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Shorter shipping routes not necessarily more climate friendly

For economic and political reasons, freight shipping has begun to utilise shorter routes across Arctic waters. This study assessed the costs, emissions and climate impact of trade using the Northern Sea Route between the Northern Pacific and Europe. It concludes that there are no overall climate benefits to using this route, even though it reduces voyage distance, due to the additional impact of emissions in the Arctic region.

Maritime freight shipping is big business in Europe. Almost 90% of EU external freight trade is via sea[1], yet this generates large amounts of emissions such as greenhouse gases[2] and air pollutants.

Although historically inaccessible to ships, global warming has made large parts of the Arctic free of ice, and therefore possible to travel during summer and autumn. One popular route is the Northern Sea Route, which goes from the Atlantic to the Pacific Ocean along the Russian Arctic coast, and reduces the distance of the journey between Northern Europe and Japan by 40%. The number of recorded vessels passing through this route has increased drastically in recent years, from four in 2010 to 71 in 2013. This increase in traffic is likely to continue as the path becomes easier to traverse.

Traditionally, climate assessments of maritime transport focus on CO_2 emissions. However, the exhaust gas from ship engines also contains carbon monoxide, sulphur oxides, nitrogen oxides, methane, organic carbon and black carbon — all of which have adverse effects on climate.

This study measured the 'climate impact' of each of these emissions via Global Warming Potential (GWP), a metric that expresses emission impact as CO_2 equivalents (the impact of each pollutant in terms of the amount of CO_2 that would create the same amount of warming). This is a common method of comparing the contributions to climate change of emissions of different substances. Negative values are given to pollutants that have a cooling effect on the atmosphere, and positive values for those that warm the atmosphere. GWP values were sourced from the IPCC for each of the emission types, for the Arctic and for the rest of the world.

The impacts of emissions on climate are heavily linked to regional differences in atmosphere, sea ice and solar radiation. The Arctic is particularly sensitive to emissions and prone to large climate impact. To account for these differences, the authors used region-specific GWP characterisations.

The authors compared the emissions, costs and climate impacts of trading via the Northern Sea Route compared to the more traditional Suez Canal route, per tonne of freight transported. To do so, they applied a model that considers power requirement, cost per voyage, emissions per pollutant per voyage, and climate impact.

The study considered three different fuels: light fuel oil (sulphur content 0.5%); marine gas oil (sulphur content up to 0.1%); and liquid natural gas (sulphur content < 0.01%). Emission factors were determined for each of the fuels in grams per kilowatt hour.

Although the Northern Sea Route was cheaper per tonne of goods transported and had the lowest CO_2 emissions, when the comparison was made based on CO_2 equivalents, the Suez route had a lower climate impact than the Arctic route for all fuels.

Continued on next page.

1.http://ec.europa.eu/transport/modes/maritime/index_en.htm

2.http://ec.europa.eu/clima/policies/transport/shipping/index_en.htm

3. Smith, T.W.P. et al. (2014b) Third IMO GHG Study 2014. London: International Maritime Organisation

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The results indicate the Northern Sea Route has no overall benefits for the climate, even when cleaner fuels are used, as the impact of emissions in the Arctic region counteract the benefits of shorter voyage times. This will be a difficult trade-off for policymakers to make, as the route also offers significant economic savings.

The authors say their study also indicates the need for broadening the CO_2-only approach in climate assessment. The GWP approach can better differentiate between options, provides the opportunity to model the real-world impact of reduced operational speed, and can model the impact of different technologies and fuels within environmentally sensitive areas, like the Arctic.