

Article

Post-Disaster Planning, Compound Climate–Displacement Vulnerability, and Urban Resilience Governance in Lagos, Nigeria: A Systematic Review

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Abstract

Lagos, Nigeria (population c.18.3–25 million), occupies a position of compound exposure at the intersection of accelerating climate hazards, recurring displacement and urban fragility, and governance constraints that have amplified rather than mitigated disaster risk. Conventional single-hazard planning paradigms have been demonstrably insufficient to address the structural drivers of this vulnerability, which emerge from the interaction among bio-physical exposure, colonial spatial legacies, post-independence governance deficits, and inequities within the global climate finance architecture. This article employs a structured, systematic literature review of 74 peer-reviewed, institutional and policy sources, conducted through a transparent three-stage protocol involving keyword-based Boolean searches of Scopus, Web of Science, Google Scholar, and the African Journals OnLine (AJOL) database, title–abstract screening, full-text eligibility assessment against pre-specified criteria, and thematic synthesis using a combined deductive–inductive coding framework, reported in accordance with the PRISMA 2020 guidelines. Thematic analysis yields four principal findings: Lagos’s flood and displacement cycles are products of structurally produced vulnerability; compound climate–displacement dynamics are systematically underestimated by single-hazard frameworks; nature-based solutions, community-led upgrading, and participatory governance show measurable effectiveness under enabling governance conditions; and transformative resilience approaches are constrained by political economy and land tenure dynamics. An original Integrated Urban Resilience Framework (IURF) incorporating five pillars is proposed and conceptually benchmarked against twelve comparable Global South frameworks. Post-disaster urban futures in rapidly urbanising megacities require technically rigorous, politically grounded, and ecologically integrated planning frameworks. The IURF offers a replicable conceptual scaffold for cities facing compound climate–displacement risk, subject to future empirical testing. Potential applications of the framework for state planning agencies, multilateral and bilateral funders, community organisations, and comparable West African coastal cities are specified, and the limitations of the review are set out in full.



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Keywords: post-disaster urbanism; disruptive planning; climate resilience; Lagos; Nigeria; flooding; informal settlements; displacement; land governance; systematic review; Global South; Integrated Urban Resilience Framework

1. Introduction

The convergence of rapid urbanisation, accelerating climate change, socioeconomic inequality, and recurring displacement is reshaping disaster risk landscapes across cities

of the Global South [1–3]. Sub-Saharan African cities face a particularly acute version of this convergence; they must absorb enormous demographic pressures while managing compound risk environments for which inherited planning systems, infrastructures, and governance architectures were never designed [1–3]. Lagos, Nigeria, represents a paradigmatic instance of this challenge, not merely as an extreme case, but as a city whose compound risk profile renders it analytically instructive for understanding the structural drivers of urban vulnerability more broadly. With a metropolitan population estimated to be between 18.3 and 25 million [4,5] and a contribution of approximately 25 percent to national GDP [6], Lagos is simultaneously a city of extraordinary economic vitality and one where approximately 60–70 percent of residents inhabit informal settlements characterised by inadequate drainage, tenuous land tenure, and chronic environmental hazard exposure [7–10]. The annual economic losses attributable to flood disasters are estimated at USD 900 million to USD 1.5 billion [5,7].

From a land-use and environmental planning perspective, Lagos's flood vulnerability is not merely a function of climate change acting on a passive urban landscape. It is, fundamentally, a product of decades of land-use decisions, namely, the destruction of mangrove belts and coastal wetlands that functioned as natural flood buffers; the occupation of flood-prone land through informal settlement expansion; the reclamation of lagoon areas for elite residential and commercial development; and the progressive sealing of permeable surfaces that accelerates surface runoff. These land-use and ecological processes are as central to flood risk as rainfall intensity or sea-level rise, and any resilience framework must engage with land governance as a material and political resource, not merely as an administrative background [11,12].

Research Questions: This article addresses three explicit research questions: (RQ1) What structural drivers, across physical, governance, and political economy dimensions, produce and reproduce compound flood–displacement vulnerability in Lagos? (RQ2) What evidence exists, from Lagos and analogous Global South contexts, for the effectiveness of disruptive, community-led, and ecologically grounded planning approaches? (RQ3) What operational framework architecture is required to integrate compound climate–displacement vulnerability, structural vulnerability reduction, and disruptive planning principles within a single replicable scaffold for rapidly urbanising megacities?

The article makes three principal scholarly contributions. First, it produces the first systematic literature review to explicitly integrate the studies of Lagos flood vulnerability, displacement–conflict, and planning governance studies within a unified analytical framework oriented towards land-use and territorial governance. Second, it proposes and conceptually benchmarks an original Integrated Urban Resilience Framework (IURF) against twelve comparable frameworks. Third, it advances transformative resilience theory by specifying the political economy and land governance conditions under which disruptive planning approaches are, and are not, likely to succeed.

2. Conceptual Framework: Post-Disaster Urban Futures, Disruptive Planning, and Land Governance

2.1. *Post-Disaster Urbanism: Beyond Linear Recovery*

The dominant framing of disaster in urban planning follows a linear cycle: preparedness, response, recovery, mitigation, implying a return to a pre-disaster 'normal' [13,14]. This model has been empirically destabilised by the realities of cities in the Global South, where compound, overlapping, and frequently recurrent hazards mean that there is no discrete post-disaster phase, only an ongoing condition of partial recovery and renewed exposure [15–19]. Post-disaster urban futures, as theorised in this article, refer to the forward-looking transformative horizon of what cities can become when they move be-

yond reactive crisis management towards structurally transformative approaches to risk, vulnerability, and recovery [20–24]. In Lagos, where the pre-disaster condition is itself one of widespread informality, infrastructural deficit, and tenure insecurity, recovery towards the status quo ante is not a meaningful goal; transformation of the underlying conditions that produce vulnerability is the only analytically defensible objective.

2.2. *Disruptive Planning: A Precise Conceptual Definition*

Disruptive planning is defined, for the purposes of this article, as an intentional planning practice that challenges and seeks to restructure the dominant political economic arrangements, land governance regimes, and institutional architectures through which urban vulnerability is produced and reproduced, rather than merely ameliorating vulnerability's symptoms within existing structural conditions. This definition distinguishes disruptive planning from adjacent concepts: (i) adaptive planning [25] adjusts spatial systems within existing governance frameworks; (ii) transformative planning [26] operates primarily at the level of policy discourse; (iii) insurgent planning [12] emphasises grass-roots resistance; (iv) participatory planning [27] and co-productive governance [28,29] are enabling conditions for, but not sufficient for, disruptive planning. Disruptive planning encompasses both institutional innovation within planning systems and community-led resistance outside them, treating the two as complementary modes.

Four principal modes of disruptive planning are relevant to the Lagos context: (i) radical incrementalism, which scales informal community-generated solutions into formal planning systems [30,31]; (ii) ecological urbanism, which treats natural systems, including wetlands, mangroves, and drainage corridors, as primary planning infrastructure [32,33]; (iii) conflict-sensitive design, which accounts for how spatial interventions can exacerbate or ameliorate social tensions and displacement risks [34,35]; and (iv) co-productive governance, which restructures the relationship between state planning institutions and community organisations [28,29].

2.3. *Transformative Resilience: From Equilibrium to Structural Change*

This article adopts a transformative resilience framework [36,37] that links resilience building to the reduction of structural vulnerabilities rooted in inequality, marginalisation, and inadequate governance. Meerow et al. [22] (p. 39) define urban resilience as “*the ability of an urban system to maintain or rapidly return to desired functions, to adapt to change, and to transform systems that limit current or future adaptive capacity,*” which provides the operational anchor for the IURF's performance indicators. Davoudi [38] and Shaw [39] caution against resilience discourses that naturalise existing social arrangements and mask political choices—a critique that the IURF explicitly addresses by foregrounding governance reform and community agency alongside technical interventions. The conceptual framework directly informs the coding and synthesis of the literature review by establishing five a priori thematic categories: hazard exposure; structural vulnerability drivers; governance responses; disruptive planning interventions; and resilience frameworks.

