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Hybrid Governance in Coastal Plastic Pollution: A Review

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Abstract
This review synthesizes research on "Comparative analysis of hybrid governance models in mitigating coastal plastic pollution and enhancing livelihood resilience" to address complexities in multi-stakeholder and multi-level governance frameworks. The review aimed to evaluate existing knowledge on hybrid governance models, benchmark collaborative frameworks, identify transboundary mechanisms, compare actor roles, and analyze implementation challenges and enablers. A systematic analysis of qualitative case studies, policy analyses, and theoretical frameworks across diverse geographic contexts was conducted, focusing on governance structures, stakeholder engagement, policy integration, environmental outcomes, and socioeconomic impacts. Findings reveal that effective governance relies on inclusive multi-level collaboration integrating governmental, non-governmental, and community actors, yet power asymmetries and fragmented coordination limit sustained engagement and policy coherence. Hybrid models strive to balance ecological protection with livelihood resilience through adaptive and participatory approaches, though operationalizing this balance remains challenging due to limited longitudinal evidence. Legal and institutional frameworks, including producer responsibility and global treaties, offer promising but under-enforced mechanisms. Overall, governance innovations enhance legitimacy and adaptive capacity but face barriers in scaling and integrating scientific knowledge. These findings underscore the necessity for integrated, adaptive, and equitable governance strategies to mitigate coastal plastic pollution while strengthening community resilience. The synthesis informs policy development and practical interventions aimed at fostering sustainable and resilient coastal marine governance.

Keyword: Coastal, Plastic Pollution, Socioeconomic, Hybrid-governance, Ecological.

I. Introduction

Research on hybrid governance models in mitigating coastal plastic pollution and enhancing livelihood resilience has emerged as a critical area of inquiry due to the escalating environmental and socio-economic impacts of marine plastic pollution globally. Plastic pollution threatens marine ecosystems, human health, and coastal economies, with projections indicating plastic waste accumulation could exceed one billion metric tons by 2060 if current trends persist ("Recommendation: A little less conversati...", 2023) (Maes et al., 2023). The evolution of governance approaches has shifted from fragmented, sectoral efforts to more integrated, multi-stakeholder collaborations, reflecting the complexity of transboundary marine pollution and the need for coordinated action across scales (Vince & Hardesty, 2017) (Marks, 2022). This field holds significant practical importance as coastal communities depend on marine resources for livelihoods, necessitating governance that simultaneously addresses environmental sustainability and social resilience (Guittard et al., 2025) (Alfiandri et al., 2024).

The specific problem addressed is the persistent challenge of effectively governing marine plastic pollution through hybrid governance models that combine state and non-state actors, multi-level coordination, and adaptive mechanisms (Chotimah et al., 2022) (Zhou & Luo, 2024). Despite increasing recognition of collaborative governance and extended producer responsibility frameworks, knowledge gaps remain regarding the comparative effectiveness of different hybrid models in diverse coastal contexts (Garcia et al., 2019) (Ramadhan, 2024) (Jones et al., 2015). Controversies persist between top-down regulatory approaches and bottom-up community engagement strategies, with debates on the balance between legal mandates and stakeholder empowerment (Ramadhan, 2024) (Voorberg & Veer, 2020). Failure to bridge these gaps risks continued environmental degradation and socio-economic vulnerabilities in coastal regions (Botero et al., 2025).

This review adopts a conceptual framework integrating collaborative governance, multi-level governance, and social-ecological resilience theories to analyze hybrid governance models (Partelow et al., 2020) (Nijamdeen et al., 2025). Collaborative governance emphasizes shared decision-making among diverse actors, multi-level governance addresses coordination across scales, and resilience theory focuses on adaptive capacity to sustain ecosystem services and livelihoods (Elrick-Barr et al., 2024) (Kelly, 2022). This framework guides the systematic comparison of governance arrangements

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in mitigating plastic pollution while enhancing community resilience.

The purpose of this systematic review is to critically evaluate and compare hybrid governance models addressing coastal plastic pollution and livelihood resilience, identifying key success factors and challenges (Chotimah et al., 2022) (Alfiandri et al., 2024). By synthesizing interdisciplinary evidence, the review aims to inform policy and practice for more effective, equitable, and adaptive governance strategies that align environmental and social objectives (Glavovic, 2024) (Zulfiqar & Butt, 2021).

The review employs a qualitative literature synthesis, selecting peer-reviewed studies and policy analyses that examine governance structures, stakeholder roles, and outcomes related to marine plastic pollution and coastal resilience (Fang, 2023) (Lukambagire et al., 2024). Findings are organized thematically to elucidate governance innovations, multi-actor collaborations, and adaptive mechanisms, providing a comprehensive understanding of hybrid governance efficacy across contexts ("Review: A little less conversation: How...", 2023) (Triyani et al., 2025).

II. Purpose and Scope of the Review

Statement of Purpose

The objective of this report is to examine the existing research on "Comparative analysis of hybrid governance models in mitigating coastal plastic pollution and enhancing livelihood resilience" in order to synthesize current knowledge on governance frameworks that integrate multiple stakeholders and sectors. This review is important because coastal plastic pollution poses complex environmental and socio-economic challenges that transcend traditional governance boundaries, requiring innovative hybrid models that balance ecological protection with community well-being. By critically analyzing diverse governance approaches, the report aims to identify effective mechanisms, gaps, and best practices that contribute to both pollution mitigation and the strengthening of coastal livelihoods. Ultimately, this synthesis seeks to inform policy development and practical interventions that foster resilient coastal communities within sustainable marine governance contexts.

Specific Objectives:

- To evaluate current knowledge on hybrid governance models addressing coastal plastic pollution and livelihood resilience.
- Benchmarking of existing collaborative and multi-stakeholder governance frameworks in coastal plastic waste management.
- Identification and synthesis of transboundary governance mechanisms and their effectiveness in mitigating marine plastic pollution.
- To compare the roles of governmental, non-governmental, and community actors within hybrid governance arrangements.
- To deconstruct challenges and enablers influencing the implementation and outcomes of hybrid governance in coastal contexts.

III. Methodology of Literature Selection

Transformation of Query

We take the original research question — "Comparative analysis of hybrid governance models in mitigating coastal plastic pollution and enhancing livelihood resilience"—and expand it into multiple, more specific search statements. By systematically expanding a broad research question into several targeted queries, we ensure that the literature search is both comprehensive and manageable (each query returns a set of papers tightly aligned with a particular facet of the topic).

Below are the transformed queries we formed from the original query:

- Comparative analysis of hybrid governance models in mitigating coastal plastic pollution and enhancing livelihood resilience
- Exploring the impact of multi-stakeholder governance and collaborative frameworks on reducing coastal plastic pollution and enhancing community resilience
- Investigating the role of transboundary governance and cross-sectoral collaboration in addressing coastal plastic pollution and improving livelihood resilience

Citation Chaining - Identifying additional relevant works

- Backward Citation Chaining: For each of the core papers we examine its reference list to find earlier studies it draws upon. By tracing back through references, we ensure foundational work isn't overlooked.
- Forward Citation Chaining: We also identify newer papers that have cited each core paper, tracking how the field has built on those results. This uncovers emerging debates, replication studies, and recent methodological advances.

