International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 08 Issue: 04 | Apr 2021 www.irjet.net p-ISSN: 2395-0072

A Study of IGBC and GRIHA Rating Systems for Individual Residential Unit

Ar. Smita Mane[1], Dr. Madhav Kumthekar[2]

[1]P.G. Student, S.P.S.M.B.H'S College of Architecture, Kolhapur, Maharashtra, India.
[2]Professor and Head, Department of Civil Engineering, Government Engineering College, Karad, Maharashtra, India.

Abstract - *With the construction sector experiencing an advent in growth, it is inevitable that this will have a negative impact on the environment. Green rating systems for buildings are technical instruments used to assess the environmental impact of buildings and construction projects. These practises are intended to assist project managers in developing more sustainable projects by providing frameworks with precise criteria for assessing the various aspects of a building's environmental impact. Given India's growing interest in sustainable development, a plethora of rating systems for evaluating the environmental impact of buildings have been established in recent years, each with its own set of unique characteristics and application areas. The current work is motivated by an interest in examining these rating systems and deriving the primary implications for single family residential buildings. Additionally, it makes an attempt to summarise in a comprehensible manner the vast and fragmented assortment of information available today. Green Rating for Integrated Habitat Assessment (GRIHA) and The Indian Green Building Council (IGBC) are the two main rating systems studied in this study. A significant similarity between these programmes is the use of a credit-based system that allows for some flexibility in terms of which credits or measures building developers pursue, as well as mandatory requirements for certification. As this analysis demonstrates, there are numerous assessment criteria that have the same meaning but are denoted differently in various rating systems. Additionally, the IGBC developed a rating system specifically for single-family residential buildings.*

Key Words: Green rating system, environmental impact, sustainable development, single family residential buildings, GRIHA, IGBC.

1. INTRODUCTION

The construction industry is one of the most well-known consumers of energy on a global scale. According to the World Business Council for Sustainable Development, the construction industry consumes 40% of total energy. Apart from energy consumption, buildings generate Green House Gas (GHG) emissions through construction materials, demolition waste, municipal solid waste, and also raise the heat island effect, which all contribute to global warming. According to the researchers, global carbon emissions from buildings will reach 42.4 billion tones in 2035, up 43 percent from 2007 levels.

According to Make In India's survey, India will be the world's third largest construction market by 2030, with a 15% contribution to GDP. India's real estate market is expected to reach USD 180 billion in value by 2020 and USD 1 trillion by 2030 as shown in figure1.

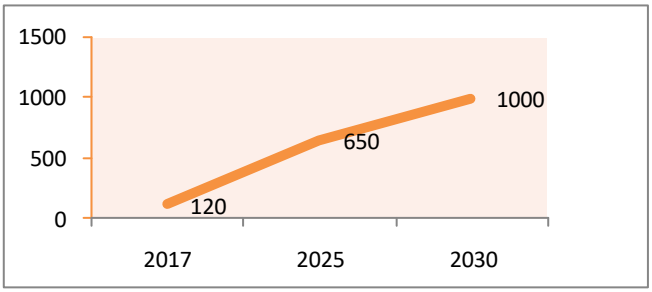

Fig -1: Market capitalization of real estate in India

(in billions of dollars)

The real estate sector's primary drivers are regulatory reforms, sustained demand generated by rapid urbanisation, rising household income, and an increase in the number of nuclear families. Currently, 377 million people live in 7,935 towns and cities throughout the country (up from 5,161 in 2001), accounting for approximately 31.2 percent of the total population. By 2039, urban population is expected to equal rural population (Ministry of Housing and Urban Poverty Alleviation, 2011). This urban population growth trend will increase the demand for buildings, particularly housing as shown in figure2, in all types of towns.

