

Development of green buildings in Vietnam: International experience and policy implications

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ABSTRACT

The article analyzes the current state of green building development in Vietnam within the context of the global shift toward sustainable construction. Green buildings not only mitigate environmental impacts but also enhance energy efficiency and long-term asset value. This study employs a synthesis and comparative approach, drawing on international experience from developed economies such as Singapore, Japan, South Korea, the United States, and several European countries to identify key drivers of green building development. The findings indicate that critical factors include mandatory policy frameworks, supportive financial mechanisms, transparent certification systems, and coordinated implementation capacity. In Vietnam, although the number of green buildings has been increasing, the overall scale of development remains limited due to barriers such as high initial investment costs, the lack of effective financial incentives, and the gap between design and operational performance. Based on these insights, the article proposes several policy implications to promote the advancement of green building development in Vietnam.

1. Introduction

1.1. The Necessity of Green Building Development

Green buildings (GBs) are increasingly regarded as a pivotal approach in contemporary urban development and construction. Rather than focusing solely on “green” aesthetics or superficial features, GBs aim to optimize environmental performance throughout the entire building lifecycle, from design and construction to operation. Under this approach, buildings are designed to use energy, water, and natural resources efficiently, while simultaneously enhancing indoor environmental quality and minimizing adverse impacts on the surrounding environment [1, 2]. In Vietnam, the concept of green buildings has also been incorporated into the legal framework, emphasizing energy efficiency, resource conservation, indoor environmental quality, and environmental protection [3].

In the context of climate change, increasing infrastructure pressures, and the growing demand for improved urban living standards, green buildings (GBs) offer a pragmatic development approach. They contribute to reducing long-term operational costs, mitigating compliance risks as environmental and energy standards become increasingly stringent, and enhancing the competitiveness of real estate projects in the eyes of tenants, investors, and other stakeholders. Globally, GBs have gradually transitioned from a “voluntary initiative” to a “market norm” through the establishment of standards, certification systems, and accompanying policy and financial mechanisms, thereby creating an ecosystem that effectively drives transformation [1].

1.2. Overview of Global Green Building Development

Globally, green buildings have evolved from a voluntary trend into an increasingly mainstream model within the construction industry. This transition has typically been driven by three key groups of factors: certification systems that establish market benchmarks, policies and regulatory frameworks that define minimum requirements, and measurement mechanisms that enable the assessment of actual operational performance [1].

With regard to certification systems, many countries adopt standards such as LEED and BREEAM to establish a “common language” for the market in assessing building sustainability. These systems help standardize evaluation criteria and enhance transparency when comparing different projects, while also fostering competition as buildings achieve specific rating levels. In addition, several countries have developed context-specific certification schemes, notably Green Mark in Singapore, which aligns green criteria closely with local climatic conditions and urban management requirements [1, 4].

In terms of policy, a prominent trend is that many regions have moved beyond mere encouragement toward establishing progressive roadmaps that gradually raise standards over time. A notable example is Europe, where policies emphasize the renovation of low-performance buildings according to specific milestones, with the aim of improving the overall energy efficiency of the existing building stock [5]. This highlights that the focus of green building development extends beyond

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new construction to include the retrofitting and operational optimization of existing buildings, which account for the majority of energy consumption.

Alongside these standards, international markets have gradually shifted from assessments based on “design documentation” toward performance evaluations grounded in operational data, with the aim of reducing the gap between design intent and actual outcomes. This transition provides a critical foundation for transforming green buildings into a measurable and scalable standard, rather than merely a qualitative commitment.

1.3. Overview of Green Building Development in Vietnam

In Vietnam, prior to 2010, the concept of green buildings was primarily introduced through a number of studies and international cooperation projects supported by the World Bank, the Asian Development Bank, and the United Nations Development Programme. At that stage, attention was largely focused on energy conservation and improving building operational efficiency, while criteria related to green materials, water efficiency, and indoor environmental quality received limited emphasis. In 2010, the first green building in Vietnam to be certified under the LEED standard was Deutsches Haus Ho Chi Minh City, which serves as the headquarters of the German Consulate General in Ho Chi Minh City.