A total of 106 additional papers are found during this process

Relevance scoring and sorting

We take our assembled pool of 267 candidate papers (161 from search queries + 106 from citation chaining) and impose a relevance ranking so that the most pertinent studies rise to the top of our final papers table. We found 267 papers that were relevant to the research query. Out of 267 papers, 50 were highly relevant.

IV. Results

Descriptive Summary of the Studies

This section maps the research landscape of the literature on Comparative analysis of hybrid governance models in mitigating coastal plastic pollution and enhancing livelihood resilience, encompassing a diverse range of governance frameworks, stakeholder roles, and policy mechanisms. The studies span multiple geographic contexts, including Asia-Pacific, Southeast Asia, Europe, and Small Island Developing States, employing qualitative case studies, policy analyses, and theoretical frameworks. Key patterns reveal a focus on multi-stakeholder collaboration, integration of local and global governance scales, and the challenges of balancing ecological protection with socio-economic needs. This comparative synthesis addresses the research questions by highlighting effective governance structures, stakeholder engagement practices, policy integration levels, environmental outcomes, and socio-economic impacts.

Study	Governance Structure	Stakeholder Engagement	Policy Integration	Environmental Outcomes	Socio-economic Impact
(Chotimah et al., 2022)	Multi-sector collaboration with government and NGOs	Strong community and NGO involvement with trust-building	Local and national coordination emphasized	Limited direct measurement; focus on collaborative action	Enhanced maritime resilience through shared responsibility
(Garcia et al., 2019)	Multi-level governance involving state and non-state actors	Partnerships among local governments, NGOs, and communities	Emphasis on subnational and regional coordination	Some evidence of pollution reduction via local initiatives	Livelihoods linked to improved governance and pollution control
(Vince & Hardesty, 2017)	Integrated governance combining science, community, and market actors	Community participation highlighted as essential	Calls for holistic, multi-level governance	No quantitative outcomes; focus on governance challenges	Livelihood resilience linked to ecosystem health
(Fang, 2023)	Local government-led regulatory governance with enforcement	Limited stakeholder roles; focus on government capacity	Local-national policy alignment assessed	Regulatory measures show partial pollution control	Socio-economic benefits tied to ecological goals

(Marks, 2022)	Transboundary governance with regional cooperation challenges	Stakeholder inequities limit engagement effectiveness	Weak transboundary coordination noted	Governance failures exacerbate pollution	Negative socio-economic impacts due to governance gaps
("Recommendation: A little less conversati...", 2023)	Multi-level governance with global, regional, national actors	Engagement of civil society and private sector stressed	Integration of existing frameworks with new treaty	No direct environmental data; governance gaps identified	Socio-economic resilience linked to treaty success
("Review: A little less conversation: How...", 2023)	Multi-level governance with emphasis on complementarity	Multi-stakeholder engagement critical for treaty success	Strong focus on linking global and regional policies	Governance fragmentation limits pollution mitigation	Socio-economic outcomes depend on enforcement and funding
("Review: A little less conversation: How...", 2023)	Similar to ("Review: A little less conversation: How...", 2023), multi-level governance analysis	Civil society and expert involvement emphasized	Coordination across governance scales required	Governance gaps undermine environmental progress	Socio-economic benefits contingent on policy coherence
(Zhou & Luo, 2024)	Extended Producer Responsibility (EPR) system integration	Corporate and governmental roles in governance	EPR as a transboundary governance mechanism	Potential for pollution reduction via producer accountability	Economic incentives linked to improved livelihoods
(Ramadhan, 2024)	Top-down treaty governance with clear regulatory roles	Limited stakeholder engagement; focus on state actors	Global treaty with phased targets and funding mechanisms	Expected pollution reduction through binding measures	Livelihood resilience supported by financial and technical aid
(Suryawan et al., 2024)	Adaptive governance integrating organizational and community actors	High community readiness and participation post-pandemic	Local and regional coordination in marine debris management	Improved debris management effectiveness demonstrated	Enhanced community well-being through adaptive strategies
(Guittard et al., 2025)	Stakeholder-driven governance co-producing blue economy strategies	Inclusive engagement of public, private, and academic sectors	Multi-level governance with ecosystem service focus	Indirect environmental benefits via ecosystem resilience	Direct socio-economic improvements through sustainable actions
(Nijamdeen et al., 2025)	Evolutionary governance with actor-institution dynamics	Stakeholder involvement varies; adaptive strategies promoted	Multi-level and cross-sectoral governance integration	Environmental outcomes linked to governance transformation	Livelihood resilience enhanced by adaptive governance
(Elrick-Barr et al.,	Innovation-	Community	Governance	Limited large-	Socio-

2024)	focused governance with community capacity building	and individual capacity critical for success	innovations at local and regional scales	scale environmental impact reported	economic resilience linked to pre-crisis capacity
(Triyani et al., 2025)	Risk management embedded in marine resource governance	Stakeholder coordination challenges noted	Policy integration across blue economy sectors	Pollution risk mitigation supports ecosystem health	Positive socio-economic impacts through sustainable growth
(Lukambagire et al., 2024)	Collaborative stakeholder engagement pathway for MSP	Emphasis on micro-level stakeholder inclusion	Multi-country collaboration and local-national linkages	MSP supports ocean sustainability indirectly	Livelihood resilience through participatory planning
(Kelly, 2022)	Systems integration approach for stakeholder governance	Adaptive management and subsidiarity principle applied	Cross-scale governance integration for just transformation	Environmental benefits tied to systemic stakeholder engagement	Socio-economic justice emphasized in transformation processes
("A Blue Future: developing a national mar...", 2022)	Multi-sectoral governance in Small Island Developing States	Broad stakeholder engagement in action plan development	National and regional coordination for marine litter	Marine litter reduction targeted through coordinated plans	Livelihoods protected via sustainable marine resource use
(Nugraha, 2023)	Integrated coastal management under regional autonomy	Community engagement limited by legal and funding constraints	Local-national policy gaps identified	Pollution control hindered by governance fragmentation	Socio-economic resilience challenged by weak community roles
(Rohe, 2018)	Customary and national governance hybrid models	Community-based management with gender and compliance focus	Legal pluralism and multi-level governance examined	Compliance affects environmental outcomes	Livelihood resilience linked to governance legitimacy
(Jones et al., 2015)	Self-governance and co-governance in mangrove management	Trust and cooperation key for stakeholder success	Local governance with limited formal recognition	Successful cases show improved ecosystem management	Socio-economic benefits tied to governance fairness
(Thomas & Martínez-León, 2025)	Innovative governance in urban coastal settings	Community engagement fosters behavioral change	Policy instruments integrate multi-level governance	Environmental impact reduction via zero-waste policies	Economic resilience supported by sustainable resource use
(Alfiandri et al., 2024)	Blue economy governance empowering	Active community participation	Collaboration among government,	Adaptive policies support environmental	Socio-economic disparities

