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# Analysis of Green Building Certification Attainment through GRIHA System for R & D Block at KLEF, India

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**Abstract.** GRIHA is known as a green rating for integrated habitat assessment. The National Scoring System would periodically research the environmental efficiency of a building in its full life cycle; it will provide a clear benchmark for what makes a green building. Both national and international definitions are focused on the development and implementation of all emerging technologies that have an excellent balance on the energy and environmental values of the scoring system. The Green Building Rating System is a method that tests the environmental efficiency of a building through its life cycle. The current paper analyses the process for achieving the GRIHA ranking by evaluating many criteria such as site conditions, resource and activity, social aspects, energy optimization, waste management, human health and the security of the inhabitants in the recycling and reuse of products, lighting control, and water management for the academic building in Andhra Pradesh.

## 1. Introduction

Due to the incomplete understanding of urban sustainability, there is a lack of integrated solutions and coordinated actions[1,2]. These actions are essential for addressing such a complex issue, necessitating a holistic understanding of sustainability in the context of urban areas[3]. Even after understanding the need of sustainability lately, the development driven by economic and demographic considerations has caused in more consumption of natural and renewable resources and resulted in more pollution and waste[4,5]. To implement the sustainability in an appropriate manner, especially in urban areas, the green building concept has been introduced. In the past decades the approaches, parameters, checklist and technologies have taken drastic changes in the sustainable approaches we choose to make a green building. Many rating systems have evolved in the scenario[1,6–12]. LEED and GRIHA are some such rating systems that found acceptance and popularity. In respect to the different ranking schemes, LEED has parallels and distinctions with the GRIHA scheme. A major distinction between the two

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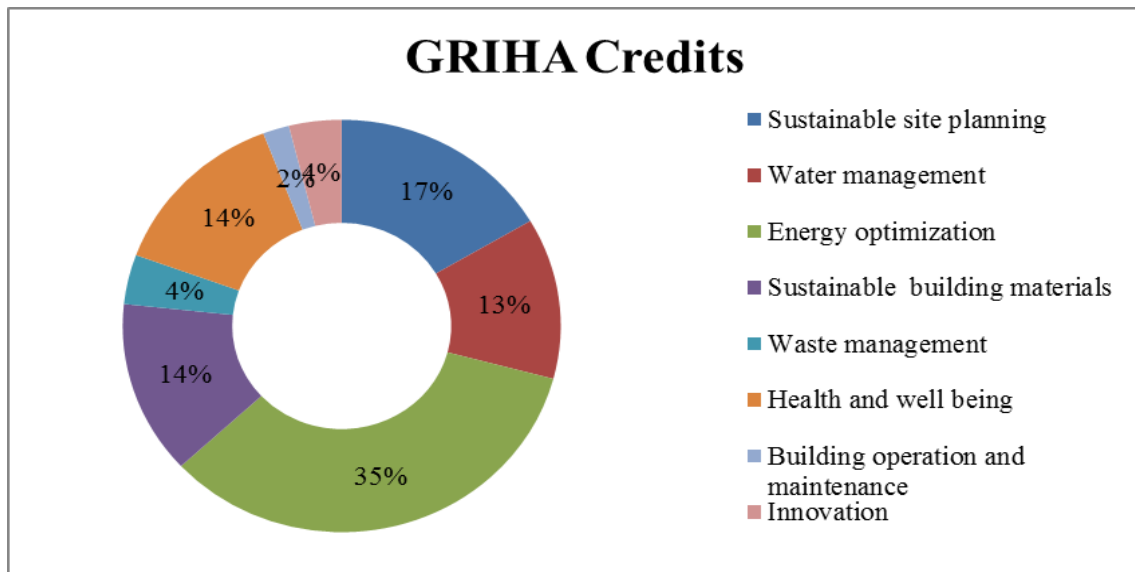


systems is the usage of a credit-based framework and certain variance as to what rewards or steps creators choose to follow, coupled and compulsory qualification criteria [10]. This may also render LEED more integrative than GRIHA, as it does not require a limited number of requirements to obtain specific qualification. For the ranking of new building architecture, LEED and GRIHA also submit specific ranking requirements for property, energy, water, indoor environmental performance.

