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Adaptive Strategies for Coastal Resource Management in the Era of Climate Change: Literature Review

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ABSTRACT

***Purpose**: The study aims to clarify the responsive steps taken in the management of coastal resources in order to address the growing climate stresses. It seeks to identify and categorize adaptation approaches, and to evaluate their effectiveness in promoting sustainable and resilient governance.*

***Subjects and Methods:** The research is a systematic literature review based on 84 peer-reviewed journal articles and authoritative grey literature published between 2000–2025. The analysis focused on identifying patterns, typologies, and governance frameworks employed in coastal resource management.*

***Results:** The review identified a typology consisting of four main areas of response: (1) Institutional and policy-based modes; (2) Community-based adaptation; (3) Ecosystem-based frameworks; (4) Technology-infrastructure responses. Findings reveal increasing complexity in coastal governance under conditions of epistemic uncertainty, with innovation occurring alongside institutional inertia. Decentralized governance has gained prominence but remains limited by regulatory constraints, jurisdictional fragmentation, and short-term focus. Ecosystem-based interventions offer long-term benefits but face challenges in policy integration and implementation. Technological and infrastructure responses help manage immediate risks but often neglect equity and long-term resilience.*

***Conclusions:** The study highlights the need for systems-based, iterative-learning, and cross-scalar interaction frameworks in adaptive governance. It suggests that future management should move beyond short-term fixes and adopt proactive, inclusive, and resilient approaches. The findings offer both theoretical and empirical opportunities for policy change, capacity building, and improved resource planning to confront escalating climate impacts.*

INTRODUCTION

The rising trend of climate change in the world has led to extreme, often irreversible consequences on the coastal areas in danger of ecosystems, livelihoods, and infrastructure. Home to an estimated 40 % of the world population located within 100 kilometers of shore, coastal zones represent one of the most ecologically productive and economically important zones on the planet (Mikhaylov & Plotnikova, 2021). That said, these regions that are already vulnerable are more prone to more risks of sea-level rise, coastal erosion, saline intrusion, and extreme weather events intensification.

All these threats are connected and undermine the stability of coastal resource systems such as the environments of fisheries, mangroves, wetlands, and coral reefs, as well as beaches which serve the purposes of critical environmental shield against shocks and sources of food, income, and identity to millions. Adaptive policies have risen into the fore in the debate on climate versatility in the maritime places over recent decades. By the definition presented by the Abbass et al. (2022), adaptation can be described as the process of response to the current or anticipated climate and its impacts.

Within the framework of the coastal resource management, adaptation can be defined as an expansive cluster of measures, which, along with institutional reforms and technological solutions, involve ecosystem-related practices as well as community-based responses and serve to minimize the risks and maximize the socio-ecological resilience (Drogkoula et al., 2023). According to current discussions, this is one of the difficulties in understanding that these strategies are not only technical solutions but rather are highly political, context specific as well as culturally situated processes. Such need to respond is especially strident in the Global South where the institutional means, economic finances and social security nets are often inadequate to address the fast- developing nature of climate impacts.

Emerged as an interdisciplinary coastal resource management field, coastal resource management is now a field where the likes of environmental science, policy study, governance theory, and participatory development are integrated. The historical coastal management was based on command-and-control paradigm which made considerable use of hard infrastructure and centralized planning. This framework, with its anchoring ecological ignorance and social exclusion, led to a paradigm shift to adaptive, integrated and ecosystem-based frameworks of management (Khan & Srivastava, 2025).

This paradigmatic shift is already supported by the use of the concept of Integrated Coastal Zone Management (ICZM) that focuses on coordination between sectors at distinct levels of governance, the particular involvement of stakeholders, as well as the balancing of conservation with the development demands. The problem of adapting further arise because of the complexities of integrated coastal systems by linking it with social, political and economic systems. Some coastal communities are regularly subjected to a variety of stressors- poverty, land-use conflict, migration, and weak governance, which interacts with climate risks in intricate manner (Touza et al., 2021).