Since then, numerous policies and legal instruments have been introduced to promote the development of green buildings (GBs) in Vietnam. These include the Law on Economical and Efficient Use of Energy (2010), the Program for the Development of Non-fired Building Materials to 2020 (2010), the National Green Growth Action Plan for the period 2014–2020 (2014), the Vietnam Renewable Energy Development Strategy to 2030 with a vision to 2050 (2015), the National Action Plan for the Implementation of the 2030 Agenda for Sustainable Development (2017), and the National Program on Economical and Efficient Use of Energy for the period 2019–2030 (2019). In addition, the amended Construction Law (2020) reaffirms the policy orientation of encouraging green buildings and energy-efficient construction, while strengthening the role of the Ministry of Construction in this domain. Most recently, at COP26, the Prime Minister of Vietnam committed that the country will achieve net-zero greenhouse gas emissions by 2050 (2021).

As of 2024, the total number of green buildings in Vietnam has reached 599, exceeding the initial targets. However, the proportion of newly constructed buildings obtaining green certification remains relatively modest compared to its potential, with the total certified green floor area representing only a small fraction of the more than 100 million m² of new construction delivered annually. At the same time, greenhouse gas emissions from the building sector remain significant, accounting for approximately 38 % of total emissions [2, 6].

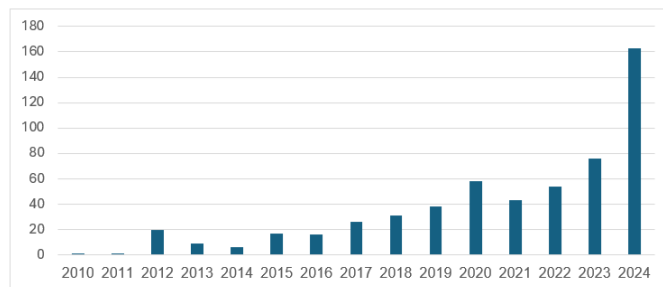


Figure 1. Number of certified green buildings in Vietnam [2, 6].

The market is currently characterized by the parallel use of multiple assessment systems, including EDGE, LEED, Green Mark, and LOTUS. Among these, LOTUS-developed by the Vietnam Green Building Council-has emerged as a prominent domestic certification system, alongside widely adopted international schemes such as LEED and EDGE [7].

The advantages of LOTUS lie in its design, which is tailored to local climatic conditions, regulatory frameworks, and the practical realities of the domestic construction industry, while adopting a holistic approach to green buildings. This includes key criteria such as energy, water, materials, waste management, and indoor environmental quality. In contrast, EDGE is often preferred for projects requiring clearly defined quantitative criteria and streamlined implementation processes, as it focuses on measurable resource-efficiency solutions [7].

Nevertheless, from the perspective of large-scale replication, the development of green buildings (GBs) in Vietnam continues to face several critical bottlenecks. First, the motivation for many projects remains driven by branding considerations or partner requirements, rather than by a stable market mechanism grounded in data and operational performance. Second, high upfront investment costs constitute a significant barrier, leading developers to prioritize short-term considerations, while operational savings typically materialize only in the medium to long term. Third, implementation capacity remains uneven, particularly in building operation and post-handover performance verification, resulting in some projects struggling to maintain their expected performance levels [8, 9]. Fourth, the policy and legal framework for GB development remains incomplete. The concept of “green building” is currently defined only in a sub-law regulation (Decree No. 15/2021/ND-CP), while the Law on Real Estate Business (2023) does not explicitly address GBs or green real estate, thereby rendering GB development largely voluntary and dependent on investor discretion, without strong mandatory requirements or binding legal enforcement [3]. Finally, financial support mechanisms remain insufficiently attractive. Advanced financial instruments, such as green bonds and sustainable finance funds, have not yet been widely deployed, leading to a shortage of capital for potentially viable projects [2].

