Urban Planning–Architecture Synergies for Climate-Resilient Cities in Developing Countries

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ABSTRACT: Rapid urbanisation in developing countries has intensified exposure to climate-related risks such as flooding, heat stress, and infrastructure failure. This paper examines how the integration of urban planning strategies and architectural innovations can enhance climate resilience in cities of the Global South. Using a narrative review of 47 peer-reviewed studies published between 2010 and 2025, the paper synthesises evidence on compact urban form, green infrastructure, climate-responsive design, low-carbon materials, and participatory governance. The findings indicate that planning-led interventions, such as land-use efficiency, ecosystem-based adaptation, and sustainable mobility, are most effective when reinforced by architectural innovations, including passive cooling, vernacular-inspired design, and energy-efficient building systems. However, persistent challenges, including weak policy enforcement, limited institutional capacity, inadequate financing, and exclusion of informal settlements, constrain large-scale implementation. The paper argues that climate resilience cannot be achieved through isolated disciplinary approaches but requires coordinated planning–design frameworks tailored to local socio-economic and environmental contexts. By bridging urban planning and architectural perspectives, this study contributes actionable insights for policymakers, practitioners, and researchers seeking scalable pathways toward resilient and sustainable cities in developing countries.

Keywords: Climate-resilient cities; Urban planning; Architectural innovation; Sustainable built environment; Developing countries; Climate adaptation.

I. Introduction

Urban areas across the globe are increasingly exposed to climate-related hazards, including flooding, heatwaves, sea-level rise, desertification, and infrastructure stress. These risks are particularly pronounced in developing countries, where rapid urbanisation is occurring alongside weak institutional capacity, socio-economic inequality, and inadequate infrastructure provision (Bulkeley et al., 2014; IPCC, 2022). As cities in Africa, Asia, and Latin America continue to expand at unprecedented rates, the urgency of building climate-resilient urban systems has become a central concern within global sustainability and development discourse (Satterthwaite et al., 2020). Climate resilience in this context extends beyond disaster response to encompass the ability of urban systems, communities, and the built environment to anticipate, absorb, adapt to, and recover from climate-induced shocks and stresses (Meerow et al., 2016).

Urban planning and architecture play pivotal and interdependent roles in shaping the resilience of cities. From a planning perspective, climate resilience is pursued through land-use regulation, compact urban form, sustainable mobility systems, green infrastructure, and ecosystem-based

adaptation strategies that reduce exposure to hazards while enhancing adaptive capacity (Newman et al., 2017; Kabisch et al., 2017; UN-Habitat, 2020). Compact and mixed-use urban development, for example, has been shown to reduce energy consumption, limit urban sprawl, and improve infrastructure efficiency, thereby lowering vulnerability to climate risks (Ewing & Cervero, 2010; Sharifi, 2021). Similarly, integrating natural systems such as wetlands, parks, and urban forests into planning frameworks enhances ecosystem services, mitigates urban heat island effects, and provides cost-effective buffers against flooding (Kabisch et al., 2017; Anguelovski et al., 2022).

Architectural innovation complements these macro-scale planning strategies by addressing climate resilience at the building and neighbourhood scales. In developing contexts, where buildings often account for a significant share of energy consumption and climate vulnerability, architectural responses such as passive cooling, climate-responsive orientation, and low-carbon material selection are critical (Ng et al., 2016; Adegbie, 2021). The use of vernacular and locally sourced materials, including earth-based blocks, bamboo, and composite panels, has gained renewed attention due to their lower embodied energy, affordability, and adaptability to local climatic conditions (Adedeji et al., 2013; Adegun & Adedeji, 2017; Torgal & Jalali, 2011). These innovations not only reduce greenhouse gas emissions but also improve thermal comfort in regions where access to reliable energy remains limited.

The intersection of urban planning and architecture becomes particularly significant in the context of informal settlements, which accommodate a large proportion of urban residents in developing countries and are often located in climate-vulnerable areas such as floodplains and unstable slopes (Roy et al., 2020; Watson, 2019). Informality presents a dual challenge: planners struggle with regulatory enforcement and infrastructure provision, while architects face constraints in delivering affordable yet resilient housing solutions. Evidence suggests that integrated, participatory approaches combining inclusive planning frameworks with context-sensitive architectural design are more effective than isolated, top-down interventions (Satterthwaite et al., 2020; Anguelovski et al., 2016). Such approaches recognise local knowledge, socio-cultural practices, and incremental development patterns as assets rather than obstacles to resilience.

Despite growing recognition of the importance of built-environment interventions for climate adaptation, significant barriers persist in developing countries. Weak policy enforcement, fragmented institutional responsibilities, limited technical capacity, and inadequate financing mechanisms constrain the mainstreaming of both planning-led and design-led resilience strategies (Dodman & Mitlin, 2015; Bai et al., 2018; Amuda-Yusuf et al., 2020). Architectural innovations often remain confined to pilot projects, while urban plans incorporating resilience principles are frequently undermined by informal development and political interference (Adelekan et al., 2015). These challenges highlight the need for stronger alignment between planning policies, architectural practice, and governance structures.

At the global scale, international frameworks such as the Sustainable Development Goals, particularly SDG 11 (Sustainable Cities and Communities), and the Paris Agreement underscore the central role of cities in addressing climate change (UN, 2015; UNEP, 2022). However, scholars caution that resilience models transferred directly from developed contexts often fail to account for the socio-economic, cultural, and institutional realities of developing countries (Jiboye, 2011; Dodman & Mitlin, 2015). Locally grounded solutions that integrate indigenous knowledge, community participation, and adaptive governance are therefore increasingly advocated as more effective pathways toward urban resilience (Lin & Agyeman, 2020; Akinyemi et al., 2022).

Against this backdrop, this paper examines how urban planning approaches and architectural innovations can be integrated to support the development of climate-resilient cities in developing countries. Drawing on a narrative review of 47 peer-reviewed studies published between 2010 and 2025, the paper synthesises evidence on planning strategies, building-scale innovations, and cross-

disciplinary synergies that enhance resilience while addressing sustainability and equity concerns. By bridging the perspectives of urban planners and architects, the study contributes to ongoing debates on climate adaptation in the built environment. It offers insights relevant to policymakers, practitioners, and researchers seeking scalable and context-sensitive resilience solutions.

II. Research Methodology

2.1 Narrative Review Design

This study adopts a narrative literature review approach to examine the role of urban planning and architectural innovations in building climate-resilient cities in developing countries. The narrative review method is appropriate for synthesising diverse theoretical, empirical, and policy-oriented studies across interdisciplinary fields such as urban planning, architecture, climate change, and sustainability. Unlike systematic reviews, which prioritise rigid inclusion protocols, the narrative approach allows for critical interpretation, thematic integration, and contextual analysis of complex socio-technical issues relevant to the built environment (Green et al., 2006; Ferrari, 2015). This flexibility is particularly valuable for climate resilience research, where evidence is fragmented across disciplines and geographic contexts.