The effectiveness of adaptive tactics does not therefore rely only on the technical measures, it is also associated with institutional flexibility, knowledge co-production, and even inclusive governance. Adaptive capacity is taken as a central factor of resilience in this constellation and is affected by social capital, availability of information, institutional arrangements, and power relations. A growing body of research has come to question coastal adaptation, but the literature has shown high fragmentation levels. Studies are scattered with regards to disciplines, geographic locations and paradigm of methodologies (Paul & Jha, 2021).

Despite evidence of successful local practice, such as the replanting of mangroves in Southeast Asia, the traditional early warning system of the Pacific region, and participatory mapping in the Caribbean, empirical evidence indicated a large degree of outcome and scale heterogeneity. In addition, adaptation processes tend to recreate prevailing disparities when they are centrally controlled or miscarrying the voices of the marginalized groups. Under the growing climatic threat conditions, the need to coordinate these bifurcated experiences, evaluate their comparative success, and outline the ways to transform adaptation to refocus on equity, justice, and future sustainability is vivid (Orlove, 2022).

More opportunities and challenges are emerging at functions of coastal resources governance due to the current acceleration of climate science and the resulting global increase in finance to reduce the impact of adaptation. Mainstreaming adaptation to national and local development plans is clearly required by such international frameworks as the Sendai Framework on Disaster Risk Reduction, the Paris Agreement, and the Sustainable Development Goals (SDGs). However, there is an issue with translating these extensive commitments into some specific and contextualized actions, which is often limited by the institutional pushback, inefficient coordination, or lack of

capacity at a local level. This disjunctive goes to reinforce the need of flexible measures, both evidence-based and politically feasible, yet socially legitimate.

METHODOLOGY

The current research employed the methodology of the systematic literature review (SLR) to extract, critically analyze, and synthesize the available academic inquiry on adaptive strategies of coastal resource management in the context of climate change. By choosing this type of design, the researchers preferred the methodological rigor, transparency and resulting replicability that SLRs are associating with, these characteristics enable a more objective and structured analysis of the knowledge base that exists. The review was within the Preferred Reporting Items of the Systematic Reviews and Meta-Analyses (PRISMA) framework, which set out clear steps to be adopted in the formulation of search strategies, formulation of inclusion and exclusion criteria, and managing the study selection, as well as conducting the analysis. The framework was chosen to guarantee the generation of a critical, evidence-based insight into the manner in which adaptive strategies have been conceptualized, how they have been operationalized, and used in varying coasts. The systematic literature review procedure was performed in five interdisciplinary and established academic databases, including Scopus, Web of Science, ScienceDirect, JSTOR, and Google Scholar. The utilization of these platforms was based on the fact that they are broad in the literature of environmental science, climate science, policy, and social sciences. In order to make the publication relevant both historically and in the present, the time of publications was scheduled between the year 2000 and 2025, to cover the publication period of more than twenty years of academic research on the topic of climate adaptation and governance along the coastline of the USA. The search strategy was a mixture between controlled vocabulary, Boolean and variations of keywords to achieve the above goal of inclusiveness and thematic precision. The following terms were utilized in combination e.g. coastal resource management, climate change adaptation, adaptive strategies, coastal communities, resilience, vulnerability, climate risk, governance, coastal ecosystems, integrated coastal zone management. Such search strings were modified in the ongoing rotation as the search continued to improve specificity and relevance. Moreover, deductive means such as backward citation tracking (analysis of the references contained in identified research articles of importance) and forward citation tracking (trace identification of newer articles that have referred to the key articles) were used to discover key works that may have not immediately shown up by the use of keyword search strategies.

Inclusion and Exclusion Criteria

The purpose of the present systematic review was to provide analytical precision and credibility that is acceptable to academe. Therefore, when setting up its selection protocol, a strict selection protocol was adopted. Papers were included provided they met four main criteria of eligibility: 1) they could be published in peer-reviewed journals, edited scholarly books, or official reports (e.g. UNDP, IPCC, FAO); 2) they were concerned with the interaction of coastal resource management and climate change adaptation; 3) they could offer conceptual, empirical or policy-oriented findings of the adaptive response; and 4) they were of high methodological clarity, analytical depth and scholarly quality. Conversely, the articles were not included when they focused on ecosystems along the coast or in the sea without specifically directing them to the issue of climate change or adaptation; focused on biodiversity and left out the governance or anthropogenic-environmental interaction aspects considerably; did not explicate the methodology explicitly or came in other non-peer reviewed format (op-ed or technical newsletters); or did not work withing the English speak parameters used in this investigation. In the first search 137 different studies were identified, which were then narrowed down to 84 core studies after systematically screening the abstracts and the full text of the studies, with regards to relevancy and robustness of the methodology and the explanatory nature of the study to review central questions.

