The Resilient Mercantile Hub: An Evidence-Derived Architectural and Governance Framework for Sustainable Waterfront Regeneration in Port Harcourt, Nigeria

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Abstract
This article develops and presents the Resilient Mercantile Hub, a conceptual architectural design framework for sustainable waterfront regeneration in Port Harcourt, Nigeria, synthesising historical building condition data, community survey findings (n = 364), and semi-structured interview testimony from informal traders and built-environment professionals into a coherent, three-zone spatial and governance model. The framework is organised around five empirically derived principles proximate access, flood resilience, incremental formalisation, heritage as asset, and livelihood integration and divides the waterfront into three interlocking spatial zones: Waterfront and Landing (a flood-resilient platform and mangrove buffer), Adaptive Reuse Core (retrofitted colonial warehouses housing trade-specific market halls and upper-floor community infrastructure), and Public Realm and Movement Corridor (an elevated promenade and rain gardens). A Waterfront Community Land Trust governance model, modelled on comparable trusts in Mumbai and Cape Town, addresses the tenure insecurity identified as the binding constraint on private investment. We argue that the framework's distinguishing methodological contribution is its derivation procedure: every spatial and architectural decision is traced explicitly to a specific, quoted item of empirical evidence a survey percentage, a verbatim trader testimony, or a Building Condition Assessment Matrix score rather than to generic adaptive-reuse or waterfront-regeneration design convention, producing a framework whose design logic is auditable against the data that generated it.

Keywords: *conceptual design framework; adaptive reuse; community land trust; flood-resilient architecture; participatory design; mercantile heritage; Port Harcourt*

1. Introduction

A recurring critique of adaptive reuse and waterfront regeneration scholarship in postcolonial contexts is that heritage scholars advocate for preservation of mercantile buildings as static historical artefacts, divorced from the chaotic socio-economic reality surrounding them, while socio-economic scholars rigorously document the vitality and vulnerability of informal traders but fail to propose physical, spatial infrastructure to support them, and environmental scientists diagnose flooding and pollution risk without offering architectural mitigation strategies (Obinna et al., 2010; Ogbonna et al., 2021; Ekong et al., 2020). Each discipline produces a partial, single-

lens account; none has previously synthesised heritage condition, socio-economic need, environmental vulnerability, and governance constraint into a single, evidence-traceable architectural design response for the Port Harcourt waterfront specifically.

This article presents that synthesis: the Resilient Mercantile Hub, a conceptual design framework developed not from generic adaptive-reuse precedent but from the explicit empirical findings of a mixed-methods study combining a 364-respondent structured questionnaire, sixteen semi-structured interviews, and a Building Condition Assessment Matrix applied to five surviving colonial warehouses. We present the framework's derivation, its spatial and architectural content organised into three zones, and its accompanying governance model, with every design decision traced explicitly to the specific evidentiary item that motivated it.

The framework addresses six interconnected challenges that companion empirical research in this study has each documented separately: the historical evolution and present structural condition of the mercantile warehouse stock; the compounding socio-spatial, economic, and environmental vulnerabilities of the communities surrounding it; the latent capacity of the buildings themselves to formalise the informal economy presently occupying the waterfront; the lessons available from global and regional waterfront precedent; the institutional and policy bottlenecks currently obstructing intervention; and — the subject of this article specifically — the architectural and governance synthesis required to act on all five findings simultaneously. No single one of the preceding five findings, addressed in isolation, would produce a viable regeneration outcome: a structurally sound building with no resolved tenure attracts no investment; a tenure-resolved site with no flood-resilient design floods regardless; flood-resilient design with no trade-specific programming serves no one's actual livelihood. The framework presented here is therefore deliberately integrative rather than additive, treating the prior findings as simultaneous constraints a single design response must satisfy together.