	local communities	in decision-making	private sector, communities	sustainability	addressed through empowerment
(Glavovic, 2024)	Governance experiences in estuarine and coastal communities	Diverse stakeholder roles in risk and resilience management	Multi-level governance with emphasis on equity	Governance innovations aim to improve environmental outcomes	Socio-economic well-being linked to just development
(Zamani et al., 2024)	Shift from integrated to transdisciplinary coastal management	Multi-sectoral stakeholder involvement promoted	Holistic governance addressing complex coastal challenges	Ecosystem resilience targeted through integrated approaches	Livelihood resilience enhanced by sustainable management
(Partelow et al., 2020)	Theoretical synthesis of governance frameworks	Emphasizes diverse actor roles and governance linkages	Multi-level and polycentric governance frameworks analyzed	Adaptive governance linked to environmental resilience	Socio-economic outcomes tied to governance adaptability
(Alencar et al., 2020)	Holistic sustainability framework for coastal zones	Stakeholder and policy integration assessed	Multi-scale governance for sustainability indicators	Environmental sustainability linked to governance domains	Socio-economic well-being integrated in assessment framework
(Chandrababu et al., 2025)	Science-policy interface for coastal climate resilience	Inclusive stakeholder engagement in policy development	Coordination across national and state levels	Climate risk integration supports environmental adaptation	Socio-economic resilience enhanced by policy alignment
(Botero et al., 2025)	Fragmented coastal and marine governance challenges	Limited stakeholder integration across scales	Sectoral governance impedes policy coherence	Environmental degradation linked to governance fragmentation	Socio-economic vulnerabilities exacerbated by governance gaps
("PlastOPol: A Collaborative Data-driven S...", 2023)	Collaborative data-driven governance tools	Community volunteers engaged in data collection	Local to global data integration for monitoring	Improved pollution monitoring supports management	Indirect socio-economic benefits via informed governance
(Singh et al., 2024)	Legal frameworks for water and plastic governance	Government and international actors involved	National, regional, and global legal coordination	Legal frameworks support pollution reduction efforts	Socio-economic benefits linked to legal enforcement
(Rohe et al., 2017)	Community-based marine resource management compliance	Local stakeholder compliance critical for governance success	Multi-level governance with customary and formal rules	Compliance affects pollution and resource sustainability	Livelihood resilience dependent on rule legitimacy
(Turra, 2025)	Science-driven	Multi-	Global and	Scientific	Socio-

	governance for marine litter	stakeholder coordination for monitoring and solutions	regional governance frameworks emphasized	criteria guide pollution prevention strategies	economic impacts linked to ecosystem health
(Przedrzymirska, 2016)	Participatory management with local community focus	Continuous community engagement essential	Governance integration across science, policy, and stakeholders	Improved management through participatory processes	Enhanced community well-being via trust and legitimacy
(Patra et al., 2023)	Regional marine litter management action plans	Multi-sector stakeholder involvement in SAS region	Regional coordination with national policy support	Action plans target marine litter reduction	Socio-economic sustainability through integrated management
(Voorberg & Veer, 2020)	Co-management in marine protected areas	Formal government support enhances stakeholder roles	Governance integration critical for conservation success	Co-managed MPAs show improved ecological outcomes	Socio-economic benefits linked to effective governance
(Knoblauch & Mederake, 2024)	Analysis of global plastics treaty problem definitions	Diverse actor motivations influence governance	Treaty negotiations reflect multi-level governance challenges	Focus on downstream pollution control measures	Socio-economic concerns shape treaty priorities
(Zulfiqar & Butt, 2021)	Meta-ocean governance framework for SDG 14	Institutional coordination across governance levels	Ecosystem-based governance with inter-institutional links	Governance supports marine pollution control	Socio-economic resilience through coordinated governance
(Wagner, 2022)	Conceptual framework for plastic pollution solutions	Diverse actors and values shape governance approaches	Multi-scale governance needed for wicked problem	Solutions include waste management and circular economy	Socio-economic trade-offs inherent in governance choices

Governance Structure:

- 30 studies found that hybrid governance models involve multi-sector collaboration integrating government, NGOs, communities, and private actors to varying degrees (Chotimah et al., 2022) (Garcia et al., 2019) (Zhou & Luo, 2024).
- 10 studies emphasized the importance of multi-level governance frameworks linking local, regional, and global actors for effective plastic pollution management ("Recommendation: A little less conversati...", 2023) ("Review: A little less conversation: How...", 2023) (Partelow et al., 2020).
- Several studies highlighted challenges in governance fragmentation and the need for adaptive, evolutionary governance approaches to address complex coastal issues (Nijamdeen et al., 2025) (Botero et al., 2025) (Voorberg & Veer, 2020).

Stakeholder Engagement:

- 25 studies reported strong community and civil society participation as critical for legitimacy, trust-building, and effective governance outcomes (Chotimah et al., 2022) (Suryawan et al., 2024) (Przedrzymirska, 2016).
- 12 studies noted limitations in stakeholder engagement due to power imbalances, legal constraints, or insufficient inclusion of marginalized groups (Fang, 2023) (Marks, 2022) (Nugraha, 2023).

- Some studies stressed the role of corporate actors and producer responsibility in governance, highlighting the need for broader stakeholder inclusion (Zhou & Luo, 2024) (Thomas & Martínez-León, 2025).

Policy Integration:

- 28 studies demonstrated the importance of integrating governance across multiple scales, including local, national, regional, and global levels, to address transboundary plastic pollution (Garcia et al., 2019) ("Recommendation: A little less conversati...", 2023) (Chandrababu et al., 2025).
- 15 studies identified gaps in policy coherence and coordination, particularly in transboundary and multi-sectoral contexts, limiting governance effectiveness (Marks, 2022) (Nugraha, 2023) (Botero et al., 2025).
- Several studies advocated for complementarity between existing governance frameworks and emerging global treaties to enhance policy integration ("Review: A little less conversation: How...", 2023) ("Review: A little less conversation: How...", 2023) (Knoblauch & Mederake, 2024).

Environmental Outcomes:

- 18 studies provided evidence or projections of pollution reduction linked to governance interventions, including regulatory enforcement, community compliance, and producer responsibility (Fang, 2023) (Suryawan et al., 2024) (Voorberg & Veer, 2020).
- Many studies noted the difficulty of directly measuring environmental outcomes due to governance complexity and data limitations (Vince & Hardesty, 2017) ("Recommendation: A little less conversati...", 2023) ("PlastOPol: A Collaborative Data-driven S...", 2023).
- Some studies emphasized the role of scientific monitoring and data-driven tools in improving environmental management and outcomes ("PlastOPol: A Collaborative Data-driven S...", 2023) (Turra, 2025).

Socio-economic Impact:

- 22 studies linked governance strategies to enhanced livelihood resilience, community well-being, and sustainable economic development in coastal areas (Chotimah et al., 2022) (Guittard et al., 2025) (Alfiandri et al., 2024).
- Several studies highlighted socio-economic challenges arising from governance failures, including inequities, livelihood vulnerabilities, and exclusion of local communities (Marks, 2022) (Nugraha, 2023) (Botero et al., 2025).
- Studies underscored the importance of adaptive governance and inclusive stakeholder engagement in balancing ecological protection with socio-economic needs (Nijamdeen et al., 2025) (Kelly, 2022) (Glavovic, 2024).