2.2 Sources of Literature and Selection Criteria

The review is based on 47 peer-reviewed journal articles published between 2010 and 2025, reflecting contemporary debates and evolving practices in climate-resilient urban development. Academic sources were retrieved from established scholarly databases, including Scopus, Web of Science, and Google Scholar. Key search terms included urban planning, architectural innovation, climate resilience, sustainable cities, low-carbon design, and developing countries.

Inclusion criteria required that studies:

i. explicitly address climate change adaptation or mitigation within the built environment.
ii. focus on developing or Global South contexts; and
iii. provide insights relevant to urban planning, architectural design, or their integration.

Studies were excluded if they were non-peer-reviewed, contextually irrelevant, or focused exclusively on developed economies without transferable insights. This ensured the relevance and analytical coherence of the reviewed literature.

2.3 Analytical Framework and Thematic Synthesis

An integrative thematic framework was employed to analyse and synthesise the selected studies. The literature was organised around three interrelated thematic domains. The first domain focused on urban planning strategies, including compact city development, land-use efficiency, green infrastructure, sustainable mobility, and governance mechanisms. The second domain examined architectural innovations, encompassing climate-responsive design, passive cooling strategies, low-carbon and vernacular materials, and energy-efficient building systems. The third domain addressed cross-cutting synergies, highlighting the interaction between planning and architecture through community participation, institutional coordination, and policy alignment.

This thematic synthesis enabled comparative analysis across disciplines and contexts, revealing both complementarities and gaps between planning-led and design-led resilience approaches (Meerow et al., 2016; Bai et al., 2018).

2.4 Geographical and Contextual Scope

Although the reviewed literature spans the Global South, particular attention was given to African and Asian cities, where rapid urbanisation, informal settlement growth, and climate vulnerability are most acute (Satterthwaite et al., 2020; Elmqvist et al., 2019). Case evidence from countries such as Nigeria, Bangladesh, and India was prioritised to reflect contexts characterised by weak regulatory enforcement, limited infrastructure capacity, and socio-economic inequality. This focus enhances the relevance of the findings for policymakers and practitioners operating in comparable developing-country settings.

2.5 Methodological Justification and Limitations

The narrative review methodology provides a holistic understanding of climate resilience by

integrating planning, architectural, and governance perspectives within a single analytical framework. It enables the identification of broad patterns, emerging themes, and contextual insights that may be overlooked in narrowly defined empirical studies. However, the approach is inherently interpretive and does not provide quantitative synthesis or statistical generalisation. To mitigate this limitation, the study draws on a wide range of peer-reviewed sources and emphasises convergence across multiple studies rather than isolated findings.

III. Urban Planning Approaches to Climate Resilience

Urban planning plays a foundational role in shaping the capacity of cities to anticipate, absorb, and adapt to climate-related shocks. In developing countries, where rapid urban growth often exceeds planning and infrastructural capacity, planning-led interventions provide the structural framework through which resilience objectives can be operationalised. The literature consistently emphasises that climate-resilient urbanism depends on coordinated land-use planning, sustainable infrastructure provision, ecosystem-based adaptation, inclusive governance, and socially responsive policy instruments (Meerow et al., 2016; Bai et al., 2018).

3.1 Compact Urban Form and Land-Use Efficiency

Compact urban development is widely recognised as a core planning strategy for enhancing climate resilience. By promoting higher densities, mixed land uses, and proximity between residential, employment, and service areas, compact cities reduce urban sprawl, limit land consumption, and lower infrastructure and transportation energy demands (Newman et al., 2017; Ewing & Cervero, 2010). These characteristics are particularly relevant in developing countries, where uncontrolled peri-urban expansion often results in settlement patterns that are costly to service and highly vulnerable to climate hazards.

Empirical studies indicate that compact urban form contributes to reduced greenhouse gas emissions, improved mobility efficiency, and greater accessibility to social and economic opportunities (Sharifi, 2021). From a resilience perspective, land-use efficiency also enables more effective emergency response, infrastructure redundancy, and service delivery during extreme events. However, achieving compactness in developing cities is frequently undermined by informal land markets, weak development control, and fragmented planning institutions (Watson, 2019). This underscores the need for regulatory frameworks that accommodate incremental development while steering growth toward safer, better-served locations.

3.2 Green Infrastructure and Ecosystem-Based Adaptation

Green infrastructure constitutes a central pillar of climate-resilient urban planning. Ecosystem-based adaptation strategies integrate natural and semi-natural systems, such as wetlands, urban forests, green corridors, and permeable surfaces, into urban landscapes to mitigate climate risks while delivering social and environmental co-benefits (Kabisch et al., 2017). In flood-prone cities across Africa and Asia, restored wetlands and floodplains have demonstrated the capacity to attenuate stormwater, reduce flood damage, and enhance water quality (Adelekan et al., 2015; Alam & Rabbani, 2017).

Beyond flood mitigation, green infrastructure contributes to urban heat regulation by moderating microclimates and reducing heat island intensity, an increasingly critical concern under rising global temperatures (Anguelovski et al., 2022). Planning frameworks that prioritise green networks and ecological connectivity, therefore, enhance both environmental resilience and urban liveability. Nonetheless, land scarcity, competing development pressures, and weak enforcement often marginalise green infrastructure in developing contexts, highlighting the need for stronger policy integration and long-term spatial planning commitments.

3.3 Sustainable Mobility and Low-Carbon Transport Planning

Transportation systems are a major source of urban emissions and a key determinant of climate vulnerability. Urban planning responses increasingly prioritise low-carbon and resilient mobility systems, including public transit, non-motorised transport, and transit-oriented development (Cervero & Sullivan, 2011; Rode et al., 2017). In developing cities, investments in bus rapid

transit (BRT), light rail, and integrated pedestrian networks have shown potential to reduce congestion, emissions, and exposure to climate stressors (Goodfellow, 2020).

From a resilience standpoint, compact, transit-oriented cities are better positioned to withstand fuel price shocks, energy supply disruptions, and extreme weather events. However, planning outcomes are often compromised by poor coordination between land use and transport infrastructure, as well as informal encroachment on transit corridors (Sharifi, 2021). Strengthening institutional coordination and aligning transport investments with land-use policies are therefore critical for realising the resilience benefits of sustainable mobility planning.

