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The Green Building For Sustainable Development In India

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Abstract :

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 (GRIHA), sheds light on their role in promoting and certifying green buildings. These institutions have developed rating systems and guidelines specific to the Indian context, fostering sustainable building practices and creating awareness among stakeholders.

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 policymakers, professionals, and stakeholders to further promote and integrate green building practices into the Indian construction industry, facilitating a more sustainable built environment.

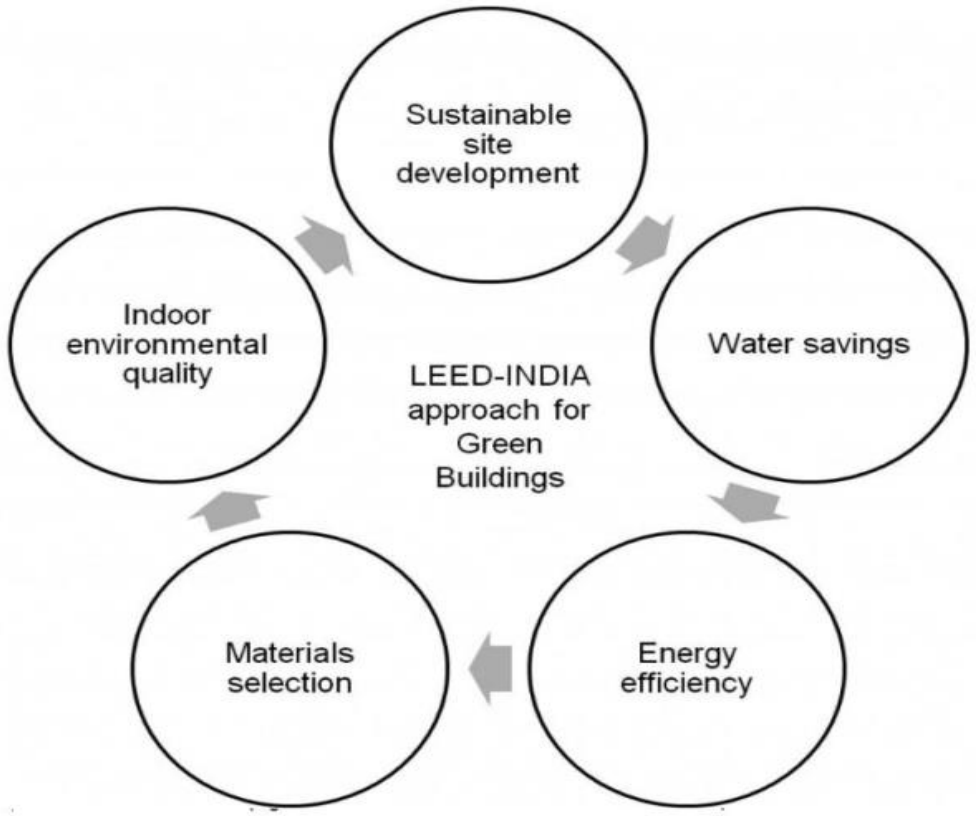
Keywords: Green Building, Sustainable Development, Green marketing, Green Rating

Introduction:

The green building movement emerged in response to the significant environmental impact caused by buildings. As stated in the provided research, buildings consume a substantial portion of global resources, energy, and water while contributing to carbon dioxide emissions and indoor air pollution. Uncontrolled urban development has further exacerbated these environmental challenges.

The green building movement aims to address these issues by promoting sustainable building practices that minimize resource consumption, reduce energy use, mitigate greenhouse gas emissions, and improve indoor environmental quality. Green building practices encompass various aspects, including design, construction, operation, and maintenance of buildings.

Key objectives of the green building movement include:



Energy Efficiency: Green buildings incorporate energy-efficient technologies and design strategies to minimize energy consumption for heating, cooling, lighting, and appliances. This reduces the demand for fossil fuels and mitigates greenhouse gas emissions.

