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Research Article

# Rethinking Coastal Spatial Planning Through Equity: Evidence from Semarang and Dutch Water Governance

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**Abstract:** Coastal spatial planning can generate socio-spatial exclusion when infrastructure-led development prioritizes physical protection over social equity and local livelihood security. This systematic literature review synthesizes 47 peer-reviewed studies and 8 government documents to evaluate the implementation of Semarang's Spatial Plan (RTRW 2011–2031) and the Giant Sea Wall project. Despite inclusive policy narratives, hard-engineering interventions remain insufficient in addressing extreme relative sea-level rise driven by the combined effects of land subsidence and sea-level rise (103–128 mm/year), while potentially transferring flood risks to vulnerable coastal communities. The synthesis identifies seven critical global implementation gaps: (1) political-economic priorities overriding risk-based zoning, (2) limited institutional recognition of geodetic hazards, (3) inadequate participatory planning mechanisms, (4) fragmented regulatory responsibilities across administrative institutions, (5) tenure insecurity associated with coastal commodification, (6) technological path dependency in hydraulic infrastructure, and (7) disconnected livelihood compensation frameworks. Drawing on comparative insights from Dutch democratic *waterschappen* and the Room for the River approach, this study demonstrates how infrastructure-centric coastal governance may undermine the resource access and livelihood security of traditional fishing communities, thereby reinforcing distributional inequalities. Moving beyond conventional engineering solutions, this paper proposes an equity-centered spatial governance framework that integrates social justice considerations into formal coastal zoning regulations. Future research should develop spatially explicit socio-ecological vulnerability indices to quantitatively assess long-term displacement risks and economic pressures affecting informal marine economies.

**Keywords:** Coastal Governance, Comparative Governance, Giant Sea Wall, Spatial Planning, RTRW Implementation.

## 1. Introduction

Semarang City is the capital of Central Java province, exemplifies the acute vulnerability of Southeast Asian coastal megacities to compound climate-ocean-geological hazards [1]. The city faces a severe geological squeeze driven by accelerating land subsidence, which reaches 100-120 mm annually based on InSAR satellite analysis [1]. Broader physical alterations and shoreline degradation along the coastal margin compound this localized sinking [2]. Furthermore, the region experiences increasing tidal flooding severity, creating permanent inundation zones (rob) that affect nearly 8,954 hectares in the adjacent Demak Regency as of 2023 [3]. These intersecting pressures create a massive effective relative sea-level rise [4]. Consequently, this extreme exposure index results in the loss of approximately 1 m of usable coastal land every decade [5].

Statutory Instruments and Infrastructure Interventions. In response to this mounting vulnerability, Semarang's municipal government adopted the Rencana Tata Ruang Wilayah (RTRW) 2011-2031 Regional Spatial Plan [6]. Theoretically, this statutory document incorporates comprehensive disaster risk reduction policies to manage coastal hazards [7]. Concurrently, authorities initiated the Giant Sea Wall, a massive infrastructure project reflecting the state's commitment to physical coastal protection [8]. This seawall forms part of a much broader 500+ kilometer infrastructure initiative spanning Java's entire northern coast [9]. Administratively, specific presidential directives frame the project as an urgent crisis intervention targeting multiple provinces [10].

These interventions are officially framed as balancing economic development aspirations with the preservation of livelihoods. Government rhetoric emphasizes that the sea wall will provide integrated water management, including drainage, fisheries infrastructure, and job creation. The project is often touted as a civilizational leap, drawing heavy conceptual inspiration from Dutch water management achievements [11]. However, from a spatial justice lens, this infrastructural bias reduces a multi-dimensional socio-ecological crisis into a mere technical-hydraulic problem. By focusing overwhelmingly on the physical containment of water, current planning paradigms ignore how structural spatial restructuring alters the distribution of environmental risks [12]. Ultimately, this approach effectively prioritizes high-value commercial zones while displacing the spatial and economic footprints of vulnerable coastal communities.

Nearly a decade after RTRW adoption and five years into sea wall project implementation, a critical analytical gap persists. Empirical evaluations reveal a multi-tiered operational failure: at the policy formulation level, systemic exclusions of environmental data leave compressed soils vulnerable to development [13], while zoning classifications actively strip traditional fishing grounds of protection [14]. These regulatory gaps manifest in the spatial economy by narrowing infrastructure benefits to commercial-industrial interests [15], ultimately disrupting rather than reinforcing community-scale adaptation strategies [16].

