

PERFORMANCE AND RATING OF RESIDENTIAL GREEN BUILDING

Hemant Kumar¹ and Vaishali Sahu²

Department of Civil & Environmental Engineering, ITM University, Gurgaon, Haryana, India

ABSTRACT

The green building concept is becoming more and more popular these days because these are considered as environment friendly building. The government is taking appropriate steps in implementation of green building concepts by providing increase in Floor area ratio. They are making action plan on climate change on sustainable habitats by proposing smart city concepts. Further in addition to that BEE is putting their effort on appliance labelling programme which helps in appraisal and clearance of large construction projects. Several corporate organizations, institutions and construction companies are now practising green building concept in the construction. There are many green building rating systems in place. GRIHA (Green Rating for Integrated Habitat Assessment) and LEED (Leadership in Energy and Environment Design) was developed in response to this need. The GRIHA is considered as Indian National Rating System which have been finalised after incorporating various modifications suggested by a group of architects and experts. United States Green Building Council administered (LEED) as the leading green building rating system which is ranked first among other systems. LEED is contributing heavily in converting the built environment towards sustainable development. The buildings which come under GRIHA are those which are having land area more than 2,500 Sqm. (except for industrial complexes). These buildings can undergo this certification programme. The GRIHA doesn't cover buildings having area less than 2500 sqm so the present study focuses on providing a rating system for small residential buildings. By adopting this rating system more and more buildings may be covered for sustainable development. It gives a boost to nearby surroundings.

KEYWORDS

Green Building, GRIHA, LEED, Rating System

1. INTRODUCTION

The building constructions have major environmental effect on surroundings and natural resources during their life cycle. The natural resources like ground water, soil, trees and fuels are dwindling to give way to buildings. The soil cover is used for landscaping, energy-consuming systems for lighting, space cooling and heating, ventilation and water heating system to provide comfort to the resident. Hi-tech controls like lux sensor, occupancy sensor add intelligence to the buildings. Fire fighting system, security and building management system controls and monitor the resource use. Water is major resource for an occupant who gets used by the occupants during construction and operation time. Large occupied buildings generate good amount of waste like solid waste, liquid waste, air pollution and noise pollution. Buildings are now considered as one of major pollutants that have huge impact on various environments.

Hence, the need of present is to design a green building to save the climate as well as natural resources. The cost of constructing green building is more than the conventional building design but the operation and maintenance cost is less as compared to other buildings and have good

environmental benefits. The main hurdle is to achieve these benefits with less or affordable cost.

According to Ministry of Environment & Forest, India, Green Building is the “practice of creating structures and using processes that are environmentally responsible and resource-efficient throughout a building life-cycle from sitting to design, construction, operation, maintenance, renovation, and deconstruction.” Green building shows our efforts in the construction practices. With the development of technology and new construction and building materials the status of the efforts also changes. Therefore, we have to emphasize the green building concept on all scale projects including small residential buildings as it contributes to the major share of construction.

2. OVER VIEW OF PARAMETER AND DESIGN

The purpose of green building design is to bring down the demand to minimal and maximize the utilization efficiency. The parameters to be considered for green building design are use of version soil, vegetation of landscaped area, maximum use of recycled water efficient building material, minimum energy usage, and maximum use of renewable energy like solar, wind, ventilated building design, and efficient waste management technique. The agency critically evaluates the impacts of the building design and then arrives at a cost effective design solutions which can minimize the environmental impacts and therefore enhance the efficiency of the building.

2.1. Benefit of Green Building

It has been reported that the consumption of natural resources is very less in green building as compared to conventional buildings. The resources in a building with their respective reasons are follows:

- Due to passive architectural intervention, efficient material consumption and innovative technologies in design of the building, green buildings consume lesser electricity as compared to conventional buildings.
- Green Buildings generate the renewable energy at on-site and utilize its energy needs. Solar panel uses for hot-water generation and can replace the electrical geyser in buildings fully or partially. Solar PV panels can also be used to generate electricity which will ultimately reduce the buildings dependency on the grid power.
- Water consumption of Green buildings is very less as compared to conventional buildings. Green Building utilizes low-flow faucets, waste-water recycling systems through tertiary treatment, dual plumbing systems and water conservation techniques like rain-water harvesting etc.
- By using waste management strategies on site Green buildings generate less waste. They help to reduce the load on the municipal waste management system and landfills.
- At the time of construction and while in use Green Buildings generate less pollution. The proper storage and usage of construction materials, measure to prevent air and noise pollution during construction activities etc. ensures reduced impact on the surrounding environment.
- During Construction and while operation Green buildings ensure safety, health and sanitation facilities for the labourers.
- Green buildings are in demand and can be leased out at higher price as compared to conventional building.