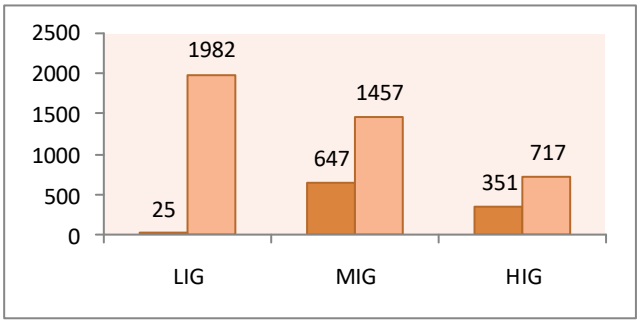

Fig -2: Housing Demand-Supply Ratio in the Top 8 Cities ('000 units) 2016–2020
(Source: The India Brand Equity Foundation)

Due to limited land resources and high construction cost in megacities, high density residential housing type is preferred. However, there is a demand for low density residential development in urban sprawl areas and small cities. Though the land area required for this type of development is small, it is substantial in number across India.

Conventional homes has a significant impact on people's health and well-being, and also on the environment. They consume resources, generate various types of waste, and emit greenhouse gases over the course of their 75-year or longer life. With India's real estate boom in recent years, the demand for green home is increasing in order to provide a better future for future generations.

Green homes are important because the world is rapidly depleting its natural resources, making it impossible to continue living as we have in the past. There must be sufficient resources now and in the future for everyone. While a green home may appear to be a costly strategy at first, the long-term benefits are substantial.

Three major programmes have been developed in India to promote a more sustainable development pattern: LEED-India, GRIHA, and IGBC. These programmes aim to improve the efficiency of built forms through improved planning, design, and selection of appropriate materials and technologies. Additionally, these programmes will aid in the efficient use of India's limited resources and enhance occupants' overall quality of life. The purpose of this paper is to analyse the GRIHA and IGBC rating systems with a focus on individual residential units.

2 GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT (GRIHA)

GRIHA (Green Rating for Integrated Habitat Assessment) was established by TERI and adopted by the Government of India as the national rating system for green buildings in 2007. The framework was created to assist in the 'design and assessment' of new construction projects. A building is evaluated based on its expected performance over its entire life cycle, from conception to service. The following stages of the life cycle have been established for assessment:

Pre-construction stage: In this stage, intra-and inter-site issues like proximity to public transport, type of soil, kind of land, where the property is located, the flora and fauna on the land before construction activity starts, the natural landscape and land features are evaluated.

Building planning and construction stages: In this stage, issues of resource conservation and reduction in resource demand, resource utilisation efficiency, resource recovery and reuse, and provisions for occupant health and well-being are evaluated. The prime resources that are considered in this section are land, water, energy, air, and green cover.

Building operation and maintenance stage: In this stage, issues of operation and maintenance of building systems and processes, monitoring and recording of energy consumption, and occupant health and well-being, and also issues that affect the global and local environment are considered.

Except for factory buildings, SVAGRIHA is a guidance-cum-rating system being established for small stand-alone buildings such as homes, commercial offices, motels, dispensaries, and colleges, and/or a group of buildings with a combined built-up area of 2500 sq.m. or less. There are 14 criteria in the rating system. Energy, water and waste, materials, landscape, and others are the five general subgroups of the criteria. Certain points in each sub-group would be required to be attempted. A project can earn up to 50 points in total. On a scale of one to five stars, the rating will be given. The parameters and their weighting are shown in table 1.