Overall, Vietnam has established an initial foundation in terms of assessment frameworks and pioneering projects. However, for green buildings to become a mainstream development trend, it is essential to

draw on international experience in integrating policy instruments, financial mechanisms, implementation capacity, and performance measurement systems, thereby creating sustainable and scalable drivers for development.

1.4. Research Methodology

This study adopts a mixed-method research approach combining qualitative synthesis and comparative analysis. Specifically, the research is conducted through the following steps: First, a systematic literature review is employed to collect and synthesize theoretical and empirical studies related to green building development. Second, a comparative analysis method is applied to examine selected international cases, focusing on countries with advanced green building systems. The comparison is based on key dimensions, including regulatory frameworks, financial incentives, certification systems, and implementation capacity. Third, a descriptive and analytical approach is used to assess the current status of green building development in Vietnam. Finally, a synthesis method is applied to derive policy implications for Vietnam by integrating international experience with the domestic context. This approach ensures both theoretical grounding and practical relevance of the research findings.

2. Green Building Development in Selected Countries

The selection of countries for comparative analysis in this study is based on several criteria to ensure both representativeness and relevance to Vietnam's context. First, countries are selected based on their level of advancement in green building development, including the existence of well-established certification systems, comprehensive policy frameworks, and measurable outcomes (e.g., Singapore, the United States, the United Kingdom, Germany, and the Netherlands). Second, several countries are chosen due to their geographical or developmental similarities with Vietnam, particularly in terms of climate conditions, economic structure, or stage of urbanization. For example, Singapore and Thailand share tropical climatic conditions, while Indonesia represents a developing country with comparable institutional and market constraints. Third, the selection also aims to capture a diversity of policy approaches, ranging from mandatory regulatory frameworks (e.g., China, South Korea) to incentive-based systems (e.g., Japan, the United States), thereby enabling a more comprehensive comparison of different governance models.

2.1. Singapore

Singapore is widely recognized as a regional frontrunner in green building development, driven by the "Green Mark" program implemented by the Building and Construction Authority and its ambitious "80-80-80" target by 2030—namely, achieving 80 % green building coverage, ensuring that 80 % of new developments meet super

low energy standards, and improving energy efficiency by 80 % [4]. All large-scale new buildings are required to obtain at least Green Mark certification and are encouraged to achieve higher ratings such as Platinum or Gold.

In addition to mandatory regulations, the Government of Singapore has implemented a range of financial incentives, including support for the development of green materials, tax reductions for energy-efficient investments, concessional financing schemes, and energy retrofit incentive packages such as the Green Mark Incentive Scheme (GMIS) [4]. Under this scheme, up to SGD 15 million per year is allocated to subsidize green design costs (50 % disbursed upfront and 50 % upon project completion), while additional incentives include a bonus gross floor area of 1–2 % for buildings achieving higher certification levels. As a result, by 2025, more than 4,500 buildings have obtained Green Mark certification, accounting for nearly 26 % of the total built floor area in Singapore [10].

2.2. Japan

Japan has developed its green building framework based on the CASBEE system and the "Low-Carbon Building" program implemented by the Ministry of Land, Infrastructure, Transport and Tourism. Although not mandatory nationwide, the Japanese government provides tax incentives and preferential credit schemes for buildings that achieve CASBEE ratings or green certifications—for example, projects certified under the Low Carbon Building scheme benefit from tax reductions and concessional financing [11]. In major cities such as Tokyo, property tax reductions are offered for energy-efficient buildings. Capacity building in the green building sector is promoted through programs led by the Japan Green Building Council and technical institutions, complemented by public awareness campaigns on residential energy conservation [11].

2.3. Korea

South Korea has implemented the G-SEED certification system since 2013; under the Green Building Support Act, all public buildings and large-scale construction projects are required to achieve at least a one-star G-SEED rating, while private sector projects are encouraged to comply. The government provides various incentives, including regulatory relaxations (e.g., reductions in building density and floor area ratio constraints) and tax incentives for projects that obtain G-SEED certification [12]. In addition, government agencies organize G-SEED training programs and awareness-raising workshops. After nearly a decade of implementation, the total number of G-SEED-certified projects in South Korea has reached 8,199, with a high concentration in Seoul and its surrounding areas [12]. However, this figure accounts for only approximately 0.13 % of the total building stock nationwide (based on statistical estimates), indicating that although awareness has

increased, the adoption rate remains relatively low compared to the overall scale of construction activity [12].

