Cost evaluation of the environmental impact of container ships during red sea crisis

Ruikai Sun [1] *^, Wessam Abouarghoub [2], Emrah Demir [3], Andrew Potter [4]

Ruikai Sun [1] *^, Cardiff University. E-mail: sunr10@cardiff.ac.uk

Wessam Abouarghoub [2], Cardiff University. E-mail: abouarghoubw@cardiff.ac.uk

Emrah Demir [3], Cardiff University. E-mail: demire@cardiff.ac.uk

Andrew Potter [4], Cardiff University. E-mail: PotterAT@cardiff.ac.uk

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Abstract Summary :

The global supply chain is currently in turmoil due to the Red Sea incident. Starting 19/11/2023, rising security risks in the Bab-el-Mandeb Strait have led most major shipping companies to plan ship detours around the Cape of Good Hope. This will significantly increase the transportation costs of the route, as well as the greenhouse gas emissions and the additional environmental costs. This paper calculates the Greenhouses gas (GHG) emissions of the Cape of Good Hope route using an activity-based bottom-up model based on the latest AIS data. The environmental costs of GHG emissions are determined through a literature review and the total environmental costs of new route are calculated. Finally, a scenario simulation system is developed to explore how transportation delays and additional environmental costs can be minimized simultaneously under the dual effects of adjusting vessel speed and increasing vessel schedule. The results show that the new route will increase the time of a round trip by 17-21 days and the environmental costs by 40-50.5%. The scenario analysis indicates that increasing the number of ships on the ship line generates fewer environmental costs than adjusting the speed of ships and can alleviate delays.