Shipping activities on the high seas could hamper worldwide carbon mitigation and sustainability efforts

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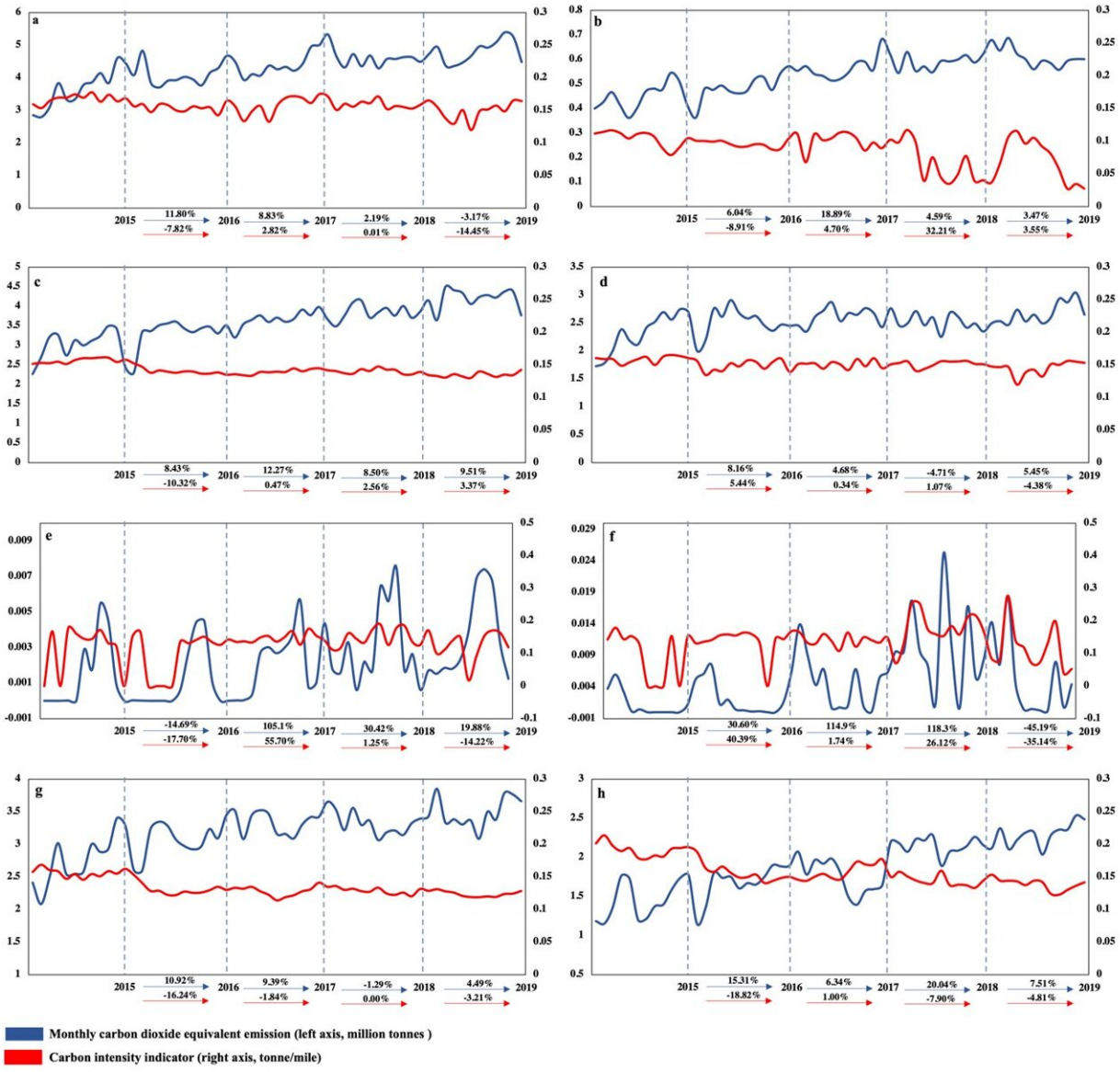


(a)-(h) provide the monthly carbon dioxide equivalent emissions and energy efficiency operational indicator for North Pacific Ocean High Seas (a), South Pacific Ocean High Seas (b), North Atlantic Ocean High Seas (c), South Atlantic Ocean High Seas (d), Arctic Ocean High Seas (e), Southern Ocean High Seas (f), Indian Ocean High Seas (g), and Other High Seas (h). Credit: Science China Press

A new study on carbon mitigation has been published by Dr. Shouyang Wang from the Academy of Mathematics and Systems Science, Chinese Academy of Sciences, and Dr. Dabo Guan from Tsinghua University.

