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Use of Sustainable Green Materials in Construction of Green Buildings

Mr. Bhola Ram[1], Mr. Mahesh Sharma[2]
M.Tech Scholar at Poornima University, Guest Faculty at Poornima University, Sitapura Jaipur

Abstract: ***Due to many advantages, sustainability is becoming an important concern in the building industry. Since sustainability is becoming more and more popular around the world, the construction industry places a high priority on the creation of sustainable buildings. A number of environmental problems are emerging as a result of massive urbanization activities. By utilizing sustainable building materials, pollution will be reduced and the present situation of environmental issues will be improved. The application of recycled design products in the building sector is covered in the article. There is a great need for reasonably priced, environmentally friendly housing developments built with materials that may be found nearby. It protects the environment, the economy, and the energy supply. Consequently, the research takes into account distinctive goods that can satisfy the minimal specifications for the construction of sustainable buildings. Keywords: Green Building, Sustainable Development, Green marketing, Green Rating.***

I. INTRODUCTION

The green building movement has gained significant traction as a means to address the environmental impact of buildings and promote sustainable development. This research paper examines the application of green building practices in the context of sustainable development in India. Buildings in India account for a substantial portion of resource consumption, energy use, and carbon dioxide emissions. Uncontrolled urban development has further intensified these environmental challenges. Recognizing the need for a more sustainable approach, the green building movement has emerged as a solution to minimize the environmental footprint of buildings. This paper explores the key principles and objectives of green building practices, including energy efficiency, resource conservation, water management, and indoor environmental quality. It highlights the significance of sustainable site selection and life cycle assessment in the context of green building development. A comprehensive review of the green building institutions and organizations in India, such as the Indian Green Building Council (IGBC) and Green Rating for Integrated Habitat Assessment , sheds light on their role in promoting and certifying green buildings. The findings of this study emphasize the crucial role of green building practices in achieving sustainable development in India. By reducing resource consumption, mitigating greenhouse gas emissions, and improving indoor air quality, green buildings contribute to environmental preservation, energy savings, and occupant well-being. The paper concludes with recommendations for professionals, and stakeholders to further promote and integrate green building practices into the Indian construction industry, facilitating a more sustainable development.

Recognizing:- The need for a more sustainable approach, the green building movement has emerged as a solution to minimize the environmental footprint of buildings. This paper explores the key principles and objectives of green building practices, including energy efficiency, resource conservation, water management, and indoor environmental quality. It highlights the significance of sustainable site selection and life cycle assessment in the context of green building development. A comprehensive review of the green building institutions and organizations in India, such as the Indian Green Building Council (IGBC) and Green Rating for Integrated Habitat Assessment he green building movement has gained significant traction as a means to address the environmental impact of buildings and promote sustainable development. This research paper examines the application of green building practices in the context of sustainable development in India. Buildings in India account for a substantial portion of resource consumption, energy use, and carbon dioxide emissions. Uncontrolled urban development has further intensified these environmental challenges. Recognizing the need for a more sustainable approach, the green building movement has emerged as a solution to minimize the environmental footprint of buildings. This paper explores the key principles and objectives of green building practices, including energy efficiency, resource conservation, water management, and indoor environmental quality. It highlights the significance of sustainable site selection and life cycle assessment in the context of green building development. A comprehensive review of the green building institutions and organizations in India, such as the Indian Green Building Council (IGBC) and Green Rating for Integrated Habitat Assessment (GRIHA), sheds light on their. The findings of this study emphasize the crucial role of green building practices in achieving sustainable development in India.

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By reducing resource consumption, mitigating greenhouse gas emissions, and improving indoor air quality, green buildings contribute to environmental preservation, energy savings, and occupant well-being. The paper concludes with recommendations for policymakers, professionals, and stakeholders to further promote and integrate green building practices into the Indian construction industry, facilitating a more sustainable built environment. The green building move sheds light on their role in promoting and certifying green buildings. These institutions have developed rating systems and guidelines specific to the Indian.

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II. HISTORICAL BACKGROUND

1) Mr. Jiau Zuo and Mr. Zhen Yu Zhao completed their research on green building technology and provided an update on its state as well as future plans. They gave a report on a critical analysis of the corpus of prior research on green building studies. After determining the similar research themes and methodology, they proceeded with the research. They concentrated on common study topics including what constitutes a green building, how big of a building can be made green, how much better green buildings are than conventional structures, and how to get there. Additionally, they discovered during their investigation that the majority of the focus of previous studies has been on the environmental elements of green buildings. They outline in their study work the potential for the future, including the impact of climate conditions on the efficacy of tools for assessing green buildings, the verification and actual performance of green building techniques, the needs of certain populations, and future proofing. In their research, the author presented a critical analysis of previous studies on green buildings conducted all around the world. According to their study, these studies may be broadly categorized into two areas: the definition and scope of green buildings; the advantages and disadvantages of green buildings.

