

# Black carbon and shipping: Trends and policy options to protect the Arctic and the planet

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Clean Arctic Alliance World Oceans Day Event

# What to expect

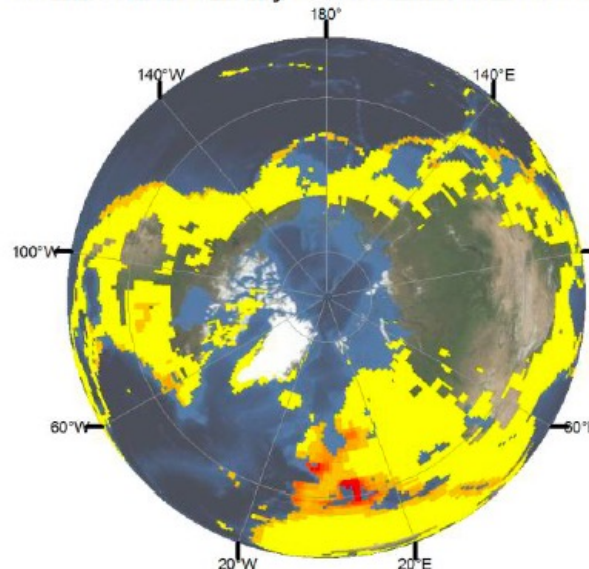
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Today, I'll do the following:

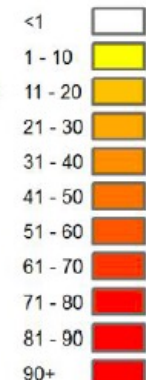
- Explain trends in BC emissions from ships in the Arctic and globally
- Describe the impact of IMO's Arctic HFO ban on BC emissions
- Present the BC emissions reduction potential of switching from HFO to distillates
- Explain the additional benefits of switching to distillates compared to HFO and VLSFO
- End with some conclusions

# Black carbon is a climate pollutant and a health hazard

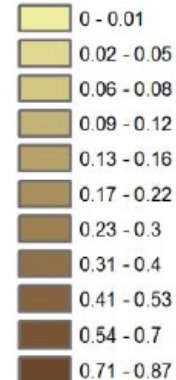
Premature Mortality Rates Attributed to Ship BC & POM



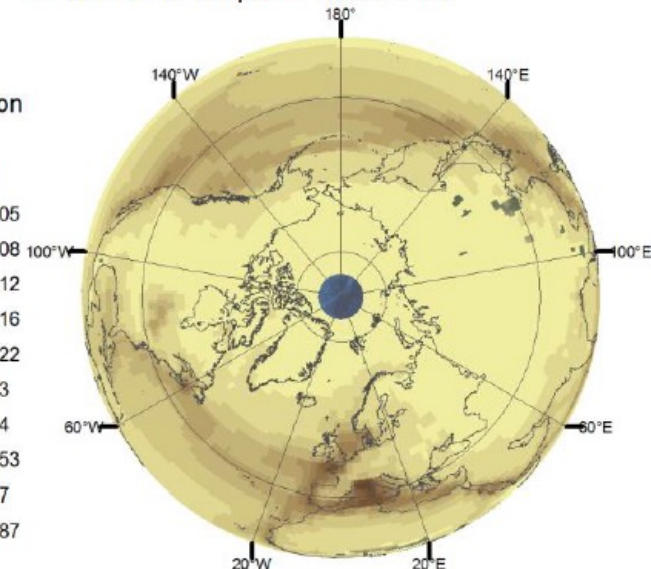
Premature  
Mortality Rate  
(per million)



