

Assessment of Green Building through GRIHA Rating Tool and its Implementation

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Abstract

This paper presents the issues on sustainable design approach in all industries and sectors that has become a demand of the global world. The negative impacts of the industries such as climate change, global warming, ozone depletion and inefficient resource consumption have become a great concern and awareness among the public, politicians and academicians is the need of the time. ^[1] Thus, a lot of efforts have been initiated either in terms of theories or practices in order to reduce the negative impacts of the industries. GRIHA rating tool is a tool to facilitate design, construction, and operation of green buildings.

Keywords- Green Building, Greenship Rating Tool, Sustainable Design, Conventional Building, Combat Global Warming

I. INTRODUCTION

A green Building uses less energy, water and other natural resources, creates less waste and greenhouse gases and is healthy for people during living or working inside as compared to a conventional Building. Green Building is not about a little more efficiency, it is about creating buildings that optimize on the local ecology, use of local materials and most importantly they are built to save power, water and material requirements.

The rating tool features several key elements – sustainable site, energy, water and waste management, material resources, indoor quality, innovation, transportation and social economy that are divided into criteria. Points are awarded in each criteria. The sustainable building rating systems adopted in the building sector which intended to faster more sustainable building design, construction and operations by promoting and making possible a better integration of environmental concerns with cost and other traditional decision criteria. ^[2]

The rating tool, which is called Greenship, is in the pipeline as a follow up to the establishment of the Green Building Council of Indonesia (GBCI) last year. Greenship is being set as a voluntary effort to keep natural resources sustainable and to combat global warming. GRIHA rating is very useful to all peoples and safe for our country.

II. BENEFITS

Green Buildings are beneficial to the building owners, users and the community as a whole. The operational cost is reduced because renewable energy is used without compromising the household's level of comfort. Water conservation through rain water harvesting process. Heating, Ventilation and Air condition systems are reduced in size to provide optimal performance at local conditions. As a result, the capital cost also is reduced. Keeping in mind of biodiversity and ecological balance, GRIHA supports minimization of deforestation and land erosion on site. Pollution and waste are controlled through recycling and reuse of energy. The above mentioned processes ensure health benefits with reduced water and air pollution. Moreover, green building owners get the image of being conscious and sensitive to environmental degradation. ^[4] By getting their buildings rated under GRIHA, they are contributing in maintaining biodiversity and protecting the earth from further damage. So this rating system is very beneficial to the owners.

III. SCOPE

It is proposed to carry out some theoretical, experimental and analytical studies on. The stages of the life cycle that have been identified for evaluation are the pre-construction, building design and construction, and building operation and maintenance.

The National Rating System will evaluate the environmental performance of a building totally over its entire life cycle, thereby providing a definitive standard for what constitutes a 'Green Building'. The rating system, based on accepted energy and environmental principles, will seek to strike a balance between the established practices and emerging concepts, both national and international. The guidelines opinion may be revised every three years to take into account the latest scientific developments during this period. [5]

IV. OBJECTIVES

- 1) To study the reports on green building & various rating system which evaluate performance of green building.
- 2) To study different methods of rating system.
- 3) To study the various categories of criteria which evaluates Greenship.
- 4) To evaluate Greenship rating of a building by using Greenship rating tool.
- 5) To suggest the suitable measures in the situation of implementation of Greenship rating tool.
- 6) Greenship rating system helps to reduce energy transfer and carbon emission to greater extent. [3]

V. STATEMENT OF PURPOSE

Carbon emission produces climatic changes. Now a day's buildings are designed according to sustainability. But the huge portions of existing buildings were designed by considering traditional approach which consumes lots of energy and resources. The Greenship rating system improving energy efficiency & reducing waste generation, minimizing the carbon emission of building, for the better future of earth. To maximize the conservation and utilization of resources such as land, water, natural habitat, energy conservation and enhance efficiency of the systems and operations.

