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# THE ROLE OF URBAN PLANNING IN GUIDING URBAN DEVELOPMENT WITHIN SAUDI VISION 2030 PROJECTS: FROM STRATEGIC INTENT TO SPATIAL REALITY

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## ABSTRACT

*The Kingdom of Saudi Arabia is currently undertaking one of the most ambitious national transformation programs in modern history, Saudi Vision 2030, which fundamentally reimagines the nation's urban form, economic structure, and social fabric. While the economic dimensions of this transition are well-documented, the specific spatial planning mechanisms translating high-level national goals into on-the-ground urban realities remain under-theorized. This study investigates the role of urban planning as a guidance mechanism within the Vision 2030 ecosystem, specifically examining how spatial strategies operationalize economic diversification and sustainability. Utilizing a mixed-method approach that integrates policy document analysis with geospatial assessment, the research analyzes the National Spatial Strategy 2030 alongside comparative case studies of key developments, including the National Housing Company (NHC), Riyadh's metropolitan restructuring, and the King Salman International Airport. The methodology employs GIS-based spatial analysis to evaluate land-use dynamics, transit accessibility, and infrastructure provision, identifying the alignment and occasional mismatch between policy intent and spatial implementation. The results identify a definitive shift from traditional static master-planning toward a hybrid "strategic-adaptive" model, characterized by centralized governance authorities, integrated infrastructure-led development, and the aggressive deployment of smart city technologies. However, the spatial analysis reveals persisting challenges, including "first-mile/last-mile" connectivity gaps and spatial imbalances in service provision between central and peripheral zones. The study concludes by proposing a conceptual "Saudi Vision 2030 Urban Planning Guidance Model" (UPGM), which illustrates the causal pathways between governance architecture, planning instruments, and urban performance outcomes, offering a reproducible framework for emerging economies transitioning away from resource dependency while navigating complex environmental constraints.*

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**KEYWORDS:** Saudi Vision 2030; Sustainable Urban Planning; Mega-projects; Spatial Planning; Urban Governance; Transit-Oriented Development; National Housing Company (NHC); Riyadh.

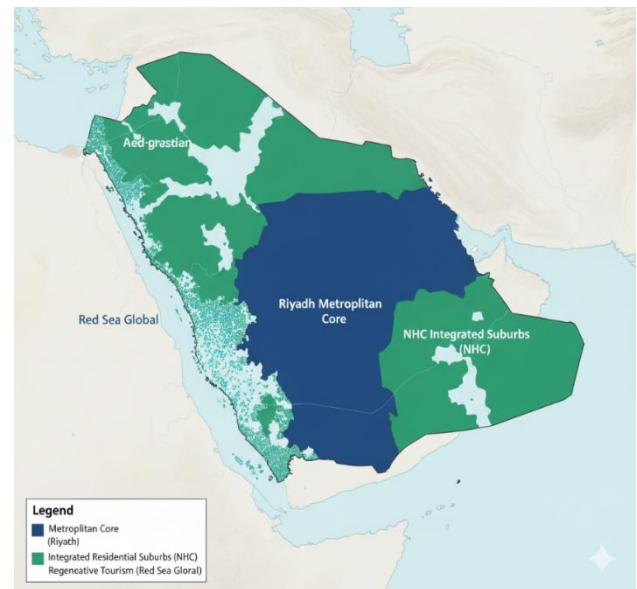
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## 1. INTRODUCTION

Urban planning has long served as a critical instrument of statecraft, functioning as the primary mechanism for shaping spatial reality. In the contemporary era, national transformation agendas are increasingly relying on spatial strategies to address complex, interlocking challenges ranging from climate resilience to digital integration and economic diversification. For resource-dependent economies in the Global South, the stakes are particularly high; urban planning ceases to be solely a technical discipline of land-use management and becomes a central vehicle for engineering structural economic transition. The Kingdom of Saudi Arabia stands at the forefront of this global urban paradigm shift. Historically characterized by a rapid, oil-fueled urbanization pattern that prioritized low-density expansion and automobile dependence, the nation is now pivoting toward a new developmental logic. As noted by Almulhim and Cobbinah (2024), the Kingdom is moving away from a *laissez-faire* approach to growth toward a model of "planning-led development," where urbanization is no longer treated as a byproduct of economic activity but as its deliberate driver. This fundamental restructuring is necessitated by urgent demographic pressures and severe environmental constraints, including acute water scarcity and extreme heat, which demand a radical departure from conventional, sprawling urban forms to ensure long-term resilience (Garba, 2004). Furthermore, the structural transformation of the land sector and the optimization of asset utilization are becoming prerequisites for attracting foreign direct investment and fostering non-oil GDP growth (Abdrabo, 2024).

Launched in 2016, Saudi Vision 2030 represents a comprehensive roadmap to reduce the Kingdom's dependence on oil and develop public service sectors such as health, infrastructure, recreation, and tourism (Kingdom of Saudi Arabia, 2016). While frequently analyzed through macroeconomic or geopolitical lenses, the Vision is inherently spatial. It mandates the creation of a "vibrant society" and a "thriving economy," goals that are inextricably linked to the physical environment of cities. The implementation of these high-level objectives is supported by the National Spatial Strategy (NSS) 2030, which seeks to achieve balanced regional development by leveraging the distinct competitive advantages of different provinces (United Nations Development Programme [UNDP], 2021). Consequently, Vision 2030 has catalyzed a dual-track development approach: the regeneration and restructuring of existing metropolitan hubs like

Riyadh and Jeddah (Alhubashi et al., 2024; Mahboob, 2025), and the creation of greenfield "giga-projects" that serve as testbeds for futuristic urbanism. This portfolio of projects ranging from the integrated residential suburbs of the National Housing Company (NHC) to the heritage-centric Diriyah Gate represents a massive spatial intervention designed to alter the country's settlement patterns and economic geography as shown in figure 1.

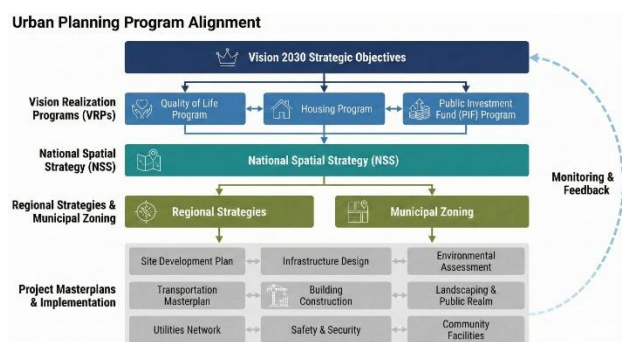


**Figure 1: Spatial portfolio map of Vision 2030 urban mega-projects.** The map illustrates the geographic distribution of key developments, distinguishing between the central metropolitan core (Riyadh), the integrated residential suburbs (National Housing Company), and the regenerative tourism archipelagos (Red Sea Global). Insets highlight the density of the Riyadh metropolitan area compared to the dispersed coastal project.

The sheer scale of these interventions signals a departure from the "rentier city" model, where urban growth was largely driven by the distribution of oil revenues through land grants and interest-free loans, a system that historically incentivized sprawl and fragmentation (Mubarak, 2004; Aina et al., 2019). In its place, a more sophisticated "state entrepreneurial" model is emerging. This is visible in the strategic alignment of the Quality of Life Program, which is specifically designed to enhance the livability of Saudi cities through better urban design, increased green spaces, and cultural integration (Quality of Life Program, 2024; Al-Qawasmi et al., 2021). Moreover, the push for smart cities is not merely technological but foundational to the Vision's sustainability targets, aiming to create urban environments that are data-driven and resource-efficient (Alqahtany, 2025; Almulhim & Aina, 2025). A pivotal element of this spatial transformation is the re-imagining of logistics

and connectivity as urban anchors, exemplified by the development of the King Salman International Airport in Riyadh. This project signals a strategic shift toward an "aerotropolis" model, where the airport functions not just as transport infrastructure but as a central urban core driving commercial, residential, and logistical growth. This integrates with broader efforts to restructure Riyadh from a car-centric metropolis into a sustainable, transit-oriented capital, supported by the Riyadh Metro and massive greening initiatives (Almatar, 2025; Homoud et al., 2024).