Table -1: Criteria and points for SVAGRIHA

Criterion number	Criterion name	Points	Sub Groups
1	Reduce exposed, hard paved surface on site and maintain native vegetation cover on site	6	Landscape
2	Passive architectural design and systems	4	Energy
3	Good fenestration design for reducing direct heat gain and glare while maximising daylight penetration	6	
4	Efficient artificial lighting system	2	
5	Thermal efficiency of building envelope	2	
6	Use of energy efficient appliances	3	
7	Use of renewable energy on site	4	
8	Reduction in building and landscape water demand	5	Water and Waste
9	Rainwater harvesting	4	
10	Generate resource from waste	2	
11	Reduce embodied energy of building	4	Materials
12	Use of low-energy materials in interiors	4	
13	Adoption of green lifestyle	4	Lifestyle

14	Innovation	2	
	Total	50	-

The percentile weightage of sub-group is shown in figure 3

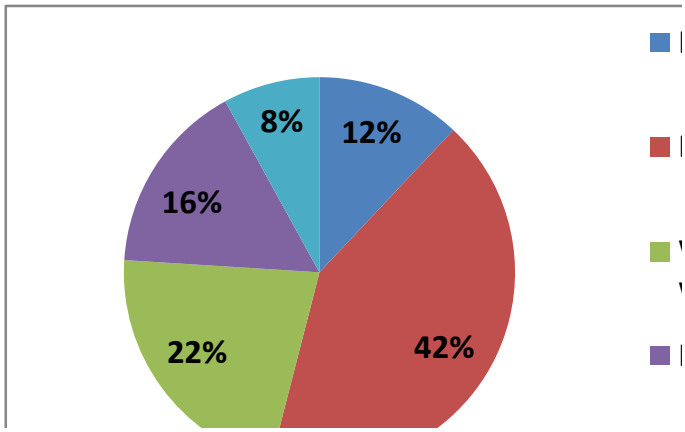

Fig -3: Percentile weightage of sub-group for SVGRIHA

The rating of a project according to points achieved is shown in table no. 2

Table -2: Certification levels for SVGRIHA

Points achieved	SVAGRIHA Rating
25-30	★
31-35	★★
36-40	★★★
41-45	★★★★
45-50	★★★★★

3. INDIAN GREEN BUILDING COUNCIL (IGBC)

When the CII-Sohrabji Godrej Green Business Centre building in Hyderabad was given the first and most prestigious Platinum green building ranking in India, the green building movement in India was sparked. Since then, India's Green Building movement has gathered considerable momentum. In 2001, the Confederation of Indian Industry (CII) created the Indian Green Building Council (IGBC). "To enable a sustainable built environment for all" and encourage India to become one of the global leaders in the sustainable built environment by 2025, the council's vision states. The IGBC Green Homes Rating System, developed by the Indian Green Building Council (IGBC), is the first rating system built specifically for the residential sector in India. There are two types of rating systems in the residential sector: one for individual residential units and another for multi-dwelling residential units. It is based on well-established energy and environmental values and strikes a balance between well-established traditions and innovative ideas. The 'IGBC Green Home Rating System version 2' assesses some mandatory criteria and credit points for individual residential units using a prescriptive approach and others using a performance-based approach. The IGBC Green Homes® rating system version 2 looks at green features in the following categories:

-Site Selection and Planning

-Water Conservation

-Energy Efficiency

-Materials & Resources

-Indoor Environmental Quality

-Innovation & Design Process

The parameters and their weighting for IGBC rated green home are shown in table 3. However, there are certain non-negotiable criteria that must be met by any Green Home.

Table -3: Criteria and points for IGBC Green Home

Sr. No.	Criterion	Points	Submittal stage	Sub group
Site Selection and Planning				
SSP (M) 1	Local Building Regulations	Required	Construction Submittal	Site Selection and Planning
SSP (M) 2	Soil Erosion Control	Required	Construction Submittal	
SSP (C) 1	Basic House-hold Amenities	1	Design Submittal	
SSP (C) 2	Natural Topography or Vegetation	2	Design Submittal	
SSP (C) 4	Heat Island Effect, Roof	4	Design Submittal	
SSP (C) 7	Design for Differently Abled	1	Design Submittal	
SSP (C) 8	Basic Facilities for Construction Workforce	1	Construction Submittal	