VI. METHODOLOGY

- 1) Study the report on green building & various rating system which evaluate performance of Green building over a conventional building through various components.
- 2) Study of different rating system.
- 3) Finding the various Categories of criteria & rating points to those criteria.
- 4) Collection of data through questionnaires' survey.
- 5) Analyze the collected data through Greenship Rating Tool.
- 6) Evaluate Greenship rating of building.
- 7) Finding the suitable measures in context of implementation of Greenship rating tool. [6]

VII. THE RATING SYSTEM

There are 34 criteria of the GRIHA rating system under four main categories:

- 1) Selection and site planning
- 2) Conservation and efficient utilization of resources
- 3) Building operation and maintenance
- 4) Innovation

Eight of these 34 criteria are mandatory, four are partly mandatory, while the rest are optional. Each criteria has a number of points assigned to it. It means that a project intending to meet the criterion would qualify for the points. Different levels of certification (one star to five stars) are awarded based on the number of points earned. The minimum points required for certification is 50. [7]

Table 1: Different levels of certification

Points scored	Ratings
50-60	One star
61-70	Two stars
71-80	Three stars
81-90	Four stars
91-100	Five stars

VIII. CASE STUDY

- SUZLON ONE EARTH, Hadapsar, Pune – 5 stars

- KIRLOSKAR BROTHERS LTD., Baner, Pune – 3 stars
- IRICEN, Koregaon Park, Pune – 4 stars



Fig. 1: Suzlon One Earth, Pune (GRIHA Points=96/100)

A. *Project Description*

- Location: Hadapsar, Pune
- Site Area: 45392 m²
- Built-Up Area: 70865 m²
- Air-Conditioned Area: 40418 m²
- Non Air- Conditioned Area: 24582 m²
- Energy Consumption Reduction: 47%Reduction from GRIHA Benchmark
- Water Consumption Reduction: 65%Reduction from GRIHA Benchmark
- EPI: 55.86 KWh/ m²/Year
- Occupancy Hours: 2640 Hrs/ Year
- Renewable Energy Installed On Site: 154.83 KW
- GRIHA Rating: 5 stars^[8]

Suzlon One Earth is corporate headquarters located in Pune, India. The campus stands as a testimony to the organizational philosophy of pursuing sustainable development. Built in-line with its vision of powering a greener tomorrow, the expansive, environment-friendly campus is spread over 10 acres. Divided into inter-connected, individual buildings named after the elements of nature, the campus houses employees, members of senior management and the Board of Directors in its Sun, Aqua, Sky, Tree and SEA (Suzlon Excellence Academy) lounges. One Earth is self-sufficient, employing effective controls and building management systems for minimum disturbance to the natural ecology of the site.^[9]

A LEED Platinum and GRIHA 5 star certified building, One Earth is one of greenest corporate campuses in the world and the place where the team of Suzlon comes together from across the globe to work in harmony with nature and build a greener tomorrow, today.

A million S.F. of ground plus two levels in a 10.4 acre urban setting achieved a LEED Platinum and TERI GRIHA 5 Star certification with 8 percent of its annual energy generated on-site through photovoltaic panels and windmills with a total incremental cost of about 11%. There are no other LEED certified buildings with this level of certification and on-site renewable energy that have achieved this kind of cost efficiency. 154 KW of electricity is produced on site (80% wind and 20% photovoltaic). All other energy (4MW) is produced in the client's wind mill farms. With 92% (4 MW) being consumed by the project is 'sustainable energy' making this a Zero Energy Project.^[8]

To reduce the impact of proposed buildings on nature they have adopted some implementations in their buildings which are as follows:

1) *Sustainable Site Planning*

- Dust screens provided around construction area to prevent air pollution.
- Soil erosion control measures adopted on site.
- Utility corridors designed along roads and pathways on site.

2) *Reduction in Water Consumption (Compared to GRIHA Benchmark)*

- 65% reduction in building water consumption by use of low-flow fixtures.
- 55% water recycled and reused within the complex.
- 50% reduction in landscape water consumption by planting native species of trees and shrubs and by using efficient irrigation systems.

3) *Passive Architectural Design Strategies Adopted in the Building*

- Orientation: Facades of the building face north, south, north-west and south-east
- 100% shading by external louvers on first and second floor.
- Partly self-shading blocks.
- Small terraces created in all blocks to promote interaction with external environment.

