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PERSPECTIVES AND CHALLANGES

"Contributions to Sustainable Environment"

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A Review on Impacts of Urban Heat Islands in Cities and the Importance of Green Buildings

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ABSTRACT

The term "urbanization" refers to the population shift from rural to urban regions, the accompanying decrease in the rural population, and how societies adapt to this change. Global warming and climate change are among the major challenges in the twenty-first century. Rapid development causes numerous environmental issues. As a consequence, urban heat island is a significant issue. It damages our urban ecology and harms public health. Pollutants in the air in metropolitan areas cause more precipitation, which results in the highest temperature. Heat islands raise both total electricity consumption and peak energy demand. Green structures and cool pavements are the most effective ways to decrease urban heat. This encompasses all elements of the ecology of any organism found in urban areas, as well as large-scale concerns of city ecological sustainability. Green building allows us to save energy, reduce waste, and decrease greenhouse gas emissions. Efficient ventilation aids in efficiency, energy saving, and the treatment of health issues. It also enhanced air quality and reduced stress for those who live in those buildings. This review covers various techniques for constructing green buildings. Green buildings contribute to the ecological equilibrium of our cities. Green architecture is also referred to as sustainable or high-performance construction.

KEYWORDS: **Green buildings, Urban Heat Islands, Urban ecology**

1 Introduction

Every human activity creates various adverse effects on our environment. 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 the area. Rapid urbanization is one of the factors to cause urban problems. Urban heat is a big problem facing many cities. The urban heat island (UHI) is a phenomenon whereby urban regions experience warmer temperatures than their rural, undeveloped surroundings. The UHI is the most obvious atmospheric modification attributable to urbanization, the most studied of climate effects of cities and an iconic phenomenon of urban climate (1). Numerous factors are held accountable for this effect, including anthropogenic heat release, surface cover, climatic conditions, air pollutants, etc. (2). One of the important mitigation measures includes green building. The green building strives to minimize the number of resources consumed in the building's construction, use and operation, as well as curtailing the harm done to the environment through the emission, pollution and waste of its components. Sustainable architecture 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.

URBAN HEAT ISLANDS

Urban heat island effect is defined as the presence of significantly higher temperatures in urban areas compared to the temperatures in surrounding rural zones mainly due to human factors (2). Urban heat islands occur many problems in cities. The main causes of urban heat islands include low albedo materials (Albedo is the ratio of the reflected solar energy to the incident solar energy. It depends on the arrangement of surfaces, materials, pavements, coatings, etc (3). If the albedo of the urban surface is low, it will store more solar energy, and the effect will be an increase in urban temperature), paved and impermeable surfaces, lack of vegetation, Buildings contain much thermal mass (they store much heat during the day and are slow to release the heat overnight), Air pollutants – Air pollution is a major issue in urban areas. Exhaust gases from vehicles, industrial pollutants released in the atmosphere, trap solar radiation causing an increase in temperature and climate change (4).

EFFECTS OF URBAN HEAT ISLANDS

Higher energy consumption

The temperature in cities is higher, especially on summer nights. This generates an increase in the demand for energy to power air-conditioning units, which in turn drives up the price of electricity

Elevated emissions of Air pollutants and Greenhouse Gases

Urban heat islands demand more electricity during the summer seasons. It leads to more consumption of fossil fuel power plants to meet much of this demand, which in turn leads to an increase in air pollutants and greenhouse gas emissions.

Impact on health

The high temperatures can affect the health of city dwellers, causing widespread discomfort, respiratory problems, sunstroke, dehydration, tiredness and even increased mortality rates due to heatstroke.

Humidity effects

Although there is little difference in the amount of water that cities and country sides retain in their atmospheres (absolute humidity), the higher urban temperatures effectively lower the relative humidity (since warm air can hold more water than cold air).

Urban haze

The haze of air pollution hanging over many cities can act as a miniature greenhouse layer, preventing outgoing thermal radiation (heat) from escaping urban areas.

However, urban areas are more susceptible to heat because the amount of warmth generated by global climate change is exacerbated by the urban heat island effect. As the climate warms, this means that city dwellers will confront higher temperatures and more intense heat waves in the future. More than half of the world's population now lives in cities, and by 2050, the number of urban people is predicted to reach 70%, implying that the problem of urban heat islands will worsen (5). So, the mitigation of the urban heat island is very important in cities. Green buildings are helpful to reduce urban heat effect in cities. Sustainable architecture is 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 BUILDINGS

Green building, also known as sustainable building or green construction, is the concept of designing and building structures and processes that are environmentally responsible and resource-efficient throughout a building's life-cycle, from siting to design, construction, operation, maintenance,

renovation, and deconstruction. Green architecture is one of the options to limit the waste of drinking water for applications where the required quality can be lower (6). In their studies, they reported the applications of three different green architectural solutions and rainwater and treated greywater is used methods like roof wetland, green roof and green wall in three different countries like Tanzania, Italy and India. Bionic building energy efficiency and bionic green architecture are important factors to achieve the sustainable development of buildings (7). They analyzed the applications and typical cases of bionic building energy efficiency and bionic green architecture. With the help of solar energy construction technology improve the indoor thermal environment and leads to low energy consumption for buildings.

