Vol. 2 No. 5 (2024)

Spectrum of Engineering Sciences

SPECTRUM OF ENGINEERING SCIENCES

Online ISSN
3007-3138
Print ISSN
3007-312X

Sustainable Architecture in Pakistan: A Path to LEED Certification: An Architect's Perspective

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Abstract

This paper explores the sustainable architecture practices worldwide and in Pakistan in the context of adopting these practices and pursue LEED certification. This paper by studying various published papers investigates the methodologies by which architects, construction professionals and other stakeholders can build environment, following LEED standards, exploring the value of renewable materials, energy conservation systems, that are adoptable to local cultural and historical context. This paper highlights the challenges presented due to climate change, natural resource depletion, and traditional construction practices, and

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Online ISSN
3007-3138
Print ISSN
3007-312X

explores avenues for innovation and sustainable growth. This research paper by adopting qualitative research method, explores various papers and examining LEED principles and criteria, offers perspectives on the current state of sustainable architecture in Pakistan, challenges and opportunities being faced, and proposes strategies for further developments.

Key words: Sustainable Architecture, sustainable construction, Pakistan, LEED Certification, Green Building, Energy Efficiency, Urban Development, Green Building Practices, Innovation,

Introduction

The expression 'Sustainable Architecture' refers to the eco-friendly approach, construction methods, and green architectural design. The nation has gained acknowledgment lately as Pakistan deals with multiple ecological issues, including rising energy consumption, air and water pollution, and fast urbanization. Pakistan's development toward green urbanization makes sense because it is critical to address these environmental issues and advance sustainable urban development. Cities can curtail environmental impact and enhance the life quality for their citizens by adopting green practices like trash reduction, energy efficiency, and sustainable mobility (Muhammad, Farooq, Feroze, & Faisal, 2024) (Nasrullah & Syafri, 2024)

The Challenge

The environmental issues Pakistan facing today are mostly due to its rapid urban growth and pollution. The absence of considerable sustainable practices, multiply the complexity. The urban centres like Karachi and Lahore are expanding with an annual growth rate of 3%. This rapid expansion is exerting a considerable strain on natural resources like water, other than degradation of healthy

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3007-3138
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environment. The adoption to sustainable practices is crucial to resolve these adverse effects, and enhance urban resilience, ensuring a long-term green environment. (Muhammad, Farooq, Feroze, & Faisal, 2024) . The healthy built environment is not only essential for human habitat but also a signification contributor to natural resource consumption and carbon emissions. (Mehdi & Martek, 2024)

Problem Statement

According to current statistics, only seventy-four buildings in Pakistan are certified by LEED, which makes only .04% of the total LEED projects worldwide. (USGBS, n.d.) Architects in Pakistan should lead the advancement in sustainable development. By adopting LEED certification process, they can considerably improve the environmental sustainability, economic efficiency, and advocate social equity. This discussion explores, how LEED-certified structures can reshape the architectural landscape in Pakistan, facilitating a path towards a more sustainable and resilient future.

Understanding LEED in the Local Context

What is LEED?

"A community of leaders working to make green buildings available to everyone within a generation.". (Ford, 2016) LEED is worldwide the most recognized rating system. it was established by the U.S. Green Building Council (USGBC), which is a private sector organization. (Pushkar S. , 2020) (Guide to LEED Certification, n.d.)

LEED Certification Rating System

The LEED rating system awards certification based on the credit points obtained by following certain requirement in several categories, including interrogative process (IP), location and

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3007-3138
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transport (LT), sustainable sites (SS), water efficiency (WE), energy and atmosphere (EA), materials and resources (MR), indoor environmental quality (EQ), and innovation and design process (ID), regional priority (RP). In order of increasing point requirements, the certification levels are Certified, Silver, Gold, and Platinum. Since its pilot Version 1.0 in 1998, LEED has undergone seven revisions and split into 26 different rating systems, based on specific building sectors or project types and region. (Guide to LEED Certification, n.d.) (Katherine Madson, 2022) (Pushkar S. , 2022)

Sr no	Certification level	Credit points
1	Basic certification	40-49
2	Silver	50-59
3	Gold	60-79
4	Platinum	80+

Table.1 Points Criteria For Certification Level.