Data Extraction and Analysis

A data extraction matrix was also created and adopted to code and categories every selected study to make it systematic. This allowed recognizing the patterns of themes and consistency of analysis in various coastal environments. Studies were categorized across a number of important key dimensions including geographic focus (e.g. Global North or Global South, or island or continental systems), the nature of the adaptive approach being discussed (e.g. institutional,

ecological, technological or community based), the theoretical approaches to resilience that were applied (e.g. resilience thinking, socio-ecological systems, adaptive governance), the type of stakeholders being involved, the scale and level of government (local, national, regional or transboundary) and the reported results or effectiveness of the strategies. Of special interest, challenges, trade-offs, and enabling conditions were noticed in every report. The results were subsequently put under the thematic analysis where themes would be inductively determined and not coined. It was made possible to combine the literature in a flexible but guided manner that allows seeing not only all common patterns but also their striking differences. The analysis put into sharp focus contextual sensitivity because we observed that the adaptation strategies are altered by socio-political dynamics, institutional arrangements and ecological variability and should thus be interpreted within the particular geographical and cultural context.

RESULTS AND DISCUSSION

Coastal regions face mounting pressures from climate change, including rising sea levels, coastal erosion, and extreme weather events. These threats demand urgent, adaptive responses across governance, communities, ecosystems, and infrastructure. This study reviews 84 relevant sources to identify and categorize how various actors are adapting coastal resource management practices. Four main clusters of strategies emerged: institutional-policy responses, community-based efforts, ecosystem-based approaches, and technological-infrastructure solutions. The following sections present each cluster in detail, highlighting their strengths, limitations, and interdependencies.

Institutional and Policy-Based Adaptation

The climate change unleashes new risks in the coastal areas that exceed the existing ones, and to cope with them, scholars and practitioners are focusing on the institutional and policy-based adaptation. Theoretical arguments about resilience-generating responses in governance systems have been supported by current evidence that resilience-enhancing responses in governance systems are becoming more dependent on three interconnected aspects i.e.: the integration of climate-risk assessments in development agendas, the decentralization of power and co-generation of knowledge between state and non-state actors. Most of the studied reports argue that institutional flexibility will be inevitably limited due to limited institutional flexibility even by strong technical interventions (Kuzior, et al., 2023). Theme running through the literature is the shift away from inflexible, top-down models of institutions to multi-level and polycentric systems that allow adaptive governance (Staub, 2025). The integration of coastal adaptation measures in larger land-use disaster-risk-reduction agendas could be done, the examples of the Netherlands and the Philippines demonstrate that long-term strategy formulation can create successful scenarios. Decentralization also becomes an important force of efficient adaptation: the empirical evidence has it that once the local governments are given legal powers, financial independence, and technical potentials, their response will be better tuned to the local realities than the ones generated by centralized authorities. However, the effectiveness of decentralization is dependent on the favorable enabling environments, political will and institution learning processes.

Integration of climate-related responsibilities into the sectoral areas, such as planning the coastline, fishing practices and water management have turned up more than half the literature reviewed. Such mainstreaming of resilience into established regulatory frameworks goes deeper than the category of project-specific interventions, however, where especially in low-income and small island developing States, this path can be hampered by the limitations of scarce institutional capacities, enduring donor dependency, and lack of a coherent policy framework. Co-management and participatory governance mechanism of integrated coastal governance was widely reported in Latin America and Southeast Asia. These types of models increased stakeholder commitments, improved compliance with coastal resource regulations, and also triggered place-based innovations. However, local projects had to confront some limits due to the

lack of supportive national systems, even in cases when the local projects showed some practical achievements.