GRIHA-(GREEN RATING FOR INTEGRATED HABITAT ASSESSMENT) has developed into administrative, commercial and residential buildings in the Asian country, focusing mainly on environmental issues, autochthonic solutions, and global climatic conditions [13]. While having all the considerations in view, the new building movement came into the picture as Green Building [12]. Green Building minimizes the use of natural resources to a minimum throughout its design and service periods. GRIHA is used to calculate and rank buildings assisted by environmental sustainability in the light of changing climate conditions in India [14]. GRIHA measures these metrics, such as energy consumption, waste production, the use of renewable energy or the entire life cycle of the building [12]. As part of the survey, the construction and maintenance of buildings are responsible for 30-40 per cent of the world's electricity [13]. The main objective is to take care of environmental issues to decrease the overall influence on the natural ecosystem of the construction sector [15]. The most aspect of the scoring system to a green building is to the extent the energy efficiency, water efficiency, material efficiency and scale back wastage, by enhancing the recycling process[12]. There'll be an enormous benefit by improving the environment by reducing greenhouse gasses[9]. GRIHA is five-star rating systems consisting of 100 points with 34 criteria which are mandatory to satisfy while other or optional points. Different levels are awarded levels of percentage of points earned. Required criteria for qualification should be 50 [9]. The GRIHA rating system is based on an agreement between energy and environmental principles that aims to strike a national and international balance between current standards and those concepts [16].

## **2. Green building GRIHA rating system summary**

GRIHA could be a national green building grading system in the Asian country. Planned by TERI and established jointly by the Ministry of Renewable Energy, the Government has promoted agreed energy and environmental values across the world [10]. Over three hundred ventures have come across the Asian nation of differing sizes and efficiency area units designed to support GRIHA goals[14]. TERI, deeply committed to every dimension of property development, has taken on the challenge of acting as an instrument for popularizing green buildings by developing a framework for measuring and evaluating the environmental quality of buildings in the context of India's varied climate and construction activities[16]. This approach would "orientate the building on the degree of its greenness" through its qualitative and quantitative evaluation parameters which are shown in figure1. The classification shall measure the environmental efficiency of a building in a comprehensive manner throughout its entire life cycle, thus establishing a clear criterion for what constitutes a 'green building' [11].



**Figure1.** GRIHA Category Chart [5]

Total credits points under the different categories of GRIHA are 104 of which one hundred feasible points come under the eight sections of criteria and the remaining four feasible points come under 'project innovation' as shown in figure1. GRIHA could also be a value-oriented program where awards are won for the achievement of the success requirements. Every test has points allocated to it. This indicates that the project showing conformity with the criteria will obtain the corresponding points and the star rating as shown in Table 1.

**Table1.** Scores for achieving GRIHA rating

Points attained	Rating
91 to 100	5*****
81 to 90	4****
71 to 80	3***
61 to 70	2**
50 to 60	1*

And in GRIHA assessment the project evaluation is broadly classified into two types namely, Pre-documentation stage, Post-documentation stage. The Pre-documentation stage is where the team alongside clients meet to work out the points that are targeted by the project as soon as the building has registered. In the Post-documentation stage, the required documents needed for points targeted under the criteria are submitted. Then the third-party evaluators will determine the ultimate rating awarded for the building[9].

During the development of the project, the team members will make three diligence visits to see the relevance of the GRIHA criteria on-site. Once the required documentation has been uploaded, the building will be evaluated by the on-site system commission and rated in a three-tier phase. The preliminary evaluation shall, therefore, be carried out by the team's experts and shall also check the mandatory points and the compliance of the project [7]. If the mandatory criteria are not met, the project is rejected. The team then assesses the optional criteria and estimates the total points that can be achieved. Consequently, the enforcement records are reviewed through the assessment process as described by GRIHA [11]. The interim GRIHA classification shall be awarded only after the conclusion of the review of the records[6]. The final GRIHA ranking is granted after receipt and



review of the Post Occupancy Quality Audit Reports. The assessment is carried out after 1 year of building occupancy. The ranking shall be effective for 5 years from the date of commissioning of the building. GRIHA's funds are allowed to carry out random audits of any conditions that are given [9].