However, translating these ambitious national goals into tangible urban realities requires a robust guidance mechanism that bridges the gap between policy intent and implementation. The institutional architecture of Saudi planning has undergone significant reform to facilitate this. The emergence of Royal Commissions and Special Purpose Vehicles (SPVs) has created a parallel governance structure designed to bypass traditional bureaucratic inertia and accelerate project delivery (Aldegeishem, 2023b). These entities operate with significant autonomy, allowing for the testing of new regulatory instruments, such as form-based codes and performance-based zoning that differ markedly from the standard municipal planning framework (Amer et al., 2021). Understanding this vertical alignment, from the Vision's strategic objectives down to the specific planning tools used on the ground, is critical for comprehending the trajectory of Saudi urbanization (Figure 2).



**Figure 2: Urban planning program alignment diagram.** This framework illustrates the hierarchical governance structure and "cascade of authority," tracing how high-level Vision 2030 objectives flow through Vision Realization Programs (VRPs) and the National Spatial Strategy (NSS) to inform project-specific masterplans and implementation mechanisms.

Existing literature tends to isolate specific elements of the transformation, such as the environmental implications of sustainable housing developments by the National Housing Company

(NHC) or the specific challenges of transit-oriented development (TOD) implementation in Riyadh (Alasmari & Alarabi, 2024; Mazzetto et al., 2025). There is a distinct lack of integrated models that explain the "guidance mechanisms", the causal chains linking high-level policy intent to the specific governance structures, regulatory tools, and spatial designs that emerge on the ground.

To address this gap, this research aims to analyze the mechanisms through which urban planning guides spatial, infrastructural, and socioeconomic development within Saudi Vision 2030 mega-projects. The study seeks to deconstruct the institutional architecture and planning instruments that translate the Vision's abstract goals into tangible urban environments. Specifically, the inquiry investigates three core questions: First, what specific planning frameworks and regulatory instruments are embedded in the governance of Vision 2030 projects? Second, how do these spatial planning tools and governance structures influence the physical direction of urban development, particularly regarding density and infrastructure integration? And third, to what extent do these planning decisions causally affect outcomes related to sustainability, livability, and economic diversification? By defining a "Saudi Vision 2030 Urban Planning Guidance Model" (UPGM), this paper fills a critical theoretical and empirical gap in Middle Eastern planning research. It offers a framework applicable to other emerging economies attempting state-led rapid urbanization and provides policymakers with an evidence-based roadmap for optimizing the interface between governance mandates and spatial execution, particularly in arid environments facing severe climate change challenges (Arif & Aldosary, 2023; Alshuwaikhat et al., 2022).

## 2. LITERATURE REVIEW

The academic discourse surrounding urban planning has evolved significantly over the past half-century, shifting from a focus on static land-use management to a recognition of planning as a dynamic, multi-dimensional tool for national competitiveness, social engineering, and ecological resilience. In the context of the Global South, and specifically resource-rich nations, this evolution is critical; planning is no longer merely about organizing space but about engineering economic transition. This literature review synthesizes three concentric circles of scholarship: global theoretical frameworks on strategic and smart urbanism, the specific trajectory of urbanization in the Gulf Cooperation Council (GCC) region, and the emerging, highly distinct planning paradigms

currently being operationalized within Saudi Arabia's Vision 2030. By interrogating these layers, the review establishes the theoretical basis for understanding how disparate projects, ranging from heritage preservation in Diriyah to integrated residential communities developed by the National Housing Company (NHC) are unified under a singular, albeit complex, governance and guidance mechanism.

### ***2.1 Global Urban Paradigms: From Rational Planning to Strategic Adaptation***

The discipline of urban planning has undergone a significant paradigmatic shift, moving away from the rigid, "rational comprehensive" master-planning models of the mid-20th century toward more adaptive, strategic frameworks suited for an uncertain globalized economy. Traditional rational planning, characterized by fixed land-use zoning, long-term static blueprints, and a reliance on demographic predictability, has largely been criticized for its inability to respond to rapid economic volatility and environmental shifts. In response, contemporary theory emphasizes "strategic spatial planning," which prioritizes flexibility, multi-stakeholder governance, and the integration of infrastructure investment with spatial development.

Within this strategic turn, three dominant sub-paradigms have emerged that are particularly relevant to Saudi Arabia's national transformation: Smart Urbanism, Transit-Oriented Development (TOD), and the Aerotropolis model. First, Smart Urbanism reconceptualizes the city as a system of information flows, where data-driven governance optimizes resource allocation and service delivery. As noted by Alqahtany (2025), smart cities in the Arab world are increasingly viewed not just as technological projects but as pathways to sustainable urbanism, leveraging digital twins and IoT sensors to manage energy consumption and urban logistics. This aligns with the broader discourse on "Ecological Modernization," which posits that technology can decouple economic growth from environmental degradation.

Second, Transit-Oriented Development (TOD) seeks to reverse the sprawling, automobile-dependent urban forms characteristic of the late 20th century by densifying land use around high-capacity public transport nodes. This model focuses on the "D-variables" Density, Diversity, and Design to create walkable, mixed-use communities that reduce carbon footprints and enhance social mobility (Almatar, 2022). For cities transitioning from car-centric models, TOD represents a radical structural intervention, requiring not just infrastructure investment but a complete overhaul of zoning codes and urban design guidelines (Mazzetto et al., 2025).

Third, and increasingly critical for global connectivity, is the Aerotropolis model, or airport-centric urbanism. Here, major airports transcend their role as transport nodes to become the central anchors of urban economic regions, driving logistics, business clusters, and urban expansion. This model suggests that in a globalized economy, the airport is the "physical internet," and urban development should logically cluster around it to maximize speed and connectivity, a theory clearly resonant with recent logistics-led developments in Riyadh.

### ***2.2 Urbanization in the Gulf: The Rentier State and the Spatial Fix***

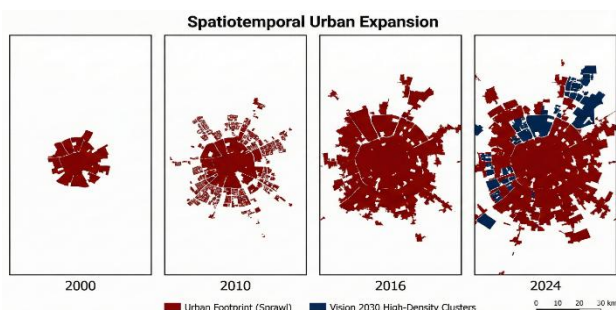
Urban development in the Gulf Cooperation Council (GCC) countries presents a unique case study in the global planning landscape. Historically, urbanization in the region was driven by the "rentier state" model, where oil revenues fueled rapid, low-density expansion. Governments utilized land distribution mechanisms often in the form of large residential plots and interest-free loans as a means of wealth redistribution, leading to sprawling, low-density cities heavily reliant on private vehicles (Mubarak, 2004). This era was characterized by the importation of Western planning grids that often ignored local climatic and cultural contexts, resulting in urban environments with high energy intensity and low walkability.