3. Materials and Methods

3.1. *Research Design*

This article employs a systematic literature review design, selected because the central analytical task of synthesising evidence on structural drivers of urban vulnerability, governance responses, and planning interventions in a complex, multi-hazard urban context requires a reproducible and transparent process of source identification, selection, and synthesis [40,41]. The review meets the methodological requirements of systematic reviews as specified by the Campbell Collaboration [42], namely, an explicit and repro-

ducible search strategy; transparent and pre-specified eligibility criteria; and structured, reproducible synthesis. The review is reported in accordance with the PRISMA 2020 guidelines, as outlined by Page and colleagues [43]. An important methodological limitation acknowledged at the outset is that all stages of screening, quality appraisal, and coding were conducted by a single researcher, introducing a risk of coding bias that is partially mitigated through transparent reporting of the full coding framework, eligibility criteria, and reasons for exclusion.

3.2. Search Strategy and Source Identification

Searches were conducted in Scopus, Web of Science, Google Scholar, and the African Journals OnLine (AJOL) database using four keyword clusters combined with Boolean operators. All four databases were accessed on 28 February 2026 (Scopus, <https://www.scopus.com>; Web of Science, <https://www.webofscience.com>; Google Scholar, <https://scholar.google.com>; African Journals OnLine, <https://www.ajol.info>). AJOL was included specifically to capture West African and sub-Saharan African scholarship not consistently indexed in the primary databases. Primary search strings: (Cluster 1: Lagos OR Nigeria OR “West Africa” OR “sub-Saharan Africa”) AND (Cluster 2: flood* OR “climate change” OR “sea level rise” OR “urban risk” OR “disaster risk”) AND (Cluster 3: “urban planning” OR “disruptive planning” OR “urban resilience” OR “informal settlement” OR “post-disaster”) AND (Cluster 4: “urban governance” OR “climate adaptation” OR “community-led” OR “participatory planning”). For Google Scholar, the first 100 results per string were screened; for AJOL, the first 50 results per string were screened. Searches were supplemented by forward and backward citation tracking from the 20 most relevant sources.

3.3. Eligibility Criteria

The inclusion and exclusion criteria applied at each stage of screening are summarised in Table 1.

Table 1. Systematic Review Eligibility Criteria.

Criterion	Inclusion	Exclusion
Thematic scope	Urban vulnerability, disaster risk, climate adaptation, urban planning, resilience, Lagos/Nigeria/West Africa/Global South megacities; land-use and territorial governance	Rural contexts; non-urban disaster settings; epidemiological studies without a spatial component
Source type	Peer-reviewed articles; institutional reports (UN, World Bank, IPCC); government policy documents; monitoring agency data	Opinion pieces without empirical basis; blog posts; unpublished theses unless cited in peer-reviewed sources
Language	English	Non-English sources (resource constraint acknowledged)
Geographic relevance	Lagos, Nigeria, West Africa, sub-Saharan Africa, or comparable Global South megacities	Global North cities without articulated comparative applicability
Analytical quality	Sources with identifiable methodology or evidence base assessed via modified MMAT	Sources lacking identifiable evidence base or methodology

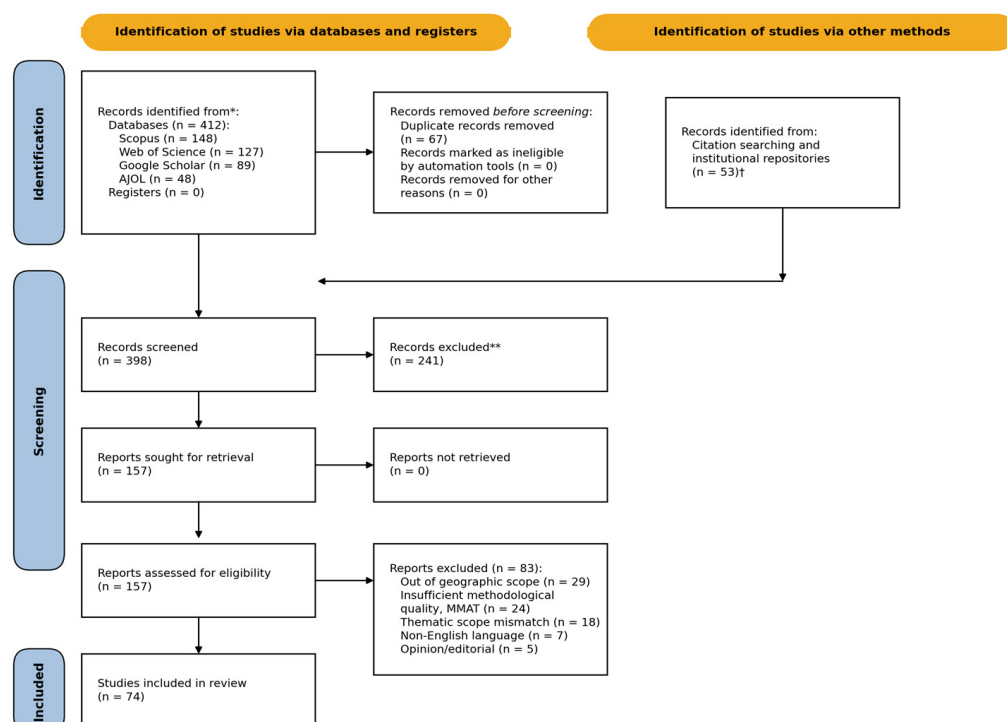
Note: Eligibility criteria were pre-specified before screening commenced. Peer-reviewed sources and grey literature were assessed using distinct MMAT criteria.

3.4. Screening Process and Quality Appraisal

The screening process followed three sequential stages: (1) title and abstract screening; (2) full-text screening applying all eligibility criteria; and (3) quality appraisal using a modified Mixed Methods Appraisal Tool (MMAT, version 2018) [44] adapted for heterogeneous source types. The following consistency assurance measures were adopted for single-

researcher process: (i) all eligibility and MMAT appraisal criteria were operationalised in a written decision protocol before screening commenced; (ii) a 10% random intra-rater consistency reassessment was conducted after a two-week interval; (iii) borderline decisions were documented with an explicit rationale; and (iv) the full coding framework and reasons for exclusion are provided in Supplementary Tables S1 and S2. The final corpus comprised 74 sources: 41 peer-reviewed journal articles; 12 institutional reports; 9 government policy and planning documents; 7 edited books or book chapters; and 5 NGO/civil society reports. Bibliographic records, screening decisions, and MMAT appraisal scores were managed in Microsoft Excel (Microsoft 365; Microsoft Corporation, Redmond, WA, USA), and thematic coding was conducted in NVivo (Release 1.7; Lumivero, Denver, CO, USA). No automation tools were used to exclude records. The full screening and inclusion pathway is summarised in Figure 1.

PRISMA 2020 flow diagram for new systematic reviews which included searches of databases, registers and other sources



*Consider, if feasible to do so, reporting the number of records identified from each database or register searched (rather than the total number across all databases/registers). **No automation tools were used; all exclusions were made by the reviewer. †Records identified via citation searching and institutional repositories (n = 53) were pooled with the database records (n = 412, total n = 465) before deduplication, and therefore enter the single screening pathway shown.

Figure 1. PRISMA 2020 flow diagram of study identification, screening, and inclusion, reported in accordance with the PRISMA 2020 statement (reporting template of Page et al. [43]).