Despite these valuable contributions, existing literature extensively documents these environmental and economic 'symptoms' on the ground without interrogating the structural, textually driven policy conflicts embedded within the state's planning instruments. Current research lacks a comparative policy analysis that measures Semarang's official statutory materials against established equitable governance frameworks through a strict social equity lens. This study directly fills this gap by shifting the analytical focus from a mere cataloging of implementation anomalies toward a structured, comparative deconstruction of the institutional mechanisms that drive policy-reality divergence. By integrating Ribot and Peluso's access framework [17] directly into critical spatial planning theory, this paper uncovers how hard-infrastructure planning mandates are inherently designed to produce socio-spatial exclusion, offering a novel theoretical framework for subsiding deltas in the Global South.

## 2. Literature Review

### 2.1. The Epistemology of Coastal Vulnerability: Physical Hazard vs. Socio-Spatial Exclusion

Early theoretical frameworks in planning conceptualized coastal vulnerability predominantly as a physical exposure to environmental hazards [18]. However, contemporary political ecology and sustainability sciences robustly challenge this hazard-deterministic view. Turner et al.[19] argue that vulnerability is inherently multidimensional, shaped fundamentally by a system's socioeconomic sensitivity and its inability to cope rather than mere hazard exposure. In Semarang, the absence of formal participation in governance exacerbates physical vulnerability, severely constraining the adaptive capacity of coastal residents [20]. Furthermore, restricted migration patterns and socioeconomic immobility often hinder adaptation to coastal flooding, limiting mitigation options

[21].

Expanding on this socio-spatial perspective, Ribot and Peluso [17] demonstrate that vulnerability is actively produced when individuals lose the practical ability to benefit from resources, regardless of their formal legal rights. In coastal governance, the viability of fishing access depends on resource access that ensures sufficient fish stocks, alongside socioeconomic and legal structures [22]. Equality in coastal development, therefore, requires not merely avoiding the destruction of livelihoods but actively protecting the conditions of access that enable livelihoods to persist [23]. Therefore, the critical academic debate has shifted from merely measuring physical hazards to interrogating how planning interventions disrupt access and disproportionately burden traditional communities with risks [22].

### 2.2. The Spatial Planning Paradox: Technical Inadequacy vs. Institutional Fragmentation

Contemporary planning theory emphasizes communicative and collaborative frameworks to balance land development demands [24]. However, recent scholarship challenges this collaborative idealism, arguing that the persistent policy-implementation gap reflects structural conflicts among competing strategic values and unequal power distributions rather than mere technical inadequacies [25]. In the Indonesian context, this transformation of spatial planning is heavily influenced by post-authoritarian political dynamics that inherently favor elite urban development [26].

Structural flooding persists in megacities because formal planning processes systematically exclude affected populations from decision-making arenas [22]. This structural disconnect manifests as a ‘mainstreaming gap,’ where disaster risk reduction is rhetorically endorsed in high-level policy but operationally omitted during collaborative governance implementation [27]. Consequently, ‘wicked’ problems like land subsidence remain invisible in actual policy execution, allowing commercial development to proceed in high-risk zones under the guise of statutory compliance [28].

### 2.3. Coastal Protection Paradigms: Hard Infrastructure vs. Adaptive Democratic Governance

The most polarizing debate in contemporary coastal adaptation pits infrastructure-centric interventions against adaptive, inclusive governance models. While stakeholders possess vital contextual hazard data necessary for equitable consensus building [29], actual planning practices frequently relegate citizen engagement to the lower rungs of Arnstein’s ladder, functioning merely as tokenistic, one-directional information provision [30]. Consequently, without structurally codifying communities as formal co-decision-makers within governance institutions, participation remains purely performative [29].

In sharp contrast to centralized infrastructural models, the comparative water governance literature advocates adaptive management, drawing predominantly on the Dutch delta experience. Historically, Dutch water boards (*waterschappen*) are mandated to represent diverse stakeholders, including fishing communities and farmers, in regional water management decisions [31]. This institution governs traditional polders through cooperative management that has evolved over centuries to protect livelihoods and, explicitly, to provide flood defense [32]. Furthermore, contemporary Dutch policy has explicitly shifted toward adaptive delta management frameworks that recognize the impossibility of permanently protecting infrastructure against climate change [32]. This philosophy prioritizes spatial flexibility, multifunctionality, and community coexistence with dynamic water systems over continuous dike heightening [33]. Ultimately, comparative literature asserts that translating long-term coastal resilience into cities like Jakarta or Semarang requires directly addressing the institutional impasses of equitable governance rather than simply importing hard-engineering blueprints [34]. To achieve true spatial justice, planners must explicitly address the uneven equity impacts and unequal resource distribution inherent in modern urban land-use planning [35].

