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A Systematic Literature Review On Engineering Maritime-Based Fiscal Development Strategy Models Through Technology Management And System Dynamics Approaches

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Abstract

Maritime sectors have become increasingly important as strategic drivers of regional economic growth and fiscal sustainability, particularly in coastal regions with significant maritime activities. However, the contribution of maritime-based economic activities to regional fiscal revenues often remains below their actual potential due to fragmented governance, limited technological integration, and the absence of dynamic policy evaluation frameworks. This study aims to develop a maritime-based fiscal development strategy model through the integration of Technology Management and System Dynamics approaches. A Systematic Literature Review (SLR) following the PRISMA 2020 guidelines was conducted to identify key factors influencing maritime fiscal performance, technology adoption, blue economy implementation, and policy effectiveness. The review synthesizes evidence from maritime economics, smart ports, digitalization, and system dynamics literature published between 2015 and 2025. The proposed framework provides a

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comprehensive basis for analyzing interactions among fiscal, technological, institutional, and environmental variables and supports the formulation of sustainable maritime fiscal policies through simulation-based decision-making and strategic scenario evaluation.

Keywords: Maritime Fiscal Development, Technology Management, System Dynamics, Blue Economy, Smart Port, PRISMA 2020, Maritime Governance.

INTRODUCTION

The maritime sector has become one of the most strategic drivers of economic growth and regional competitiveness in many coastal and archipelagic countries. As global trade increasingly depends on maritime transportation and logistics networks, maritime activities contribute significantly to economic development through shipping services, port operations, fisheries, offshore industries, and marine-based resource utilization. In addition to facilitating international trade, maritime industries generate substantial fiscal opportunities through port charges, vessel services, concession schemes, anchorage fees, and maritime taxation. Consequently, governments worldwide have begun to recognize maritime sectors as critical sources of public revenue capable of supporting infrastructure development, regional competitiveness, and sustainable economic growth (Haralambides, 2023; Liang et al., 2022; Österblom et al., 2017; Zaucha et al., 2023; Tedesco et al., 2025).

Indonesia possesses one of the largest maritime territories in the world, with more than 17,000 islands and extensive coastal resources that provide significant opportunities for maritime-based economic development. Within this context, East Kalimantan Province occupies a strategic position due to its extensive coastline, proximity to major international shipping routes, abundant marine resources, and growing importance as a logistics gateway supporting the development of the new national capital. Maritime activities in East Kalimantan are concentrated around major ports, ship-to-ship (STS) operations, anchorage areas, vessel guidance and towing services, and logistics networks that connect natural resource production centers with domestic and international markets. These maritime activities generate considerable economic value and create opportunities for expanding regional fiscal capacity through maritime-based revenue generation mechanisms. However, despite the rapid growth of maritime activities, the contribution of the maritime sector to regional fiscal revenues remains relatively limited compared to its economic potential (Mudakir et al., 2024; Haralambides, 2023; Liang et al., 2022; Wang et al., 2023; Alamoush et al., 2022).

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The discrepancy between maritime economic potential and realized fiscal revenues can be attributed to several structural and institutional challenges. Fragmented governance arrangements among regional governments, port authorities, maritime operators, and national institutions often create inefficiencies in revenue collection and policy implementation. Furthermore, the absence of integrated monitoring systems may contribute to revenue leakage from maritime activities such as ship-to-ship operations, anchorage services, and port concessions. Existing fiscal mechanisms are often unable to capture the full economic value generated by maritime operations due to limited technological integration, insufficient data transparency, and weak coordination among stakeholders. As maritime systems become increasingly complex, traditional fiscal management approaches may no longer be sufficient to support effective maritime revenue optimization and evidence-based policymaking (Yang et al., 2025; Heilig et al., 2021; Wang et al., 2023; Khaled et al., 2023; Liang et al., 2022).

Recent developments in digital technologies offer new opportunities to improve maritime governance and fiscal management. The emergence of smart ports, digital logistics platforms, Internet of Things (IoT) technologies, artificial intelligence, digital twins, and Automatic Identification Systems (AIS) has transformed the maritime sector into a data-driven ecosystem capable of supporting real-time monitoring, predictive analytics, and automated decision-making. These technologies enable maritime authorities to monitor vessel movements, cargo flows, and operational activities more effectively while simultaneously enhancing transparency and accountability. In the context of fiscal development, technology management can improve revenue tracking, reduce information asymmetry, minimize revenue leakage, and support more accurate forecasting of maritime fiscal performance. Therefore, technology management has become an essential component of modern maritime governance and strategic development initiatives (Alamoush et al., 2022; Wang et al., 2023; Yang et al., 2025; Khaled et al., 2023; Heilig et al., 2021).

