MODULE 4

GREEN BUILDING RATING SYSTEMS

Hundreds of GBRSs are now available worldwide, varying in approaches, application processes, and evaluation metrics. **BREEAM, LEED, Green Star and GRIHA** are among the most applied worldwide. Despite some differences, they all adhere to the same general evaluation structure: project performances. Areas measured using a set of relevant indicators, grouped per topics such as **water management, energy use, materials, site qualities.** Each requirement is assigned a score/judgment, the total of which determines the level of sustainability achieved.

BUILDING RESEARCH ESTABLISHMENT ENVIRONMENTAL ASSESSMENT METHOD (BREEAM)

It is a voluntary green building sustainability rating system established in 1990 in UK for assessing the environmental performance of buildings. BREEAM is the world's leading validation and certification systems for sustainable built environment. This Assessment method used to describe both new and existing buildings environmental performance. The method originated in the UK, but buildings built outside the UK can also be assessed. Its Certificate validity is 3 years.

THE MAJOR CATEGORIES ASSESSED WITHIN BREEAM ARE:

Energy: efficient use and management of energy, and reduction of carbon emissions.

Land use: protection and sustainable use of the land surrounding a project, with a focus on habitat and biodiversity conservation.

Materials: responsible sourcing, procurement, and disposal of materials used in construction.

Pollution: reduction of a project's impact on its surrounding environment in the form of noise, air, water, land, or light pollution.

Waste: reduction and sustainable management of waste from construction, operations, and future repairs of a structure.

Water: efficient use of water by reducing water consumption and loss via leakage.

Health and wellbeing: enhancement of the health, comfort, safety, and overall quality of life of occupants.

Transport: availability and accessibility of public and other more sustainable means of transportation for building occupants.

Management: incorporation of sustainable values and actions throughout the entire building process from design to operations.

Innovation: use of innovative or high-performing features in any category that goes beyond the standard requirement levels.

Efforts in each of these categories are assessed using a credit system, whereby each relevant feature incorporated into a project earns the certain number of points. Each category is weighted according to the different credits achieved within it, determining the final performance and rating of the project.

PURPOSE:-

- It works to raise awareness amongst owners, occupiers and designers to take benefits of a sustainable approach, providing a framework to help them to successfully adopt sustainable solutions in a cost-effective manner, and provides market recognition of their achievements.
- It aims to reduce the negative effects of construction and improvement of the environment.

KEY HIGHLIGHTS:-

- There are standard versions of the assessment for common building uses including courts, healthcare, industrial, prisons, offices, education and retail.
- The assessment works by giving a building a score based on its performance against a series of set of criteria. There are two assessment stages: a **design stage assessment** that leads to a provisional rating followed by a **post construction assessment** leading to the final rating.
- The building's score will establish its BREEAM rating. BREEAM "Outstanding" is the highest rating, followed by Excellent, Very Good, Good, Pass and Unclassified.

BREEAM rating	% score
Outstanding ★★★★★	≥85
Excellent ☆★★★★	≥70
Very good ☆☆★★★	≥55
Good ☆☆☆★★	≥45
Pass ☆☆☆☆★	≥30
Unclassified ☆☆☆☆☆	<30

Leadership in Energy and Environmental Design (LEED):-

Leadership in Energy and Environmental Design (**LEED**) is a green building certification program developed in 1998 by the U.S. Green Building Council (USGBC). It includes a set of rating systems for the design, construction, operation, and maintenance of green buildings, homes, and neighbourhoods, which aims to help building owners and operators be environmentally responsible and use resources efficiently. Its certificate validity is 3 years.

PURPOSE:-

The goal of LEED is to create better buildings that:

♠ To reduce contribution to global climate change.

♠ To enhance individual human health.

♠ To protect and restore water resources.

♠ To protect and enhance biodiversity and ecosystem services.

♠ To promote sustainable and regenerative material cycles.

♠ To enhance community quality of life.

Key Highlights:-

LEED rating systems differ according to the type of the project. The different types of rating systems fall under:

♠ **Building Design and Construction**: For new construction or major renovations.

♠**Interior Design and Construction**: For building projects.

♠ **Building Operations and Maintenance**: For existing buildings undergoing improvement but with little construction work.

♠ **Neighbourhood Development**: For new land development projects or redevelopment projects.

♠ **Homes**: For single family, low-rise multi-family or mid-rise multi-family homes.