2.2. Rating methodology

The rating system consists of different parameters as listed below. It covers the different stages from designing and planning to operation and maintenance. These points are common for all type of rating system which has been discussed in detail in below points.

1. Sustainable Site Planning

- Site Selection
- Preserve and protect landscape during construction
- Soil Conservation
- Local Building Regulations
- Preservation or Transplantation of Trees
- Alternative Transportation, parking capacity
- Proximity to Public Transport

2. Water Management

- Reduce landscape water requirement
- Reduce building water use
- Efficient water use during construction
- Water recycle and reuse
- Innovative Wastewater Technologies
- Rainwater Harvesting, Roof & Non-roof
- Management of Irrigation Systems
- Ensure water Quality
- Water Metering

3. Energy Optimization

- Enhance outdoor lighting system efficiency
- Plan utilities efficiently and optimise on site
- Renewable energy utilization
- Energy audit and validation
- Increased Ventilation
- Controllability of systems, lighting
- Controllability of systems, thermal comfort
- Energy Metering and Management
- Optimise building design to reduce conventional energy demand
- Low emitting Vehicles

4. Sustainable Building Materials

- Utilization of fly ash in building structure
- Regional Materials
- Passive Architecture

5. Waste Management

- Efficient waste segregation
- Storage and disposal of waste
- Segregation of Waste, Post-occupancy
- Minimise Indoor and Outdoor Pollutants

6. Health & Well being

- Minimize Ozone depleting substances
- Provide at least minimum level of Sanitation / Safety facilities for construction workers
- Tobacco and smoke control

7. Innovation

- Innovation & New Idea

2.3. GRIHA

In this rating system the credit possible It has been observed that the major concentration is towards energy optimization and least in building operation maintenance as shown in figure-1.

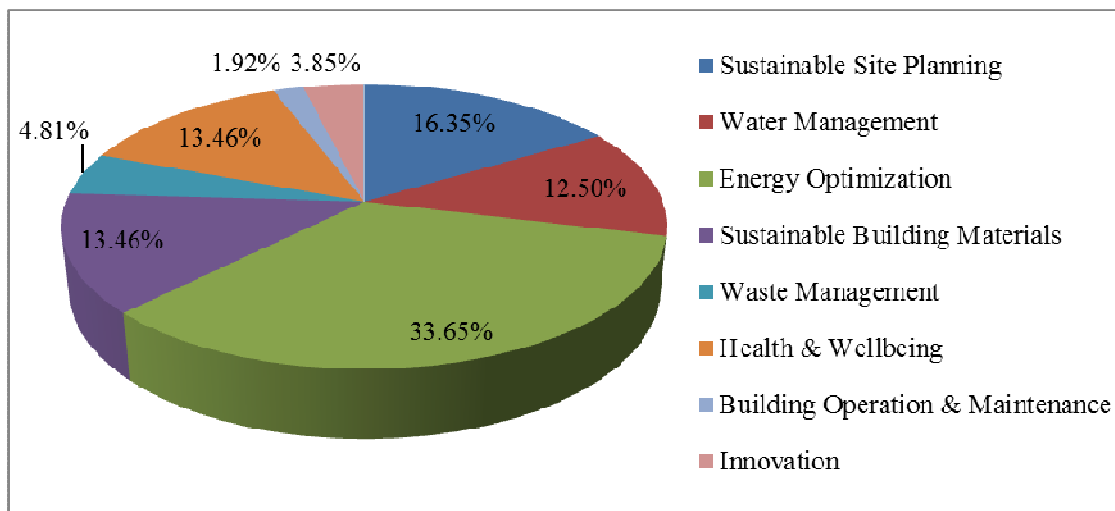


Figure 1: GRIHA rating system

2.4. LEED

This rating system is mostly used internationally, here shows the pie chart having different criterion of sustainable building design. This rating system has major emphasis on energy optimization and minor on innovation and water management.

