

# **TITLE: URBAN VECTOR ECOLOGY AND BIOSECURITY: MITIGATING PUBLIC HEALTH RISKS IN RAPIDLY GROWING MEGA-CITIES**

## **Abstract:**

Rapid urbanization has transformed mega-cities into complex ecological systems, creating hotspots for vector-borne diseases. High population density, poor sanitation, and environmental degradation amplify the spread of pathogens transmitted by mosquitoes, ticks, and other arthropod vectors. These challenges are particularly acute in rapidly growing urban centers of West Africa, where emerging infectious threats intersect with gaps in biosecurity and public health infrastructure.

This study explores the ecological and socio-environmental drivers of vector proliferation, integrating field entomological surveys, spatial mapping, and risk modeling. Results highlight urban hotspots shaped by stagnant water, unmanaged waste, and microclimatic variability, while human mobility and socio-economic disparities intensify exposure risk. Conventional vector control strategies, when applied in isolation, are insufficient to address these multi-layered challenges.

A unique aspect of this research is its biosecurity focus: it evaluates how urban planning, infrastructure gaps, and early detection systems influence vulnerability to emerging infectious diseases. Integrating entomological surveillance with community engagement and predictive modeling enables proactive intervention, enhancing outbreak preparedness. Early detection of invasive vectors and real-time risk assessment provide actionable insights for municipal authorities and policymakers, supporting data-driven strategies that save lives and resources.

By bridging entomology, urban ecology, and public health policy, this study offers a replicable framework for resilient cities. While grounded in West African contexts, the findings are globally relevant, offering lessons for rapidly urbanizing mega-cities worldwide—including those in Asia—facing similar public health and environmental challenges.

In conclusion, safeguarding urban populations from vector-borne disease requires interdisciplinary collaboration, proactive biosecurity, and environmentally informed planning. This research demonstrates that sustainable urban health is inseparable from ecological stewardship and anticipatory public health strategies. By providing a model that combines local insights with global applicability, this study contributes to evidence-based policy, resilient urban planning, and improved health outcomes for urban populations.

Keywords: Urban vector ecology, biosecurity, public health risk, entomology, sustainable cities, emerging infectious diseases