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## Data-Driven Insights into LEED Certification Trends: Saudi Arabia's Path to Sustainability

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### Abstract

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This study investigates the adoption and impact of LEED certification in Saudi Arabia, aligning with the nation's Vision 2030 goals for sustainability and environmental stewardship. It analyzes trends over the past decade, focusing on certification growth, building types, rating levels (Certified, Silver, Gold, Platinum), and regional distribution. Data were collected from public directories and official LEED databases to identify patterns and driving factors. Findings reveal a consistent increase in LEED-certified projects, predominantly in major cities such as Riyadh, Jeddah, and the Eastern Province. Commercial and institutional buildings lead in certification, with a noticeable rise in Platinum-level projects. The study concludes that LEED certification is increasingly influencing sustainable urban development in the Kingdom. The insights provided can support policymakers, planners, and developers in advancing green building initiatives and promoting environmentally responsible construction practices across Saudi Arabia.

**Keywords:** LEED certification; Saudi Arabia; Sustainable buildings; Vision 2030; Green urban development.

### 1. Introduction

Sustainability has emerged as a crucial consideration in global development, particularly within the built environment sector. Green building certifications, such as the Leadership in Energy and Environmental Design (LEED), have become integral to promoting sustainable construction practices. Developed by the U.S. Green Building Council (USGBC), LEED provides a framework for achieving high performance in key areas, including energy efficiency, water conservation, indoor environmental quality, and material usage [1]. The widespread adoption of LEED certification reflects a growing commitment to mitigating the environmental impacts of buildings, which account for a significant proportion of global energy use and greenhouse gas emissions [2].

In Saudi Arabia, the adoption of LEED certification aligns closely with the nation's Vision 2030, which prioritizes sustainability and environmental stewardship as pillars of development [3]. Vision 2030 seeks to diversify the economy while reducing dependence on fossil fuels, placing sustainability at the forefront of the Kingdom's urban development agenda [4]. As Saudi Arabia undertakes major construction initiatives, such as NEOM and the Red Sea Project, the integration of sustainable design practices has become essential [5]. LEED certification has become a key benchmark for these projects, reflecting the Kingdom's dedication to adopting internationally recognized standards [2].

Despite its growing prominence, limited research has been conducted to analyze the trends and impact of LEED-certified projects in Saudi Arabia. While global studies have demonstrated the benefits of LEED certification, such as reduced energy costs and improved occupant well-being, there remains a lack of comprehensive analysis specific to the Saudi context [6]. Understanding the adoption patterns and regional distribution of LEED certification in the Kingdom can provide valuable insights for policymakers and developers [7].

This research aims to analyze the trends and patterns of LEED certification in Saudi Arabia, providing a data-driven perspective on its growth and implications. The study evaluates the growth trajectory of LEED-certified projects and identifies the driving factors behind LEED adoption [8]. The findings of this study are expected to contribute to the broader discourse on sustainable development in Saudi Arabia, offering actionable insights for stakeholders seeking to expand the adoption

## 2. Theoretical Background

The concept of sustainable development has been a critical focus of global discourse since the publication of the Brundtland Report in 1987, which emphasized the importance of meeting present needs without compromising the ability of future generations to meet their own [10]. Within the built environment, sustainability involves balancing economic, social, and environmental goals to create resource-efficient, environmentally friendly structures that are conducive to occupant well-being [11]. As the construction industry is responsible for substantial energy consumption, greenhouse gas emissions, and resource depletion, the adoption of green building practices has become a central strategy for addressing these challenges [12].

Green building certifications have emerged as practical tools to standardize and promote sustainable construction practices globally. Among these, (LEED) certification is among the most widely recognized systems. Developed by the U.S. Green Building Council (USGBC), LEED provides a comprehensive framework to evaluate building performance across categories such as energy efficiency, water conservation, site sustainability, indoor environmental quality, and material selection [13]. The certification is awarded at four levels—Certified, Silver, Gold, and Platinum—depending on the number of credits a project earns by meeting specific sustainability criteria [14]. LEED certification has been widely adopted across various sectors, including residential, commercial, institutional, and industrial buildings [15].