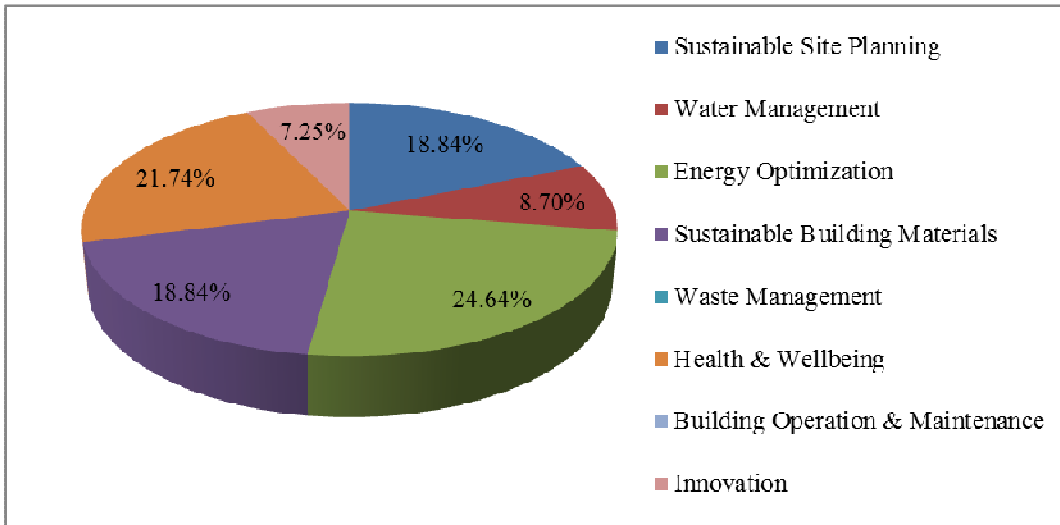


Figure 2: LEED rating system

3. PROPOSED SYSTEM

This rating system is being developed by us for small residential building situated in national capital region after study and taking feedback from market experts like real estate experts, architects and engineers (Annexure attached):

The feedback shows that the experts are majorly interested in energy optimization and water management and least on sustainable building material & innovation. This is because people are not much interested in innovation in their houses. The main emphasis is on usage of electricity and water which are critical parameters for sustainable design and directly linked to the living cost.

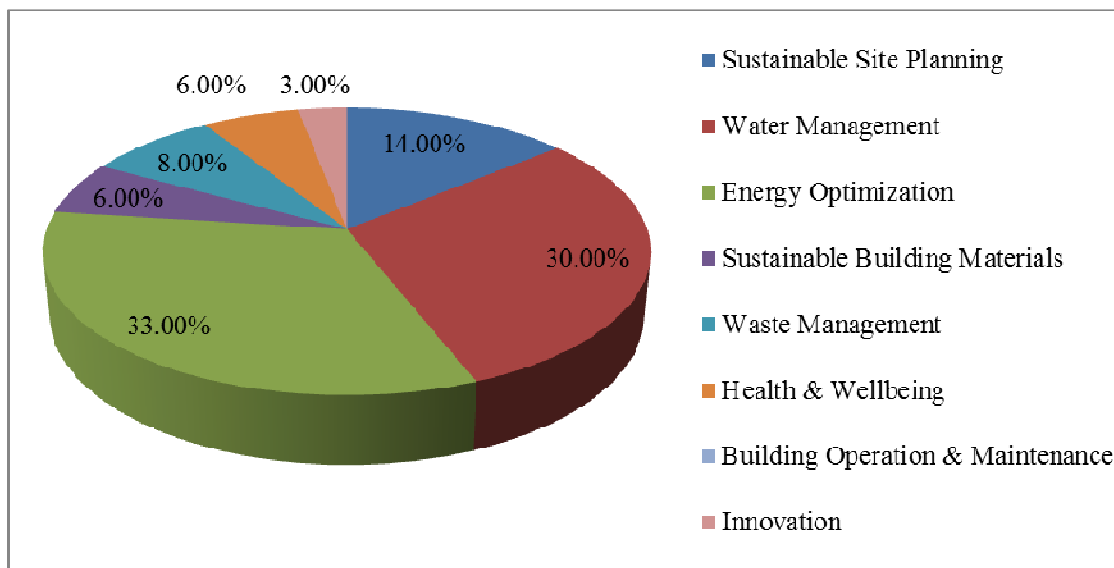


Figure 3: Proposed rating system

The critical analysis shows that both established rating system is focusing on energy optimization but not on operation & maintenance which is somehow contradictory. If we need to save energy it should be operated in efficient manner and need to be maintained properly.