## 3. Methodology

This study utilizes a Systematic Literature Review (SLR) approach. This review strictly adheres to the PRISMA 2020 guidelines [36]. This protocol eliminates selection bias. It also ensures strict replicability. The initial database identification phase established two distinct operational tracks. The researchers searched Scopus, Google Scholar, and Portal Garuda. The first track is the Semarang Coastal Core Corpus. This corpus targets academic literature between 2005 and 2026. These sources focus on the implementation of the Regional Spatial Plan (RTRW). They also cover land subsidence dynamics and fishing community access rights. The second track is the Dutch Comparative

Governance Corpus. This dataset captures international literature on *waterschappen*. It also includes polder governance and the Room for the River program. A standardized screening protocol was applied to both corpora.

The historical baseline of 2005 was purposely selected to capture the long-term evolution of Semarang's coastal spatial policy post-disaster decentralization mandates in Indonesia [37] Additionally, this period coincides with the earliest availability of continuous InSAR- and GPS-derived land subsidence datasets in the peer-reviewed academic literature. This 21-year window provides a comprehensive temporal framework to assess the structural policy-reality divergence across multiple planning cycles. Table 1 shows the details of the step-by-step study selection process.

Table 1. Systematic Review Implementation Parameters

| Phase | Core Process & Screening Parameters | Resulting Records (N) |
|---|---|---|
| Initial Identification | Comprehensive database queries spanning Track 1 and Track 2 themes. Yielded 177 records for the Semarang coastal analysis and 14 targeted academic sources for the Dutch governance model. | Total: N = 191 (Track 1: 177; Track 2: 14) |
| Title & Abstract Screening | Evaluation of all identified titles and abstracts against rigid inclusion and exclusion metrics.<br>1. Inclusion: Peer-reviewed articles in Scopus/SINTA 1–4, empirical datasets, and statutory policy texts.<br>2. Exclusion: Pure hydraulic engineering blueprints lacking social planning variables, conference abstracts, and non-peer-reviewed opinion pieces. | Excluded: N = 102<br><br>Retained: N = 89 (Processed to next phase) |
| Full-Text Eligibility Assessment | Comprehensive retrieval and qualitative, rigorous reading of the remaining full-text documents to verify methodological alignment and thematic depth. | Assessed: N = 89 |
| Full-Text Exclusion | Detailed filtering resulted in the removal of 34 articles due to strict methodological boundaries:<br>1. Reason A: Lacked direct relevance to coastal spatial planning equity (N = 19).<br>2. Reason B: Provided purely technical hydro-geological monitoring without assessing socio-economic or policy implementation dimensions (N = 15). | Total Excluded: N = 34 |
| Final Synthesized Corpus | The final, qualified systematic corpus is anchored in the research objectives. The sample is cleanly bifurcated into 47 peer-reviewed empirical articles (which seamlessly absorb the 14 comparative Dutch governance studies) and 8 official statutory government documents (including the RTRW 2011–2031, and provincial spatial decrees). | Final Corpus: N = 55 (47 Articles + 8 Documents) |

Following the initial identification, the dataset underwent a rigorous, two-tiered screening process to determine ultimate eligibility. First, a preliminary screening of titles and abstracts was conducted against predefined inclusion and exclusion criteria, resulting in the exclusion of 102 sources. The remaining 89 relevant documents were then subjected to a comprehensive full-text review to ensure strict alignment with detailed inclusion parameters. This secondary evaluation refined the pool to a final, eligible selection of 55 sources. Ensuring a foundation of verifiable and authoritative literature, this final selection consisted exclusively of 47 peer-reviewed articles and 8 official government documents.

In the concluding analytical phases, the researchers conducted structured data extraction on the 55 final sources using predefined abstraction forms. This systematic extraction captured essential variables, including study design, geographic focus, temporal scope, and key findings on RTRW implementation, seawall project outcomes, and subsequent impacts on local fishing communities. Finally, the extracted qualitative data were subjected to thematic coding and analysis utilizing NVivo

14 software. This advanced analytical approach enabled the researchers to systematically identify underlying patterns, empirical contradictions, and broader conceptual relationships across the synthesized literature. The qualitative analysis uses a thematic coding method. This method avoids reviewing individual researchers as separate subjects. Text chunks were synthesized into nodes based on patterns of convergence. The thematic node structure generated four primary analytic clusters. These clusters dictate the framework of Chapter 4. Cluster 1 is the Hazard-Plan Disconnect and Spatial Data Invisibility. Cluster 2 is Empirical Realities vs. Project Projections. Cluster 3 represents Comparative Structural Barriers. Cluster 4 covers the Political Economy of Hegemonic Spatial Restructuring.