3.4 Governance Frameworks and Institutional Capacity

Effective governance is a prerequisite for climate-resilient urban planning. The literature highlights that resilience objectives must be embedded within statutory plans, zoning regulations, and development control systems to influence urban outcomes at scale (Bai et al., 2018). In many developing countries, however, planning institutions are constrained by limited technical capacity, fragmented responsibilities, and weak enforcement mechanisms, resulting in plans that are rarely implemented as intended (Dodman & Mitlin, 2015). These governance gaps contribute to uncontrolled development, infrastructure deficits, and heightened vulnerability, particularly in informal settlements. Strengthening institutional capacity through professional training, inter-agency coordination, and transparent regulatory enforcement is therefore essential. Moreover, integrating climate resilience into national urban policies and local planning instruments can create an enabling environment for both public and private sector investment in resilient infrastructure (Adelekan et al., 2015).

3.5 Community Participation and Inclusive Planning

Community participation is increasingly recognised as a critical component of climate-resilient urban planning. Inclusive planning processes enhance local ownership, improve contextual relevance, and increase the likelihood that resilience interventions are sustained over time (Meerow et al., 2016). In developing-country contexts, participatory planning has proven particularly effective in informal settlements, where residents possess detailed knowledge of local risks and adaptive practices (Satterthwaite et al., 2020).

Inclusive approaches also address the equity dimensions of climate resilience by ensuring that vulnerable groups, such as low-income households, women, and youth, are not excluded from decision-making processes (Anguelovski et al., 2016). Nevertheless, meaningful participation remains limited in many planning systems due to top-down governance cultures and limited institutional commitment. Strengthening participatory mechanisms is therefore essential for translating planning strategies into socially just and resilient urban outcomes.

3.6 Synthesis of Urban Planning Contributions

The reviewed literature demonstrates that urban planning contributes to climate resilience through interconnected strategies encompassing land-use efficiency, ecosystem-based adaptation, sustainable mobility, governance reform, and social inclusion. While these strategies offer significant potential, their effectiveness in developing countries is often constrained by institutional weakness, informality, and socio-economic pressures. Importantly, the evidence suggests that planning-led resilience initiatives achieve greater impact when reinforced by architectural innovation at the building and neighbourhood scales. This interdependence underscores the need for integrated planning–design frameworks capable of addressing climate risks holistically across multiple spatial and governance levels.

IV. Architectural Innovations for Climate-Resilient Cities

Architectural innovation constitutes a critical micro-scale complement to planning-led resilience strategies by translating climate objectives into tangible building and neighbourhood outcomes. In developing-country contexts, where exposure to heat stress, flooding, and energy insecurity is acute, architecture mediates resilience through material choices, building form, passive performance, retrofit strategies, and culturally grounded design. The

literature underscores that resilient architecture is not a singular technology but a systems approach that integrates environmental performance, affordability, constructability, and social acceptance (Ng et al., 2016; Adegun & Adedeji, 2017).

4.1 Climate-Responsive and Passive Design Strategies

Passive design remains the cornerstone of climate-resilient architecture in tropical and arid regions. Strategies such as orientation-sensitive layouts, cross-ventilation, solar shading, thermal mass optimisation, and courtyard typologies reduce dependence on mechanical cooling while maintaining indoor thermal comfort (Ng et al., 2016; Adegbie, 2021). Empirical evidence demonstrates that passive envelopes significantly lower peak cooling loads and enhance thermal autonomy, an essential attribute in contexts characterised by unreliable electricity supply and rising temperatures. In dense urban settings, architects adapt passive principles through vertical shading devices, ventilated façades, double roofs, and semi-open transitional spaces that buffer interior environments from extreme heat and rainfall. When coordinated with neighbourhood-scale airflow corridors and solar access protected through planning controls, these building-scale interventions amplify resilience outcomes. However, inadequate design standards and cost-driven construction practices frequently undermine passive performance, highlighting the need for regulatory alignment and professional capacity building (Amuda-Yusuf et al., 2020).

4.2 Low-Carbon, Vernacular, and Locally Sourced Materials

Material innovation is a major lever for reducing embodied carbon while enhancing climatic performance. Studies consistently highlight the resilience benefits of vernacular and locally sourced materials such as stabilised earth blocks, laterite, bamboo, timber, and composite panels, which offer lower embodied energy, improved hygrothermal regulation, and affordability (Adedeji et al., 2013; Adegun & Adedeji, 2017; Torgal & Jalali, 2011). These materials are particularly suited to incremental housing and post-disaster reconstruction, where speed, cost, and local availability are critical.

Beyond environmental performance, vernacular materials embed cultural familiarity and construction knowledge, improving acceptance and long-term maintenance. However, their uptake is constrained by negative perceptions, lack of formal standards, and limited inclusion in building codes (Amuda-Yusuf et al., 2020). Architectural innovation, therefore, extends beyond design to advocacy for performance-based regulations that legitimise alternative materials within formal construction systems.

4.3 Building Retrofit and Adaptation of Existing Stock

Given the dominance of thermally inefficient buildings across developing cities, retrofitting existing stock represents a high-impact pathway for resilience. Architectural interventions such as improved glazing, external shading, reflective roofing, façade insulation, and natural ventilation upgrades have demonstrated measurable reductions in indoor heat stress and energy demand (Adegbie, 2021; Ng et al., 2016). Retrofit strategies are especially relevant for public buildings, schools, clinics, and markets, that function as community anchors during climate emergencies.

Architectural approaches increasingly emphasise “graceful degradation,” whereby buildings maintain acceptable comfort and safety during power outages or extreme weather events. This includes reliance on passive survivability, breathable envelopes, ceiling fans, and daylighting. Nevertheless, widespread retrofit adoption remains limited by financing constraints and a lack of incentive frameworks, reinforcing the need for alignment with planning-led retrofit programmes and public investment strategies.

4.4 Energy-Efficient and Low-Carbon Building Systems

Architectural resilience is further enhanced through the integration of energy-efficient systems and renewable energy technologies. Solar photovoltaic integration, solar water heating, energy-efficient lighting, and smart control systems reduce operational emissions while improving energy security (Obodoh et al., 2024). In developing contexts, decentralised energy systems embedded at

the building or cluster scale support resilience during grid failures and climate-induced disruptions. However, technological solutions alone are insufficient without climate-sensitive architectural envelopes that minimise loads. Evidence shows that high-performance systems yield optimal benefits only when paired with passive design and appropriate user behaviour (Ghaffarianhoseini et al., 2016). Architects, therefore, play a critical role in harmonising technology with form, orientation, and occupancy patterns to ensure long-term resilience and affordability.