However, the pressing need for economic diversification has forced a re-evaluation of these models. Cities in the Gulf are no longer merely residential centers for a workforce but are being retooled as engines of economic competitiveness, tourism, and global logistics (Arif & Aldosary, 2023). This "post-oil" urbanism is characterized by a shift from managing growth to actively "entrepreneurializing" the city. Governments are increasingly acting as master developers, using state-owned enterprises to bypass traditional bureaucratic hurdles and deliver mega-projects that serve as branding tools for global investment. This shift has manifested in the rise of "eco-cities" and "smart cities" across the region, such as Masdar City in Abu Dhabi and Lusail in Qatar. However, scholars note that these developments often grapple with the tension between branding and genuine sustainability (Alshuwaikhat et al., 2022). The challenge for Gulf planning systems is to move beyond the superficial application of green technologies to address fundamental structural issues, such as extreme heat adaptation, water scarcity, and social inclusion, while simultaneously fostering economic innovation (Almulhim & Aina, 2025).

### 2.3 Saudi Arabia's Urban Planning Evolution: Limits of the Old Model

Saudi Arabia's urban planning trajectory mirrors the broader Gulf experience but is distinguished by the sheer scale and speed of its transformation. For decades, the planning system was centralized under the Ministry of Municipal and Rural Affairs (MOMRA), utilizing a comprehensive master-planning approach that struggled to keep pace with the explosive population growth of the 1970s and 1980s. This era resulted in significant urban sprawl, particularly in Riyadh and Jeddah. Studies by Aljoufie et al. (2013a; 2013b) have documented the profound disconnect between land-use planning and transportation infrastructure during this period, where road networks were expanded to facilitate sprawl rather than to guide consolidated growth.

A critical instrument during this phase was the Urban Growth Boundary (UGB), intended to contain expansion and promote infill development. However, Amer et al. (2021) identified significant failures in the UGB policy, noting that technical instruments often lacked the institutional enforcement mechanisms to effectively restrain land speculation and leapfrog development. The result was a fragmented urban fabric characterized by vacant "white lands" within the city limits and scattered subdivisions on the periphery (Figure 3) (Garba, 2004).



**Figure 3: Spatiotemporal urban expansion of Riyadh (2000–2024).** The multi-panel time-series visualization highlights the shift from low-density, scattered sprawl in the pre-Vision era (2000–2016) to the emerging pattern of strategic densification and nodal clustering observed in the current phase (2024).

Under Vision 2030, the planning paradigm has shifted from "managing growth" to "directing development." This transition is characterized by the centralization of strategic decision-making and the decentralization of operational execution through new governance vehicles. Almulhim and Cobbinah (2024) describe this as the state acting as an "urbanization provocateur," actively intervening to reshape urban forms to meet diversification targets. This new era emphasizes "smart governance" and the digitization of

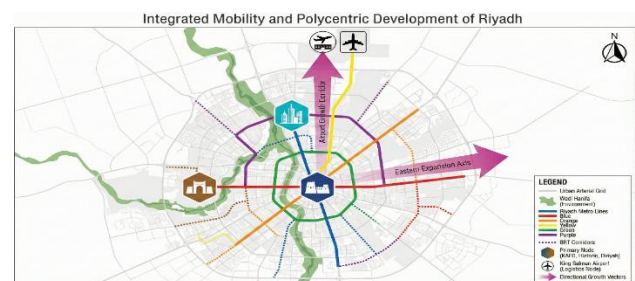
planning processes to improve transparency and efficiency (Aldegheshem, 2024). Furthermore, there is a growing recognition of the social dimensions of planning. Alasiri et al. (2025a; 2025b) highlight the evolving role of participatory planning, suggesting that while top-down strategies remain dominant, there is an increasing openness to engaging local communities, particularly in urban regeneration projects to ensure that developments align with social needs and cultural values (Aldegheshem, 2023a).

### 2.4 Vision 2030 Mega-Projects as Planning Laboratories

The most visible manifestation of this new planning logic is the portfolio of "giga-projects" and the strategic restructuring of existing metropolitan areas. These projects serve as "planning laboratories" where new regulatory frameworks, design codes, and sustainability technologies are tested before potential nationwide application.

#### Metropolitan Restructuring: Riyadh and Jeddah

In existing cities, the planning focus is on retrofitting sustainable infrastructure into the existing urban fabric, a complex challenge given the legacy of auto-centric design. In Riyadh, the strategy relies heavily on the integration of the Riyadh Metro and Bus Rapid Transit (BRT) systems to drive Transit-Oriented Development (TOD) (Figure 4). Almatar (2025) and Mazzetto et al. (2025) argue that successful TOD in Riyadh requires more than just rail lines; it demands comprehensive zoning reforms to encourage mixed-use density and pedestrian-friendly environments. Current research indicates that while the infrastructure is state-of-the-art, the "first-mile/last-mile" connectivity remains a significant hurdle due to the hostile pedestrian environment and lack of shading (Homoud et al., 2024; Jarrar & Al-Homoud, 2024).



**Figure 4: Integrated mobility and polycentric development structure plan.** The map visualizes the structural realignment of Riyadh, highlighting the six metro lines and BRT corridors as the urban skeleton. It identifies the emergence of a polycentric system anchored by KAFD (North), the Historic Core (Center), and Diriyah (West), moving away from a monocentric model.

Simultaneously, the "Green Riyadh" initiative represents a massive geo-engineering planning strategy aimed at mitigating the urban heat island effect through the planting of 7.5 million trees. This is not merely landscaping but a critical adaptation strategy to make the outdoor environment viable for the social activities envisioned by the Quality of Life Program (Kurban et al., 2025; Asfour & Hossain, 2025). In Jeddah, similar strategic approaches are being applied to align urban management with Vision 2030, focusing on addressing informal settlements and improving coastal resilience (Alhubashi et al., 2024).

### **Greenfield Urbanism: The National Housing Company (NHC) and Integrated Suburbs The National Housing Company (NHC)**

represents a complete break from traditional subdivision planning, serving as a primary engine for increasing homeownership to 70% by 2030. Rather than the piecemeal development of isolated plots, the NHC employs a "comprehensive developer" model to create massive, integrated residential suburbs (such as Al Fursan and Khuzam). These developments challenge the conventional, car-dependent grid by adhering to strict "Quality of Life" standards. The planning logic here subordinates maximum land subdivision to social and environmental KPIs, mandating the integration of vast green networks, pedestrian pathways, and community centers. This model represents a shift toward "human-centric" urbanism, where the spatial form is engineered to foster social interaction and active lifestyles, addressing the historic lack of public realm in Saudi cities.

### **Regenerative Tourism and Heritage**

The Red Sea Project and AIUla represent a third typology: "Regenerative Tourism" planning. Unlike standard resort development, the planning logic here is dictated by environmental carrying capacity and heritage preservation. Filippi and Mazzetto (2024) compare these approaches, noting that they rely on "Marine Spatial Planning" and strict heritage codes to monetize natural and cultural assets without degrading them. This approach frames conservation not as a limit on development, but as the primary value proposition. Similarly, Diriyah Gate employs a "heritage-led regeneration" model, using the strict Najdi architectural code to create a distinct urban identity that contrasts with the glass-and-steel modernism of the King Abdullah Financial District (Mazzetto & Vanini, 2023).

