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# Editorial: Global vessel-source maritime pollution governance—technical innovation and policy orientation

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## Editorial on the Research Topic

### Global vessel-source maritime pollution governance—technical innovation and policy orientation

As we sail into an era of heightened awareness and responsibility toward our planet, the need for sustainable practices and rigorous governance in the maritime industry has never been more crucial. This Research Topic unites 13 papers from Chinese scholars that explore the landscape of global vessel-source maritime pollution governance, presenting valuable insights into technical innovation and policy orientation.

The opening salvo is from [Dong et al.](#), who critically examine decarbonization laws and policies on international, regional, and national scales. They underscore the importance of striking the right balance between unilateral and uniform regulation while identifying areas for improvement in the shipping industry's ongoing decarbonization efforts. Their work sets the stage for the issue, providing a comprehensive analysis of global maritime decarbonization governance.

The following papers concentrate on China, a pivotal player in maritime activities. [Sun et al.](#) challenge the notion that shore power universally reduces carbon emissions, pointing to the limitations of China's coal-heavy energy structure. Their work calls on the government to develop shore power initiatives in tune with local conditions and to significantly increase clean energy's share in the power structure. Their research underlines the importance of context-specific strategies in reducing carbon emissions.

Continuing this focus on China, a new method of assessing ocean ecological security is introduced by [Wang et al.](#), which uses the concept of the energy ecological footprint as a means of assessing marine ecological security. Through a case study of Guangxi's marine ecosystem, they offer actionable guidelines for the sustainable development and utilization of marine ecosystems using this method as a novel tool for marine ecological security evaluation.

Several papers then delve into the operational and policy challenges confronting shipping decarbonization. [Zheng et al.](#) introduce a method for optimizing speed in real time with the goal of maintaining a balance between schedule reliability and energy efficiency. Their approach involves dynamically modifying sailing speeds to counterbalance the disruptions brought about by unpredictable changes in port handling efficiency. This

could play a significant role in achieving a balance between reliability and energy efficiency, particularly in light of diverse policies aimed at reducing carbon emissions.

In a similar vein, [Zhang et al.](#) conduct a numerical assessment of China's policies aimed at reducing carbon emissions in the shipping industry using the policy modeling consistency index method. Their findings suggest that although the policies are largely consistent, there are areas in each that could be enhanced. The research highlights the necessity of promoting and utilizing clean energy, fostering cooperation between the shipping and port sectors, and setting up a strong governance structure to address issues related to decarbonization in the shipping industry.

[Li et al.](#) shift the focus to the environmental efficiency of ports, specifically examining eight ports within China's Bohai rim port group. They discovered a lack of environmental efficiency and proposed potential solutions such as technological advancements, optimization of input-output processes, and increased management supervision. This perspective aligns with the assessment by [Yang et al.](#) of China's regulatory framework for reducing carbon emissions in shipping. They argue that strengthening compulsory regulations and broadening the scope of policy norms are crucial measures toward achieving decarbonization in the shipping industry.

[Yao et al.](#) introduce a two-dimensional assessment framework for evaluating policy synergy in Coastal Ocean Pollution Prevention and Control Programs (COPPCP) in China. They highlight the importance of interdepartmental collaboration and suggest that the nature of such collaboration varies across different provinces. This perspective is complemented by the analysis of the evolving cruise industry from [Tong et al.](#) They identify five policy areas requiring further attention, signaling the need for an active and supportive government attitude toward the industry.

The issue of port pollutant emissions in the United States is brought into sharp focus by [Xiao et al.](#) They analyze the spatial distribution of port pollutant emissions and the factors affecting them, finding that NO<sub>x</sub> emissions were the highest, followed by SO<sub>2</sub> and CO. They emphasize the urgent need for effective control measures for NO<sub>x</sub> emissions. According to the authors, coastal expansion and population growth tend to increase pollution emissions in ports, while container traffic has the opposite effect. This analysis provides crucial insights for port managers and regulatory departments to curb pollution.

Alongside this, [Xiao and Cui](#) employ an evolutionary game model to explore the intricate relationship between the government and shipping companies, particularly in relation to shipping cycles and carbon quotas. They deduce that the government's carbon quota policy is heavily impacted by demand in the shipping market. As a result, they advise the government to predict shipping market demand and modify regulations as needed. Their research

highlights the fluid interaction between policy and market dynamics in the pursuit of decarbonization in the shipping industry.

Meanwhile, [Meng et al.](#) provide a systematic visual analysis of the cruise research literature. The authors acknowledge the challenges faced by the cruise industry, including environmental sustainability issues. The authors also suggest that future research should focus on the optimization of energy systems and the impact of climate change on the cruise industry. This indicates a recognition of the environmental impact of the industry and the need for sustainable practices.

Finally, [Tang et al.](#) put forward three optimization models for repositioning empty containers in a low-carbon manner across multiple ports under uncertain conditions. Their research indicates that strategies that include the repositioning of empty containers can decrease storage and leasing expenses, in addition to reducing carbon emissions. This makes maritime operations both more economical and more eco-friendly.

In essence, this Research Topic illuminates the intricate tapestry of maritime pollution governance. It emphasizes the importance of embracing both technical innovations and policy reforms to navigate the shipping industry toward a more sustainable future. The voyage toward this future will undoubtedly be challenging, but as these papers clearly demonstrate, it is not only necessary but achievable. The contributions of these researchers collectively provide a compass for the industry, policy-makers, and researchers alike, guiding us toward a cleaner, greener future in maritime activities.

## Author contributions

All authors listed have made a substantial, direct, and intellectual contribution to the work and approved it for publication.

## Conflict of interest

The authors declare that the research was conducted in the absence of any commercial or financial relationships that could be construed as a potential conflict of interest.

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