## 4. Finding and Discussion

### 4.1. Finding

#### 1) The Hazard-Plan Disconnect and Spatial Data Invisibility

Translating geodetic data into planning instruments reveals a profound institutional visibility gap. Time series InSAR satellite analysis demonstrates extreme land subsidence [1]. Long-term GPS monitoring confirms this trend [13]. Semarang's coastal margin sinks between 100 and 120 mm annually [1]. This physical hazard transforms tidal fluctuations into catastrophic inundation events (rob) [4]. Vast administrative sub-districts now sit permanently below average sea level [6]. Scientists have provided twenty years of uninterrupted geodetic documentation [13]. Yet, deconstructing the official Regional Spatial Plan (*Rencana Tata Ruang Wilayah*, RTRW) 2011–2031 reveals a major omission [38]: land subsidence is absent from the formal spatial hazard zoning maps [38].

Spatial planning instruments consistently default to static, historical flood maps. These documents treat inundation as a temporary hydrological anomaly. By ignoring accelerating land collapse, the statutory RTRW classifies only 23% of subsidence-prone parcels within restrictive hazard zones and assigns highly permissive zoning designations to the remaining 77% of vulnerable areas [39]. This setup actively encourages large-scale commercial development on compressible soils. The deliberate exclusion of subsidence overlays creates a structural policy vacuum. Real estate expansion receives legal approval in areas experiencing multi-meter-per-decade land loss.

#### 2) Socio-Spatial Impact Bifurcation - Localized Baseline Realities vs. Future Giant Sea Wall (GSW) Projections

The socio-spatial configuration of Semarang’s coastline requires an analytical split. This split separates past localized embankments from the upcoming GSW project.

#### a) Documented Baseline Realities (Past/Present Localized Embankments)

Empirical studies up to 2026 capture the immediate consequences of piecemeal civil engineering [8]. These structures include localized dikes in Tambak Lorok [40]. These hard structures have systematically altered local coastal hydrodynamics. They inadvertently accelerate shoreline erosion in adjacent, un-embanked villages [2]. This physical presence causes severe economic compression within the informal marine sector [15]. Fishing household income fell from an average of IDR 150,000 to IDR 50,000 per day [15]. This decline stems from the destruction of intertidal mangrove grounds [12]. It also relates to altered nearshore fish migration patterns [40]. Furthermore, these physical interventions entrench severe tenure insecurity [20]. Local authorities refuse to issue formal land certificates in structurally degraded areas [20]. This restriction strips vulnerable families of legal leverage. They cannot access formal adaptation capital [20]. This dynamic traps residents in a cycle of psychosocial anxiety [17]. They face continuous, uncompensated land loss [16].

#### b) Projected Long-Term Impacts (The 2025/2026 Giant Sea Wall Framework)

The macro–Giant Sea Wall (GSW) project operates under a newer framework. The National Medium-Term Development Plan (RPJMN 2025–2029) formally operationalized the project [9]. Presidential Decree No. 77 of 2025 established the Northern Coast of Java Operations Authority [10]. The GSW is an integrated toll road infrastructure sea embankment [15]. It spans more than 500 kilometers across multiple provinces [9]. Therefore, its projected impacts operate on a macro socio-spatial scale. Spatial projections indicate a permanent seal on traditional marine access [41]. The project converts open-access fishing grounds into restricted commercial polders. The planning statements of the new Operations Authority prioritize high-speed logistics corridors [10]. Consequently, models predict the

structural phase-out of the informal fishing economy. The project lacks a legally binding framework for alternative landing sites. It offers no preservation of marine resource access. It also omits spatial compensation for informal economic displacement

### 3) Comparative Structural Analysis and Institutional Mismatches

The structural and institutional matrix outlined in Table 2 highlights a profound systemic divergence between the two frameworks, beginning with their core administrative designs. While the Netherlands operates under a decentralized functional democracy driven by autonomous regional water boards (*waterschappen*) with legally codified citizen representation, Semarang's governance remains confined to centralized, top-down silos with fragmented mandates split across multiple agencies, rendering local community participation largely tokenistic. Fiscal vulnerabilities further exacerbate this structural mismatch; unlike the self-sufficient Dutch model supported by independent water taxes (*waterschapsbelasting*), Semarang features a regressive and dependent financial framework that relies heavily on centralized allocations and private developers, hampered by a disaster risk reduction budget execution rate of under 35%.