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Spectrum of Engineering Sciences

SPECTRUM OF ENGINEERING SCIENCES

Online ISSN
3007-3138
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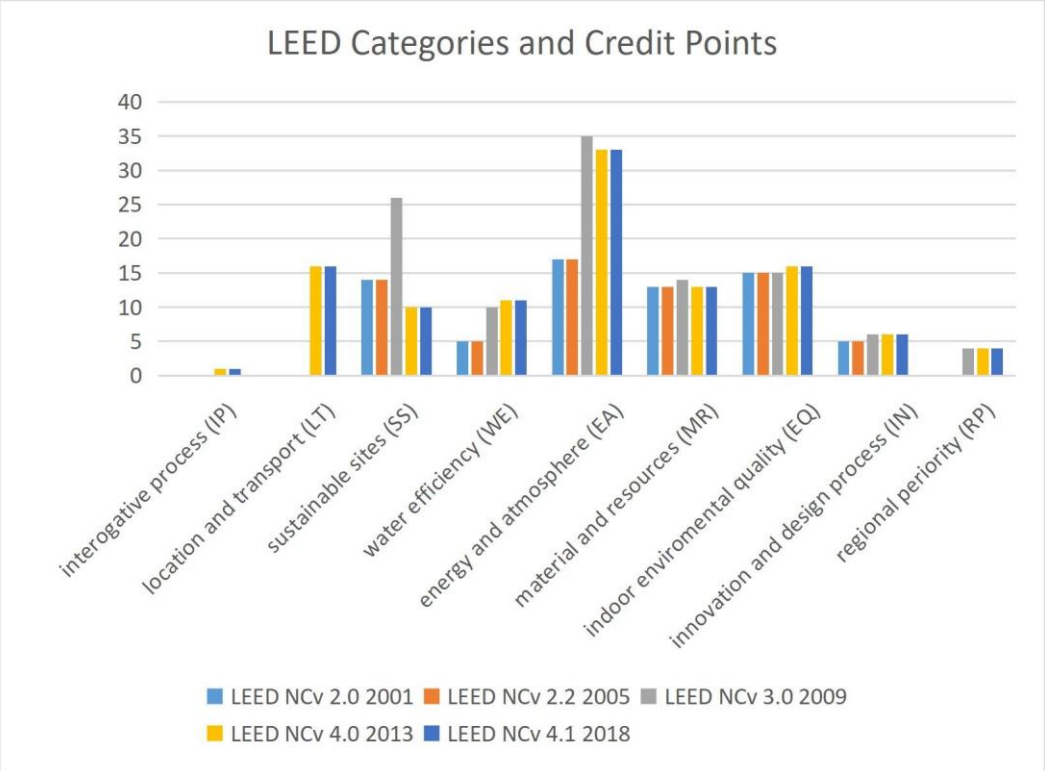

Graph 1 LEED available maximum credit points in categories for all versions. (Pushkar S. , 2020)

Main Categories for LEED Certification (Guide to LEED Certification, n.d.)

Location, Transport (LT) and Sustainable Sites (SS): The LEED encourages in this category on the selection and development of building sites to minimize environmental impact. The credit points in this category are up to 10 It includes considerations for minimal habitat disturbance, site restoration, rain and Stormwater management, heat island reduction, light pollution reduction. (Toğay, 2024) (Pushkar S. , 2020)

Water Efficiency (WE): The LEED emphasizes on reducing water consumption and reuse of waste and rainwater. The credit points in this category are up to 10. The considerations include efficient plumbing fixtures, reuse and recycling of wastewater, rainwater

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harvesting and water efficient landscape irrigation strategies. (Toğay, 2024) (Pushkar S. , 2020)

Energy and Atmosphere (EA): This category accounts up to 40 credit points, highest in any single category signifying its influence on achieving certification. The consideration includes building envelope performance, high performance windows and doors, energy efficient HAVC and lighting systems. (Toğay, 2024) (Pushkar S. , 2020)

Materials and Resources (MR): this category encourages sustainable materials and sustainable construction throughout the development process. This category makes up to 14 credit points. The consideration includes adoptive design, environment friendly materials, recycled materials, PBT resource reduction, reducing the demolition and construction waste, and building durability and resilience. (Toğay, 2024) (Pushkar S. , 2022)

