

Awareness of Leed Rating System Credit Categories for Green Buildings Applications to the Existing Building

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Abstract:- Buildings have major environmental impacts over their entire life cycle. Thus, buildings are one of the major pollutants that affect urban air quality and contribute to climate change. Hence, the need to design a green building is the essence of which would be to address all these issues in an integrated and scientific manner. Many official green building programs, communities and organizations launched several rating systems to help the sustainable process assessment; all of these rating systems are built in a way to adapt the idea of Sustainability in architecture which seeks to minimize the negative environmental impact of buildings by enhancing efficiency in the use of materials, energy, and space. Hence, this paper aims at clarifying and Analyzing the application of green practices in existing buildings describes the most widely used benchmark for assessing green practices, the U.S. Green Building Council's LEED Rating System, and provides a "road map" for pursuing LEED certification. LEED or Leadership in Energy & Environmental Design, is a green building certification program that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification. The result of the assessment is presented in a building checklist way that allows organization to benchmark their maturity and to monitor their development. With this checklist, organizations can translate the abstract and interpretive concepts of sustainable development into practical actions. In applying green features for existing building we need to understand the basic awareness of LEED rating system credit categories, its features, methodology and importance of this organization. LEED therefore, have significant role in the process of assessing the sustainability criteria in existing buildings.

Keywords:- LEED, Green Building.

I. INTRODUCTION

LEED, or Leadership in Energy & Environmental Design, is a green building certification program that recognizes best-in-class building strategies and practices. To receive LEED certification, building projects satisfy prerequisites and earn points to achieve different levels of certification. Prerequisites and credits differ for each rating system, and teams choose the best fit for their project. LEED certification provides independent verification of a building or neighbourhood's green features, allowing for the design, construction, operations and maintenance of resource-efficient, high-performing, healthy, cost-effective buildings. LEED is the triple bottom line in action, benefiting people, planet and profit.

Application of LEED certification for converting existing buildings into green building in India and optimizing operations and maintenance will not only address the country's growing energy, air quality and water crisis, it will also enhance companies' bottom line through reduced power & water bills and increasing occupant health, comfort and wellbeing. LEED certification is recognized across the globe as the premier mark of achievement in green building. Hence biggest opportunity for improvement is to retrofit our existing buildings into a green building taking into account the aspects of energy, water and materials along with cost considerations such that the occupant well-being, environmental performance and economic returns are improved [16, 17, 18, 19].

Versions of LEED are - v4 - LEED v4, v3 - LEED 2009, v3 - LEED 2008, v3 - LEED India 2011, v2 - Schools 2007, v2 - LEED 2.2, v2 - LEED 2.1, v2 - LEED 2.0, v1 - LEED 1.0 pilot, 2009 Energy Update, v1 - PEER v1.1

II. PURPOSE OF THE STUDY

Have you ever seen or heard of application of green practices in existing buildings? Converting existing building into Green Buildings aim to improve the environment by using LEED rating system credit categories for the existing building, but few people really understand them. In order to obtain clear explanation for these questions, we intend to learn thoroughly about converting existing building into Green Buildings. We

would also like to know why Green Buildings having important role for the sustainable development. For those reasons, we conduct this study to search for the answers.

A. The understanding of the Sustainable Development concept [1,2,3,4,5,6]

Already in the 70s it was perceived that the classical concept of development that considered only economic growth, within short would cause a total collapse of all natural systems. A new development model was needed, which would take into account both economic growth and equitable distribution of resources. Economic growth in itself is not sufficient; the development is only real if it increases the quality of life in a long-lasting way. The concept of sustainable development aims to maintain economic advancement and progress while protecting the long-term value of the environment; it “provides a framework for the integration of environment policies and development strategies”. The overall goal of sustainable development (SD) is the long-term stability of the economy and environment; this is only achievable through the integration and acknowledgement of economic, environmental, and social concerns throughout the decision making process.