Furthermore, a critical philosophical disconnect exists regarding spatial justice and planning paradigms. Semarang's framework adopts a strictly property-centric approach that recognizes only formal land titles and ignores informal spatial access rights. In contrast, the Dutch model provides statutory mechanisms for full financial restitution (*Nadeelcompensatie*) for the loss of access. This legal protection aligns with the Netherlands' shift toward flexible, socio-ecological coexistence paradigms like "Room for the River." In contrast, Semarang remains locked in a technical-hydraulic path dependency focused strictly on hardened infrastructure. Ultimately, as shown in Table 2, these compounding institutional, fiscal, and philosophical mismatches demonstrate that any attempt to adopt Dutch water management strategies in Semarang will fail without a fundamental overhaul of local legal and governing structures.

Table 2. Structural and Institutional Matrix: Semarang vs. The Netherlands

| Comparative Dimension | Semarang Coastal Governance Framework | Dutch Integrated Delta Management Model |
|---|---|---|
| Institutional Architecture | Centralized & Segmented Silos: Fragmented mandates split across Bappeda, Dinas Kelautan, and BBWS [7]. Operates through top-down directives [10]. | Decentralized Functional Democracy: Governed by regional *waterschappen* (water boards) [31]. These bodies operate apart from municipal administrations [31]. |
| Stakeholder Representation | Performative & Tokenistic: Participation is restricted to post-announcement public socialization [15]. Meetings use formal languages [15] | Mandated Codified Representation: Stakeholder seats are legally institutionalized within water board councils[42]. Citizens hold direct voting power[31]. |
| Fiscal Capacity | Regressive & Dependent: Heavily reliant on centralized state allocations and private developers [43]. Average DRR budget execution is below 35% [38] | Independent Functional Taxation: *Waterschappen* levy autonomous water taxes (*waterschapsbelasting*) [44]. This ensures continuous self-sufficiency [31]. |
| Livelihood Protection | Absent / Property Centric: Frameworks strictly recognize formal, registered land titles [43]. They ignore informal spatial access rights [43]. | Legally Anchored *Nadeelcompensatie*: Statutory mechanisms mandate full financial restitution for access loss [45]. |
| Planning Philosophy | Technical-Hydraulic Path Dependency: Rooted in a "maximum protection" ideology [11]. Relies exclusively on hardened infrastructure[12] | Adaptive Socio-Ecological Coexistence: Governed by "Room for the River" paradigms [33]. Prioritizes spatial flexibility [33] |

## 4.2. Discussion

The refusal to integrate land subsidence data into spatial planning has lasted for two decades [13]. This gap is not a simple technical oversight. It is also not a lack of institutional capacity. Instead, this enduring hazard-plan disconnect is a highly functional omission. The political economy of coastal property oligarchies drives them. It also stems from structural flaws within Indonesia's decentralization framework

The primary structural driver of this paradox is the hegemony of coastal property oligarchies.

Northern Semarang represents a high-value geographic corridor. Industrial zones, container ports, and luxury waterfront estates intersect here. Legally integrating subsidence data into the RTRW would mandate strict changes. The state would reclassify lucrative commercial tracts into non-buildable conservation zones. Such rezoning would instantly collapse speculative land values. It would trigger massive capital flight. It would also invalidate major private-sector investments. Entrenched developer elites leverage structural influence over municipal apparatuses to prevent this devaluation. They successfully lobby against geodetic hazard zoning in formal statutory texts. The RTRW changes from a risk-reduction tool to a mechanism for capital accumulation. capital accumulation. It deliberately maintains a state of legal invisibility over land subsidence. This invisibility facilitates the continuous flow of private investment into collapsing soils.

Indonesia's post-authoritarian decentralization framework enables this oligarchic capture [46]. Under current decentralization laws, municipal governments face extensive public service mandates [47]. However, they lack robust, independent sources of fiscal revenue. Consequently, local governments must maximize their Locally Generated Revenue (*Pendapatan Asli Daerah, PAD*) [48]. This revenue relies heavily on property acquisition taxes (*Bea Perolehan Hak atas Tanah dan Bangunan*, *BPHTB*) and zoning licenses. This fiscal structure creates a perverse institutional incentive [49]. Regional Development Planning Agency (*Badan Perencanaan Pembangunan Daerah*, *Bappeda*) face a structural disincentive to establishing restrictive hazard zones. Enforcing these zones would directly shrink their local tax base [50].

