

Green building designing innovation in India – A Literature Review

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Abstract

Being probably the greatest buyer of energy and furthermore probably the biggest maker of ozone harming substances, civil structures are a subject of conversation on a global gathering. These percent of sulfur dioxide, and 20 percent of nitrogen oxide found noticeable all around, as indicated by the insights of National Establishment of Building Sciences (USA). This features structures produce 30 percent of carbon dioxide (an essential ozone harming substance related with environmental change), 45 a quick necessity to actualize sustainability in each new development, which will assist us with making a healthy and sustainable environment. Green structures follow the standard of ideal utilization of water, energy and non-inexhaustible natural assets; produce less waste and give more advantageous spaces to its inhabitants. It is the application that targets making structures and utilizing activities that are ecologically dependable and effective asset all through a structure's life-cycle from designing, development, functioning, preservation, restoration and dismantle. This application helps in development of the traditional structure configuration concern of monetary possibility, utility, strength, and solace. The basic purpose of this paper is green plan as a central upheaval of contemporary engineering which is being exercised in India. It means to take a gander at a few ecological and physical plan approaches for green structures in India. Along these lines,

the paper presents an investigation of belief system of green engineering, hypotheses and perspectives sketched out in the field and furthermore the investigation of effective instances of eco friendly structures in India.

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Keywords

Civil structure or structure, Ecosystem, Ozone, Sustainable development, Contamination, Greenhouse, GHG.

1. INTRODUCTION

Gigantic development in financial movement over the globe prompting increment in human exercises is causing an irreversible harm to the worldwide condition, which in future will undesirably affect the personal satisfaction of future generations.

According to UNEP Report, at present, civil structures contribute so a lot as 33% of complete worldwide ozone depleting substance or greenhouse gases (GHG) outflows, essentially using petroleum products during their operational stage. The structure division contributes up to 30%

of worldwide yearly green house gas discharges and devours up to 40% of all energy [1]. One of the primary guilty parties is carbon dioxide discharges, which is ensnared to contribute up to 40% of every single worldwide outflow in which India's position is 144th (1.4 metric ton) in carbon emanation rating on the planet [13]. Because of gigantic development in new infrastructural advancements in transition economies of developing nations, and the lacking and inappropriate utilization of existing building stock generally, it is a basic of the business to create economical and sustainable structure advancements. In the event that no unmistakable advances are taken soon, ozone depleting substance outflows from structures will more than twofold in the following two decades. Subsequently, if focuses towards GHG outflows decrease are to be satisfied, at that point discharges from the structure division must manage as an essential by the policy makers. Decrease of GHG emanations from structures must be one of the vital achievements of every national environmental change policy. The planet needs to have reduced GHG discharges by at any rate fifty percent, in the following forty years to avoid the most pessimistic scenario situations of environmental change. Over the world at any rate twenty five percent decrease in outflows should be accomplished in the coming eleven years [6]. With time passing quickly by, the countries need to work quicker to accomplish the targets to stay away from irreversible harms. Green structure is a key engineering idea of the 21st century. Green structure is the procedure of

developing or changing structures to be eco friendly, sustainable and asset productive throughout their life span. This amalgamates various highlights like effective use of water, energy and eco-friendly condition, utilization of sustainable power source and reused/recyclable materials, adequate utilization of scenes, and improved indoor quality for good wellbeing and solace of the inhabitants. The idea of green structures not just favors human wellbeing yet in addition shields earth from unsafe and toxic eventual outcomes, satisfying the responsibility of the idea of sustainable development.

2. REPERCUSSION AT THE WORLD LEVEL

The measure of weight that human race applies upon the planet for acknowledgment of his/her wants is far more noteworthy than and ever raising at an upsetting rate. However, as referred to from the Brundtland Report, 'Sustainable advancement is the improvement that addresses the issues of the present without trading off the capacity of people in the future to address their own issues' [13]. As indicated by MEA (Millennium Ecosystem Assessment) Report, 2005, the capacity of the worldwide ecosystem to sustain people in the future can never again be built upon [9]. With the activities individuals are following over the most recent four decades, there has been a decrease of sixty percent in assets like rainwater or any non replenishing assets, or environmental parity [8], which thusly has achieved an unquestionable

anxiety that earth is under the threat of dangerous as well as potentially irreversible changes.