2) Ignacio Zabalza Bribian; Antonio Velvo Capilla; Alfonso Aranda The results of a lifetime assumedresearch comparing the most widely used building materials with the same eco materials using three different impact categories were reported in a paper on building and environment released by Uson. The primary goal of the authors' publication of this work is to increase our understanding of the energy and environmental requirements for construction materials. Additionally, they supported research into and analysis of their potential for reduction and improvement. plants and substitutes, ending the product cycle. This also entails a dedication to recycling and reusing materials, as well as constantly reducing the amount of raw materials and finished goods transported. All of these methods for constructing green buildings actions would encourage the use of locally accessible resources.

3) Ries; Robert Bilec; Melissa M Gokhen; Nurvi Mehmet Needy and Kim Lascola released a report that included a case study and a thorough analysis of the financial advantages of green buildings. They said that for many building projects, both conventional and green building techniques are taken into consideration throughout the planning and construction phases[3].Their final choice is frequently made primarily on the basis of timetables and budgets, and the long-term implications are frequently disregarded. Their presumption is that the advantages of the green building will far outweigh any additional costs. Additionally, they stated that paired t-tests were used to examine before and post move definitely responses in order to see whether the mean values of the variables had changed in a way that was statistically significant. In their published study, they also came to the conclusion that green buildings helped enhance productivity.

4) T.ramesh ravi & Prakash k.k Furthermore, they mentioned that in order to determine whether there had been a statistically significant change in the mean values of the variables, paired t-tests were employed to compare the pre- and post-move definitely responses. They also concluded in their publishedstudy that green buildings contributed to increased productivity.

III. METHODOLOGY

The research process for this review paper is broken down into five primary sections in order to precisely analyze the present obstacles, advancements, and future research direction for sustainable development ofgreen buildings. First off, the main database for this review paper was selected to be the WoS (Web of Science).

In order to determine the current state of the green building field and to provide recommendations for the sustainable development of green buildings, a theoretical analysis of the literature was carried out in conjunction with a content study of the literature. Furthermore, research has not discovered any noteworthy variations in the analysis's findings. As a result, the review study in this paper was conducted using a reliable database.

The Top 5 Eco-Friendly Building Materials

1) Bamboo.
2) Slabs of precast concrete.
3) A cork: Unfinished Bundles. In sustainable construction, straw bales are utilized as a naturalinsulating material for walls.
4) Repurposed Steel.
5) Large-scale Wood.

A. Bamboo



Fig.01 Bamboo

For millennia, bamboo has been utilized in construction as a fast regenerating resource. It is robust, long- lasting, and useful for a variety of things, including flooring and structural beams. Advantages: Bamboo is a sustainable substitute for traditional hardwoods since it grows considerably more quickly. Additionally, its modest weight lowers emissions from transportation.

B. Precast Concrete Slabs



Fig.02 Precast Concrete Slabs

These are concrete slabs that have been placed into a reusable mold and allowed to cure in a controlled setting before being delivered to the building site. Benefits: Using precast slabs guarantees uniform quality and minimizes waste on the job site. Additionally, it expedites the building process.

C. Cork



Fig.03 Cork

A sustainable resource, cork is extracted from the bark of cork oak trees. It can be applied walls, floors, and even insulation. Benefits: Cork offers superior thermal and acoustic insulation and is recyclable and biodegradable.

D. Straw Bales

Although it's not as common, straw bale building is becoming more and more popular. Simply stacking solid materials, builders construct these in a way akin to that of a log home. The structures have superior sound-deadening and insulating qualities. Because air cannot pass through the straw bales, they are unexpectedly resistant to fire.

Advantages: Straw is a plentiful byproduct of grain production. It is a cheap building material, biodegradable, and offers superior insulation.

E. Recycled Steel

Steel from abandoned buildings and structures is recovered and recycled. Advantages: Up to 75% less energy is needed to produce new steel when recycled steel is used.

IV. ADDITIONAL RELEVANT GREEN MATERIALS.

1) Insulated Concrete Forms (ICF)—Two years of insulating material are positioned between cast- in-place concrete walls. These systems are robust and need little energy. This construction method is frequently used for low-rise buildings, which can be used for residential, commercial, or industrial purposes. Though the walls are often thicker, traditional finishes are given to both the interior and exterior facades of the buildings, giving them a similar appearance to regular construction. Because of its longevity and durability, concrete is regarded by many as a green building material, despite having a much higher embodied energy than most other building materials.