♠ **Cities and Communities**: For entire cities or sub-sections of a city. Assessment of a city's water consumption, energy use, waste, transportation etc.

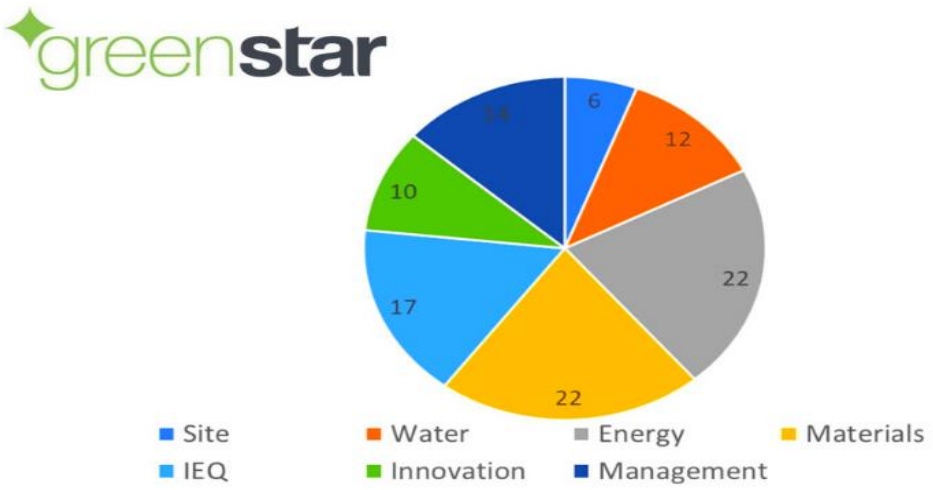
♠ **LEED Recertification**: For occupied and currently-in-use projects that have already received LEED certification but aiming to maintain and improve the building.

♠ **LEED Zero**: For projects with net-zero goals in carbon emissions and resource use.

Green Star rating System:-

- Green Star is an internationally-recognised Australian sustainability rating and certification system.

- There are four Green Star categories, these provide a means of certification for building design and construction, operation and communities.
- Green Star benchmarks projects against the nine Green Star categories of: **Management; Indoor Environment Quality; Energy; Transport; Water; Materials; Land Use & Ecology; Emissions and Innovation.**



GREEN STAR-CERTIFIED BUILDINGS AND COMMUNITIES ADVANTAGES:

- Lower operating costs and increase asset value.
- Use 66% less electricity than average Australian city buildings.
- Use 51% less potable water than if they had been built to meet minimum industry requirements.
- Boost productivity by up to 15%.
- Improve the health and wellbeing of occupants.
- Increase student learning and engagement.
- Speed up recovery times of hospital patients.
- Deliver a competitive edge in a crowded marketplace.

GREEN STAR RATING TOOLS INCLUDE:

- **Green Star – Design and As Built:** guiding the sustainable design and construction of a range of schools, offices, universities, industrial facilities, public buildings, retail centers and hospitals.

- **Green Star – Interiors:** transforming the interior fitouts of everything from offices and hotels to schools and shops.
- **Green Star – Communities:** improving the sustainability of projects at the neighbourhood, precinct or community scale.
- **Green Star – Performance**: supporting higher levels of operational efficiency within existing buildings.

GRIHA:-

- GRIHA -**Green Rating for Integrated Habitat Assessment** is India's National Rating System for Green buildings. It has been developed by TERI (The Energy and Resources Institute) and is endorsed by the MNRE (Ministry of New and Renewable Energy) in 2007.
- It is based on nationally accepted energy and environmental principles, and seeks to strike a balance between established practices and emerging concepts, both national and international levels.
- Certificate validity is 3 years.

PURPOSE:-

♠ To maximize the conservation and utilization of resources (land, water, natural habitat, avid fauna, and energy) and enhance efficiency of the systems and operations.

♠ To protect the health of construction workers and prevent pollution.

♠ To maximize resource (water, energy, and materials) conservation and enhance efficiency of the system and operations.

♠ To promote the recycle and reuse of water.

♠ To minimize waste generation; streamline waste segregation, storage, and disposal; and promote resource recovery from waste.

♠ To ensure healthy indoor air quality, water quality, and noise levels, and to reduce the global warming potential.

KEY HIGHLIGHTS:

♠ **Comprehensive assessment:** GRIHA evaluates the environmental performance of buildings holistically, taking into account site selection, energy efficiency, water conservation, waste management, and other factors.

