



Sustainable Environment and the built Space: Integrating Ecology, Planning and Human Well-being

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ANALYSIS OF VERTICAL FARMING POTENTIAL IN NIGERIAN URBAN HIGH-RISE BUILDINGS

Emeka J. Mba¹, Ikechukwu W. Ozigbo², Chinelo A. Ozigbo³, Walter I. Ibekwe^{4*}

^{1,4}Department of Architecture, University of Nigeria, Enugu Campus, Enugu

^{2,3}Department of Urban and Regional Planning, University of Nigeria, Enugu Campus, Enugu

Corresponding author*: ⁴walterifeanyichukwy@gmail.com

Abstract

Urban communities around the world are constantly adapting to the shifting demands of the rising population. This challenges food security in urban centres, necessitating innovative solutions like vertical farming (VF) within high-rise buildings. The integration of vertical farming into high-rise buildings in Nigeria holds potential for transforming structures into self-sustaining ecosystems. The study assesses the feasibility and design challenges of integrating VF, identifying key barriers such as high energy costs and structural deficits. Findings from a mixed-method approach, including a survey of AEC professionals (n=384), a feasibility study, and spatial analysis, confirmed that VF is technically possible. However, identified challenges such as structural incompatibility and high operational costs driven by energy consumption present major setbacks to a seamless implementation. Significant solutions exist in the form of external load-bearing exoskeletons and building-integrated photovoltaics from the technical perspective and updated urban planning policies and building regulations in Nigeria should be updated, and other efforts to bridge financial and regulatory gaps. The study suggests the collaborative efforts of developers, architects, and urban planners with agricultural experts and sustainability consultants to design and implement effective vertical farming strategies tailored to local climate and socio-economic conditions. This approach towards merging architecture with agriculture will create self-sufficient, environmentally conscious urban centres, promoting a sustainable framework for both existing and proposed high-rise structures. It provides a context-specific framework for integrating food production into the city infrastructure of developing countries. The framework can be applied to planning and designing new city infrastructure and to research on controlled environments agriculture systems.

Keywords: Feasibility analysis, Food security, Sustainable urban design, Urban high-rise buildings, Vertical farming