

Shipping as a source of black carbon in the Arctic



The use of heavy fuel oil and diesel engines make shipping a source of black carbon in the Arctic.¹

Globally, over a 20-year period, black carbon emissions from shipping account for approximately 20% of the warming potential.² Emission in the Arctic depend on how the Arctic is defined. The *Arctic Council Expert Group on Black Carbon and Methane* states that shipping currently accounts for about 5 percent of black carbon emissions in the Arctic.³

Sources and projections

A major culprit of emissions of black carbon is the use of Heavy Fuel Oils (HFOs), accounting for approximately two thirds of the black carbon emission from shipping in the Arctic.⁴

An Arctic emissions inventory from 2015 identified fishing vessels (25%), general cargo vessels (19%), and service vessels (12%) as the top three emitters of black carbon.⁵ Globally, cruise vessels account for a disproportionate amount of emissions, where an average cruise ship has three times the emissions of black carbon of an average container ship.⁶

Satellite tracking of ships and estimates of fuel use and combustion technologies indicate that most of the emissions occur along the coasts. However, icebreakers and research vessels contribute to black carbon emission all the way to the North Pole. Emission estimates for the Arctic depend on how the Arctic is defined, where the IMO definition excludes important, but ice free, shipping regions along the coasts of Norway, Iceland and south of Anchorage Alaska.⁷

Shipping in the Arctic is increasing, especially along the coasts, where black carbon emissions in addition to the climate impacts also degrade local air quality, with potential

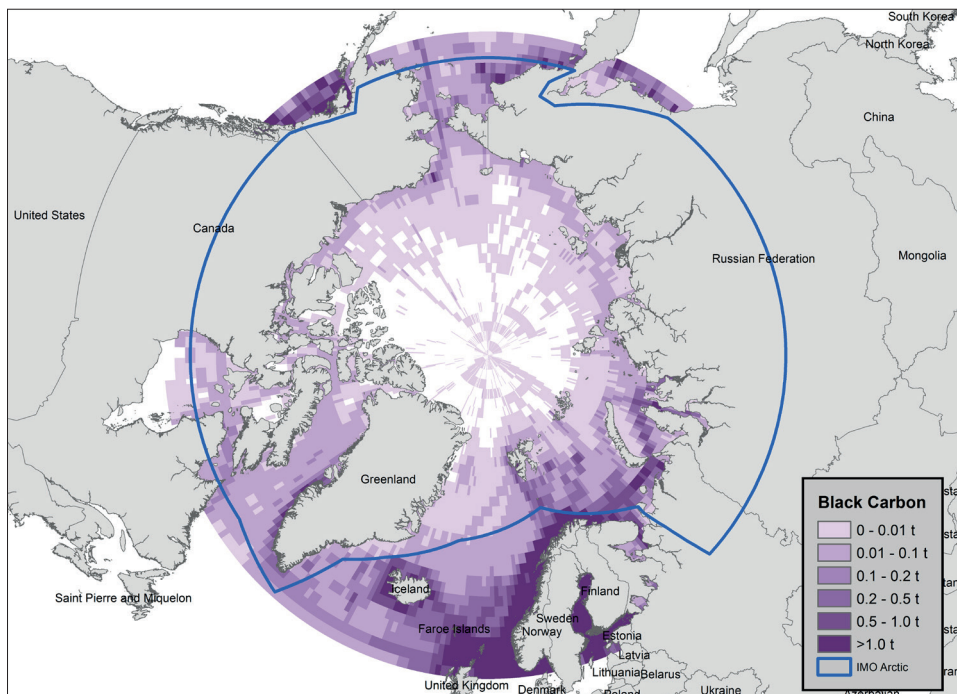
health impacts.⁸ Estimates of future transpolar shipping are uncertain, where a major shift from using the Panama and Suez canals to polar routes seems unlikely. Nevertheless, even a small such shift (1-2%), could lead to a dramatic increase in Arctic black carbon emissions unless the increase of shipping in the Arctic is accompanied by a transition to less problematic fuels and emission controls.⁹

Reducing emissions: Fuels and filters

There are several ways to reduce black carbon emissions from shipping. Most efficient is to switch from residual fuels, such as heavy fuel oil, to distillate fuels. On average, this could reduce emission by 33%. Globally such a shift could cut black carbon emission from shipping in half. Fuel quality regulations are important for driving such a shift.¹⁰

A switch to distillate fuels have the additional benefit of making it possible to use diesel particulate filters to remove black carbon from the exhaust, cutting emissions by as much as 90%. For ships that still operate on residual fuel, scrubbers could reduce black carbon emission by 30% for a vessel.¹¹

Other options for reducing black carbon emissions include a switch to Liquefied Natural Gas (LNG) fuels. This would almost eliminate emissions of black carbon, but LNG as fuel still contributes to carbon dioxide and methane emissions. More long-term options include a switch to methanol, biofuels, or hydrogen fuels. These are currently more expensive than traditional fuels.¹² A switch to electric motors is also being considered, especially for short-haul ferries.¹³



Black carbon emissions (tonnes) in the Arctic, 2015. Reproduced with permission from Comer, B. et al. (2017) Prevalence of heavy fuel oil and black carbon in Arctic shipping, 2015 to 2025. International Council on Clean Transportation; <https://theicct.org/publications/prevalence-heavy-fuel-oil-and-black-carbon-arctic-shipping-2015-2025>

Policy initiatives

Emissions from shipping are mainly regulated by the *International Maritime Organization (IMO)* and in the Arctic under IMO's International Code of Ships Operating in Polar Waters (Polar Code). Discussions are on-going about the role of better technologies and emission standards for other air pollutants and how they could also reduce emissions of black carbon. In 2018, IMO agreed on 41 appropriate ways to control black carbon from ships, including using cleaner burning fuels and capturing black carbon in diesel particulate filters.¹⁴ However, IMO has yet to decide on any control policies. Such a discussion is scheduled to take place in February 2020.¹⁵