Indoor Environmental Quality (EQ): This category emphasizes to improve indoor environment, natural ventilation, daylighting and thermal comfort to boost occupant health and productivity. This category makes up to 15 credit points. The considerations include natural and mechanical ventilation, low-emitting materials, and natural lighting, acoustic performance, view to outdoor environment, zoning for smoking areas (Pushkar S. , 2022)

Innovation (ID): This category makes up to 6 points. The considerations are innovation in design and construction process, adoption to new technologies, and exemplary performance during the development. (Toğay, 2024) (Pushkar S. , 2022)

Regional Priority (PR): This category focuses on regional environmental priorities and encourages design adaptations on local issues. This category makes up to 4 points. The considerations

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are geographic environmental issues, social equity, and public health priority. (Pushkar S. , 2020) (Toğay, 2024)

Adaptation to Local Environment

Application of LEED sustainability methodology to Pakistan's diverse climatic, cultural, and economic landscape requires a thorough examination of several factors

Climatic Conditions

The climatic diversity of Pakistan includes different environments, from dry deserts i.e. Thal, Thar, Cholistan to humid coastal areas i.e. Karachi, Gwadar, Pasni and high-altitude areas i.e. Gilgit Baltistan. Therefore, the projects aiming for LEED certification in Pakistan need to incorporate design strategies that suit these different climatic conditions. For example,

Passive Design: Sustainable design strategies, such as building orientation, shading, and natural ventilation, are widely recognized for their ability to reduce the need for air conditioning, mechanical ventilation and lighting, thereby lowering energy consumption and carbon emissions. (Muhammad, Farooq, Feroze, & Faisal, 2024) (Nasrullah & Syafri, 2024).

Water Management: Water conservation is the important aspect of sustainability. Rainwater harvesting system and, greywater recycling, and efficient irrigation practices are significant methodologies to address water scarcity. (Okwandu, Akande, & Sikhakhane, 2024)

Energy Efficiency: Energy efficient design and construction is the key to sustainability. The use of automated energy efficient systems, passive energy sources i.e. solar and wind energy systems, and high-performance insulation to reduce reliance on conventional energy sources. (Toğay, 2024)

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Cultural Background

The adaptation of sustainable methodology in Pakistan's perspective needs integration according to local environmental conditions, cultural customs and materials. Use of local traditional construction martials, such as clay bricks, wood and open-air courtyard spaces, can be incorporated to meet modern green building standards. (Bashir & Khan, 2024) Additionally, active community involvement is crucial for the successful execution of construction projects. (Akram, Chen, Tariq, Li, & Hou, 2024)

Economic Conditions

The premium cost of the sustainable practices may be higher in comparison to traditional methods but, their ecological benefits, such as lower long-term operational expenses and improved health and environmental outcomes, make the investment worthwhile. These advantages are particularly appealing in a developing country like Pakistan, where economic constraints, and resource depletion are a significant factor. (Lodhi, 2024)

Architectural Strategies for LEED Compliance

This section discusses the essential strategies suggested for attaining LEED certification compliance, based on insights from various research papers.

Site Selection and Development

Minimizing Environmental Impact: The site assessment is essential to understand environmental features like soil quality and existing plantation. The main objective should be to design construction activities to minimize disruption to the national ecosystem. Redeveloping existing brownfields is another effective strategy, as this may minimize disruption to untouched green fields and preserves natural ecosystems (Hou, et al., 2023) . The erosion

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control techniques like silt fencing, vegetative covers or erosion control blankets during construction helps protect nearby aquatic environments and maintain soil integrity. (Sana, Naeem, & Waheed, 2020)

Maximizing Resource Efficiency: The site selection in an already developed infrastructure amenities like urban transport, reduces the carbon footprint. An appropriate planting design can assist control outdoor temperature and lessen the need for artificial heating and cooling. Landscape integrating green roofs and sustainable landscaping boosts biodiversity, reduces urban heat island effects, and efficiently manages stormwater (Wu & Environment, 2024) (de Oliveira Santos, Pacheco, & Fernandes, 2024) (Sana, Naeem, & Waheed, 2020)