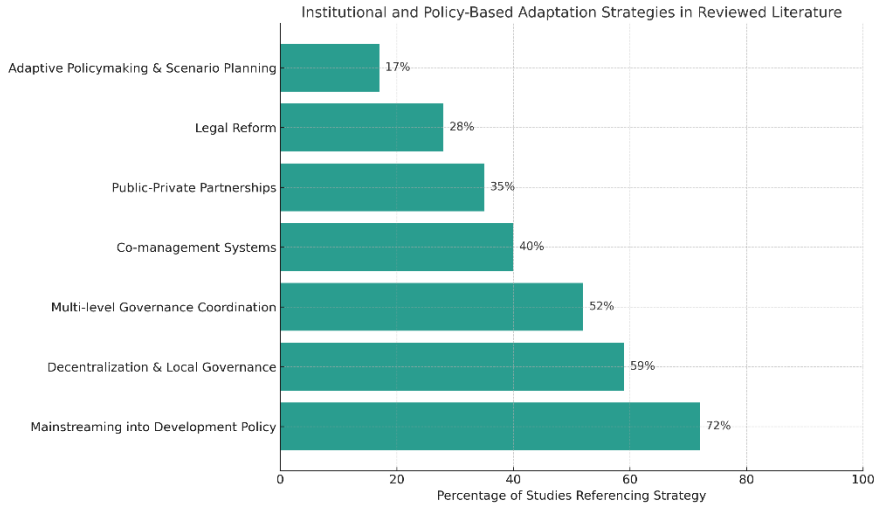

Figure 1. Distribution of Institutional Adaptation Strategies and Enabling Policy Mechanisms Derived From 84 Studies

The figure 1 reports on the frequency and distribution of institutional/policy-based adaptation strategies reported in the 84 reviewed core studies. The strategy of mainstreaming climate change into national and local development policies is the most mentioned (found in 72 percent of the studies), a global move to integrating resilience within formal structures of governance. In 59 percent of the studies, decentralization and the reinforcement of local governance was mentioned as an important feature of adaptation measures that were context-specific. A 52 percent proportion of the cases indicated multi-level governance organization, which means an institutional alignment must take places at national, regional, and local levels. In comparison, legal reform appeared in only 28 percent of review literature suggesting that legal systems that are either outdated or lack adaptivity persist as barriers to adaptation process in most areas. Sometimes mentioned in 3540 per cent of studies, co-management and public-private partnership are two examples of emerging collaborative forms of government an issue, more relevant when government capacity or legitimacy is weak. However, most often these types of cooperation are hampered by blurring roles, unequal funding, and institutional mistrust. It is the least mentioned policy strategy adaptive policymaking and scenario planning quoted in 17 percent of studies, indicating that although the idea of policy flexibility is developed, there is not much translation of the concept into practices during policy-making cycles.

Community-Based Adaptation Strategies

Community-Based Adaptation (CBA) is a concept that had taken center stage in the discourse on climate-resilience (especially in coastal environments) since the mid-2000s, due to the fact that it is local communities (in coastal environments) who are the first to face and solve climate-based risks. The literature provided below shows that CBA is usually characterized by the elements of bottom-up planning, utilization of social resources and systematic integration of local and indigenous knowledge into decision making and adaptation. The applied strategies of participatory planning and inclusive decision-making processes were found to be reported in 68 % of the reports as constituting the basis of the strategies and were considered essential in affirming that adaptation initiatives would not overshoot the priorities, needs and value of the local stakeholders and thus boosting their legitimacy and efficacy (Bell & Reed, 2022).

In 55 % of studies, the Indigenous and traditional ecological knowledge was integrated; a higher rate was observed in coastal communities of the Pacific Islands, Southeast Asia, and Latin

America. It was found that local knowledge conventions provide priceless understanding about seasonal fluctuations, ecosystem processes and risk reduction, and frequently complement scientific constructions. There still exist gradual issues of integrating the local knowledge into formal policy mechanisms and avoiding facing the threat of being moved to peripheral or formal role of tokenism at the implementation stage (Moyo, 2023). Early warning systems, linked to communities and local-based resource monitoring were mentioned repeatedly as adequate adaptive capacity enhancing and vulnerability reducing mechanisms. Such systems often use local volunteers, conventional forecasting methods and mobile information technologies to deliver timely warning about storm, floods or tidal surges (Brown et al., 2023). About 49 % of the studies conducted and reviewed elicited the effectiveness of such systems in the easing of a quick response and raising preparedness.