### 3. Project description:

The University Research and Development Block is found with a 6-story campus block that covers an area of 4525 sq.ma. And the location of the building is shown in figure2. The entire building is fully air-conditioned and controlled with RFID (Radio Frequency Identification) equipment or well-furnished high-tech rooms well secured with smoke detectors and CCTV safety systems, complete with reading rooms on all levels, complete with Hydro Motorized Water supply. Centrifugal Glazing Wind farm for HVAC and doors and windows are designed in such a way as to provide more sunshine and cooling and use of double-glazed glasses to reduce solar radiation and equipped with more energy-saving equipment and solar systems.

- Construction Name: KL University Research and Development Building
- Building Location: Vaddeswaram
- Location: Latitude 16°26'27.81" N, Longitude 80°37'25.26" E
- City: Guntur
- State: Andhra Pradesh
- Country: India
- Maximum construction area: 31322sq.m
- Construction Type (s): Academy Research and Development Building
- Project Type: Institutionalized Building Storey: G + 6 high rise's (seven-level support land)



**Figure2.** Site location on Google earth

### 4. Result & Discussion

The successful outcome of the project was a study of the details, guidelines and design tools required for the Green Building System, the GRIHA rating system, the requirements, credentials, etc. The performance appraisal indicates that the KL University Research and Development Block earned 93 credit rating points. Almost the current building protected all dimensions to obtain a ranking of five stars. Project points in terms of smart land use policy, water management, electricity optimization, renewable building materials, waste management, safety and well-being, construction and

maintenance and sustainability, as shown in Table 2. Which are shown where points are earned and where points are lost in every level of the GRIHA certification process.

**Table2.** Viewing the total GRIHA points attained in the certification process

Criteria	Total points	Points attained
Sustainable site planning	17	13
Water management	13	11
Energy optimization	35	32
Sustainable building materials	14	14
Waste management	4	4
Health and well being	14	14
Building operation and maintenance	2	2
Innovation	4	3
<b>Total</b>	<b>104</b>	<b>93</b>

In the division of “Sustainable site planning” the maximum points available were 16, while the current building has achieved 13. The three-point difference occurred due to design to include existing site features where the building has to minimize the disruption of the natural ecosystem and It should be designed in such a way that it can take full advantage of the predominant precision-climate. It also loses the point in Plan utilities efficiently and optimizes on-site circulation efficiency where the building must minimize road and pedestrian footpath length by appropriate planning and provide aggregate corridors for utility lines. In the "water management" category the maximum points available were 13 the current building has attained 11. The difference of two points occurred due to reduced landscape water requirements where the building must use more native species to reduce lawn areas and to increase irrigation efficiency and must reduce the water requirements for the landscaping. It also lost the point in water recycle and reuse where the building should reduce the usage of water by using low-flow fixtures and equivalent tools. In the "energy optimization" category the maximum points available were 35 the current building has attained 32. The difference of three points is occurred due to optimizing building design to reduce conventional energy demand where the building must be planned appropriately to reflect climate responsiveness and it should be designed to use more adequate day lighting as well as efficient artificial lighting. In the "innovation" category the maximum points available were 4 while the current building has attained 3. The difference of one point is due to dedicated facilities for service staff and battery-operated vehicles, charging points that are not dedicated to this building.

## 5. Conclusion

The GRIHA rating is a step towards environmental friendliness. It will help to determine the location of the building in green buildings. Because the green building is followed by numerous tangible benefits such as cost savings, energy and water conservation, lower waste generation usage, lower maintenance costs, and improved occupant comfort. It will help to create sustainable, energy-efficient green buildings by proper coordination between different staff involved in the construction activity. It will help minimize the impact on the eco-system surrounding it. A green building during the construction phase will deplete a very small amount of natural resources. If all buildings in urban areas are made to follow the green building concept, India could save energy and use many more services and optimize natural resource use.

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