## **2.5 Identified Research Gap**

While the literature provides robust analyses of individual components, such as the efficacy of UGBs (Amer et al., 2021) or the potential of smart cities (Alqahtany, 2025), there is a notable absence of a unified theoretical model. Current research has yet to fully articulate the process of guidance: how the high-level ambitions of Vision 2030 flow through specific governance architectures (like the transition from municipal oversight to Royal Commissions) to select specific planning instruments. Furthermore, the interplay between the "Aerotropolis" logic of King Salman International Airport, the heritage logic of Diriyah, and the integrated community logic of the National Housing Company (NHC) represents a divergent yet complementary planning strategy that has not been comparatively analyzed within a single framework. The literature describes what is being built, but largely overlooks the institutional mechanics, the causal chain of governance, instrument selection, and spatial operationalization that functions as the steering wheel for this massive national transformation. This study seeks to bridge this gap by mapping the "guidance mechanism" itself.

## **3. THEORETICAL FRAMEWORK**

To rigorously analyze the 'guidance mechanisms' of urban planning within Saudi Vision 2030, a single theoretical lens is insufficient. The transformation under investigation is simultaneously spatial, institutional, and ecological. It involves the physical reordering of territory and the redefinition of the relationship between urbanism and nature. Therefore, this research adopts a multi-dimensional theoretical framework that synthesizes Strategic Spatial Planning Theory, Institutional Theory (specifically State-Led Urban Entrepreneurialism), and Ecological Modernization Theory. Together, these three lenses provide the necessary scaffolding to interpret how Vision 2030 projects are designed, governed, and implemented.

### **3.1 Strategic Spatial Planning and the "Spatial Fix"**

Classical urban planning in the mid-20th century was dominated by "rational comprehensive" models, where the planner's role was to produce fixed, long-term master plans based on predictable demographic trends. However, the volatility of the global economy and the speed of Saudi Arabia's desired transformation require a shift toward Strategic Spatial Planning. This theoretical approach views planning not as the production of static blueprints,

but as the active coordination of policies, infrastructure investments, and stakeholder actions to shape spatial development in real-time. In the Saudi context, this explains the decisive move toward "infrastructure-led development," where massive transport networks, such as the Riyadh Metro or the logistics hubs of King Salman International Airport are utilized to structure urban growth rather than merely service it. The plan becomes a flexible framework for guiding investment rather than a rigid zoning map.

Furthermore, this research integrates the geographical political economy concept of the "Spatial Fix." This theory suggests that states often resolve crises of capital accumulation by "switching" capital into the built environment to secure long-term growth. Analyzed through this lens, the giga-projects of Vision 2030 are not merely real estate ventures but are strategic "spatial fixes" designed to absorb oil surpluses and physically reconfigure the national economy. By opening new territories (like the Red Sea coast) and creating new asset classes (tourism, logistics, entertainment), the state uses spatial planning to engineer the economic diversification that the oil sector alone can no longer sustain.

### 3.2 Ecological Modernization and Techno-Optimism

Finally, to analyze the environmental claims of projects like **integrated residential suburbs** and Green Riyadh, the study employs Ecological Modernization Theory. Unlike radical environmentalism, which often views economic growth and environmental protection as contradictory, Ecological Modernization argues that they can be decoupled through technological innovation and "smart" management. This is the theoretical underpinning of the "Smart City" paradigm adopted in Saudi Arabia. It frames environmental challenges, such as extreme heat, water scarcity, or energy consumption not as limits to growth, but as design flaws to be solved through efficiency.

In the context of Vision 2030, this manifests as "Techno-Optimism." The planning guidance mechanism relies heavily on the belief that advanced technologies, such as cloud seeding, desalination, AI-driven resource management, and hydrogen power will allow for the construction of sustainable communities in harsh desert environments without ecological collapse. This lens is critical for evaluating the "Regenerative Tourism" model of Red Sea Global, which aims for a net positive biodiversity impact. It moves the analysis beyond simple sustainability (maintaining the status quo) to "regenerative development," positing that high-value economic

activity can generate the revenue necessary to fund the technological restoration of ecosystems. By applying this theoretical lens, the research can critically assess whether the planning instruments are genuinely driving sustainability or merely performing a "green fix" through high-tech branding.

## 4. METHODOLOGY

To effectively deconstruct the complex, multi-layered mechanisms of urban planning within Saudi Vision 2030, this study adopts a robust mixed-methods research design. The phenomenon under investigation, the strategic guidance of rapid national transformation is inextricably linked to both the institutional architecture of the Saudi state and the physical realities of the built environment. Therefore, a singular methodological lens would be insufficient. A purely qualitative policy analysis might capture the strategic intent but fail to verify the spatial outcome, while a purely quantitative GIS assessment might reveal spatial patterns without explaining the governance logic that produced them. Consequently, this research integrates Qualitative Comparative Analysis (QCA) of policy frameworks with Geospatial Analytics (GIS) to triangulate findings as illustrated in Figure 5. This dual-track approach allows for "process tracing," linking high-level governance mandates (the cause) to observable urban forms (the effect).

### 4.1 Research Design and Case Selection

The study employs a "maximum variation" sampling strategy to select case studies that represent the diverse spectrum of planning typologies emerging under Vision 2030. Rather than focusing on a single city, the research analyzes a portfolio of projects that function as distinct "planning laboratories." The selection criteria were based on three dimensions: governance model (e.g., Royal Commission vs. Municipality), development type (Greenfield vs. Brownfield), and primary economic driver (e.g., Tourism, Logistics, Urban Living).

Based on these criteria, four primary case studies were selected for deep-dive analysis:

1. **National Housing Company (NHC):** Represents the "Integrated Residential Suburb" typology, testing the delivery of large-scale, master-planned communities (such as Al Fursan and Khuzam) with direct state-led governance to meet homeownership targets.
2. **Riyadh Metropolitan Area:** Represents the "Brownfield Restructuring" typology, focusing on the retrofitting of transit infrastructure (Metro/BRT) into an existing car-dependent fabric.

3. **King Salman International Airport:** Represents the "Aerotropolis/Logistics" typology, illustrating infrastructure-led economic zoning.

4. **Red Sea Global:** Represents the "Regenerative/Archipelagic" typology, highlighting Marine Spatial Planning and environmental carrying capacity constraints.

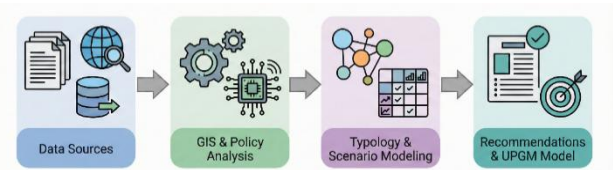
This comparative design allows the research to test whether the proposed "guidance mechanisms" hold true across vastly different development contexts, thereby increasing the external validity of the proposed Urban Planning Guidance Model (UPGM).

#### 4.2 Data Collection and Triangulation

The validity of the research is established through the triangulation of primary and secondary data sources across three hierarchical levels: policy documentation, spatial datasets, and performance indicators.

**Policy and Textual Data:** At the strategic level, the study systematically collected and analyzed official planning documents, including the Saudi Vision 2030 strategic papers, the National Spatial Strategy (NSS) 2030, and the Quality of Life Program delivery plans (Nofal, 2022; UNDP, 2021). These documents provide the normative baseline the "policy intent" against which spatial outcomes are measured. At the project level, data was sourced from technical master plan disclosures, sustainability reports (such as those from Red Sea Global), and architectural design guidelines released by relevant development authorities (e.g., Diriyah Gate Development Authority). This textual data was supplemented by academic literature documenting historical urban growth patterns in Saudi cities (Aljaddani et al., 2022; Garba, 2004).

