WHY GREEN RATINGS FOR BUILDINGS MATTER?

An exponential increase in the population over the past decade has led to the emergence of rapid urbanization as a key global trend of prominence and concern. It is expected that more than 40% of the Indian population will be dwelling in urban cities by 2030, and the total urban population of India is anticipated to hit the three quarters of a billion mark by 2050. **Santhosh Ramkumar** takes a closer look at the significance of green ratings for buildings.

Introduction

Rapid demographic, spatial, and economic growth of the country has expanded the environmental footprints of our cities. India's rate of increase in urban population from 1995 to 2015 was 2.5%. The level of urbanization[1] in 2015 was 32.7%, and it is estimated to increase to 37% by 2025. Thus, a sharp increase in demand for infrastructure and housing can be foreseen. While addressing this demand is critical to housing our burgeoning population, it is equally prudent to ensure that the new construction activity is sustainable throughout its life cycle.

[1] World Cities Report 2016: Data Annex

It is estimated that the built environment contributes towards 30%[2] of the global greenhouse gas emissions and accounts for consumption of one-third of the global raw materials, energy, and water. Hence, without a doubt, it can be seen that the social, political, and economic transformation of our cities presents a unique opportunity to ensure that their construction goes hand in hand with the judicious use of precious natural resources and sustainable development practices.

Benefits of Green Buildings

A green building is one that makes minimal impact on the environment. Its design is climate responsive, and utmost care is taken while constructing it to minimize negative impacts on the environment. It is operated in such a manner that it utilizes all natural resources efficiently. Reducing negative environmental impact and providing occupant comfort are the key features of a green building.

Some of the tangible benefits of constructing green are as follows[3]:

- 30–50% reduction in energy consumption
- Up to 40% reduction in freshwater demand
- 40–65% reduction in building water consumption
- 30–40% reduction in operational cost of buildings

Green rated buildings are a sure-fire step forward towards developing an energy secure future for the country, and planning their design, construction, and operation will result in the following:

- Prevent destruction of the local natural habitat and biodiversity
- Reuse of the construction waste material to the maximum possible extent
- Reduce the energy and water demands of the building
- Reduce air and water pollution loads on the community
- Limited waste generation due to recycling and reuse
- Increase occupant productivity
- Enhance marketability for the community as a whole

Why Rate Green Buildings?

'Claims of sustainability are to be substantiated with acceptable documentary evidence' and 'what gets measured gets managed'. These are the two foundational mantras for the development of a green rating.

Green ratings assess a building based on its predicted performance over its entire life cycle – conception through operation. This results in the development of buildings that consume less natural resources without sacrificing the acoustic, thermal, and visual comfort of its occupants.

This is furthered by attempts to quantify aspects such as energy and water consumption, renewable energy adoption, and so on to manage, control, and reduce a building's resource consumption, waste generation, and overall ecological impact within certain nationally acceptable to limits/benchmarks.

The mark of a reliable green building rating would be one that:

- Adapts to the climatic conditions of the area of its adoption
- Unifies and mandates compliance with internationally/nationally accepted building codes and performance benchmarks
- Emphasizes on planning green features during the design phase of the building
- Provides incremental performance improvement benchmarks for buildings to aspire towards a higher quality
- Widely accepted by all national and regional urban development institutions
- Monitors the development of the project through periodic, construction linked due diligence visits
- Serves as a platform for project developers to access linked incentives such as tax breaks and development of premium discounts
- Validates the credibility of the sustainability claims made by the project team
- Creates transition scenarios that push the performance benchmarks of the industry

Green ratings serve as the ideal tool for validating the sustainability claims of buildings by mandating regulatory compliances and setting performance benchmarks to promote higher construction and operational resource efficiency.

Green Ratings in India

Green Rating for Integrated Habitat Assessment (GRIHA) Council is an independent, not-for-profit society jointly set up by The Energy and Resources Institute (TERI) and the Ministry of New and Renewable Energy (MNRE), Government of India to promote and administer green buildings in India.

The GRIHA rating was adopted as the National Rating System for Green Buildings in India by MNRE in 2007. The GRIHA rating has been acknowledged as the tool to evaluate reduction in emissions intensity through habitats as part of the mitigation strategy for combating climate change in India's 'Nationally Determined Contributions' (NDCs) submitted to the UNFCCC.[4] GRIHA rating works on the underlying principle of 'what gets measured gets managed'.