In parallel with technological transformation, the Blue Economy concept has emerged as a dominant framework for achieving sustainable maritime development. The Blue Economy promotes the responsible utilization of marine resources to achieve economic growth while ensuring environmental sustainability and social well-being. This approach emphasizes the integration of economic objectives, ecological preservation, innovation, and inclusive governance. As maritime industries expand, policymakers increasingly face the challenge of balancing fiscal development objectives with environmental sustainability considerations. Consequently, maritime fiscal strategies must be aligned with Blue Economy principles to ensure that revenue

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generation mechanisms contribute not only to economic growth but also to long-term environmental resilience and sustainable coastal development (Österblom et al., 2017; Voyer et al., 2021; Kabil et al., 2024; Zaucha et al., 2023; Tedesco et al., 2025).

Given the complexity of maritime systems, effective policy formulation requires analytical approaches capable of capturing dynamic interactions among economic, technological, institutional, environmental, and regulatory variables. System Dynamics has been widely recognized as a powerful methodology for analyzing complex systems characterized by feedback loops, nonlinear relationships, and delayed effects. Through the use of Causal Loop Diagrams (CLD), Stock-and-Flow Diagrams (SFD), and simulation modeling, System Dynamics enables policymakers to evaluate alternative policy scenarios and identify strategic leverage points before implementation. Previous studies have successfully applied System Dynamics to maritime transportation, port development, shipping decarbonization, coastal economic development, and sustainability policy evaluation, demonstrating its effectiveness as a decision-support tool for complex maritime challenges (Gao et al., 2023; Suryani et al., 2025; Pratama et al., 2024; Zaucha et al., 2023; Tedesco et al., 2025).

Although previous studies have examined maritime economics, smart ports, Blue Economy governance, digital transformation, and System Dynamics applications independently, limited research has integrated these perspectives into a comprehensive framework for maritime fiscal development. Existing studies generally focus on individual aspects of maritime development without addressing the interactions among fiscal policy, technology management, and dynamic policy evaluation. Furthermore, empirical research on regional maritime fiscal optimization remains scarce, particularly in developing maritime regions where institutional complexity and governance challenges significantly influence fiscal performance. This gap highlights the need for an integrated model capable of supporting maritime fiscal development through technology-enabled governance and dynamic policy simulation (Haralambides, 2023; Liang et al., 2022; Alamoush et al., 2022; Suryani et al., 2025; Wang et al., 2023).

Therefore, this study aims to develop an engineering model for maritime-based fiscal development strategies through the integration of Technology Management and System Dynamics approaches. The study seeks to identify key factors influencing maritime fiscal performance, examine their dynamic interactions, and evaluate alternative policy scenarios that can enhance regional revenue generation while supporting sustainable maritime development. The proposed model contributes to the literature by bridging the gap between maritime fiscal policy, technology management, and system dynamics while providing a practical decision-

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support framework for policymakers responsible for maritime governance and regional economic development in East Kalimantan and other maritime regions.

LITERATURE REVIEW

Maritime Fiscal Development and Regional Economic Growth

Maritime fiscal development has become an increasingly important policy instrument for strengthening regional economic growth and enhancing public revenue generation in coastal regions. The maritime sector contributes significantly to economic development through port operations, maritime logistics, shipping services, and various ocean-based industries that support trade competitiveness and investment attraction. Recent studies indicate that maritime economic performance is strongly influenced by governance quality, fiscal policies, technological innovation, and institutional capacity. Furthermore, ports are evolving from conventional transportation nodes into integrated economic ecosystems that generate substantial fiscal value through port charges, concession fees, anchorage services, vessel traffic management, and logistics activities. The increasing adoption of sustainable maritime development and blue economy principles has further reinforced the importance of effective fiscal governance in maximizing economic benefits while ensuring environmental sustainability and social welfare (Haralambides, 2023; Liang et al., 2022; Österblom et al., 2017; Zaucha et al., 2023; Tedesco et al., 2025).

