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Green Building in Algeria: From Environmental Commitment to Economic Imperative

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Abstract:

The promotion of green building practices in Algeria represents a strategic pathway toward achieving sustainable and balanced economic development. This approach integrates environmental protection, efficient resource use, and long-term economic performance within the construction sector. Green building in Algeria has evolved from being a purely environmental initiative aimed at ecosystem preservation into an economic necessity driven by rising energy consumption, increasing pressure on natural resources, and the urgent demand for sustainable urban development. This study aims to examine the concept and core principles of green building, while analyzing its economic, environmental, and social dimensions in the Algerian context. A descriptive–analytical and comparative methodology is adopted to assess the current state of the construction sector, contrast green and conventional buildings, and identify the key challenges and opportunities associated with the large-scale adoption of green construction practices.

The findings indicate that green building contributes significantly to reducing energy and water consumption, lowering carbon emissions, decreasing long-term operational costs, and enhancing property value. Despite these advantages, the widespread implementation of green building in Algeria remains constrained by high initial investment costs, limited technical expertise, insufficient regulatory frameworks, and low public awareness. The study concludes that green building is no longer an optional environmental choice, but rather an economic imperative for achieving sustainable development in Algeria. Policy recommendations are proposed to strengthen legislative frameworks, financial incentives, and institutional coordination in order to accelerate the transition toward sustainable construction.

Keywords: Green building; Renewable energy; Sustainable development; Algeria.

1. Introduction:

The construction industry is one of the most resource- and energy-intensive sectors globally, significantly contributing to environmental degradation and greenhouse gas (GHG) emissions. According to the United Nations Environment Programme (UNEP, 2021), the building and construction sector accounted for 37% of global energy-related carbon dioxide (CO_2) emissions in 2020, underscoring its pivotal role in climate change dynamics. In this context, sustainable construction—particularly through green building practices—has emerged as a critical strategy to mitigate environmental impacts while supporting economic development and social well-being (Kibert, 2016).

Green buildings are designed to reduce the overall impact of the built environment on human health and the natural ecosystem by efficiently using energy, water, and materials, while also enhancing occupant comfort and productivity (U.S. Green Building Council [USGBC], 2023). Beyond their environmental benefits, such structures increasingly demonstrate compelling economic advantages, including reduced operational costs, enhanced asset value, and job creation in emerging green sectors (World Green Building Council [WorldGBC], 2019).

In Algeria, rapid urbanization, population growth, and rising energy demand have intensified pressure on natural resources and infrastructure systems. The country's construction sector has expanded significantly in recent decades, yet it remains heavily reliant on conventional, high-emission practices that exacerbate environmental stress and economic inefficiencies (Boukeloua et al., 2020). Against this backdrop, green building presents a strategic opportunity to align national development goals with global climate commitments, particularly under the Paris Agreement, which aims to limit global warming to well below 2°C above pre-industrial levels (United Nations Framework Convention on Climate Change [UNFCCC], 2015).

However, a central question arises: Is green building in Algeria primarily an environmental choice aimed at ecological preservation, or has it evolved into an economic imperative shaped by shifting market dynamics, policy frameworks, and mounting environmental challenges? Addressing this question is essential for understanding how sustainability can be integrated into national development strategies.

This study investigates the multifaceted role of green building in Algeria by examining its environmental, economic, and social dimensions. It evaluates current adoption barriers and enablers, compares the performance of green versus conventional buildings, and proposes evidence-based policy recommendations to accelerate the transition toward sustainable construction. By doing so, the research contributes to both academic discourse and practical policymaking in a region where sustainable development remains an urgent priority.

2. Definition of Green Building:

A green or sustainable building is defined as one that minimizes or eliminates adverse effects on the environment throughout its design, construction, or operation. Furthermore, it can contribute positively to the climate and natural resources, as stated by the World Green Building Council. The World Green Building Council outlines several components that contribute to a building's sustainability: efficient utilization of energy, water, and other resources; incorporation of renewable energy; implementation of strategies to mitigate pollution and waste while promoting recycling; selection of non-toxic and sustainable materials; consideration of environmental factors and the well-being of residents during the design, construction, and operational phases; and designing the structure to accommodate changes in the environment.