Water Efficiency

Water Conservation and Rainwater Harvesting: Water conservation is one of the most important aspects of the sustainable construction. It includes monitoring and efficient use of water, reduction of water usage by efficient plumbing tools, graywater recycling , alternative water sources, rainwater reservoirs. (Ayuningtyas, Susanto, Buwana, & Emelia, 2022)

Greywater Systems: Greywater is a large volume of wastewater with high reuse potential and applicability. It is domestic wastewater from showers, hand washing sinks, laundries, and kitchen water. Grey water can be used in buildings, especially for flushing toilets, garden irrigation, car washing, and laundries and are regarded as alternative water resources. (Elif Ayyüce Kılınç, 2024)

Drought-resistant Landscaping: Using native and drought-resistant plants reduces the need for irrigation, conserving water

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resources. The use of efficient irrigation techniques, like drip irrigation, minimize water wastage. (de Oliveira Santos, Pacheco, & Fernandes, 2024)

Energy-efficient Design

Building Orientation: Strategic building orientation optimizes natural lighting and ventilation, reducing the need for artificial indoor lighting, mechanical ventilation and air-conditioning. High-performance insulation materials and double-glazed windows enhance thermal efficiency, resulting in energy efficiency. (Gil-Ozoudeh, Iwuanyanwu, Okwandu, & Ike, 2022)

Renewable Energy Sources: The concept of self-sustaining buildings, which not only minimize their impact on the environment but also actively contribute to its regeneration, has emerged as a compelling vision for the future of architecture. The use of solar panels and wind turbines not only reduces reliance on conventional energy sources and improve energy efficiency but also contribute to its regeneration. (Wu & Environment, 2024) (Okwandu, Akande, & Sikhakhane, 2024).

Material Selection

Local Materials: Using traditional materials with low carbon footprint, such as mud bricks, and sourcing local materials, reduces transportation emissions and supports local economies (Wu & Environment, 2024).

Recycled and Sustainable Materials: Incorporating materials with recycled content, like recycled steel and concrete, reduces reliance on virgin resources (de Oliveira Santos, Pacheco, & Fernandes, 2024) . Sourcing timber from sustainably managed forests ensures responsible material use (Hou, et al., 2023).

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Indoor Environmental Quality

Natural Lighting and Ventilation: Optimizing the placement of windows and skylights enhances indoor illumination and reduces energy consumption. Promoting cross ventilation improves indoor air quality (Gil-Ozoudeh, Iwuanyanwu, Okwandu, & Ike, 2022).

Non-toxic Materials: Selecting low-VOC products and certified materials reduces indoor air pollution, contributing to healthier indoor environments.

This comprehensive approach ensures that environmental, economic, and social dimensions are all addressed effectively. The integration of green infrastructure, such as vegetated building envelopes, can enhance sustainable environmental and climate regulation. (MacKinnon, 2024) . Additionally, the use of passive design strategies, such as thermal mass and shading, can further enhance energy efficiency and occupant comfort in green buildings. (Gil-Ozoudeh, Iwuanyanwu, Okwandu, & Ike, 2022)

Challenges and Recommendations for Pakistani Architects

The challenges and opportunities for Pakistani architects in sustainable architecture and LEED certification involve various barriers. In Pakistan's emerging economy, the construction industry faces obstacles in adopting green practices. Nonetheless, these challenges also offer opportunities for sector growth and innovation. The following sections explore these aspects in detail.

Challenges

Cost: The major challenge for sustainable architecture and LEED certification is high initial cost due to the certification process, expensive sustainable materials and technologies. Several studies are conducted to identify the potential barriers for implementation

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of green building practices, high initial investment, is one of the main reasons. (Sana, Naeem, & Waheed, 2020) (Sarvari H, 2024)

Awareness: There is lack of awareness among public, construction professionals and labour make if even difficult to adopt sustainable architectural practices. To promote green living, short courses, workshops and awareness program should be conducted (Sana, Naeem, & Waheed, 2020) (Sarvari H, 2024).