Despite the significant economic potential of maritime activities, many coastal regions continue to face challenges in transforming maritime growth into sustainable fiscal revenues. These challenges are frequently associated with fragmented governance structures, limited institutional coordination, inadequate monitoring systems, and inefficient revenue collection mechanisms. Research suggests that effective maritime fiscal development requires integrated policy frameworks that combine economic planning, technological advancement, governance reform, and sustainability considerations. In addition, regional governments are increasingly expected to adopt evidence-based approaches that improve transparency, accountability, and operational efficiency while simultaneously promoting long-term economic resilience. Consequently, maritime fiscal policies should be designed within a comprehensive framework that aligns economic development objectives with technological modernization and sustainable resource management (Liang et al., 2022; Haralambides, 2023; Voyer et al., 2021; Zaucha et al., 2023; Tedesco et al., 2025).

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Technology Management in Maritime Development

Technology management has emerged as a fundamental driver of transformation within the maritime sector by enabling organizations to systematically acquire, implement, integrate, and optimize technological resources. Recent advances in digital technologies, including Artificial Intelligence, Internet of Things, blockchain, digital twins, autonomous vessels, and integrated maritime information systems, have significantly improved operational efficiency, decision-making quality, and service reliability. These technological developments have accelerated the transition toward smart ports and digital maritime ecosystems that support real-time information exchange, predictive analytics, and automated operations. As a result, technology management is increasingly recognized as a strategic capability that enhances competitiveness, sustainability, and operational performance across maritime industries (Alamoush et al., 2022; Wang et al., 2023; Khaled et al., 2023; Heilig et al., 2021; Yang et al., 2025).

Digitalization has also transformed maritime governance by improving transparency, accountability, and fiscal oversight. Technologies such as the Automatic Identification System (AIS), Port Community Systems, smart logistics platforms, and integrated vessel monitoring systems provide authorities with real-time information regarding vessel movements, cargo flows, and maritime service utilization. These technologies facilitate more accurate revenue collection, reduce information asymmetry, improve regulatory compliance, and strengthen strategic planning processes. However, successful implementation depends on multiple factors, including organizational readiness, stakeholder collaboration, technological infrastructure, policy support, and institutional commitment. Therefore, technology management should be viewed not only as a technical function but also as a strategic mechanism for enhancing maritime governance and fiscal performance (Alamoush et al., 2022; Wang et al., 2023; Yang et al., 2025; Khaled et al., 2023; Heilig et al., 2021).

Blue Economy and Sustainable Maritime Development

The Blue Economy has become a globally recognized framework for promoting sustainable growth through the responsible utilization of marine and coastal resources. The concept emphasizes the integration of economic development, environmental protection, and social inclusion to ensure long-term sustainability. Unlike traditional economic models that focus primarily on growth, the Blue Economy encourages innovation, resource efficiency, ecosystem preservation, and sustainable governance. Contemporary literature highlights that maritime transportation, fisheries, tourism, renewable energy, aquaculture, and port development are

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among the principal sectors contributing to Blue Economy implementation. These sectors create substantial opportunities for employment, investment, and revenue generation while simultaneously requiring effective environmental management and policy coordination (Österblom et al., 2017; Voyer et al., 2021; Tedesco et al., 2025; Zaucha et al., 2023; Kabil et al., 2024).

Achieving a sustainable Blue Economy requires strong institutional frameworks, technological innovation, and evidence-based policymaking. Recent studies emphasize that digital technologies, smart ports, renewable energy systems, and integrated maritime governance play critical roles in facilitating sustainable maritime development. Furthermore, policymakers are increasingly encouraged to align fiscal strategies with sustainability objectives to ensure that economic benefits are distributed equitably while preserving marine ecosystems. This integrated perspective suggests that maritime fiscal development should be viewed as an essential component of broader Blue Economy strategies aimed at promoting economic resilience, environmental stewardship, and inclusive regional development (Kabil et al., 2024; Tedesco et al., 2025; Wang et al., 2023; Zaucha et al., 2023; Voyer et al., 2021).