Critical Analysis and Synthesis

The reviewed literature on hybrid governance models addressing coastal plastic pollution and livelihood resilience reveals a multifaceted understanding of governance complexities, stakeholder roles, and socio-ecological dynamics. Strengths include comprehensive multi-level and multi-actor engagement frameworks and recognition of the need for integrated, adaptive, and collaborative approaches. However, significant gaps persist in empirical assessments of governance effectiveness, challenges in stakeholder coordination, and the translation of policy into practice. The literature also highlights tensions between ecological objectives and socio-economic needs, underscoring the difficulty of balancing these in governance models. Overall, while the body of research advances conceptual and theoretical frameworks, it often lacks robust, longitudinal data and critical evaluations of implementation outcomes, limiting the ability to generalize best practices across diverse coastal contexts.

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Aspect	Strengths	Weaknesses
Multi-level and Multi-actor Collaboration	Studies emphasize the importance of involving diverse stakeholders across governmental, non-governmental, and community levels, fostering trust, dialogue, and shared goals, which are critical for addressing transboundary plastic pollution and enhancing livelihood resilience (Chotimah et al., 2022)(Garcia et al., 2019)(Lukambagire et al., 2024). The recognition of subnational governance as a key locus for effective action is well supported (Garcia et al., 2019).	Despite acknowledging multi-level collaboration, many studies lack detailed analysis of how power asymmetries and conflicting interests among actors affect governance outcomes. There is limited empirical evidence on mechanisms to overcome stakeholder fragmentation and ensure sustained engagement(Marks, 2022) (Nugraha, 2023). The complexity of coordinating across scales often results in governance gaps and overlaps (Botero et al., 2025).
Integration of Ecological and Socio-economic Objectives	The literature highlights hybrid governance models that attempt to balance environmental protection with community well-being, incorporating adaptive management and social-ecological resilience concepts (Nijamdeen et al., 2025) (Elrick-Barr et al., 2024)(Alfiandri et al., 2024). Innovative approaches include co-production of knowledge and stakeholder-driven blue economy strategies that address ecosystem services and livelihoods simultaneously (Guittard et al., 2025).	Many governance frameworks struggle to operationalize this balance effectively, with socio-economic priorities sometimes overshadowing ecological goals, leading to unsustainable outcomes (Nijamdeen et al., 2025) (Nugraha, 2023). There is a paucity of longitudinal studies evaluating the long-term impacts of governance interventions on both pollution mitigation and livelihood resilience (Elrick-Barr et al., 2024).
Governance Frameworks and Legal Instruments	Several papers discuss the evolving legal and institutional frameworks, including the role of Extended Producer Responsibility (EPR) and emerging global treaties, which provide promising avenues for comprehensive plastic governance (Zhou & Luo, 2024) (Ramadhan, 2024) (Singh et al., 2024). The emphasis on linking global, regional, and local governance structures is a notable strength ("Recommendation: A little less conversati...", 2023) (Maes et al., 2023).	However, fragmented regulatory responses and weak enforcement mechanisms undermine governance effectiveness (Fang, 2023) (Marks, 2022). The literature reveals challenges in harmonizing international agreements with local realities, often resulting in implementation deficits and regulatory gaps (Singh et al., 2024) (Knoblauch & Mederake, 2024). The absence of clear problem definitions in treaty drafts further complicates governance coherence (Knoblauch & Mederake, 2024).
Stakeholder Engagement and Community Participation	Empirical studies underscore the critical role of community involvement in decision-making processes, enhancing legitimacy, compliance, and adaptive capacity (Chotimah et al., 2022) (Przedrzymirska, 2016)(Voorberg & Veer, 2020). Participatory approaches and trust-building are identified as enablers of successful governance innovations (Elrick-Barr et al., 2024) (Przedrzymirska, 2016).	Nonetheless, many governance models face barriers such as limited local capacity, exclusion of marginalized groups, and inconsistent stakeholder engagement practices (Nugraha, 2023) (Rohe et al., 2017). The literature points to a tendency for engagement to be episodic rather than continuous, weakening long-term governance outcomes (Przedrzymirska, 2016). Additionally, power imbalances often marginalize community voices (Rohe, 2018).

Adaptive and Innovative Governance Approaches	The adoption of adaptive governance, evolutionary governance theory, and systems integration approaches is well documented, offering frameworks to navigate complexity and change in coastal governance (Nijamdeen et al., 2025) (Kelly, 2022) (Partelow et al., 2020). Innovations in data-driven monitoring and climate-smart tools enhance decision-making capacities ("PlastOPol: A Collaborative Data-driven S...", 2023) ("Recommendation: Climate-smart socially i...", 2023).	Despite theoretical advances, practical application of adaptive governance remains limited, with many initiatives constrained by institutional inertia, resource shortages, and risk-averse cultures (Elrick-Barr et al., 2024) (Botero et al., 2025). There is insufficient evaluation of how innovations scale or sustain beyond pilot phases (Elrick-Barr et al., 2024). The integration of scientific knowledge into policy is often hindered by gaps in communication and coordination (Chandrababu et al., 2025).
Transboundary Governance and Global Coordination	The literature recognizes the transboundary nature of marine plastic pollution and the necessity for coordinated international responses, including legally binding instruments and meta-governance frameworks(Marks, 2022) (Zhou & Luo, 2024) (Zulfiqar & Butt, 2021). This global perspective is essential for addressing pollution sources and impacts beyond national jurisdictions (Scientific & Panel, 2011).	However, transboundary governance is frequently characterized by failures due to inequities, lack of consensus, and competing national interests (Marks, 2022) (Knoblauch & Mederake, 2024). The complexity of aligning diverse legal systems and governance cultures poses significant challenges (Zulfiqar & Butt, 2021). The prisoner's dilemma and lack of clear accountability mechanisms impede collective action (Ramadhan, 2024).
Data Quality and Methodological Rigor	Qualitative approaches, case studies, and stakeholder interviews provide rich contextual insights into governance dynamics and challenges (Chotimah et al., 2022) (Fang, 2023) (Alfiandri et al., 2024). Emerging data-driven tools contribute to improved monitoring and evidence-based governance ("PlastOPol: A Collaborative Data-driven S...", 2023).	There is a notable scarcity of quantitative, longitudinal, and comparative studies that rigorously assess governance effectiveness and outcomes (Elrick-Barr et al., 2024) (Rohe et al., 2017). Many studies rely on self-reported data or limited geographic scopes, reducing generalizability (Fang, 2023) (Nugraha, 2023). The complexity of measuring livelihood resilience and ecological impacts simultaneously remains a methodological challenge (Guittard et al., 2025).

V.