**Geospatial and Quantitative Data:** To support the spatial analysis, the study utilized open-source and official geospatial datasets. Road network and building footprint data were extracted from OpenStreetMap (OSM) and validated against satellite imagery to ensure currency, particularly for rapidly developing giga-project sites. Public transport data, including metro station locations and BRT corridors, were sourced from the Royal Commission for Riyadh City (RCRC) open data portals and verified against recent construction updates (Alasmari & Alarabi, 2024). Additionally, remote sensing data, specifically Landsat and Sentinel-2 imagery, were employed to assess vegetation cover (NDVI) and urban heat island intensity (LST), serving as proxies for environmental performance.



**Figure 5: Methodological framework.** A flowchart detailing the mixed-methods research design, delineating the data inputs (policy documents, geospatial datasets), analytical processing steps (policy coding, GIS spatial analytics), and the synthesis of findings into the proposed guidance model.

#### 4.3 Analytical Framework

The data analysis followed a structured two-phase protocol: **Policy Coding** and **Spatial Analytics**.

**Phase 1: Policy Content Analysis (The "Guidance Mechanism")** The first phase involved a systematic thematic analysis of the collected policy documents. The text was coded to identify recurring "planning instruments" and "governance mechanisms." The analysis focused on extracting specific regulatory tools, such as "form-based codes," "performance-based zoning," or "marine protection boundaries" and mapping them to their governing authority. This process allowed the research to categorize the mode of guidance (e.g., restrictive vs. incentive-based) and the level of centralization for each project. For instance, the analysis traced how the "Quality of Life" mandate in Vision 2030 was translated into specific "Humanization" guidelines in Riyadh's municipal code.

**Phase 2: Geospatial Analytics (The "Spatial Outcome")** The second phase employed advanced GIS techniques to quantitatively assess how these policies have manifested in physical space. This involved four specific analytical procedures designed to measure the effectiveness of the planning guidance:

- **Typology Clustering (DBSCAN):** To empirically categorize the urban forms emerging under Vision 2030, the study applied Density-Based Spatial Clustering of Applications with Noise (DBSCAN). This machine-learning algorithm clustered urban zones based on variables such as building density, land-use mix, and street network connectivity. This analysis moved beyond official project labels to identify the actual urban typologies present on the ground, distinguishing between "transit-oriented clusters," "car-dependent sprawl," and "emerging mixed-use nodes".
- **Network Analysis and Isochrones:** To evaluate the "First-Mile/Last-Mile" connectivity, a critical success factor for Riyadh's Metro, the study utilized network analysis to generate isochrones (travel time maps). This modeled the accessible

service area for pedestrians (5, 10, and 15-minute walks) and vehicles around key transit hubs and mega-project sites. By overlaying population density data on these isochrones, the study quantified the "catchment efficiency" of the new infrastructure, identifying gaps where high-density populations remain disconnected from the transit backbone (Alasmari & Alarabi, 2024).

- **Kernel Density Estimation (KDE):** To visualize the concentration of services and investment intensity, Kernel Density Estimation was applied to point data representing public services (schools, healthcare), logistics hubs, and commercial permits. This produced "heatmaps" of service intensity, allowing for a comparative analysis of the "Aerotropolis" effect around King Salman Airport versus the "Polycentric" service distribution intended by the Riyadh General Plan.
- **Mismatch Analysis:** Finally, a "demand-supply mismatch" analysis was conducted by overlaying the KDE maps (representing demand/activity) with the infrastructure layers (representing provision). This spatially highlighted districts where planning guidance has succeeded (high alignment) versus areas where it has lagged (high mismatch), effectively visualizing the "implementation gap" discussed in the literature (Aldegheishem, 2023b).

#### 4.4 Synthesis and Model Development

The final stage of the methodology involved synthesizing the qualitative and quantitative findings to construct the Saudi Vision 2030 Urban Planning Guidance Model (UPGM). This was achieved through "pattern matching," where the theoretical propositions derived from the literature review (e.g., Strategic Planning, Spatial Fix) were compared against the empirical evidence from the case studies. By identifying converging patterns, such as the universal use of SPVs to bypass municipal zoning or the reliance on digital twins for greenfield sites, the research distilled the core components of the Saudi planning model. This synthesis ensured that the final conceptual model was not merely theoretical but grounded in the verified spatial realities of the Kingdom's ongoing transformation.

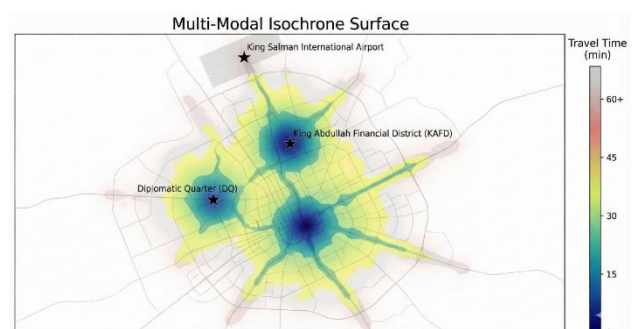
## 5. RESULTS

The empirical analysis of the planning frameworks governing the National Housing Company (NHC), King Salman International Airport, the Red Sea Project, and the broader Riyadh restructuring reveals a fundamental transformation in how urban development is guided in Saudi Arabia. The results

indicate that Vision 2030 has effectively replaced the traditional, municipal-led master planning model with a "strategic-adaptive" system. This new system relies on three distinct spatial mechanisms to guide development: the restructuring of metropolitan mobility around transit backbones, the clustering of economic activities into specialized typologies, and the integration of environmental performance as a primary design constraint. The following subsections detail the geospatial and policy-based findings regarding how these mechanisms have materialized in physical space.

### 5.1 Metropolitan Restructuring: Accessibility and the "Aerotropolis" Effect

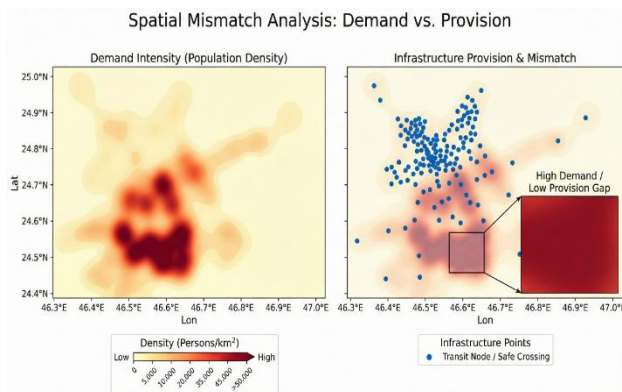
The most significant spatial finding within the Riyadh metropolitan area is the emergence of a dual-track restructuring process: the densification of the central core through Transit-Oriented Development (TOD) and the northward expansion driven by the "Aerotropolis" logic of King Salman International Airport. The network analysis of the Riyadh Metro and Bus Rapid Transit (BRT) system reveals a stark dichotomy in accessibility patterns. As illustrated in the accessibility surface analysis, the fully operational metro system is projected to place approximately 40% of the city's population within a 45-minute transit commute of the central business district, specifically the King Abdullah Financial District (KAJD) and Olaya corridor. This represents a massive structural shift for a city historically defined by low-density sprawl and automobile dependence. However, the magnitude indicators in the analysis highlight a critical disparity: while accessibility by private vehicle remains high across the sprawling periphery, albeit subject to increasing congestion delays high-quality transit accessibility is sharply concentrated along the north-south spine.



**Figure 6: Multi-modal accessibility surface (isochrones).** The geospatial analysis depicts travel time zones (0–15, 15–30, 30–45 min) from key employment anchors (KAJD, Diplomatic Quarter, Airport). The magnitude legend highlights the stark contrast between high-accessibility transit spines and the lower-accessibility peripheral zones (Source: Authors).