Resource Conservation: Green buildings employ strategies to minimize material usage, promote recycling and reuse, and minimize waste generation during construction and demolition. This reduces the strain on natural resources and landfill capacities.

Water Conservation: Green buildings integrate water-efficient fixtures, rainwater harvesting systems, and water recycling mechanisms to reduce water consumption and preserve water resources.

Indoor Environmental Quality: Green buildings prioritize occupant health and comfort by ensuring proper ventilation, natural lighting, and the use of low-emission materials. This improves indoor air quality and reduces exposure to pollutants.

Sustainable Site Selection: Green buildings consider the environmental impact of site selection, aiming to preserve ecosystems, protect biodiversity, and minimize habitat disruption.

Life Cycle Assessment: Green building practices take into account the life cycle impacts of a building, including the extraction of raw materials, construction, operation, and end-of-life considerations. This holistic approach helps identify opportunities for reducing environmental impacts at every stage.

Various green building certification systems, such as LEED (Leadership in Energy and Environmental Design), BREEAM (Building Research Establishment Environmental Assessment Method), and GRIHA, have been developed to provide frameworks and standards for evaluating and recognizing green buildings.

The green building movement has gained significant momentum globally, with governments, organizations, and individuals increasingly recognizing the importance of sustainable construction practices. By promoting environmentally responsible buildings, the movement strives to mitigate environmental degradation, conserve resources, and create healthier and more sustainable built environments.

“Green building” encompasses strategies, methods, and materials that are more environmentally friendly than standard construction practices. According to the Commission for Environmental Cooperation (2008), residential and commercial building operations account for about 20, 30, and 40 percent of the primary energy consumption in Canada, Mexico, and the United States, respectively. These buildings also account for 20 to 25 percent of waste generation, which goes to the landfill and consume 5 to 12 percent of water for daily use.

Green Building

Green building brings together many practices, methods, and skills to lessen and eliminate the building's impact on human health and environment the. The construction practices and technologies used in a green building are constantly developing. Even though the methods vary , the main principles persist.

The figure above shows the CII Sohrabji Godrej Building in Hyderabad, the first platinum-rated green building in India. It 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 71 productivity. 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 growth in 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. 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.

In India, three mega urban schemes were launched, which will trigger the progression of urban transformation to aid better living. They are Smart Cities Mission, Atal Mission for Rejuvenation and Urban Transformation (AMRUT), and Housing for All in urban areas. The missions are new, state-of-the-art, and focused on the need to improve the quality of life for citizens today and in the future. The government has allocated an outlay of Rs. 98,000 crores to execute 100 smart cities, and the Atal Mission for Rejuvenation and Urban Transformation (AMRUT), which is an urban rejuvenation programme, for 500 towns and cities in the next five years (pmindia.gov.in, 2015).

Green Certifications for Residential Green Building

Agenda 21 was published in 1999 by the International Council for Research and Innovation in Building and Construction, which highlighted the main challenges that sustainable development presents to construction industry. Over the past few years, many countries have introduced new rating tools in order to improve knowledge about the level of sustainability in the buildings sector. Some of the prominent international rating tools are BREEAM (The Building Research Establishment's Environmental Assessment Method) in United Kingdom, HK-BEAM(The Hong Kong Building Environmental Assessment Method) in Hong Kong, LEED(The Leadership in Energy and Environmental Design)based on BREEAM in USA, Green Star rating system in Australia, and the Green Mark rating system in Singapore. In India, green buildings are certified by the IGBC (Indian Green Building Council), TERI (The Energy and Resources Institute), and Eco-Housing. The assessment tools are developed to measure the implementation of the sustainability concepts in the building sector and to check the progress made towards sustainable development. The rating tools attempt to achieve continuous improvement in optimizing the performance of green buildings and reducing environmental impact, providing a measure of a building's effect on the environment, and setting trustworthy standards by which buildings can be judged objectively.