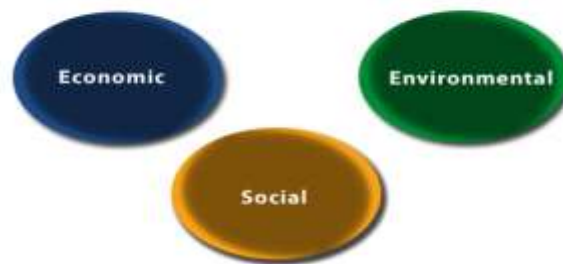


Fig. 1: Economic, Environmental and Social concerns

Environmental Sustainability-Environmental Sustainability can be defined as the capacity to preserve over time the three basic functions of the environment: the resource supply function, the waste receiver function and that of direct usefulness. In other words, within a territory (area / region), environmental sustainability means the capacity to increase and bring up the value of the environment and its peculiarities, while assuring the protection and the renewal of natural resources and the environmental patrimony.

Economic Sustainability – Economic Sustainability can be defined as the capacity of an economic system to generate a constant and improving growth of its economical indicators. In particular, the capacity to generate incomes and employment in order to sustain the populations within a territorial system, economic sustainability means the capability, through the most efficient mix of resources, to produce and maintain the highest added value, in order enhance the specificity of territorial products and services.

Social Sustainability –Social Sustainability can be defined as the ability to guarantee welfare (security, health, education), equitably distributed among social classes and gender. Within a territory, Social Sustainability means the capacity of the different social actors (stakeholders), to interact efficiently, to aim towards the same goals, encouraged by the close interaction of the Institutions, at all levels.

It seems therefore essential to guarantee an economical development truly compatible with social equity and ecosystems, capable to act in environmental equilibrium and to respect the so called “Three E’s balance rule”: Environment, Equity, and Economy. In practice, sustainable development requires the integration of economic, environmental, and social objectives across sectors, territories, and generations. Therefore, sustainable development requires the elimination of fragmentation; that is, environmental, social, and economic concerns must be integrated throughout decision making processes in order to move towards development that is truly sustainable. Conclusively, the pursuit of Sustainable Development depends on the governance’s capacity to guarantee a complete interaction among economy, society and environment.

B. Understanding of LEED Certifying an Existing Building [19]

The driving force behind implementing green practices in existing buildings is knowledgeable and diligent property management companies. Unlike fulfilling green building requirements for new construction, converting existing buildings into green buildings requires an ongoing commitment to monitor building systems, train staff, and keep up to date with certification requirements. While this may seem like added work with added costs, the financial benefits of pursuing green practices are pronounced and long lasting. As is the case in many instances, the only way to learn how to green an existing building is by actually working through the process. LEED certification begins with registration of a building and proceeds with bringing the building up to LEED-

EB standards. This process usually takes 9 to 24 months, depending on the current state of the building. After successfully meeting the LEED rating system requirements, an organization then submits all relevant information to the USGBC for certification through the LEED website.

C. When to Use LEED for Existing Buildings: [20]

LEED for Existing Buildings: Operations & Maintenance was designed to certify the sustainability of the ongoing operations of existing commercial and institutional buildings [14, 16].

All commercial and institutional buildings, including offices, retail and service establishments, libraries, schools, museums, churches, and hotels, as well as residential buildings of four or more habitable stories are eligible.

The rating system encourages owners and operators of existing buildings to implement sustainable practices and reduce the environmental impacts of their buildings over their functional life cycles.

The rating system addresses exterior building site maintenance programs, water and energy use, environmentally preferred products and practices for cleaning and alterations, sustainable purchasing policies, waste-stream management, and ongoing indoor environmental quality.

The rating system is targeted to single buildings, whether owner-occupied, multitenant or multiple-building campus projects. If there are multiple buildings on the same campus, each must certify individually. Also, It is a whole-building rating system; individual tenant spaces are ineligible.

III. RATING SYSTEM SELECTION GUIDANCE[17]

a. LEED for building operations and maintenance:

Buildings that is fully operational and occupied for at least one year. The project may be undergoing improvement work or little to no construction and must include the entire building's gross floor area in the project [12].