Furthermore, regional autonomy has fractured coastal resource governance into insulated administrative silos. Municipal planning agencies control land-use zoning up to the shoreline. However, the provincial government retains exclusive statutory jurisdiction over the immediate marine space (0 to 12 nautical miles). Meanwhile, the central government monopolizes the funding of major hydraulic engineering projects. [10]. This monopoly operates through the Ministry of Public Works and BBWS. This vertical and horizontal fragmentation creates a severe accountability vacuum. Sectoral engineering departments (*Balai Besar Wilayah Sungai, BBWS*) design massive seawalls based entirely on technical timelines [8]. They operate independently of municipal spatial plans. They also lack a regulatory mandate to coordinate with municipal fisheries departments (*Dinas Perikanan*). This gap prevents joint efforts to safeguard the access rights of traditional fishing communities.

This institutional topography explains why transferring Dutch water expertise to post-colonial Indonesian urban contexts encounters severe structural barriers, leading to the impasse of the *waterschappen* framework in Semarang [34]. While the original Dutch model thrives on a decentralized, single-focus functional democracy funded by autonomous water taxes [31], it also enforces a legally binding equity framework (*Nadeelcompensatie*) that actively penalizes the state for disrupting informal economies [45]. Conversely, Semarang's spatial governance operates within an asymmetric political economy characterized by fragmented state mandates, fiscal dependence on private developers [43], and the systematic political marginalization of informal populations.

The upcoming Giant Sea Wall project represents the ultimate consolidation of this capital-driven planning paradigm. [15]. The project operates under the centralized 2025/2026 Northern Java Operations Authority [10]. By concentrating decision-making power within a centralized technocratic body, the state bypasses local democratic accountability. This structure isolates the project from community-level resistance. The GSW functions fundamentally as a structural shield. It protects macro-industrial logistics hubs and high-value real estate assets [8]. It mitigates a geodetic crisis that the state's own spatial planning policies have actively exacerbated over the past two decades [13]. Therefore, the devastating socio-spatial exclusion and loss of access are not accidental engineering externalities. They are the predictable structural outcomes of a hegemonic spatial planning architecture. This architecture is engineered to prioritize the preservation of commercial land over the survival of informal marine economies [11].

## 5. Conclusion

This systematic literature review maps the state of the art in coastal governance research. The synthesized literature exposes a structural policy-reality gap in subsiding deltas. The primary academic contribution of this study is the deconstruction of the hazard-plan disconnect. The review moves beyond a simple cataloging of engineering or planning anomalies. Instead, it synthesizes empirical and institutional datasets into a coherent critical framework. This framework links the invisibility of land subsidence directly to the political economy of real-estate capital accumulation.

The main theoretical contribution of this study challenges conventional planning paradigms.

Traditional planning theory treats zoning as a neutral, risk-reduction tool. Conversely, this review offers a new paradigm for critical spatial planning theory. In subsiding coastal megacities, statutory spatial planning often operates as an instrument of hegemonic space production. Hard infrastructure projects, such as the Giant Sea Wall, act as spatial shields. These shields protect high-value industrial assets while systematically displacing informal marine economies. Therefore, the core philosophical message of this study is clear. Long-term coastal resilience cannot be engineered through technical-hydraulic isolation alone. True socioecological endurance requires inclusive planning institutions. These institutions must legally anchor the territorial, landing, and access rights of marginalized stakeholders within the formal planning fabric.

The comparative analysis with the Dutch model isolates critical structural barriers rather than romanticizing foreign solutions. Direct policy transfer fails due to post-colonial institutional asymmetries and fiscal dependence on real estate developers. Future research must shift away from broad, normative policy recommendations. Instead, scholars should focus on testing community-scale water councils within the fragmented Indonesian decentralization framework. Specifically, future empirical agendas should operationalize pilot-scale waterschap models at the sub-district level. These localized councils must possess independent regulatory input and veto power over municipal zoning decisions. Future studies must also develop spatialized socio-ecological vulnerability indices. These indices will quantitatively map the long-term displacement and economic compression of informal marine economies. This empirical path will provide a verifiable foundation for inclusive institutional reform.

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