2.4. Thailand

Thailand has developed the TREES system (2010), which is based on LEED criteria but adapted to local conditions. Government policies include tax incentives for energy-efficient investments and green investment promotion through the Board of Investment (BOI); however, no comprehensive mandatory requirements have yet been established. Capacity building for engineers and architects in green building practices is carried out by the Thailand Green Building Institute through training courses and workshops. Recent evidence indicates a growing number of projects in Bangkok and other major urban areas adopting green certification schemes: a 2018 survey reported that among 38 projects studied, 55.3 % applied LEED and 44.7 % adopted TREES [8]. Although comprehensive national statistics remain limited, the trend suggests that the TREES system is increasingly being expanded within Thailand's construction industry.

2.5. Indonesia

Indonesia has developed the GreenShip standard through the Green Building Council Indonesia (GBCI) since 2009. The country has established a regulatory framework through Building Standards No. 02/2015 and No. 21/2021, which define technical specifications for green buildings and set out key evaluation criteria, including energy, water, waste, and health. At the local level, several major cities have introduced their own green building codes; for example, Bandung (2016) promotes "star-rated buildings" by offering property tax reductions for projects achieving 2–3 stars, while Semarang (2019) mandates that new commercial buildings comply with energy efficiency and green standards [13]. Green finance policies, notably the Sustainable Finance Roadmap (2017), require banks to develop green financing plans, and the central bank has provided preferential loan-to-value (LTV) ratios with a 5% incentive for green housing. In terms of outcomes, GreenShip had certified approximately 5 million m² of building floor area by 2019, with around 1.5 million m² of newly constructed space certified as green in that year alone-accounting for a small proportion of total new construction [13]. In addition, Green Sukuk (green bonds) mobilized nearly USD 2 billion for green projects during 2018–2019. Capacity-building efforts have also been strengthened, with GBC Indonesia and International Finance Corporation (through the EDGE program) delivering training programs on certification and energy-efficiency advisory services [13].

2.6. China

China has developed the China Green Building Label (CGBL), also known as the Three-Star Green Building system, introduced in 2006 and

updated in 2019. Under this framework, the three-star rating is awarded by the Ministry of Housing and Urban-Rural Development, while lower ratings are issued by local authorities. Initially, under the 2013 national plan, only large public buildings and social housing projects were required to obtain green certification. However, under the 14th Five-Year Plan and carbon peaking targets, China has set a goal that by 2025 all new buildings must achieve at least the Basic Grade, with 30 % attaining a minimum one-star rating [14]. Several local governments have adopted even more stringent regulations; for instance, since July 2022, Shenzhen has required all new buildings to meet at least a one-star standard, while publicly funded projects must achieve a two-star rating. Supporting incentives include preferential low-interest loans, local financial subsidies, and support for green materials. As a result of these policies, by mid-2022 more than 25,000 projects had been certified as green buildings in China, with the number continuing to grow steadily [14]. In parallel, professional capacity has been strengthened through extensive training of experts on the three-star standards and energy-efficiency practices.

2.7. The United States

The United States does not mandate a single national green building certification system; however, the most widely adopted frameworks include LEED, developed by the U.S. Green Building Council, and ENERGY STAR, administered by the United States Environmental Protection Agency. The country has implemented a broad range of federal and state-level policies to promote green construction, such as energy efficiency requirements under the Energy Policy Act (2005), tax incentives for renewable energy investments (e.g., the Solar Investment Tax Credit), and widely applied energy performance standards. More recently, federal initiatives such as the Inflation Reduction Act (IRA), together with state-level policies such as Illinois' Climate and Equitable Jobs Act, have further strengthened support for the development of the green building sector in The United States [11].