Isochrone analysis indicates that the "15-minute city" model is currently realizable primarily within specific nodes like KAFD and the Diplomatic Quarter, where mixed-use zoning has been systematically implemented. In contrast, most residential neighborhoods fall outside this active mode catchment, necessitating "last-mile" vehicular trips. This highlights the distinction between the rapid delivery of macro-level transport infrastructure and the gradual adaptation of the micro-level urban fabric, which remains influenced by legacy zoning patterns.

To examine this, a "demand-supply mismatch" analysis identified specific provision gaps. Results highlight "high mismatch" zones in southern and eastern Riyadh (Figure 7), where population density exceeds current infrastructure provision. Conversely, the northern corridor demonstrates "high alignment," with investment matching growth. The data confirms that while metro stations are present in high-density districts, limitations in local accessibility persist, affecting potential ridership and validating concerns regarding the "first-mile" challenge.

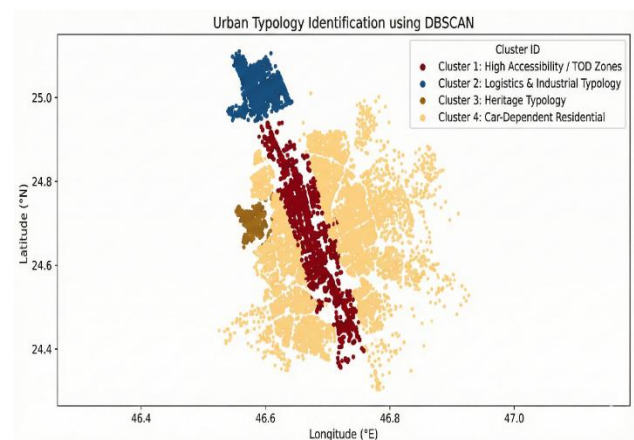


**Figure 7:** Spatial mismatch analysis: Demand vs. Provision. (Left) Kernel Density Estimation (KDE) of population and employment density. (Right) Infrastructure provision density (transit nodes and safe crossings). The zoomed inset illustrates a "high mismatch" district in southern Riyadh where high population density coincides with low infrastructure provision.

The mismatch analysis further suggests that the "guidance mechanism" of the Royal Commission for Riyadh City (RCRC) is most effective in new development zones where it has total control over the right-of-way, but faces friction in retrofitting existing neighborhoods where municipal jurisdiction overlaps with private property rights. The spatial evidence points to a "two-speed" urbanization, where strategic corridors modernize rapidly while the urban hinterland lags behind.

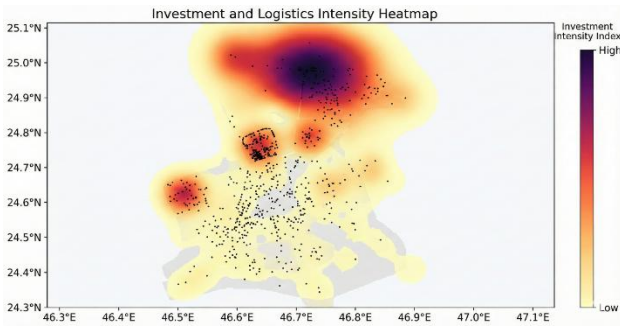
## 5.2 Urban Typologies: From Sprawl to Specialized Clusters

The application of the DBSCAN clustering algorithm to the urban fabric reveals that Vision 2030 is driving the emergence of distinct, specialized urban typologies that differ fundamentally from the homogenous suburban sprawl of the pre-2016 era. The clustering analysis moves beyond official administrative boundaries to identify functional urban zones based on density, land use mix, and connectivity variables. The results distinguish clearly between "Transit-Oriented Clusters," "Logistics/Industrial Clusters," "Car-Dependent Residential Sprawl," and "Heritage Cores".



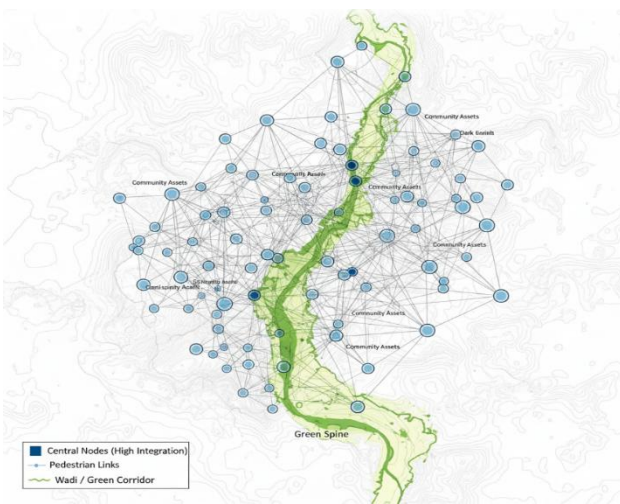
**Figure 8:** Urban typology clustering using DBSCAN. The scatter plot identifies distinct functional urban zones based on density and connectivity variables. Clusters include the "Aerotropolis/Logistics" zone (North), "Emerging TOD Nodes" (Central), "Heritage Core" (West), and "Car-Dependent Sprawl" (South/East).

A key finding from this typological analysis is the distinct "Logistics/Industrial" cluster forming around the King Salman International Airport. Unlike traditional airport zones which are peripheral and isolated, the Kernel Density Estimation (KDE) analysis reveals a high-intensity coalescence of logistics facilities, free trade zones, and commercial services integrating directly with the airport infrastructure. This confirms the "Aerotropolis" hypothesis: the airport is functioning as a magnetic core, pulling urban development northward. The density of planned investment points in this zone exceeds that of the historic city center, signaling a realignment of the city's economic gravity away from the traditional south-central axis. This spatial shift is not accidental but a direct result of the National Spatial Strategy's directive to leverage logistics as a pillar of economic diversification.



**Figure 9: KDE density of investment and logistics intensity.** The heatmap reveals the formation of a "Logistics Core" or "Aerotropolis" in northern Riyadh, characterized by a high concentration of planned investment projects and commercial permits surrounding King Salman International Airport.

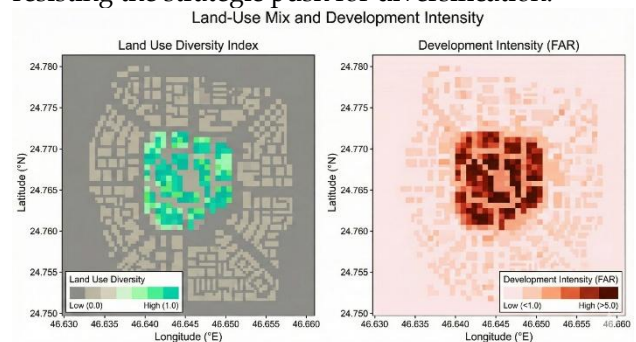
In contrast to Riyadh's nodal restructuring, the analysis of the National Housing Company (NHC) developments confirms a distinct "Integrated Suburb" typology. The clustering analysis here does not show radial growth but rather the formation of large-scale, self-sufficient community zones. The network analysis visualizes this unique connectivity model, where internal pedestrian pathways are engineered to link residential units with essential services (schools, mosques, retail) within a 15-minute radius, minimizing the need for external vehicular trips. The constraints analysis demonstrates how these suburbs are designed to integrate with natural drainage channels (Wadis) to enhance environmental resilience. This validates the "Quality of Life" mandate, prioritizing human-centric design over maximum land subdivision.



**Figure 10: Network connectivity and topographical constraints analysis of NHC Suburbs.** The graph visualizes the integrated community connectivity of the residential clusters, with nodes colored by accessibility levels. The analysis demonstrates how the pedestrian network is engineered to maintain connectivity across natural wadi corridors.