Searches were conducted in February 2026. Databases: Web of Science, Scopus, Google Scholar, and AJOL. Grey literature: World Bank, UN-Habitat, IPCC, UNDRR, and Lagos State Government repositories. The review was reported in accordance with Page et al. [43].

3.5. Thematic Synthesis

Thematic synthesis proceeded through three stages following Thomas and Harden's [45] approach: (1) line-by-line inductive coding; (2) grouping codes into descriptive themes; (3) generation of analytical themes through interpretive synthesis. Five a priori categories functioned as organising categories: hazard exposure; structural vulnerability drivers; governance responses; disruptive planning interventions; and resilience frameworks. Thematic saturation was assessed qualitatively; no substantively new themes emerged after approximately the 60th source.

3.6. Framework Development and Conceptual Benchmarking

The IURF was developed through a structured two-stage process. Stage 1 (framework synthesis) generated the five pillars from thematic analysis findings, grounded in theoretical frameworks and structured around the performance indicator logic of the Sendai Framework for Disaster Risk Reduction [46]. Stage 2 (conceptual benchmarking) compared the IURF with 12 resilience frameworks from comparable Global South cities, evaluating them against four criteria: theoretical coherence; empirical grounding; institutional feasibility; and equity orientation. This process constitutes conceptual benchmarking, not empirical validation.

4. Climate Crisis, Land-Use Change, and Urban Vulnerability in Sub-Saharan Africa

Sub-Saharan Africa is the region most disproportionately affected by climate change relative to its historical contribution to global greenhouse gas emissions [3,47]. The IPCC Sixth Assessment Report projects increased frequency and severity of extreme weather events [3,48]. Africa's urban population is projected to exceed 1.5 billion by 2050, with most growth concentrated in informal settlements [49,50]. West Africa is a particularly acute hotspot: the West African Monsoon system is projected to intensify at its seasonal peaks [51,52], and sea-level rise along the Gulf of Guinea coast poses severe long-term threats to coastal urban infrastructure [53,54].

Critically, the climate vulnerability of sub-Saharan African cities is deeply intertwined with land-use change and ecological degradation. Urban expansion has consumed peri-urban agricultural land and wetlands at unprecedented rates, destroying the ecosystem services that historically buffered urban communities against climate extremes [55,56]. In coastal West African cities, the destruction of the mangrove belt has eliminated natural coastal protection, increasing exposure to storm surge and sea-level rise. Table 2 situates Lagos within a comparative framework of West African coastal cities, with compound risk scores incorporating land system change as an explicit dimension.

Table 2. Comparative Climate Vulnerability Profile—Selected West African Coastal Cities.

City/Country	Pop. (M)	Flood Risk	SLR	Inform. (%)	Land-Use Change	Adapt. Cap.	Risk Score
Lagos, Nigeria	15.3–21	V. High (0.87)	High	60–70%	Severe wetland/mangrove loss	Med–Low	8.4/10
Accra, Ghana	3.4	High (0.71)	Medium	~45%	High peri-urban sprawl	Medium	6.9/10
Abidjan, Côte d'Ivoire	5.3	High (0.74)	Med–High	~55%	Lagoon reclamation	Medium	7.2/10
Cotonou, Benin	0.8	V. High (0.82)	V. High	~65%	Severe coastal erosion	Low	8.1/10
Dakar, Senegal	3.7	Med–High (0.65)	High	~50%	Dune/wetland loss	Med–High	6.5/10

SLR = sea-level rise. Compound risk score: weighted composite of flood exposure, SLR trajectory, informality rate (inverse), land-use change severity, and adaptive capacity. Sources: [17,48,49,53,55]. See Supplementary Materials, Figure S5, for spatial representation.

5. Lagos as a Case Study: Geography, Land Systems, and Socioeconomic Context

5.1. Geographic Setting and Land-Use Dynamics

Lagos occupies a uniquely precarious geographic position on the southwestern coast of Nigeria, straddling a complex of barrier islands, lagoons, creeks, and the low-lying coastal plain along the Bight of Benin [57,58]. Approximately 40 percent of Lagos's land

area lies less than two metres above sea level [53]. Mangrove cover has declined by over 60 percent since 1975 [56]; wetlands have been sand-filled for residential and commercial development; and the Lagos Lagoon shoreline has been progressively reclaimed for elite waterfront projects, including Eko Atlantic on Victoria Island. These processes are direct causes of flood risk, eliminating natural flood storage capacity, accelerating coastal erosion, and increasing hydraulic pressure on formal drainage systems [54]. See Supplementary Materials, Figure S3 for a schematic map of Lagos’s topographic exposure and flood-prone zones.

5.2. Demographic and Socioeconomic Characteristics

Lagos is Nigeria’s most populous metropolitan area, with a 2023 provisional census population of approximately 18.3 million [4], while estimates accounting for peri-urban growth range up to 25 million [5,59]. Informal settlements—most notably Makoko, a waterside community of approximately 250,000 residents built on stilts over the Lagos Lagoon—house an estimated 60–70 percent of the metropolitan population [10,60,61]. Table 3 presents key socioeconomic and infrastructure indicators.

Table 3. Key Socioeconomic and Infrastructure Indicators—Lagos Metropolitan Area.

Indicator	Lagos (2022/23)	Nigeria National Average
Population (metropolitan)	15.3–21.0 million	218 million (national)
Urban population below poverty line	~38%	~40%
Informal settlement residents (%)	~60–70%	~50%
Access to piped water (%)	~29%	~19%
Access to adequate sanitation (%)	~34%	~28%
Flood-prone land area (% of metro)	~40%	N/A
Formal unemployment rate	~14.8%	~33.3%
Annual climate disaster economic loss (avg.)	USD 900 M–1.5 B	N/A
Literacy rate (%)	~92%	~62%

Sources: NPC (2023); World Bank (2021); Lagos State Development Plan 2022–2025; UN-Habitat (2022). N/A = not applicable at the national level.

5.3. Empirical Experience from the Lagos Case Study

The analytical claims of this review are anchored in the documented empirical record of the Lagos case study. Between 2000 and 2004 and 2019–2022, recorded flood events rose from an average of 5.4 to 22.2 per year, while estimated annual economic losses grew from USD 139 million to approximately USD 1.23 billion, with the 2012 floods, amplified by emergency releases from the upstream Ogun dam, constituting the most severe single episode [62–64]. These aggregate trends materialised in specific, well-documented events. The 2012 demolition of the Makoko waterfront displaced an estimated 30,000 residents within 72 h [61,65]; the 2016–2017 Otodo Gbame evictions destroyed a waterside community of comparable size, including many households that had previously been displaced by flooding [66,67]. Together, these episodes demonstrate empirically that flood hazard and displacement operate in Lagos as a single compound dynamic rather than as separate risks.

The case study record equally documents community-generated adaptation. SERAC-supported participatory enumerations in Makoko and Otodo Gbame produced the evidentiary base used to contest eviction and to negotiate tenure regularisation [61,66]; the Makoko Floating School prototyped amphibious, flood-adaptive construction rooted in local building practice [68]; and LASEMA annual reporting provides an emerging official record of event frequency and response performance [69]. These empirical experiences of

loss, contestation, and improvisation directly inform the design of the IURF: the centrality of tenure security (Pillar II), the requirement for conflict-sensitive governance (Pillar III), and the positioning of community organisations as primary planning actors rather than consultees.

6. Results I: Flood Hazard, Exposure, Vulnerability, and Adaptive Capacity in Lagos

6.1. Conceptual Distinctions

Analytical clarity requires distinguishing among four components of disaster risk: flood hazard (physical properties of flood events); exposure (presence of people and assets in hazard zones); vulnerability (susceptibility of exposed elements to harm, conditioned by social and political factors); and adaptive capacity (ability to anticipate, respond to, and recover from flood events) [22,48].