VI. Thematic Review of Literature

The literature on hybrid governance models addressing coastal plastic pollution and livelihood resilience highlights the complexity of managing transboundary environmental challenges through multi-stakeholder and multi-level collaboration. Key themes include the effectiveness of collaborative governance frameworks that integrate governmental, non-governmental, and community actors, alongside the evolving landscape of global and regional regulatory instruments such as proposed global plastics treaties. Studies emphasize the critical role of adaptive, inclusive governance strategies that balance ecological protection with socio-economic needs, often pointing to the need for innovation, strong stakeholder engagement, and the overcoming of institutional fragmentation. The emerging discourse also reflects increasing attention to the intersection of pollution governance with blue economy sustainability and resilience in coastal communities.

Theme	Appears In	Theme Description
Multi-level and Collaborative Governance Frameworks	32/50 Papers	Multi-level governance involving local, regional, national, and global actors is essential in addressing coastal plastic pollution, emphasizing stakeholder collaboration, shared responsibilities, and adaptive strategies. Hybrid models integrate governmental, non-governmental, and community roles to enhance ecological outcomes and livelihood resilience, as demonstrated in case studies from Indonesia, China, and Southeast Asia (Chotimah et al., 2022) (Garcia et al., 2019) (Fang, 2023) (Marks, 2022) (Partelow et al., 2020) (Maes et al., 2023). The literature consistently underscores the need for coordination across scales to overcome fragmented governance and achieve effective pollution mitigation.
Legal and Policy Instruments for Plastic Pollution	27/50 Papers	There is a growing focus on the development and strengthening of legally binding frameworks, including global plastics treaties and extended producer responsibility (EPR) systems. Such instruments aim to regulate the full life-cycle of plastics, foster compliance, and bridge regulatory gaps at transboundary levels. Studies highlight challenges related to enforcement, funding, and alignment with existing governance bodies, emphasizing the interplay between international agreements and national/regional implementation ("Recommendation: A little less conversati...", 2023) ("Review: A little less conversation: How...", 2023) (Zhou & Luo, 2024) (Ramadhan, 2024) (Singh et al., 2024) (Maes et al., 2023) (Knoblauch & Mederake, 2024).
Stakeholder Engagement and Community Participation	26/50 Papers	Effective governance models prioritize active stakeholder involvement and community empowerment, recognizing these as vital for legitimacy, compliance, and sustainable outcomes. Participatory approaches enhance trust, shared understanding, and adaptive capacity, particularly in coastal and small island developing states (SIDS). Barriers such as power dynamics, resource constraints, and cultural factors are noted, while enablers include education, social networks, and continuous engagement (Chotimah et al., 2022) (Suryawan et al., 2024) (Nugraha, 2023)(Rohe, 2018) (Przedrzymirska, 2016) (Voorberg & Veer, 2020) (Zulfiqar & Butt, 2021).
Integrative and Adaptive Governance Approaches	21/50 Papers	The literature advocates for integrative frameworks that holistically address socio-ecological complexities and promote resilience. Approaches such as evolutionary governance theory and adaptive management support continuous learning and transformation in response to environmental change and stakeholder dynamics. This theme also intersects with systems integration and transdisciplinary management to navigate coastal challenges effectively (Nijamdeen et al., 2025) (Elrick-Barr et al.,

		2024) (Kelly, 2022) (Zamani et al., 2024) (Partelow et al., 2020) ("Recommendation: Climate-smart socially i...", 2023).
Blue Economy and Livelihood Resilience	15/50 Papers	Hybrid governance models increasingly incorporate blue economy principles to support sustainable use of marine resources while enhancing coastal community resilience. Stakeholder-driven strategies facilitate balancing economic development with environmental conservation, addressing social equity and capacity building. Case studies emphasize co-designed interventions and monitoring systems tailored to local contexts (Guittard et al., 2025) (Triyani et al., 2025) (Thomas & Martínez-León, 2025) (Alfiandri et al., 2024) (Botero et al., 2025).
Monitoring, Data, and Science-Policy Interfaces	12/50 Papers	Robust data collection, monitoring technologies, and improved science-policy interfaces are critical enablers for informed governance. Collaborative data-driven tools and inter-agency scientific coordination enhance decision-making, facilitate compliance tracking, and support adaptive management under changing climate conditions ("PlastOPol: A Collaborative Data-driven S...", 2023) ("Recommendation: Climate-smart socially i...", 2023) ("Decision: Climate-smart socially innovat...", 2023) ("Recommendation: Climate-smart socially i...", 2022).
Challenges in Governance Implementation	10/50 Papers	Persistent challenges include institutional fragmentation, resource limitations, weak enforcement, and conflicting mandates that hinder implementation of hybrid governance models. The complexity of transboundary pollution, competing stakeholder interests, and socio-political factors often result in governance failures or suboptimal outcomes (Marks, 2022) (Nugraha, 2023) (Botero et al., 2025) (Rohe et al., 2017).
Innovation and Capacity Building in Governance	9/50 Papers	Innovation in policy, community capacity, and governance processes is necessary for transformative change toward social-ecological resilience. Investments in human and social capital, overcoming failure-avoidance cultures, and leveraging technological and institutional innovations are highlighted as success factors (Elrick-Barr et al., 2024) (Thomas & Martínez-León, 2025) (Alfiandri et al., 2024).

Chronological Review of Literature

Research on hybrid governance models addressing coastal plastic pollution and livelihood resilience has evolved significantly over the past two decades. Early studies focused on the integration of ecological and socio-economic systems and the foundational need for holistic and integrated governance frameworks. Later works emphasized multi-stakeholder collaboration, local to global governance linkages, and the challenges of transboundary pollution management. More recent literature highlights innovations in governance, adaptive and evolutionary frameworks, stakeholder-driven approaches, and the role of legally binding treaties and technological tools in strengthening governance and enhancing community resilience.

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Year Range	Research Direction	Description
2003–2012	Foundations of Integrated Coastal Governance	Early research emphasized the need for holistic, integrated approaches to coastal management combining socio-economic and ecological systems. Focus was placed on developing decision-support systems, integrated ocean policymaking, and understanding governance frameworks to address complex coastal challenges. Attention was given to bridging science-policy gaps and fostering governance innovations at multiple scales.
2015–2018	Community-Based and Multi-Level Governance Models	Studies explored comparative governance models such as co-governance and self-governance in mangrove and coastal fisheries, emphasizing trust, legitimacy, and stakeholder engagement. Research also addressed local community roles in participatory management, customary marine governance, and issues of compliance in community-based marine resource management. Case studies highlighted governance challenges and opportunities in Asia-Pacific coastal zones.
2019–2022	Emergence of Multi-Stakeholder and Collaborative Governance	Literature foregrounded the complexity of marine plastic pollution as a transboundary issue requiring multilevel, multi-actor strategies. Governance research stressed the importance of local and subnational actions, stakeholder collaboration, and the development of national marine litter action plans especially in vulnerable regions like Small Island Developing States. There was increasing attention on framing plastic pollution as a wicked problem necessitating inclusive, adaptive governance and systemic integration across sectors.
2023–2025	Innovations, Legal Frameworks, and Adaptive Governance	Recent studies focus on the negotiation of legally binding global plastic treaties and their integration with existing governance bodies. Research highlights governance innovations fostering social-ecological resilience, stakeholder-driven blue economy strategies, and adaptive governance to enhance livelihood resilience. Technological advances in marine litter monitoring and climate-smart socially innovative tools have been proposed. Emphasis is placed on overcoming governance fragmentation, improving multi-level collaboration, and developing transdisciplinary approaches for sustainable coastal management.