The influence of green ecological buildings on energy saving and emission. In their studies, they calculated the total energy consumption of green ecological buildings and energy consumption in the operation stage of green ecological buildings (8). The energy consumption in the operation stage of green ecology is compared with that of ordinary buildings. It revealed the energy consumption of an ordinary building is more than that of green ecological buildings. Many journals work reported the benefits of green buildings. Five major elements of green buildings include Sustainable site design, Water conservation and quality, Energy and environment, Indoor environmental quality and Conservation of materials and resources (9).

BENEFITS OF GREEN BUILDINGS

Energy efficiency

Green building designers make every effort to avoid reliance on non-renewable energy sources such as coal. It installs solar panels to harness solar energy and designs windows to let in as much natural light as possible, reducing the need for artificial lighting.

Protect existing natural spaces

Green buildings tend not to be constructed on environmentally sensitive lands. If they are constructed on or near green spaces, measures are taken to limit the impact on the local ecology.

Preservation of the natural environment

The operation of green buildings helps to conserve their natural habitat. This event encourages residents to develop healthy habits such as walking, exercising, and participating in other physical activities. It also attracts birds and other species, resulting in a diverse environment in the whole region.

Green roofs and vegetation cover

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 (10).

Enhanced Health: Eco-Friendly For Life

Living in a sustainable building can literally save your life. According to research, people who live in green constructions benefit from a plethora of health benefits as a result of the eco-friendly materials used in construction. Green buildings, for example, avoid utilizing construction materials that may include dangerous volatile organic compounds (VOCs) or plastic by-products that have been shown to emit poisonous vapours and carcinogens into the environment. These hazardous compounds have been related to respiratory disease, allergies, and other health problems, as well as an elevated risk of cancer in extreme circumstances.

Enhances Indoor Environment Quality

Good indoor environment quality is one that protects the health of the building's occupants, reduces stress and improves their quality of life. Green buildings achieve this through the installation of operable windows that allow in as much sunlight as possible and reduce the use of materials that may emit elements that are dangerous to health.

Reduce Carbon Footprint

As green building consumes less energy during construction as well as in operation. They are more environmentally friendly. Less energy consumption means less carbon footprint on your building.

Sustainable Materials reduce the impact on the environment

Sustainable architects, engineers, and green designers are tapping into existing resources to lower carbon footprints and save natural resources by employing recycled materials and recycling resources (and even repurposing old structures). Green building businesses may produce very efficient structures that can last the test of time by incorporating sustainable tactics into the design process, such as eliminating waste, saving natural resources (such as water and wood), safeguarding our air supply, and limiting energy use.

EXAMPLES OF GREEN BUILDINGS IN INDIA

Rajiv Gandhi International Airport (RGIA), Hyderabad

The sixth busiest airport in India, located in central Hyderabad, has established a precedent for green structures in the country. The airport's structure is meant to use less water and power while conserving natural resources. There is a 273-hectare green belt with numerous vegetation on the airport campus. RGIA has successfully saved almost 3.97 million kWh of energy and reduced its carbon footprint by 3331 tons during the last few years. The GMR airport is the 1st airport in Asia and 2nd globally to have won a LEED silver rating certification

CII- Sohrabji Godrej Green Business Centre, Hyderabad

This architectural marvel has established the best example of passive architectural design in the world. At the time of its opening, the CII-Sohrabji Godrej Green Business Center (GBC) was the first building outside of the United States to be awarded a LEED platinum rating. The building generates no garbage and recycles it entirely inside. The structure is literally constructed entirely of recycled materials. Two air-cooling towers chill the air by up to 8 degrees, a terrace garden covers almost 55% of the roof, and solar cells on the roof produce nearly 20% of the required energy.

Indian Green Building Council

The Indian Green Building Council (IGBC), part of the Confederation of Indian Industry (CII) was formed in the year 2001. The vision of the council is, "To enable sustainable built environment for all and facilitate India to be one of the global leaders in the sustainable built environment by 2025". The council offers a wide array of services which include developing new green building rating programmes, certification services and green building training programmes. The council also organizes the Green Building Congress, its annual flagship event on green buildings (11).

CONCLUSION

The study of ecological processes in urban areas is known as urban ecology. This comprises all aspects of the ecology of any organism found in urban regions, as well as large-scale issues of urban ecological sustainability. Green building contributes to the ecological equilibrium of our cities. Green building is partly responsible for lessening the influence on urban ecosystems. It also enhanced air quality

and reduced stress for folks who live in those buildings. It alleviates heat stress in cities. The initial construction expense is one of the disadvantages of green buildings. Green building materials are not always as widely available as traditional building materials,. Green buildings, on the other hand, are the wealth of the future. Several well-known cities have embraced this method and established councils to determine the reasons and regulations for awarding a "green" stamp to a newly constructed building.

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"A green economy is an economy that aims at reducing environmental risks and ecological scarcities, that aims for sustainable development without degrading the environment"

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