2) Fiberglass insulation is usually not regarded as a green material by architects or builders because it requires a lot of energy to manufacture and usually contains a harmful binding agent. On the other hand, a key component of green building is super-insulating a structure above and above what is required by building codes. Many eco-friendly builders use the super insulation's inexpensive cost and simple installation to save money for other environmentally friendly features.

3) Cellulose is the second most popular insulating material, is made from recycled paper and, when used correctly, is thought to be a particularly green option. It is also reasonably priced, costing about the same as fiberglass. Natural fiber (cotton, wool): Batts, which are prefabricated sections of insulation that are tailored to fit snugly in framed cavities, are often created from recycled cotton fibers. Wool is a quickly replenishable resource and a great insulator. Though it is sold commercially, you can usually only find it in places where wool is plentiful.

4) Roofing A building's longevity depends on keeping the elements out in addition to making it a comfortable placeto be. Just as there are now many options for other construction elements, there are also several approaches to covering a building. Another factor to consider is the material's color.All roofing types should use lighter colors since they reflect more energy away from the building and lessen the cooling demand.

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5) Steel Steel roofing, in the form of panels and shingles, is becoming a more and more eco-friendly option due to its durability and high recyclable content.

6) Slate and stone These organic materials are great environmentally friendly options, but they can be costly where they are easily accessible because of labor and material costs. They live incredibly long lives.

Green building technology is crucial for advancing the construction industry's transition, safeguarding the environment and natural resources, and raising people's standards of living. The new homes being built will be designed with public green building education in mind. A framework that outlines the various educational objectives and content could serve as a helpful foundation for curricula that are official, informal, or even non-formal. The matrix titled "Major features of green building literacy" expands upon earlier research. Green building reduces and eliminates a building's negative effects on the environment and public health by combining a variety of techniques, methodologies, and talents. The methods and tools employed in green building construction are always evolving. Though the approaches differ, the fundamental ideas
in India.

V. SUMMARY

Green building reduces and eliminates a building's negative effects on the environment and public health by combining a variety of techniques, methodologies, and talents. The methods and tools utilized in greenbuilding construction are always evolving. The basic ideas remain the same. The CII Sohrabji Godrej Building in Hyderabad, the first platinum-rated green building, is seen in the above figure. in India. It is a20,000 sq. ft. building created using innovative green building technologies and sustainable green bulindgs.

Green building design, practices, techniques, and skills make efficient use of energy, water, and other natural resources to reduce and ultimately eliminate the structure's overall impact on the surrounding natural environment. It enhances worker productivity while safeguarding the health and welfare of the residents.

Green buildings reduce waste production, pollution, and environmental degradation. India's Status of Green Buildings Nearly 31% of India's present population, according to the 2011 Census,resides in urban areas and makes contributions to 63% of the GDP of India. Urban regions are predicted to house 40% of India's population and contribute 75% of the country's GDP by 2030 due to rising urbanization (censusindia.gov.in, 2014).

To support this growth, a thorough development of the institutional, social, economic, and physical infrastructure is needed. The housing market in India is expanding swiftly and making asignificant contribution to the development of the country's economy. In order to support growth in a sustainable manner, the housing sector urgently needs to adopt green concepts and approaches. The conservation of water, enhanced energy efficiency, decreased reliance on fossil fuels, effective management of domestic waste, less use of virgin materials, and the welfare and health of occupants are among the national goals that a green building aims to address. In government facilities, traffic and transport management, energy generation and use, education, healthcare,efficient water use, and waste reduction and treatment. To improve the management of urban movements and allow for real-time responses to challenges, smart city applications are being developed. Hence, a smart city will be more prepared to respond to challenges than a regular city. is a 20,000 sq. ft. building created using innovative green building technologies and sustainable architecture. Green building design, practices, techniques, and skills lessen and eradicate the overall influence of the building on the surrounding natural environment by efficiently using energy, water, and other natural resources.

It protects the occupants' health and well-being as well as improves employee work Residential Green Buildings Opportunities and Challenges. Green buildings decrease waste generated, environmental pollution, and degradation. Green Building Status in India As per the 2011 Census, almost 31 percent of India's current population lives in urban areas and contributes 63 percent of India's GDP. With increasing urbanization, by 2030, urban areas are expected to house 40 percent of India's population and contribute 75 percent of India's GDP (censusindia.gov.in, 2014). Comprehensive development of physical, institutional, social, and economic infrastructure is required to accommodate this growth. In India, the housing segment is growing quickly and is contributing enormously to the progress of the national economy. There is an immediate need to implement green concepts and methods in the housing sector, which can help growthin a sustainable way.