System Dynamics for Maritime Policy Development

System Dynamics has become an increasingly important methodology for analyzing complex maritime systems characterized by feedback loops, nonlinear relationships, delays, and dynamic interactions among economic, technological, environmental, and institutional variables. The methodology enables researchers and policymakers to understand system behavior over time through the development of causal loop diagrams, stock-and-flow structures, and simulation models. Maritime applications of System Dynamics have expanded considerably in recent years, particularly in areas such as shipping decarbonization, sustainable transportation, coastal development, maritime governance, and strategic planning. These applications demonstrate the usefulness of System Dynamics for evaluating alternative policy scenarios and supporting evidence-based decision-making (Suryani et al., 2025; Pratama et al., 2024; Gao et al., 2023; Zaucha et al., 2023; Tedesco et al., 2025).

METHODOLOGY

This study employs a **Systematic Literature Review (SLR)** based on the **Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA 2020)** guidelines developed by Page et al. (2021). This approach was selected because it provides a rigorous,

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transparent, reproducible, and internationally recognized framework for identifying, evaluating, and synthesizing scientific evidence. The application of PRISMA 2020 is particularly appropriate for establishing the conceptual foundation of research on engineering maritime-based fiscal development strategy models through technology management and system dynamics approaches, as it enables a comprehensive examination of global research trends related to maritime fiscal policy, blue economy, maritime digitalization, technology management, smart ports, and system dynamics.

The literature review focuses on scientific articles published between **January 2015 and December 2025**. This timeframe was selected to capture recent developments in maritime digital transformation, smart port implementation, Automatic Identification System (AIS) technologies, blue economy initiatives, maritime governance, and the increasing adoption of system dynamics methodologies in strategic policy formulation. The selected period also reflects the contemporary evolution of maritime economic development and technology-driven fiscal governance, which are highly relevant to the development of a maritime-based fiscal model for East Kalimantan.

The literature search was conducted using several internationally recognized academic databases that provide extensive coverage of peer-reviewed publications. These databases included Scopus, Web of Science, ScienceDirect, SpringerLink, Emerald Insight, Taylor & Francis Online, and Wiley Online Library. These databases were selected because they contain a substantial number of high-quality studies in maritime economics, maritime policy, technology management, logistics, port governance, and system dynamics.

The search strategy was developed based on the research objectives and conceptual framework. Keywords included maritime fiscal policy, maritime economy, blue economy, port governance, technology management, maritime digitalization, smart port, Automatic Identification System, system dynamics, causal loop diagram, simulation model, policy model, and development strategy. These keywords were combined using Boolean operators (AND and OR) to maximize search coverage while maintaining relevance to the research objectives.

All retrieved records were exported into reference management software to facilitate duplicate detection and preliminary screening. Studies were considered eligible if they were peer-reviewed journal articles, indexed in Scopus, written in English, published between January 2015 and December 2025, and directly related to maritime fiscal policy, maritime economics, blue economy, maritime technology management, port governance, maritime digitalization, or system dynamics. Studies focusing exclusively on marine biology, oceanography, naval defense, or legal

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aspects of maritime affairs without economic, fiscal, technological, or strategic implications were excluded.

Following the identification stage, a quality assessment process was conducted to ensure that only methodologically robust studies were included in the final synthesis. The assessment examined the clarity of research objectives, methodological rigor, relevance to the research theme, contribution to policy or strategic model development, and publication status in Scopus-indexed journals. Studies failing to meet the minimum quality standards were excluded to maintain the validity and reliability of the review findings.

Identification Stage

The identification stage aimed to collect all potentially relevant studies associated with the research topic. The literature search was conducted in January 2026 across seven international databases. The search process yielded 2,880 records from the selected databases. In addition, 58 studies were identified through backward and forward citation tracking. Consequently, a total of 2,938 records were identified during the initial search stage.

Table 1. Literature Identification Results

Database	Number of Articles
Scopus	1,124
Web of Science	532
ScienceDirect	463
SpringerLink	317
Emerald Insight	149
Taylor & Francis Online	208
Wiley Online Library	87
Additional Sources	58
Total	2,938

Screening Stage

The screening stage was conducted to remove duplicate records and studies that were not relevant to the research objectives. Duplicate detection was performed using Mendeley and Zotero reference management software. This process identified 684 duplicate records, which

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were subsequently removed. After deduplication, 2,254 unique records remained for title and abstract screening.

Title screening revealed that a substantial number of studies focused on topics unrelated to maritime fiscal development, technology management, or system dynamics. Consequently, 1,273 records were excluded at this stage. Abstract screening was then performed on the remaining records, leading to the exclusion of an additional 612 studies that did not satisfy the relevance criteria. As a result, 369 articles were retained for full-text assessment.