2. Theoretical Framework

The framework is positioned at the intersection of three theoretical traditions. Spatial Justice and Right to the City theory (Harvey, 2008) provides the normative basis for treating informal waterfront traders as legitimate claimants to urban space rather than as a disorder requiring correction; the framework explicitly rejects the tabula rasa planning paradigm Watson (2009) documents as the dominant African governance posture. The Triple Bottom Line (environmental, economic, social) provides the framework's evaluative structure, requiring every zone and component to be assessed against all three pillars rather than environmental or economic performance alone — the dimension Baltimore and Canary Wharf precedents, evaluated in companion research, conspicuously failed to satisfy. Adaptive reuse theory (Plevoets & Van Cleempoel, 2019; Langston, 2011) provides the architectural logic for retaining rather than demolishing the existing structural fabric, on both embodied-carbon and structural-redundancy grounds independently verified by this study's Building Condition Assessment Matrix.

These three traditions are not invoked as independent theoretical justifications applied post-hoc to a design already arrived at on other grounds; rather, each supplies a specific design constraint the framework must satisfy simultaneously. Spatial justice theory requires that the framework's economic model not depend on displacing existing users to achieve viability — a constraint operationalised in Section 7's land trust rent-capping mechanism. The Triple Bottom Line requires that no single pillar be optimised at the expense of the other two — a constraint visible in the deliberate trade-off, documented in Section 8, of slightly higher construction cost (retaining rather

than replacing degraded roof sheeting) against lower embodied-carbon impact and higher heritage-character retention. Adaptive reuse theory requires that retention be the structurally and economically justified default rather than a merely sentimental preference — a constraint the BCAM's independent structural verification (Section 5) discharges directly, since retention here is recommended only where the Structural Integrity sub-criterion supports it, not as an unconditional heritage mandate.

3. Methods: Derivation Procedure

The framework was derived through deliberate synthesis of three empirical strands gathered as part of a broader mixed-methods study: (1) a structured questionnaire administered to 364 respondents across Abonnema Wharf, Bundu Waterside, and Marine Base, covering physical condition, environmental vulnerability, adaptive reuse attitudes, and policy perception; (2) semi-structured interviews with nine informal traders/community leaders and seven urban planners/architects/officials, analysed via Braun and Clarke's (2006) six-phase thematic framework; and (3) a Building Condition Assessment Matrix applied to five surviving warehouses (A1–A5) at the Abonnema Wharf corridor. Critically, the framework-derivation procedure required that every proposed spatial or architectural component be traceable to a specific quantitative finding, a specific verbatim quotation, or a specific BCAM score — a discipline intended to prevent the framework from defaulting, even inadvertently, to generic adaptive-reuse convention disconnected from the Port Harcourt evidence base.

4. The Five Organising Principles

Building on the documented existing layout (Section 5) and the empirical findings summarised above, the framework is organised around five core principles, each derived directly from the data. **Proximate access:** all regeneration occurs on the existing waterfront without relocation, responding to the universal preference across both trader and official interview testimony for retaining trading communities at their present, river-proximate locations rather than displacing them to facilitate construction.

Flood resilience: elevated decks, improved drainage, and amphibious strategies address the 75.3% of respondents who reported frequent flooding disruption (Item B3), and specifically distinguish the predictable tidal mechanism from the unpredictable rain-induced mechanism documented in interview testimony.

Incremental formalisation: existing trading patterns and social networks are respected while infrastructure is added incrementally, responding directly to the "just green enough" caution against large-scale exclusionary intervention raised independently by both Anguelovski et al. (2019) in the literature and Port Harcourt officials in interview.

Heritage as asset: colonial warehouses are adaptively reused rather than demolished, responding to the 72.5% who agreed this would boost the economy and preserve history (Item C2) and to the independently verified Building Condition Assessment Matrix finding of a mean Adaptive Reuse Potential Score of 71/100.

Livelihood integration: spaces are designed for specific trades, directly addressing the fish smoker's verbatim request for a "good smoke place" and the timber processor's demand for wide columns and unobstructed floor area.

