Arctic Ship Traffic Data

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www.astd.is

PAME Workshop on Observer engagement in shipping work

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Arctic Ship Traffic Data (ASTD)

- First comprehensive Arctic shipping activity database
- Detailed statistics on multiple aspects, including:
  - Ship emissions
  - Number of ships in the Arctic
  - Types of ships in the Arctic
  - Fuel use and consumption of fuel
  - Traffic in specific areas in the Arctic (EEZ's, LME's, Polar Code Area etc).
  - Number of ships in Arctic Ports
- **Download of data a crucial aspect**

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Arctic Ship Traffic Data (ASTD)

Purpose:

Collect historical information about shipping activity in the Arctic from the Arctic States to use for trend analysis and related purposes under the auspices of the Arctic Council.

Outcome:

User-friendly maritime traffic analyses of Arctic shipping data that benefits the Arctic Council, its working groups and subsidiary bodies.

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ASTD: Main Goals

- Provide reliable data for different analyses performed under the realm of the Arctic council
  - For its Member States
  - Permanent Participants
  - Working Groups
  - Observers
  - Recognized research Institutes
  - Academic institutions
- Promote Arctic research and development by offering high quality data

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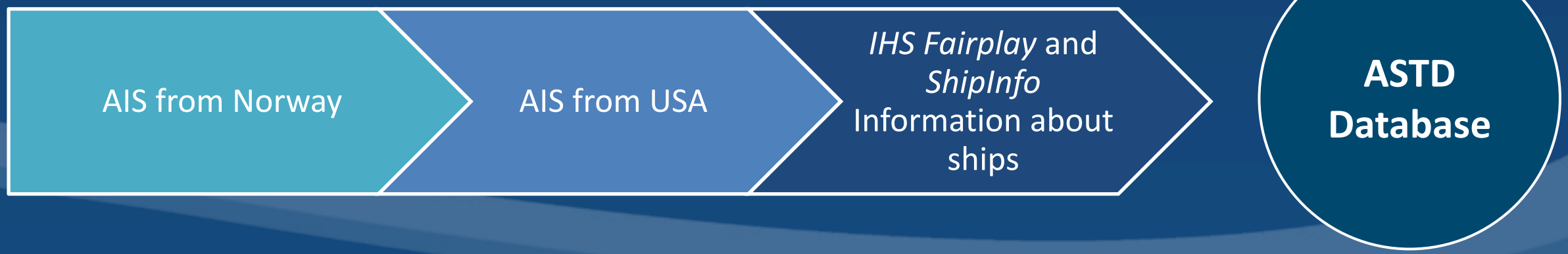
Data

