Carbon Footprints of Antarctic Activities

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**Information Paper submitted by ASOC**

***Summary***

Almost every human activity in Antarctica carries a carbon footprint. At present, there are no requirements for fishing and tourist vessels, logistics vessels and aircraft for stations or station operations to calculate their carbon emissions. Without that data, it will be impossible to reduce and/or offset those carbon loads in a timely and effective way. ASOC suggests that the ATCM, CCAMLR and COMNAP, and their membership consider how they could monitor the carbon footprint of Antarctic activities (including black carbon). This could eventually lead to a systematic approach to reducing carbon emissions and local black carbon pollution from all activities in the Antarctic.

***Introduction***

In February 2023, NGOs associated with Ocean Geographic and Mission Blue worked with Aurora Expeditions to take a group of 94 people to Antarctica on the new *Sylvia Earle* vessel. The organizers calculated the carbon footprints of all passengers involved, including their roundtrip flights to Buenos Aires, feeder flights to Ushuaia, the vessel’s fuel use, and the flights from King George Island to Punta Arenas and on to Santiago. The totals for the ship (119 metric tonnes of Low Sulphur Marine Gas Oil producing 378 tonnes of CO2) and the flights (over 400 tonnes of CO2) were allocated to each person based on their air itineraries. Combined, that is equivalent to approximately 800 economy round-trip flights between New York and London or 2 million miles by car. The calculation did not include crew flights to and from the ship, or the carbon implications of the food and other supplies used during the voyage. The black carbon emissions from this one voyage were between 30 – 46 kg.[[1]](#endnote-1)

Additionally, passengers on the vessel engaged in a citizen science program that conducted analyses at each landing site. A final report on their findings will be released on June 8. Similar science activities are carried out on some IAATO expeditions. These programs yield two benefits: informing the passengers of the implications and impacts of their activities, thus allowing them to choose fully vetted offset investments; and building a database that can be updated through time.

***Accounting for current emissions from Antarctic activities***

Calculations of carbon footprint or emissions are not standard for Antarctic activities, whether tourism, fishing and associated activities, or research. As well as a growing number of ships, the number and variety of aircraft continues to expand for tourism, logistics and science.

The two main vectors of Antarctic tourism are traditional shipborne tourism, primarily focused in the Antarctic Peninsula area; and tourism in the Antarctic interior, which is air-supported, land-based, and spread out over a large area. There are a number of fly-sail operations using King George Island as either a gateway to or departure from a ship.[[2]](#endnote-2) It is unclear to what extent Antarctic tourism operators track their carbon footprints or fuel usage, although several tour companies claim to be ‘carbon neutral’ and a few companies have experimented with carbon offsets for their passengers.

The International Association of Antarctica Tour Operators (IAATO) has taken some proactive steps to reduce emissions from its members’ vessels. In October 2021 it agreed to an ambitious plan to track the International Maritime Organization (IMO) Greenhouse Gas (GHG) Strategy target of at least 50% emissions reductions by 2050 compared with 2008, and a global goal of net zero before 2050. For the first time each member will submit seasonal fuel consumption data to the Association’s secretariat as part of its climate change strategy for Antarctic tourism.[[3]](#endnote-3) This is a welcome development, and a possible model for Antarctic Treaty and CCAMLR Parties

At present, CCAMLR does not have a measure in place to require fishing or transhipment vessels to account for the quantities of fuel used while in the Antarctic or in transiting to and from the Southern Ocean, nor does it have any regulations on limiting fuel use or emissions.

COMNAP maintains a database of ships involved in supplying Antarctic science stations and exchanging expedition members.[[4]](#endnote-4) Many new vessels have been commissioned in recent years or are currently on order that provide safer and more environmentally friendly operations. COMNAP published a paper in 2021 describing new research vessels with technologies that improve fuel efficiency,[[5]](#endnote-5) but which still burn substantial amounts of marine diesel fuel.

In 2017, COMNAP produced a catalogue of all stations, which contains information about each facility including fuel usage.[[6]](#endnote-6) Since then, the information for some but not all stations has been updated.[[7]](#endnote-7) UNLESS, an NGO active on Antarctic issues, canvassed 77 Antarctic stations in its landmark publication Antarctic Resolution.[[8]](#endnote-8) Only Princess Elisabeth is reported close to being a carbon zero station, and it operates only in the summer. Neither the COMNAP nor UNLESS databases contain detailed information on (1) how energy is generated or (2) total annual fuel use by category.