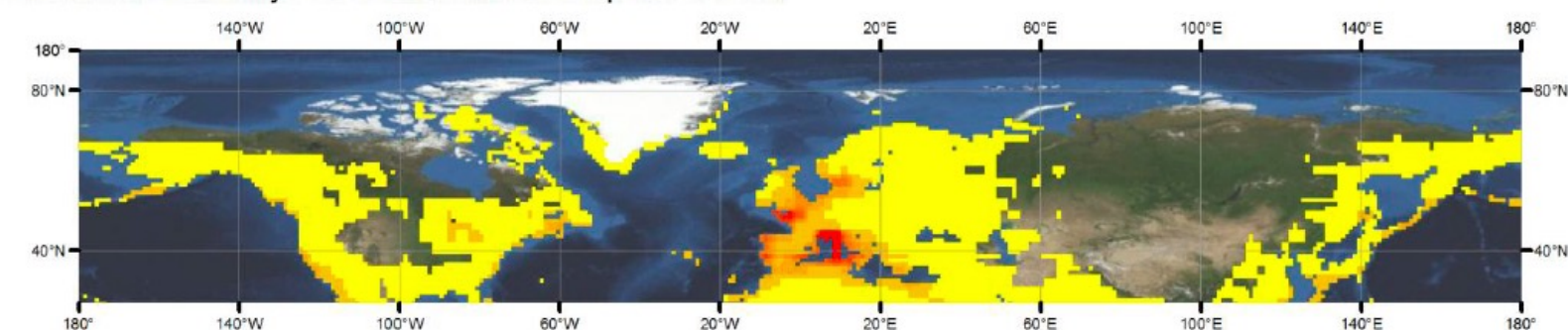
PM  
Concentration  
Change



$\Delta$ PM due to ship BC and POM



Premature Mortality Rates Attributed to Ship BC & POM

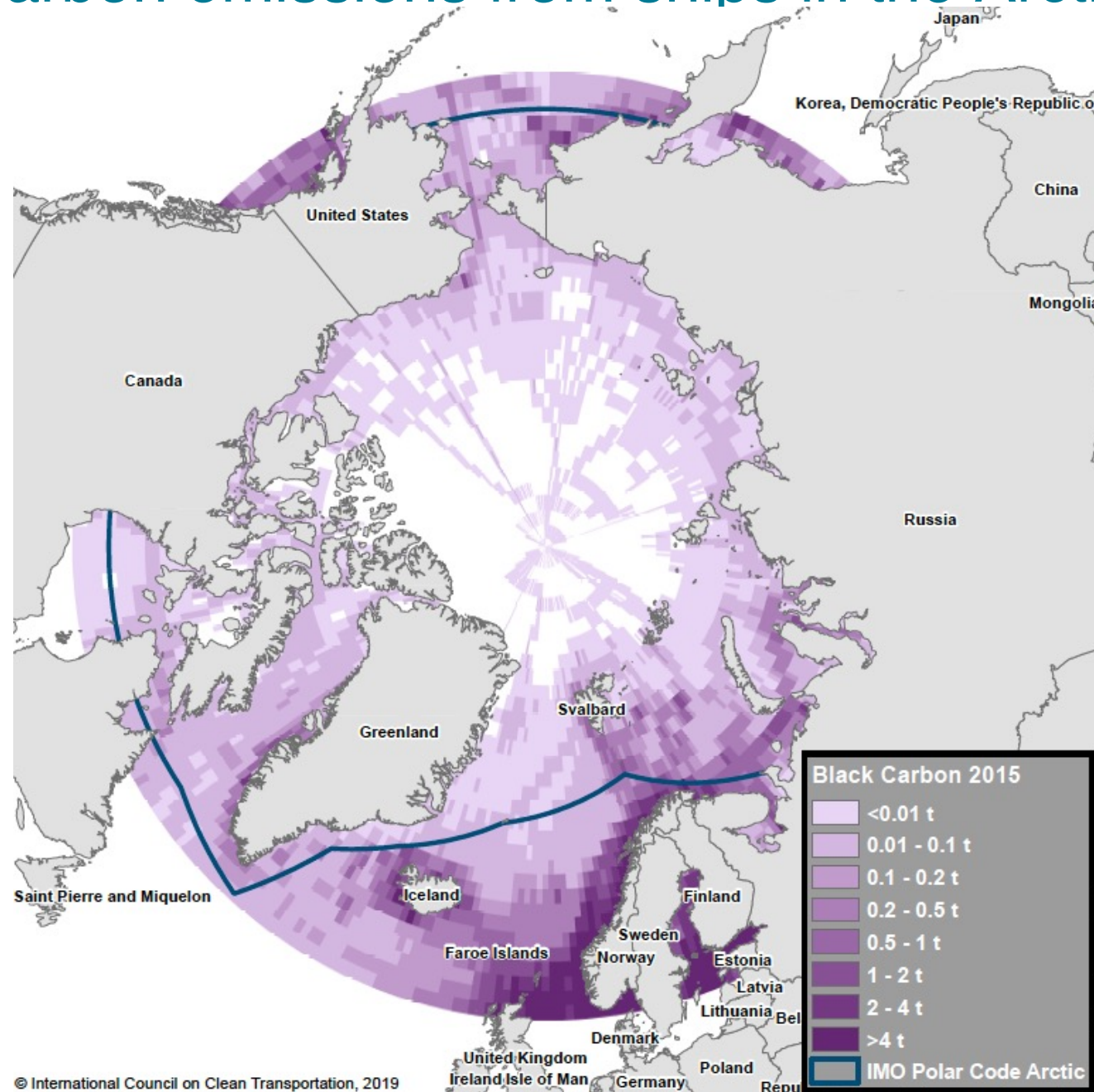


Source: Green, E., Silberman, J., Comer, B., Winebrake, J., & Corbett, J. (2011). *Mortality