The GRIHA Council is in the process of rating 1700+ projects pan India with a footprint of 565 million square feet. This

[2] Sanjay Seth. 2018. It's time to get building green and affordable... Details available at https://www.deccanherald.com/content/662199/its-time-get-building-green.html, last accessed on 22 October 2019

[3] GRIHA Council. 2015. For more details on GRIHA rating, visit https://www.grihaindia.org/about-griha

[4] UNFCCC. 2015. India's Intended Nationally Determined Contribution (INDC): Working Towards Climate Justice, p. 12

includes new and existing buildings of various built-up areas under residential, commercial, and institutional typologies. Figure 1 shows the growth in adoption of GRIHA green ratings over the past 4 years.

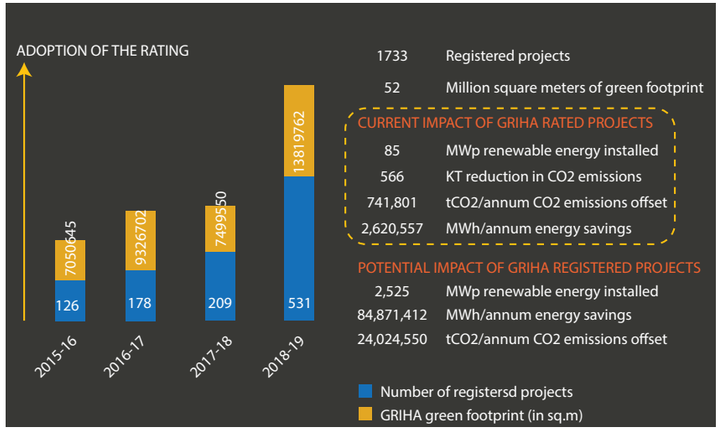

Figure 1 Growth in adoption of the GRIHA rating over the past 4 years

The salient features of the GRIHA rating are as follows:

» Performance-based rating system designed for different climatic zones and incorporating regional variations
» Unifies multiple national and state level codes and norms, such as NBC, ECBC, CPCB, and CGWB, into a simple set of criteria
» Common sense oriented with non-applicability clauses, that is, every project is unique and its rating is evaluated only on the basis of attempted criteria
» Places emphasis on using the integrated design approach and implementation of cost-effective strategies
» Emphasis on strategies to identify and reduce losses in energy consumption
» Ensures the acoustic, thermal, and visual comfort for all building occupants
» Recommends taking a realistic approach towards indoor air quality through usage of low VOC paints, adhesives, and sealants
» Construction stage linked due diligence visits to ensure that the commitments made during the design stage are being implemented

Headquarters Building for Unique Identification Authority of India (UIDAI)

Location	:	New Delhi
Site Area	:	4447.51 m^2
Built-up Area	:	8634.81 m^2
Air-Conditioned Area	:	4722.30 m^2
Non-Air-Conditioned Area	:	3912.51 m^2
Typology	:	Commercial (Office Building)
Energy Consumption Reduction	:	62.2% reduction in energy consumption compared to GRIHA benchmark
Energy Performance Index (EPI)	:	52.57 kWh/m^2/year
Renewable Energy	:	Rated capacity of solar PV installed is 100 kWp
GRIHA Provisional Rating	:	5 stars
Year of Completion	:	2018

The following strategies were adopted to reduce the building impact on the natural environment:

Sustainable Site Planning:
- Top soil was preserved and re-applied in landscape and a part of it was donated to nursery for appropriate use.
- Air pollution control measures such as site barricading, coverage of dusty material, wheel washing and water sprinkling were implemented during construction.

Water Management:
- Reduction of more than 40% from the GRIHA base case has been demonstrated in landscape water demand through use of highly efficient drip irrigation system.
- Reduction of 54% from the GRIHA base case has been demonstrated in building water use by installing water efficient flush and flow fixtures.
- 100% storm water is being recharged into the ground through rain water recharge system.

Energy Optimization:
- High efficacy lamps are installed for exterior lighting which is operated by timer controller.
- EPI reduction of 62.2% from GRIHA benchmark has been demonstrated.
- 75% of the habitable spaces are day lit and meet the daylight factors prescribed by the National Building Code of India.
- 100 kWp solar PV panels have been installed on site.