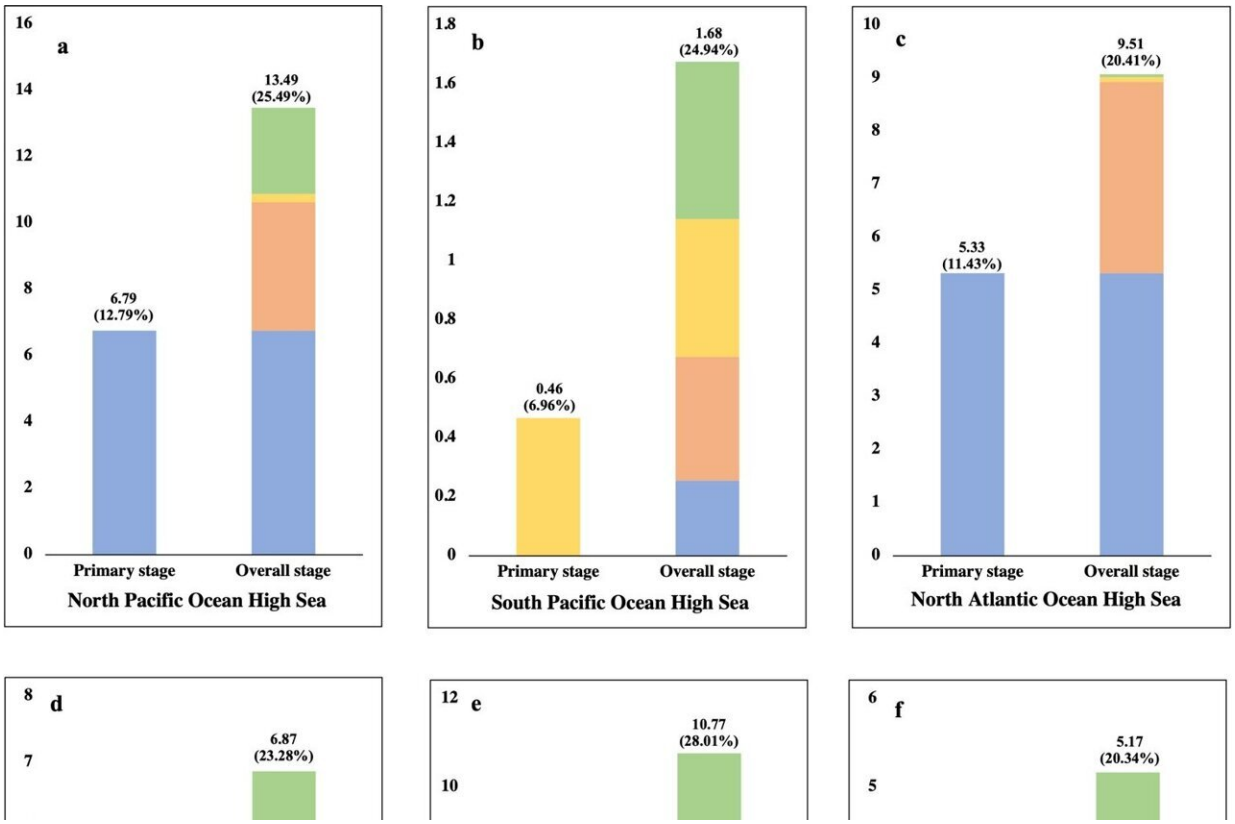
Strict carbon emission regulations are set with respect to countries' territorial seas or exclusive economic zone shipping activities to meet their climate change commitment under the Paris Agreement. However, since signatories are not directly responsible for high seas carbon reduction under the Paris Agreement, no shipping carbon mitigation policies have been proposed for the high seas.

"Given that the high seas account for more than two-thirds of the world ocean regions, the carbon intensive shipping activities on the high seas could become a potential barrier to the worldwide carbon mitigation and sustainability efforts," Shouyang Wang says.

Shouyang Wang, Dabo Guan and colleagues track shipping GHG emission patterns on high sea regions with a geographic-based emission estimation model. They find that the annual shipping carbon dioxide equivalent (CO_2-e) emissions on high seas reach 211.60 million metric tons in 2019.

This amount accounts for about one-third of all shipping emissions

globally and exceeds the annual GHG emission outputs of many mid-sized countries in Europe, such as Spain. Given the current trends in high seas shipping, they estimate that average emission from shipping activities on high seas is growing at approximately 7.26% per year, which far surpasses the global shipping emission growth rate of 2.23%.



(a)-(f) provide the estimated carbon mitigation effectiveness of North Pacific Ocean High Seas (a), South Pacific Ocean High Seas (b), North Atlantic Ocean High Seas (c), South Atlantic Ocean High Seas (d), Indian Ocean High Seas (e) and Other High Seas (f). Credit: Science China Press

Feeding different scenarios into their model, the authors identify the main emission drivers in each high seas and recommend the best policy

to be implemented in each region.

They define the primary implementation policy with respect to the main shipping carbon emission driver of each high sea derived from the model results. They find that implementing different carbon mitigation policies in each high seas represent the best way to alter the current emission structure and reduce future emissions from high seas shipping.

The policy evaluation results indicate that implementing tailored carbon mitigation policies in different high seas regions could reduce 25.46 and 54.36 million tons of CO_2 equivalent emission in the primary intervention stage and the overall intervention stage, respectively.

The tailored carbon mitigation policy implemented through the primary stage shows the greatest emission reduction percentage in each of the high seas regions (at average 46.84% of the total emission reduction). This indicates that it is the most effective policy in reducing emissions in the particular region compared to other policies.

"By identifying the key factors driving the emission patterns in different high seas regions and designing tailored carbon mitigation policies for each region accordingly, it allows international high seas shipping to contribute to the world trading and economic growth in a more environmentally-friendly manner," Shouyang Wang says.

The work is published in the journal *National Science Review*.

More information: Yuze Li et al, The climate impact of high seas shipping, *National Science Review* (2022). DOI: 10.1093/nsr/nwac279

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