The IMO has taken some steps that could supply more information on Antarctic activities. In 2016, the IMO adopted the Ship Fuel Oil Consumption System, requiring reporting for all vessels 5000 GT or larger. [[9]](#endnote-9) In 2022 it published Guidelines for Ship Energy Efficiency Management Plans,[[10]](#endnote-10) Administration Verification of Ship Oil Consumption Data,[[11]](#endnote-11) the Ship Fuel Oil Consumption Database,[[12]](#endnote-12) and Submission of Data to the IMO Data Collection System.[[13]](#endnote-13) Starting in 2023, this data is being used to calculate each ship’s Operational Carbon Intensity. If this approach were applied to fishing vessels, it would make a big difference both in Antarctica and the global ocean. The IMO has yet to require particulate filters or other technology to prevent black carbon from being emitted in the Antarctic Special Area. Although there has been active discussion of measures to be applied to reduce the impact of black carbon on the Arctic for over a decade nothing mandatory has been agreed as yet.[[14]](#endnote-14)

Climate change has been a significant focus of the Antarctic Treaty System for many years, including numerous workshops, resolutions and papers introduced by Parties, Observers and SCAR.[[15]](#endnote-15) There will be a special focus on the issue at this year’s Antarctic Treaty Consultative Meeting. The IPCC’s 6th Assessment Report concludes that there is now high confidence that abrupt and/or irreversible change will occur in the climate system when tipping points are reached, which will lead to further global warming. At sustained levels of warming between 2-3ºC the West Antarctic ice sheet could be lost completely and irreversibly.

At the same time, over the last three decades, the pace and extent of all Antarctic activities has increased substantially. In 2022, IAATO anticipated that 2022-23 activity levels will rise as forecasted to pre-pandemic rates.[[16]](#endnote-16) Tourism was estimated to have reached a total of around 104,000 people this past season (2022-23), involving more air support and many different types and sizes of vessels. Helicopters and submersibles are increasingly being used as well. In the 1992-93 season a year after IAATO was founded, there were 6,700 tourists. More than 56,000 visited in the 2018-19 season.[[17]](#endnote-17)

Fishing and research activities are also on the rise. CCAMLR has licensed 36 fishing vessels from 12 countries fishing in the Southern Ocean,[[18]](#endnote-18) with other vessels used to support fishing activities operate in the Southern Ocean, but their numbers are not well known. Likewise, the number and sizes of science stations have increased in the past decade, as have the logistics vessels and planes needed to supply them and exchange personnel. COMNAP’s database lists 72 vessels involved in logistics.

Although there has been a global focus on reducing CO2 emissions to combat climate change, Antarctic Treaty System bodies have not extensively discussed emissions from activities in the Antarctic. There are no ATCP Measures or recommendations specifically about reducing fuel use in the building and operation of stations, for the logistics involved in supplying them, or for the scientific activities carried out. Even if these activities are only a small part of global emissions, there is evidence that black carbon from local activities directly exacerbates Antarctic melting.[[19]](#endnote-19) Moreover, as the scale of the human footprint increases in Antarctica and the Southern Ocean, now is the time for the Antarctic Treaty System to show global leadership by contributing to efforts to reduce the emissions impact of Antarctic activities.

The IMO has taken some steps designed to reduce the impact of shipping, including designating the Antarctic Treaty Area as a Special Area under the International Convention for the Prevention of Pollution from ships (MARPOL) Annexes I (oil), II (chemicals) and V (garbage). Additionally, the use and carriage of heavy fuel oil in the Southern Ocean was banned in 2011 given the Antarctic’s Special Area status. Although the IMO has not set fuel efficiency or emissions standards for vessels operating in the Southern Ocean, in 2011 it adopted amendments to MARPOL Annex VI to mandate technical and operational energy efficiency measures to reduce the amount of CO2 emissions from international shipping.[[20]](#endnote-20) That initiative is driving innovation in the shipping sector. The Antarctic Treaty System should draw on the IMO's climate change and air pollution measures aimed at shipping globally and identify what additional measures are required to better protect the Antarctic region.

***Next steps***

ASOC believes that a better understanding of the carbon footprint of Antarctic activities would be a useful foundation for developing future ATCM instruments designed to reduce the environmental impact of those activities. To achieve this, ASOC proposes to produce an analysis and estimate of the emissions generated by fishing, tourism, and scientific research that is as thorough and accurate as possible, aiming to present it at the 2024 ATCM. We look forward to working with ATCPs, IAATO, NAPs, COMNAP, and other ATCM and CCAMLR Observers and Experts to obtain accurate information that could be used to complete this analysis.

ASOC suggests that the ATCM, CCAMLR and COMNAP, and their membership consider how they could monitor the carbon footprint of Antarctic activities (including black carbon). This could eventually lead to a systematic approach to reducing carbon emissions and local black carbon pollution from all activities in the Antarctic.