The most reviewed literature was related to capacity-building interventions especially focusing on climate literacy, preparedness and disaster management, and alternative livelihoods, which were largely the target of 60% of the reviewed literature. The programs act as storage of institutional memories and encourage the intergenerational learning hence enhancing community resilience (Trujillo et al., 2023). The ability to buffer the impact of climate-related fluctuations in income due to microfinance efforts and diversification plans, especially those in coastal agriculture and fisheries-related environments, was also noted in 38% of the articles to be of utmost importance. Community implemented ecosystem restoration projects such as mangrove vegetation restoration, coral gardening, dune reinforcement, etc. were mentioned therein and found in 33% of the studies reviewed. These initiatives led to the creation of major ecological and social payoffs because they were mainly motivated by NGOs or community organizations. However, they were really dependent on long-term funding and institutional support.

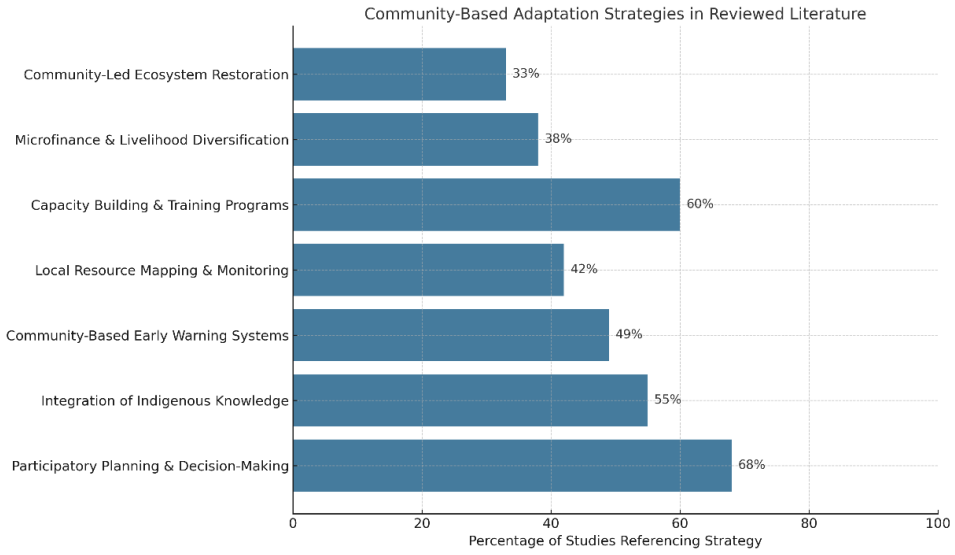

Figure 2. Prevalence of Community-Based Adaptation Strategies in Reviewed Literature

Figure 2 gives a visual representation of the research evidence on community-based strategies of adaptation. The only strategies consistently mentioned are participatory planning and inclusion in decision-making, which were identified in 68 percent of 84 core studies and thus reflect a high level of agreement that democratizing adaptation processes is of core concern. The other activity receiving a high percentage of occurrence (60 percent) is capacity building and training program, which reinforces the basic assumption of community resiliency bottom line as investment in human capital. Inclusion of indigenous knowledge is embraced in half of the literature in indications about the increasing recognition of this body of knowledge as an important addition to the body of science. The use of early warning systems and resource mapping in 49% and 42

percent of studies respectively shows the proactive nature of communities, where there is wide surveillance of risk as well as monitoring of environment. Other important but less common quoted approaches are microfinance and livelihood diversification (38 percent) and community-led restoration work (33 percent). The strategies outlined, including growing awareness of economic and ecological aspects of community resilience, emphasize the importance of the economic and ecological aspects of the community resilience; some challenges of funding procurement, institutional alignment and continuity of the programs may be reflected in their relatively less frequent use.