### 5.3 Land Use Dynamics and Service Distribution

The effectiveness of these spatial strategies is further evaluated through an analysis of land-use mix and service distribution. A critical goal of the Quality of Life Program is to increase the diversity of land uses to promote livability and reduce the need for long-distance commuting. The multi-panel analysis of land-use intensity and mixing reveals significant variations across the case studies. In the "Brownfield" case of Riyadh, the results show a persistent dominance of single-use residential zoning in approximately 70% of the city's clusters. This confirms that the legacy of "villa zoning" remains a formidable barrier to mixed-use transformation, resisting the strategic push for diversification.



**Figure 11: Land-use mix and development intensity analysis.** (Left) Land Use Diversity Index showing the emergence of mixed-use clusters. (Right) Development intensity (Floor Area Ratio proxy). The comparison highlights the fragmentation between high-intensity TOD nodes and the surrounding low-intensity residential fabric.

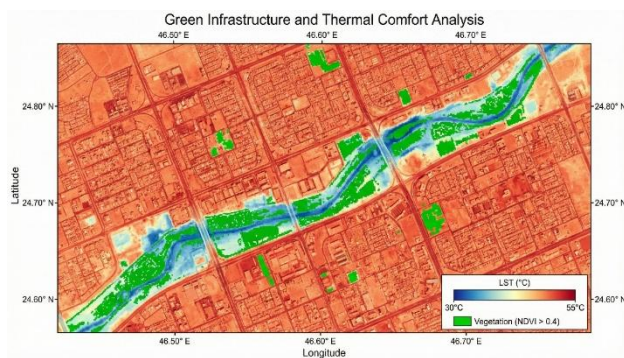
However, within the "TOD Nodes" specifically around major metro stations like Olaya and the Western Station, the analysis detects a significant uptick in mixed-use permits and higher Floor Area Ratios (FAR). This indicates that the intent to densify is beginning to materialize in regulatory approvals, creating islands of high intensity within the broader low-density fabric. The "intensity surface" maps reveal a fragmentation pattern where density spikes abruptly at specific nodes rather than transitioning gradually, a hallmark of project-led rather than market-led densification.

In the "Greenfield" cases such as the Red Sea Project and the National Housing Company (NHC) suburbs, the land-use analysis reveals a "Master-Planned Enclave" pattern. Development is not continuous with the existing grid but organized into distinct, high-standard zones with strict design codes. This spatial pattern is a direct physical manifestation of the Quality of Life instrument,

which mandates the provision of parks and community facilities. In the Red Sea context, this also aligns with Marine Spatial Planning, where "no-go" zones limit land consumption to protect biodiversity.

#### 5.4 Environmental Performance and Livability

Finally, the results quantify the integration of environmental performance into the urban form, specifically focusing on the mitigation of the Urban Heat Island (UHI) effect, a critical prerequisite for the walkability envisioned in Vision 2030. The analysis maps the correlation between Vegetation Cover (NDVI) and Land Surface Temperature (LST) around key "Humanization" corridors in Riyadh. The spatial overlay reveals a strong inverse relationship: areas with recent "Green Riyadh" interventions (high NDVI) show a measurable reduction in surface temperature, approximately 2-4°C lower than adjacent non-greened streets. This empirical data validates the efficacy of the "Green Infrastructure" planning mechanism as a tool for micro-climatic modification.



**Figure 12: Green infrastructure and thermal comfort analysis.** A geospatial overlay of Land Surface Temperature (LST) and Vegetation Index (NDVI). The map visually correlates the presence of green corridors (NDVI > 0.4) with localized cooling effects (blue zones), validating the micro-climatic impact of "Green Riyadh" interventions.

The analysis identifies a pattern of "thermal variance," where cooling benefits are concentrated in northern districts and key mega-projects, while densely populated southern districts remain warmer with lower vegetation coverage. This suggests that while ecological interventions are effective, their current distribution prioritizes economic hubs, highlighting a need for broader neighborhood-level application.

Regarding NHC suburbs, environmental analysis confirms that their master-planned form increases per capita green space compared to conventional subdivisions. By clustering housing around "Green Spines," these communities achieve significant micro-climatic cooling. However, their peripheral

location necessitates reliance on regional transport links, creating a potential vehicular dependency that may offset some localized sustainability gains.

## 6. DISCUSSION

The empirical findings of this study suggest that the urban planning paradigm within Saudi Arabia is undergoing a profound structural metamorphosis. The analysis of the National Housing Company (NHC), the Red Sea Project, and the restructuring of Riyadh indicates a definitive break from the "rentier city" model of the late 20th century, moving toward a sophisticated, state-led model of "strategic urban entrepreneurialism." By synthesizing the geospatial evidence with the policy analysis, this discussion interprets the "guidance mechanisms" of Vision 2030 through the theoretical lenses of the spatial fix, institutional capacity, and ecological modernization.

### 6.1 Streamlined Governance: Centralization as a Guidance Mechanism

The Vision 2030 planning model is distinguished by its reliance on "Specialized Governance Authorities" to accelerate development. In Greenfield zones like King Salman International Airport and NHC communities, this governance architecture employs an integrated management model that achieves high infrastructure alignment, effectively addressing the fragmentation identified by Amer et al. (2021). However, the "mismatch heatmaps" (Figure 7) reveal the limitations of this model within the existing "Brownfield" fabric. Significant connectivity gaps in southern Riyadh indicate that while the guidance mechanism functions efficiently in master-planned ecosystems, it encounters greater complexity when retrofitting the legacy of villa-centric sprawl in established neighborhoods.

### 6.2 The Spatial Fix: Logistics and Tourism as New Accumulation Strategies

The emergence of the "Aerotropolis" cluster and the "Regenerative Tourism" archipelagos provides empirical support for the theory of the "Spatial Fix." As oil revenues become volatile, the Saudi state is successfully "switching" capital into the built environment to secure long-term accumulation in non-oil sectors. The density of logistics investments around King Salman Airport (Figure 10) is not merely a zoning decision; it is a macroeconomic strategy operationalized through spatial planning. By physically restructuring the city's growth axis northward toward the airport, the planning system is engineering the land-value capture necessary to sustain the post-oil economy.

Similarly, the constrained land-use patterns observed in the Red Sea Project (Figure 11), where development is clustered to preserve natural assets demonstrate a shift in how land value is conceptualized. In the rentier era, land value was derived from speculation and subdivision (Mubarak, 2004). Under Vision 2030, land value is derived from "exclusivity" and "ecosystem services." The planning guidance here restricts supply (through conservation zones) to increase value, a strategy that Filippi and Mazzetto (2024) note is essential for high-yield tourism. This represents a sophistication of the spatial fix, moving from quantitative expansion (sprawl) to qualitative intensification (clusters).

### **6.3 Ecological Modernization and the Techno-Optimism Trap**

The environmental analysis presents a complex picture of "Ecological Modernization." While the strong correlation between "Green Riyadh" interventions and reduced surface temperatures (Figure 12) confirms that design can mitigate the harsh climate, the resulting "thermal inequality" raises significant equity concerns. If green infrastructure is concentrated solely in high-investment zones, the system risks creating a "climate apartheid" where thermal comfort becomes a luxury rather than a public good.

Furthermore, the NHC's integrated suburbs represent a shift from "Techno-Optimism" to "Social Engineering." By replacing the traditional logic of "Privacy and Segregation" (villas) with "Quality of Life" (shared green spines), the planning guidance now prioritizes community interaction over private land ownership. However, success relies heavily on social acceptance of high-density living. If residents revert to car dependency, these spatial forms may prove dysfunctional, highlighting the risks of top-down planning that assumes rapid cultural transformation.