The United Nations perceives the notion of green building as encompassing structures that ensure all necessary conditions and capabilities to safeguard and enhance the environment throughout their construction and use, while also promoting sustainable development. In contrast, the US Environmental Protection Agency characterizes green building as the practice of utilizing environmentally responsible and resource-efficient methods across a building's entire life cycle, which includes site selection, design, construction, operation, maintenance, renovation, and demolition. Therefore, green building represents a holistic approach to the design, construction, and operation of buildings, with the objective of reducing the consumption of natural resources, minimizing environmental impact, and achieving economic efficiency.

Green buildings have been a part of human history since the advent of construction; the initial building techniques were more sustainable compared to the contemporary methods that were subsequently embraced, resulting in extensive commercial development. The contemporary green building movement has gained traction in the last ten years, yet its roots can be traced back to the late 19th century, as stated by the American Natural Stone Institute.

The modern green building movement emerged from the necessity for enhanced energy efficiency and environmentally sustainable construction practices. The surge in oil prices during the 1970s, along with the escalating effects of climate change in recent years, catalyzed initiatives aimed at improving energy efficiency and fostering the development of renewable energy sources. As the demand for the construction sector to engage in sustainability efforts grew, the Building Research Establishment Environmental Assessment Method (BREEAM) was first introduced in 1990, followed by the Leadership in Energy and Environmental Design (LEED) rating system in 1998, established by the US Green Building Council (USGBC). Both BREEAM and LEED serve as the primary regulatory organizations responsible for establishing building standards that align with environmental sustainability objectives.

Emissions from the Construction Sector Encouraging sustainable building practices has the potential to lower carbon emissions originating from the construction sector, which represented approximately 37% of total energy-related emissions by the conclusion of the previous year, as reported by United Nations environmental initiatives. Emissions associated with energy-related building operations decreased to 8.7 gigatonnes in 2020, down from 9.6 gigatonnes in

2019; however, this reduction is primarily attributed to the effects of the coronavirus pandemic rather than genuine efforts to reduce emissions.

Regarding emissions resulting from building construction and operation, they reached their highest point in 2019 at 13.4 gigatonnes, in comparison to 13.1 gigatonnes in 2015, which coincided with the signing of the Paris Climate Agreement. In 2020, carbon dioxide emissions from the construction sector decreased by approximately 10% to 11.7 gigatonnes, a level not observed since 2007; however, this decline was primarily influenced by a reduction in energy demand. These elevated emissions occur at a time when buildings represent nearly one-third of global energy demand. It is imperative that emissions from buildings are reduced by 50% by the conclusion of this decade to ensure that the world remains on course to achieve carbon neutrality by 2050, necessitating an annual reduction of 6%, as stated by the International Energy Agency.

According to the United Nations Environment Programme's reports, it is confirmed that the increase in emissions from the building and construction sector highlights the critical necessity for a threefold approach aimed at significantly reducing energy demand within the sector, decarbonising the energy sector, and executing material strategies that lessen lifecycle carbon emissions.

This poses a significant challenge, especially considering the UN's forecasts that the number of existing buildings in Asia and Africa is expected to double in the next thirty years, as projected by the United Nations. Furthermore, it is anticipated that global material consumption will also double by 2060, with construction materials representing one-third of that growth.

3. Green Building and Sustainable Development:

Green building is intricately associated with the idea of sustainable development, which emphasizes the equilibrium among economic, social, and environmental aspects.