4.5 Architecture, Informality, and Incremental Housing

Informal settlements present one of the greatest challenges and opportunities for architectural innovation in climate resilience. Architects increasingly engage with incremental housing models that accommodate self-building practices while introducing flood-resistant foundations, elevated plinths, modular components, and climate-adaptive layouts (Olotuah et al., 2018; Satterthwaite et al., 2020). Such approaches recognise informality as a dynamic process rather than a planning failure, enabling resilience upgrades without displacement.

Participatory design processes strengthen these interventions by incorporating local knowledge, social networks, and livelihood needs into architectural solutions (Anguelovski et al., 2016). When aligned with planning-led upgrading programmes, architectural innovation in informal contexts can significantly reduce vulnerability while enhancing dignity and social equity.

4.6 Synthesis of Architectural Contributions

The literature demonstrates that architectural innovation contributes to climate resilience through passive design, material selection, retrofit strategies, energy efficiency, and inclusive engagement with informal urbanism. These contributions operate most effectively when embedded within supportive planning frameworks and governance systems. In isolation, architectural solutions risk remaining fragmented pilot projects; when integrated with urban planning strategies, they form a critical foundation for scalable, context-sensitive, and socially just climate-resilient cities in developing countries

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V. Synergies between Urban Planning and Architecture

5.1 Synergies between Urban Planning and Architecture

The effectiveness of climate resilience strategies in developing cities depends largely on the degree of integration between urban planning frameworks and architectural practice. While planning provides the macro-scale structure for land use, infrastructure, and governance, architecture operationalises these strategies at the building and neighbourhood scales. The literature consistently demonstrates that climate-resilient outcomes are strongest where these two domains interact coherently rather than functioning in parallel or isolation (Meerow et al., 2016; Bai et al., 2018).

5.1 Integrated Planning–Design Frameworks for Resilient Urban Systems

Integrated planning–design frameworks enable resilience objectives articulated in plans to be translated into spatial and physical outcomes. Planning strategies such as compact urban form, mixed land use, and transit-oriented development rely on architectural responses that ensure density does not compromise thermal comfort, daylight access, or liveability (Newman et al., 2017; Sharifi, 2021). Architectural solutions, such as vertical shading systems, courtyard configurations, and adaptable building typologies, allow compactness to coexist with environmental performance in climate-sensitive contexts.

Empirical evidence from developing cities shows that infrastructure resilience improves when architectural design is coordinated with planning-led systems such as drainage networks, mobility corridors, and green infrastructure (Adelekan et al., 2015; Alam & Rabbani, 2017). For example, flood mitigation strategies embedded in land-use plans are more effective when complemented by elevated building designs, permeable surfaces, and climate-responsive site planning. This alignment reduces vulnerability across scales and enhances the functional performance of urban systems during extreme events.

5.2 Linking Green Infrastructure with Building-Scale Design

Green infrastructure represents a key interface between planning and architecture. Urban planners designate and protect ecological networks, while architects integrate nature-based solutions within buildings and plots through green roofs, vertical gardens, rainwater harvesting, and permeable pavements (Kabisch et al., 2017; Obodoh et al., 2024). This multi-scalar integration strengthens ecosystem services such as stormwater regulation, urban cooling, and air quality improvement.

In developing-country contexts, where land competition is intense, the embedding of green infrastructure within architectural design compensates for limited public open space (Anguelovski et al., 2022). However, such integration requires supportive planning regulations that permit flexible land-use arrangements and incentivise building-scale green interventions. Without this policy alignment, architectural green innovations often remain isolated and fail to contribute meaningfully to citywide resilience goals.

5.3 Governance Alignment and the Policy–Practice Nexus

Governance structures and regulatory environments also shape synergies between planning and architecture. Urban planning instruments, such as zoning regulations, development control guidelines, and building codes, define the boundaries within which architectural innovation occurs. Where these instruments incorporate climate resilience and energy-efficiency criteria, architects are empowered to mainstream low-carbon materials, passive design strategies, and adaptive building systems (Bai et al., 2018).

In many developing countries, weak enforcement and fragmented institutional responsibilities undermine this policy–practice nexus, limiting the scalability of architectural innovation (Dodman & Mitlin, 2015; Amuda-Yusuf et al., 2020). Strengthening collaboration between planning authorities and professional bodies enables feedback loops in which architectural practice informs regulatory reform, ensuring that planning policies reflect technical feasibility and local realities. Such alignment is essential for translating resilience principles from policy documents into built form.

5.4 Community-Centred Co-Production of Resilient Environments

Community participation provides another critical synergy between planning and architecture. Inclusive planning processes establish platforms for community engagement, while architectural co-design translates local knowledge and socio-cultural practices into spatial solutions (Anguelovski et al., 2016). Evidence from informal settlement upgrading demonstrates that resilience outcomes improve when planners coordinate infrastructure provision and tenure arrangements alongside architect-led design of affordable, climate-adaptive housing (Satterthwaite et al., 2020; Olotuah et al., 2018).

Such co-production approaches strengthen social capital, enhance maintenance of infrastructure, and improve long-term adaptability. Importantly, they address equity dimensions of climate resilience by ensuring that marginalised groups are not excluded from decision-making processes or resilient design benefits. The literature suggests that resilience strategies lacking social legitimacy are less likely to be sustained, regardless of technical sophistication (Meerow et al., 2016).

5.5 Lessons from Integrated Case Experiences

Case evidence from the Global South illustrates the tangible benefits of integrated planning and architectural interventions. In flood-prone urban areas, coordinated land-use zoning combined with architect-designed elevated housing and climate-responsive public buildings has reduced exposure and recovery time following extreme events (Alam & Rabbani, 2017). Similarly, transit-oriented development initiatives achieve greater resilience when transport planning is reinforced by architecturally designed intermodal hubs and pedestrian-oriented streetscapes that encourage low-carbon mobility (Goodfellow, 2020).

These experiences highlight that resilience is not achieved through singular interventions but through layered, interdisciplinary action. Where planning and architecture operate in silos, resilience strategies tend to be fragmented and uneven. Conversely, integrated approaches enable scalable, context-sensitive solutions that address environmental, social, and economic dimensions simultaneously.

5.6 Synthesis of Planning–Architecture Synergies

The reviewed literature confirms that climate resilience in developing cities emerges from the dynamic interaction between urban planning and architectural innovation. Planning provides the strategic vision, regulatory framework, and infrastructural backbone, while architecture delivers adaptive, human-centred, and climate-responsive solutions at the scale of daily life. Strengthening synergies between these domains, through integrated frameworks, governance alignment, and community co-production, offers a robust pathway for building resilient and sustainable cities capable of responding to escalating climate challenges.