4) *Reduction in Energy Consumption (Compared to GRIHA Benchmark) while Maintaining Occupant Comfort*

- For achieving visual comfort
- Adequate day lighting and glare control measures adopted.
- 100% desks equipped with LED lights governed by motion sensors.

5) *For Achieving Thermal Comfort*

- Pre-cooling of fresh air
- Heat recovery/exchanger mechanisms to minimize energy consumption
- High efficiency mechanical systems to reduce energy consumption.

6) *Renewable Energy Technologies Installed on Site*

- Installed capacity of solar energy: 13.44 KW.
- Installed capacity of wind energy: 18 windmills of 4.75 kW each.
- 250000 units of electricity generated annually.

7) *Use of Low-Energy/Green Materials*

- 37% reduction in quantity of structural concrete by using Post Tension slabs.
- 50% reduction in quantity of structural steel by using Post Tension slabs.
- Use of siporex fly-ash blocks for better insulation.

IX. CONCLUSION

The finding of this study provides valuable insight for perceptions of contractors toward Greenship rating tools on apartment building in Chikhali, Ravet, Punawale, Pimpri-Chinchwad. Since contractors such as primary project stakeholders play an important role in the Greenship building, it is therefore essential to know their perceptions toward eight aspects of Greenship rating tools. As a results, the aim of this study can be identified by obtaining the factors that would easily. According to the contractor's perceptions, some factors that would easily to be applied are accessibility to public area, daylight, rain water usage, local material, visual comfort, operating and maintenance cost, soil conservation. Then, based on the perceptions consultants, these factors are site landscaping, daylight, reduce water usage, local material, smoke monitoring system, CO₂ pollution, protect health occupant.

^[3]Starting with the project first step that we took was we prepared one questionnaire survey form. For the purpose of project related survey we had visited about 30 buildings, from which 20 of them supported the concept and also help us by giving us the information in short and also filled the form that we had prepared from this survey we also got to know that how many buildings are implementing for GRIHA certification, and also about how much energy is consumed.

If all Buildings in urban areas were made to adopt green building concepts, India could save more than 8400 MW of power which is enough to light half of Delhi or 5.5 lakh homes a year according to estimates by TERI. A green building depletes very little of the natural resources during to its construction and operation. The aim of a green building design is to minimize the demand on non-renewable resources and maximize the utilization efficiency of these resources when in use and maximize utilization of renewable resources.

REFERENCE

- [1] Rajendra Mathur, (2012). "Green Building Concept & Norms" CPWD Work Manual, Chapter-2, P.P 1-20.
- [2] Baharuddin & Ramli Rahim, (2012). "Energy Efficiency: Comparison between Greenship & LEED" This paper was presented in Hasanuddin University, Makassar Indonesia. P.P B5-43.
- [3] Muhamad Abduh, Wulfram I. Ervianto, Dewi Chomistriana & Agus Rahardjo, (2014). "Green Construction Assessment Model For Improving Sustainable Practices Of The Indonesian Government Construction Projects". This paper was presented in Green Construction assessment model for improving sustainable practices of Indonesia, Government construction projects, Indonesia. P.P 111-122.
- [4] Retno Rahardjati, Dr. Mohd. Faris Khamidi & Ap. Dr. Arazi Idrus, (2011). "Green Building Rating System: The Need of Material Resources Criteria in Green Building Assessment". This paper was presented in international conference on environmental science & technology, PICBEE Volume No. 6, Singapore. P.P 148-151.
- [5] Njo Anastasia, (2013). "The Way to Encourage Green Building in Indonesia". This paper was presented in Christian University, Surabaya, Indonesia. P.P 1-14
- [6] Aden Firdaus, (2012). "Identification of the Greenship Professional Competence on Green Building Project". P.P 1-4.
- [7] Richard Red, Anita Bilos, Sara Wilkinson & Karl-Werner Schulte, (2009). "Identification of the Greenship Professional Competence on Green Building Project". Volume No. 1, P.P 1-22
- [8] Herry Pintardi Chandra & Paulus Nugraha, (2014). "Perceptions of Contractors & Consultants toward Application of Greenship Rating Tools on Apartment Buildings in Surabaya". IPTEK, the Journal for Technology & Science, Volume 25, P.P 1-6.