5. Existing Spatial Layout: The Palimpsest Condition

The existing layout of Port Harcourt's waterfront mercantile buildings reflects a palimpsest of colonial planning, post-independence neglect, and informal adaptation. The original British colonial administration (c. 1912–1960) laid out the waterfront as a logistics corridor: warehouses (UAC, UTC, Equip) were positioned immediately adjacent to the Bonny River around Abonnema Wharf, with rail sidings and wide access roads for moving palm oil, groundnuts, and manufactured goods between ships and the interior. The buildings themselves were engineered for heavy loads, with thick laterite brick walls, high ceilings, wide column spacing, and large timber roof trusses covered with corrugated iron sheets. Since the 1970s, this formal layout has undergone a profound informal transformation: 74.2% of respondents perceive the warehouses as abandoned and decayed (Item B1), yet the basic structural skeletons remain intact, consistent with the high agreement on Item C1 (70.9% agreeing the warehouses are structurally capable of conversion) and independently verified by the BCAM, where no surveyed building scored below 58/100 and three (A2, A3, A4) scored 72, 78, and 77 respectively, placing them in the GOOD category for immediate reuse. Building A3's surviving roller-shutter loading bay and clerestory windows correspond precisely to trader demands for loading access and fish-smoking ventilation, demonstrating that the buildings and the community's needs are spatially pre-aligned, independent of any design intervention.

6. The Three-Zone Spatial Framework

6.1 Zone 1: Waterfront and Landing

This zone addresses the environmental and logistical challenges documented in Item B3 (flooding disruption) and trader testimony such as "When tide high, we dey carry fish waka." The proposal is a flood-resilient landing platform raised 1.5 metres above the mean high-water level, accessible by gangways from boats. The platform includes dedicated off-loading bays for fish, timber, and general cargo, with roller conveyors and handcarts to replace the manual head-loading the trader testimony explicitly identifies as the present, unmitigated practice. Rainwater drainage channels and small retention basins capture surface runoff. This design directly responds to the 73.1% of respondents who agreed that informal businesses suffer losses due to a lack of formal structures (Item B2). A green buffer of replanted mangroves along the river edge absorbs wave energy and stabilises the bank, addressing the environmental-pillar requirement independent of the social and economic responses addressed in Zone 2.

6.2 Zone 2: Adaptive Reuse Core

This zone encompasses the colonial mercantile buildings documented in Section 5. Each warehouse is retrofitted while preserving its external character and structural grid. The ground floor is dedicated to trade-specific market halls: a fish-smoking wing with stainless steel kilns, extractor hoods, and tiled wash areas with clean water supply, responding directly to the fish smoker's request for a "good smoke place"; a timber-processing wing with the existing wide column spacing (six-metre grid) retained and supplemented with overhead gantry cranes, responding directly to "make columns wide, make space big so we fit turn log"; and a general

merchandise hall with modular lockable stalls for small-scale traders, serving the 41.5% who identified as traders in the occupational survey data. The upper floor, historically used for office or light storage, is converted into community infrastructure: a union hall for traders, responding to "market no be only to sell; we need union hall"; a childcare centre, responding to "place for our pikin"; a first-aid clinic; and training rooms for financial literacy and business skills. Solar photovoltaic panels on south-facing roof sections provide clean electricity, directly addressing the fish smoker's complaint: "No light, no clean water, how we want process fish well?"

6.3 Zone 3: Public Realm and Movement Corridor

This zone responds to the spatial disorganisation documented in interview testimony — "Na confusion everywhere, boat go land, but we go still waka far before we fit sell" — and to the 68.7% combined agreement (Item C4) that promenades connecting historic buildings would drive sustainable commerce. The proposal is an elevated promenade, raised 0.5 metres above flood level and four metres wide, with a utility spine (drainage, electrical conduit, water supply) routed beneath the walking surface, directly connecting the Zone 1 landing platform to the Zone 2 market halls and eliminating the unorganised, congested goods-movement pathways the trader testimony identifies as a hidden transaction cost on every trade cycle. Rain gardens and small pocket parks are positioned at the junctions between zones, providing both additional drainage capacity and informal social space consistent with the social-infrastructure principle established in Zone 2.

Zone	Spatial Components	Evidentiary Basis
Zone 1: Waterfront and Landing	Raised landing platform, off-loading bays, mangrove buffer, drainage channels	Item B2 (73.1%), B3 (75.3%); tidal-inundation testimony
Zone 2: Adaptive Reuse Core	Fish-smoking wing, timber wing, merchandise hall, union hall, childcare, solar PV	Items C1 (70.9%), C2 (72.5%); BCAM mean 71/100; trader testimony
Zone 3: Public Realm and Movement	Elevated promenade, utility spine, rain gardens	Item C4 (68.7%); spatial disorganisation testimony

Table 1. The three-zone spatial framework and its evidentiary derivation.