With a target of reducing greenhouse gas emissions by 50–52 % by 2030 (relative to 2005 levels) and achieving net-zero emissions by 2050, the United States has promoted sustainable urban development through a wide range of programs and policy frameworks at both federal and local levels [11]. Major cities such as New York City, Los Angeles, San Francisco, Seattle, and Boston have introduced mandatory regulations on energy performance and carbon emission limits for large-scale buildings, while also requiring retrofits for existing buildings that exceed permitted emission thresholds.

In addition, the federal government and individual states have implemented a wide range of financial support mechanisms, including tax incentives for energy-efficient buildings (e.g., the Section 179D tax deduction for energy-efficiency upgrades in commercial buildings), retrofit investment incentives (notably the Property Assessed Clean Energy (PACE) program, authorized in 37 states to finance energy-

efficiency improvements and repaid through property tax assessments), and funding programs for public building retrofits (such as energy performance contracting for government facilities). These measures have collectively played a significant role in mobilizing private sector participation in green building development [11]. However, as observed in many other countries, the application of these policies in the United States varies considerably across states, resulting in uneven levels of adoption and effectiveness of green building practices nationwide.

2.8. The United Kingdom

The United Kingdom is renowned for the BREEAM system, developed by the Building Research Establishment in 1990. This system is widely applied across various building types, including commercial, residential, and public projects. The UK enforces stringent energy performance requirements through its Building Regulations (notably Parts L and F), mandating high standards for new constructions, while many cities require at least a minimum BREEAM certification level for public projects [15]. Green finance mechanisms, such as the Energy Savings Opportunity Scheme (ESOS) and national energy-efficiency support programs, are implemented nationwide, with both the government and financial institutions providing partial support through concessional energy-related loans. As a result, the BREEAM system currently has nearly three million registered projects worldwide, with the UK accounting for a significant share [15]. In practice, public buildings, offices, and schools in the UK have consistently increased in number with high BREEAM ratings and advanced energy performance standards. Furthermore, the UK is well known for its high-quality training in green building practices, supported by professional programs delivered by BRE and specialized certification courses [15].

2.9. Germany

Germany has implemented a robust set of policies to support energy-efficient construction. A prominent example is the concessional loan and grant program administered by KfW Bank (since 2006), which finances both renovation and new construction projects meeting the “Energy-Efficient House” standards (Effizienzhaus 55 and 40). These initiatives have been consolidated under the Federal Funding for Energy Efficiency (BEG) scheme. To date, approximately six million housing units have benefited from KfW support, with total disbursements (loans and grants) contributing to an annual reduction of around 12 million tons of CO₂ emissions [16]. As a result, many newly developed residential and office buildings in Germany achieve green certifications such as DGNB or exceed regulatory requirements. Germany also provides financial incentives for energy-efficient materials and installations, including subsidy schemes and tax reductions for energy-related expenditures. Furthermore, the German Sustainable Building Council delivers professional training programs, certifies experts, and

conducts extensive outreach activities to enhance awareness of sustainable construction practices [16].

2.10. Netherlands

Netherlands requires all new buildings to meet nearly zero-energy building (nZEB) standards from 2015 onward, while all existing buildings must obtain an Energy Performance Certificate (EPC). Since early 2023, the Netherlands has introduced Minimum Energy Performance Standards (MEPS) for large office buildings, mandating compliance with EPC ratings between A and C, which has had a significant impact on improving average performance levels. The government provides financial support through tax reductions, subsidies for the installation of solar panels and heat pumps, and accelerated depreciation schemes for green investments. As a result, the Netherlands ranks among the world leaders in per capita solar power capacity, with widespread adoption of rooftop photovoltaic systems. Many buildings in Amsterdam and Rotterdam have achieved high BREEAM-NL ratings or EPC class A. The green building training system in the Netherlands is managed by the Dutch Green Building Council, which collaborates with the Building Research Establishment to administer BREEAM-NL certification and provide professional training for architects [17].