### **6.4 The Connectivity Paradox: Infrastructure vs. Urban Form**

The isochrone and network analyses (Figure 6 and Figure 10) highlight a "connectivity paradox." While Riyadh is advancing its metro system, limitations in immediate local accessibility persist. These "last-mile" gaps underscore the lag between infrastructure delivery and urban design reform, validating findings by Almatar (2022) and Homoud et al. (2024) that transport investment is a necessary but insufficient condition for TOD.

This paradox stems from the "villa zoning" legacy, where single-family zones (Figure 11) limit the

density gradients required for optimal transit support. Although TOD overlay zones have been introduced, the market response in brownfield areas remains slower than in greenfield sites. This suggests that the "guidance mechanism" may require further regulatory alignment to effectively encourage the intensification of vacant lands near stations (Aljoufie et al., 2016).

### **6.5 Socio-Cultural Friction and Participatory Planning**

Finally, the discussion must address the socio-cultural dimension. The rapid imposition of high-density, mixed-use typologies exemplified by the NHC's shift toward apartments and townhouses, challenges the traditional Saudi preference for privacy and segregation characterized by the villa and the compound. Alasiri et al. (2025b) and Aldegheshem (2023a) highlight the growing importance of community participation. The results of this study, particularly the mismatch in service provision, suggest that top-down planning, while efficient for giga-projects, may miss the nuance of neighborhood-level needs. The "Quality of Life" targets (parks, walkability) are universal, but their implementation requires local adaptation. The friction between the "global city" image projected by Vision 2030 and the "local city" lived by residents is the primary tension that future planning guidance must resolve.

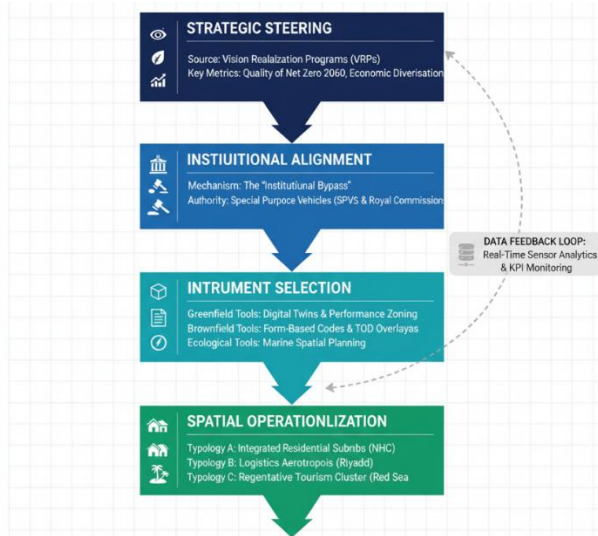
### **6.6 Limitations**

This study acknowledges certain limitations, primarily the reliance on public geospatial data which necessitates approximating construction details for restricted sites like NHC suburbs. Additionally, the "planned vs. built" gap means the analysis captures a current implementation snapshot subject to evolution by 2030. Finally, environmental performance relies on proxies (e.g., NDVI) rather than on-site micro-climatic measurements. Despite these constraints, the mixed-method design provides sufficient depth to identify structural planning trends with confidence.

## **7. PROPOSED PLANNING MODEL FOR VISION 2030 (UPGM)**

Based on the comparative analysis of the governance structures, policy instruments, and spatial strategies across the case studies, this research synthesizes the findings into the Saudi Vision 2030 Urban Planning Guidance Model (UPGM). This conceptual model (Figure 13) explains the causal mechanism of how the Vision is operationalized,

offering a blueprint for understanding state-led urban transformation in the Kingdom.



**Figure 13: The Saudi Vision 2030 Urban Planning Guidance Model (UPGM).** A conceptual diagram illustrating the proposed four-stage guidance mechanism: (1) Strategic Steering via VRPs; (2) Institutional Alignment via Special Purpose Vehicles; (3) Instrument Selection (e.g., Digital Twins, Form-Based Codes); and (4) Spatial Operationalization, connected by a smart governance feedback loop.

The model operates through a four-stage linear cascade, driven by a recursive feedback loop of data analytics:

#### Stage 1: Strategic Steering (The Mandate)

The process originates with the Vision Realization Programs (VRPs), specifically the Quality of Life Program, the Public Investment Fund Program, and the National Industrial Development and Logistics Program. These bodies set the non-negotiable Key Performance Indicators (KPIs) for economic diversification, sustainability (e.g., Net Zero 2060), and livability. Unlike previous master plans which were often advisory or aspirational, these KPIs act as binding political mandates that trickle down to all subsequent development decisions.

#### Stage 2: Institutional Alignment (The Vehicle)

To accelerate decision-making processes and legacy regulatory constraints, the strategic mandate activates a Special Purpose Governance Vehicle (e.g., Royal Commission for Riyadh City, the National Housing Company, Red Sea Global). This body is granted "institutional exception", the legal authority to draft its own planning codes, issue building permits, and manage public assets independently of the broader municipal system. This "agile

governance framework" is the critical enabler of speed and innovation, allowing these projects to operate effectively as states-within-a-state to accelerate delivery.

#### Stage 3: Instrument Selection (The Mechanism)

The governance body selects specific High-Performance Planning Instruments tailored to the unique project typology:

- **For Integrated Residential Suburbs (NHC):** The primary instruments are "Comprehensive Master Planning" and "Community-Centric Zoning" (e.g., mandates for green spines and 15-minute service accessibility), which replace the traditional subdivision of isolated plots.
- **For Brownfield/TOD (Riyadh):** The instruments focus on retrofitting, utilizing "TOD Overlay Zones" and the "Form-Based Code" (e.g., The Humanization Code) to incentivize density and walkability in existing districts.
- **For Regenerative Tourism (Red Sea):** The instruments are restrictive and ecological, specifically "Marine Spatial Planning" and "Carrying Capacity Caps" that limit visitor numbers to preserve biodiversity.

#### Stage 4: Spatial Operationalization (The Outcome)

These instruments dictate the physical urban form, resulting in the specialized typologies identified in the empirical results: **The Integrated Suburb**, **The Aerotropolis**, and **The Regenerative Archipelago**. The outcome is not a uniform national urban fabric, but a constellation of high-performance clusters that differ radically from the surrounding sprawl.

#### The Feedback Loop: Smart Governance

Crucially, the model is closed by a "Smart Governance" loop. The extensive deployment of sensors and digital platforms allows the Special Purpose Vehicles (SPVs) to monitor urban performance in real-time. If the spatial outcome fails to meet the VRP KPIs (e.g., if thermal comfort targets are not met or transit ridership lags), the planning instrument is adjusted dynamically. This "Strategic-Adaptive" capability distinguishes the UPGM from the static, rigid master planning of the past.

## 8. CONCLUSION

This study investigates how Saudi Vision 2030's national ambitions are translated into spatial reality. The research identifies a "hybrid planning paradigm" that combines centralized implementation efficiency with strategic spatial planning and ecological modernization. The analysis confirms that projects

like the National Housing Company (NHC) and King Salman International Airport function as testing grounds for new socio-economic models: one integrating into global logistics, the other reinventing neighborhood living to foster social cohesion.

However, challenges remain. The "connectivity paradox" and "thermal inequality" in Riyadh highlight the complexity of retrofitting existing urban environments compared to greenfield developments. Guidance mechanisms effective in

controlled giga-projects encounter greater implementation complexity within the existing urban fabric. Consequently, while the "Specialized Governance Authority" model accelerates delivery, long-term success depends on reintegrating these specialized clusters into a coherent national urban system. Future research should prioritize longitudinal post-occupancy evaluation to verify if predicted sustainability and livability metrics are realized once these projects are fully operational.

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