Ecosystem-Based Adaptation

Ecosystem-Based Adaptation (Eba) has been described as a potential tool in improving the resilience of coastal ecosystems and communities relying on it against the challenge of climate change. The analyzed literature proves that Eba involves nature-based solutions combining ecological restoration and socio-economic adaptation demands. In the 84 core studies reviewed, what one can merely say is that ecosystem-based approaches have gained much prominence in the content of more than 70 % of the articles, be it in the academic or the policy arena. Mangroves repair is the most commonly reported Eba intervention, and takes place in 62 % of the studies under discussion. Mangroves act like a natural barrier of storm surges, diminish coastal erosions and give habitat to breeding of diversified marine life, making them play a crucial role in ecological as well as human resilience (Asari et al., 2021). Some of the countries like Indonesia, Bangladesh and Philippines, which have substantial mangroves systems and most prone to cyclones, are exceptionally busy in this area.

Coral reef rehabilitation is next with the studies reporting its application in 51 % of the studies. Coral reefs guard coastlines and provide important fisheries habitat and are particularly exposed to acidification and warming in the oceans. Coral gardening and construction of artificial reefs are the methods that are also used to restore these habitats (Rinkevich 2014). Yet, the literature regularly points to the low scalability and high sensitivity of this type of interventions with respect to climate thresholds. A similar situation can be observed when discussing the wetland conservation, mentioned in 47 % of the works as well as being considered the pillar of Eba. Wetlands control hydro-systems, clean water, and trap carbon; their damage tend to magnify the flood hazard. Stabilization of Dunes (39 %), the creation or enforcement of Marine Protected Areas (MPAs) (35 %) are synergistic partnerships (Schéré, 2024).

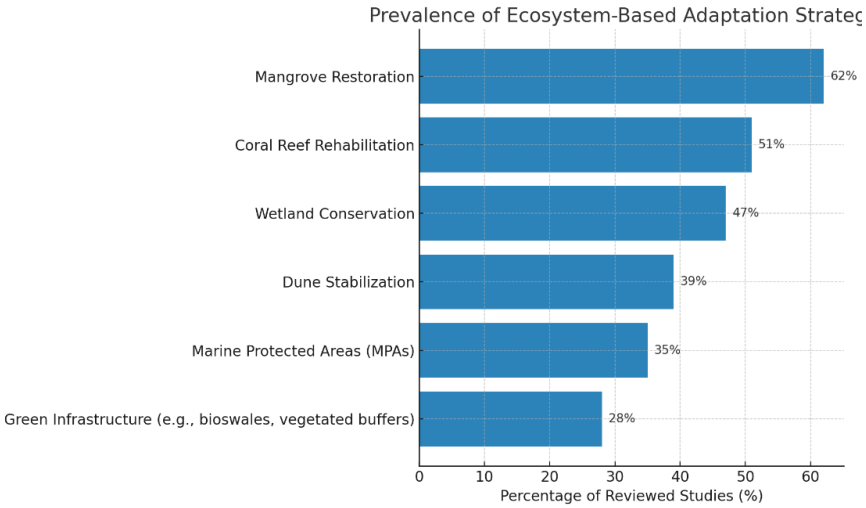

Figure 3. Ecosystem-Based Adaptation Strategies

The current chart is composed by the synthesis of the relative prevalence of ecosystem-based adaptation strategies disclosed throughout the literature evaluated. Mangrove restoration (62%)

takes the center stage of the debate since it is an effective means of incorporating the ideas of ecological safety with human survival and economic good. The next priorities are coral-reef restoration and wetland protection as medium priorities, which often are limited by biophysical reality, or insufficiency of funds. Marine-protected area appointments and dune-stabilizing efforts are policy-technical chimeras that depend on effective institutional resources. The rather low level of the consideration of green infrastructure (28%) can be explained by its youth and, sometimes, low funding and professional planning base, especially in the Global South.