6.2. Structural Architecture of Flood Vulnerability

Thematic analysis of the flood literature ($n = 24$ sources) identifies six interacting structural determinants [7,62,63]: (1) topographic and hydrological exposure, ~40 percent of land below 2 m ASL [54,70]; (2) land-use-driven ecological degradation, loss of wetland and mangrove cover [56,71]; (3) drainage infrastructure deficits, with the World Bank estimating a USD 2.5 billion rehabilitation gap [5,72,73]; (4) informal settlement location on flood-prone land, itself a product of constrained housing markets and planning exclusion [9,60,61]; (5) governance fragmentation, overlapping jurisdictions and accountability gaps [74,75]; and (6) climate change forcing, increasing intensity and variability of West African Monsoon precipitation [3,51,52]. The resulting trend in recorded flood frequency and estimated economic losses is shown in Figure 2.

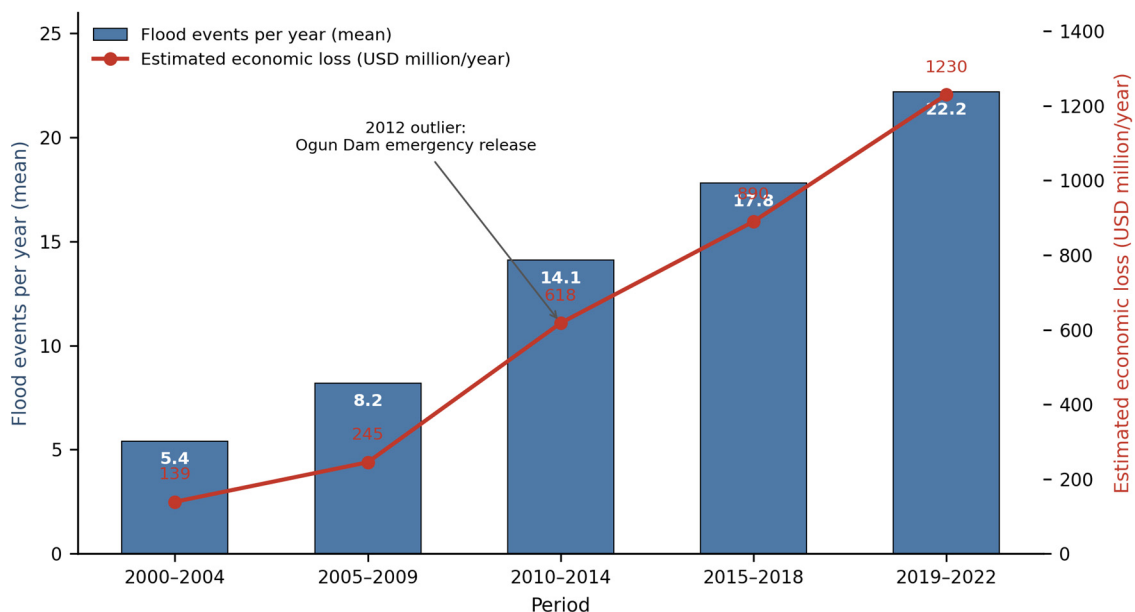


Figure 2. Flood event frequency and estimated economic losses, Lagos metropolitan area, 2000–2022. Bars show the mean number of recorded flood events per year (left axis) and the line shows estimated mean annual economic losses (right axis). The arrow identifies the 2010–2014 period, in which losses were inflated by the 2012 flood event attributable to emergency water releases from the upstream Ogun Dam. Sources: [5,64,69] and the EM-DAT Global Disaster Database. Values for 2000–2012 are as reported by NEMA and EM-DAT; values for 2013–2022 are the author’s synthesis of LASEMA annual reports and are indicative. Economic losses are order-of-magnitude estimates rather than precise measurements.

6.3. Differential Vulnerability and Social Dimensions of Adaptive Capacity

The distribution of flood risk and adaptive capacity is profoundly unequal. Women, children, elderly residents, and persons with disabilities face disproportionately severe flood impacts across four dimensions: evacuation capacity; asset loss; health outcomes; and recovery duration [76,77]. Sea-level rise projections of 0.3–1.2 metres by 2100 under moderate to high emissions scenarios [53,78] imply that between 1.2 and 4.8 million additional residents could face inundation risk by mid-century. Figure 3 sets this exposure against the trajectory of metropolitan population growth and informal settlement expansion.

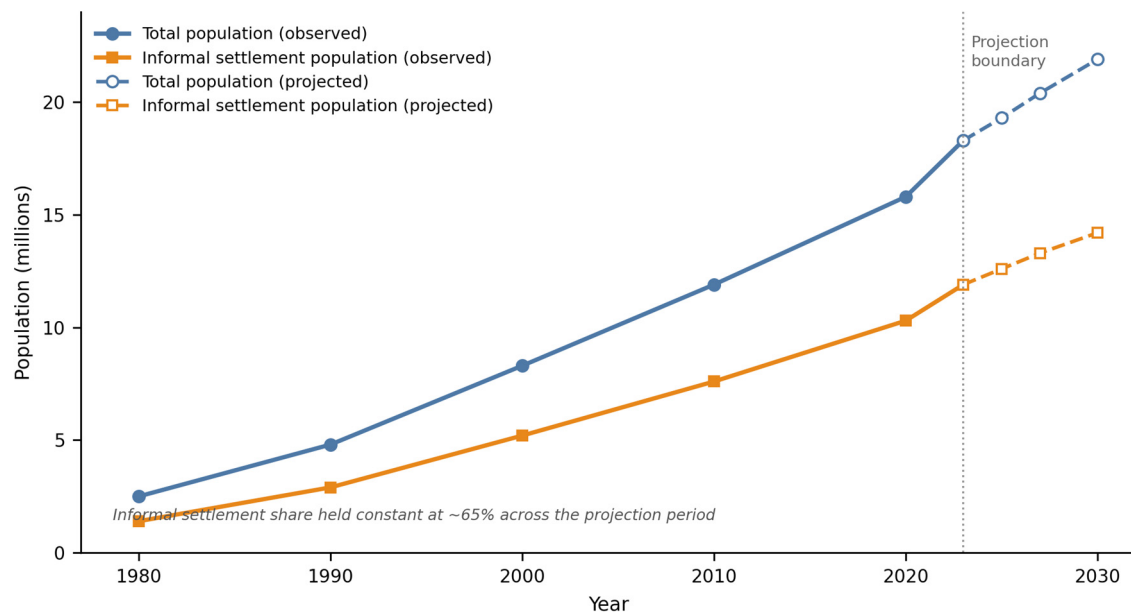


Figure 3. Lagos metropolitan population growth and informal settlement expansion, 1980–2030. Solid lines show observed estimates and dashed lines show projected values beyond 2023, separated by the dotted projection boundary. Sources: [4,31,49,59]; author’s projections. Projections assume a 2.8% compound annual growth rate derived from the 2006–2022 trend, with the informal settlement share held constant at 65% [49]; the actual future proportion is subject to policy intervention.

7. Results II: Displacement, Urban Fragility, and the Typology of Conflict in Lagos

7.1. Defining Conflict in the Lagos Context

Following Muggah [35] and Bollens [34], four types of urban conflict are distinguished: (i) land conflict; (ii) displacement violence; (iii) social fragmentation; and (iv) climate-induced migration. All four types are present in Lagos and interact in complex ways.

7.2. The Compound Climate–Displacement Dynamic

The thematic analysis of the displacement-fragility literature ($n = 18$ sources) supports the characterisation of Lagos’s vulnerability as compound. The case for climate–displacement interaction [79,80] is operationalised through three mechanisms: resource competition intensified by climate-induced asset destruction; governance delegitimation triggered by inadequate disaster response; and displacement-induced community fragmentation [58,61,81]. Claims about mechanisms derive from secondary literature synthesis; direct primary evidence of climate–conflict causal pathways in Lagos specifically is limited.