7. Governance: The Waterfront Community Land Trust

Because professional interview testimony identifies land tenure ambiguity, not architectural feasibility, as the binding constraint on implementation ("Without clear tenure, no developer will invest"), the spatial framework is accompanied by a governance proposal: a Waterfront Community Land Trust, modelled on comparable trusts operating in Mumbai's Dharavi upgrading programme and in Cape Town (Patel, 2018). The trust holds freehold or long-term leasehold over the warehouses and landing zones, governed by a three-party board comprising one state government representative, one representative of the waterfront traders' association, and one independent technical expert. Traders receive renewable fifteen-year licences to occupy specific stalls, with rent capped at an affordable proportion of income, and a portion of lease revenues reinvested in a sinking fund for major repairs — directly responding to the 70.3% of respondents who supported collaborative government–community partnership models (Item D4) and to

officials' own identification of tenure insecurity as the single missing precondition for sustained investment. The land trust structure additionally resolves the bankability concern raised independently by a planner in interview: "If we can demonstrate a viable business model, such as lease revenues, flood-resilient storage, and market management, then developers will see the financial case." By separating land ownership (held permanently by the trust) from building use (licensed to traders on renewable terms), the model gives prospective capital partners — whether state, donor, or private — a single, legally coherent counterparty to contract with, rather than the fragmented federal/state/local/customary claim structure that Durand-Lasserve and Selod (2009) and the companion institutional-bottleneck study (this issue) document as the principal obstacle to investment in comparable West African contexts. The trust's sinking fund further addresses the maintenance-funding gap that, left unresolved, would otherwise risk the retrofitted buildings sliding back into the same decay cycle the BCAM has now documented and that adaptive reuse is intended to reverse.

8. Architectural Detailing and Material Strategy

8.1 Structural Retention Strategy

The framework's structural strategy is conservative by design: retain the existing laterite brick load-bearing walls, timber roof trusses, and column grid wherever the BCAM's Structural Integrity sub-criterion (worth 25 of 100 points) records a FAIR or better rating, and limit new structural insertion to elements the existing fabric cannot itself provide — principally the elevated landing platform (Zone 1), the promenade substructure (Zone 3), and localised mezzanine insertions within the warehouses' generous floor-to-ceiling heights where upper-floor community infrastructure (Zone 2) requires additional usable area. This minimises new-build embodied carbon, consistent with the architect-interviewee's framing of reuse as "economic prudence" given the embodied carbon already sunk into the existing masonry, and with the IPCC's (2022) call for greater attention to embodied carbon in urban development more broadly.

8.2 Climate-Responsive Material Selection

Material specification responds directly to the dual flood mechanism identified in interview testimony (tidal versus rain-induced). Below the 1.5-metre flood-resilience datum established for Zone 1, all finishes are selected for tidal-immersion tolerance: engineered stone or sealed concrete flooring, galvanised or stainless steel fixtures, and masonry pointed with hydraulic lime mortar rather than cement-based mortar, which is more vulnerable to rising-damp-driven spalling — the specific degradation mechanism the BCAM identified as the dominant driver of low Roof Condition and Flood Resilience sub-scores across the five surveyed buildings. Above the flood datum, within the retained warehouse fabric, original timber roof trusses are retained and re-clad rather than replaced, preserving the heritage character explicitly valued by 72.5% of survey respondents (Item C2) while addressing the specific roof-sheeting degradation the BCAM documented.

8.3 Passive Environmental Strategy

The existing warehouses' high ceilings and generous clerestory window openings — originally provided for natural ventilation of stored bulk commodities rather than for occupant comfort — are retained and adapted for the fish-smoking wing's ventilation requirements, supplemented with mechanical extractor hoods only at the kiln stations themselves rather than throughout the building

volume, minimising mechanical-system capital and operating cost. South-facing roof sections, identified through the BCAM's structural survey as the least shaded and most photovoltaic-suitable across the five buildings, host the solar arrays addressing the electricity deficit documented in interview testimony, sized to meet the specific operational loads of the kilns, water pumps, and lighting circuits rather than a generic building-wide electrical specification.