Integrated Strategic Implications for Coastal Climate Adaptation in Public and Environmental Management

The combination of institutional, community-based, ecosystem-driven and technological responses to coastal climate adaptation reveals one of the inherent difficulties in such a complicated nature of intervention, which is the weakness of discipline-based, disaggregated interventions in treating multisystemic exposures. The volume of managerial responses to climate change is proliferating, but they rarely have integration, reflexivity, and adapting qualities. Such gaps can be explained by the fact that inherent models of public and strategic management, emphasizing the role of linear planning, hierarchical authority, and siloed expertise, continued their existence (Fors et al., 2021). Although contemporary adaptation processes are quite diverse, they are limited by creating a gap between the institutional structure and the changing needs of social-ecological systems in a climate-stressed environment. Prescriptive governance logics are still eagerly followed in institutional and policy-based approaches. Such logics reflect a technocratic assumption that policy instruments and regulatory coherence comprise the most significant tool of promoting adaptation; however, empirical evaluations of climate policy execution continually display that the existence of formal schemes and plans is typically associated only loosely with adaptive results, including in cases with gaps in coordination, and bureaucratic procrastination, and political disincentives (Behr, 2021).

Such complexity forces the scientist to abandon the institutional rationalism and flow to adaptive institutions, which can learn, listen to feedback, and act with decentralized responsiveness. Public management, to play a significant role in coastal adaptation, would have to use rather design principles based on flexibility, experimentation, and cyclical governance. This study supports the claim that community-based adaptation (CBA), along with its participatory and place-based nature is structurally limited to the power imbalance, power concentration, and lack of enabling conditions at the local levels (Selje et al., 2024). The management implication of the issue is also two-part: the planning of the strategy should cease to regard community engagement as an auxiliary and ceremonial matter, it should become an on equal footing component of design, funding, and appraisal activities. Second, good CBA assumes the modification of institutional incentives and structures especially in the area of decision-making legitimacy and devolution of resources. To this effort, cross-scale accountability structures, bridging the top-down requirements with the bottom-up legitimacies, are necessary (Allen et al., 2023). The management discipline, therefore, needs to get past the participation rhetoric and put into practical use power-sensitive, equity-oriented regimes of governance.

The emergence of Ecosystem-Based Adaptation (Eba) also brings an interfering challenge to the existing management metrics. Project assessment systems used in public and strategic management concentrate on deliverable, output and cost effectiveness. Comparatively, Eba seems to require appraisal that relates to resilience of systems, preservation of biodiversity, and preservation of ecosystem service- three facets that have been treated out of mainstream management theory (Chaudhary et al., 2021). To adjust, public administrators and decision-makers need to know how to deal with uncertainty, spatial variability and long ecological responses. This involves developing those managerial competencies that are seeks to integrate ecological literacy with policy innovations i.e.-boundary-spanning managerial skills (Agger & Tortzen, 2023). The structure of institutional performance should also be restructured to consider

the resilience thinking and the complexity of nested-adaptive. Despite the fact that the technologies and infrastructure-based strategies of adaptation to disasters are frequently noticed in the socio-political arena and can be seen in the social scope, an engineering-focused approach is still embraced, which is more of a symptom of managerial propensity of evidence-based, capital-intensive measures Muzamil et al., 2021). But infrastructure adaptation would not be without cost: in most cases it can increase the spatial inequality, risk transfer, or systems inelasticity. In managerial terms, a manager should realize that the results of this kind highlight the necessity to redesign the project organization and implementation including the incorporation of inclusive mechanisms of design, a methodical approach to the evaluation of the risks, and review-based evaluation models. The coastal infrastructure specifically should not be viewed solely in the terms of a tangible property, however, rather as a socio-technical system, the functioning of which presupposes continual interaction between engineers, communities, and the institutions of government (Singhvi et al., 2021).