In the context of Saudi Arabia, the adoption of LEED certification represents a response to both global environmental concerns and local sustainability challenges. The Kingdom is undergoing a period of significant transformation, driven by its Vision 2030 agenda, which aims to diversify the economy, reduce dependence on oil, and create sustainable urban environments [3]. As part of this initiative, the government has launched numerous megaprojects, shown in Figure 1, including NEOM, the Red Sea Project, and Qiddiya, which incorporate sustainability as a core principle [5]. These projects often seek LEED certification to ensure alignment with international green building standards and to enhance their global competitiveness [4].

The theoretical basis for adopting LEED certification in Saudi Arabia can be understood through multiple frameworks. The Diffusion of Innovation Theory by Everett Rogers provides insights into how new practices, such as green building certifications, are adopted by organizations and industries. According to this theory, factors such as relative advantage, compatibility, complexity, trialability, and observability influence the rate of adoption [16]. In the Saudi context, the perceived benefits of LEED certification—such as energy savings, enhanced occupant satisfaction, and improved marketability—serve as key motivators for adoption [12].

Additionally, the Triple Bottom Line (TBL) framework is pertinent in understanding the value proposition of LEED certification. This framework emphasizes the integration of economic, environmental, and social sustainability in decision-making processes [17]. LEED-certified projects often demonstrate cost savings through reduced energy and water consumption, contribute to environmental preservation through lower emissions and enhance social well-being through improved indoor air quality and occupant comfort [11].

In conclusion, this study's theoretical background highlights the relevance of LEED certification as a mechanism for achieving sustainable development in the built environment. By examining the adoption trends and patterns of LEED certification in Saudi Arabia, this research contributes to a broader understanding of how global sustainability frameworks are applied in specific regional contexts.

## 3. Material and Methods

This study employs a quantitative research approach to analyze the trends and patterns of LEED certification in Saudi Arabia. The primary dataset comprises information on 787 LEED-certified projects listed in the USGBC's project directory. This publicly available database provides comprehensive details on each project, including certification levels (Certified, Silver, Gold, Platinum), building types, location, and certification date. The research methodology involves the following steps:

### A. Data Collection:

The dataset is extracted from the USGBC project directory, specifically filtering for projects located in Saudi Arabia. Key variables include project name, location, certification level, building type, gross floor area, and certification date.

### B. Data Cleaning and Organization:

The dataset is cleaned to remove duplicates, incomplete entries, or irrelevant data. Projects are categorized based on project locations, LEED versions, and certification levels to enable comparative analysis.

### C. Data Analysis:

Descriptive statistics are used to evaluate the distribution of LEED-certified projects across certification levels and building types. A time-series analysis is conducted to assess the growth trajectory of LEED certification in Saudi Arabia over the years. Geographic distribution is visualized using bar charts to identify regional concentrations and trends.

### D. Comparative Analysis:

Results from Saudi Arabia are compared to identify unique patterns and contextual factors influencing LEED adoption in the Kingdom.

### E. Interpretation and Insights:

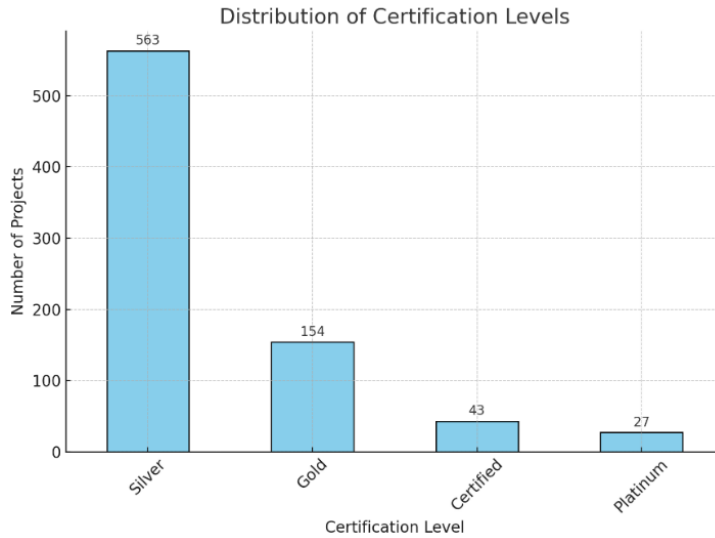
The analysis aims to identify key drivers and barriers to LEED adoption, offering actionable insights for stakeholders to promote sustainable building practices.