7.3. Forced Evictions, Land Tenure, and the Displacement–Climate Nexus

The demolition of Makoko waterfront communities in 2012, displacing an estimated 30,000 residents within 72 h [61,65], and the Otodo Gbame evictions of 2016–2017, which

destroyed a waterfront community of approximately 30,000 residents, including many climate migrants [66,67], exemplify what critical urban scholars term the ‘violence of planning’ [61]. The spatial logic of such evictions consistently relocates the most climate-vulnerable residents to sites of renewed vulnerability [81,82]. See Supplementary Materials, Figure S4, for a spatial map of major informal settlements and eviction sites. Figure 4 summarises the resulting multi-hazard risk profile across selected local government areas.

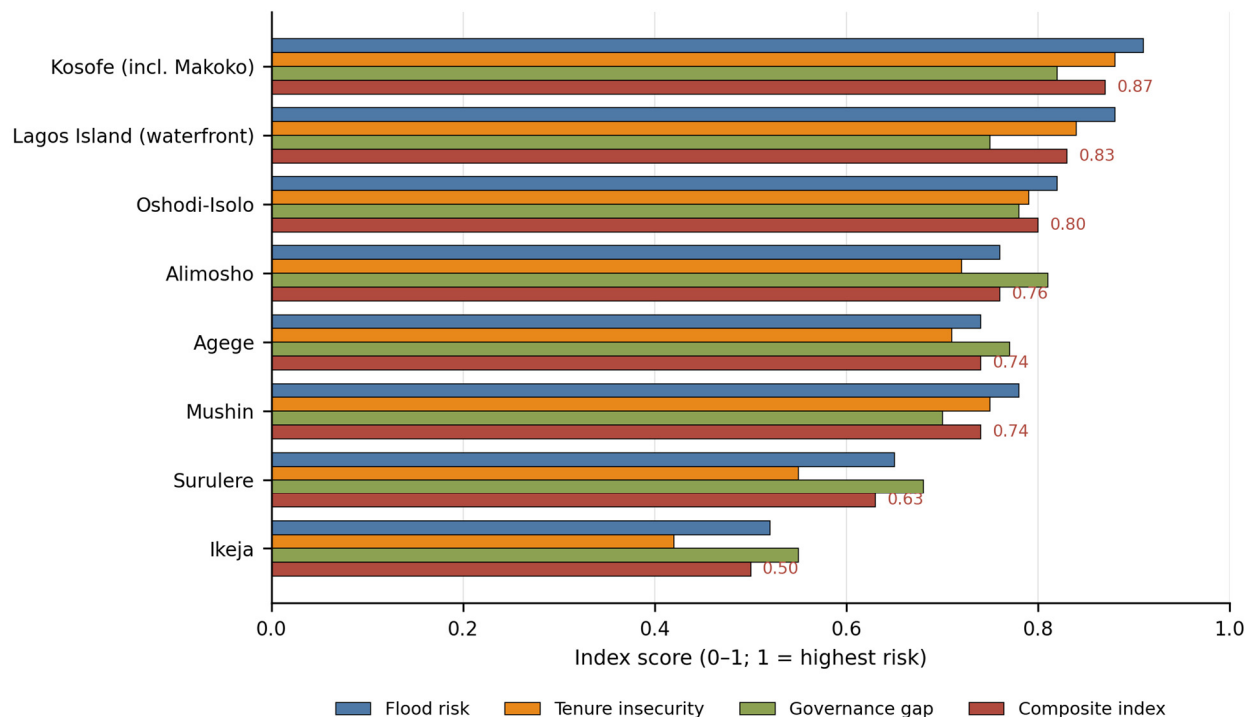


Figure 4. Multi-hazard risk index by selected Lagos local government areas. The composite index is the normalised average of the flood exposure, sea-level-rise vulnerability, governance gap, and tenure insecurity indices (scale 0–1, where 1 denotes the highest risk); values are labelled for the composite index only. Sources: [8,55]; author’s synthesis of the geospatial and governance literature. Risk scores are indicative comparative estimates rather than authoritative measurements, and local government area boundaries are approximate. See Supplementary Materials, Figure S4, for the spatial map.

8. Results III: Current Planning and Governance Responses—A Differentiated Institutional Assessment

8.1. The Formal Planning Architecture

The formal planning framework for Lagos comprises layered and frequently contradictory instruments: the Lagos State Urban and Regional Planning and Development Law (2010) [83]; the Lagos State Climate Change Policy (2012) [84]; and the Lagos State Flood Management Plan (2019) [85]. At the federal level, NEMA provides post-disaster response coordination; the World Bank-funded LMDGP has directed development finance towards drainage infrastructure. Ayorinde et al. [75] document that fewer than 30 percent of Lagos’s land area is covered by up-to-date development plans, and enforcement of development control is severely uneven.

8.2. Critical Evaluation of Governance Mechanisms

Table 4 evaluates the principal disaster risk governance mechanisms currently operating in Lagos against their documented achievements, critical failures, land governance implications, and reform priority.

Table 4. Critical Evaluation of Current Disaster Risk Governance Mechanisms—Lagos.

Mechanism	Approach	Key Achievements	Critical Failures	Land Governance Dimension	Reform Priority
Lagos Flood Management Plan (2019)	Technocratic/top-down	Hazard mapping; drainage masterplan	Non-participatory; enforcement absent	No wetland protection or tenure provisions	High
Lagos Climate Change Policy (2012)	Policy/regulatory	First subnational climate policy in West Africa	Siloed from spatial planning; weak implementation	No land-use integration mechanisms	High
LASPPDA Dev. Control	Regulatory	Formal control in core areas	Selective enforcement; permits wetland destruction	Captured by development interests	Very High
NEMA Disaster Response	Emergency/reactive	Post-flood relief coordination	Reactive only; no preventive capacity	No land tenure or resettlement mandate	Medium
World Bank LMDGP	Development finance	Drainage infrastructure investment	Top-down; uneven resettlement safeguards	Involuntary resettlement documented in some components	Medium
Community DRR (NGO-led)	Bottom-up/hybrid	Early warning; participatory enumeration	Fragmented; not integrated with state systems	Tenure advocacy central; produces regularisation evidence	High
Lagos Ocean Front Project	Megaproject/engineering	Coastal protection intent	Contested; displacement risk; inadequate EIA	Accelerates elite waterfront consolidation	Very High

Sources: [6,61,66,75,83,84]; author's assessment.

The cross-cutting pattern is that technocratic and engineering-focused approaches consistently fail to generate community trust or equitable outcomes, whereas community-based approaches demonstrate local effectiveness but lack the institutional integration and resources required for scale.

9. Disruptive Planning Approaches: Evidence, Conditions, and Transferability Constraints

9.1. Ecological Urbanism and Nature-Based Solutions

Three bodies of comparative evidence support the case for ecological urbanism in Lagos. First, Narayan et al. [86] demonstrate that mangroves reduce wave energy by an average of 70 percent across 20 global study sites. Given that Lagos's historic mangrove belt has been reduced by over 60 percent since 1975 [56], targeted restoration represents a measurable near-term intervention. Second, urban wetland parks in comparable high-density contexts, including Rotterdam, Singapore, and Medellín, demonstrate city-scale flood-buffering potential [87]. Third, assessment of green infrastructure across Lagos residential neighbourhoods finds its quality to be rated poor by residents and links that deficit to the leading environmental sustainability challenges facing the metropolitan area, indicating considerable scope for restoration [88].