The inference is obvious: the practice of management needs to change, so as to cease dealing with adaptation actions as distinct projects and/or confining it to technical experts. Rather, adaptation to climate change should be deeply embedded into strategic management on the whole, and its implications should run through the financial planning, institutional design, and leadership development. The management profession will have to deal with the fact that climate adaptation is not a situation of enhanced prediction or more effective bureaucracy; it is a question of governance in complexity, uncertainty and risk (Rahman et al., 2022). With such a recognition in hand, managers will be able to develop institutions and processes not just that have the capacity to respond to threats of climate but that can also affirmatively build resilience, justice, and collective agency. Strategic incoherence in adaptation regimes can always be found during local application of national climate approaches (Darjee et al., 2021). This inconsistency is attributed to vertical and horizontal misalignment, e.g., differences between the roles of the ministries and municipalities as well as a disconnection between the roles of water, housing, and disaster risk sectors. To the management scholars, this observation brings out the need to develop cross-sectoral leadership, inter-organizational learning networks, and adaptive multi-level governance platforms. Whether it stands, the key to success in coastal adaptation will therefore be more than the output of adaptation plans; some governance architecture will have to rise, capable of learning, coordinating, and adapting under conditions of uncertainty.

Discussion

The findings of this study highlight the inherent complexity of coastal climate adaptation, particularly when examined through the intersecting lenses of institutional, community-based, ecosystem-driven, and technological responses. A central insight is that while diverse strategies are being deployed, they often remain fragmented, discipline-specific, and limited in their ability to address the multisystemic nature of climate stressors. This fragmentation reflects the persistence of linear and hierarchical models of public management, which are ill-suited for the dynamic and uncertain realities of climate governance. Institutional and policy-based approaches demonstrate ambition in regulatory coherence but often fail in practice due to bureaucratic inertia, political disincentives, and jurisdictional fragmentation. The overreliance on prescriptive logics continues to limit transformative governance, suggesting a pressing need for adaptive institutions capable of reflexivity, feedback integration, and decentralized responsiveness.

Community-based adaptation (CBA) emerges as an indispensable modality, yet remains constrained by structural power imbalances and limited local capacities. The implications are clear: CBA must be elevated from a symbolic engagement exercise to a fully integrated component of strategic planning, funding, and evaluation. Cross-scale accountability mechanisms are essential to bridging top-down mandates with bottom-up legitimacy. Ecosystem-Based Adaptation (EbA), despite its promise of long-term resilience, challenges conventional management frameworks. Its emphasis on biodiversity, ecosystem services, and resilience

requires a paradigm shift toward ecological literacy and boundary-spanning managerial competencies. The relatively high prioritization of mangrove and coral restoration underscores both the urgency and the limitations of ecosystem projects, which remain vulnerable to funding shortfalls and weak institutional integration.

Technology and infrastructure-based strategies dominate policy discourses due to their visibility and political appeal. However, they risk entrenching inequalities, creating rigid socio-technical systems, and neglecting equity considerations. Effective adaptation requires reframing infrastructure not merely as a physical asset but as a socio-technical system embedded in community and institutional interactions. Taken together, the results indicate that coastal adaptation governance must move beyond fragmented, short-term, and technocratic approaches. A systems-based, iterative, and reflexive framework one that integrates ecological resilience, community agency, and adaptive institutional practice emerges as the most viable path forward. Management, therefore, is not simply about optimizing projects but about cultivating governance architectures capable of learning, coordination, and resilience under uncertainty.

CONCLUSION

The above literature-based research methodically determined matters regarding the adaptation mechanisms that have been implemented in the coastal resources management in face of the increasingly growing climate change. The study outlined four interdependent adaptive courses, which involve institutional-policy responses, community-based adaptations, ecosystem-based interventions and community-based interventions that are instrumental in adapting to the impact of climate change, although this is in recognition of the extensive interplay of other overall governance structures. The results had shown that despite the broader range of adaptive strategies, there still remains a significant disconnect between the theoretical enunciation of the adaptive strategies, strategic planning, and operational implementations. The responses are often institutionally reactionary in their inability to adapt because of preexisting governance architectures that limit the ability to adapt; the community-based response is participatory in nature, but does often encounter underlying inequalities and structural forms of disempowerment; an ecosystem- based adaptation challenges the standard measures of performance, instead emphasizing complexity and resilience along with the ecological health over the long-term, thus foreshadowing the need to reconfigure a paradigm of success and measure it accordingly; infrastructure-based responses, despite being primarily technocratic, threaten to recreate.

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