Table 2. Screening Results

Description	Number of Articles
Records identified	2,938
Duplicate records removed	684
Records after deduplication	2,254
Excluded based on title screening	1,273
Excluded based on abstract screening	612
Full-text articles assessed for eligibility	369

Eligibility Stage

The eligibility stage involved a comprehensive full-text assessment of all studies that passed the screening process. This assessment ensured that each article contributed directly to the development of maritime fiscal strategies through technology management and system dynamics approaches.

The evaluation identified several studies that did not explicitly address maritime fiscal issues, maritime economic development, technology management, or policy modeling. Other studies were excluded because they lacked full-text accessibility, were not peer-reviewed journal articles, or demonstrated insufficient methodological quality according to the established quality assessment criteria.

Table 3. Reasons for Exclusion During the Eligibility Stage

Reason for Exclusion	Number of Articles
Not related to maritime fiscal policy or maritime economics	81
Not related to technology or technology management	47
Did not employ policy, strategic, or modeling approaches	58

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Non-peer-reviewed publications	36
Full text unavailable	22
Insufficient methodological quality	41
Total Excluded	285

Following the full-text assessment, 84 studies satisfied all inclusion criteria and were retained for the final systematic review.

Included Stage

The final stage of the PRISMA 2020 process resulted in the inclusion of 84 studies that fulfilled all eligibility and quality requirements. These studies were analyzed in depth to identify key concepts, variables, theoretical foundations, strategic frameworks, and causal relationships relevant to maritime fiscal development. The synthesis was organized into thematic clusters representing the primary dimensions of the research domain, including maritime fiscal policy, maritime economy, blue economy, port governance, technology management, maritime digitalization, smart ports, and system dynamics.

Table 4. Distribution of Included Studies by Research Theme

Research Theme	Number of Articles
Maritime Fiscal Policy	15
Maritime Economy	17
Blue Economy	12
Port Governance	11
Technology Management	10
AIS and Maritime Digitalization	7
Smart Port	5
System Dynamics	7
Total	84

The synthesis of these 84 studies provides the theoretical and empirical foundation for developing the conceptual framework of this dissertation. Specifically, the review supports the identification of latent variables for Structural Equation Modeling Partial Least Squares (SEM-PLS), the formulation of internal and external strategic factors for SWOT analysis, the construction of

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Causal Loop Diagrams (CLD), and the development of System Dynamics simulation models for evaluating alternative maritime fiscal development strategies in East Kalimantan.