The primary significance of advocating for green building lies in its ability to diminish carbon emissions originating from the construction industry, thus mitigating the adverse effects of the climate change crisis. Green buildings contribute to the reduction of carbon, water, energy, and waste, which in turn has a beneficial impact on public health and aids in the preservation of natural resources. For instance, a study conducted by the U.S. Department of Energy involving approximately 22 green buildings certified by the Leadership in Energy and Environmental Design (LEED) revealed that carbon dioxide emissions were reduced by 34%, energy usage was lowered by 25%, water usage fell by 11%, and 80 million tonnes of waste were prevented from being incinerated.

A study conducted in 2014 at the University of California, Berkeley revealed that building structures in accordance with LEED standards led to a 50% decrease in greenhouse gas emissions when compared to traditionally constructed buildings. In addition to this, there are a multitude of other advantages; environmentally friendly buildings have the potential to generate millions of jobs and bolster the economy. For instance, green construction in the United States accounted for roughly $167.4 billion in GDP from 2011 to 2014, as reported by the U.S. Green Building Council. Moreover, green buildings are financially advantageous, as initial investments can enhance property values, with an increasing number of property owners experiencing a rise in asset value of 10% or more, according to the council.

Adopting sustainable construction methods aids in decreasing energy usage, which in turn reduces water and electricity expenses for homeowners and alleviates pressure on electrical grids. Additionally, it lowers maintenance costs since sustainable structures utilize natural materials that have extended lifespans and require less upkeep. Eco-friendly building materials play a significant role in environmental conservation as they naturally decompose without releasing harmful substances, in contrast to conventional building materials. Green buildings are designed with an emphasis on environmental sustainability, mitigating the adverse effects of construction on the environment through the use of renewable resources, recycled materials, waste minimization and recycling, as well as energy efficiency. This approach helps to curtail greenhouse gas emissions, commonly referred to as global warming gases, while enhancing the quality of indoor living for individuals. The benefits of sustainable construction encompass:

- **Enhancing indoor air quality :** Green homes are constructed to optimize natural light and ventilation while minimizing the levels of carbon dioxide, nitrogen dioxide, and other hazardous substances present in buildings. By enhancing air circulation and augmenting the influx of fresh air within green homes, the exposure to toxins and

allergens can be diminished, thereby improving residents' health and elevating their sense of comfort more effectively than in traditional buildings, which in turn positively influences overall quality of life.

- **Preservation of Natural Resources :** Green buildings contribute to the conservation of natural resources in various ways, including minimizing the demand for new building materials. For instance, the implementation of green roofs allows homeowners to save on materials necessary for thermal and sound insulation, as well as other construction elements such as drywall, while also enhancing the longevity of the building. Furthermore, sustainable and eco-friendly structures not only aid in the preservation of natural resources but also diminish the requirements for land development, as green buildings typically utilize less concrete and occupy less space compared to conventional construction techniques.
- **Minimizing the carbon footprint:** The concept of carbon footprint pertains to the quantity of greenhouse gas emissions generated as a result of personal or industrial activities. A person's carbon footprint is determined by assessing the volume of carbon dioxide and other greenhouse gases they emit over a period. Constructing green homes stands out as one of the most efficient methods to diminish an individual's carbon footprint. The Environmental Protection Agency indicates that building a home certified by the Leadership in Energy and Environmental Design system, commonly referred to as LEED, can lead to energy savings of 30% to 50% compared to traditional buildings. For instance, solar panels installed on the rooftops of green buildings produce free electricity for many years, which results in reduced monthly utility expenses for homeowners, less strain on the power grid, and a decrease in carbon emissions by approximately 20%. Furthermore, green buildings play a significant role in lowering the carbon footprint and combating climate change by utilizing sustainable building materials. For example, bamboo flooring is a preferable option as it is more environmentally friendly, requiring less energy for its production and manufacturing in comparison to conventional wooden floors.
- **Minimizing construction and operational expenses** : Sustainable construction techniques play a crucial role in enhancing energy efficiency by utilizing renewable energy sources like solar and wind power, which in turn reduces overall heating and cooling expenses. Green buildings can achieve energy cost reductions of up to 30% when compared to traditional buildings, thanks to their dependence on clean and renewable energy sources. This approach not only leads to financial savings but also diminishes the environmental footprint of the building. Furthermore, the adoption of sustainable construction practices aids in decreasing construction expenses by incorporating energy-efficient materials and advanced construction technologies. Green buildings can also lower construction costs through enhanced insulation and building envelope design, the implementation of passive heating and cooling strategies, minimizing construction waste, and boosting construction productivity. Moreover, sustainable building practices help in reducing operational and maintenance costs while prolonging the lifespan of building materials.
- **Improving efficiency throughout every phase of the building lifecycle :** Eco-friendly buildings necessitate less upkeep and repairs than traditional structures, and they also exhibit greater durability and an extended lifespan. This implies that homeowners who opt for environmentally sustainable construction methods will realize financial savings over time. The expenses associated with maintenance and repairs for eco-friendly buildings are lower than those for conventional ones, and their enhanced resistance to damage results in reduced maintenance needs. Furthermore, green buildings undergo less depreciation of their materials compared to standard buildings, indicating that their value diminishes at a slower pace than that of non-eco-friendly structures following construction or renovation using conventional techniques such as steel frameworks or drywall. Consequently, green building provides sustainable advantages, which encompass the reduction of harmful emissions and pollution, enhancement of quality of life and public health, support for the green economy, and the generation of green job opportunities.