3. Lessons Learned for Vietnam

3.1. Lessons of Success

Robust and Mandatory Policy Frameworks: Many countries worldwide have achieved success through coherent and binding policy frameworks. Vietnam has also begun to develop national green building standards; however, a key lesson is the need to further refine the legal framework and introduce mandatory requirements (for certain building types or large-scale projects), rather than relying solely on voluntary incentives.

Financial Mechanisms to Promote Green Building Development: Financial support through concessional loans and tax incentives plays a crucial role in offsetting high upfront investment costs and attracting private sector participation in green building development. For example, Singapore has implemented the Green Mark Incentive Scheme (GMIS) to finance energy-efficient retrofits, alongside tax incentives and preferential loan rates for green projects [4], while Germany has introduced concessional financing programs through KfW Bank, supporting approximately six million housing units and reducing around 12 million tons of CO₂ emissions annually [16]. Similarly, Japan provides tax reductions and preferential interest rates for buildings achieving green certifications such as CASBEE [11]. By lowering financial barriers, these mechanisms have encouraged developers to actively invest in green building projects. Vietnam can draw on these experiences by establishing green credit funds, providing interest rate subsidies, and offering tax exemptions or reductions for green materials

and projects, thereby creating clear and effective incentives to accelerate market development in a substantive manner.

Climate-Responsive Design and Early Integration of Green Solutions: Integrating sustainable solutions from the design stage is critical in determining the overall performance of green buildings. In Singapore, which shares a tropical, hot, and humid climate similar to southern Vietnam, passive design strategies-such as solar shading (e.g., overhangs and louvers), the use of insulated glazing, and natural ventilation-have significantly reduced cooling demand in buildings. Vietnam can adopt these approaches in domestic projects; for example, incorporating green roofs and vertical greenery (as seen in buildings such as the BCA Academy in Singapore), as well as designing open corridors and well-ventilated spaces to improve microclimatic conditions and reduce reliance on air conditioning. These solutions are particularly suitable for high-rise buildings, residential complexes, and educational facilities in Vietnam [4].

Ecological Urban Planning: Another key lesson is the early integration of sustainable and ecological principles into urban planning. Punggol Eco-Town in Singapore represents a notable example of a new urban development that holistically integrates green spaces, water features, renewable energy, and public transportation, thereby fostering a sustainable green community [4]. Vietnam can draw on this model in the development of new urban areas-such as Thu Duc City or expansion zones in Da Nang-by incorporating green parks, water bodies, flood control canals, rooftop solar systems, and source-based waste segregation. Such an integrated ecological planning approach would enable Vietnamese cities to simultaneously address environmental challenges (e.g., flooding and urban heat island effects) while enhancing overall urban livability.

Rigorous Certification Systems and Standards: Establishing a reliable national framework of green building assessment criteria is fundamental to ensuring quality. Leading countries have developed their own certification systems, such as Green Mark in Singapore, China Green Building Label in China, G-SEED in South Korea, and CASBEE in Japan, and have linked these systems with either mandatory regulations or financial incentives. As Vietnam continues to develop its national green building criteria, it is essential to ensure transparency and rigor in line with international standards. The timely issuance of technical standards tailored to domestic conditions, while aligned with global development trends, will provide investors with clear benchmarks and contribute to elevating the overall quality of green buildings nationwide.

Capacity Building and Awareness Raising: A skilled workforce and strong societal awareness are critical determinants of successful green building development. Singapore has established institutions such as the BCA Academy and the Singapore Green Building Council to provide continuous training for architects, engineers, and facility managers in green technologies, while Japan promotes structured capacity building through organizations such as the Japan Green Building Council and technical universities, focusing on green building design and assessment [8]. As a result, these countries have developed a substantial pool of

qualified professionals, alongside a well-informed public that recognizes the long-term benefits of green buildings. In contrast, Vietnam continues to face shortages of experts in green architecture and building energy management, while public awareness remains relatively limited. A key lesson is that Vietnam should strengthen education and training programs-from university curricula to short-term professional courses-on green design and energy management, while also enhancing public communication through media channels such as press, television, and social networks to promote awareness of green building benefits. With a sufficiently skilled workforce and strong public support, green building initiatives can be implemented more effectively, ensuring that projects designed as “green on paper” deliver genuine environmental performance in practice.

