

Editorial

Special Issue on Advances in Maritime Transport: Sustainability, Contamination and New Technologies

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The need to adopt sustainable solutions in the maritime sector has become more urgent in recent years, driven by stricter MARPOL Annex VI regulations, global decarbonization commitments [1], and a growing focus on the environmental health of our ports and oceans. In this context, this edition aligns with a wave of technological innovation seeking integrated and effective pathways to reduce air pollutants generated by ships, especially nitrogen oxides (NO_x), sulfur oxides (SO_x), and particulate matter (PM) [2].

One of the most notable articles in this collection details the implementation of a pioneering hydrogen selective catalytic reduction (H₂-SCR) technology, which achieves the removal of up to 80% of NO_x, 99.8% of SO₂, and 72% of PM under real-world conditions onboard a cruise ship [3]. The innovation here lies in the combination of three subsystems: seawater scrubbers, an oxidative catalytic reactor, and an onboard electrolysis-powered H₂-SCR system, offering a robust alternative to the traditional urea-based system, which carries operational and environmental risks [3]. In addition, other featured articles address methodologies to predict vessel capsizing risks [4], the optimization of navigation parameters to improve maritime safety [5], and the control of generator synchronization using artificial intelligence. From a logistics and territorial perspective, the analysis of the port hinterland in Spain opens new opportunities to understand the role of ports in the economic and environmental development of the region. And in line with emerging technologies, synthetic generation of maritime traffic for evaluating autonomous vessels presents a truly innovative and flexible approach to validating navigation and control systems [6].

These contributions are complemented by international scientific literature that validates the technical and environmental feasibility of technologies such as the Pt/MgO–CeO₂ system for NO_x conversion [3], sulfidation-resistant catalysts, and metallic oxidizers for particulate removal [7]. Furthermore, advances in computational modeling of marine engine behavior, life-cycle assessment tools, and coherent regulatory proposals contribute to a sustainable transition in the maritime sector [8].

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