From the ecological point of view, structures represent almost 50% of the whole energy use and crude material utilization around the world. As expressed by IEA (International Energy Agency), structures are answerable for thirty two percent of the energy devoured all inclusive [3]. As demonstrated by a research completed by Willmott Dixon Group (2010), structures are at risk for forty five to fifty percent energy utilization, 50% water use, use of materials for development of structures and streets (by mass) is sixty percent, 80% of the rich farming area is lost to structures, 60% of wood items (90% of hardwoods) are used for development, around the world [13]. It additionally features that, the gauge of worldwide contamination that can be credited to structures is outsized. According to some other explores, the air quality in the urban communities is reviewed second rate by twenty three percent, structures credit to 50% GHGs, the contribution to landfill waste is 50% and contribution to drinking water contamination is 40%. Another most significant test confronted is ozone exhaustion, the crumbling of which gets quickened by 50% because of the contamination brought about by structures [12]. Housing and business structures devour around 60% of the world's power [1]. According to the report of the Bureau of Energy Efficiency (BEE) 2006, 116 billion housing units devour 23.4 percent of the energy and the 33 billion business units swallow 6.6 percent of the India's utilization [3]. According to the gauge of Indian Union Ministry

of Urban Development there is a close to predictable 8 percent rise in yearly energy utilization in the housing and business divisions structures. This enormous necessity for energy starts because of advancement in innovation which has lead to extra needs, for example, cooling, refrigeration, hot water and so forth other than the earlier fundamental needs in various kinds of structures. For instance, in Delhi during summer months this could be almost 52 percent of the power utilization [3]. Moreover, the grade of air and water is falling apart as each day cruises by. Likewise, there is a colossal increment in the landfill waste too, and with a portion of the non-recyclable building materials, for example, toxic paints, asbestos, shape, squanders containing mercury, bright light bulbs, batteries which present genuine ecological and wellbeing problems[6], the challenge increases. These worries unmistakably feature the requirement for convincing endeavors towards making ecofriendly structures and ecofriendly design methods for structures.

3. RATING FRAMEWORK OF GREEN BUILDINGS

Structures are durable, and urban areas have significantly longer life length: their effects convert into the lives of a few generations to come; into a fate of obscure assets, environmental contamination and precarious climatic conditions. The green structure development has prompted the appearance of a combination of green rating frameworks. The main frameworks being:

- LEED - Leadership in Energy and Environmental Design, created by the US Green Building Council (USGBC) what's more, utilized in the United States of America;
- BREEAM - Building Research Establishment Ecological Assessment Method, broadly utilized in the Joined Kingdom;
- CASBEE - Comprehensive Assessment System for Building Environmental Efficiency, created by Japan sustainable Building Consortium and is utilized in Japan;
- Green Star - created by the Green Building Council of Australia and utilized in Australia. The New Zealand Green Building Council have custom fitted the Green Star apparatus to their own prerequisites;
- NABERS - National Australian Built Environment Rating Framework overseen by the NSW (New South Wales) Branch of Environment and Climate Change. This is the main rating framework to quantify progressing operational execution.
- Green Mark - utilized in Singapore and ordered by the Building and Construction Authority for all new improvement and retrofit works;

3.1. GREEN RATING FRAMEWORKS IN INDIA

- LEED India - regulated by the Indian Green Building Board (IGBC);

- GRIHA - Green Rating for Integrated Habitat Assessment created by TERI (The Energy and Research Institute).
- SVAGRIHA - Small Versatile Affordable Green Rating for Integrated Habitat Assessment created by TERI (The Energy and Research Institute).

These mechanisms are generally new and in the process of evolving. An ever increasing number of builders are depending on these frameworks to get their structures guaranteed as it makes the structures increasingly advantageous to the purchasers due to their sustainability and ecofriendly certifications. Numerous occupiers and financial specialists are utilizing these mechanisms as a manual for choosing properties for rent or acquisition. In any case, as the Indian development industry is a complex framework in which capacities shift from manufacturer, supervisor and planner toward one side to skilled and incompetent work at the other with no single set of rules to work upon. In spite of the difficult task, TERI has attempted to set out an plan for green structures through GRIHA (Green Rating for Incorporated Habitat Assessment) and SVAGRIHA (Small Versatile Affordable Green Rating for Integrated Habitat Assessment). GRIHA codes and rules have made approach utilized by the Bureau of Energy Efficiency, the Ministry of Non-Conventional Energy Sources, MoEF (Ministry of Environment and Forests), Government of India, also, the Bureau of Indian

Standards their core value. GRIHA was created by TERI and has now been further embraced and put to usage by the Ministry of New and Renewable Energy (MoNRE) as the Indian National Rating System for Green Buildings.

