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Fostering sustainable urban transformation in Nigeria through green building

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Abstract

The rapid urbanization in Nigeria has resulted in significant environmental challenges, including increased greenhouse gas emissions, waste generation, and the depletion of natural resources. Sustainable urban transformation is essential to address these issues and ensure a resilient future for Nigerian cities. Green building practices emerge as a pivotal approach to achieving this transformation by promoting energy efficiency, resource conservation, and improved indoor environmental quality. This essay explores the importance of green buildings in fostering sustainable urban development in Nigeria, highlighting their benefits, challenges, civil engineering proposals, and the path forward.

Keywords: Sustainable urban development; Green building practices; Energy efficiency; Environmental sustainability; Nigeria

1 Introduction

Nigeria is one of the fastest urbanizing countries in the world, with its urban population expected to surpass 200 million by 2050 (UN-Habitat, 2021). This rapid growth poses significant challenges related to housing, infrastructure, transportation, and environmental sustainability. Urban areas are often characterized by inadequate waste management systems and dilapidated infrastructures that contribute to pollution and climate change. As such, fostering sustainable urban transformation has become a pressing need for policymakers and stakeholders.

Green building refers to designing, constructing, operating, and maintaining buildings that are environmentally responsible and resource-efficient throughout their life cycle (U.S. Green Building Council). In Nigeria's context, the adoption of green building practices stands out as an effective means to mitigate environmental degradation while enhancing the quality of life for residents. These practices involve using sustainable materials and reducing energy consumption through innovative architectural solutions aimed at minimizing reliance on non-renewable energy sources.

2 Benefits of Green Buildings

One significant benefit of green buildings is their capacity to drastically lower operational costs through energy efficiencies (Kibert & Chini, 2019). For instance, buildings designed with natural ventilation systems can reduce reliance on air conditioning units, thereby saving costs on electricity bills. Additionally, incorporating renewable energy sources such as solar panels can further enhance these savings while addressing power shortages common in many Nigerian cities.

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Furthermore, green buildings improve indoor air quality, leading to better health outcomes for occupants (Aleksandrov et al., 2020). Proper ventilation systems in these structures help curb pollutants associated with conventional construction methods, reducing respiratory ailments among residents—a critical concern amidst Nigeria's public health challenges.

2.1 Civil Engineering Proposals

To bolster the adoption of green building practices in Nigeria, civil engineering interventions can play a pivotal role:

2.1.1 Sustainable Materials and Recycling

- Promote the use of locally sourced, renewable, and recycled materials such as bamboo, laterite bricks, and recycled concrete to reduce carbon footprints.
- Develop centralized construction waste recycling facilities to process materials for reuse in new projects.

2.1.2 Rainwater Harvesting Systems

- Integrate rainwater collection and storage systems into building designs to address water scarcity and reduce reliance on municipal supplies.
- Construct permeable pavements and bioretention systems for effective stormwater management.

2.1.3 Energy-Efficient Structural Design

- Optimize building orientation and structural designs to maximize natural lighting and ventilation, reducing energy needs for artificial lighting and cooling.
- Implement advanced insulation techniques using eco-friendly materials to enhance thermal performance.

2.1.4 Smart Infrastructure Integration:

- Embed smart sensors and IoT technologies in buildings for monitoring energy consumption and optimizing resource use.
- Incorporate microgrid systems powered by renewable energy to enhance energy independence and reliability.

2.1.5 Green Roofs and Vertical Gardens

- Encourage the adoption of green roofs and vertical gardens in urban areas to improve air quality, reduce urban heat islands, and provide additional insulation for buildings.
- Utilize treated wastewater for irrigation in these systems, enhancing water conservation efforts.

2.2 Challenges in Adoption

Several challenges hinder the broader adoption of green building practices within Nigeria's architectural landscape. High initial investment costs and inadequate knowledge among builders regarding sustainable construction methods remain significant barriers (Osagie et al., 2018). Addressing these barriers requires multifaceted approaches, including government incentives like tax rebates for sustainable investments and capacity-building programs that educate stakeholders on the long-term benefits of transitioning toward greener alternatives.

2.3 Strategies for Overcoming Challenges

2.3.1 Financial Innovations

- Introduce green bonds and low-interest loans to reduce the financial burden on developers.
- Provide tax rebates for investments in renewable energy systems and sustainable construction materials.

2.3.2 Capacity-Building Programs

- Conduct workshops and training programs for architects, builders, and policymakers to raise awareness and skills in green construction techniques.
- Collaborate with universities and research institutions to develop locally tailored green building solutions.

2.3.3 Policy Reforms

- Update national building codes to include mandatory sustainability standards, prioritizing energy efficiency, waste reduction, and renewable energy integration.

- Establish a certification system for green buildings to encourage market recognition and competition.

2.3.4 Stakeholder Engagement

- Empower community groups and NGOs to advocate for green building practices, fostering grassroots support.
- Encourage private-sector partnerships to drive innovation and scale production of affordable, eco-friendly materials.

3 Conclusion

Enabling sustainable urban transformation through green building initiatives represents a critical pathway toward addressing pressing issues associated with rapid urbanization in Nigeria. Civil engineering interventions, such as sustainable material use, energy-efficient designs, and smart infrastructure, can significantly enhance the feasibility and effectiveness of these initiatives. By prioritizing eco-efficient designs and supportive policies aimed at overcoming existing barriers, Nigeria has immense potential to cultivate resilient cities equipped not just for current demands but for future generations seeking sustainable living conditions amidst an evolving global climate crisis. By integrating innovative strategies and fostering collaboration among stakeholders, the country can accelerate its progress towards sustainable urban development and a greener future.

Compliance with ethical standards

Disclosure of conflict of interest

No conflict of interest to be disclosed.

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