

Climate and nitrogen implications of alternative fuels pathways for maritime shipping

Maritime shipping accounts for about 3% of global greenhouse gas emissions and has long been considered one of the hardest sectors to decarbonize. The emergence of alternative fuels, such as ammonia, has demonstrated promising options for decarbonizing the sector and is increasingly positioned as an ocean-friendly solution for maritime transport.

Meanwhile, the widespread adoption of these alternative fuels also brings a range of potential risks, from impacts on ocean health and food security to uncertainties regarding their net climate benefits, underscoring the need to raise awareness among stakeholders. As one of the leading alternative fuel candidates, ammonia can be produced using renewable energy or coupled with carbon capture and storage, resulting in a lower carbon intensity than conventional fuels. However, its production, transportation, storage, and combustion can lead to emissions of ammonia and other unintended byproducts, including nitrogen oxides (NO_x) and nitrous oxide (N₂O). Even modest emissions could exacerbate coastal pollution, disrupt ocean nitrogen cycling, and increase atmospheric concentrations of N₂O, which is the third most important greenhouse gas and the most abundantly emitted ozone-depleting substance today. Replacing fossil fuels in shipping with ammonia could increase global ammonia demand by more than three times of current production levels. Because ammonia is currently used primarily for fertilizer production, this shift could disrupt fertilizer markets and supplies, with potential implications for global food security.

These concerns are particularly acute in many African countries, where limited access to nitrogen fertilizer remains a major constraint on agricultural production, and where many countries rely heavily on fertilizer imports and are therefore vulnerable to global market disruptions. At the same time, the transition toward ammonia as a shipping fuel could create opportunities for renewable energy development, local fertilizer production, and participation in emerging clean-fuel supply chains. Realizing these opportunities while minimizing risks will require careful planning, investment, and governance.

This side event examines these opportunities and risks through an ocean-centred nitrogen lens, bringing together scientists, fuel producers, policymakers, maritime regulators, and civil society to ask: Are we decarbonizing shipping while externalizing risks to the ocean and coastal communities? What role can African nations play in ensuring a safe, just, and equitable transition?

The discussion will highlight key scientific uncertainties regarding nitrogen emissions, climate impacts, and ocean health, while identifying priorities for monitoring, assessment, and governance. More broadly, this event aims to serve as a launching point for continued international collaboration to guide maritime decarbonization in ways that deliver positive outcomes for climate mitigation, ocean ecosystem health, food security, and a more sustainable and equitable energy transition.

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