GRIHA is a rating framework which assesses the environmental execution of structures on 34 standards recorded under various sub-headings, for example, site determination and arranging, building envelope configuration, building framework structure, choice of environmentally supportable materials, combination of inexhaustible energy, indoor ecological quality, preservation and efficient use of assets, building upkeep and advancement points on a size of 0-104 scale. Based on number of points scored, a structure can be appraised between 1 and 5 stars. Though SVAGRIHA is a latest developed framework particularly for microscopic ventures for example structures with developed area under 2500 m² [13]. The rating framework intends to accomplish productive asset usage, improved asset effectiveness, and better personal satisfaction in the structures. GRIHA is being utilized to advance the idea of green structures. In this way, to supervise the different exercises related with GRIHA, MoNRE and TERI together settled an autonomously enlisted society called ADaRSH (Association for Development and Research of Sustainable Habitats). ADaRSH capacities as a stage for collaboration between different partners as well as encourages GRIHA, SVAGRIHA and other comparable green structure rating frameworks in India [13].

4 . FEATURES OF GREEN BUILDING

Of the aggregate, around 15.5 million sq ft of green structures are under IGBC Green Homes. As indicated by V Suresh, executive of the Indian Green Building Council (IGBC) and previous CMD, HUDCO, "We need to make India number one on the planet by having 10 billion sq ft of green structure footmarks.[14]

- i. Dependence on renewable energy and energy efficient.
- ii. Efficient use of water.
- iii. Environmental friendly construction materials.
- iv. Minimum waste output from the operation of green building.
- v. Minimum Toxics output from the operation of green building.
- vi. Enhanced Indoor Air Quality.
- vii. Overall Growth with Sustainable Development.

5. CASE STUDIES OF FEW GREEN BUILDINGS IN INDIA

5.1. ITC GREEN CENTER, GURGAON

Spread over a rambling 1, 80,000 sq ft, the ITC Green Center has set a benchmark for green structures in India. Situated in Sector-32, Gurgaon, the structure has been granted the Platinum Green Building rating by USGBC-LEED (Green Building Council-Leadership in Energy and Environmental Design), making it the first corporate house in the country.

The structure is planned remembering the most elevated ecological guidelines. It is comprised of blocks and cement containing fly-ash and is outfitted with high-productivity gear that diminishes 53 percent energy utilization over an ordinary structure and 40 percent consumable water prerequisites. Zero water release, sunlight based heating innovation, rainwater system, intelligent high-albedo rooftop paint, minimum outside lighting and separate smoking rooms with exhaust framework are a portion of different highlights of the structure.[15] *Albedo is the measurement of reflected light from the surface.*



Fig. 1 ITC Green Center, Gurgaon [15]

5.2.PATNI (I-GATE) KNOWLEDGE CENTER, NOIDA

Granted with the lofty LEED Platinum rating, Patni Knowledge Center is one of the green

structures in India. Situated in rural Noida and spread over more than 4, 60,000 sq ft, the structure's intelligence is planned so that it provides 75% of daylight to its interior. Around 50 percent of the zone is saved for open green space. What's more, the grounds follows the productive water management like water gathering, sunlight based water heating and drip water system. 100 percent sewage is dealt with and the reused water is utilized to cool the tower makeup, cultivating and flushing.[15]



Fig.2 Patni (i-GATE) Knowledge Center, Noida

5.3. OLYMPIA TECH PARK, CHENNAI

Situated in the core of Chennai (Gundy), the Olympia Tech Park has gotten one of the greatest and generally looked for after IT parks in Chennai. The tech park houses MNCs that works day and night which is the reason energy saving highlights and the eco-friendly condition turn into a need. Evaluated as one of the biggest gold LEED rating structures on the planet, the structure utilizes

energy and water saving strategies (water gathering) and reusing and to accomplish zero percent release. The double pipes line of the structure which helps in treating greywater is utilized for flushing or in gardening.[15]



Fig. 3 Olympia Tech Park, Chennai [15]

6. CONCLUSION

The fast paced growth in economic and human activity across the globe has put environmental resources under tremendous pressure thereby becoming a cause for irreversible damages to the

environment at large and putting the quality of life of future generations to unknown risks. The increasing apprehension towards the environment is pushing the policy makers to seek sustainable solutions, leading to the origin of the theory of green buildings. The concept and criteria of green buildings is being incorporated in new as well as old structures around the globe. Even though green buildings are the need of the hour worldwide, developers face a major challenge in the development of green buildings due to increase in construction costs and lack of awareness on the benefits of green buildings, materials and technology. In India, some of the world class green buildings have been constructed in the last few years, but still the concept of green buildings for general masses is in its formative years. Present work is an attempt in the direction to make people, networks and overall population mindful about the upsides of green design for practical natural turn of events also, the executives and feature a couple of green structures which are feasible to nature and productive as far as possible client.

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