



Received: 05-09-2023
Accepted: 15-10-2023

International Journal of Advanced Multidisciplinary Research and Studies

ISSN: 2583-049X

Trends in Green Building Development Worldwide and Recommendations for Vietnam

Tuan-Dung Hoang

Faculty of Real Estate-Valuation, University of Finance-Marketing, Vietnam

Corresponding Author: Tuan-Dung Hoang

Abstract

Green building is a crucial component of the strategy for sustainable development within the framework of green growth. In recent years, numerous countries have continually promoted the development of green buildings, with widespread application of green building certifications such as LEED, BREEAM, WELL, etc. Recognizing the benefits of green buildings, many countries have swiftly enacted policies ranging from incentives to mandatory

implementation, exemplified by China, which boasts the highest number of green buildings in the world. The current number of green buildings in Vietnam remains quite modest in comparison to the pace of economic growth. To accelerate the construction of green buildings, the Vietnam government should implement more mandatory policies rather than relying solely on voluntary initiatives as is currently the case.

Keywords: Green Building, Lotus, Leed, Well

1. Introduction

In the face of escalating climate change impacts and the recent surge in fuel prices, nations are increasingly prioritizing environmental protection, resource use efficiency, and sustainable development. Notably, in the realm of construction and real estate, green buildings have emerged as crucial elements in advancing eco-urban development and propelling the nation towards a greener economy. These structures offer a multi-faceted solution, capable of mitigating adverse environmental effects, enhancing the quality of life for occupants, and providing both short-term and long-term financial benefits to businesses. Recognizing the mounting pressures for sustainable development, nations worldwide have enacted numerous regulations guiding the construction of green buildings. This collective effort has resulted in the establishment of global standards that govern the practice of green building.

Past researches vividly illustrate that the adoption of green building practices has not only yielded positive outcomes but also sparked a global movement for sustainability. Prominent nations, including the United States, the United Kingdom, and China, have played a significant role in advancing green building development, offering valuable insights and lessons for us to readily embrace. In 2012, the Vietnamese government achieved a significant milestone by endorsing the 'National Green Growth' strategy, a comprehensive approach aimed at fostering sustainability across various sectors. However, the outcomes have not met the initial expectations. This article aims to uncover the emerging trends in the global and Vietnamese green building sector, drawing on an analysis of past policies. Following this research, the article will offer tailored recommendations that align with Vietnam's unique context.

2. Overview of Green Growth and Green Building

2.1 Definitions

In the past, as countries worldwide became increasingly aware of the impacts of climate change and rising oil prices, the concept of "green growth" has gained widespread usage. The World Bank (2012) ^[7] defines green growth as economic growth closely linked to the natural resources use efficiency, minimizing pollution and environmental impacts, having the ability to recover considering natural disasters, and the role of environmental management and natural capital in physical hazard prevention. The OECD (2011) ^[3] defines it as "promoting economic growth and development while ensuring that natural assets continue to provide resources and environmental services upon which our livelihoods depend." There are various definitions of green growth, but in practice, it is important to acknowledge that there can be no absolute green growth; any consumption of

goods in the modern era will inevitably have adverse environmental effects, and green growth strategies strive to minimize these impacts in various aspects.

From a global perspective, construction projects such as high-rise buildings contribute to resource consumption and the phenomenon of global warming. In the United States, one of the world's largest energy consumers, the share of electricity consumption by buildings tends to increase compared to other electricity consumers. Since 1980, the electricity consumption of buildings has accounted for 61% of the total electricity consumption, rising to 71% in 2004

and is projected to increase to 81% by 2030 (DOE, 2007) ^[4]. Buildings also generate carbon emissions, either directly or indirectly, throughout their life cycle (including four stages: material production, construction, operation, and demolition). Carbon emissions from buildings account for approximately 38% of the United States' total and about 9.8% globally (DOE, 2007) ^[4]. To address the negative impacts of construction and real estate development, countries have proposed definitions and standards for green buildings.