in latitudes 40°N and above from primary particulate matter emissions by shipping*. Published as IMO document MEPC 62/INF.32, annex (CSC).

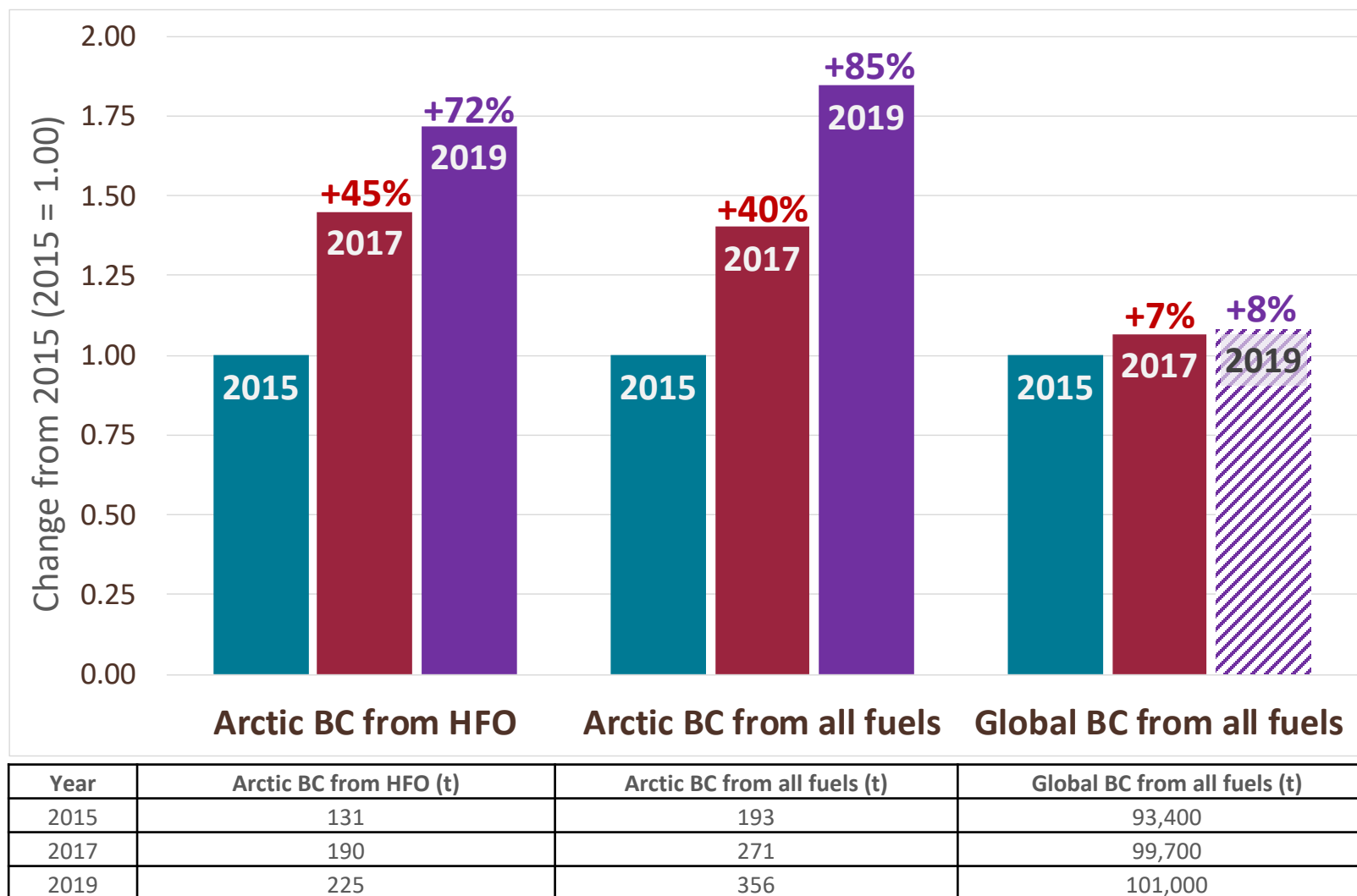
BC and solid particles emitted >40°N account for approx. **6200 premature deaths each year**

