

Green Building Rating system in India & Studying the long-term effectiveness of Green building

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ABSTRACT

The building sector is one of the biggest consumers of electricity in India^[1]; it is also the largest generator of CO₂ emission & one of the highest consumers of water in India. This is the basic reason why Green building movement comes to India so that we can minimise the environment effect caused by the construction activity in India.

Green buildings have potential to reduce up to 34 percent lower CO₂ emissions, consume 25 percent less energy and 11 percent less water, and have diverted more than 80 million tonnes of waste from landfills^[2].

The author of this paper has studied different rating systems in India & the sustainability of the green buildings in India. The paper goes beyond Green building rating system and gives a thought to the understanding of embedded emission and operational emission. The author of the paper gives an idea of not only Green Building but also a sustainable green building by Post occupancy evaluation.

Keywords

Green Building, Green building Rating system in India, post occupancy evaluation, sustainable green.

INTRODUCTION

1.1 Purpose of study

India is a fast urbanising country; according to Census of India 2011 the urban population has grown from 290 million in 2001 to approximately 386 million in 2011. Construction industry contribution is estimated at 308 billion to the national GDP in 2011-12.

The construction sector is the largest consumer of energy, material & water.

The sustainable growth in the construction industry can be obtained by Green Building certification system; the author has understood the different rating systems currently active in India & the green building certification process. The important part of the study is that green building certification is based on pre-construction predictions and design specifications. The rating system currently active in India throws very little light on the post-occupancy performance of the green building & the author try to find out the missing link in the green building certification process.

1.2 Importance of study

As per IGBC one of the green building certification agency in India there are more than 3,921 Green Buildings projects (as on 31 December 2016) coming up with a footprint of over 4.48 Billion sq.ft are registered with IGBC (Indian Green Building Council), out of total 3921 projects 942 Green Building projects are certified and fully functional in India.

Green Buildings are the buzz of the current time. Developers are promoting Green Buildings to sell their projects at a premium price. Buyers are going for it because it generates less waste and provides

healthier spaces for occupants. Therefore it is essential to know what type of rating systems are there in India & do they actually perform for the rest of their life or Developers or Green building certification agency wash their hands post the handover of the project to buyers.

In most of the cases, Green buildings for Builders are more than just taking a premium in comparison the other non-green Buildings, in a recent cases of Green initiative of State Authorities they are giving additional FAR (floor area ratio) for Green Building Certifications^[3] like Noida and Greater Noida announced an additional 5% FAR, Haryana Government to 25% additional FAR, West Bengal Government 10% additional FAR and Punjab Government 5% additional FAR to the builders of the green project in their respective city. Hence its Green Buildings importance is much deeper than USP & having the potential to change the dynamics of commercial & residential projects.

1.3 Rationale of study

This paper will discuss the current active Green building systems in India, also it will throw light on their criteria for awarding the green buildings & try to conclude on the in paper to focus on “Green Building” relationship to global climate change and its contribution to the effort to reduce greenhouse gas emission which is the important parameter which needs to be taken care while conceptualised the project.

The author shares its vision on the sustainable Green Building concept, not just Green building for the Building USP for upselling.

1.4 Overview of the study

Construction industry which includes infrastructure are the backbone of any country, Construction industry is biggest economic driver with the growing at over 20% compounded annual growth rate^[4] comparison to global it's only 5%^[5].

Thus there is a need to encourage the complete construction industry, which includes Developers/Builders, architects & designers & owners to construct Green Buildings.

Green construction or sustainable building is also known as Green Building refer to both a structure which is environmentally responsible and it is resource-efficient throughout a building's life from siting to design, construction, operation, maintenance, renovation, and demolition. Green building design should be in such way that it striking a balance between homebuilding and the sustainable environment.

Green Building has deemed important in creating sustainable buildings by careful site selection to preserve wildlife habitats and virgin land and low light pollution help ensure that buildings do not adversely affect their surroundings or create heat islands. Human health is also supported by credits specifying low-VOC (volatile organic compound) building materials and regulating the minimum standards of ventilation.