Transferability conditions: Nature-based solutions require: (i) land availability; (ii) tenure security to prevent 'green gentrification' displacement; (iii) maintenance governance; and (iv) community acceptance. These conditions are treated as prerequisites in the IURF, not assumed outcomes.

9.2. Radical Incrementalism and Community-Led Upgrading

Slum Dwellers International's federated approach, documented in 337 cities across 43 countries [28], demonstrates that participatory enumeration, savings-based financing, and community-managed construction yield more equitable and durable upgrading outcomes than top-down clearance and resettlement [31]. In Lagos, SERAC's participatory enumerations have been used to negotiate with state agencies and to build the evidentiary base for tenure regularisation [60,61].

9.3. Conflict-Sensitive Design and Social Cohesion Infrastructure

Evidence from post-conflict urban contexts [34,35,89] demonstrates that spatial interventions designed with explicit attention to inter-group dynamics produce measurably better social cohesion outcomes. Applied to Lagos, conflict-sensitive design principles generate three intervention priorities: public spaces designed as socially mixed interfaces; infrastructure investment distributed with explicit equity mapping; and resettlement programmes with conflict-sensitive consultation and compensation protocols [81,82].

9.4. Digital Innovation: Enabler, Not Substitute

Community-based early warning systems leveraging mobile phone networks have demonstrated promising results in comparable high-density informal settlement contexts [69,90,91]. However, the review identifies consistent evidence that enthusiasm for digital solutions can displace attention from the governance and political reforms that are the structural prerequisites for transformative resilience [38,39]. Digital tools are positioned in the IURF as multipliers of governance reform rather than substitutes for it.

10. The Integrated Urban Resilience Framework: Proposal and Conceptual Benchmarking

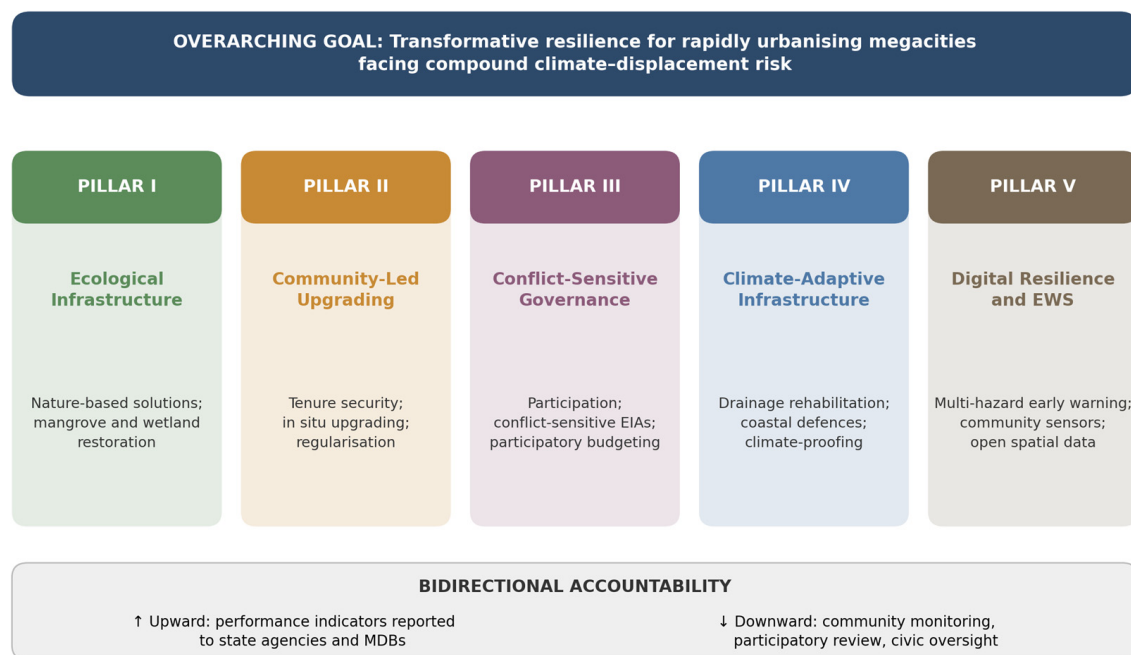
10.1. IURF Design Principles, Nature, and Scope of Claims

Important caveat: The IURF is a conceptual framework derived from thematic synthesis of secondary literature and comparative analysis. It has not been empirically tested through expert evaluation, Delphi consultation, stakeholder review, or operational application. It is presented as a structured conceptual proposal grounded in the reviewed evidence, not as a validated planning tool. Future empirical testing, participatory validation with Lagos-based community organisations, and adaptation to specific implementation contexts are prerequisites for operational application.

The IURF is distinguished from existing resilience frameworks by three design features: (i) it is compound, integrating climate, displacement-fragility, land governance, and governance dimensions into a single analytical scaffold; (ii) it is structurally grounded, with each pillar explicitly linked to the structural vulnerability drivers identified in the thematic analysis; and (iii) it is bidirectionally accountable, operating upward to state and international funders and downward to communities as primary stakeholders. The resulting five-pillar architecture is presented in Figure 5.

10.2. Operational Framework: Pillars, Indicators, Actors, and Trade-Offs

Table 5 sets out the operational architecture of the IURF, specifying for each pillar the structural driver addressed, the priority interventions, the key actors, the performance indicators, and the principal trade-offs and implementation barriers.



UNDERPINNING THEORY: Sendai Framework for Disaster Risk Reduction; transformative resilience theory; and urban resilience theory

Figure 5. The Integrated Urban Resilience Framework (IURF): five-pillar architecture. The upward and downward arrows in the accountability panel denote, respectively, performance reporting to state agencies and multilateral development banks, and community monitoring and civic oversight. The framework is underpinned by the Sendai Framework for Disaster Risk Reduction [46], transformative resilience theory [36,37], and urban resilience theory [22]. The IURF is a conceptual framework derived from thematic synthesis of secondary literature; it has not been empirically tested through expert evaluation, Delphi consultation, stakeholder review, or operational application.

Table 5. Integrated Urban Resilience Framework (IURF)—Five Pillars, Indicators, Actors, and Implementation Barriers.

Pillar	Structural Driver	Priority Interventions	Key Actors	Performance Indicators	Trade-Offs	Barriers
I. Ecological Infrastructure	Ecological degradation; wetland loss; coastal exposure	Mangrove restoration (Lekki, Badagry); urban wetland parks; bioswale drainage	LSEG; NESREA; NGOs; Communities	Mangrove cover (ha); flood peak reduction (%); biodiversity index; green space/capita (m ²)	Land for restoration may conflict with housing need; green displacement risk	Land availability; development interests; maintenance governance
II. Community-Led Upgrading	Informality; tenure insecurity; service exclusion	Participatory enumeration; in situ upgrading; tenure regularisation; community land trusts	Communities; SERAC; SDI; LASPPDA; World Bank	HH with tenure security (%); settlements upgraded (no.); evictions prevented (no.)	Regularisation may increase land values and displace non-regularised residents	Political resistance; resource constraints; governance coordination
III. Conflict-Sensitive Governance	Governance fragmentation; displacement violence	Community resilience committees; conflict-sensitive EIAs; participatory budgeting	Lagos State Govt; civil society; traditional institutions	Community representation in planning (%); displacement incidents (no.); gender equity index	Participation requires time; tension with speed of climate action	Short-termist electoral incentives; institutional inertia

Table 5. Cont.

