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Wind Assisted Ship Propulsion for Decarbonisation

A key focus of maritime decarbonisation is on alternative fuels but availability, costs, logistical and safety concerns remain a barrier to adoption. Wind propulsion, a historically proven and readily available technology, is now being adopted in new innovative ways to significantly reduce greenhouse gas (GHG) emissions. This bulletin summarises the state of the art and policy challenges in promoting wind-assisted ship propulsion.

A wide range of wind propulsion systems (WPS) have been developed to assist ship propulsion in reducing fuel consumption and associated pollutant emissions. These include sails (either soft sails or rigid wings), rotating cylinders (such as Flettner rotors), or kites (static or dynamic) shown in Figure 1. Each have advantages and disadvantages, and choice of WPS depends on vessel type and voyage routes.

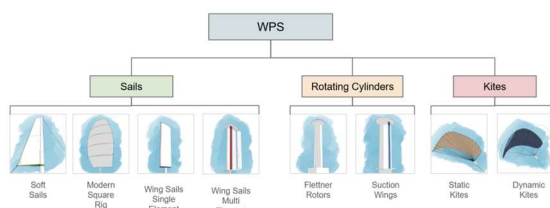


Figure 1. Types of Wind Propulsion Systems (WPS)

Assuming heavy diesel oil fuel use, combustion emissions are predominantly carbon dioxide (CO₂). The potential CO₂ emission reduction reflected by WPS and lower consumption of heavy diesel oil is typically estimated to be:

- 5%-20% for retrofitted vessels and no operational changes
- 25%-30% for retrofitted vessels with operational optimisation for wind propulsion e.g. routing for best wind conditions
- 50%+ for new vessels designed and operationally optimised for wind propulsion

Our review of the latest research confirms these estimates and enables us to provide a better understanding of expected CO₂ emissions reduction for WPS of various types. Figure 2 shows the review findings with the boxes showing the main reduction results, the line in the box is the median result, and black lines on either side to illustrate the overall variability.

These findings demonstrate the potentially substantial emissions reduction from wind-assisted ship propulsion. However, most regulations remain fuel-centric, and wind-assisted ship propulsion is undervalued.

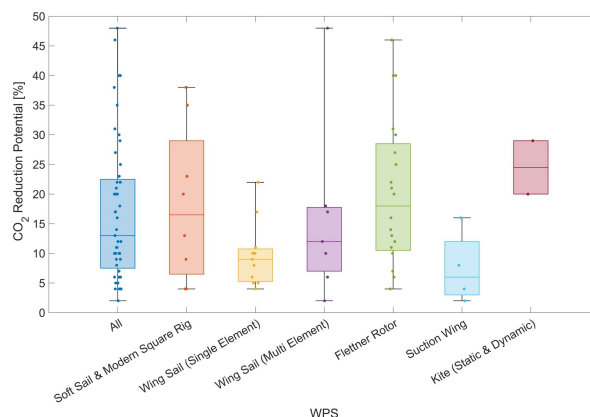


Figure 2. WPS CO₂ emissions reduction potential in the literature

POLICY IMPLICATIONS

Current regulations, such as the IMO short-term reduction measures, focus on emissions per tonne of fuel burnt. This means that wind-assisted propulsion is not directly encouraged.

The UK could look at countries such as France, with an impending new law to support Wind Propulsion through official recognition for its role in fuel and emissions reduction, fiscal assurances and access to funding. The anticipated adoption of the IMO mid-term measures to reduce emissions, where consideration is given to the whole life cycle of fuels, may also provide a stronger case for adopting wind-assisted propulsion.

RESEARCH PUBLICATIONS

Huang, J., & Soupez, J.-B. (2025). State of the Art in Wind Assisted Ship Propulsion for Maritime Decarbonisation and Sustainable Shipping: A Systematic Review. *Journal of Sailing Technology*, 10(1): 258–278. <https://doi.org/10.5957/jst/2025.10.1.258>

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