National priorities addressed by a green building are water conservation, increased energy efficiency, reduction in the use of fossil fuels, efficient handling of household waste, reduced use of virgin materials, and the health and well-being of residents. In this direction, the Government of India has implemented smart cities, which requires that 80 percent of buildings constructed should be green. Smart City Movement in India. A smart city is a way towards providing a quality of life, clean and sustainable environment, and attracting investment to the cities. A smart city uses information and communication technologies (ICT) to improve the quality and performance of urban services, reduces costs and resource consumption, and engages effectively and actively with its citizens.

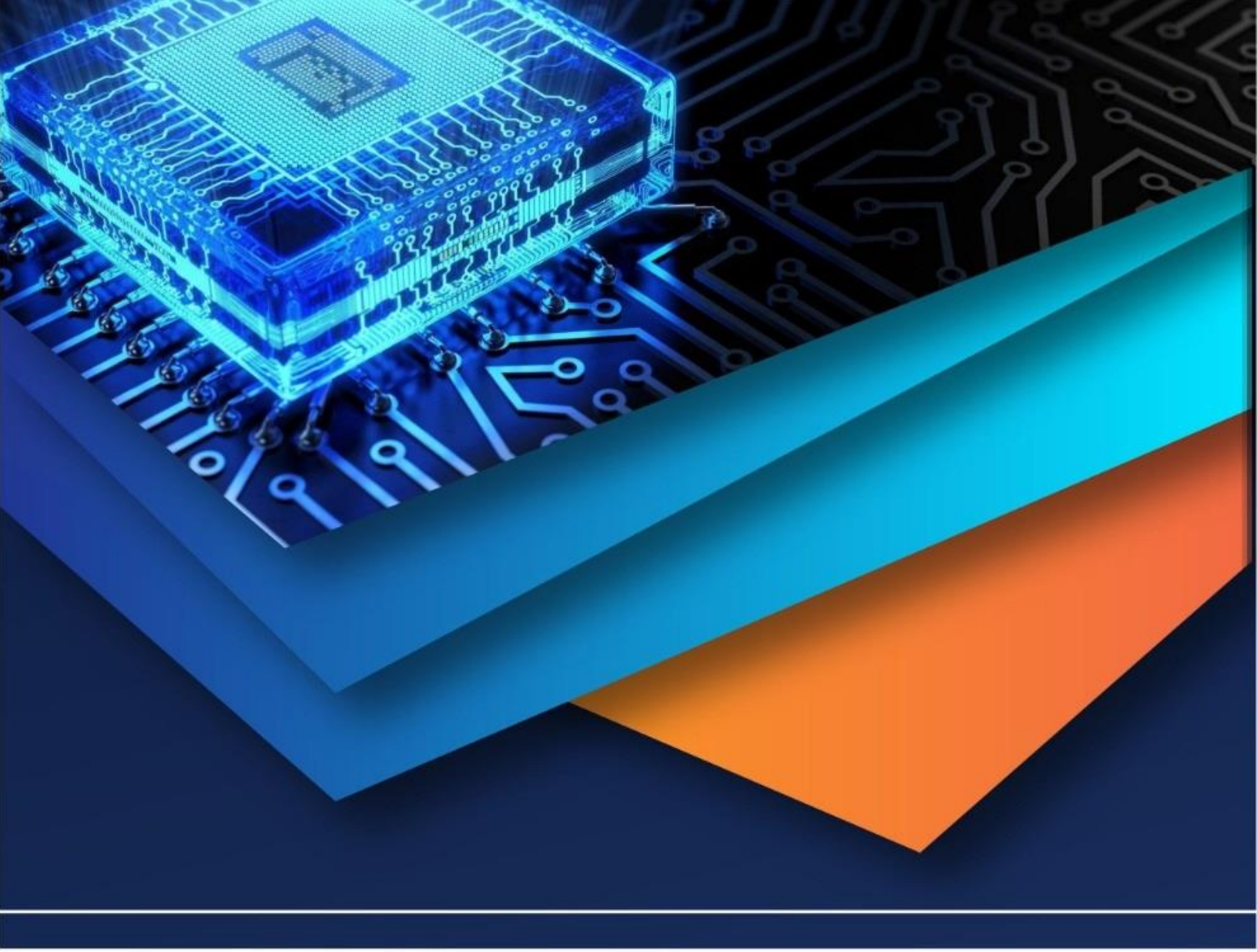
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A smart city proposal in India requires that at least 80 percent of the buildings should be green buildings. Smart city technology is being developed in all sectors, including commercial and residential buildings, government facilities, traffic and transport management, energy generation and use, education, healthcare, efficient water use, and waste reduction and treatment. To improve the management of urban movements and allow for real-time responses to challenges, smart city applications are being developed. Hence, a smart city will be more prepared to respond to challenges than a regular city.

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