current economy and ecology.

Tan and Liu (2019) [16] investigated how green ecological buildings affect emissions and energy savings. They determined the overall energy consumption of green ecological buildings as well as the energy consumption during the building's operation. Green ecology's operational energy usage is contrasted with that of regular buildings. It showed that regular structures use more energy than green, ecological buildings. Perov *et al*. (2019) [11] concentrated on current Russian environmental design and energy-efficient architecture. They discovered that while there is no environmentally friendly architecture in Russia, a quantitative comparison with the top nations shows that green technology are used sparingly in Russian civil engineering and architecture. The authors examined how the low level of green architecture is caused by a lack of eco-friendly education and stringent laws. They suggested that Russia's advancements in green architecture raise the country's standing in the world.

According to Shafique and Kim (2017), [15] the green-blue roof is a novel low-impact development (LID) technique that has shown promise in reducing the urban heat island phenomenon. A modified version of green roof technology is the green-blue roof. Rainwater can be stored in the soil layer and vegetation, and it also speeds up evapotranspiration, which lowers local temperatures.

Lehman (2014) [7] reported rapid urbanization is one of the factors of environmental degradation. That leads to adverse effects of climate change. The urban canopy has a major role to reduce the urban heat island effect in cities. Green architecture reduces energy consumption and the development of greenery in urban areas. Both urban designers and policymakers have an important role to reduce the heat in urban areas, promote green architecture and sustainable development. According to Price *et al*. (2015), [12] green roofs are another technique used to reduce the intensity of urban heat islands by adding plants to the roof to boost evapotranspiration. Similar functions of evapotranspiration can also be performed by vertical "green walls." According to Bevilacqua *et al*. (2017), [2] because they may significantly lower the surface temperature of rooftops, green roofs have recently been considered as helpful techniques to alleviate the Urban Heat Island phenomenon. The analysis's findings demonstrated that whereas green roofs were able to produce a surface temperature that was between 0.57 and 0.63 times lower, the traditional roof in June achieved a peak of 74.3 0C with a daily excursion of 51.5 0C.

The green roofs reduce both the surface temperature and the air temperature of an urban area during the daytime (Razzaghmanesh *et al*. 2016). [14] Getter and Rowe (2006) [6] reported green roofs to absorb heat and filter the air, keeping the temperature low, and also green roofs help to delay the runoff duration which will keep the cities cooler for a longer period. Green roofs absorb water and it helps to reduce the temperature. Green roofs present a great method of lessening the impacts of urban heat islands. Green roofing is the practice of planting vegetation on a roof, just like they are planted in a garden. Plants on the roof are excellent insulators during summer and decrease the overall urban heat island effect. Planning of sustainable cities serves as a fundamental catalyst for change, improving the environmental quality of the natural and built environments, and upgrading conditions for the development of green architecture. The study revealed that sustainable cities and their green structural component provide an opportunity for innovations and developments of green architecture. Our surroundings have started to change with new inventions and new opportunities and that leads to the planning of sustainable cities and green surroundings (Oglu Huseynov 2011). [10] Clark et., al (2008) [3] reported green roofs are primarily valued for increased roof longevity, reduced stormwater runoff, and decreased building energy consumption. Green roofs provide better air quality than conventional roof methods. The rivers and lakes could also separate urban thermal fields, reducing thermal radiation, alleviating thermal field circulation, and eliminating urban heat island effects. It was observed in Bozhou, China. So, areas near to a river, lakes, etc., with convenient traffic are beneficial to the climatic environment. Urban greenery and reflective surfaces can reduce the temperature and near-surface levels of ozone in an urban environment. (Yang *et al*. (2016) [17] and Fallman *et al*., (2016) [5].

Conclusion

Rapid urbanization is one of the major adverse effects of our environment. Many drastic changes are occurred due to urbanization. Urban heat island is one of the problems facing many cities. Green architecture is one of the mitigation measures to reduce urban heat in cities. Green architecture reduces both environmental problems related to energy consumption. Urban ecology is the study of ecological processes in an urban environment. This includes all aspects of the ecology of any organisms found in urban areas as well as large-scale considerations of the ecological sustainability of cities. Green architecture helps to balance our urban ecology. Green architecture is responsible for reducing the impact on urban ecology. It also improved air quality and reduced stress in occupants living in those buildings.

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