♠ **Customizable rating:** The rating system is flexible and customizable, allowing developers to choose the level of certification they want to achieve based on their specific needs and priorities.

♠ **Cost-effective:** GRIHA certification is cost-effective and accessible to all kinds of buildings, from affordable housing to high-end commercial buildings.

♠ **Emphasis on local context:** The rating system takes into account the local climatic conditions, building materials, and cultural context of the region, making it suitable for all types of buildings across India.

♠ **Social and cultural aspects:** GRIHA considers the social and cultural aspects of the building, such as accessibility, safety, and comfort, ensuring that the building is not only environmentally friendly but also liveable and comfortable for its occupants.

♠ **Continuous improvement:** GRIHA certification is not a one-time achievement, but a continuous process that encourages building owners and occupants to continuously monitor and improve the building's environmental performance.

♠ **Government support:** GRIHA is supported by the Ministry of New and Renewable Energy, making it a widely recognized and respected rating system in India.

♠ **Integrated approach:** GRIHA follows an integrated approach to sustainable building design, which means that all aspects of the building's design and operation are considered in a holistic and interrelated manner.

GREEN DESIGN:-

Green design is the creation of buildings which are energy-efficient, healthy, comfortable, flexible in use and designed for long life. Green design should have a minimal impact on the environment, both in terms of products and materials used in the construction and also in the functionality of the building. Basic objectives of sustainability are: to reduce consumption of non-renewable resources, minimize waste, and create healthy, productive environments.

PRINCIPLES OF GREEN DESIGN:-

Principles	Subfactors
1. Resources and materials consumption	*a*. Recycling and reuse of materials and water
	b. Resource usage efficiency
	c. Land use
2. Environmental impact	*a*. Waste management
	b. Toxics elimination
	c. Carbon emission
	d. Ecosystem
	e. Water efficiency
3. Quality of comfort	*a*. Occupational health and safety
	b. Indoor environment quality (air, noise, lighting, ventilation, temperature, and humidity)
	c. Indoor chemical and pollutant source control
	d. Controllability of systems (lighting, temperature, ventilation and etc.)
	e. Occupants and owner's satisfaction
4. Energy efficiency	*a*. Renewable energy (biomass, wind energy, solar energy and etc.)
	b. Optimum energy performance
5. Design process	*a*. Daylight
	b. Thermal comfort
	c. Ventilation
	d. Spaces flexibility and adaptability
	e. Ecological innovation
6. Life cycle costing	*a*. Cost efficiency
	b. Financial return
	c. Payback period
7. Functional applicability	*a*. Market demand and supply
8. Life span	*a*. Service life/durability of building and design
	b. Maintenance and refurbishment
9. Heritage and cultural preservation	*a*. Heritage preservation
	b. Cultural preservation

CHARACTERISTICS OF SUSTAINABLE BUILDING:-

Some of these characteristics involve:

 Energy Efficiency

- Use of efficient lighting fixtures
- Use of solar water heating systems

 Use of Renewable Energy:

- Solar energy
- Wind energy

 Use of Sustainable and locally available Materials,

 Measures for:

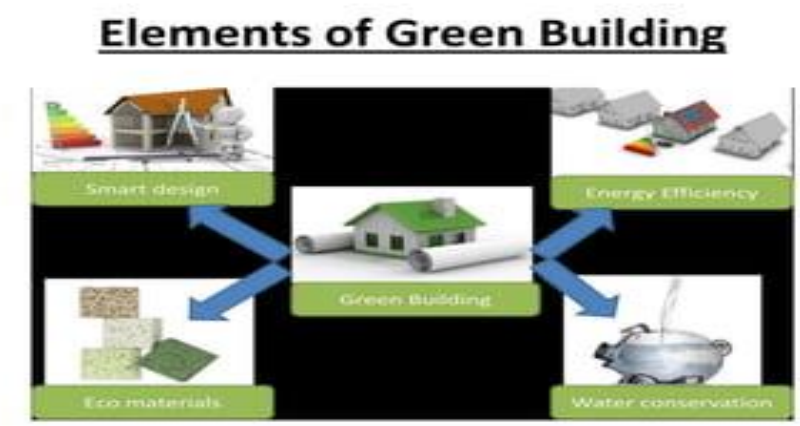
- Pollution Reduction
- Waste Reduction
- Waste Management (On site treatment)
- Waste Water Management (On site treatment)

 Good indoor environmental air quality

 Installation and use of Rainwater Harvesting Systems

 Surrounding greenery and garden spaces.

