

Policy and Institutional Frameworks for Sustainable Sea Transportation Management: National Maritime Policy, Port Governance, and Regional Implications

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Abstract. Sustainable sea transportation management depends not only on vessel- and port-level operational practice but also on the policy and institutional frameworks that set the incentives and obligations within which ports and shipping operators function. This paper examines national maritime policy integration, port governance and privatization, and the diversification of sea transportation activity, illustrated through Arctic shipping route logistics and yachting tourism, as policy dimensions bearing on sustainable sea transportation management, using Politeknik Pelayaran Sulawesi Utara (Poltekpel Sulut) as a reflective regional case setting for April 2025 to January 2026. Synthesizing the policy literature on integrated maritime governance, port privatization and pricing, and route- and sector-diversification of sea transportation with institutional observation at Poltekpel Sulut, the paper argues that regional maritime training institutions have an underused role as intermediaries between national policy design and local implementation capacity. The paper proposes that maritime polytechnics can strengthen sustainable sea transportation outcomes by building applied research and advisory functions that translate national policy frameworks into locally feasible implementation guidance for regional port authorities..

Keywords: maritime policy, port governance, sea transportation management, port privatization, maritime education, regional development

1. Introduction

Discussions of sustainable sea transportation often focus on technology and operational practice, but the ultimate determinant of whether sustainable practices are adopted at scale is the policy and institutional framework within which port authorities and shipping operators make investment and operating decisions. National maritime policy sets the direction and priorities for the sector; port governance structures, including the degree of privatization and the design of pricing instruments, determine how those priorities translate into local incentives; and the diversification of sea transportation activity, including into new routes and new sectors such as maritime tourism, tests the flexibility of both policy and governance frameworks.

This paper examines these three policy dimensions, integrated national maritime policy, port governance and privatization, and route- and sector-diversification, as they bear on sustainable sea transportation management, using Politeknik Pelayaran Sulawesi Utara (Poltekpel Sulut) as a reflective regional case setting for the period April 2025 to January 2026. As a maritime training institution situated at the regional rather than national policy-making level, Poltekpel Sulut offers a useful vantage point for examining how national and international policy frameworks are experienced, interpreted, and potentially

supported at the implementation level. The paper draws on the international policy literature on integrated maritime governance, port privatization and emission pricing, and sea transportation diversification to interpret institutional documentation and observation from the stated period.

2. Literature Review

2.1 Integrated National Maritime Policy

Paridaens and Notteboom (2021), examining national integrated maritime policies across multiple jurisdictions, find that policy integration, meaning coordination across shipping, port, fisheries, and coastal-zone policy domains rather than siloed sector-specific regulation, is strongly associated with more coherent implementation outcomes at the port and regional level. Their analysis suggests that fragmented policy frameworks tend to produce inconsistent local implementation, because regional authorities and operators receive conflicting signals from differently coordinated national agencies. For a regional maritime training institution, this literature implies that understanding the degree of policy integration at the national level is useful for anticipating how consistently sustainability and safety obligations will be enforced regionally.

2.2 Port Governance, Privatization, and Emission Pricing

Pian et al. (2020) examine the interaction between global emission taxes and port privatization policies, finding that the environmental effect of an emission-based charge depends substantially on port ownership structure; privatized ports operating under competitive pressure may resist emission charges that raise their relative costs unless charges are applied consistently across competing ports, while state-owned or more centrally coordinated ports can sometimes implement charges more consistently but with less responsiveness to efficiency incentives. This finding is relevant to Indonesian sea transportation management, where port governance arrangements vary regionally, and it implies that the effectiveness of any future emission-pricing policy in a region such as Sulawesi Utara will depend on how that region's port governance structure compares with neighbouring, potentially competing, ports.

2.3 Diversification of Sea Transportation: Route and Sector Expansion

Du et al. (2023), studying the sustainability implications of the Arctic shipping route for Shanghai port logistics in the post-pandemic era, find that new shipping route development creates both opportunity and governance strain, because emerging routes often outpace the regulatory and monitoring frameworks designed for established routes,

creating a temporary period of elevated environmental and safety risk until governance catches up. Yao et al. (2021), examining constraints on yachting tourism development in China, identify a parallel pattern in sector diversification, finding that maritime tourism growth is frequently constrained less by market demand than by regulatory and licensing frameworks that were designed for cargo and passenger shipping and have not been adapted for tourism-oriented vessel traffic. Both studies point to a common policy lesson for sea transportation management: diversification of routes or sectors tends to outpace governance frameworks, creating a policy lag that regional institutions are well placed to help identify and address given their proximity to emerging local activity.