The study employs statistical and visualization tools such as Microsoft Excel to analyze and present the data. By leveraging the USGBC's extensive database, this research provides a robust and data-driven perspective on the adoption and impact of LEED certification in Saudi Arabia.

## 4. Results

The distribution of projects across certification levels, shown in Figure 1, indicates that Silver is the most common level, followed by Gold, Certified, and Platinum. Silver certifications account for a significant proportion of all certifications,

suggesting that many projects aim for a mid-tier level of sustainability. Gold and Platinum certifications, while fewer in number, represent higher aspirations in sustainability goals, reflecting projects with greater resources or commitments to achieving advanced green building standards.



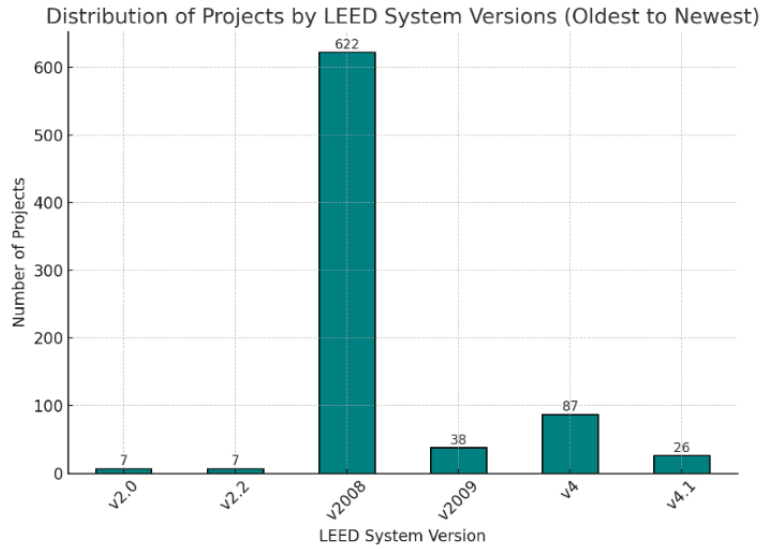
**Figure 1.** Distribution of LEED Projects in Saudi Arabia by Certification Level.

The analysis of geographic distribution by city, demonstrated in Figure 2, reveals that Riyadh dominates in the number of LEED-certified projects, followed by Jeddah, Dammam, and Al Madinah. Riyadh’s leading position reflects the city’s role as a major hub for construction and development in Saudi Arabia. Other cities, while less prominent, still contribute to the growing trend of sustainable building practices across the country, showcasing a nationwide interest in green certifications.



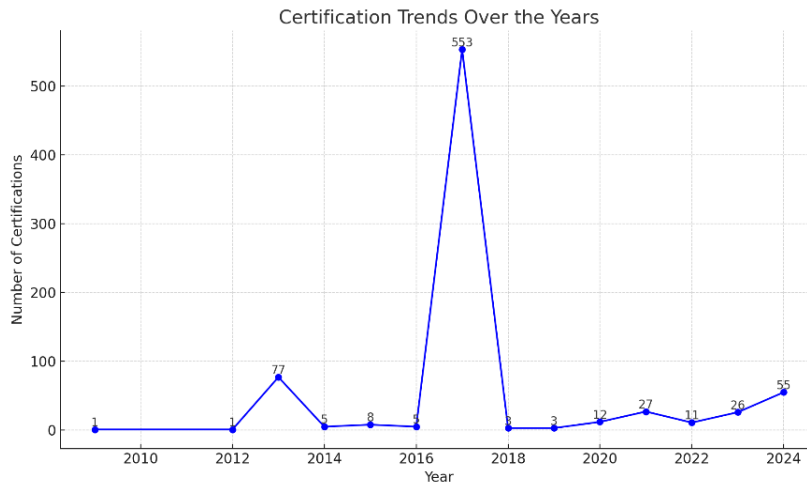
**Figure 2.** Distribution of LEED Projects in Saudi Arabia by Top 10 Cities.