VI. Challenges and Gaps in Practice

Despite growing recognition of the importance of integrated urban planning and architectural innovation for climate resilience, significant challenges continue to limit effective implementation in developing-country contexts. The literature reveals persistent structural, institutional, socio-economic, and knowledge-based gaps that constrain the translation of resilience principles into widespread practice. These challenges are particularly acute in rapidly urbanising cities where informality, resource limitations, and governance deficits intersect (Dodman & Mitlin, 2015; Satterthwaite et al., 2020).

6.1 Weak Policy Enforcement and Regulatory Constraints

One of the most critical barriers to climate-resilient urban development is the weak enforcement of planning regulations and building codes. Although many developing countries have adopted policies that reference sustainability and resilience, these frameworks are often poorly implemented due to limited institutional capacity, political interference, and fragmented regulatory systems (Bai et al., 2018). As a result, urban expansion frequently occurs outside formal planning controls, leading to settlements in hazard-prone areas and the proliferation of climate-vulnerable building typologies.

For architects, weak regulatory enforcement reduces incentives to adopt low-carbon materials, passive design strategies, and resilience-oriented innovations, as compliance is rarely monitored or rewarded (Amuda-Yusuf et al., 2020). Planning-led resilience strategies embedded in master plans are similarly undermined when development approvals bypass established procedures. This regulatory gap creates a disconnect between policy intent and on-the-ground outcomes, limiting the scalability of resilient design and planning interventions.

6.2 Institutional Fragmentation and Capacity Deficits

Institutional fragmentation remains a major impediment to integrated resilience planning and design. Responsibilities for land-use planning, housing, environmental management, and infrastructure are often distributed across multiple agencies with limited coordination, resulting in overlapping mandates and inconsistent implementation (Dodman & Mitlin, 2015). Such fragmentation weakens accountability and delays the delivery of climate-resilient infrastructure and housing.

In addition, many local governments in developing countries lack sufficient technical expertise to evaluate, approve, and monitor climate-responsive planning and architectural proposals. This capacity deficit affects both public-sector implementation and private-sector innovation, as architects and planners encounter limited institutional support for non-conventional materials, passive design solutions, or integrated planning frameworks (Amuda-Yusuf et al., 2020). Strengthening institutional capacity through training, inter-agency collaboration, and professional development is therefore essential for closing this gap.

6.3 Socio-Economic Constraints and Informal Urbanisation

Socio-economic inequalities present another significant challenge to climate resilience in developing cities. A large proportion of urban populations reside in informal settlements characterised by insecure tenure, overcrowding, and inadequate infrastructure, often in environmentally vulnerable locations such as floodplains and coastal zones (Roy et al., 2020; Watson, 2019). These conditions heighten exposure to climate hazards and limit residents' ability to invest in resilient housing or adaptation measures.

Architectural innovations tailored to resilience, such as improved materials, elevated structures, or energy-efficient systems, are frequently perceived as unaffordable by low-income households, even when long-term benefits outweigh initial costs (Adegun & Adedeji, 2017). Similarly, planning interventions such as relocation or densification may face resistance due to livelihood disruption and social dislocation. These socio-economic realities underscore the need for inclusive, incremental, and affordable resilience strategies that align with the lived experiences of urban residents.

6.4 Limited Community Engagement and Public Awareness

Although community participation is widely acknowledged as central to effective climate adaptation, meaningful engagement remains limited in many planning and architectural processes. Top-down approaches often dominate, with resilience measures designed and implemented without sufficient input from local communities, leading to poor acceptance and maintenance (Anguelovski et al., 2016). This disconnect undermines the social sustainability of resilience interventions and reduces their long-term effectiveness.

Public awareness of climate risks and climate-responsive building practices also remains low in many developing contexts. Residents may prioritise immediate economic needs over long-term resilience, particularly where climate impacts are perceived as uncertain or unavoidable (Satterthwaite et al., 2020). For architects and planners, this lack of awareness complicates efforts to promote low-carbon materials, passive design strategies, and compact urban forms, reinforcing the need for targeted education and capacity-building initiatives.

6.5 Financial Limitations and Investment Gaps

Financial constraints represent a persistent barrier to the implementation of climate-resilient planning and architectural solutions. Many resilience-oriented interventions require higher upfront investment, even when they deliver long-term economic and environmental benefits. In developing countries, limited access to credit, weak housing finance systems, and competing development priorities restrict both public and private investment in resilient infrastructure and buildings (World Bank, 2021).

Architectural innovation is often confined to small-scale pilot projects supported by external funding, while planning-led resilience initiatives struggle to move beyond policy statements due to inadequate financing mechanisms (UNEP, 2022). The absence of incentives such as subsidies, tax relief, or low-interest loans further discourages adoption by households and developers. Addressing these financial gaps is essential for transitioning from experimental resilience initiatives to mainstream urban development practice.

6.6 Knowledge Gaps and Research–Practice Disconnect

Finally, a disconnect persists between academic research, professional practice, and policy formulation. While a growing body of literature documents effective resilience strategies, these insights are not consistently translated into planning guidelines, building codes, or professional training curricula (Bai et al., 2018). Architects and planners may therefore lack access to context-specific evidence needed to inform design and decision-making.

Moreover, much of the existing research is case-specific or donor-driven, limiting its transferability across different urban contexts (Satterthwaite et al., 2020). Bridging this knowledge gap requires stronger collaboration between researchers, practitioners, and policymakers, as well as the development of locally grounded research agendas that reflect the realities of developing cities.

6.7 Synthesis of Challenges and Gaps

The challenges identified in this section, ranging from weak governance and institutional fragmentation to socio-economic constraints and financial limitations, underscore that climate resilience in developing cities is not solely a technical issue but a systemic one. Addressing these gaps requires coordinated action across policy, planning, architecture, finance, and community engagement. Without such integration, resilience strategies risk remaining fragmented, inequitable, and insufficient to meet the escalating demands of climate change.

VII. Discussion

This study set out to examine how urban planning approaches and architectural innovations contribute, individually and collectively, to the development of climate-resilient cities in developing countries. The synthesis of 47 peer-reviewed studies reveals that while both disciplines offer substantial resilience benefits, the greatest potential lies in their strategic integration across scales, institutions, and socio-economic contexts. The discussion below situates these findings within broader theoretical and policy debates, highlights key convergences and tensions, and reflects on their implications for sustainable urban development.

7.1 Interpreting the Complementary Roles of Planning and Architecture

The findings affirm that urban planning and architecture address climate resilience at different but interdependent spatial and functional scales. Urban planning primarily operates at the macro and meso levels, shaping land-use patterns, infrastructure networks, mobility systems, and governance frameworks that determine cities' exposure and sensitivity to climate risks (Meerow et al., 2016; Bai et al., 2018). Architectural innovation, by contrast, intervenes at the micro scale, influencing how buildings perform under climatic stress through design, materials, and technology (Ng et al., 2016; Adegun & Adedeji, 2017).