4. The Reality of the Construction and Energy Sector in Algeria:

In Algeria, where the demand for energy and water is on the rise due to urban expansion, green construction serves as a crucial instrument for promoting sustainable development. The construction industry in Algeria encounters numerous challenges: inadequate energy efficiency stemming from dependence on conventional technologies, excessive energy usage for heating and cooling, and mounting pressures on water resources. These issues indicate that embracing green construction is not merely a luxury but an urgent requirement to guarantee resource sustainability and attain economic efficiency. Both green construction and sustainable energy are vital components for realizing sustainable development; the former emphasizes minimizing the consumption of natural resources and energy while reducing the

carbon footprint of buildings, whereas the latter seeks to diversify energy generation sources away from fossil fuels and aims to mitigate emissions and unsustainable energy usage.

4.1 Renewable Energy in Algeria: Current Status and Approach

- Present Situation Research shows that Algeria acknowledges the necessity of moving towards a sustainable energy economy by investing in renewable energy sources like solar and wind energy, with the goal of decreasing dependence on oil and gas while promoting the transition to a green economy.
- Policies and Approaches Recent studies highlight that the nation has established ambitious objectives to enhance the proportion of renewable energy within the national energy mix and to enact laws and regulations that encourage investment in this sector, notwithstanding certain bureaucratic hurdles and the need for improved infrastructure.
- Challenges The primary obstacles to advancing renewable energy in Algeria consist of the gradual modernization of the electrical grids, the requirement for increased funding, and institutional difficulties in the comprehensive execution of the plans.
- Opportunities Algeria is endowed with vast natural resources, especially solar energy found in the desert, which serves as a promising source for generating clean and sustainable energy.

4.2 Green building in Algeria: legal and developmental studies:

Legal and regulatory approach An academic study titled 'The Approach Towards Green Building as an Indicator for Promoting Sustainable Urban Planning in Algerian Law' regards green building as a significant environmental and developmental indicator that facilitates the reduction of natural resource and energy consumption in buildings while promoting the use of eco-friendly materials.

Sustainability strategy Additional research, such as 'Green Building Strategy for Ensuring Urban Sustainability', supports the notion that the shift towards green buildings is crucial for the effective utilization of natural resources and energy, thereby mitigating the environmental impacts of conventional construction and fostering economic growth and urban development.