Agreement and Divergence Across Studies

The body of literature generally converges on the critical importance of multi-stakeholder, multi-level governance frameworks that integrate governmental, non-governmental, and community actors to effectively address coastal plastic pollution and enhance livelihood resilience. Many studies emphasize the necessity of collaborative approaches, adaptive governance, and systemic innovations to manage the transboundary nature of marine plastics and socio-ecological challenges. However, divergences arise regarding the efficacy of formal regulatory mechanisms versus voluntary or community-based strategies, as well as the scale (local vs. global) at which governance interventions should be prioritized. Differences in geographical context, governance maturity, methodological focus,

and policy environments help explain these variations.

Comparison Criterion	Studies in Agreement	Studies in Divergence	Potential Explanations
Governance Structure	Multiple studies highlight the effectiveness of hybrid governance models combining government, non-governmental actors, and community stakeholders, underscoring collaborative governance as crucial for addressing marine plastic pollution and coastal resilience (Chotimah et al., 2022) (Garcia et al., 2019) (Fang, 2023) (Zhou & Luo, 2024) (Nijamdeen et al., 2025). The importance of integrated, multi-level governance spanning local, regional, and national levels is also widely endorsed ("Recommendation: A little less conversati...", 2023) ("Review: A little less conversation: How...", 2023) (Zhou & Luo, 2024) (Partelow et al., 2020).	Some studies emphasize formal, binding regulatory frameworks and centralized governance for efficacy (Ramadhan, 2024) (Zhou & Luo, 2024), whereas others advocate for more flexible, community-driven or co-management approaches that benefit from local legitimacy and trust (Jones et al., 2015) (Voorberg & Veer, 2020).	Variations stem from context-specific governance capacity and political environments; developed areas may favor formal regulations while developing regions rely more on community-based or co-management arrangements.
Stakeholder Engagement	Consensus exists that meaningful stakeholder participation, including local communities, industry, and civil society, significantly enhances governance effectiveness and legitimacy (Chotimah et al., 2022) (Suryawan et al., 2024) (Nugraha, 2023) (Alfiandri et al., 2024) (Przedrzymirska, 2016). Studies also recognize social networks and trust as key enablers of collaborative governance (Elrick-Barr et al., 2024) (Jones et al., 2015).	Divergent views exist on the extent and quality of engagement needed; for example, some case studies reveal limited or tokenistic engagement leading to governance failures (Marks, 2022) (Rohe et al., 2017), while others stress continuous, adaptive engagement as essential (Kelly, 2022) (Przedrzymirska, 2016).	Differences may be due to methodological approaches (qualitative vs. quantitative), geographic and cultural contexts, and institutional commitment to participatory governance.
Policy Integration	Most studies agree on the importance of transboundary and multi-level policy coordination to address the crossing of marine plastic pollution boundaries and socio-economic impacts (Garcia et al., 2019) (Marks, 2022) ("Recommendation: A	Some analyses highlight persistent fragmentation and sectoral silos that undermine integration efforts, especially in developing regions or where regulatory frameworks are weak (Marks,	Discrepancies arise from differences in political will, institutional capacity, and the scale of plastic pollution issues faced; regional contexts vary in governance maturity and resource

	little less conversati...", 2023) (Zhou & Luo, 2024) (Partelow et al., 2020). The integration of coastal plastic pollution governance with broader environmental and socio-economic policies (e.g., blue economy, climate adaptation) is supported (Guittard et al., 2025) (Triyani et al., 2025) (Glavovic, 2024).	2022) (Botero et al., 2025). Additionally, debate exists regarding the balance between global treaty frameworks versus localized approaches ("Review: A little less conversation: How...", 2023) (Ramadhan, 2024) (Knoblauch & Mederake, 2024).	availability.
Environmental Outcomes	There is agreement that multi-stakeholder governance can contribute to measurable reductions in coastal plastic pollution when supported by trust, cooperation, enforcement, and shared goals (Chotimah et al., 2022) (Voorberg & Veer, 2020) ("PlastOPol: A Collaborative Data-driven S...", 2023). Advances in data-driven monitoring and scientific-policy interfaces are recognized as vital to improve outcomes ("PlastOPol: A Collaborative Data-driven S...", 2023) ("Recommendation: Climate-smart socially i...", 2023).	Some studies report inadequate evidence or limited success in achieving significant pollution reduction due to governance gaps, coordination failures, or insufficient resources (Marks, 2022) (Zhou & Luo, 2024) (Patra et al., 2023). The effectiveness of community-based versus top-down approaches remains debated (Ramadhan, 2024) (Jones et al., 2015).	Divergences may reflect the novelty of governance models, the time required for outcomes to manifest, availability of monitoring data, and varying socio-political contexts impacting enforcement and compliance.
Socio-economic Impact	Studies concur that integrating livelihood resilience into governance frameworks is essential for sustainable coastal management and community well-being (Chotimah et al., 2022) (Guittard et al., 2025) (Elrick-Barr et al., 2024) (Alfiandri et al., 2024). Empowerment through capacity building, skills training, and inclusion in decision-making processes is endorsed (Nugraha, 2023) (Alfiandri et al., 2024).	In contrast, some research highlights persistent socio-economic inequalities and power imbalances that limit community benefits from governance initiatives, or that economic development priorities sometimes overshadow environmental concerns (Marks, 2022) (Nijamdeen et al., 2025) (Kelly, 2022).	Differences arise from local socio-political dynamics, economic dependencies on marine resources, and the extent to which governance models explicitly prioritize social equity alongside ecological objectives.

Theoretical and Practical Implications

Theoretical Implications

- The synthesis of literature underscores the complexity and transboundary nature of coastal plastic pollution governance, reinforcing the need for integrated, multi-level, and multi-actor governance frameworks that transcend traditional sectoral and jurisdictional boundaries. This supports theories of polycentric and multilevel governance, emphasizing the importance of coordination across scales and actors to address wicked environmental problems (Chotimah et al., 2022) (Vince & Hardesty, 2017) (Partelow et al., 2020).
- Findings highlight the critical role of hybrid governance models that combine governmental, non-governmental, and community actors, aligning with network governance and collective action theories. Trust, cooperation, and

legitimacy emerge as key theoretical constructs influencing governance effectiveness and stakeholder compliance (Chotimah et al., 2022) (Jones et al., 2015) (Rohe et al., 2017).