The literature demonstrates that planning-led strategies such as compact urban form, green infrastructure, and sustainable mobility are insufficient on their own if they are not translated into climate-responsive buildings and neighbourhoods. Similarly, architectural solutions, such as passive cooling or low-carbon materials, have limited systemic impact when implemented in isolation from supportive planning policies and infrastructure systems. This reinforces the argument that climate resilience in developing cities is a multi-scalar phenomenon requiring coordinated action across disciplines rather than sectoral silos.

7.2 Climate Resilience, Informality, and Equity Considerations

A central insight from the review is the critical role of informality in shaping resilience outcomes. Informal settlements dominate the urban landscape in many developing countries and represent both heightened vulnerability and latent adaptive capacity (Roy et al., 2020; Watson, 2019). Planning systems often treat informality as a regulatory failure, while architectural practice has historically prioritised formal development contexts. The reviewed evidence suggests that this disconnect undermines resilience efforts by excluding large segments of the urban population from adaptation strategies.

Integrated approaches that combine inclusive planning frameworks with incremental, participatory architectural design offer more equitable and effective pathways to resilience (Satterthwaite et al., 2020; Olotuah et al., 2018). These approaches align with broader justice-oriented perspectives on climate adaptation, which emphasise that resilience must address not only environmental risk but also socio-economic vulnerability and unequal access to resources (Anguelovski et al., 2016). The discussion, therefore, reinforces the need to reposition both planning and architecture as instruments of social as well as environmental resilience.

7.3 Governance, Institutions, and the Implementation Gap

Another key theme emerging from the findings is the persistent gap between resilience-oriented policy aspirations and on-the-ground implementation. Although international frameworks such as the Sustainable Development Goals and national urban policies increasingly reference climate resilience, weak institutional capacity and fragmented governance continue to limit their effectiveness in developing countries (Dodman & Mitlin, 2015; UNEP, 2022). This implementation gap constrains both planning-led interventions and architectural innovation.

The discussion highlights that architects and planners are not merely implementers of policy but active agents who can shape regulatory reform through professional practice, advocacy, and feedback into governance systems. Strengthening the policy–practice nexus, through performance-based building codes, integrated planning regulations, and inter-professional collaboration, emerges as a critical condition for scaling resilience

solutions beyond pilot projects (Amuda-Yusuf et al., 2020; Bai et al., 2018).

7.4 Implications for Sustainable Development and Climate Policy

The findings have important implications for the achievement of the Sustainable Development Goals, particularly SDG 11 (Sustainable Cities and Communities) and SDG 13 (Climate Action). Integrated planning–architecture approaches contribute simultaneously to environmental sustainability, social inclusion, and economic efficiency, reinforcing the interconnected nature of the SDGs (UN, 2015). For example, compact urban form supported by climate-responsive architecture reduces emissions while improving accessibility and housing quality.

However, the uneven adoption of these approaches in developing contexts highlights the risk that global climate and sustainability agendas may exacerbate existing inequalities if not locally adapted. The discussion therefore supports calls for context-sensitive resilience pathways that prioritise local knowledge, affordability, and institutional realities rather than replicating models from developed countries (Jiboye, 2011; Lin & Agyeman, 2020).

7.5 Contribution to Knowledge and Research Gaps

This study contributes to the growing body of literature on climate-resilient urbanism by explicitly bridging urban planning and architectural perspectives within a single analytical framework. While existing studies often focus on either planning systems or building-scale solutions, this review demonstrates that resilience outcomes are contingent on their interaction. In doing so, it advances understanding of climate resilience as a relational and interdisciplinary construct.

Nonetheless, the review also reveals persistent research gaps. There remains limited empirical evidence on the long-term performance of integrated planning–architecture interventions in informal and resource-constrained settings. Additionally, comparative studies across regions of the Global South are scarce, limiting generalisability. Addressing these gaps will require longitudinal, practice-oriented research that engages directly with planners, architects, communities, and policymakers.

7.6 Synthesis of Discussion

Overall, the discussion reinforces the central argument of this paper: that climate resilience in developing cities cannot be achieved through isolated planning or architectural interventions. Instead, it requires synergistic frameworks that integrate spatial planning, building design, governance reform, and community participation. By situating these findings within broader debates on sustainability, equity, and urban governance, the study underscores the necessity of interdisciplinary collaboration as a foundation for resilient urban futures in the face of accelerating climate change.

VIII. Conclusion and Recommendations

8.1 Conclusion

This study has examined the role of urban planning approaches and architectural innovations in advancing climate resilience in developing-country cities. Drawing on a narrative review of 47 peer-reviewed studies published between 2010 and 2025, the paper demonstrates that climate resilience is not achievable through isolated interventions at either the planning or building scale. Rather, resilient urban outcomes emerge from the integration of planning-led strategies, such as compact urban form, green infrastructure, sustainable mobility, and inclusive governance, with architectural innovations that emphasise climate-responsive design, low-carbon materials, passive performance, and incremental adaptation.

The findings confirm that urban planning provides the structural and regulatory foundation for resilience by shaping land use, infrastructure systems, and governance frameworks that influence exposure and adaptive capacity. Architectural innovation complements these efforts by translating resilience objectives into tangible building and neighbourhood solutions that directly affect daily living conditions. However, the effectiveness of both domains in developing contexts is constrained by persistent challenges, including weak policy enforcement, institutional fragmentation, socio-economic inequality, informality, limited financing, and low public awareness.

Overall, the study underscores that climate resilience in developing cities is a systemic challenge requiring coordinated, context-sensitive, and socially inclusive approaches. By bridging urban planning and architectural perspectives, the paper contributes to a more holistic understanding of resilience in the built environment. It highlights pathways for aligning climate adaptation with sustainable development objectives.

8.2 Recommendations

Based on the reviewed evidence, several recommendations are proposed to strengthen climate-resilient urban development in developing countries.

First, **governance and regulatory frameworks** should be strengthened to mainstream climate resilience across planning and building systems. Governments should integrate resilience indicators into land-use plans, zoning regulations, and building codes, supported by transparent enforcement mechanisms. Performance-based regulations that accommodate alternative materials and passive design strategies can enable architectural innovation while ensuring safety and quality.

Second, **institutional capacity building** is essential. Local planning authorities, architects, and construction professionals require continuous training in climate-responsive design, low-carbon technologies, and integrated planning approaches. Stronger coordination among planning, housing, and environmental agencies can reduce fragmentation and improve implementation efficiency.