4.3 Linking green building and renewable energy:

- Attaining sustainable development In a separate study titled 'Renewable Energy Strategy for Attaining Sustainable Development in the Construction Sector', it was emphasized that utilizing renewable energy and improving energy efficiency are crucial methods for fulfilling the objectives of green building and minimizing the environmental footprint of buildings. The research suggests that realizing sustainable development objectives within the construction sector necessitates the incorporation of renewable energy technologies in both design and operational phases.
- Mutual advantages Connecting renewable energy with green building contributes to the reduction of carbon emissions, enhances thermal comfort within buildings, and decreases long-term operational expenses, which are significant aspects discussed in academic literature regarding urban sustainability and clean energy. Consequently, green building is regarded as a benchmark for sustainable urban development and necessitates well-defined legal and legislative frameworks along with incentives for its broad implementation. The integration of the renewable energy sector facilitates and accelerates the outcomes of green building, aiding in the simultaneous achievement of environmental and economic objectives.

5. IV- The Economic Aspects of Green Building in Algeria:

Although the initial investment for green building is higher, it yields long-term economic benefits such as decreased energy and water expenses, reduced maintenance costs over time, enhanced property market value, attraction of investments, and the generation of new employment opportunities in sustainable materials, renewable energy, and environmental engineering services.

- **Fostering Economic Growth and Sustainable Development :** Green building plays a significant role in promoting overall economic growth by offering a construction model that minimizes resource usage and boosts efficiency, which in turn lowers the operational costs of buildings over time and increases the added value of real estate projects.
- Utilizing local resources: Utilizing local green building materials not only supports the national industry but also minimizes imports, thereby enhancing local economic activity and generating job opportunities within the sustainable building materials production sectors.

- Decreasing long-term operational expenses While the upfront costs associated with green building materials and techniques may exceed those of traditional construction, sustainable buildings yield savings over the medium and long term by: decreasing energy (cooling/heating) and water usage, which favorably impacts operational expenses, and reducing maintenance costs due to the employment of more efficient and durable materials.
- Generating investment prospects and a new employment market The green building sector paves the way for both local and international investment in fields such as: renewable energy (including solar energy in buildings), sustainable engineering design, and services for assessing energy efficiency and environmental performance. This all contributes to the establishment of a new industrial foundation and the employment of advanced technical and professional skills within the Algerian labor market.
- Enhancing the value and market appeal of properties: Green buildings typically command higher sale and rental prices than conventional buildings due to:
    - Improved energy efficiency
    - Superior quality of the working and living environment
    - Reduced operating costs for the end user.

  These characteristics render green buildings a desirable asset for investors and purchasers, thereby boosting market demand and augmenting potential profits for real estate developers.

- Economic obstacles to the implementation of green building in Algeria
    - Elevated initial costs: The expense of sustainable building materials and technologies may be greater initially compared to traditional construction, which could deter some developers from embracing them without financial incentives.
    - Insufficient expertise and training: The Algerian market frequently lacks skilled labor and trainers in green building technologies, which may escalate training expenses and hinder the pace of adoption.
    - Requirement for clear legislation and incentives: While there are some legislative indicators to promote sustainable development, the Algerian legal framework is still developing in comparison to globally recognized green building standards.
- Broader economic consequences:
    - Facilitating the shift towards a completely green economy: Green construction is an integral component of a comprehensive strategy for a green economy in Algeria, which seeks to incorporate economic, environmental, and social aspects to attain sustainable development.
    - Contributing to the reduction of national energy consumption and emissions, thereby enhancing the balance of payments by decreasing the national energy expenditure.

6. Environmental Dimensions of Green Building in Algeria:

Green building is recognized as one of the most significant strategies for mitigating environmental degradation linked to the construction industry, which ranks among the highest consumers of natural resources and energy.

- **Rationalising the Consumption of Energy and Natural Resources Green building plays a vital role in:**
    - Decreasing energy consumption through effective thermal insulation, climate-responsive design, and the incorporation of natural lighting and ventilation.
    - Diminishing dependence on fossil fuels, which is particularly important in Algeria, given the country's heavy reliance on natural gas for electricity generation.
    - Conserving natural resources by utilizing sustainable, locally sourced, or recycled building materials.