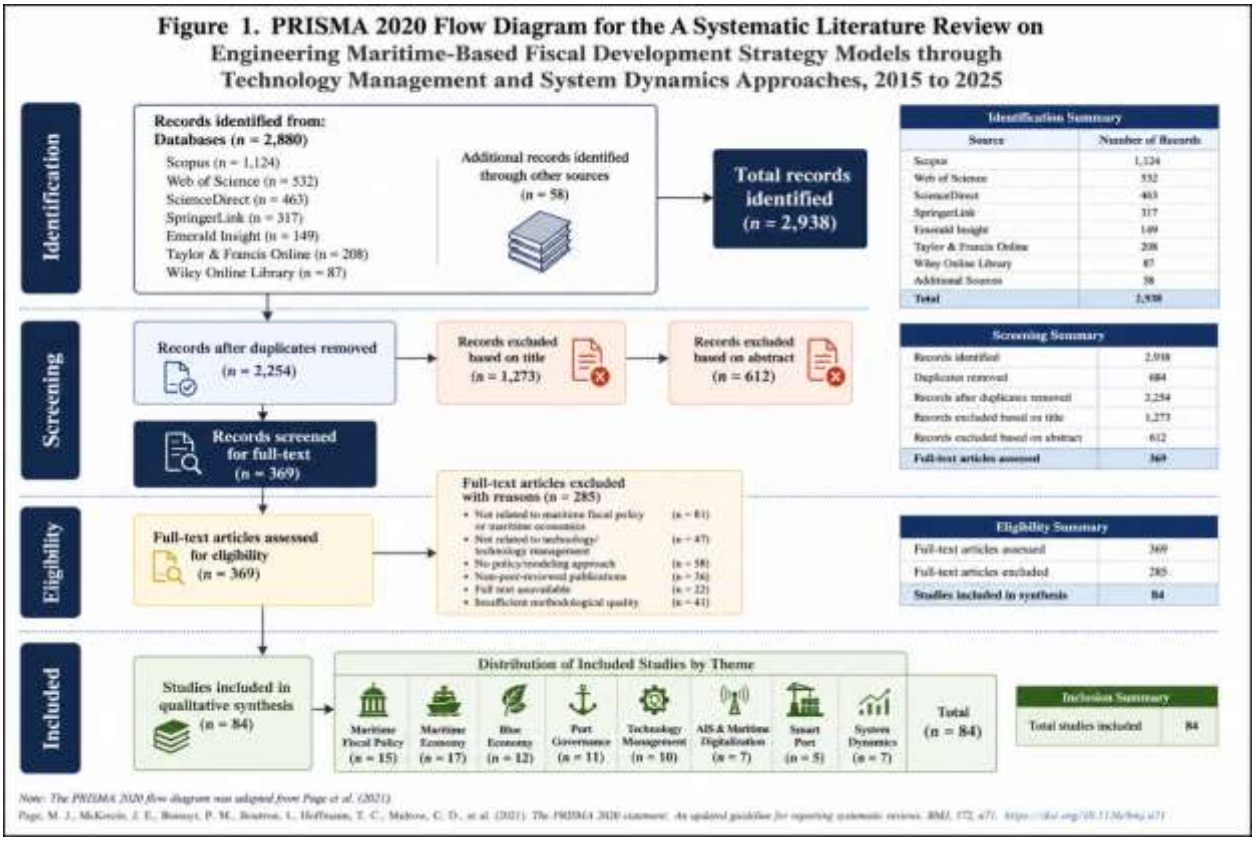


Figure 3.1. PRISMA 2020 Flow Diagram for the Systematic Literature Review on Engineering Maritime-

Based Fiscal Development Strategy Models through Technology Management and System Dynamics Approaches

RESULTS AND DISCUSSION

Results of the PRISMA 2020 Literature Selection Process

The systematic search conducted across seven international databases identified 2,938 records published between January 2015 and December 2025. After removing 684 duplicate records, 2,254 unique articles remained for screening. Title and abstract screening excluded 1,885 studies that did not meet the inclusion criteria. The remaining 369 articles were subjected to full-

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text assessment. Following the eligibility evaluation, 285 articles were excluded due to insufficient relevance to maritime fiscal development, technology management, or system dynamics. Ultimately, 84 studies met all inclusion and quality assessment criteria and were included in the final review.

The distribution of the selected studies demonstrates increasing scholarly attention toward maritime economic development, digital transformation, blue economy initiatives, and sustainable maritime governance. Most publications appeared after 2020, indicating growing academic and policy interest in integrating technological innovation and sustainability principles into maritime development strategies. This trend reflects the global transition toward data-driven maritime governance and the increasing need for adaptive policy frameworks capable of responding to rapidly changing economic and environmental conditions.

Maritime Fiscal Development as a Strategic Source of Regional Revenue

The reviewed literature consistently identifies maritime activities as significant contributors to regional economic growth and public revenue generation. Maritime fiscal development is commonly associated with port operations, logistics services, vessel traffic management, concession agreements, anchorage services, and maritime taxation mechanisms. Several studies emphasize that ports have evolved beyond their traditional transportation functions and now operate as complex economic ecosystems that create substantial fiscal opportunities for governments and regional authorities (Haralambides, 2023; Liang et al., 2022; Österblom et al., 2017; Zaucha et al., 2023; Tedesco et al., 2025).

However, the findings also reveal persistent challenges in converting maritime economic activities into fiscal revenues. Revenue leakage, fragmented governance arrangements, weak institutional coordination, and inadequate monitoring systems remain major barriers to fiscal optimization. Many studies indicate that maritime fiscal performance depends not only on the volume of maritime activities but also on the effectiveness of governance structures and policy implementation mechanisms. Consequently, successful maritime fiscal development requires integrated approaches that combine economic planning, technological innovation, and institutional reform.

The synthesis further indicates that regional governments increasingly recognize maritime sectors as potential sources of sustainable revenue. Nevertheless, existing fiscal frameworks often fail to capture the full economic value generated by maritime operations. This finding highlights the importance of developing strategic models that can improve fiscal transparency,

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accountability, and revenue collection efficiency while maintaining long-term economic sustainability.