1. Using the IMO’s 4th GHG study we calculated 119 tonnes @ 0.38 kg/tonne = 45.22 kg of black carbon; using the Comer & Osipova study we calculate 119 tonnes @ 0.26 kg/tonne = 30.94 kg of black carbon. [↑](#endnote-ref-1)
2. Antarctic and Southern Ocean Coalition (ASOC). 2022. Antarctic tourism policies after the “pandemic pause”ATCM XLIV - CEP XXIV. [↑](#endnote-ref-2)
3. See <https://iaato.org/antarctic-tour-operators-fuel-consumption-to-be-analysed-as-they-embark-on-climate-strategy/>. The fuel data submissions will include vessels of all sizes, aircraft, and accessory vehicles. [↑](#endnote-ref-3)
4. See <https://github.com/PolarGeospatialCenter/comnap-antarctic-vessels/releases>. This is a comprehensive list of vessels administered by/for National Antarctic Programs operating below 60°S latitude for science/science support and logistics purposes. The information included in the datasets was provided by each National Antarctic Program to COMNAP and is updated frequently. Data hosted by the [Polar Geospatial Center](https://www.pgc.umn.edu/). [↑](#endnote-ref-4)
5. Rogan-Finnemore M, Ojeda M, Paz Acosta JM, Bretel P, Browne N, Flått S, Shuoren W, and Sliester R. Icebreaking polar class research vessels: New Antarctic fleet capabilities. Polar Record 57(e46): 1–9. https:// doi.org/10.1017/S003224742100067X [↑](#endnote-ref-5)
6. See <https://static1.squarespace.com/static/61073506e9b0073c7eaaf464/t/611497cc1ece1b43f0eeca8a/1628739608968/COMNAP_Antarctic_Station_Catalogue.pdf>. [↑](#endnote-ref-6)
7. See <https://github.com/PolarGeospatialCenter/comnap-antarctic-vessels>. [↑](#endnote-ref-7)
8. Antarctic Resolution, Giulia Foscari, ed. Lars Muller Publishers (2021). See page 494 for a list of stations, broken down by fuel type (either fully fossil or partly fossil and partly renewable). [↑](#endnote-ref-8)
9. <https://www.imo.org/en/ourwork/environment/pages/data-collection-system.aspx>. The aggregated data is reported to each flag state at the end of each calendar year, and that data is supposed to be uploaded to the IMO’s Ship Fuel Consumption Database by June 30th. The IMO will produce an annual report to its Marine Environmental Protection Committee annually. Thus far there is no publicly available information on compliance with this new system. Under MEPC rules, the data will be anonymised in such a way that identification of a specific ship is not possible. [↑](#endnote-ref-9)
10. [https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Air pollution/MEPC.346%2878%29.pdf](https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Air%20pollution/MEPC.346%2878%29.pdf) [↑](#endnote-ref-10)
11. [https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Air pollution/MEPC.348%2878%29.pdf](https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Air%20pollution/MEPC.348%2878%29.pdf) [↑](#endnote-ref-11)
12. [https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Air pollution/MEPC.1-Circ.871-Rev.1.pdf](https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Air%20pollution/MEPC.1-Circ.871-Rev.1.pdf) [↑](#endnote-ref-12)
13. [https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Air pollution/MEPC.1-Circ.871-Rev.1.pdf](https://wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Air%20pollution/MEPC.1-Circ.871-Rev.1.pdf) [↑](#endnote-ref-13)
14. PPR 10/6/3 A pathway for regulation of Black Carbon impacting the Arctic. Submitted by FOEI, WWF, CSC and Pacific Environment. 17 February 2023. [↑](#endnote-ref-14)
15. # See for example WG-EMM-16/71, SC-CAMLR Work on Climate Change (Paper XP19 to CEP–SC-CAMLR Workshop 2016); Australia and Norway, WG-FSA-17/01, Proposal for a Climate Change Response Work Program for CCAMLR; ASOC, CCAMLR-XXVII/BG/27, Impacts of Climate Change on Antarctic Marine Ecosystems: A Call for Action; Australia, SC-CAMLR-XXVIII/BG/17, Southern Ocean Sentinel: An International Program to Assess Climate Change Impacts on Marine Ecosystems.

    [↑](#endnote-ref-15)
16. # IAATO 2022. IAATO Overview of Antarctic Tourism: 2021-22 Season and Preliminary Estimates for 2022-23 Season ATCM XLIV/IP 42.

    [↑](#endnote-ref-16)
17. See Paige McClanahan, Tourism in Antarctica: Edging Toward the (Risky) Mainstream, New York Times February 26, 2020. <https://www.nytimes.com/2020/02/26/travel/antarctica-tourism-environment-safety.html>. [↑](#endnote-ref-17)
18. Australia, Chile, China, France, Japan, South Korea, New Zealand, Norway, South Africa, Spain, Ukraine and United Kingdom. See <https://www.ccamlr.org/en/compliance/authorised-vessels-0>. [↑](#endnote-ref-18)
19. https://www.nature.com/articles/s41467-022-28560-w [↑](#endnote-ref-19)
20. [https://www.imo.org/en/OurWork/Environment/Pages/Improving the energy efficiency of ships.aspx](https://www.imo.org/en/OurWork/Environment/Pages/Improving%20the%20energy%20efficiency%20of%20ships.aspx). [↑](#endnote-ref-20)