There are three green building rating agencies in India. They are:

Indian Green Building Council (IGBC) Green Homes Rating System

Indian Green Building Council

The Green Building Movement in India has been spearheaded by IGBC, a part of the Confederation of Indian Industry (CII), since 2001. IGBC rating tools have been modified and adopted by LEED, which is an internationally accepted rating tool. According to the IGBC, 'Green Homes' is the first rating programme developed in India, exclusively for the residential sector and is a voluntary and consensus- based programme. This rating is designed primarily for new residential buildings. However, it is also applicable for existing buildings designed in accordance with the IGBC Green Homes criteria. There are over 780 certified green buildings (residential and commercial) and 3559 registered projects.

Green Rating for Integrated Habitat Assessment (GRIHA)

GRIHA was founded by TERI (The Energy and Resources Institute, New Delhi) with support from MNRE (Ministry of New and Renewable Energy, Government of India) along with experts in the sustainable building industry from across the country. GRIHA was adopted as the national rating system for green buildings by the Government of India in 2007. There are currently over 650 projects registered with the GRIHA Council totalling to over 230 million sq ft. About 30 projects have been rated so far. These 30 projects have led to a cumulative annual energy consumption reduction of 74,000 MWh and installation of 14.5 MW of renewable energy. The potential impact of the current 650 projects is expected to lead to a cumulative annual energy consumption reduction of 16,00,000 MWh/annum and installation of 315 MW of renewable energy. GRIHA certification is provided on five levels of '1 Star' to '5 Star' depending on the points acquired by the building. '1 Star' recognition is given if

the scores are between 25-40, '2 Star' is given if the score is between 41-55, '3 Star' for the building getting 56- 70 points, '4 Star' if the points are between 71-85, and highest recognition of '5 Star' if the points are more than 86.

Eco-Housing

The Pune Municipal Corporation along with the International Institute for Energy Conservation (IIEC), The Energy Resources Institute (TERI), and the Science and Technology Park (STP), University of Pune under the USAID-GDA sponsored eco-housing initiative developed a new rating tool in 2004 called Eco-Housing. As part of this initiative, a set of Eco-Housing Assessment Criteria have been developed based on local environmental issues. To accommodate different climatic zones of India and to make it a national rating tool, Eco–Housing Assessment Criteria Version II has been designed. Due to this, rating can be easily applied to any municipal corporation across India.

The rating has maximum achievable points of 1000 and a project has to get a minimum of 500 points to qualify. The greater the number of points achieved, higher the Eco-Housing rating is.

The Eco-Housing certification levels are A A building with a score of 500-600 gets a recognition of '*', 601-700 score gets '**', 700-800 score gets '***', while the 801-900 score gets '****' recognition. The highest

recognition of '*****' is given if the score is above 900. According to the Eco-Housing organization, 63 projects have been registered, of which 3 projects have been completed and 42 projects have been awarded provisional certificate. An area of 15.05 lakh sq m with more than 20,000 certified apartments has led to 60-65% savings in electricity and 50 – 55% water savings through waste water treatment, reuse, and management. Conventional energy use is reduced to 80,000 units and water saving amounted to about 90,00,000 litres/day. The estimated carbon footprint reduction per year will be around 80,000 tons from these projects.

Model Green Home

The Future

'The Living Building Challenge (LBC)' is the built environment's most rigorous performance standard. It requires that building projects operate as cleanly, beautifully, and efficiently as nature's architecture. The green building certification programme defines the most advanced measure of sustainability possible today and acts to diminish the gap between current limits and ideal solutions. Projects that achieve this level of performance can claim to be the 'greenest' anywhere and serve as role models. To be certified under the challenge, projects must meet a series of ambitious performance requirements, including net zero energy, waste, and water, over a minimum of 12 months of continuous occupancy. The challenge comprises seven performance areas or petals: Site, Water, Energy, Health, Materials, Equity, and Beauty. The petals are subdivided into 20 imperatives, each of which focuses on a specific sphere of influence.

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