LEED O+M: Existing Buildings - Existing buildings that do not primarily serve K-12 educational, retail, data centers, warehouses and distribution centers, or hospitality uses.

LEED O+M: Retail. Existing buildings used to conduct the retail sale of consumer product goods. Includes both direct customer service areas (showroom) and preparation or storage areas that support customer service.

LEED O+M: Schools. Existing buildings made up of core and ancillary learning spaces on K-12 school grounds and may also be used for higher education and non-academic buildings on school campuses.

LEED O+M: Hospitality. Existing buildings dedicated to hotels, motels, inns, or other businesses within the service industry that provide transitional or short-term lodging with or without food.

LEED O+M: Data Centers. Existing buildings specifically designed and equipped to meet the needs of high density computing equipment such as server racks, used for data storage and processing.

LEED O+M: Data Centers only addresses whole building data centers.

LEED O+M: Warehouses & Distribution Centers. Existing buildings used to store goods, manufactured products, merchandise, raw materials, or personal belongings (such as self-storage).

Areas need to be focus while converting existing building into green building and for new construction:

The following table summarizes key principles, strategies and technologies which are associated with the Six major elements of green building design which are: Sustainable Sites; Water efficiency Conservation and Quality; Energy and Environment; Indoor Environmental Quality; Conservation of Materials and Resources; Innovation and design process. This information supports of the use of the USGBC LEED Green Building Rating System, but focuses on principles and strategies rather than specific solutions or technologies, which are often site specific and will vary from project to project.

GBCI EXAM AREAS OF FOCUS			LEED RATING SYSTEM CREDIT CATEGORIES	
I.	Project Site Factors	=		Sustainable Sites (SS)
II.	Water Management	=		Water Efficiency (WE)
III.	Project Systems and Energy Impacts	=		Energy and Atmosphere (EA)
IV.	Acquisition, Installation, and Management of Project Materials	=		Materials and Resources (MR)
V.	Improvements to the Indoor Environment	=		Indoor Environmental Quality (IEQ)
VI.	Stakeholder Involvement in Innovation	=		Innovation in Design (ID) & Regional Priority (RP)
VII.	Project Surroundings and Public Outreach	=		

Fig. 2: LEED rating system credit categories

b. Overview of Credit Categories[19]

Sustainable Sites: Construction related pollution prevention, site development impacts, transportation alternatives, stormwater management, heat island effect, and light pollution. The Sustainable Sites (SS) category rewards decisions about the environment surrounding the building, with credits that emphasize the vital relationships among buildings, ecosystems, and ecosystem services. It focuses on restoring project site elements, integrating the site with local and regional ecosystems, and preserving the biodiversity that natural systems rely on.

Location and Transportation: This category rewards thoughtful project team decisions about the location of tenant space, with credits that encourage compact development, alternative transportation, and connection with amenities, such as restaurants and parks. The LT category is an outgrowth of the Sustainable Sites category, which formerly covered location-related topics. Whereas the SS category now specifically addresses on-site ecosystem services, the LT category considers the existing features of the surrounding community and how this infrastructure affects occupants’ behaviour and environmental performance.

Water Efficiency: Landscaping water use reduction, indoor water use reduction, and wastewater strategies. The Water Efficiency (WE) section addresses water holistically, looking at indoor use, outdoor use, specialized uses, and metering. The section is based on an “efficiency first” approach to water conservation. As a result, each prerequisite looks at water efficiency and reductions in potable water use alone. Then, the WE credits additionally recognize the use of non potable and alternative sources of water.

Energy and Atmosphere: Commissioning, whole building energy performance optimization, refrigerant management, renewable energy use, and measurement and verification. The Energy and Atmosphere (EA) category approaches energy from a holistic perspective, addressing energy use reduction, energy-efficient design strategies, and renewable energy sources.