The Arctic Council does not have any legal mandate to regulate shipping in the Arctic but is engaged in shipping issues as a knowledge provider and by presenting recommendations. Its *Expert Group on Black Carbon and Methane* issued recommendations related to shipping in both 2017 and 2019.¹⁶ The 2019 recommendations broadened an earlier focus on accelerating black carbon work under the IMO to also include activities and measures to be considered by Arctic States and, as appropriate, include other international work on black carbon emissions. The 2019 report also lists specific actions that Arctic countries have taken in relation to reducing emissions of black carbon from shipping.¹⁷



The Arctic Council *Working Group on Protection of the Arctic Marine Environment (PAME)* works specifically on mitigating risks associated with the use and carriage of Heavy Fuel Oil (HFO) by vessels in the Arctic. It includes collecting and reporting the use of heavy fuels and exploring 'environmental, economic, technical and practical aspects of the use by ships in the Arctic of alternative fuels.'¹⁸

¹ Naya Olmer et al., "Greenhouse Gas Emission from Global Shipping, 2013-2015" (Washington DC: International Council on Clean Transportation, 2017), <https://theicct.org/publications/GHG-emissions-global-shipping-2013-2015>.

² Bryan Comer et al., "Black Carbon Emission and Fuel Use in Global Shipping 2015" (Washington DC: International Council on Clean Transportation, 2017), <https://theicct.org/publications/black-carbon-emissions-global-shipping-2015>.

³ Arctic Council, "Expert Group on Black Carbon and Methane. Summary of Progress and Recommendations 2017" (Tromsø, Norway: Arctic Council Secretariat, 2017), <http://hdl.handle.net/11374/1936>.

⁴ Bryan Comer et al., "Prevalence of Heavy Fuel Oil and Black Carbon in Arctic Shipping, 2015 to 2025" (Washington DC: International Council on Clean Transportation, 2017), <https://theicct.org/publications/prevalence-heavy-fuel-oil-and-black-carbon-arctic-shipping-2015-2025>.

⁵ Comer et al.

⁶ Comer et al., "Black Carbon Emission and Fuel Use in Global Shipping 2015."

⁷ Comer et al., "Prevalence of Heavy Fuel Oil and Black Carbon in Arctic Shipping, 2015 to 2025."

⁸ Comer et al., "Black Carbon Emission and Fuel Use in Global Shipping 2015."

⁹ Comer et al., "Prevalence of Heavy Fuel Oil and Black Carbon in Arctic Shipping, 2015 to 2025."

¹⁰ Comer et al., "Black Carbon Emission and Fuel Use in Global Shipping 2015."

¹¹ Comer et al.

¹² Comer et al.

¹³ Mia Bennett, "Greening the World's Blue Highways," *The Maritime Executive* (blog), May 1, 2019, <https://www.maritime-executive.com/magazine/greening-the-world-s-blue-highways>.

¹⁴ Bryan Comer and Dan Rutherford, "Turning the Ship, Slowly: Progress at IMO on New Ship Efficiency and Black Carbon," *International Council on Clean Transportation* (blog), May 21, 2019, <https://theicct.org/blog/staff/mepc74>.

¹⁵ Jane George, "IMO Pushes Back Talks on Limiting Arctic-Warming Black Carbon Emissions to 2020," *Arctic Today*, June 3, 2019, <https://www.arctictoday.com/imo-pushes-back-talks-on-limiting-arctic-warming-black-carbon-emissions-to-2020/>; Safety4Sea, "NGOs Criticize Lack of Action on Arctic Black Carbon Emissions," May 20, 2019, <https://safety4sea.com/ngos-criticize-lack-of-action-on-arctic-black-carbon-emissions/>.

¹⁶ Arctic Council, "Expert Group on Black Carbon and Methane. Summary of Progress and Recommendations 2017"; Arctic Council, "Expert Group on Black Carbon and Methane. Summary of Progress and Recommendations 2019" (Tromsø, Norway: Arctic Council Secretariat, 2019), <http://hdl.handle.net/11374/2411>.

¹⁷ Arctic Council, "Expert Group on Black Carbon and Methane. Summary of Progress and Recommendations 2019."

¹⁸ Additional information can be found on the following PAME web portal: www.arcticshippingforum.is as well as PAME's Arctic Ship Traffic Database: www.astdt.is

Why is black carbon a concern in the Arctic?

What is the European Union action on black carbon in the arctic?

The European Union (EU) Action, which runs from 2018–2020, will contribute to efforts to reduce black carbon emissions in the Arctic by:

- Supporting the development of commitments and targets to limit production of Arctic black carbon, with a focus on the three regionally important human sources from Arctic nations (gas flaring from oil and gas fields, residential heating—including heating stoves and diesel fuel use—and maritime shipping); and
- Enhancing international cooperation on black carbon policy in the Arctic region.

The action has four major work components:

- Improving the knowledge base on black carbon emissions,
- Increasing awareness and sharing knowledge,
- Preparing technical advice documents and scenario analyses, and
- Supporting development of a roadmap for international cooperation on black carbon.

Why is the EU interested in taking action on black carbon in the Arctic?

The Arctic is a strategically important region and is experiencing dramatic, transformative impacts from climate change. The EU recognizes the importance of taking action now on black carbon to reduce its warming effect on the Arctic, improve air quality, and protect human health. Cost-effective technologies to reduce black carbon emissions already exist and can be implemented now.



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For further information, visit <https://eua-bca.amap.no/maritime-shipping>