Table 1: Definitions of green buildings by countries

Countries	Institutions	Definitions
USA	U.S. Green Building Council	A building that is planned, designed, constructed, and operated with consideration for important factors such as energy use, water use, indoor environmental quality, and the building's impact on its site.
United Kingdom	Building Research Establishment	A construction that creates a sustainable environment, improves the health of people living and working in the building, helps conserve natural resources, and adds attractiveness to real estate investments.
Europe	Europe Commission Deligation	A building can contribute to environmental protection by incorporating features that enhance the quality of life for occupants, such as efficient use of space and improved air quality.
Japan	Architecture Insitute of Japan	A structure designed: (1) to conserve energy and resources, recycle materials, and minimize the release of harmful substances throughout its lifecycle, (2) to harmonize with the local climate, traditions, culture, and surrounding environment, and (3) to sustain and enhance the quality of human life while maintaining the capacity of the local and global ecosystem.
China	Green Building Evaluation Standard of China	A building that conserves resources throughout its entire lifecycle, including energy, land, water, and materials, while also protecting the environment, and minimizing pollution to provide people with a healthy, comfortable, efficient living and working space that harmonizes with nature.
Vietnam	Vietnam's National Green Growth Strategy	A building that achieves high efficiency in energy and material use, minimizing negative impacts on the environment. Additionally, it is designed to mitigate the adverse effects of construction on human health and the natural environment to the greatest extent possible.

Source: Author

In general, the definitions of green building design and construction shared by various countries exhibit similarities, including: (1) Efficient use of energy, water, and other resources, (2) Safeguarding the health of occupants and enhancing employee productivity, (3) Minimizing waste, pollution, and environmental degradation. Except for Japan, which supplements specific requirements such as aligning with "local traditions" and "cultural heritage".

2.2 Advantages and Disadvantages of Green Buildings

The goal of green buildings is to enhance the positive aspects and minimize the negative aspects throughout the entire lifecycle of a construction project. They aim to have less negative environmental impact compared to conventional buildings. This is achieved by using eco-friendly materials that can be recycled during construction, utilizing natural light, using highly efficient HVAC (heating, ventilation, and air conditioning) systems, and creating indoor environments with minimal pollution, low levels of VOCs (volatile organic compounds) in materials like paints, floors, furniture, and landscape designs that reduce water usage (e.g., using native plants that can thrive without additional irrigation).

The U.S. General Services Administration (GSA) surveyed 12 green-certified buildings and compared them to the national average in terms of criteria such as environmental efficiency, financial performance, and tenant satisfaction. The results indicated that green buildings use 26% less energy, have 13% lower maintenance costs, emit 33% less greenhouse gases, and provide a 27% higher tenant satisfaction level compared to the national average (GSA, 2008) ^[1]. The research findings confirmed that, on average, green buildings consume less energy, emit less CO₂, incur

lower maintenance costs, and provide higher level of satisfaction for occupants compared to conventional buildings.

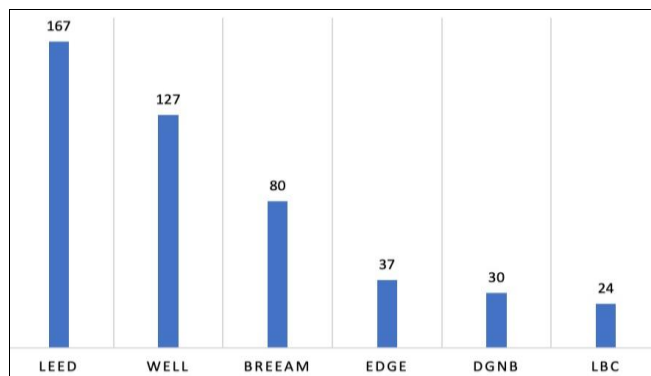
Even though green buildings excel in environmental and operational efficiency, they still have limitations. Green buildings require significant upfront investment, and the construction costs can be up to 10% higher than conventional buildings with the same functions, creating barriers in low-income countries (Ministry of Construction, 2021) ^[2]. Green building designs demands higher technical expertise, as well as challenges in sourcing materials. Some materials that meet environmental-friendly or high-reusability criteria may not be suitable for local environmental conditions. For example, using unfired clay bricks can reduce CO₂ emissions in the production process and decrease the use of clay resources, but they may not be suitable for areas with high rainfall due to poor waterproofing and shrinkage issues. Some materials may not be readily available and might need to be imported at high costs. Green buildings may not be suitable for all locations to achieve optimal energy efficiency. Areas with a low number of sunny days per year may not benefit from rooftop solar energy systems effectively. Additionally, they cannot eliminate negative environmental impacts.

3. Trends in Green Building Development Worldwide

Countries worldwide have developed various green building assessment systems, typically administered through certification programs. In 1990, the first green building assessment system, BREEAM, was introduced by the Building Research Establishment (BRE) in the United Kingdom. Subsequently, the U.S. Green Building Council launched its own standard, LEED, in 1998. International and

national organizations in other regions also established their own assessment standards tailored to local conditions and organizational goals. Examples of locally-oriented certifications include Australia's Green Star, Singapore's BCA certification, Germany's DGNB, and certifications from organizations like WELL and LBC in the United States.

