

A Comparative Study of Rating Systems in Green Building

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Abstract: *With the increasing awareness of sustainable development in the construction industry, implementation of a green rating procedure to assess buildings is becoming more important. The paper presents the comparative review of four prominent sustainable green building rating systems namely BREEAM, LEED, GREEN STAR and GRIHA. The main goal of this study to consider all aspect of the rating system in order to find out of best one(s). The study provides a deep insight into sustainable green building rating systems and can be recommendation and reference for users when choosing between rating systems.*

Keywords—Green building, Rating system, Breeam, Leed, Green Star, Griha.

I. Introduction

A green building is one which uses less water, optimizes energy efficiency, conserves natural resources, generates less waste and provides healthier spaces for occupants, as compared to a conventional building." Green or sustainable Building is a designing concept that reduces the environmental impact of buildings through innovative land use and construction strategies. Based on the magnitude of green measures adopted, points are awarded to a building and, after appropriate weighting; a total score is ascribed to determine the rating of the building. This helps to convey the range of application of green measures in building construction.^[i]

Worldwide there is hundreds of green building evaluation systems that focus on different area of sustainable development and are designed for different types of projects.However only a few systems are widely acknowledged and really set a recognizable standard for sustainable development. The following four systems are chosen to be reviewed in this paper because they are most popular, influential and technically advanced rating systems available.^[ii]

- BREEAM (Building Research Establishment’s Environmental Assessment Method) is the leading and most widely used environmental assessment method for buildings. It was developed in the UK in 1990 and is the building environmental assessment method with the longest track record.

- The Leadership in Energy and Environmental Design (LEED) Green Building Rating System, developed by the U.S. Green Building Council (USGBC) in 1998, provides a suite of standards for environmentally sustainable construction. LEED-India programmed has adapted by the Indian Green Building Council (IGBC) from United States Green Building Council’s (USGBC) in 2007.Since its inception in 1998, LEED has grown to encompass more than 14,000 projects in the US and 30 countries covering 99 billion m² of development area.

- GREEN STAR is a voluntary environmental rating system for buildings in Australia. It was launched in 2003 by the Green Building Council of Australia. The system considers a broad range of sustainable issues while also considering occupant health and productivity, and cost savings

- Green Rating for Integrated Habitat Assessment (GRIHA) Green Building Rating System, conceived by TERI and developed jointly by the Ministry of New and Renewable Energy, Government of India as of November 1 2007, it is based on nationally accepted energy and environmental principles. Over 300 projects across India of varying scale and function are being built based on GRIHA guidelines.

II. Comparison Criteria

In terms of the specific rating system BREEAM,LEED,GREEN STAR and GRIHAhave similarities and differences amongst them. A key similarity between these programs is the use of credit based system with some flexibility for what credits or measures building developers want to pursue, along with mandatory requirements that must be met for certification.As it reflects from this analysis that there are many assessment criteria considered which have the same meaning but they are denoted by a different wording in respective rating systems.There are Differences between these systems in terms of popularity& influence,process, certification cost,data collection, development and certification result.

Popularity and Influence:

LEED is very popular in comparison with other systems. More than 22 countries have adopted LEED and USGBC has a stated goal of becoming the global standard for green building rating systems. BREEAM is oldest system. GRIHA was formed in 2007 and indicates that more than 2,000 buildings have been certified under GRIHA in India. Much of the growth in the India has been in the last 2 to 4 years, and they continue to see increasing interest in GRIHA from building owners, design professionals, and governmental agencies^[vi].

Table 1. Popularity and Influence

Criteria	BREEAM	LEED	GREEN STAR	GRIHA
Inception year	1990	1998	2003	2007
Country	UK	US	Australia	India
No. of projects Registered certified	+220,300 +531,700	+83,750 +27,000	+404 +237	+550 2,000

Process:

The BREEAM rating system uses Checklists and Excel PreAssessmentEstimators.LEED, on the other hand, is very documentation-intensive, more complex, time consuming and (ironically) is still a mostly paper based system^[viii]. It uses PDF rating Checklists and Excel Checklists. GREEN STAR use Excel tool and Technical manuals^[ix].

The GRIHA rating system uses an offline questionnaire-based approach. Once the questionnaire has been completed, a report is generated that provides ratings, a list of sustainability achievements, and recommendations for improvement^[x]. An independent third-party verifier (known as a Green Globes assessor) completes the task, which eliminates the need for binders or templates, and is more adaptable to specific project requirements.