Regulatory Issues: Regulatory system in Pakistan do not support the certification process causing delayed in approval and construction process. There is urgent need to revise the regulation to incentivize sustainable practices. (Sana, Naeem, & Waheed, 2020) (Darko & Chan, 2017) (Sarvari H, 2024)

Cultural Shifts in Building Practices: Traditional construction methods and cultural views pose significant challenges to sustainable practices. Embracing innovative technologies and designs that prioritize sustainability is crucial. Addressing resistance to change is vital for widespread adoption of sustainable practices, requiring efforts to educate and engage construction industry stakeholders. (Sarvari H, 2024)

Implementation Strategies: (Okwandu, Akande, & Sikhakhane, 2024)**.**

Green building design offers a lot of benefits in terms of cost saving, energy efficiency, and environmental benefits by only incorporating a few changes into the building design, orientation, and architecture. In terms of energy saving, the building sector offers a potential of 30%, which is why Pakistan needs to shift towards green building design by addressing all the gaps that are present in the construction sector. This section of paper discusses

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gaps found by studying various research papers. A few of these are as follows:

Education and Training: Develop education and training programs for architects, designers, and policymakers to increase awareness and understanding of self-sustaining design principles and technologies.

Regulatory Advocacy: Advocate for the development and implementation of building codes and regulations that support and incentivize the integration of self-sustaining design features into new construction and renovation projects.

Demonstration Projects: Support the development of demonstration projects to showcase the feasibility and benefits of self-sustaining buildings. This can build up a momentum for wider adoption.

Financial Incentives: Financial institutions, governments, and other stakeholders need to develop financial incentives, such as tax credits or grants, to offset the initial costs of implementing self-sustaining design features.

Collaboration and Knowledge Sharing: Foster collaboration and knowledge sharing among architects, designers, policymakers, and other stakeholders to exchange best practices, lessons learned, and innovative ideas for sustainable architecture.

Research and Development: Invest in research and development to advance the field of sustainable architecture and develop new technologies and design strategies that further enhance the sustainability and performance of self-sustaining buildings.

Public Awareness Campaigns: Public awareness campaigns should be launched to educate the public about the benefits of

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self-sustaining buildings and the role they play in creating a more sustainable future.

Partnerships and Coalitions: Form partnerships and coalitions with industry associations, NGOs, academic institutions, and other stakeholders to coordinate efforts and amplify impact in promoting self-sustaining buildings.

By implementing these strategies, stakeholders can work together to accelerate the adoption of self-sustaining design principles and technologies, creating a more sustainable built environment for future generations.

LEED Certified Buildings in Pakistan: A Few Examples

There are 74 LEED certified building in Pakistan and 65 are either Gold or Platinum certified. Here are few prominent examples.

The Mega Corporate Office Tower: is in Clifton, Karachi, with a built-up area of 19,898 square meters, designed by Anjum Pervaiz Siddiqui. It has earned LEED Silver certification for environmental compliance. Sustainable features include energy-efficient lighting and efficient plumbing fixtures, sustainable indoor environment. This was the first LEED Silver certified building in Pakistan, designed to save 12% of energy and 45% of water use, reflecting a growing awareness of sustainable practices in the construction industry. (Archcorp, n.d.) (Mehboob, 2017) (LEED-Certified Projects in Pakistan, n.d.)

Sr no	CATEGORIES	MAX POINT	CREDITIED POINTS
1	Sustainable Sites (SS)	28	22
2	Water efficiency (WE)	10	5
3	Energy and atmosphere (EA)	37	12

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4	Material and resources (MR)	13	5
5	Indoor environmental quality (EQ)	12	6
6	Innovation (IN)	6	3
7	Regional priority (RP)	4	4
8	Credit score		57

Table 2. The Mega Corporate Office Tower Credit Score awarded by LEED, BD+C, Core and Shell, V3-2009, Certified Silver on October 25, 2017.

The Askari Corporate Tower in Lahore was designed by Arshad Shahid Abdullah. It has a 4-basement parking and 13 office floors, covering 647,250 square feet, completed in 2019. It is the first and largest LEED "Gold" certified commercial building in Pakistan, representing modern architecture. The building features an Intelligent Building Management System, AI-based elevators, and a solar energy system for efficiency. It offers amenities like a gym, cafeteria, and helipad for corporate needs**.** (ASA, n.d.) (LEED-Certified Projects in Pakistan, n.d.)