Water Efficiency				
WE (M) 1	Rainwater Harvesting, Roof & Non-roof	Required	Construction Submittal	Water Efficiency
WE (M) 2	Water Efficient Plumbing Fixtures	Required	Design Submittal	
WE (C) 1	Landscape Design	2	Design Submittal	
WE (C) 2	Management of Irrigation Systems	1	Design Submittal	
WE (C) 3	Rainwater Harvesting, Roof & Non-roof	4	Construction Submittal	
WE (C) 4	Water Efficient Plumbing Fixtures	4	Design Submittal	
Energy Efficiency				
EE (M) 1	CFC-free Equipment	Required	Design Submittal	Energy Efficiency
EE (M) 2	Minimum Energy Performance	Required	Design Submittal	
EE (C) 1	Enhanced Energy Performance	10	Design Submittal	
EE (C) 2	On-site Renewable Energy	6	Design Submittal	
EE (C) 3	Solar Water Heating System	4	Design Submittal	
EE (C) 4	Energy Saving Measures in Other Appliances &Equipment	2	Design Submittal	

Materials & Resources				
MR (M) 1	Separation of House-hold Waste	Required	Design Submittal	Materials & Resources
MR (C) 1	Organic Waste Management, Post Occupancy	2	Construction Submittal	
MR (C) 2	Handling of Construction Waste Materials	1	Construction Submittal	
MR (C) 3	Reuse of Salvaged Materials	2	Construction Submittal	
MR (C) 4	Materials with Recycled Content	2	Construction Submittal	
MR (C) 5	Local Materials	2	Construction Submittal	
MR (C) 6	Rapidly Renewable Building Materials & Certified Wood	4	Construction Submittal	
Indoor Environmental Quality				
IEQ (M) 1	Tobacco Smoke Control	Required	Design Submittal	Indoor Environmental Quality
IEQ (M) 2	Minimum Daylighting	Required	Design Submittal	
IEQ (M) 2	Fresh Air Ventilation	Required	Design Submittal	
IEQ (C) 1	Enhanced Daylighting	4	Design Submittal	
IEQ (C) 2	Enhanced Fresh Air Ventilation	2	Design Submittal	

IEQ (C) 3	Exhaust Systems	2	Design Submittal	
IEQ (C) 4	Low VOC Materials, Paints & Adhesives	2	Construction Submittal	
IEQ (C) 5	Building Flush-out	1	Construction Submittal	
IEQ (C) 6	Cross Ventilation	4	Design Submittal	
Innovation & Design Process				
ID (C) 1	Innovation & Design Process Natural Topography or Vegetation : >35% Heat Island Effect, Roof : > 95% Landscape Design: No turf, Drought resistant plant > 60% Rainwater Harvesting, Roof & Non-roof: >95% Water Efficient Plumbing Fixtures: water use less than 45% LPD <40% from baseline value, On-site Renewable Energy: >20% Reuse of Salvaged Materials : >7.5% Materials with Recycled Content : >30% Local Materials : >75% Rapidly Renewable Building Materials & Certified Wood : > 95% Cross Ventilation : >95%	4	Design Submittal/ Construction Submittal	Innovation & Design Process
ID (C) 2	IGBC Accredited Professional	1	Design Submittal	
	Total	75	-	-