3.2. Lessons of Failure

Weakly Enforced and Non-Binding Policy Frameworks: Lessons from several countries indicate that when policies rely solely on voluntary incentives without binding enforcement mechanisms, outcomes tend to be limited. South Korea provides a representative example: despite setting ambitious targets for green building development, after nearly a decade of predominantly voluntary implementation, only around 8,199 projects have obtained G-SEED certification-accounting for less than 0.13 % of the total building stock nationwide [12]. Moreover, the majority of these projects achieved only the lowest certification level (one-star, Green4), suggesting that many developments adopted a compliance-oriented approach with minimal performance improvements. The key lesson for Vietnam is to avoid such a “half-measure” approach; to effectively promote green buildings, policy frameworks must incorporate stronger mandatory requirements-particularly for public buildings and large-scale projects-accompanied by robust enforcement mechanisms, rather than relying solely on general, non-binding incentives.

Lack of Monitoring and Post-Construction Verification Mechanisms: Many shortcomings stem from the absence of post-construction monitoring and evaluation, resulting in actual operational performance falling short of expectations. In South Korea, for example, after obtaining G-SEED certification, most buildings are not subject to periodic performance monitoring, leading to continued operation under conventional practices with limited improvements in energy efficiency compared to standard buildings. Evidence from a survey of 12 G-SEED-certified residential complexes indicates that only one building achieved above-average energy performance, while the majority showed negligible differences [12]. The primary cause lies in the lack of mandatory requirements for post-occupancy audits and reporting, which results in developers and facility managers neglecting the maintenance of green solutions. The key lesson is that Vietnam should establish robust post-construction verification mechanisms for green buildings, including mandatory annual energy consumption reporting and inspections after one to two years of operation, in order to detect

performance gaps in a timely manner, enforce corrective actions, and preserve the credibility of green building certification.

Superficial Certification with Limited Practical Effectiveness: In the absence of stringent control mechanisms, green building certification risks becoming a formality rather than delivering substantive performance improvements. In South Korea, for instance, approximately half of the buildings certified under G-SEED achieve only the lowest rating level (Green4), indicating that many projects pursue certification primarily for compliance purposes while achieving minimal energy savings [12]. When certification systems prioritize quantity over quality, their overall contribution to reducing energy consumption remains limited. The key lesson for Vietnam is to avoid superficial certification practices that fail to deliver real performance gains. This requires the development of a well-structured, tiered evaluation system that incentivizes higher performance levels rather than mere compliance with minimum standards. At the same time, transparency should be enhanced by publicly disclosing operational performance data of certified buildings (e.g., through green building council platforms), enabling community oversight and helping to prevent cases where buildings are “green in name” but underperform in actual operation.

Context-Inappropriate Green Technologies: The uncritical adoption of advanced green technologies without consideration of local conditions can lead to inefficiencies and implementation failures. In South Korea, many energy-efficient technologies require substantial upfront investment and high levels of technical expertise, making them difficult to scale, while the domestic market still lacks a diverse supply of green materials and specialized equipment, creating additional cost and operational barriers for developers. Moreover, technical designs that fail to adequately account for local context may produce counterproductive outcomes; for example, several public libraries in South Korea that achieved G-SEED certification were found to consume more electricity than conventional buildings due to extensive use of glass façades and reliance on air conditioning [12]. This demonstrates that even “green” technologies, if poorly adapted, can be both costly and ineffective. The key lesson for Vietnam is to develop a context-appropriate green technology roadmap aligned with domestic capabilities. Priority should be given to fostering a local market for green materials and equipment that is diverse and cost-effective, alongside strengthening the capacity of engineers to design, operate, and maintain complex technical systems. Only with technological self-sufficiency and a skilled workforce can the adoption of international green solutions be sustainable and avoid repeating avoidable failures.