Sr no	CATEGORIES	MAX POINT	CREDITIED POINTS
1	Integrative Process (IP)	1	1
2	Location and Transportation (LT)	20	17
3	Sustainable Sites (SS)	11	7
4	Water Efficiency (WE)	11	7
5	Energy and Atmosphere (EA)	53	15
6	Material and Resources	14	5

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	(MR)		
7	Indoor Environmental Quality (EQ)	10	5
8	Innovation (IN)	6	4
9	Regional Priority (RP)	4	2
10	Credit score		63

Table 3. The Askari Corporate Tower Credit Score Awarded by LEED, BD+C, Core and Shell, V4-LEED V4, Certified Gold on December 19, 2019.

The British Council Lahore's new Library, in Lahore designed by Raza Ali Dada and completed in August 2016, is a certified Gold green building. The design focuses on simplicity and flexibility, using recycled materials and a glass wall for natural light. Sustainability was prioritized, with local materials and energy-efficient systems employed. The library excelled in water use, energy efficiency, and indoor quality ratings. Challenges included ensuring safety and sourcing specialized materials locally. (Waheed, 2019) (LEED-Certified Projects in Pakistan, n.d.)

Sr no	CATEGORIES	MAX POINT	CREDITIED POINTS
1	Sustainable Sites (SS)	26	18
2	Water Efficiency (WE)	10	6
3	Energy and Atmosphere (EA)	35	12
4	Material and Resources (MR)	14	9
5	Indoor Environmental Quality (EQ)	15	11
6	Innovation (IN)	6	5

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7	Regional Priority (RP)	4	4
8	Credit score		65

Table 4. British Council Library Credit Score Awarded by LEED, BD+C, new Construction, V3-LEED 2009, Certified Gold on January 13, 2017.

These examples illustrate the practical application of LEED principles in Pakistan, showcasing how buildings can achieve sustainability while addressing local climatic, cultural, and economic challenges.

World Bank Country Office, Islamabad

Project Overview: The World Bank Country Office Islamabad situated in sector G5 underwent reconstruction and renovation between 2016 to 2018 executed by Astral Contractors. The architectural design was provided by CITE, in collaboration with Nanji & DeSouza. The project included the main, and annex building, major structural renovations, plumbing, electric system to enhance energy efficiency and water conservation. The office's Gold score in LEED certification is evident of its commitment to sustainable building standards emphasizing energy efficiency resource conservation and low carbon foot print.

Sr no	CATEGORIES	MAX POINT	CREDITIED POINTS
1	Integrative Process (IP)	1	0
2	Location and Transportation (LT)	20	14
3	Sustainable Sites (SS)	10	3
4	Water Efficiency (WE)	11	7
5	Energy and Atmosphere (EA)	53	17

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6	Material and Resources (MR)	13	13
7	Indoor Environmental Quality (EQ)	16	6
8	Innovation (IN)	6	4
9	Regional Priority (RP)	4	2
10	Credit score		60

Table 5. World Bank Country Office, Credit Score Awarded by LEED, BD+C, New Construction, V4-LEED V4, Certified Gold on April 16, 2018.

Strategies for Architecture

Energy Efficiency: Advanced lighting and HVAC system was used for the efficient use of energy.

Water Conservation: following the sustainable practices, the water efficient fixtures were used in washbasins, toilets and urinals. Rainwater harvesting system was used to reuse water in landscape.

Sustainable Materials: sustainable construction methodology and green materials were used to archive low carbon footprint.

Indoor Environmental Quality: indoor environment and air quality was improved by using advanced ventilation system, daylighting and use of low VOC materials. (Astral Constructors (Pvt) Ltd, 2018) (LEED-Certified Projects in Pakistan, n.d.)

Comparative Analysis: World Bank Country Office vs. TAIPEI 101

TAIPEI 101, Taipei, Taiwan

Project Overview: Taipei 101 is the tallest sustainable skyscraper in the world, with 101 floors and approximately 500m height. Initially it was design for 84 floors, but later rest of the floor were added to achieve the title of highest building in world. The

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development and construction works were completed in 2004, but it received its first LEED PLATINUM Certification in Existing Building Category in 2011. Second time in 2016, it received highest score in the word 90 points in the same category. And third time in 2021, it received PLATINUM again using lasted LEED version 4.1. (Taipei 101: Sustainable Building) (USGBC, n.d).