Sustainable Building Materials:
- Fly-ash bricks and AAC blocks have been used in the project to reduce embodied energy of the building.
- Pozzolana Portland Cement with 34.4% fly-ash content by weight has been used in plaster and masonry mortar.
- Use of low energy flooring, false ceiling and paneling has been demonstrated.

Integrated Design Team:

Client	:	Unique Identification Authority of India
Principal Architect	:	Sikka Associates Architects
Landscape Architect	:	Sikka Associates Architects
Structural Consultant	:	Mehro Consultants
Electrical Consultant	:	Sikka Associates Architects
Green Building Design and Certification	:	Sikka Associates Architects

Figure 2 Case study card of UIDAI HQ building in New Delhi

Impact Reduction in GRIHA Projects

Improving building efficiency while not compromising the health of comfort of occupants is in the DNA of the GRIHA rating. This is achieved through the adoption of energy-efficient strategies that take into account the geographical location of the project, the local temperature variations over a period of time, climatic conditions, and so on. The GRIHA rating with a green footprint of 565 million square feet of built-up area since its inception has contributed towards the following:

» 85 MWp of renewable energy installations such as solar and wind through rated projects
» Offset of 741,801 tCO_2/annum of CO_2 emissions
» Savings of 2,620,557 MWh/annum in post-construction energy consumption

Take, for example, the energy efficiency leadership exhibited by the recently GRIHA rated headquarters building of Unique Identification Authority of India at New Delhi (Figure 2). This is a 5-star rated commercial building that has achieved a 62.2% reduction in its energy consumption in comparison to the GRIHA benchmark. This translates to an energy performance index (EPI) of 52.57 kWh/m^2/year for a building with a habitable built-up area of 8634.81 m^2. This high performance has been achieved through the following measures:

» Compliance to Energy Conservation Building Code 2007
» Installation of automatic timer controlled, high efficacy lighting for exterior areas
» Installation of 100 kWp solar photovoltaic system

For the online version of the case study card shown in Figure 2, visit the website https://www.grihaindia.org/sites/default/files/sites/default/files/pdf/case-studies/uidai-hq.pdf.

The currently registered 1700+ GRIHA projects post completion of rating and occupancy by 2030 are estimated to contribute towards the following:

» Installation of 2.5 GWp of renewable energy
» Offset of 24,024,550 tCO_2/annum of CO_2 emissions
» Savings of 84,871,412 MWh/annum in post-construction energy consumption

Sustainable is Affordable

Green ratings provide a structured approach/guideline for project teams to design, construct, and operate green buildings. The emphasis is placed on the achievement of specific benchmarks through adoption of no-cost or low-cost strategies and technologies.

In late 2017, GRIHA Council and TERI developed 'PRAROOP', a simulation tool to demystify the myth that sustainable is not affordable. The tool showcases a variety of building materials and technologies, such as walling material, flooring material, insulation, doors, windows, glass, plumbing fixtures, air conditioning equipment, and lighting system.

PRAROOP allowed users to choose materials to design a G+1 virtual green building for themselves. The simulation model generated a green score to indicate the level of sustainability and cost-effectiveness of the building.

The tool encapsulates the importance of selecting appropriate construction materials to optimize the life cycle cost (LCC) of the building. General sense in the market dictates that the selection of the construction material is based on its initial cost or market visibility/branding. However, the selection of the construction material must be made based on its life cycle cost. Since the cost of operating a building is on average 80–90% when compared to the initial capital investment, it is prudent to plan to incorporate the green features of the building in the design phase itself. The higher capital investment would be offset through reduced operational costs.

PRAROOP is an instrumental tool that helps building developers and occupants understand the relationship between sustainability and affordability.

Conclusion

There are no quick fixes to sustainable development. It must be considered, integrated, and implemented at every stage of the development cycle. Green ratings for buildings are but one facet of the solution towards addressing the multidimensional problem of climate change.

Green ratings for buildings have proven to result in the development of climate resilient, affordable building structures. They are an integral cog in the machinery that facilitates integrated sustainable development. The continuous and rigorous review of the evaluation criteria employed by green ratings is critical towards improving the performance benchmarks of buildings.

The ever increasing adoption of the GRIHA rating is paramount in evaluating reductions in GHG emissions intensity by 2030 and achieving the Nationally Determined Contributions submitted to UNFCCC by the Government of India. EF

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