

FLOODING IN IBADAN NORTH EAST: GIS AS A TOOL FOR MANAGING DRAINAGE SYSTEM COLLAPSE, RIVER SYSTEM ENCROACHMENT, AND BUILDING CODE VIOLATIONS

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INTRODUCTION & AIM

Background

Urban flooding poses a persistent environmental and socio-economic challenge in Ibadan North East LGA, Oyo State, Nigeria. The region suffers from drainage system collapse, unregulated river encroachment, and widespread building code violations all compounded by the limited use of GIS in urban planning.

Aim

To utilize GIS to analyze and manage drainage system collapse, river encroachment, and building code violations as contributors to urban flooding in Ibadan North East.

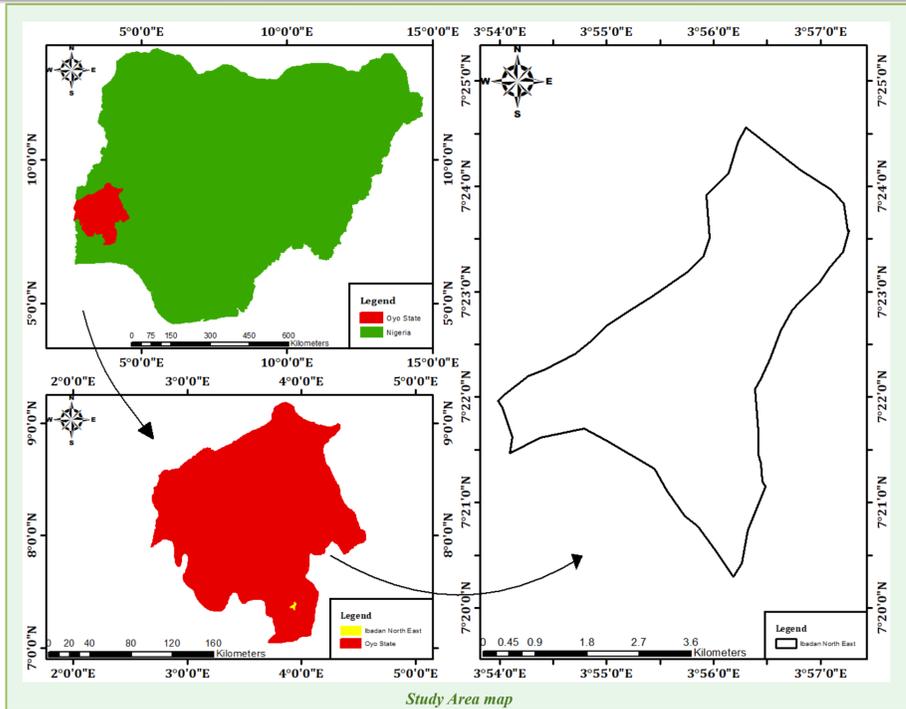
Objectives

- Assess spatial distribution and efficiency of existing drainage infrastructure
- Analyze spatial/temporal trends of river encroachment (2010–2025)
- Examine building code violation prevalence in flood-prone zones
- Develop a GIS-based framework for integrated flood risk management

Study Area

Ibadan North East LGA (~27 km²), bounded by Lagelu, Egbeda, Ibadan South East, and Ibadan North. Population: 400,000–500,000. Annual rainfall: 1,200–1,500 mm. Key flood-prone areas: Beere, Idi-Arere, Oke-Omi, Olomi, Bashorun.