Sustainable Reforms

The skyscraper underwent major sustainable reforms to generate energy and water savings. Using energy management and control system (EMCS), low mercury and no mercury energy efficient lights they reduced the annual energy consumption by 33.41M kWh. With the installation of Water management systems, efficient plumbing fixturing, motion sensors and rainwater harvesting system the building about saved 28,000 litres (30%) of potable water annually by managing all toilets, sinks, and urinal.

With implementation of MERV 13 filters and green cleaning, automated Air handling units controlling and monitoring CO2 and TVOC levels, the indoor environment is extremely healthy. (Taipei 101: Sustainable Building) (USGBC, n.d)

Comparative Insights

Examining the World Bank Country Office in Islamabad shows that LEED certification in Pakistan is possible despite challenges like financial constraints, regulatory complexities, and cultural shifts. Comparing it to international examples like Taipei 101 provides valuable insights into sustainable construction methods. After going through these case we can conclude that adopting these practices, and promoting a suitable environment in Pakistan for sustainable methodologies, a path towards sustainable future can

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be created that can mitigate changes like energy crisis and natural resource depletion.

Sr no	CATEGORIES	MAX POINT	CREDITIED POINTS
2	Location and Transportation (LT)	20	20
3	Sustainable Sites (SS)	10	9
4	Water Efficiency (WE)	12	12
5	Energy and Atmosphere (EA)	38	26
6	Material and Resources (MR)	8	5
7	Indoor Environmental Quality (EQ)	17	13
8	Innovation (IN)	6	6
9	Regional Priority (RP)	4	4
10	Credit score		90

Table 6. TAEPEI TOWER 101 Recertification, Credit Score Awarded by LEED, O+M, Existing Building, LEED V4.1, Recertified Platinum on June 15, 2016.

Conclusion

Embracing sustainable practices in Pakistan is key for green and environmentally adoptable buildings and construction methods to local conditions. LEED through its various categories like energy efficiency, water conservation etc promotes ecological methodologies that provide guidelines for establishment of self sustainable projects. The successfully completed and winning LEED certifications projects like, Askary Corporate Tower, British Council Library Building, in Lahore and World Bank Country Office, in

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Islamabad is evidence of successful sustainable practices in Pakistan. These projects are not only a contribution towards a sustainable future but also but also a pathway to a bright healthy future for coming generation.

Adaptation of Renewable Energy: The use of renewable energy sources like solar and wind power are likely to gain better acceptance. This development is essential to achieve low carbon emissions and achieve energy efficiency in buildings and beneficial for efficient operational costs in the long run. Various studies have shown that use of alternate energy sources, efficient technologies and water conservation can save up to 28% and 32% in water consumption.

Smart Building Technologies: Integration of smart building technologies like BMS (Building Management Systems), IOT devices and sensors, water management systems, are crucial technologies for efficient use of energy, water conservation and better indoor environment. LEED grading system encourages the integration of these systems, resulting in a better, sustainable healthy environment.

Educational Initiatives: The educational institutes, and universities in Pakistan should incorporate sustainable and green methodologies in their educational programmes to train Architects. Seminars, workshops and design competitions should be conducted for awareness and training of Architects and construction professionals.

Call to Action: The professional Architects can lead a role for awareness of sustainable architecture and promote LEED certification by collaborating with the stakeholders, owners, investors and contractors. The adaptation of sustainable practices

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is a key solution for climate change, pollution and depleting natural resources.

Pursuing sustainable practices for LEED certification has many advantages as discussed in the paper. The challenges like high initial costs, engagement of stakeholders, awareness and policy issues at institutional level need to be addressed. LEED certification system may have some deficiencies, as many critics highlight, but in a developing process, the need for continuous improvement is required. Regardless of these challenges, strategic planning, collaboration with the stakeholders can overcome these hurdles, leading to a more healthy, ecological friendly and sustainable environment in Pakistan.

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