Pillar	Structural Driver	Priority Interventions	Key Actors	Performance Indicators	Trade-Offs	Barriers
IV. Climate-Adaptive Infrastructure	Drainage deficit; infrastructure underinvestment	Drainage rehabilitation; elevated roads; flood-resilient public buildings; coastal defences	Lagos State Govt; Federal Ministry; MDBs	Drainage coverage (%); infrastructure climate-proofed (%); flood duration reduction; losses avoided (USD)	Hard infrastructure may not benefit informal communities equally	USD 2.5 bn + fiscal gap; technical capacity; land acquisition
V. Digital Resilience and EWS	Inadequate data; poor early warning; low community trust	Multi-hazard EWS; community flood sensors; SMS/app alert platforms; open spatial data	LASEMA; NIMET; telecoms; tech NGOs; communities	EWS coverage (%); alert lead time (hrs); community trust score; digital inclusion rate (%)	Surveillance risk; digital exclusion of most vulnerable	Digital literacy gaps; power unreliability; governance of community data

Sources: IURF pillars derived from thematic synthesis; performance indicators adapted from [22,46]. Acronyms: LSEG = Lagos State Environment Guard; NESREA = National Environmental Standards Enforcement Agency; LASPPDA = Lagos State Physical Planning and Development Authority; SDI = Slum Dwellers International; SERAC = Social and Economic Rights Action Centre; LASEMA = Lagos State Emergency Management Agency; NIMET = Nigerian Meteorological Agency; MDBs = Multilateral Development Banks.

10.3. Comparative Conceptual Benchmarking Matrix

Table 6 benchmarks the IURF against eight representative comparators from the twelve assessed. Scores (L/M/MH/H) are qualitative assessments based on a single researcher's review of published framework documentation. See Supplementary Materials, Figure S6 for the spatial distribution of all comparator cities.

Table 6. IURF Comparative Conceptual Benchmarking Matrix—Selected Global South Resilience Frameworks.

Framework/City	Scope	TC	EG	IF	EO	IURF Lessons Incorporated
IURF–Lagos (proposed)	Climate + displacement + land governance	H	MH	M	H	All criteria addressed by design; IF limited by Lagos governance environment
Medellín Urban Acupuncture (Colombia)	Social cohesion + spatial upgrading	H	H	H	H	Conflict-sensitive design; community-led upgrading (Pillars II, III)
Kampala Resilience Strategy (Uganda)	Flood + urban growth	M	M	M	M	Nature-based solutions integration (Pillar I)
Dhaka Climate Adaptation (Bangladesh)	Flood + informality	H	M	L	M	EWS design; drainage investment logic (Pillars IV, V)
Accra Green Infrastructure Initiative	Ecological infrastructure	M	M	M	L	Mangrove/wetland restoration targets (Pillar I)
Durban MCPP (South Africa)	Multi-hazard + co-production	H	H	H	H	Governance architecture; co-production model (Pillar III)

Table 6. *Cont.*

Framework/City	Scope	TC	EG	IF	EO	IURF Lessons Incorporated
100RC–Bangkok (Thailand)	Infrastructure + governance	M	M	H	L	Infrastructure climate-proofing methodology (Pillar IV)
Nairobi KISIP (World Bank)	Tenure + infrastructure	M	H	H	M	Tenure regularisation mechanism design (Pillar II)

TC = Theoretical Coherence; EG = Empirical Grounding; IF = Institutional Feasibility; EO = Equity Orientation. Scores: L = Low; M = Medium; MH = Medium-High; H = High. Assessment based on published framework documentation; author’s synthesis. Benchmarking constitutes conceptual comparative assessment, not empirical validation.

10.4. Implementation Pathway and Investment Gap Analysis

The political economy of implementing the IURF in Lagos is complex. The World Bank [5] estimates that every dollar invested in disaster risk reduction in Lagos yields between three and eleven dollars in avoided disaster losses. Figure 6 disaggregates the estimated investment requirement and the committed funding gap by IURF pillar.

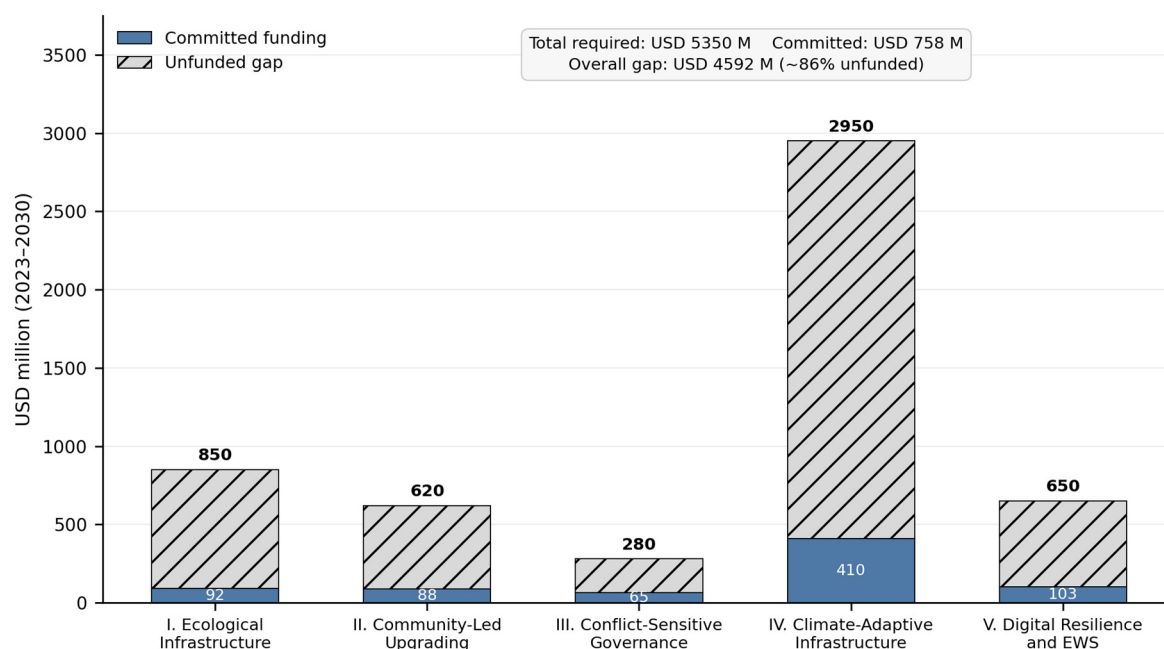


Figure 6. Estimated resilience investment requirement and committed funding gap by IURF pillar, Lagos, 2023–2030. Solid segments show committed funding and hatched segments the unfunded gap; values above each bar give the total estimated requirement in USD million. Sources: [5,6,92]; author’s estimates. Required figures are order-of-magnitude estimates extrapolated from World Bank rehabilitation gap assessments and scaled to the IURF pillars; committed figures reflect confirmed multilateral, bilateral, and state-level allocations as at 2024.

International climate finance, including the Green Climate Fund and the Adaptation Fund, represents a substantive but underutilised resource [93–95]. Structural reforms to the accessibility of climate finance for subnational urban governments are prerequisites for closing this gap.

11. Discussion

11.1. Findings in Relation to the Research Questions

Addressing RQ1 (structural drivers of compound vulnerability): Lagos's flood–displacement cycles arise from the interaction among three sets of structural drivers. Bio-physical drivers, including coastal topography, monsoon precipitation, and sea-level rise, establish the hazard baseline. Land-use and ecological drivers, including wetland destruction, drainage deficit, and soil sealing, amplify hazard into exposure and eliminate natural adaptive buffers. Governance and political economy drivers, such as tenure insecurity, planning exclusion, and speculative land development, determine who bears vulnerability and constrain adaptive capacity [7,15].

Addressing RQ2 (evidence for disruptive planning approaches): Nature-based solutions, community-led upgrading, conflict-sensitive design, and participatory governance demonstrate measurable effectiveness in comparative contexts, but only when enabling governance conditions encompassing security of tenure, freedom from forced eviction, and channels for community voice are in place.