Green Building decision on how much is the building is green can be decided by the green Building rating systems in India, there are primary two rating systems in India GRIHA-LEED & IGBC.

GRIHA rating system consists of 34 criteria categorised into four different sections while IGBC LEED has 100 points criteria.

If we implement the any of the systems we can save a substantial amount of natural resources like energy, Co2 & water.

1.5 Motivation of the paper

Green Building rating system by IGBC or IGBC are entirely based on pre-construction predictions and design specifications done at the time of designing or construction. Currently, post-construction data has no bearing on buildings certification status. A building's LEED rating is based on the compliance to the design system not to linked to its actual performance.

Picture-01

(LEED Platinum rated building)
(natural light is available)



Picture-02

(Outside light has blocked by curtains)



Picture-03

(Artificial light has introduced when



The picture-01 shows the IGBC-LEED Certified platinum-rated building which the highest rating by the LEED in Noida city in NCR, picture-02 and 03 shows the wastage of natural resource it is doing by one side they are pulling the curtain to control the natural light from outside and on the other side they are turning the lights on to lighting the area.

This is one of the cases & you can see this type of example in every department in every green building which is certified in India.

This study will focus on how this rating system works & finally try to find out sustainability of the green buildings & give a concept called "post-occupancy evaluation" of the green building.

LITERATURE REVIEW

2.1 Green Building a global concern

The construction industry growth activity across the globe is putting high pressure on natural resources and environmental. There is evidence that human activities are causing an irreversible damage to the environment, this will have an irresolvable impact on the quality of life. The rising concern for the environment in response to global warming is driving thinkers to seek sustainable solutions.

In this paper, I intend to focus on Green Building relationship to global climate change and its contribution to the effort to reduce greenhouse gas emissions. Atmospheric gases of the greenhouse would need to be stabilised immediately, requiring reduction between 50 and 85% CO₂(carbon dioxide) emissions circa 2000 by the year 2050.

Green Buildings was created in part to help encourage such reductions for improving performance across all the metrics that matter most: energy savings, water efficiency, CO₂ emissions reduction, improved indoor environmental quality, and stewardship of resources and sensitivity to their impacts.

2.2 Green Building movement & rating system worldwide

Green Building Movement has started back in the US In 1998; the USGBC (US Green Building Council) launched its first LEED Pilot Project Program, better known as LEED Version 1.0.

Originally intended to be a measure of sustainability. Let's have a look on the green building rating systems popular worldwide.

Global Green Rating Systems

1. BREEAM -Building Research Establishment Environmental Assessment Method, which is widely used in the UK.
2. LEED- Leadership in Energy and Environmental Design, developed by the US Green Building Council (USGBC) and very popular in the US.
3. Green Star- Developed by the Green Building Council of Australia and used in Australia.
4. The New Zealand Green Building Council have their own version of the Green Star tool.
5. CASBEE- Comprehensive Assessment System for Building Environmental Efficiency, it was developed by “Japan Sustainable Building Consortium” and is popular in Japan.
6. Green Mark- used in Singapore and mandated by the Building & Construction Authority for all new development and retrofit works.
7. NABERS - National Australian Built Environment Rating System managed by the NSW (NewSouth Wales) Department of Environment and Climate Change. The only rating system to measure ongoing operational performance.

2.3 Green Building rating system in India

The green rating systems followed in India are:

1. LEED India- By the Indian Green Building Council (IGBC);
2. GRIHA -Green Rating for Integrated Habitat Assessment it is developed by TERI which is also known by "The Energy and Research Institute".

Among all these rating systems we had understood globally, LEED has is themost popular Green building rating system and is followed by more than 24 countries across the globe, including India.