# Black carbon emissions from ships in the Arctic, 2015

**1450 tonnes of BC**  
emitted  $>59^{\circ}\text{N}$ ; including  
193 t BC in IMO Arctic



# Black carbon emissions from ships in the Arctic and globally relative to 2015

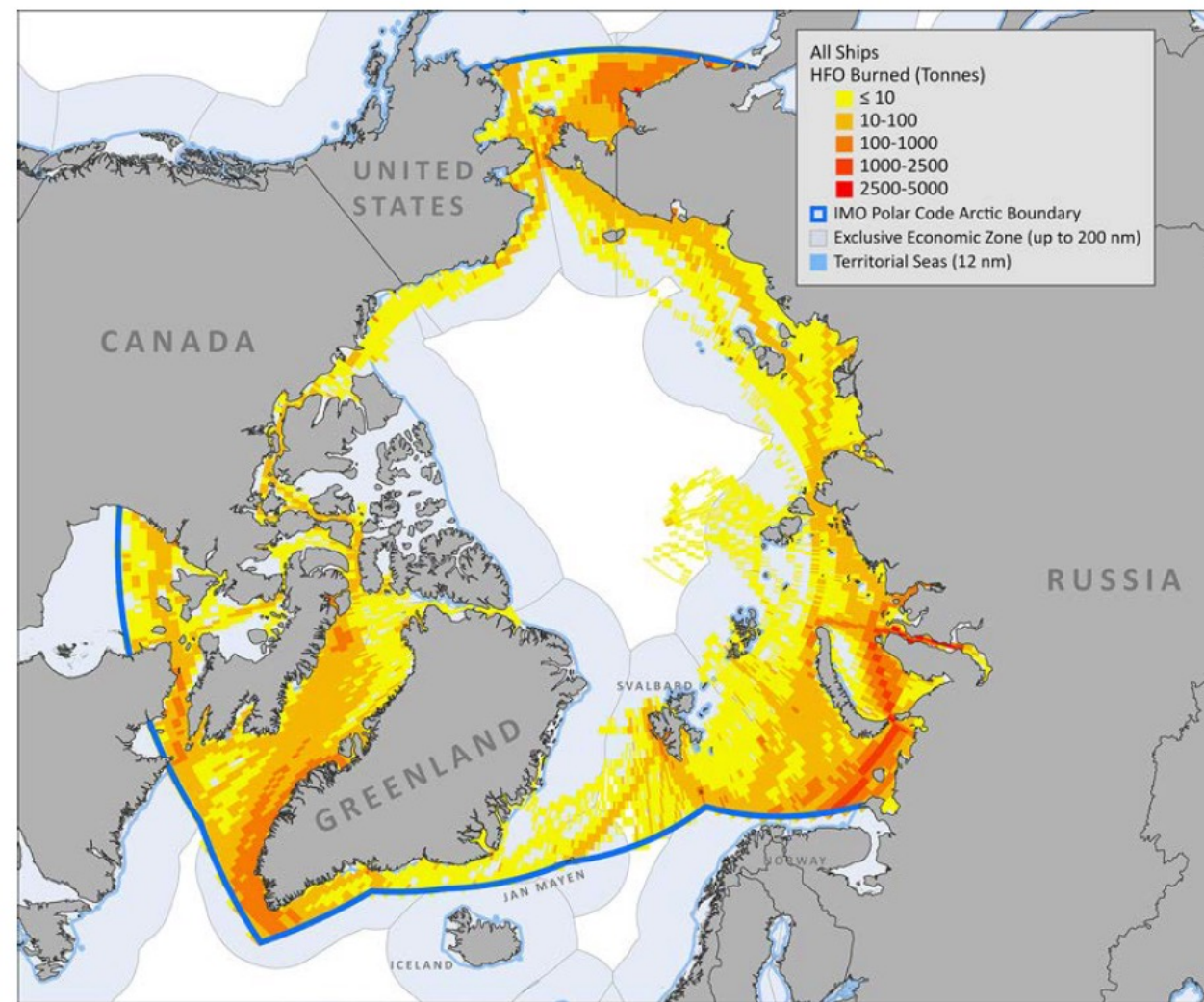




# What impact will IMO's Arctic HFO Ban have on BC emissions?

- In November 2020, MEPC 75 approved the HFO ban, which begins in July 2024, but:
  - It only covers the IMO Arctic
  - Ships built after August 2010 are exempt for 5 years because they have protected fuel tanks
  - Russia, USA, Canada, Norway, and Denmark can grant 5-year waivers to their ships in their waters, including their EEZs