Materials and Resources: Recycling collection locations, building reuse, construction waste management, and the purchase of regionally manufactured materials, materials with recycled content, rapidly renewable materials, salvaged materials, and sustainably forested wood products. The longest part of a building’s life cycle is the use phase, commonly referred to as the operations phase. To target environmental impact reductions during building operations, the Materials and Resources (MR) credit category focuses on the constant flow of products being purchased and discarded to support building operations. The life cycle of these products and materials—from extraction, processing, and transportation to use and disposal—can cause a wide range of environmental and human health harms. To reduce these burdens and thus the overall impact of a building during its operations phase, project teams should take a close look at the purchasing and waste management operations in existing buildings.

Indoor Environmental Quality: Environmental tobacco smoke control, outdoor air delivery monitoring, increased ventilation, construction indoor air quality, use low emitting materials, source control, and controllability of thermal and lighting systems. The Indoor Environmental Quality (EQ) category rewards decisions made by project teams about indoor air quality, thermal and visual comfort, and occupants’

satisfaction. Green buildings with good indoor environmental quality protect the health and comfort of building occupants. High-quality indoor environments also enhance productivity, decrease absenteeism, improve the building's value, and reduce liability for building designers and owners.

Innovation and Design Process: Innovative strategies for sustainable design. Sustainable design strategies and measures are constantly evolving and improving. New technologies are continually introduced to the marketplace, and up-to-date scientific research influences building design strategies. The purpose of this LEED category is to recognize projects for innovative building features and sustainable building practices and strategies.

Regional Priority: Because some environmental issues are particular to a locale, volunteers from USGBC chapters and the LEED International Roundtable have identified distinct environmental priorities within their areas and the credits that address those issues. These Regional Priority credits encourage project teams to focus on their local environmental priorities.

c. Certification of Levels

By referring above information during the application of LEED to the existing building we should get the number of points a project earns determines the level of LEED certification.

There are four levels of certification - the number of points a project earns determines the level of LEED certification that the project will receive. Typical certification thresholds are:

- Sustainable Sites 10 Points
- Location and Transportation 15Points
- Water Efficiency 12 Points
- Energy & Atmosphere 38 Points
- Materials & Resources 8 Points
- Indoor Environmental Quality 17 Points
- Innovation and Design Process 6 Points
- Regional Priority 4 Points
- TOTAL LEED Points 110 Points

d. Levels of Rating:

The following are the different levels of LEED-EXISTING BUILDINGS: OPERATIONS & MAINTENANCE rating awarded to projects. Total number of available points is 110 with 8 prerequisites.

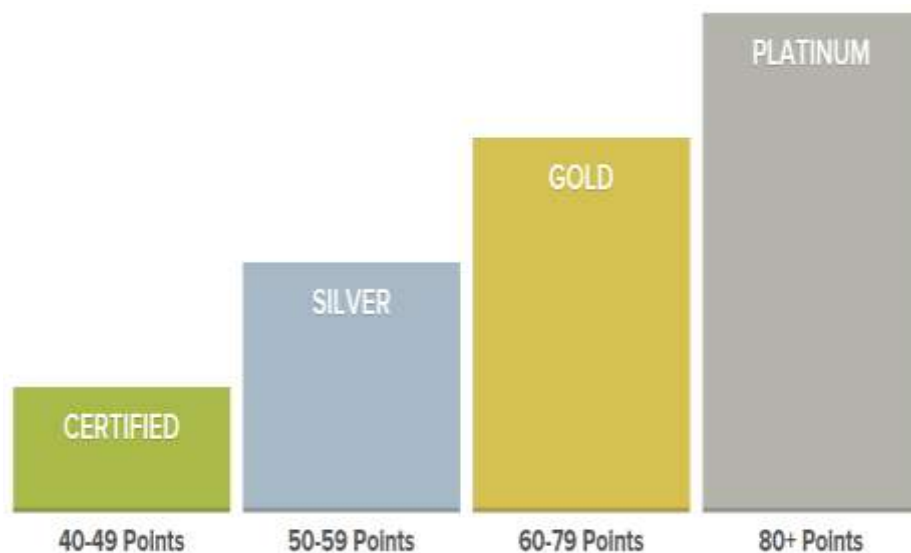


Fig.3: Different Levels of LEED for Existing Buildings: Operations & Maintenance (V4)
LEED rating system credit categories has six major areas of focus which are having checklist as per below: [6]