Technology Management as an Enabler of Maritime Fiscal Optimization

Technology management emerged as one of the most frequently discussed themes within the reviewed literature. The findings indicate that digital technologies have become essential enablers of operational efficiency, governance effectiveness, and strategic decision-making in maritime environments. Technologies such as Artificial Intelligence, Internet of Things, blockchain, digital twins, smart ports, and Automatic Identification Systems are increasingly being adopted to improve information visibility and operational performance (Alamoush et al., 2022; Wang et al., 2023; Khaled et al., 2023; Yang et al., 2025; Heilig et al., 2021).

Among these technologies, vessel monitoring and maritime information systems are particularly relevant to fiscal development because they facilitate real-time tracking of maritime activities. The literature suggests that AIS-based monitoring systems can improve revenue collection by enhancing transparency and reducing opportunities for unrecorded maritime transactions. Digitalization also enables authorities to integrate operational and financial information, thereby supporting evidence-based fiscal decision-making.

The review further demonstrates that technology adoption is influenced by multiple organizational and institutional factors. Successful implementation requires not only technological infrastructure but also stakeholder collaboration, regulatory support, human resource capabilities, and strategic leadership. Therefore, technology management should be considered a strategic capability rather than merely a technical function within maritime governance systems.

Blue Economy and Sustainable Maritime Fiscal Development

The concept of the Blue Economy appears prominently throughout the reviewed studies and serves as a foundational framework for sustainable maritime development. The literature consistently defines the Blue Economy as an approach that seeks to balance economic growth, environmental protection, and social inclusion through the sustainable use of marine resources (Voyer et al., 2021; Kabil et al., 2024; Österblom et al., 2017; Zaucha et al., 2023; Tedesco et al., 2025).

The findings suggest that fiscal development strategies should not focus exclusively on maximizing short-term revenues. Instead, maritime fiscal policies should be designed to support

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environmental sustainability and long-term economic resilience. Several studies emphasize the importance of integrating sustainability indicators into maritime policy evaluation and strategic planning processes.

Another important finding is that technological innovation and sustainability are increasingly interconnected. Smart ports, renewable energy systems, digital logistics platforms, and ecosystem-based management approaches are frequently identified as key drivers of sustainable maritime development. These findings imply that future maritime fiscal models should incorporate both economic and environmental performance indicators to align with Blue Economy objectives.

System Dynamics as a Decision-Support Tool for Maritime Policy Development

System Dynamics emerged as a valuable analytical approach for understanding the complexity of maritime systems. The reviewed studies demonstrate that maritime development involves numerous interconnected variables, including economic performance, technological investment, institutional capacity, environmental sustainability, and policy interventions. These relationships often produce feedback effects, delays, and nonlinear behaviors that cannot be adequately captured through conventional analytical methods (Gao et al., 2023; Suryani et al., 2025; Pratama et al., 2024; Zaucha et al., 2023; Tedesco et al., 2025).

The literature highlights the effectiveness of System Dynamics in evaluating alternative policy scenarios and identifying leverage points within complex systems. Through Causal Loop Diagrams and simulation models, policymakers can examine how changes in one component influence the overall behavior of the maritime fiscal system. Several studies demonstrate that simulation-based approaches improve strategic planning by enabling decision-makers to anticipate long-term consequences before policy implementation.

These findings support the suitability of System Dynamics as a methodological foundation for developing maritime fiscal development strategies. The approach provides a comprehensive framework for integrating economic, technological, institutional, and environmental considerations into a unified decision-support model.

Proposed Conceptual Framework for Maritime-Based Fiscal Development

Based on the synthesis of the 84 selected studies, a conceptual framework is proposed that integrates Maritime Fiscal Development, Technology Management, Blue Economy principles, and System Dynamics. The framework positions maritime fiscal performance as the primary

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outcome variable influenced by technological capabilities, governance effectiveness, maritime operational activities, and sustainability-oriented policies.

Technology Management functions as an enabling mechanism that enhances transparency, operational efficiency, and fiscal monitoring through digital technologies such as AIS and smart port systems. Blue Economy principles provide sustainability-oriented policy guidance that ensures fiscal development remains aligned with environmental and social objectives. System Dynamics serves as the analytical engine that captures feedback relationships among these variables and facilitates scenario-based policy evaluation.