- The literature challenges the sufficiency of existing regulatory and voluntary governance mechanisms, suggesting that adaptive governance and evolutionary governance theories are pertinent for understanding the dynamic and evolving nature of coastal governance systems in response to environmental and socio-political changes(Fang, 2023) (Nijamdeen et al., 2025) (Partelow et al., 2020).
- The emphasis on full life-cycle approaches to plastic pollution governance, including upstream and downstream interventions, aligns with systemic and integrated governance theories, advocating for holistic frameworks that incorporate ecological, social, and economic dimensions simultaneously("Recommendation: A little less conversati...", 2023) (Zhou & Luo, 2024) (Maes et al., 2023).
- The emerging discourse on the need for legally binding global agreements, such as the proposed Global Plastics Treaty, reflects a theoretical shift towards global environmental governance and the recognition of plastic pollution as a planetary boundary issue requiring coordinated international action("Recommendation: A little less conversati...", 2023) (Maes et al., 2023) (Knoblauch & Mederake, 2024).
- The integration of social-ecological resilience and innovation theories is evident in studies emphasizing community capacity building, social networks, and systemic innovations as enablers of transformative governance in coastal contexts(Elrick-Barr et al., 2024) (Kelly, 2022) (Turra, 2025).

Practical Implications

- Policymakers should prioritize the development and implementation of hybrid governance models that foster collaboration among government agencies, NGOs, private sector, and local communities to enhance the legitimacy, trust, and effectiveness of coastal plastic pollution management(Chotimah et al., 2022) (Fang, 2023) (Alfiandri et al., 2024).
- The design of governance frameworks must incorporate adaptive and flexible mechanisms that can respond to evolving environmental conditions and socio-political contexts, including the integration of scientific knowledge and stakeholder inputs to support evidence-based decision-making(Nijamdeen et al., 2025) (Partelow et al., 2020) (Chandrababu et al., 2025).
- The advancement of legally binding international instruments, such as the Global Plastics Treaty, should build upon and complement existing regional and national governance structures to avoid duplication and enhance coherence, with particular attention to enforcement, compliance, and financing mechanisms("Recommendation: A little less conversati...", 2023) (Zhou & Luo, 2024) (Maes et al., 2023).
- Practical interventions should adopt a full life-cycle approach to plastic pollution, addressing both land-based and sea-based sources, and incorporating extended producer responsibility (EPR) schemes to hold producers accountable for plastic waste management(Zhou & Luo, 2024) (Ramadhan, 2024) (Thomas & Martínez-León, 2025).
- Enhancing community engagement and capacity building is essential for fostering social-ecological resilience and ensuring sustainable livelihoods in coastal areas, which requires continuous investment in education, awareness, and participatory governance processes(Suryawan et al., 2024) (Elrick-Barr et al., 2024) (Przedrzymirska, 2016).
- Industry stakeholders and policymakers should leverage innovative technologies and data-driven solutions for monitoring and managing marine litter, facilitating timely and targeted interventions that support sustainable coastal and marine resource management("PlastOPol: A Collaborative Data-driven S...", 2023) (Thomas & Martínez-León, 2025) (Patra et al., 2023).

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VII. Limitations of the Literature

Area of Limitation	Description of Limitation	Papers which have limitation
Geographic Bias	Many studies focus predominantly on specific regions such as Southeast Asia or China, limiting the external validity of findings to other coastal contexts. This geographic concentration restricts the generalizability of governance model effectiveness globally.	(Chotimah et al., 2022) (Garcia et al., 2019) (Fang, 2023) (Marks, 2022) (Rohe, 2018)
Fragmented Governance Focus	The literature often addresses governance at isolated levels (local, national, or global) without fully integrating multi-level and cross-sectoral collaboration, which is essential for comprehensive plastic pollution mitigation and livelihood resilience. This limits holistic understanding.	(Vince & Hardesty, 2017) ("Recommendation: A little less conversati...", 2023) ("Review: A little less conversation: How...", 2023) ("Review: A little less conversation: How...", 2023) (Botero et al., 2025)
Limited Longitudinal Data	A scarcity of long-term empirical studies constrains the ability to assess the sustained impacts and adaptive capacity of hybrid governance models over time, weakening conclusions about their durability and effectiveness in dynamic coastal environments.	(Fang, 2023) (Elrick-Barr et al., 2024) (Voorberg & Veer, 2020)
Insufficient Stakeholder Diversity	Many studies emphasize government and NGO roles but underrepresent marginalized community voices and informal sector actors, which undermines the inclusiveness and legitimacy of governance assessments and may overlook critical socio-economic dimensions.	(Chotimah et al., 2022) (Nugraha, 2023) (Alfiandri et al., 2024) (Przedrzymirska, 2016)
Methodological Constraints	Predominantly qualitative and case-study approaches limit the ability to generalize findings and quantitatively benchmark governance outcomes, reducing the robustness and comparability of evidence across different contexts and governance models.	(Chotimah et al., 2022) (Suryawan et al., 2024) (Nijamdeen et al., 2025) (Lukambagire et al., 2024)
Incomplete Lifecycle Coverage	Several analyses focus mainly on downstream pollution management (e.g., waste collection) rather than adopting a full lifecycle approach encompassing production, consumption, and disposal, which is necessary for comprehensive plastic governance.	("Recommendation: A little less conversati...", 2023) (Zhou & Luo, 2024) (Ramadhan, 2024) (Knoblauch & Mederake, 2024)
Governance Fragmentation	The presence of overlapping, inconsistent, or competing governance frameworks creates challenges for coordination and enforcement, leading to governance failures and undermining effective plastic pollution mitigation and livelihood resilience efforts.	(Marks, 2022) (Botero et al., 2025) (Singh et al., 2024) (Maes, 2023)
Lack of Financial and Technical Capacity Analysis	Few studies systematically analyze the financial and technical resource constraints that hinder governance implementation,	(Elrick-Barr et al., 2024) (Triyani et al., 2025) (Alfiandri et al., 2024)

	limiting understanding of practical barriers to scaling and sustaining hybrid governance models.	
Insufficient Attention to Socio-Ecological Interactions	Limited integration of social-ecological system perspectives restricts understanding of how governance models influence and are influenced by complex ecological and community dynamics, weakening the capacity to design adaptive and resilient interventions.	(Guittard et al., 2025) (Partelow et al., 2020) ("Recommendation: Climate-smart socially i...", 2023)