3.3. Policy Recommendations for Vietnam

Policy Recommendations for Vietnam: Drawing on international experience, Vietnam should prioritize the early issuance of a national green building criteria framework to serve as a unified basis for evaluation. At the same time, requirements related to energy efficiency,

water conservation, and waste management should be integrated into mandatory building codes for new constructions. The government should also establish clear targets and a binding roadmap, aiming for 20 % of newly constructed buildings to obtain green certification by 2030 and 50 % by 2040, while mandating that all publicly funded buildings (including government offices, schools, and hospitals) achieve green standards for projects initiated after 2025.

Financial Incentive Mechanisms for Supporting Green Buildings: The government should implement green credit programs and financial incentive schemes to stimulate investment in green buildings. At the same time, tax incentives—such as exemptions or reductions in corporate income tax and land-use tax—should be considered for developers of green projects, particularly for green social housing, in order to encourage stronger private sector participation. These measures would help reduce cost barriers and create more robust incentives for the expansion of green building development in Vietnam.

Development of Domestic Markets for Green Materials, Technologies, and Services: To ensure the sustainable development of green buildings, Vietnam needs to establish a domestic market for green construction materials and technologies. The government can issue a recommended list of green materials and equipment (e.g., LED lighting, high-efficiency HVAC systems, non-fired building materials, low-VOC paints) and provide promotional support or partial subsidies for cost-intensive solutions in the early stages (such as solar panels and high-performance glazing). In parallel, a national eco-labeling scheme for construction materials should be developed to enhance user confidence, similar to the approach adopted by China, which has certified more than 2,100 green building material products [14].

Human Resource Development and Public Awareness Enhancement: Vietnam should make systematic investments in professional training and public outreach to build a strong human and societal foundation for green building development. This includes integrating green architectural design and building energy management into undergraduate and postgraduate curricula for architects and civil engineers, while also organizing certification-based training programs in energy management for building operators (following models such as those implemented by Building and Construction Authority) [4]. In parallel, public awareness campaigns should be strengthened through mass media channels to communicate the benefits of green buildings—emphasizing cost savings, improved health, and enhanced living comfort for residents.

Pilot Implementation and Scaling-Up of Successful Models: Finally, pilot implementation is essential to generate practical experience and create a demonstration effect. The government may select major urban centers such as Hanoi, Ho Chi Minh City, and Da Nang to pilot mandatory green building requirements within new urban developments. For instance, green standards could be applied to all buildings within designated zones, following models such as Punggol Eco-Town in Singapore—an integrated ecological urban area combining green spaces, water bodies, solar energy, and sustainable transportation

[4]. Successful pilot projects would establish precedents and provide valuable lessons for nationwide scaling. In parallel, international cooperation projects (e.g., ODA programs and climate change initiatives) should be leveraged to integrate green building criteria, such as requiring funded projects to achieve certifications like EDGE or LOTUS. These measures would enable Vietnam to accelerate its progress toward global benchmarks in green building development, while advancing broader goals of green growth and sustainable development.

The findings derived from the comparative methodology and synthesis of international experience provide a robust analytical basis for proposing context-specific policy recommendations for Vietnam.

4. Conclusion

Drawing on international experience, a key principle can be identified: the level of green building development should be assessed through two fundamental dimensions. The first is the extent of large-scale diffusion, whereby green buildings become a mainstream choice rather than being limited to a few pioneering developers. The second is the sustainability of outcomes, ensuring that environmental and energy performance is maintained throughout the building lifecycle, rather than achieved only at the point of certification.

To promote green building development, Vietnam should prioritize the timely completion of its system of standards and technical regulations, while establishing a mandatory implementation roadmap aligned with domestic conditions. Financial incentive mechanisms, including green credit and green tax policies, need to be clearly designed and sufficiently attractive to encourage private sector participation. In addition, human resource development and public awareness enhancement play a crucial role in building a strong societal foundation that supports the adoption and expansion of green buildings.

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