Through wide-ranging efforts, the popularity of these certifications varies significantly. LEED certification, present in 167 countries, stands as the most widespread green building certification globally. Following closely are certifications like WELL, BREEAM, EDGE, DGNB, and LBC (Fig 1).



Source: Author

Fig 1: Number of Countries with Certified Green Buildings as of 2022

One of the reasons LEED certification has become popular is its adaptability to specific market conditions. Despite being developed after BREEAM, LEED certification has gained widespread acceptance in most countries worldwide. BREEAM is commonly used in European countries, but its criteria can be challenging to apply in other markets. BREEAM assesses a project throughout its entire lifecycle, from design, construction, and operation, to renovation, with a significant emphasis on environmental factors. BREEAM standards tend to be more stringent compared to LEED. BREEAM metrics often employ absolute values, whereas LEED uses relative indices and comparisons with similar buildings. This makes LEED more compatible with local markets compared to BREEAM. Another reason for the relative popularity gap is that BREEAM's target market is primarily focused on Europe, where sustainability awareness of population has become widespread. In contrast, LEED targets a much broader global market. This broader scope contributes to LEED's greater popularity and acceptance on a global scale.

Apart from the United States, China is the country with the highest number of LEED-certified projects globally. The widespread use of LEED certification in various continents demonstrates its adaptability to specific local conditions (Table 2).

Another trend in green building certification is the emergence of WELL certification, provided by the International WELL Building Institute (IWBI) since 2014. WELL certification quickly gained popularity worldwide, being present in 127 countries. Similar to LEED, WELL emerged from the green building movement but takes a different approach compared to previous certifications.

While LEED focuses on buildings, WELL concentrates on people. WELL uses health data from individuals living and working in buildings as part of its assessment criteria. WELL introduces standards that LEED does not include, such as health and hygiene criteria, while it has fewer criteria related to environmental impact, material requirements, and location choices. This approach makes WELL more accessible to a larger market since its standards are easier to achieve, and clients/tenants can readily perceive the benefits of WELL.

Table 2: Top 10 Countries with the Largest LEED-Certified Building Area in 2022 (Excluding the United States)

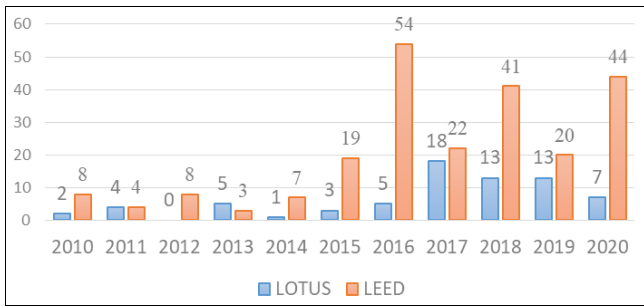
Ranking	Countries	Number of projects	LEED certified area (m2)
1	China	1.121	16.754.839,89
2	India	323	10.471.771,39
3	Canada	248	5.341.924,69
4	Brazil	108	2.402.836,88
5	Sweden	52	2.268.616,83
6	Korea	83	2.189.124,09
7	Mexico	92	1.711.985,28
8	Spain	99	1.565.575,47
9	Italy	96	1.344.229,37
10	Philippines	24	1.064.327,40

Source: USGBC

A distinctive feature in countries with exceptional green building development rates is that the green building movement is led and guided by the government. China, a leading nation in green building construction speed, took action by implementing policies that mandate state-owned buildings to achieve green certifications. Initially, state-owned projects followed the GBEL standards issued by China. In contrast, private projects preferred international certifications like LEED. Over time, as community awareness of green building increased, green-certified buildings attracted more tenants. During the boom of real estate market in China, the indirectly led to the growth of green building development.

4. Green Building Certification in Vietnam

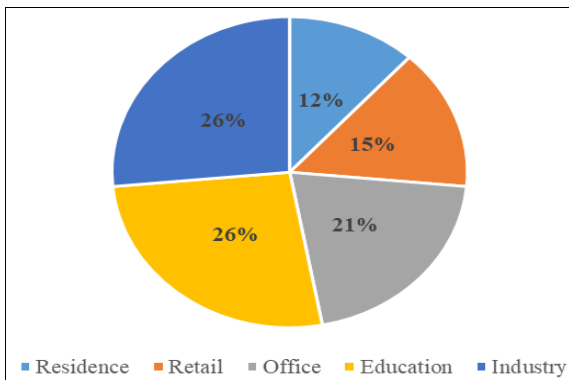
In recent times, the government has actively implemented various mechanisms, policies to encourage firms and individuals to promote the production and use of eco-friendly and energy-efficient building materials, such as non-fired materials. Based on the legal framework provided by the state, in 2010, the Vietnam Green Building Council introduced the LOTUS standard, which is based on regulations related to construction, natural conditions, and practicalities in Vietnam. Currently, in the Vietnamese market, both LOTUS and LEED certifications are widely recognized. According to data published by the Vietnam Green Building Council, the number of projects registering for LOTUS and LEED certification has significantly increased since 2015. However, the number of projects that have been certified is relatively modest. Specifically, there are 34 projects certified with LOTUS, and 37 are currently in progress. For LEED, there are 93 certified projects, with 145 in progress (Fig 2). The number of certified green buildings is considered low compared to the growth potential of the construction industry in our country at present.