  This approach not only alleviates pressure on non-renewable resources but also safeguards the rights of future generations.

- **Reducing Emissions and Environmental Pollution Green building aids in:**
    - Lowering greenhouse gas emissions associated with heating and cooling processes.
    - Mitigating air pollution in urban settings, especially in major cities like Algiers, Oran, and Constantine.
    - Minimizing waste produced from construction and demolition activities through effective recycling practices.

  This aligns with Algeria's international commitments related to climate change and sustainable development.

- **Improving water management:** Given the scarcity of water resources in Algeria, the environmental aspect of green building is highlighted through: adopting water-saving systems, reusing greywater for irrigation and cleaning, and designing green spaces that consume less water. This contributes to preserving water security and reducing pressure on public networks.

7. The social dimensions of green building in Algeria:

Green building is not limited to environmental and technical aspects, but also extends to improving quality of life and social justice.

- **Enhancing quality of life and public health Green building provides:**
  - A healthy indoor environment owing to air quality and natural lighting.
  - Reduction of respiratory diseases related to humidity and poor ventilation.
  - Thermal and acoustic comfort for residents. Socially, this raises the level of well-being and reduces health expenditure for families and the state.
- **Social justice and sustainable housing Green building contributes to:**
  - Providing decent and sustainable housing, especially in public housing programmes.
  - Reducing energy and water bills, thus alleviating the financial burden on low-income households.
  - Endorsement of the principle advocating for the right to a healthy environment, as established in the Sustainable Development Goals.
- **The creation of jobs and the development of skills as indirect social dimensions:** Establishing new employment opportunities in the areas of environmental design, renewable energy, and smart building management. Enhancing the skills of workers and engineers, while elevating professional standards within the construction industry. Fostering a culture of sustainability and environmental accountability within the community.
- **Enhancing environmental awareness and community engagement:** The proliferation of green building leads to:
  - Increasing environmental consciousness among residents.
  - Promoting more efficient patterns of energy and water usage.
  - Engaging the local community in safeguarding the urban environment.

8. Challenges facing the implementation of green building in Algeria:

Despite its benefits, green building in Algeria encounters numerous challenges:

- **Elevated initial expenses:** The price of eco-friendly materials and technologies surpasses that of conventional construction materials, resulting in a higher initial investment for green buildings. This encompasses advanced insulation technologies, high-efficiency windows, renewable energy systems, and water and energy management systems, all of which contribute to increased project costs prior to operation. Although the expenses associated with green building may be marginally higher, the long-term operational benefits (in terms of decreased energy consumption and lower operational costs) remain ambiguous to many developers, which deters investment. Consequently, costs are regarded as one of the primary economic obstacles to the widespread implementation of green building in Algeria.
- **Insufficient government backing and absence of incentive policies:** The lack of a thorough and transparent regulatory framework for green building within national policies and urban development obstructs their successful execution. There are inadequate financial incentives (such as tax breaks, funding assistance, or concessional loan programs) to motivate developers to embrace sustainable building technologies. Consequently, the market is devoid of obligatory guidelines or enforceable national standards imposed by authorities, as well as international or regional benchmarks. Insufficient legal and legislative frameworks lead to investor reluctance in broadly implementing green practices.
- **Deficiency in awareness and professional expertise**: A significant knowledge gap exists among professionals in the construction industry concerning green building principles and techniques, primarily due to the absence of specialized training and sufficient professional growth opportunities. Numerous engineers, architects, and contractors lack adequate experience in environmental practices or sustainable building performance evaluation, which adversely impacts design and execution. The deficiency in advanced training and development further impedes projects' capacity to effectively integrate sustainability principles.