The distribution of projects by LEED system versions, depicted in Figure 3, shows a clear preference for older versions, such as v2008, which dominate the dataset. Newer versions, such as v4 and v4.1, are less common, suggesting that a significant number of projects were certified under the older frameworks. This trend may also reflect the timeline of project registrations, as newer versions may only apply to recently initiated projects.



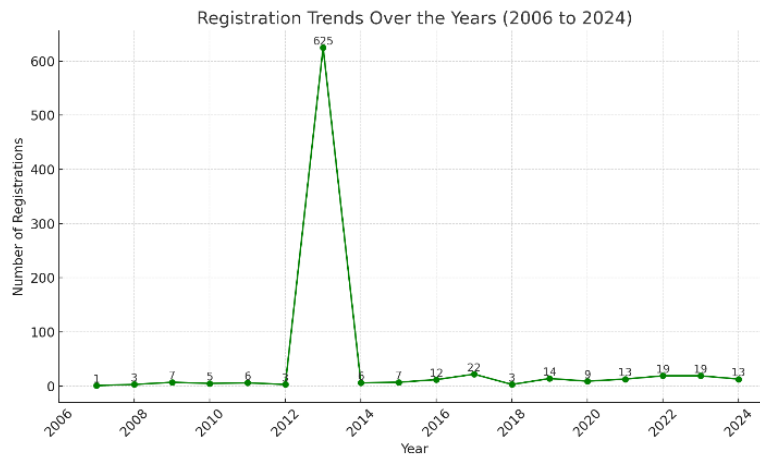
**Figure 3.** Distribution of LEED Projects in Saudi Arabia by LEED System Versions.

The trends in certifications over time indicate periods of significant activity, particularly during years when green building practices gained prominence (see Figure 4). A notable increase in certifications occurred during certain years, which could align with government policies, industry incentives, or heightened awareness of sustainability goals. Recent years show a slight decline, potentially indicating market saturation or shifts in project focus.



**Figure 5.** Certification Trends of LEED Projects

Registration trends, shown in Figure 6, follow a similar trajectory to certifications, with a steady increase during the early years, followed by peaks in specific periods. Early adoption between 2006 and 2010 was gradual, reflecting the nascent stage of green building practices in the region. Peaks in registration activity in subsequent years could correspond to campaigns or initiatives promoting LEED certifications. Recent declines may suggest challenges in maintaining the momentum or shifts towards other sustainability priorities.



**Figure 6.** Registration Trends of LEED Projects.

These results collectively highlight the growth and adoption of LEED certifications in Saudi Arabia, providing a foundation for further analysis and strategic planning to enhance sustainable construction practices in the region.

#### 4. Discussions

The analysis of the LEED project data reveals significant insights into certification levels, geographic distribution, system versions, and trends in certifications and registrations over time.

A. Certification Levels: The data demonstrates a diverse distribution across certification levels, with Silver being the most common, followed by Gold, Certified, and Platinum. This suggests that while many projects aim for higher certifications, a majority settle for mid-tier levels such as Silver, possibly due to cost, complexity, or project constraints [18].

B. Geographic Distribution: The geographic breakdown highlights that Riyadh leads significantly in the number of projects, followed by other cities such as Jeddah and Dammam. Similarly, Saudi Arabia dominates in terms of country-level distribution, indicating a strong commitment to sustainable building practices in the region. This could reflect targeted green initiatives or policy frameworks encouraging LEED certifications [12].