Certification Cost:

The cost associated with rating system shown in table below.

Table 2. Certification Cost

System	Breem	Leed	Green Star	Griha
Cost of system	Free	Free	£200 for Manual	Free
Certification fee	£740-£1500	£1133-£11331	£1100-£1500	-

BREEAM has lower cost than LEED and GREEN STAR. GRIHA has free associate membership, no appeal costs, and fewer registration costs. It also reduces the costs of billable hours for LEED consultants on documentation. Therefore, it is possible to certify under GRIHA for a lower cost than under LEED. ^[i]

Data collection:

The following issues were considered under data collection i.e. Data collection method, types of documentation, at what stage of project, Assessor & Qualification and Verification^[vi] as shown in table 3.

Development:

All the rating systems are updated periodically. BREEAM, GREEN STAR and GRIHA updated annually. While LEED is updated in interval of 2 years. Last system revisions BREEAM-2014, LEED-2013, GREEN STAR-2015 and GRIHA-2015.

Certification Result:

The results of certification for BREEM are in the form of Award certificate. Credit Point for Different Levels of Certification are given below. ^[vii]

Unclassified	< 30
Pass	≥ 30
Good	≥ 45
Very Good	≥ 55

Excellent	≥ 70
Outstanding	≥ 85

For LEED results of certification are in the form of Award letter and certificate. Credit Point for Different Levels of Certification are given below. ^[viii]

Certified	40 - 49 points
Silver	50 - 59 points
Gold	60 - 79 points
Platinum	80 points and above

Also for GREEN STAR results of certification are in the form of Certificate and published online.Credit Point for Different Levels of Certification are given below. ^[ix]

1 star	Minimum practice
2 star	Average practice
3 star	Good practice
4 star	Best practice
5 star	Australian excellence
6 star	World leadership

And in GRIHA results of certification are in the form of Certificate and published online.Credit Point for Different Levels of Certification are given below Points achieved GRIHA Rating. ^[x]

One star	50–60
Two stars	61–70
Three stars	71–80
Four stars	81–90
Five stars	91 points and above

III. Conclusion

This paper presents a complete and detail comparative review of four well-known sustainable green building rating systems. All four rating systems are good enough to be used in certain part of the country but they are not unique in nature. Since these systems are based on different parameters, the above four rating systems rate the same buildings differently. Also they are quite complex in nature and do not necessarily give a clear idea of the projects effectiveness. Each system has certain strong points and certain weak points and they are not specific on some assessment criteria. We should give preference for selection of green building rating system in following manner LEED, BREEAM, GHRIHA and GREEN STAR.

However, it is not just the final conclusion that matters, but the whole review process itself. The information, analyses, valuations and comparisons during the process would help architects, developers, managers, etc. to have better insight into sustainable rating tools. They provide a systematic and valuable reference source for various research which are related to sustainable development.

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Table 3. Data Collection

Criteria	BREEAM	LEED	GREEN STAR	GRIHA
Data Collection Method	Checklists or Online-spreadsheet	Checklist or Excel spreadsheet	Excel- spreadsheet	Checklist or Excel spreadsheet
Types of Documentation	Online or hardcopy (drawings, surveys, reports, contracts, etc.)	Online and/or hardcopy (drawings, specifications, reports, etc.)	Online and hardcopy (drawings, surveys, reports, contracts, etc.)	hardcopy (drawings, specifications, reports, etc.)
At what stage of project	Design Review and Construction Review	Design,Construction and Operation	Design Review and As Built Review	Design,Construction andOperation
Assessor & Qualification	Trainedand licensed by BRE	Trained and must pass an assessorexamination. Must be a first-class architect	Trained and certified by GBCA	Green Globes assessor
Verification (Level of Detail of Check)	Detailedassessment	Administrative and credit audits	Detailed assessment	Detailed assessment
Data Collection Method	Checklists or Online-spreadsheet	Checklist or Excel spreadsheet	Excel- spreadsheet	Checklist or Excel spreadsheet
Types of Documentation	Online or hardcopy (drawings, surveys, reports, contracts, etc.)	Online and/or hardcopy (drawings, specifications, reports, etc.)	Online and hardcopy (drawings, surveys, reports, contracts, etc.)	hardcopy (drawings, specifications, reports, etc.)