2.3.1 IGBC-LEED Buildings Rating System.

2.3.1.1The History of LEED

The U.S. Green Building Council, the parent organisation of the LEED rating systems, was co-founded in 1993 by an unlikely pair: David Gottfried, a real-estate developer, and Mike Italiano, an environmental lawyer and analyst. By 1994 the USGBC had organised a committee consisting of environmentalists and real estate agents, architects, industry representatives, a building owner, and a lawyer. Richard Fedrizzi, the USGBC's current president, CEO, and a founding chairman explained these staffingIf we could invite business to the table, we could develop standards relative to building performance. The committee, headed by Natural Resources Defense Council senior scientist Rob Watson, worked for three years on the principles of what would eventually become LEED before receiving funding from the U.S. Department of Energy's Federal Energy Management Program.

2.3.1.2 IGBC-LEED India

The green building movement in India started with the establishment of the IGBC in 2001, it was an initiative of Confederation of Indian Industries (CII), USGBC & World Green Building Council. The first green building of India was CII-Sohrabji Godrej Green Business Centre in Hyderabad back in 2001. This was a great symbolic achievement. Since then, the number and volume of green buildings in India have been phenomenal. Beginning of 20,000 sq.ft. the green built-up area in the country in the year 2003, now as on date (on 12 December 2016) IGBC LEED have more than 3,921^[6]. Green

Buildings projects are over 4.47 Billion sq.ft are registered with the Indian Green Building Council (IGBC-LEED), out of total 3921 green projects 935 Green Building projects are certified and functional in India.

IGBC Green New Buildings rating system addresses green features under the following categories:

1. Sustainable Architecture and Design
 2. Site Selection and Planning
 3. Water Conservation
 4. Energy Efficiency
 5. Building Materials and Resources
 6. Indoor Environmental Quality
 7. Innovation and Development
- Certification for New Constructions^[7]

Certification Level	Owner-occupied Buildings	Tenant-occupied Buildings	Recognition
Certified	40 to 49	40 to 49	Best Practices
Silver	50 to 59	50 to 59	Outstanding Performance
Gold	60 to 74	60 to 74	National Excellence
Platinum	75 to 100	75 to 100	Global Leadership

IGBC will recognise Green New Buildings that achieve rating levels with a letter of certification and a mountable plaque.

2.3.2 GRIHA-India Buildings Rating System.

GRIHA is India's National Rating System for Green buildings. GRIHA has developed by TERI (The Energy and Resources Institute) and is highly endorsed by the MNRE (Ministry of New and Renewable Energy). The principles are based on nationally accepted energy and environmental, and seek a balance between established practices and emerging concepts, both international & in national. GRIHA is an effort to minimise a building's resource consumption, waste generation & overall ecological or environmental impact by comparing them to certain nationally acceptable limits or benchmarks.

GRIHA rating system control and reduce or optimise the by assesses a building out of 34 criteria and awards points on a total scale of 100, to qualify for GRIHA certification, a project must achieve at least 50 points out of 100. Certain criteria or sub-criteria are mandatory and have to comply for the project to be at all eligible for rating.

Project scoring^[8]

1. 50 to 60 points is certified as a 1 star GRIHA rated building,
2. 61 to 70 is a 2 star GRIHA rated building,
3. 71 to 80 is a 3 star GRIHA rating building,

4. 81 to 90 is a 4 star GRIHA rated building

5. 91 to 100 is a 5 star GRIHA rated building

The guidelines/criteria and appraisal norms are revised every three years or as soon as take into account the latest innovations/best practices happening during this period.

3.1 Studying the long-term effectiveness of Green Building

Green Buildings are aimed to decrease both the embodied and operational CO₂ emissions of buildings. The emissions caused by constructing the building and those created in operating it post-construction. Energy usage is the primary source of existing buildings' operational CO₂ emissions; currently, the embodied energy (the energy associated with obtaining, purifying, and transporting) of tap water usage provide a very negligible amount, although this will no doubt as fresh water becomes a scarcer resource & situation will become further critical in coming years.

