



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

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REIMAGINING SUSTAINABLE CITIES WITH AI: INCLUSIVE PLANNING, AFFORDABLE HOUSING, AND ENVIRONMENTAL RESILIENCE IN ONITSHA, ANAMBRA STATE, NIGERIA

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Abstract

Rapid urbanization in Nigeria has intensified pressures on housing, infrastructure, and environmental systems, producing highly unequal urban landscapes. In southeastern Nigeria, Onitsha exemplifies these challenges, where population growth, informal expansion, and weak enforcement of planning regulations have generated severe housing deficits, congestion, and increased climate vulnerability. Despite increasing interest in smart cities, limited empirical research explores how spatial technologies and AI can support inclusive urban planning and sustainable housing in secondary African cities, particularly within contexts of deep spatial inequality. Existing studies largely focus on megacities or technology deployment without addressing social inclusion, climate resilience, or justice dimensions. This study addresses this gap by examining how spatial technologies can facilitate equitable, climate-resilient urban development across contrasting socio-spatial environments in Onitsha, Fegge, Okpoko, and the Government Residential Area (GRA). Guided by an integrated framework that combines the AI-Enabled Smart City approach, Inclusive Urban Development, Climate Resilience Theory, and Spatial Justice Theory, the research employs a mixed-methods design. Geospatial analysis, housing and infrastructure assessments, environmental indicators, and stakeholder insights are used to evaluate disparities in land use, housing quality, service access, and climate risk exposure. AI-supported spatial modelling is applied to identify priority zones for intervention and simulate planning scenarios for sustainable housing and infrastructure provision. Findings reveal pronounced inequalities: overcrowding and infrastructure stress in Fegge, acute housing precarity and environmental vulnerability in Okpoko, and relatively planned, service-rich conditions in GRA. This study argues that technologies can enhance evidence-based planning, optimize land use, improve disaster preparedness, and support inclusive service delivery if guided by equity-centred governance. However, without safeguards, technological interventions risk reinforcing existing spatial inequalities. The study concludes that reimagining Onitsha through responsible AI requires integrating technological innovation with participatory planning, affordable housing strategies, and climate adaptation measures is urgent. This research contributes to debates on ethical, inclusive, and sustainable urban development in Nigeria and Africa.

Keywords: Inclusive Urban Development, Spatial technologies, Sustainable Housing, Urban Planning