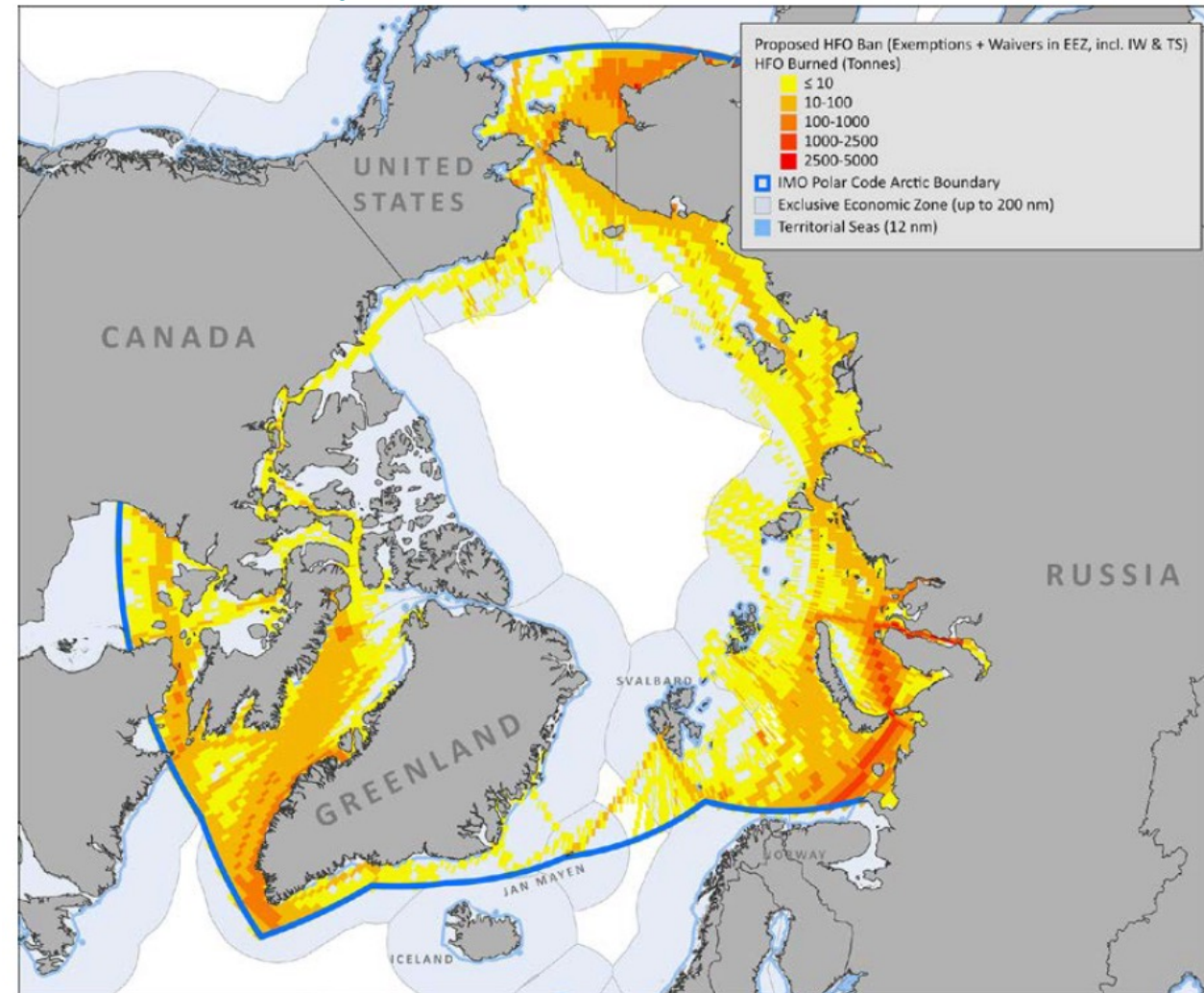
## 2019 Arctic HFO use



**Figure 6.** HFO used by ships in the Arctic in 2019

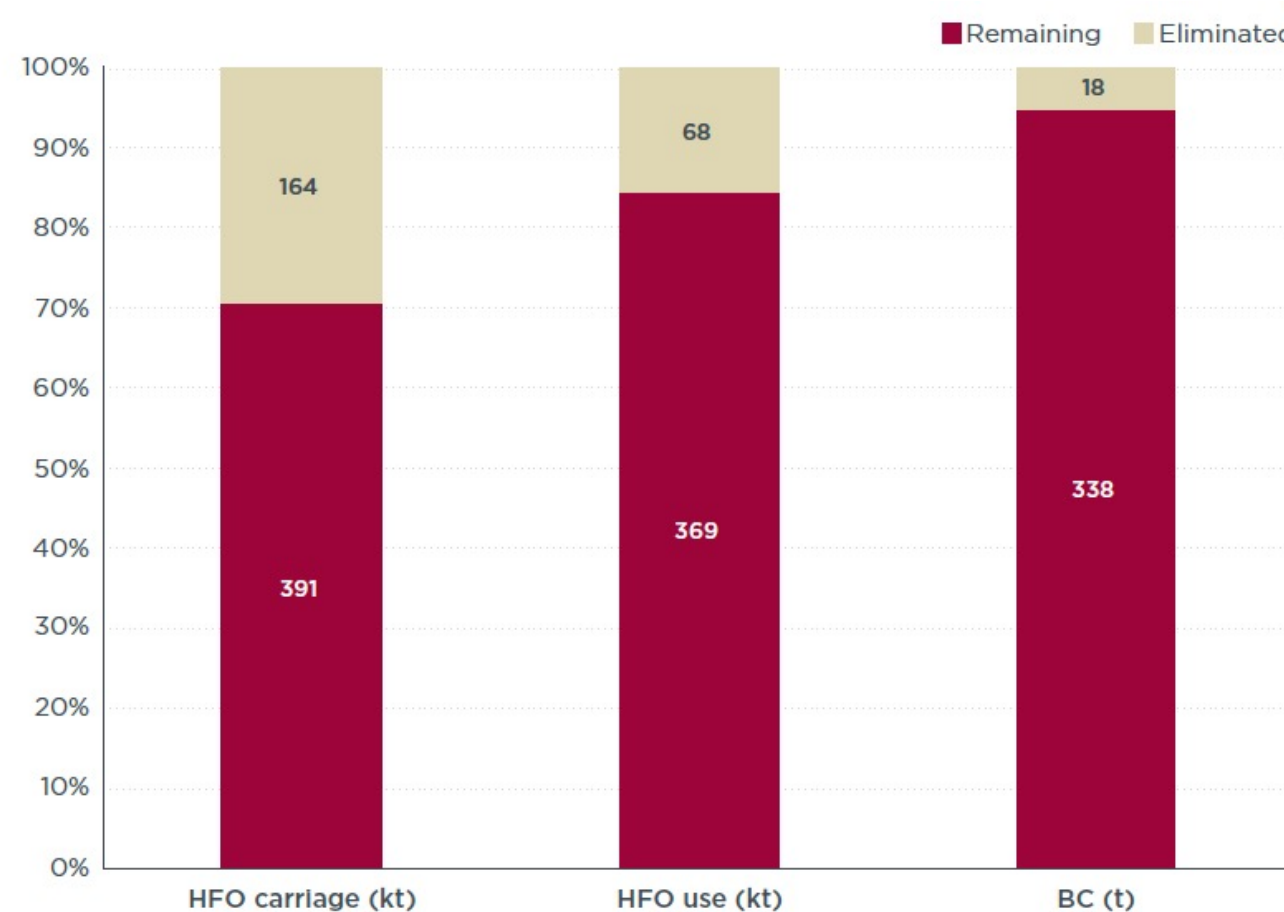
Source: Comer et al. (2020). *The International Maritime Organization's proposed Arctic heavy fuel oil ban: Likely implications and opportunities for improvement*, <https://theicct.org/publications/analysis-HFO-ban-IMO-2020>.