Source: Vietnam Green Building Council

Fig 2: Number of Registered LOTUS and LEED Certifications

The projects that receive LOTUS certification primarily focus on commercial and industrial real estate purposes such as retail, office, education, and industrial facilities, accounting for 88% of the total number of certified projects. Residential projects make up a smaller portion, only 12%. The demand for certification for commercial and industrial projects is more pressing and evident due to the higher energy usage intensity and environmental impact associated with this type of construction.



Source: Vietnam Green Building Council

Fig 3: Structure of LOTUS Certified Buildings by Purpose of Use

The registration and certification fees are among the reasons that make investors hesitant to participate in the program. For LOTUS certification, investors may have to allocate an additional 10% compared to conventional projects to achieve the highest certification level, which is Platinum (Ministry of Construction, 2021) [2]. Investors have the option to choose a lower-cost certification level (Table 3). The additional costs for LOTUS certification are higher than for LEED in most categories, even though the criteria are generally easier to meet. This is because the construction standards in the United States are higher than in Vietnam. Therefore, when applying LEED standards, the additional costs are lower. Conversely, construction standards in Vietnam are lower, so applying green building standards will lead to a significant increase in costs. For example, in the United States, even if a project doesn't pursue LEED certification, contractors are still required to take measures such as reducing the use of concrete, using non-fired clay bricks, implementing waste classification procedures, conducting analysis processes and passive design optimization (which are not applicable in Vietnam). The cost of obtaining a LEED certification is approximately four times higher than obtaining a LOTUS certification (see Table 4).

Table 3: Additional Costs Incurred in Attaining Certification Compared to Typical Buildings

Level of Certification	LEED (applicable to projects in the United States)	LOTUS
Certified	0.66%	1.2% – 2%
Silver	2.11%	1.2% – 2%
Golden	1.82%	1.8 – 5%
Platinum	6.5%	> 10%

Source: Vietnam Green Building Council

Table 4: Fees for LOTUS and LEED Registration and Certification

Fees	LOTUS	LEED
Registration Fee	440 USD	1,000 USD
Assessment and Certification Fees (Based on Gross Floor Area)	4,780-11,480 USD	8,780-45,208 USD
Optional Additional Fees	Mostly free of charge	Up to 10,000 USD

Source: Vietnam Green Building Council

The surprising fact is that despite LEED having higher registration and certification costs compared to LOTUS, it has a greater number of registered and certified projects. With internationally recognized standards, LEED certification is preferred by developers due to its international brand, making it easier to appeal foreign tenants and adding more value to a building's brand, even though it comes at a higher cost.

5. Conclusion and Recommendations

The trends in developing green buildings have become increasingly popular worldwide, with LEED certification leading the way. Additionally, the WELL certification is also being rapidly embraced globally, showing its potential applicability in Vietnam. The government could encourage more certification organizations like WELL to enter the Vietnamese market. To further promote green building development in Vietnam, the government could consider the following policies:

- Raise standards in construction activities for regular buildings, emphasizing the use of environmentally friendly materials, such as non-fired bricks, and regulations regarding indoor air quality. Experience from other countries demonstrates that the green building model only truly thrives with government intervention. Regulations on environmental protection in construction activities should be specific in laws, sub-laws, and rigorously enforced, as opposed to being voluntary as it currently stands.
- Promote the rapid adoption of the WELL certification. Its swift acceptance worldwide has demonstrated that this certification has potential applicability in Vietnam. The government could encourage more certification organizations like WELL to enter the Vietnamese market.
- Disseminate the green building model to the public through activities accompanying the green growth movement. This should particularly target consumer awareness through government action programs.
- Provide subsidies such as reduced value-added tax for materials meeting green building standards, low-interest bank loans, and priority in construction permits.
- Organize recognition activities and award ceremonies for organizations with buildings that meet green

building standards.

These recommendations and policies proposed will head in the right direction to boost the development of green buildings in Vietnam. In particular, raising standards and implementing encouraging policies will significantly contribute to creating a conducive environment for investors and builders to participate in the green building movement.

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