9. Comparative Positioning Against Global and Regional Precedent

Companion research evaluating five global and regional waterfront precedents (Baltimore Inner Harbour, London Docklands/Canary Wharf, Singapore's Marina Bay, Lagos's Eko Atlantic/Makoko dichotomy, and Calabar) against the Triple Bottom Line identifies a consistent pattern in which environmental and economic success is achieved at the cost of social-pillar failure through gentrification or exclusion. The Resilient Mercantile Hub is explicitly positioned against this pattern, as summarised in Table 2.

Dimension	Precedent Risk (if uncritically imported)	Resilient Mercantile Hub Response
Economic model	Premium-return luxury development displacing informal traders (Baltimore, Canary Wharf, Eko Atlantic)	Land trust caps rent at affordable proportion of income; lease revenue funds maintenance, not profit extraction
Environmental engineering	High capital cost, state-dependent flood infrastructure (Marina Bay)	Locally maintainable elevated platforms and drainage, scaled to artisanal rather than luxury-tourism use
Heritage strategy	Tourism-only revenue model insufficient for upkeep (Calabar)	Heritage buildings serve daily, pragmatic trade functions, not only periodic tourist visitation
Implementation pace	Comprehensive, tabula rasa redevelopment (London Docklands)	Phased, building-by-building retrofit sequenced by BCAM priority score

Table 2. The Resilient Mercantile Hub's explicit design response to risks identified in comparative precedent.

10. Discussion

10.1 The Auditable Derivation Procedure as Methodological Contribution

The framework's principal methodological contribution is not any single spatial or architectural decision in isolation, but the derivation discipline applied throughout: every zone, every component, and every material specification is traced explicitly to a quoted survey percentage, a verbatim trader or official testimony, or a BCAM score. This produces a framework whose design logic is auditable in a way generic adaptive-reuse or waterfront-regeneration templates are not — a reviewer or future researcher can verify, item by item, that the timber-processing wing's six-metre column grid responds to a specific, quoted demand rather than to a designer's independent aesthetic or functional judgement. We propose this derivation discipline as a transferable

methodological contribution applicable beyond the Port Harcourt case: any context-specific design framework purporting to respond to community need should be capable of the same item-by-item evidentiary audit.

10.2 Convergence with the Comparative Case-Study Literature

The framework's emphasis on incremental, non-displacing intervention (Principle 3) and its explicit rejection of premium-return, exclusionary development logic align directly with the lessons drawn from comparative waterfront case studies evaluated in companion research: the framework borrows the structural adaptive-reuse technique of Baltimore's Inner Harbour and the climate-engineering ambition of Singapore's Marina Bay, while explicitly avoiding the gentrification mechanism each precedent's social pillar conspicuously failed to satisfy, and positions itself, in regional terms, as the sustainable middle ground between the exclusionary Eko Atlantic model and the structurally unaddressed vulnerability of Makoko.

10.3 Limitations

The framework remains conceptual: it has not yet been tested through detailed structural engineering design, costed quantity surveying, or a pilot implementation phase, and the BCAM's non-destructive assessment basis means that full structural verification will be required before any construction commitment. The governance model, while structurally specified, has not yet been tested against Rivers State's specific statutory and customary land law, which the institutional bottleneck literature (companion research, this issue) documents as considerably more fragmented than the Mumbai and Cape Town precedents on which the trust model draws.

11. Conclusion

This article has presented the Resilient Mercantile Hub, a conceptual architectural design framework synthesising historical building condition, community survey data, and interview testimony into a three-zone spatial model and accompanying land trust governance proposal for the regeneration of Port Harcourt's waterfront mercantile corridor. The framework's distinguishing contribution is its evidentiary derivation discipline: every spatial and architectural decision is traceable to a specific, auditable item of empirical evidence rather than to generic precedent. We recommend this derivation discipline as a transferable methodological practice for community-responsive design in comparable postcolonial waterfront contexts, and identify detailed structural engineering verification and a phased pilot implementation, beginning with the highest-scoring BCAM structures, as the necessary next steps toward construction.

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