2.4 The Role of Regional Training Institutions in Policy Implementation

Simanjuntak et al. (2025), discussing the integration of maritime energy networks into sustainable coastal development planning, and Cahyadi et al. (2025), examining leadership for sustainable port and shipping practices in maritime vocational schools, both position maritime training institutions as potential intermediaries between national or provincial policy design and local implementation practice, arguing that institutions with applied research capacity and close working relationships with regional port authorities are well placed to translate broad policy objectives into locally feasible operating guidance. This intermediary role is consistent with the policy lag identified by Du et al. (2023) and Yao et al. (2021): where national policy has not yet caught up with an emerging local activity, a well-positioned regional institution can help fill that gap through applied research and advisory engagement rather than waiting for national policy revision.

3. Methodology

This paper applies a qualitative, case-based policy analysis to Poltekpel Sulut's institutional positioning within regional sea transportation governance over April 2025 to January 2026. Institutional documentation relating to the polytechnic's engagement with regional maritime authorities, port stakeholders, and applied research or advisory activity was reviewed to characterize the nature of this engagement. This review was supplemented by observation of institutional activity during the stated period, described qualitatively rather than as statistical survey data, and interpreted against the policy literature on integrated maritime governance, port privatization and pricing, and route- and sector-diversification identified above.

4. Results and Discussion

4.1 Evidence of Policy Fragmentation at the Regional Level

Institutional documentation and observation at Poltekpel Sulut during the study period suggested that sustainability and safety obligations arriving from different national agencies, spanning maritime safety regulation, environmental compliance, and vocational education standards, were experienced by the institution as separately administered requirements rather than as a coordinated policy package, consistent with the fragmentation risk identified by Paridaens and Notteboom (2021). This did not appear to prevent compliance, but it did appear to increase the administrative burden of coordinating institutional response across separately governed requirements, suggesting that greater national-level policy integration would reduce implementation friction at the regional training-institution level without requiring any change in the substantive content of the obligations themselves.

4.2 Regional Port Governance and the Feasibility of Future Emission Pricing

Consistent with the governance-dependency finding of Pian et al. (2020), regional port governance arrangements observed during the study period appeared mixed, with some facilities under more centralized regional authority and others operating with greater commercial autonomy. This mixed governance structure implies that any future emission-differentiated pricing policy applied to Sulawesi Utara's ports would need to be carefully sequenced across facilities with different governance arrangements to avoid creating incentives for cargo or vessel traffic to shift toward less-regulated facilities within the same region, a risk consistent with the competitive-avoidance dynamic Pian et al. (2020) describe at the international level.

4.3 Emerging Diversification and the Institution's Advisory Opportunity

Field observation during the study period indicated growing regional interest in diversifying sea transportation activity in Sulawesi Utara, including nascent interest in maritime tourism alongside established cargo and passenger shipping, a pattern that parallels the diversification dynamics described by Du et al. (2023) for shipping-route expansion and by Yao et al. (2021) for yachting tourism. Consistent with the policy-lag argument in both studies, regional regulatory and licensing frameworks did not yet appear fully adapted to this diversification, representing exactly the kind of gap that Simanjuntak et al. (2025) and Cahyadi et al. (2025) suggest a regional training institution is well positioned to help address. Poltekpel Sulut's existing relationships with regional maritime stakeholders, built through its core training mission, position it to contribute applied

research or advisory input on how tourism-oriented vessel traffic might be safely and sustainably integrated into existing port operations, without needing to wait for national-level regulatory revision to be completed first.

5. Conclusion

Sustainable sea transportation management depends on policy and institutional frameworks operating coherently across national maritime policy integration, regional port governance and pricing, and the capacity of governance frameworks to keep pace with route and sector diversification. The case of Politeknik Pelayaran Sulawesi Utara over April 2025 to January 2026 indicates that regional training institutions experience national-level policy fragmentation as an administrative burden, that mixed regional port governance arrangements complicate the feasibility of future emission-pricing policy, and that emerging diversification into activities such as maritime tourism is outpacing regional regulatory adaptation in ways consistent with international experience. The paper concludes that regional maritime polytechnics have an underused opportunity to act as policy-implementation intermediaries, translating national frameworks into locally feasible guidance and helping regional authorities respond to policy lag created by diversification, and recommends that Poltekpel Sulut formalize applied research or advisory engagement with regional maritime authorities as an extension of its core training mission.

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