C. LEED System Versions: The distribution of projects by LEED system versions shows a clear preference for older versions like v2008, while newer versions such as v4 and v4.1 are less prevalent. This may indicate that a substantial number of projects were registered during the time when older versions were predominant, or that some organizations are slow to adopt newer standards [20].

D. Certification Trends Over the Years: The trends in certifications over time show a peak during certain years, reflecting bursts of activity possibly due to increased awareness, favorable market conditions, or government incentives. However, a decline in certifications in recent years could suggest market saturation or challenges in achieving LEED certifications for newer projects [16].

E. Registration Trends Over the Years: Registrations exhibit a similar pattern to certifications, with a notable concentration of activity in specific periods. Early years (2006–2010) show gradual growth, likely due to initial adoption of green building practices. A sharp rise in registrations during later years could align with strategic campaigns or policy mandates encouraging sustainability in construction.

#### 5. Conclusions

This analysis successfully explored the distribution and trends of LEED-certified projects across key dimensions, including certification levels, geographic distribution, system versions, and trends over time. The objectives were met by identifying the most common certification levels, highlighting geographic leaders in LEED adoption, and examining how the adoption of system versions and certification activity has evolved over the years. The findings provide valuable insights into the state of sustainable building practices within the dataset's scope.

The analysis showed that Silver certifications dominate, followed by Gold, Certified, and Platinum levels. This distribution suggests a significant focus on mid-tier certifications, possibly reflecting a balance between sustainability goals and project feasibility. Geographic analysis revealed Riyadh as a leading city and Saudi Arabia as a leading country for LEED certifications, underscoring the region's strong commitment to green building initiatives. Furthermore, the predominance of older system versions like v2008 highlights a lag in adopting newer standards, though newer versions such as v4 and v4.1 show signs of gradual uptake.

Certification trends over time revealed significant growth during certain periods, likely driven by policy changes, increased awareness, or regional campaigns promoting green construction. However, the decline in certifications in recent years may point to challenges in maintaining momentum or market saturation. Understanding these trends can help stakeholders refine their strategies to sustain and expand green building adoption.

Despite its achievements, the analysis had limitations. The dataset may not fully represent global trends, as its scope appears regionally concentrated. Additionally, gaps in temporal data and the lack of contextual factors—such as economic conditions or policy shifts—limit the ability to draw comprehensive conclusions. Furthermore, sector-specific and project-type trends were not explored, which could have added depth to the findings.

Future research can address these limitations by comparing LEED adoption with other green building certifications to understand broader sustainability trends. Investigating the environmental and economic impacts of LEED-certified projects would also provide a more holistic perspective on their value. Sector-specific analyses could uncover targeted opportunities for growth, while a deeper focus on emerging regions may highlight areas with untapped potential for green building initiatives.

Overall, this analysis provides a solid foundation for understanding LEED certification trends and distribution while opening avenues for further exploration and targeted action in sustainable development.

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#### Conflict of Interests

The Author(s) declare(s) that there is no conflict of interest.

#### References

- Alanazi, F. (2024). Sustainable transportation and intelligent infrastructure development in Saudi Arabia: A study on the impact of Saudi Vision 2030 and renewable energy integration. <https://doi.org/10.3233/atde241184>
- Alfaris, F. (2024). Design enhancement of grid-connected residential PV systems to meet the Saudi electricity regulations. *Sustainability*, 16(12), 5235. <https://doi.org/10.3390/su16125235>