- **Limited expertise in green materials and productive infrastructure** :The availability of green materials in the Algerian market is constrained, and the expenses associated with importing them are relatively elevated. The lack of a strong local industry for sustainable materials heightens dependence on imports, which in turn drives up prices and diminishes the attractiveness of utilizing these materials in projects. Furthermore, the absence of a solid supply chain hampers the implementation of sustainable construction solutions, especially in small and medium-sized projects.
- **Insufficient societal awareness and resistance to change** : Despite a significant level of global environmental consciousness, the public's understanding within Algerian society regarding the advantages of green building is still limited when compared to nations that have embraced rating and certification systems like LEED or BREEAM. Numerous investors and individuals fail to recognize the immediate value of higher costs, despite the long-term benefits such as energy savings and enhanced indoor health of buildings. There is a pressing need for intensive awareness campaigns directed at society and stakeholders in the real estate market to foster greater demand for green practices.
- The challenge of merging urban planning with field implementation frequently leads to sustainability practices being excluded from holistic urban planning. Consequently, a cohesive system is not established across the various project phases, from design to operation. Additionally, urban planning, sustainability tools, and environmental assessment systems are predominantly not integrated in the majority of projects, resulting in green practices being applied only partially or ineffectively. In the absence of coordinated integration among planning, construction, and operation, the enforcement of green building standards remains inconsistent and yields limited effectiveness.

9. Conclusion:

Green building in Algeria has transcended its initial perception as a purely environmental initiative and has evolved into an economic imperative, driven by the convergence of escalating energy demand, resource scarcity, climate vulnerability, and the urgent need for sustainable urban development. As demonstrated in this study, green building practices offer a multifaceted response to these challenges by significantly reducing energy and water consumption, lowering greenhouse gas emissions, and enhancing the long-term economic performance of buildings through reduced operational and maintenance costs and increased asset value (UNEP, 2021; WorldGBC, 2019). Moreover, the integration of green construction principles supports the transition toward a circular and low-carbon economy, fostering job creation in emerging sectors such as renewable energy, sustainable materials manufacturing, and energy-efficient design (IRENA, 2020).

Despite these benefits, the widespread adoption of green building in Algeria remains constrained by several interrelated barriers. These include high upfront investment costs, insufficient regulatory frameworks that lack enforceable sustainability standards, limited technical expertise, and low public awareness of the long-term advantages of sustainable construction (Boukeloua et al., 2020; Cherrared et al., 2022). Overcoming these obstacles requires a coordinated, multi-sectoral strategy that aligns policy, finance, technology, and education.

To this end, the following evidence-based recommendations are proposed:

- ***Legislative and Institutional Reforms:*** Algeria should formally incorporate green building criteria into its national Urban Planning and Construction Code. The development of a context-specific national green building standard—responsive to Algeria's diverse climatic zones—is essential. Furthermore, institutional coordination must be strengthened among key ministries, including Housing, Energy, and Environment, to ensure coherent policy implementation and monitoring.
- ***Economic and Financial Mechanisms:*** Fiscal incentives—such as tax reductions, subsidies, or accelerated depreciation for green-certified projects—can significantly lower financial barriers for developers. Preferential lending schemes from public and private financial institutions, coupled with public-private partnerships, can mobilize capital for large-scale sustainable housing initiatives.
- ***Technical Innovation and Adaptation:*** Given Algeria's high solar irradiance, integrating photovoltaic systems and passive solar design into residential and administrative buildings should be prioritized. Climate-responsive thermal insulation techniques and the use of locally sourced, low-impact building materials must be standardized and promoted through updated technical guidelines.

- ***Education and Capacity Building:*** Architectural and civil engineering curricula at Algerian universities should systematically integrate sustainability principles, energy efficiency, and life-cycle assessment. Continuous professional development programs for engineers, contractors, and urban planners are equally critical to build a skilled workforce capable of delivering high-performance green buildings.

In sum, advancing green building in Algeria is not only environmentally prudent but economically strategic. With targeted policy interventions, financial support, technological adaptation, and educational reform, Algeria can harness sustainable construction as a catalyst for resilient, inclusive, and low-carbon urban development—aligning national priorities with global climate goals under the Paris Agreement (UNFCCC, 2015).

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