*(M) – Mandatory Requirement

*(C) - Credit

The percentile weightage of sub-group for IGBC Green Home is shown in figure 4

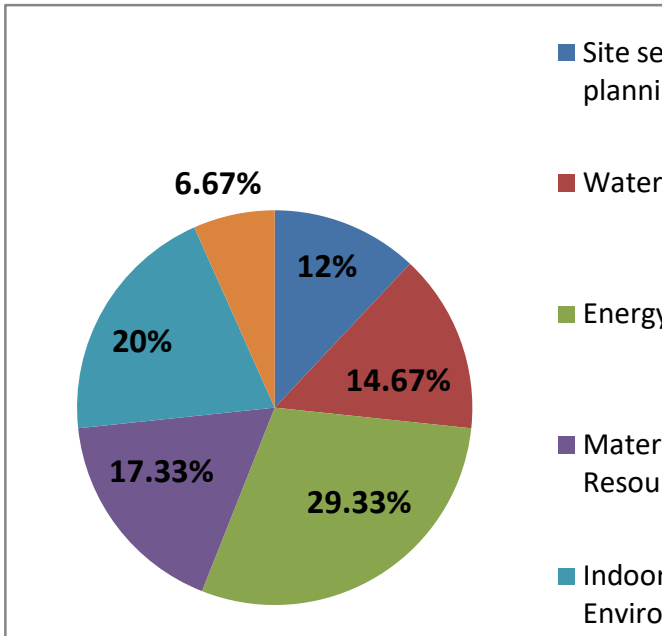

Fig -4: Percentile weightage of sub-group for IGBC Green Home

Green building certification levels are determined by the total number of credits received as shown in table no. 4

Table -4: Certification levels for IGBC Green Home

Rating	Points for Individual Residential Unit	Recognition
Certified	38 – 44	Best practices
Silver	45 – 51	Outstanding Performance
Gold	52 – 59	National Excellence
Platinum	60 - 75	Global Leadership

4. CONCLUSIONS

The introduction of a green rating procedure to evaluate buildings is becoming more relevant to the need for sustainable development in the construction industry. A green home is a structure that is environmentally sustainable because it implements certain principles during the design, development, and operation phases that enable it to derive maximum benefit from the environment while causing the least amount of damage. When designing a green house, several considerations must be taken into consideration. The use of a credit-based framework with some flexibility on what credits or steps building developers choose to follow, as well as mandatory criteria that must be met for certification, is a key similarity between SVGRIHA and IGBC Green Home rating systems. As can be seen from this study, there are various evaluation requirements that have the same significance but are denoted by different terminology in each case. As previously mentioned, the SVGHRIHA rating system is not only applicable to individual residential units it also applicable for small hotels, offices, hospitals, schools. Individual residential units are assessed using a special framework established by the IGBC. As suggested by the IGBC, a specific feature in terms of mandatory enforcement and motivating aspect for creativity will encourage more green home building.

REFERENCES

[1] Albert Ping Chuen Chan, Amos Darko, Ernest Effah Ameyaw, "Strategies for promoting green building technologies adoption in the construction industry-An International study", Sustainability Journal 9(6), 969, June 2017, pp. 01-18 doi 10 3390/su9060969.

[2] Gayatri Vyas and Kumar Neeraj Jha, "Comparative Study of Rating Systems for Green Building in Developing and Developed Countries" Conference: Third International Conference on Construction in Developing Countries (ICCIDC–III) "Advancing Civil, Architectural and Construction Engineering & Management" July 2102.

[3] Devarshi Tathagat, Dr.Ramesh D. Dod, "Role of Green Buildings in Sustainable Construction- Need, Challenges and Scope in the Indian Scenario", IOSR Journal of Mechanical and Civil Engineering (IOSR-JMCE), Mar - Apr. 2015, pp. 01-09. e-ISSN: 2278-1684,p-ISSN: 2320-334X, Volume 12, Issue 2 Ver. II.

[4] Ezanee M. Eliasa, Chong KhaiLinb, "The empirical study of green buildings (residential) implementation: perspective of house developers" Procedia Environmental Sciences 28, 2015, pp. 708 – 716, doi 10 1016/j.proenv.2015.07.083.

[5] Center for Science and Environment(CSE) Green Building "Green-Building Rating: Overrated", 2012 , 1 – 16

[6] Hemant Kumar and VaishaliSahu, "Performance And Rating Of Residential Green Building" Civil Engineering and Urban Planning: An International Journal(CiVEJ) Vol.2,No.2. June 2015 pp.47 – 53

[7] IGBC Green Homes Rating System Manual, Version 2.

[8] SVGRIHA Manual Version, 2.2