- Alhamad, S. (2024). The effectiveness of applying the economic and technological dimensions of the Kingdom of Saudi Arabia's Vision 2030 to achieve the competitive advantage of the Hail region. *Frontiers in Energy Research*, 12. <https://doi.org/10.3389/fenrg.2024.1337349>
- Alhamoudi, A. (2024). Enabling Industry 4.0 technologies to drive sustainable housing delivery across the housing supply value chain in Saudi Arabia: Challenges and prospects. *Sustainability*, 16(13), 5413. <https://doi.org/10.3390/su16135413>
- Ali, Y. (2024). The activities of ACWA Power in renewable energy and its contributions to achieving sustainable development in the Kingdom of Saudi Arabia. *IJSR*, 3(10), 369–392. <https://doi.org/10.59992/ijsr.2024.v3n10p13>
- Aljuaid, A. (2024). Integrating Industry 4.0 for sustainable localised manufacturing to support Saudi Vision 2030: An assessment of the Saudi Arabian automotive industry model. *Sustainability*, 16(12), 5096. <https://doi.org/10.3390/su16125096>
- Aloshan, M. (2024). Promoting urban corridors in Saudi city centres to enhance walkability feature using multi-criteria decision analysis methods. <https://doi.org/10.20944/preprints202406.1177.v1>
- Amen, M. A. (2024). AI-driven sustainable habitat design: Key policy frameworks and ethical safeguards. *Smart Design Policies*, 1(1), 23–32. <https://doi.org/10.38027/SMART-V1N1-4>
- Andrew, D. (2024). Sustainability practices in eco-friendly resorts. *Journal of Modern Hospitality*, 3(1), 27–39. <https://doi.org/10.47941/jmh.1952>
- Camelo, G. (2024). The ESG menu: Integrating sustainable practices in the Portuguese agri-food sector. *Sustainability*, 16(11), 4377. <https://doi.org/10.3390/su16114377>
- Chelang'at, F. (2024). Always with the best intentions? Interrogating the use of sustainable building assessment systems in developing countries: Kenya. *Sustainability*, 16(9), 3868. <https://doi.org/10.3390/su16093868>
- Ding, G. (2024). Within- and across-province agglomeration of LEED certifications in China. *Journal of Economic Surveys*, 38(5), 1906–1927. <https://doi.org/10.1111/joes.12648>
- Filippi, L. (2024). Comparing Alula and the Red Sea Saudi Arabia's giga projects on tourism towards a sustainable change in destination development. *Sustainability*, 16(5), 2117. <https://doi.org/10.3390/su16052117>
- Hamdy, A. (2024). Quality of life: Quantitative analysis in New Urbanism and LEED-ND certified neighbourhoods. *Proceedings of the Institution of Civil Engineers - Urban Design and Planning*, 177(4), 195–231. <https://doi.org/10.1680/jurdp.24.00008>
- Liu, Y. (2024). The impact of ESG performance on investors' decision-making in the real estate industry: Based on green building certification and facility management. *Highlights in Business Economics and Management*, 45, 124–129. <https://doi.org/10.54097/by2v3s39>
- Parekh, R. (2024). Trends and challenges in LEED v4.1 healthcare certification: A comprehensive analysis of U.S. hospital scores in 2024. *World Journal of Advanced Engineering Technology and Sciences*, 12(2), 726–740. <https://doi.org/10.30574/wjaets.2024.12.2.0344>
- Pushkar, S. (2024). Leadership in Energy and Environmental Design commercial interior version 4 (LEED-CI v4) gold-certified office space projects: A pairwise comparative analysis between three Mediterranean countries. *Buildings*, 14(3), 815. <https://doi.org/10.3390/buildings14030815>
- Rebelatto, B. (2024). Examining energy efficiency practices in office buildings through the lens of LEED, BREEAM, and DGNB certifications. *Sustainability*, 16(11), 4345. <https://doi.org/10.3390/su16114345>
- Sezen, S. (2024). Utilisation of project support for renewable energy financing in public buildings: A solar carport feasibility example. *International Journal of Energy Studies*, 9(2), 347–367. <https://doi.org/10.58559/ijes.1468058>
- Soysa, R. (2024). Construction of a sustainability reporting score index integrating Sustainable Development Goals (SDGs): The case of Sri Lankan listed firms. *Journal of Asian Business and Economic Studies*, 31(3), 190–202. <https://doi.org/10.1108/jabes-05-2023-0149>
- Toğay, O. (2024). Towards sustainable urban transformation: The role of LEED certification in Istanbul's future and economy. *Kastamonu University Journal of Engineering and Sciences*. <https://doi.org/10.55385/kastamonujes.1456041>