The proposed framework contributes to the literature by bridging previously fragmented research streams and providing an integrated perspective for maritime fiscal development. It also establishes the theoretical foundation for subsequent model development using Structural Equation Modeling, SWOT analysis, Causal Loop Diagrams, and System Dynamics simulation. This integrated framework is particularly relevant for East Kalimantan, where maritime activities present significant opportunities for enhancing regional fiscal capacity through technology-enabled and sustainability-oriented governance strategies.

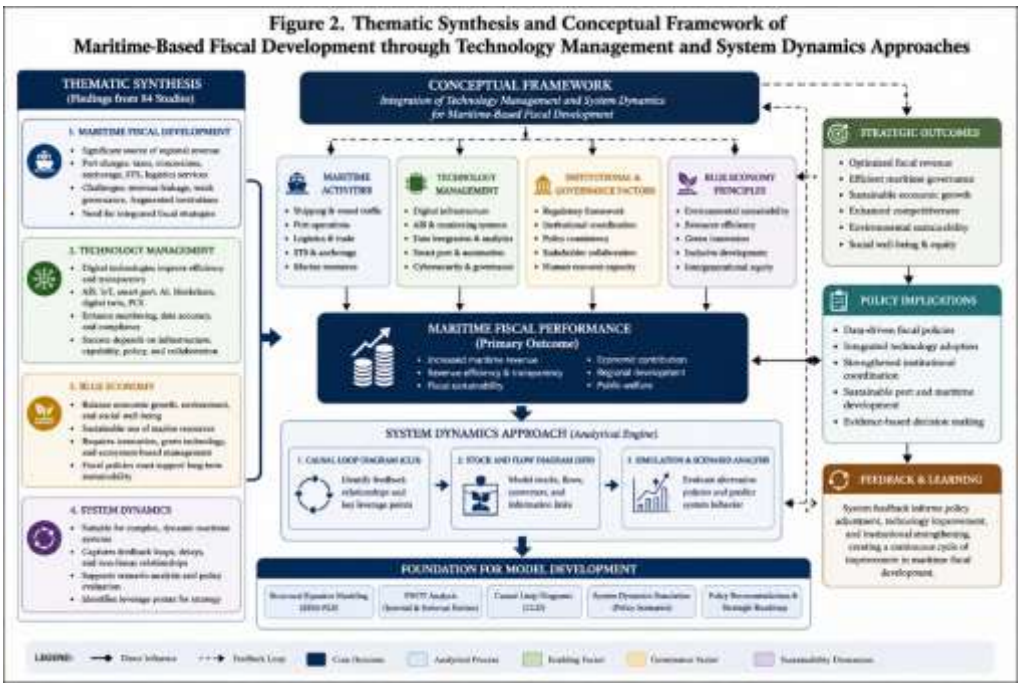


Figure 2. Thematic Synthesis and Conceptual Framework of Maritime-Based Fiscal Development through Technology Management and System Dynamics Approaches

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Table 5. Summary of Key Findings from the Systematic Literature Review (n = 84 Studies)

Theme	Key Findings
Maritime Fiscal Development	Maritime activities provide substantial opportunities for regional revenue generation.
Technology Management	Digitalization enhances transparency, efficiency, and fiscal monitoring.
Blue Economy	Sustainable maritime development requires balancing economic and environmental objectives.
System Dynamics	Simulation modeling supports evidence-based policy evaluation and strategic planning.
Integrated Framework	Fiscal development is influenced by technological, institutional, operational, and sustainability factors.

CONCLUSION

This study provides a comprehensive synthesis of the literature on maritime-based fiscal development through the integration of Technology Management and System Dynamics approaches. The findings demonstrate that maritime fiscal performance is influenced by the interaction of maritime economic activities, technological capabilities, governance effectiveness, and sustainability-oriented development policies. Technology management, particularly through digitalization, smart port systems, and maritime monitoring technologies, plays a critical role in improving transparency, operational efficiency, and revenue optimization. At the same time, Blue Economy principles ensure that fiscal development remains aligned with long-term environmental sustainability and social well-being objectives. The review also highlights the value of System Dynamics as a decision-support approach capable of capturing the complexity of maritime systems and evaluating alternative policy scenarios. Based on the thematic synthesis, an integrated conceptual framework is proposed to support evidence-based maritime fiscal policymaking and strategic planning. This framework offers a foundation for future empirical research and model development aimed at enhancing regional fiscal capacity, strengthening maritime governance, and promoting sustainable maritime development in coastal and maritime regions.

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