## Arctic HFO use remaining under the ban: Due to exemptions and waivers, only 16% of HFO use is banned



**Figure 19.** HFO use that would have been allowed under the proposed ban, had it been in place in 2019.

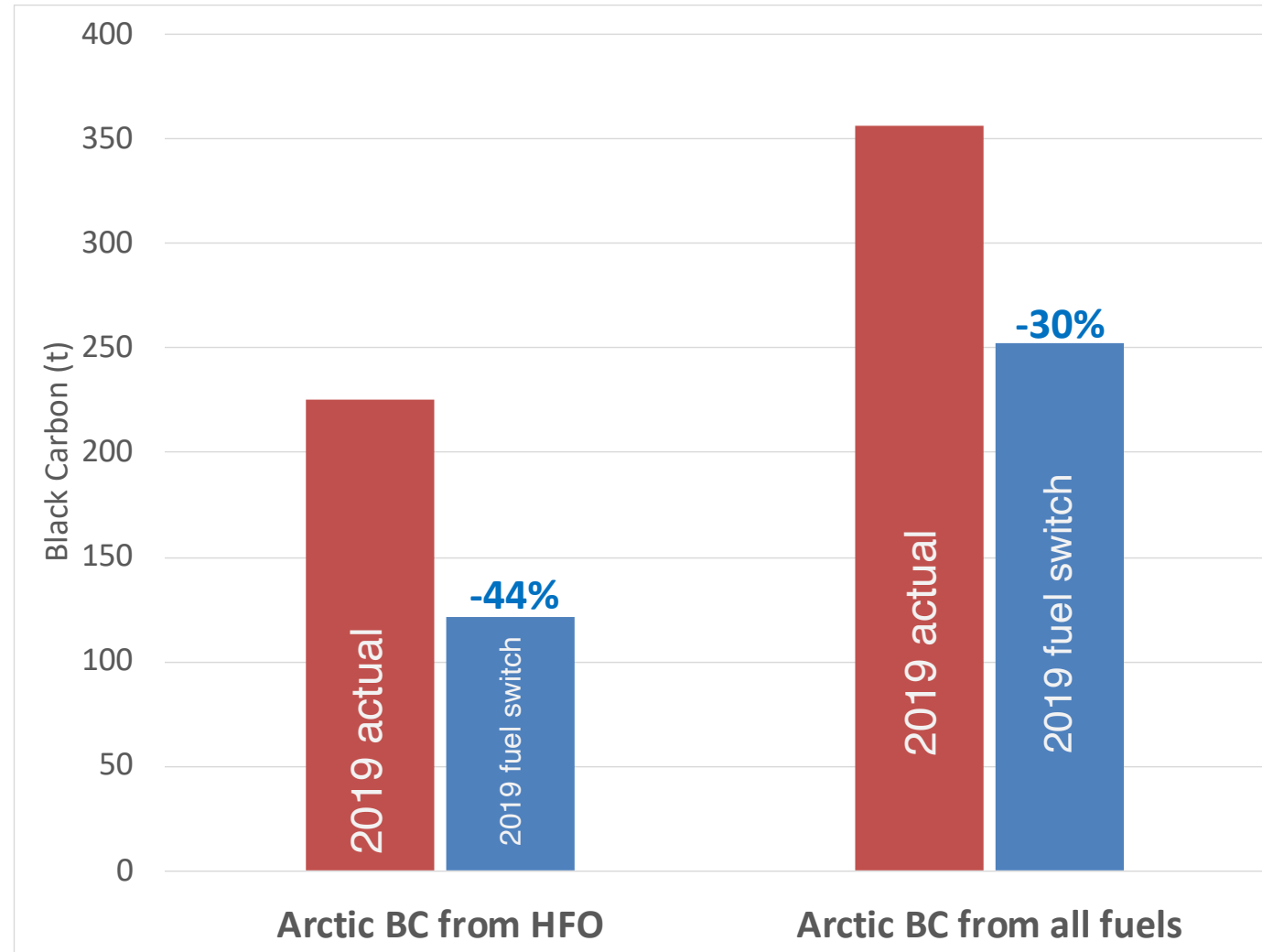
Due to exemptions and waivers, the proposed ban would only eliminate 30% of HFO carriage and 16% of HFO used in the Arctic, reducing BC emissions by just 5%



**Figure 8.** Amount of HFO carriage, HFO use, and BC emissions remaining or eliminated as a consequence of the proposed HFO ban.



# Arctic black carbon emissions if HFO-fueled ships switch to distillates, shown in blue (2019 example)



# Additional benefits of switching to distillates

- **Lowers air pollution.** Using distillates reduces  $\text{SO}_x$ , PM, and BC relative to VLSFO and HFO.
- **Enables exhaust aftertreatment:** Using distillates allows for the possibility of using BC after-treatment technologies like diesel particulate filters and electrostatic precipitators. Both reduce BC emissions by >90%.
- **Lowers potential spill costs.** Distillate spills are expected to be 30% less costly than VLSFO and 70% less than HFO.

Sources (in order):

- Comer, B., Georgeff, E., & Osipova, L. *Air emissions and water pollution discharges from ships with scrubbers*. ICCT. Available at <https://theicct.org/publications/air-water-pollution-scrubbers-2020>.
- ICCT (2019). *6<sup>th</sup> workshop on marine black carbon emissions*. Available at <https://theicct.org/events/6th-workshop-marine-black-carbon-emissions>
- Comer (2019). *Transitioning away from heavy fuel oil in Arctic shipping*. ICCT. Available at <https://theicct.org/publications/transitioning-away-heavy-fuel-oil-arctic-shipping>

# Conclusions

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- BC is a climate pollutant and a health hazard
- BC emissions from ships are growing globally and even more rapidly (>10x faster) in the Arctic.
- IMO's HFO ban will only reduce Arctic BC emissions by only 5% until exemptions and waivers expire.
- Switching from HFO to distillates would immediately reduce BC emissions from ships. BC emissions from HFO-fueled Arctic ships would fall 44%, reducing Arctic-wide ship emissions 30%.
- Switching to distillates has the added benefits of lowering air pollution, enabling the use of exhaust after-treatment, and lowering potential spill costs compared to VLSFO and HFO.

Thank you for your attention!  
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