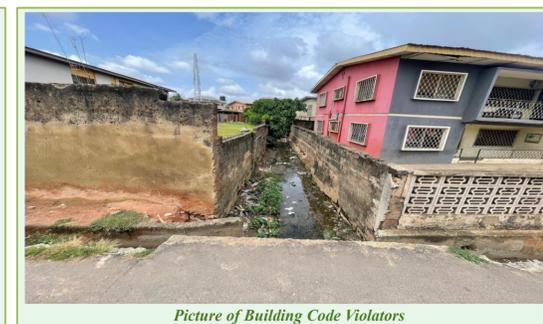
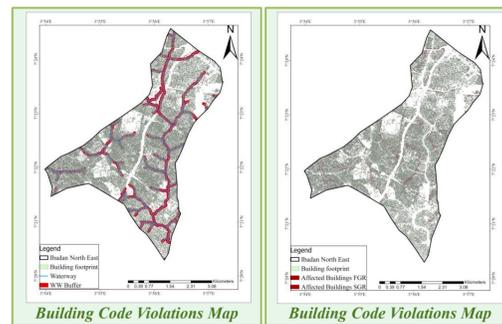
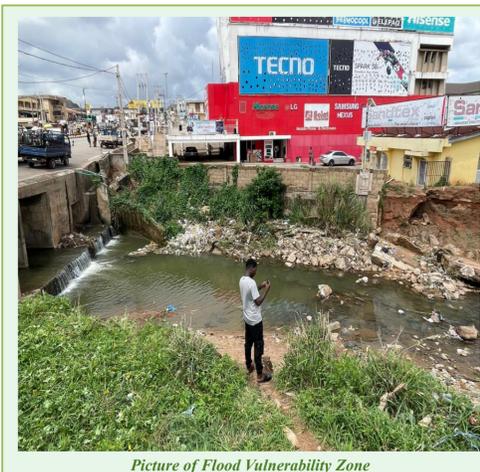
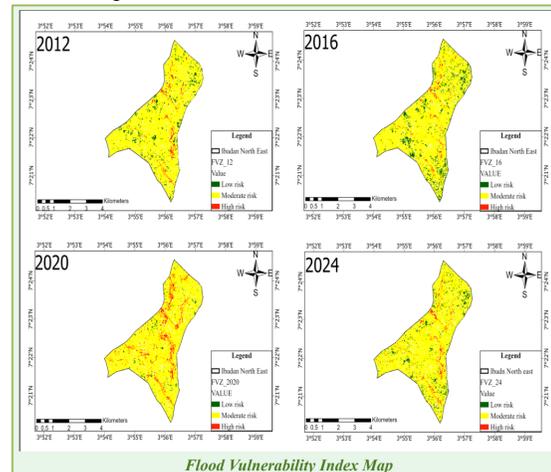
METHODOLOGY



RESULTS & DISCUSSION

Key Findings

- Ibadan North East features a dendritic drainage pattern; high flow accumulation in Beere, Idi-Arere, and Oke-Omi align with major flood hotspots
- 18% of all buildings violate official road/drainage setback buffers (51.3m federal, 34m state roads)
- LULC analysis: built-up area increased by >50% from 2012 to 2024; >60% of natural wet zones converted to residential/commercial use
- NDVI declined steadily 2012–2024; NDBI rose consistently, confirming rapid urban encroachment onto floodplains
- NDMI+NDBI overlay identified urban saturation zones — built-up areas with trapped moisture beneath impervious surfaces
- Flood Vulnerability Index: over 36% of all LGA buildings fall in moderate-to-high flood risk zones; highest risk in Beere, Olomi, Idi-Arere, and Oke-Omi
- Low slope zones (0–5°) dominate central/southern LGA — waterlogging risk; steep northern slopes cause erosion and downstream sedimentation



CONCLUSION

- Flooding in Ibadan North East is a spatially predictable and largely preventable hazard intensified by poor planning and governance failures
- GIS and remote sensing demonstrate clear value for integrating drainage analysis, encroachment monitoring, and code enforcement in a single framework
- Shift required: from reactive disaster recovery to proactive, data-driven urban planning
- Framework is replicable across similar urban environments in sub-Saharan Africa

FUTURE WORK / REFERENCES

Future Work

- Integrate real-time rainfall, climate projections and socio-economic vulnerability layers
- Develop early warning system using GIS & real-time monitoring
- Replicate framework across other Ibadan LGAs and Nigerian cities

Key References

Adelekan (2010); Ibitoye (2014, 2021); Olajuyigbe et al. (2012); Adefisan et al. (2015); Zha et al. (2003); Rouse et al. (1974); Gao (1996); Olanrewaju & Fadare (2020); UN-Habitat (2016); UNDRR (2020)