 Green roofs and walls



Integrated lifecycle design of materials:-

Life cycle assessment can help in evaluating environmental, social and economic concerns by assessing a full range of impacts associated with cradle to grave stages of a process from the extraction of raw material through material processing, manufacturing , distribution, use, repair and maintenance, disposal or recycling.

- Impacts taken into account include embroidered energy global warming potential, resource use, air pollution, water pollution and waste.

- Although life cycle design can evaluate the environmental impacts in the best way possible, it is not yet recognized as a mandatory requirement by the green building certification organizations.

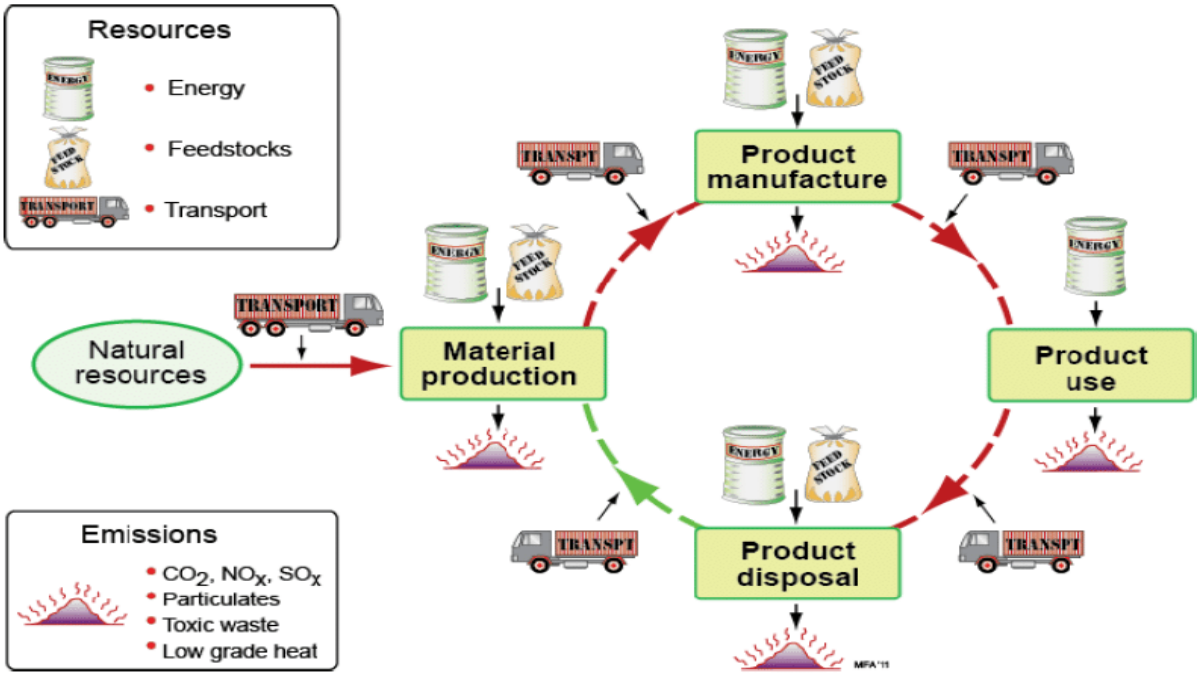
- Life cycle assessment is becoming more popular since it provides for the quantification of the environmental implications of design decisions over the project's entire life cycle.

- Previously, life cycle assessment was used to evaluate products and building components, which gave some insight into how to improve decision-making but did not provide information on the long-term effects of building operations.

- The environmental performance of the entire building, its materials, construction, operation, disposal and transportation impacts can now be assessed and compared to baselines that have been created to facilitate comparisons.

- Designers can easily compare a wide range of alternative construction systems, materials and sites to the norms for the sort of building in question. For example, the

potential for global warming and ozone depletion for multiple alternatives per unit of building area can be evaluated to determine which option is the least harmful.



Breakdown of what this concept involves:

- Materials Selection :-
  - Sustainability:
  - Resource Efficiency:
  - Performance Requirements:
- Design for Longevity:-
  - Durability & Maintenance
- Manufacturing Processes:-
  - Energy Efficiency, Waste Minimization & Environmental Impact.
- End-of-Life Considerations:-
  - Recyclability
  - Biodegradability
- Innovation and Emerging Materials:- Biomaterials & Smart Materials