LEED v4 for Operations & Maintenance: Existing Buildings

Project Checklist

Project Name:
Date:

Y	?	N			
0 0 0 Location and Transportation 15					
			Credit	Alternative Transportation	15
0 0 0 Sustainable Sites 10					
Y			Prereq	Site Management Policy	Required
			Credit	Site Development-Protect or Restore Habitat	2
			Credit	Rainwater Management	3
			Credit	Heat Island Reduction	2
			Credit	Light Pollution Reduction	1
			Credit	Site Management	1
			Credit	Site Improvement Plan	1
0 0 0 Water Efficiency 12					
Y			Prereq	Indoor Water Use Reduction	Required
Y			Prereq	Building-Level Water Metering	Required
			Credit	Outdoor Water Use Reduction	2
			Credit	Indoor Water Use Reduction	5
			Credit	Cooling Tower Water Use	3
			Credit	Water Metering	2
0 0 0 Energy and Atmosphere 38					
Y			Prereq	Energy Efficiency Best Management Practices	Required
Y			Prereq	Minimum Energy Performance	Required
Y			Prereq	Building-Level Energy Metering	Required
Y			Prereq	Fundamental Refrigerant Management	Required
			Credit	Existing Building Commissioning— Analysis	2
			Credit	Existing Building Commissioning—Implementation	2
			Credit	Ongoing Commissioning	3
			Credit	Optimize Energy Performance	20
			Credit	Advanced Energy Metering	2
			Credit	Demand Response	3
			Credit	Renewable Energy and Carbon Offsets	5
			Credit	Enhanced Refrigerant Management	1
0 0 0 Materials and Resources 8					
Y			Prereq	Ongoing Purchasing and Waste Policy	Required
Y			Prereq	Facility Maintenance and Renovations Policy	Required
			Credit	Purchasing- Ongoing	1
			Credit	Purchasing- Lamps	1
			Credit	Purchasing- Facility Management and Renovation	2
			Credit	Solid Waste Management- Ongoing	2
			Credit	Solid Waste Management- Facility Management and Renovation	2
0 0 0 Indoor Environmental Quality 17					
Y			Prereq	Minimum Indoor Air Quality Performance	Required
Y			Prereq	Environmental Tobacco Smoke Control	Required
Y			Prereq	Green Cleaning Policy	Required
			Credit	Indoor Air Quality Management Program	2
			Credit	Enhanced Indoor Air Quality Strategies	2
			Credit	Thermal Comfort	1
			Credit	Interior Lighting	2
			Credit	Daylight and Quality Views	4
			Credit	Green Cleaning- Custodial Effectiveness Assessment	1
			Credit	Green Cleaning- Products and Materials	1
			Credit	Green Cleaning- Equipment	1
			Credit	Integrated Pest Management	2
			Credit	Occupant Comfort Survey	1
0 0 0 Innovation 6					
			Credit	Innovation	5
			Credit	LEED Accredited Professional	1
0 0 0 Regional Priority 4					
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
			Credit	Regional Priority: Specific Credit	1
0 0 0 TOTALS Possible Points: 110					
Certified: 40-49 points, Silver: 50-59 points, Gold: 60-79 points, Platinum: 80+ points					

IV. CONCLUSIONS

Significant opportunities to improve the three pillars’ of sustainability lie within the existing building stock. The LEED certification program for existing buildings provides a useful framework to achieve sustainability goals that are economic, social, and environmental in scope. The LEED Portfolio Program will facilitate the process by providing economies of scale in the certification process and supporting the implementation of green practices across entire portfolios of buildings, which will result in the re-training of real estate professionals. Tackling the challenges and roadblocks present in existing buildings is the realistic alternative to the unrealistic option of replacing every traditional building with a cutting-edge, high performance structure. In applying green features for existing building we understood the basic awareness of LEED rating system credit categories, its features, methodology and importance of this organization. LEED therefore, have significant role in the process of assessing the sustainability criteria in existing buildings.

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