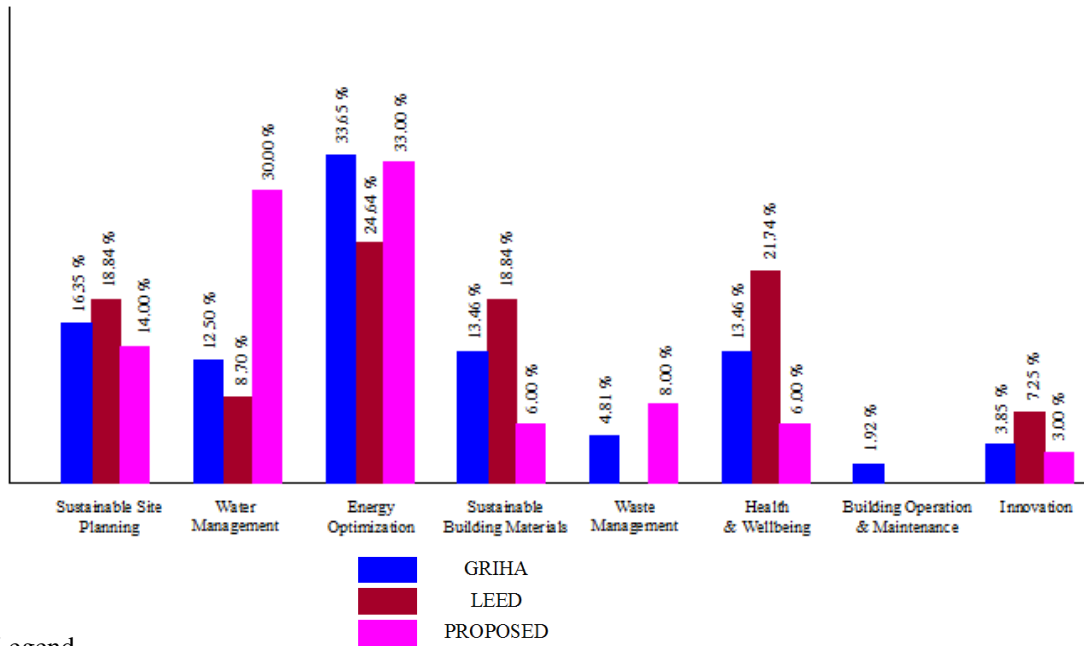
Table 1 shows the comparison of rating criterion and points:

Table 1: Data Comparison

S. No.	Description	GRIHA	LEED	PROPOSED
1	Sustainable Site Planning	16.35%	18.84%	14.00%
2	Water Management	12.50%	8.70%	30.00%
3	Energy Optimization	33.65%	24.64%	33.00%
4	Sustainable Building Materials	13.46%	18.84%	6.00%
5	Waste Management	4.81%	-	8.00%
6	Health & Wellbeing	13.46%	21.74%	6.00%
7	Building Operation & Maintenance	1.92%	-	-
8	Innovation	3.85%	7.25%	3.00%

4. CONCLUSIONS

The final rating system for small residential building shows that people are mainly focused towards conservation & reuse of water and energy optimization because it is directly related to their daily usage and cost of living. So as per above study we would like to recommend the credit point as shown in figure 4. It helps to preserve natural resources because the small housing numbers are much higher than high rise buildings.



Legend

Figure 4: Credit point for the existing and proposed system

However, to achieve sustainable development, certain mandatory criteria must be followed to achieve good economic, environmental and social system. Hence new development in green building is required which can focus more on the life cycle analysis in all product stages, knowledge integration and involving more expert people from all areas. Also using the renewable materials, utilization of the solar energy, rain water harvesting system and water reuse considering geo graphical condition of the area where Green Building to be build.

REFERENCES

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Authors

Mr. Hemant Kumar is an Assistant General Manager (Planning) with DLF Limited, leading real estate company of India. Presently pursuing M. Tech from ITM, University, Gurgaon.

Ms. Vaishali Sahu an Assistant Professor, Department of Civil & Environmental Engineering, ITM University, Gurgaon, India has 8 years of teaching experience. Her research areas are Water, Waste Water Management, Environmental Pollution & Waste Management.