Third, **financial mechanisms** must be expanded to support resilient planning and architecture. Blended finance, public–private partnerships, housing microfinance, and targeted subsidies can reduce upfront costs and encourage the adoption of resilient building practices. International climate finance should prioritise local governments and community-led initiatives to ensure that resources reach the most vulnerable urban populations.

Fourth, **community participation and social inclusion** should be central to resilience strategies. Participatory planning and co-design processes can harness local knowledge, improve acceptance of interventions, and enhance long-term sustainability, particularly in informal settlements. Policies should explicitly address the needs of marginalised groups to ensure that resilience gains are equitably distributed.

Finally, **research–practice integration** should be strengthened through applied research, pilot projects, and knowledge exchange platforms that link academia, professional practice, and policymaking. Longitudinal studies and comparative research across developing regions are particularly needed to assess the long-term performance of integrated planning–architecture interventions.

References

[1] Adelekan, I., Johnson, C., Manda, M., Matyas, D., Mberu, B., Parnell, S. & Vivekananda, J. (2015). Disaster risk and its reduction: An agenda for urban Africa. *International Development Planning Review, 37*(1), 33–43. https://doi.org/10.3828/idpr.2015.4

[2] Adegbie, M. O. (2021). Improvement on window glassing for an enhanced indoor thermal environment of tropical office buildings. *IOP Conference Series: Materials Science and Engineering, 1107*(1), 012027. https://doi.org/10.1088/1757-899X/1107/1/012027

[3] Adegun, O. B., & Adedeji, Y. M. D. (2017). Review of economic and environmental benefits of earthen materials for housing in Africa. *Frontiers of Architectural Research, 6*(4), 519–528. https://doi.org/10.1016/j.foar.2017.08.003

[4] Adedeji, Y. M. D., Taiwo, A. A., Olotuah, O. A., Fadairo, G., & Ayeni, D. A. (2013). Low-carbon construction materials and techniques for sustainable housing development in Nigeria. In *AEI 2013: Building Solutions for Architectural Engineering* (pp. 643–651). American Society of Civil Engineers. https://doi.org/10.1061/9780784412909.063

[5] Alam, M., & Rabbani, M. D. G. (2017). Vulnerabilities and responses to climate change for Dhaka. *Environment and Urbanisation, 29*(1), 139–158. https://doi.org/10.1177/0956247816687247

[6] Amuda-Yusuf, G., Adebiyi, R. W. M., Taibat, R., Abdulraheem, M. O., Soliu, I., Eluwa, S. E., & Quarters, J. (2020). Barrier factors affecting the adoption of green building technologies in

Nigeria. *Built Environment, 17*(2), 37–48. https://ir.uitm.edu.my/id/eprint/41972

[7] Anguelovski, I., Connolly, J. J. T., Masip, L., & Pearsall, H. (2022). Assessing green gentrification in globally diverse contexts. *Urban Studies, 59*(1), 174–194. https://doi.org/10.1177/0042098020955775

[8] Anguelovski, I., Shi, L., Chu, E., Gallagher, D., Goh, K., Lamb, Z., ... & Teicher, H. (2016). Equity impacts of urban land use planning for climate adaptation. *Journal of Planning Education and Research, 36*(3), 333–348. https://doi.org/10.1177/0739456X15613024

[9] Asdrubali, F., D'Alessandro, F., & Schiavoni, S. (2015). A review of unconventional sustainable building insulation materials. *Renewable and Sustainable Energy Reviews, 48*, 395–411. https://doi.org/10.1016/j.rser.2015.04.017

[10] Bai, X., Dawson, R. J., Ürge-Vorsatz, D., Delgado, G. C., Barau, A. S., Dhakal, S., ... & Schultz, S. (2018). Six research priorities for cities and climate change. *Nature, 555*(7694), 23–25. https://doi.org/10.1038/d41586-018-02409-z

[11] Brand, P., & Dávila, J. D. (2011). Mobility innovation at the urban margins: Medellín's Metrocables. *City, 15*(6), 647–661. https://doi.org/10.1080/13604813.2011.609002

[12] Bulkeley, H., Carmin, J., Castán Broto, V., Edwards, G. A., & Fuller, S. (2014). Climate justice and global cities: Mapping the emerging discourses. *Global Environmental Change, 23*(5), 914–925. https://doi.org/10.1016/j.gloenvcha.2013.05.010

[13] Chandel, S. S., Sharma, V., & Marwah, B. M. (2016). Review of passive cooling techniques in buildings. *Renewable and Sustainable Energy Reviews, 65*, 335–342. https://doi.org/10.1016/j.rser.2016.06.010

[14] Chu, E., Anguelovski, I., & Roberts, D. (2017). Climate adaptation as strategic urbanism: Assessing opportunities and uncertainties for equity and inclusive development. *Cities, 60*, 378–387. https://doi.org/10.1016/j.cities.2016.10.016

[15] Darko, A., & Chan, A. P. C. (2016). Critical analysis of green building research trends in construction journals. *Habitat International, 57*, 53–63. https://doi.org/10.1016/j.habitatint.2016.07.001

[16] Dodman, D., & Mitlin, D. (2015). The national and local politics of climate change adaptation in Africa. *Climate and Development, 7*(3), 219–225. https://doi.org/10.1080/17565529.2014.934777

[17] Elmqvist, T., Andersson, E., Frantzeskaki, N., McPhearson, T., Olsson, P., Gaffney, O., ... & Folke, C. (2019). Sustainability and resilience for transformation in the urban century. *Nature Sustainability, 2*(4), 267–273. https://doi.org/10.1038/s41893-019-0250-1

[18] Ewing, R., & Cervero, R. (2010). Travel and the built environment. *Journal of the American Planning Association, 76*(3), 265–294. https://doi.org/10.1080/01944361003766766

[19] Ghaffarianhoseini, A., et al. (2016). The essence of future smart houses: Comparative review. *Renewable and Sustainable Energy Reviews, 68*, 1232–1243. https://doi.org/10.1016/j.rser.2016.02.028

[20] Goodfellow, T. (2020). Bus rapid transit and the failure of governance in African cities. *Journal of Transport Geography, 88*, 102857. https://doi.org/10.1016/j.jtrangeo.2020.102857

[21] Hernández, P., & Kenny, P. (2010). From net energy to zero energy buildings: Definition and frameworks. *Renewable and Sustainable Energy Reviews, 14*(1), 249–257. https://doi.org/10.1016/j.rser.2009.07.010

[22] IPCC. (2022). *Climate Change 2022: Impacts, Adaptation, and Vulnerability.* Intergovernmental Panel on Climate Change. https://www.ipcc.ch/report/ar6/wg2/

[23] Jiboye, A. D. (2011). Sustainable housing development in Nigeria: The public–private partnership initiative. *The Built & Human Environment Review, 4*(1), 122–132.