Addressing RQ3 (operational framework architecture): The IURF addresses the integration requirement by structuring it around five pillars grounded in the causal mechanisms identified in RQ1 and the evidence base identified in RQ2, with explicit attention to the land governance dimension that distinguishes the IURF from most existing frameworks.

11.2. Land Governance as the Central Variable

The theoretical contribution of this analysis that warrants the greatest emphasis is the centrality of land governance, specifically, land as a material and political resource, to both the production of vulnerability and the conditions for its reduction. Flood resilience in Lagos is fundamentally a question of who controls land, who bears flood risk, who benefits from infrastructure investment, and who is displaced by adaptation projects [96]. The risk that well-intentioned resilience interventions will generate 'green displacement' that reconstitutes vulnerability in new locations is a central political economy dynamic addressed through the tenure security and conflict-sensitive governance pillars of the IURF. This conclusion is grounded in the empirical experience of the case study: as documented in Section 5.3, the Makoko and Otodo Gbame episodes show that flood vulnerability and displacement in Lagos were produced by the same land governance decisions [61,65,66].

11.3. Analytical Tensions in Post-Disaster Urban Futures

Three analytical tensions require explicit acknowledgement. (i) The speed–participation trade-off: climate acceleration creates genuine tension with the time requirements of substantive community participation. SDI's experience across 337 cities [28,31] suggests this is partially resolvable through investment in pre-established community organisational infrastructure. (ii) The local distinctiveness–scalability problem: the IURF addresses this through an indicator-based rather than prescriptive design. (iii) The temporal mismatch between transformative resilience timelines and political cycles: institutional infrastructure is essential for sustaining implementation across political transitions [23,92].

11.4. Implications for Theory and Practice

For transformative resilience theory, this analysis demonstrates the need to integrate political economy and land governance analysis more explicitly into implementation frameworks [36,37]. For planning practice in rapidly urbanising African cities, the IURF offers a replicable conceptual scaffold, subject to empirical testing and participatory validation. Within the international climate finance architecture, the investment gap analysis indicates that current funding commitments represent approximately 14 percent of estimated needs,

a shortfall that requires structural reforms to improve the accessibility of climate finance for subnational urban governments [94,95].

11.5. Potential Applications

Although the IURF awaits empirical validation, four concrete application pathways follow from the analysis. First, for Lagos State planning and emergency agencies (LASP-PDA, LASEMA), the pillar–indicator structure can serve as a diagnostic and monitoring instrument, enabling joint screening of flood risk and displacement considerations in development control and drainage investment decisions. Second, for multilateral and bilateral funders, the investment gap analysis (Figure 6) and the pillar architecture offer a prioritisation template for structuring climate finance proposals, including Green Climate Fund and Adaptation Fund submissions, with a focus on structural vulnerability reduction rather than infrastructure delivery alone [94,95]. Third, for community organisations and federations such as SERAC and SDI affiliates, the downward accountability indicators provide a structured basis for community monitoring of resilience commitments and for evidence-based negotiation over tenure regularisation [28,60]. Fourth, beyond Lagos, the framework is transferable, with contextual adaptation, to the West African coastal cities profiled in Table 2 such as Accra, Abidjan, Cotonou, and Dakar, which share compound flood–displacement risk profiles and comparable land governance constraints. In each application, the caveats specified in Section 10.1 apply: the framework is a structured conceptual scaffold, and participatory validation is a precondition for operational deployment.

12. Conclusions

This article has produced a structured, systematic review of post-disaster urban vulnerability, governance responses, and resilience frameworks in Lagos, Nigeria, yielding four principal findings. First, Lagos’s disaster cycles are products of structurally produced vulnerability arising from the interaction of biophysical exposure, land-system change, governance deficits, and political-economic inequalities. Second, compound climate–displacement vulnerabilities generate risk dynamics that exceed the analytical and operational capacity of single-hazard frameworks. Third, comparative evidence from the Global South identifies ecological urbanism, community-led upgrading, conflict-sensitive design, and participatory governance as the disruptive planning approaches with the strongest evidence bases for effectiveness, but only under enabling governance conditions currently absent in most of Lagos’s informal settlements. Fourth, implementation is constrained by land governance dynamics and political economy factors.

The IURF proposed here integrates compound climate–displacement vulnerability, structural vulnerability reduction, land governance, and disruptive planning principles into a single analytical scaffold, benchmarked against 12 comparable Global South frameworks. The five-pillar structure provides a replicable conceptual architecture for rapidly urbanising megacities facing analogous compound crises, subject to future empirical testing and participatory validation. Section 11.5 sets out concrete pathways for application by state agencies, multilateral funders, community organisations, and comparable West African coastal cities.

Limitations: The review was conducted by a single researcher, introducing a risk of coding bias, which was partially mitigated through transparent reporting. The exclusive reliance on secondary sources means that community perspectives that are underrepresented in published literature are not captured. The IURF has not been empirically tested. The restriction to English-language sources may have introduced geographic and institutional bias. Beyond these, four further limitations warrant explicit acknowledgement. First, the search protocol truncated Google Scholar results at the first 100 records and AJOL results at

the first 50 records per search string, potentially excluding relevant lower-ranked sources. Second, the composite figures reported in Figures 2–5 combine directly reported data with author synthesis of heterogeneous sources and are therefore indicative of direction and magnitude rather than precise measurement. Third, the single city research design limits statistical generalisability: the IURF’s transferability claims rest on analytical, not empirical, generalisation, and the framework’s performance in other contexts remains untested. Fourth, the policy environment analysed is rapidly evolving; policy documents current at the time of the search may be superseded, and findings regarding governance mechanisms should be read as time-bound. These limitations circumscribe the strength of the conclusions but do not undermine the review’s central structural findings, which rest on convergent evidence across multiple independent sources.

Future research directions: Longitudinal evaluation of IURF indicator performance in pilot implementation contexts; participatory validation of the framework with Lagos-based community organisations; quantitative analysis of the political economy conditions predicting implementation success; systematic assessment of climate finance architecture reforms; and primary research capturing community perspectives on compound vulnerability.

Supplementary Materials: The following supporting information can be downloaded at: <https://www.mdpi.com/article/10.3390/land15081458/s1>, Table S1: Included sources with eligibility, source-type, thematic, and quality-appraisal coding; Table S2: Full-text excluded sources with reasons for exclusion; Figures S1–S6: Cartographical and contextual information.

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Data Availability Statement: The complete systematic review dataset, including the full list of 74 included sources with eligibility coding, source type, thematic coding, and quality appraisal ratings, is provided as Supplementary Table S1 (included sources) and Supplementary Table S2 (full-text excluded sources with reasons for exclusion), both provided as Supplementary Materials. Cartographical information is provided as Supplementary Figures S1–S6. Any additional data are available from the corresponding author on reasonable request.

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Abbreviations

The following abbreviations are used in this manuscript:

DRR	Disaster Risk Reduction
EIA	Environmental Impact Assessment
EWS	Early Warning System
IPCC	Intergovernmental Panel on Climate Change
IURF	Integrated Urban Resilience Framework
LASEMA	Lagos State Emergency Management Agency
LASPPDA	Lagos State Physical Planning and Development Authority
LMDGP	Lagos Metropolitan Development and Governance Project
MDB	Multilateral Development Bank

MMAT	Mixed Methods Appraisal Tool
NbS	Nature-Based Solutions
NEMA	National Emergency Management Agency
NESREA	National Environmental Standards Enforcement Agency
NIMET	Nigerian Meteorological Agency
NPC	National Population Commission
SERAC	Social and Economic Rights Action Centre
SDI	Slum Dwellers International
SLR	Sea-Level Rise
UNDRR	United Nations Office for Disaster Risk Reduction
UN-Habitat	United Nations Human Settlements Programme

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