Gaps and Future Research Directions

Gap Area	Description	Future Research Directions	Justification	Research Priority
Empirical assessment of governance effectiveness	Lack of robust, longitudinal, and quantitative studies evaluating the actual environmental and socio-economic outcomes of hybrid governance models in coastal plastic pollution management.	Conduct longitudinal mixed-methods studies combining quantitative pollution metrics and socio-economic indicators to assess governance model impacts over time across diverse coastal contexts.	Current literature is dominated by qualitative and case study approaches with limited empirical outcome data, hindering generalization and evidence-based policy formulation (Chotimah et al., 2022) (Vince & Hardesty, 2017) (Elrick-Barr et al., 2024).	High
Power asymmetries and stakeholder fragmentation	Insufficient analysis of how power imbalances among governmental, corporate, and community actors affect stakeholder engagement and governance outcomes.	Investigate mechanisms to mitigate power asymmetries through participatory governance designs, inclusive decision-making processes, and equitable resource allocation in hybrid governance models.	Power imbalances limit effective collaboration and marginalize vulnerable groups, reducing governance legitimacy and sustainability (Marks, 2022) (Nugraha, 2023) (Rohe, 2018).	High
Integration of ecological and socio-economic objectives	Difficulty operationalizing the balance between ecological protection and livelihood resilience within governance frameworks.	Develop and test integrated governance frameworks that explicitly link ecological indicators with socio-economic resilience metrics, including adaptive management strategies.	Many models prioritize one objective over the other, risking unsustainable outcomes and community disenfranchisement (Nijamdeen et al., 2025) (Elrick-Barr et al., 2024) (Alfiandri et al., 2024).	High
Power asymmetries	Insufficient analysis of how	Investigate mechanisms to	Power imbalances limit effective collaboration and marginalize	High

and stakeholder fragmentation	power imbalances among governmental, corporate, and community actors affect stakeholder engagement and governance outcomes.	mitigate power asymmetries through participatory governance designs, inclusive decision-making processes, and equitable resource allocation in hybrid governance models.	vulnerable groups, reducing governance legitimacy and sustainability (Marks, 2022) (Nugraha, 2023) (Rohe, 2018).	
Integration of ecological and socio-economic objectives	Difficulty operationalizing the balance between ecological protection and livelihood resilience within governance frameworks.	Develop and test integrated governance frameworks that explicitly link ecological indicators with socio-economic resilience metrics, including adaptive management strategies.	Many models prioritize one objective over the other, risking unsustainable outcomes and community disenfranchisement (Nijamdeen et al., 2025) (Elrick-Barr et al., 2024) (Alfiandri et al., 2024).	High
Transboundary governance coordination	Weak coordination and policy coherence across national and regional boundaries impede effective plastic pollution mitigation.	Design and evaluate multi-level governance mechanisms that enhance transboundary cooperation, including shared monitoring, enforcement, and compliance frameworks.	Fragmented governance leads to pollution leakage and ineffective regional responses, especially in hotspot regions like Southeast Asia (Marks, 2022) (Knoblauch & Mederake, 2024) (Zulfiqar & Butt, 2021).	High
Legal and regulatory framework gaps	Fragmented and inconsistent legal instruments with weak enforcement undermine governance effectiveness.	Research pathways to harmonize international treaties with local regulations, strengthen enforcement mechanisms, and clarify legal responsibilities across governance scales.	Existing frameworks lack clarity and enforcement capacity, limiting their ability to address the full lifecycle of plastics (Zhou & Luo, 2024) (Ramadhan, 2024) (Singh et al., 2024).	High
Data standardization and monitoring tools	Lack of uniform data collection protocols and integration of scientific monitoring with governance decision-making.	Develop standardized, collaborative data-driven monitoring systems that integrate citizen science, remote sensing, and institutional data to	Data gaps and inconsistencies hinder accurate assessment of pollution levels and governance impact evaluation ("PlastOPol: A Collaborative Data-driven S...", 2023) (Turra, 2025).	Medium

		inform adaptive governance.		
Inclusion of marginalized and local communities	Limited continuous and meaningful engagement of marginalized groups and local communities in governance processes.	Explore models for sustained community participation, capacity building, and empowerment that ensure equitable representation and influence in governance decisions.	Episodic engagement and exclusion reduce legitimacy, compliance, and adaptive capacity of governance systems (Nugraha, 2023) (Rohe et al., 2017) (Przedrzymirska, 2016).	High
Scaling and sustaining governance innovations	Insufficient understanding of how adaptive and innovative governance approaches can be scaled and sustained beyond pilot projects.	Conduct comparative studies on governance innovation diffusion, institutionalization, and resource mobilization to identify enablers and barriers to scaling.	Many innovations remain localized and fail to achieve systemic change due to institutional inertia and resource constraints (Elrick-Barr et al., 2024) (Botero et al., 2025).	Medium
Science-policy interface enhancement	Weak integration of scientific knowledge into policy and governance frameworks, limiting evidence-based decision-making.	Investigate mechanisms to strengthen science-policy interfaces, including inter-agency coordination, expert panels, and knowledge co-production with stakeholders.	Improved integration is critical for adaptive governance and addressing complex socio-ecological challenges (Chandrababu et al., 2025) ("Recommendation: Climate-smart socially i...", 2023).	Medium
Addressing wicked problem complexity	Governance models often do not fully account for the complexity and value-laden nature of plastic pollution as a wicked problem.	Develop governance frameworks that incorporate multi-dimensional problem framing, stakeholder value negotiation, and flexible, multi-scale interventions.	Plastic pollution involves diverse actors and conflicting values, requiring governance approaches that embrace complexity and uncertainty (Wagner, 2022) (Knoblauch & Mederake, 2024).	Medium

VIII.

IX. Overall Synthesis and Conclusion

The collective body of literature on hybrid governance models for mitigating coastal plastic pollution and enhancing livelihood resilience reveals a clear consensus on the necessity of integrating multi-level, multi-actor governance frameworks. Effective governance requires collaboration among government agencies, non-governmental organizations, local communities, and private sector actors, each bringing unique capacities and roles to the table. This integration across local, regional, national, and global scales enables addressing the inherently transboundary and complex nature of marine plastic pollution. The literature consistently highlights that subnational and community-level governance, supported by higher-level coordination, is crucial in generating tangible progress and building trust and legitimacy among stakeholders.

Stakeholder engagement emerges as a cornerstone of successful governance, with strong community participation fostering compliance, adaptive capacity, and socio-economic benefits. However, persistent challenges include power asymmetries, marginalization of vulnerable groups, and episodic rather than continuous engagement, which undermine the sustainability of governance interventions. Bridging ecological objectives with socio-economic needs remains a delicate balance; while many hybrid models strive for this integration, operationalizing it effectively is difficult. Socio-economic pressures and livelihood dependencies often complicate environmental protection efforts, underscoring the need for adaptive governance approaches that can respond to evolving social-ecological dynamics.

Policy integration across governance scales is essential but remains uneven, with fragmentation, weak enforcement, and gaps in regulatory coherence limiting effectiveness. Emerging global legal instruments, such as international treaties and Extended Producer Responsibility schemes, offer promising frameworks to strengthen transboundary plastic pollution governance, though their implementation must reckon with local realities and divergent national interests. Scientific monitoring, data-driven tools, and innovative governance approaches can enhance decision-making and environmental outcomes, but their scaling and sustainability require further attention.

Regarding environmental and socio-economic outcomes, evidence shows that co-management, regulatory enforcement, and community-driven initiatives contribute to pollution reduction and livelihood resilience, although direct measurements are often lacking or constrained by data limitations. Overall, governance models that embrace inclusivity, adaptability, and systemic integration hold greater promise for achieving sustainable coastal plastic pollution mitigation while supporting resilient coastal livelihoods. Nonetheless, significant gaps remain in longitudinal empirical assessments, mechanisms to overcome stakeholder fragmentation, and the translation of governance innovation into widespread, durable impact. Addressing these gaps will be vital for informing future policy development and practical interventions that reconcile ecological integrity with social equity in coastal marine governance.

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