Most existing buildings are designed for high-energy inefficiency, and unfortunately, Green Buildings has not yet incentivized serious efficiency improvements. Even for those Green Buildings that have earned the maximum number of energy efficiency stars/certification levels intended to reduce the energy usage by 30-50% the operational emissions constitute over 80% of the buildings carbon footprints over their lifetimes.

Buildings that attained only the bare minimum of energy efficiency under any LEED/GRIHA rating systems, the sum of operational emissions since the date of occupancy have likely already surpassed the total emissions caused by the construction process

3.1.2 Embodied emissions Vs. Operational emissions

As the world's energy production shifts to more renewable sources, buildings embodied emissions will become a more significant factor, but for the time being, operational emissions represent a greater threat.

By the 31st December 2016, roughly 4,000 projects (3921 by LEED India & 942 by GRIHA) coming up with Green building certification in India alone. These 4000 buildings have been constructed to Green Building standards, which have been generally accepted as the most popular way to ensure structures are sustainable, and as commercial buildings, they will continue to exist and use energy and water for approximately 70-75 years. Construction factors and material choices can be considered as embodied emissions and therefore you can't make it responsible for controlling CO₂ emission for rest of building the life.

This is the broken link in both IGBC & GRIHA that both are losing focus on the operational emission. The business case isn't just that green building saves money on energy. Green building certification sells buildings to high-end clients and government, architects and builders gets sparkling free publicity, and create a new hook for selling new products, materials, and systems to builders. It's a whole new commercial ecosystem.

3.1.3 Optimising energy use & Sustained energy savings

Green New Buildings Rating System by IGBC or GRIHA gives the highest points to energy efficiency to the tune of 28% of the overall rating & majorly responsible for the rating of the Building. Green building optimises the energy use in buildings by passive energy efficiency like selecting the efficient device & then doing the proper installation. The active energy efficiency

which includes Optimised usage of installation and devices this can improve the performance by 15 to 25%.

This can be achieved by turn off devices when not needed, regulate motors or heating at the optimised level, rigorous maintenance program, measure and react in case of deviation.

Sustained energy saving is the biggest long-term challenge currently with us just optimising the energy use is not enough for the sustainable green buildings this saving is getting lost due to multiple reasons like behaviour&commitment towards the green buildings, lack of visibility&lack of automation.

The energy efficiency generated by the green building which can be to the tune of 30-50% in comparison to the conventional building can be lost because of non-visibility of the control and monitoring technologies & maintenance practice.

This is the only way to sustain the savings, which are generated by the Optimising of energy usage.

3.1.4Performance Monitoring of IGBC Rated Buildings

By the 31st December 2016, 3921 buildings are coming up with Green building certification by IGBC LEED alone in India, out of 3921 projects 942 green building projects are certified & fully functional in India.

Out of these 942 projects, which are certified & functional if we try to find out the regular monitoring of the projects on account of energy efficiency & water efficiency, the concern is that there is no such systematic way of monitoring the same.

IGBC kept a very crude form of data that to only on energy efficiency for only 46 building, which is about 5% of total building certified by IGBC-LEED.

The date of energy & water consumption of some of the certified buildings is also voluntarily by the respective project proponents & there is no systematic way of collecting the data or procedure in IGBC LEED Certified buildings.

Limitation in Green Buildings

Because Green Buildings are not retroactive and no follow-up data is required, these buildings can retain their rankings and all the benefits that come with them, even if they function no more sustainably than the non-certified structure next door.

IGBC-LEED certified buildings could be green buildings throughout their lifetimes. Green Buildings certification system tries to shy away from this duty.

CONCLUSION

Post Occupancy Evaluation is the key

Integration of the post-occupancy evaluation with the Green building certification system is the key or missing link in the whole process, also the duration of the Post occupancy evaluation duration need to be defined in the rating system by IGBC-LEED or GRIHA.

This will emphasise the focus on the operational energy efficiency along with the embedded energy efficiency making Green Building a truly Sustainable Green Building.

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