[24] Kabisch, N., Frantzeskaki, N., Pauleit, S., Naumann, S., Davis, M., Artmann, M., ... & Bonn, A. (2017). Nature-based solutions to climate change mitigation and adaptation in

urban areas. *Ecology and Society, 22*(3), 39. https://doi.org/10.5751/ES-09391-220339

[25] Kheiri, F. (2018). A review of optimisation methods in building design for sustainability. *Renewable and Sustainable Energy Reviews, 93*, 312–327. https://doi.org/10.1016/j.rser.2018.05.036

[26] Li, D. H. W., Yao, R., Yu, W., & Yu, H. (2013). A review of zero-energy building definitions and policies. *Renewable and Sustainable Energy Reviews, 19*, 463–471. https://doi.org/10.1016/j.rser.2012.11.049

[27] Lin, B., & Agyeman, S. D. (2020). Assessing Sub-Saharan Africa's low-carbon development through the dynamics of energy-related carbon dioxide emissions. *Journal of Cleaner Production, 274*, 122676. https://doi.org/10.1016/j.jclepro.2020.122676

[28] Ma, Z., Cooper, P., Daly, D., & Ledo, L. (2012). Existing building retrofits: Methodology and state-of-the-art. *Energy and Buildings, 55*, 889–902. https://doi.org/10.1016/j.enbuild.2012.08.018

[29] Meerow, S., Newell, J. P., & Stults, M. (2016). Defining urban resilience: A review. *Landscape and Urban Planning, 147*, 38–49. https://doi.org/10.1016/j.landurbplan.2015.11.011

[30] Nejat, P., Javid, M., Hin, C. J., & Abd. Majid, M. Z. (2015). A global review of building energy consumption. *Energy and Buildings, 87*, 64–79. https://doi.org/10.1016/j.enbuild.2014.11.019

[31] Newman, P., Beatley, T., & Boyer, H. (2017). *Resilient Cities: Overcoming Fossil Fuel Dependence*. Island Press.

[32] Ng, T. S. K., Yau, R. M. H., Lam, T. N. T., & Cheng, V. S. Y. (2016). Designing a zero-carbon building for a hot-humid climate. *International Journal of Low-Carbon Technologies, 11*(2), 222–234. https://doi.org/10.1093/ijlct/ctt067

[33] Obodoh, D. A., Orji, S. E., & Ekekezie, C. U. (2024). Application of solar energy and residential building integration technology in Nigeria. *Iconic Research and Engineering Journals, 8*(1), 388–393. https://www.irejournals.com/paper-details/1706013

[34] Olotuah, A. O., Olotuah, A. A., Olotuah, A. M., & Adedeji, Y. M. D. (2018). Ecological approach to sustainable housing development in Nigeria. *International Journal of Engineering Sciences & Research Technology, 7*(12), 281–290. https://doi.org/10.5281/zenodo.2297832

[35] Pittau, F., Krause, F., Lumia, G., & Habert, G. (2018). Fast-growing bio-based materials for carbon-neutral buildings. *Energy and Buildings, 162*, 646–659. https://doi.org/10.1016/j.enbuild.2017.12.051

[36] Pomponi, F., & Moncaster, A. (2017). Embodied carbon mitigation in the built environment. *Energy and Buildings, 140*, 68–80. https://doi.org/10.1016/j.enbuild.2017.01.075

[37] Raji, B., Ten Pierik, M., & van den Dobbelsteen, A. (2016). Energy saving potential of a double-skin façade in the tropics. *Energy and Buildings, 110*, 211–221. https://doi.org/10.1016/j.enbuild.2015.10.034

[38] Ramesh, T., Prakash, R., & Shukla, K. K. (2010). Life cycle energy analysis of buildings: An overview. *Energy and Buildings, 42*(10), 1592–1600. https://doi.org/10.1016/j.enbuild.2010.05.007

[39] Rode, P., Floater, G., Thomopoulos, N., Docherty, J., Schwinger, P., Mahendra, A., & Fang, W. (2017). Accessibility in cities: Transport and urban form. *Environment and Urbanisation, 29*(1), 141–162. https://doi.org/10.1177/0956247817719865

[40] Roy, A., Jahan, F., & Hulme, D. (2020). Contradictory and complex: Informality in urban governance. *Urban Studies, 57*(3), 585–604. https://doi.org/10.1177/0042098019854470

[41] Salat, S., & Bourdic, L. (2012). Urban complexity, efficiency and resilience. *Proceedings of the Institution of Civil Engineers - Urban Design and Planning, 165*(4), 245–257. https://doi.org/10.1680/udap.11.00019

[42] Santamouris, M. (2014). Cooling the cities: A review of mitigation techniques. *Energy and Buildings, 103*, 1–22. https://doi.org/10.1016/j.enbuild.2015.04.006

[43] Satterthwaite, D., Archer, D., Colenbrander, S., Dodman, D., Hardoy, J., Mitlin, D., & Patel, S. (2020). Building resilience to climate change in informal settlements. *One Earth, 2*(2), 143–156. https://doi.org/10.1016/j.oneear.2020.02.002

[44] Sharma, B., Gatoo, A., Bock, M., & Ramage, M. (2015). Engineered bamboo for structural applications. *Construction and Building Materials, 81*, 66–73. https://doi.org/10.1016/j.conbuildmat.2015.02.077

[45] Sharifi, A. (2021). Urban form resilience: A meso-scale analysis. *Sustainable Cities and Society, 65*, 102618. https://doi.org/10.1016/j.scs.2020.102618

[46] Torgal, F. P., & Jalali, S. (2011). Earth construction: Lessons from the past for future eco-efficient construction. *Construction and Building Materials, 29*, 512–519. https://doi.org/10.1016/j.conbuildmat.2011.10.054

[47] UNEP. (2022). *2022 Global Status Report for Buildings and Construction: Towards a Zero-emission, Efficient and Resilient Buildings and Construction Sector*. United Nations Environment Programme. https://globalabc.org/resources/publications/2022-global-status-report-buildings-and-construction

[48] UN. (2015). *Transforming our world: The 2030 Agenda for Sustainable Development.* United Nations. https://sdgs.un.org/2030agenda

[49] Watson, V. (2019). African urban fantasies: Dreams or nightmares? *Environment and Urbanisation, 31*(1), 213–228. https://doi.org/10.1177/0956247818815796

[50] World Bank. (2021). *State and Trends of Carbon Pricing 2021*. World Bank. https://openknowledge.worldbank.org/handle/10986/35620