- Data comes from Norway and USA
  - **Over 20 satellites and 50 base-stations**



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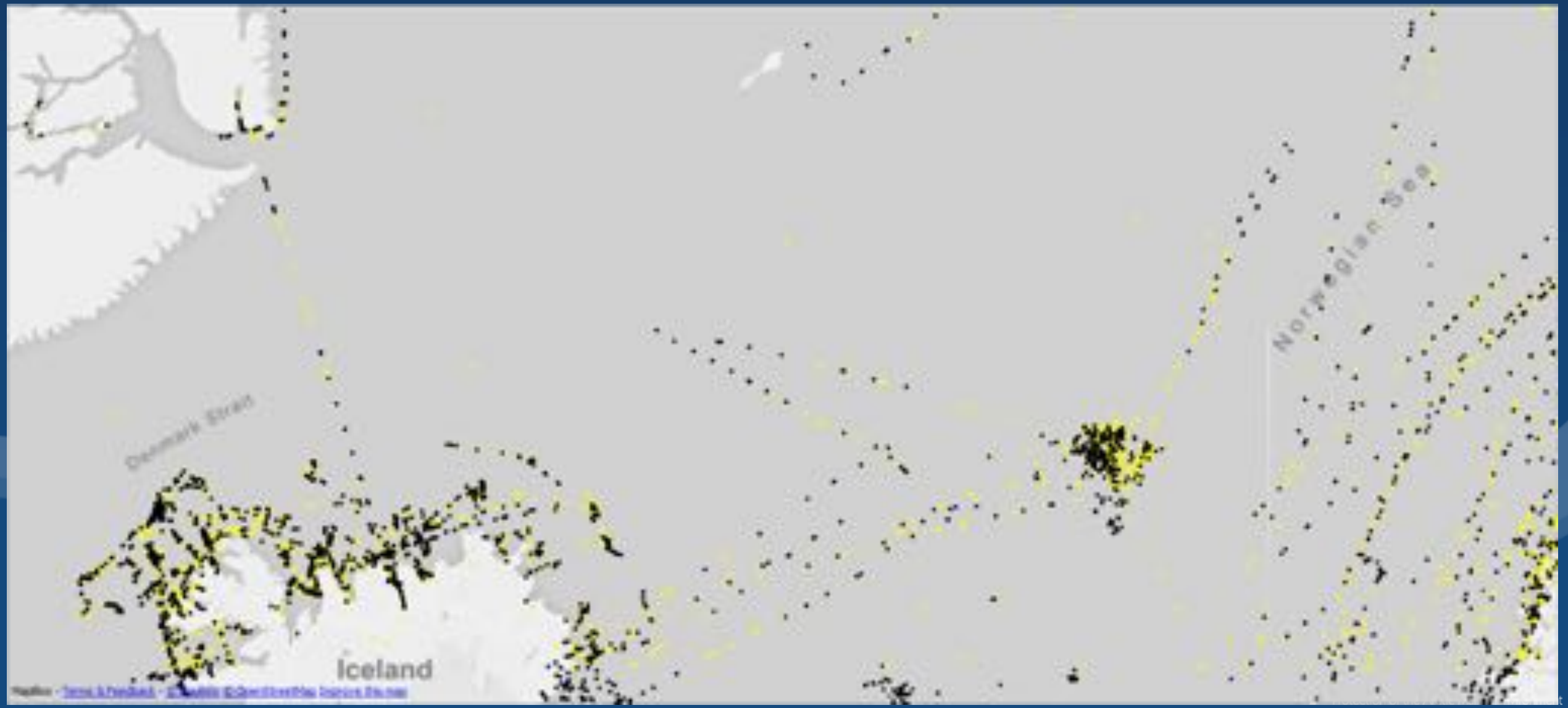
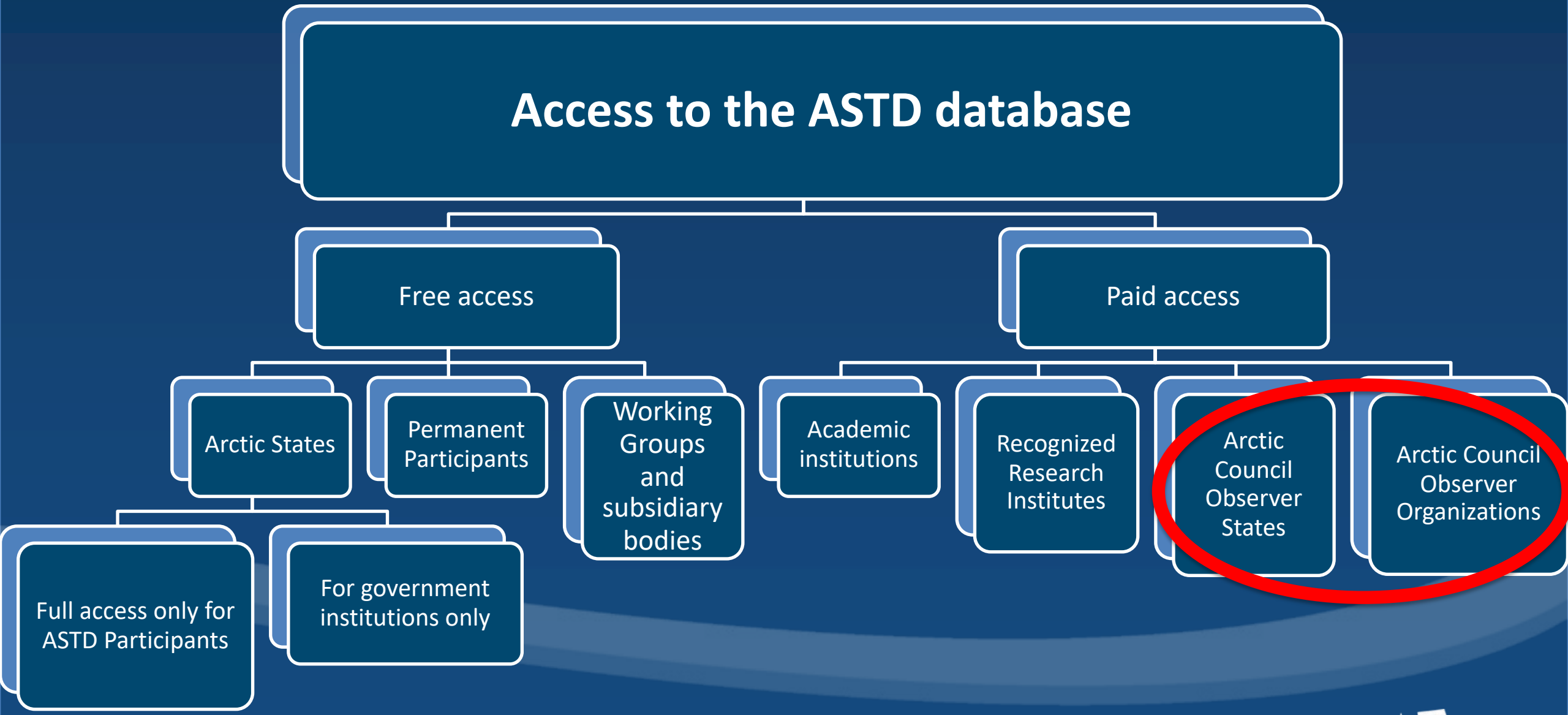
High data quality and accuracy



Access to the ASTD database



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ASTD Fee Structure

Cost for access:

- Several people can access for a specific time chosen within each country/organization

Nr.	Time	Cost (USD)
1.	1 month	500
2.	3 months	800
3.	6 months	1000
4.	12 months	1500
5.	36 months	4000
6.	48 months	5000

ASTD Library

- PAME website will publish information:
  - Shipping analysis
  - Maps
  - Charts
  - Graphics
  - Reports
  - Files for download for analysis
- Proposed project to publish regular reports on Arctic shipping activites

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DEMO: *Non-Arctic ships in the Arctic*

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The Polar Code Area

IMO definition of the Polar Code Arctic area:
In general north of 60° N but limited by a line from Greenland; south at 58° - north of Iceland, southern shore of Jan Mayen - Bjørnøya – Cap Kanin Nos.

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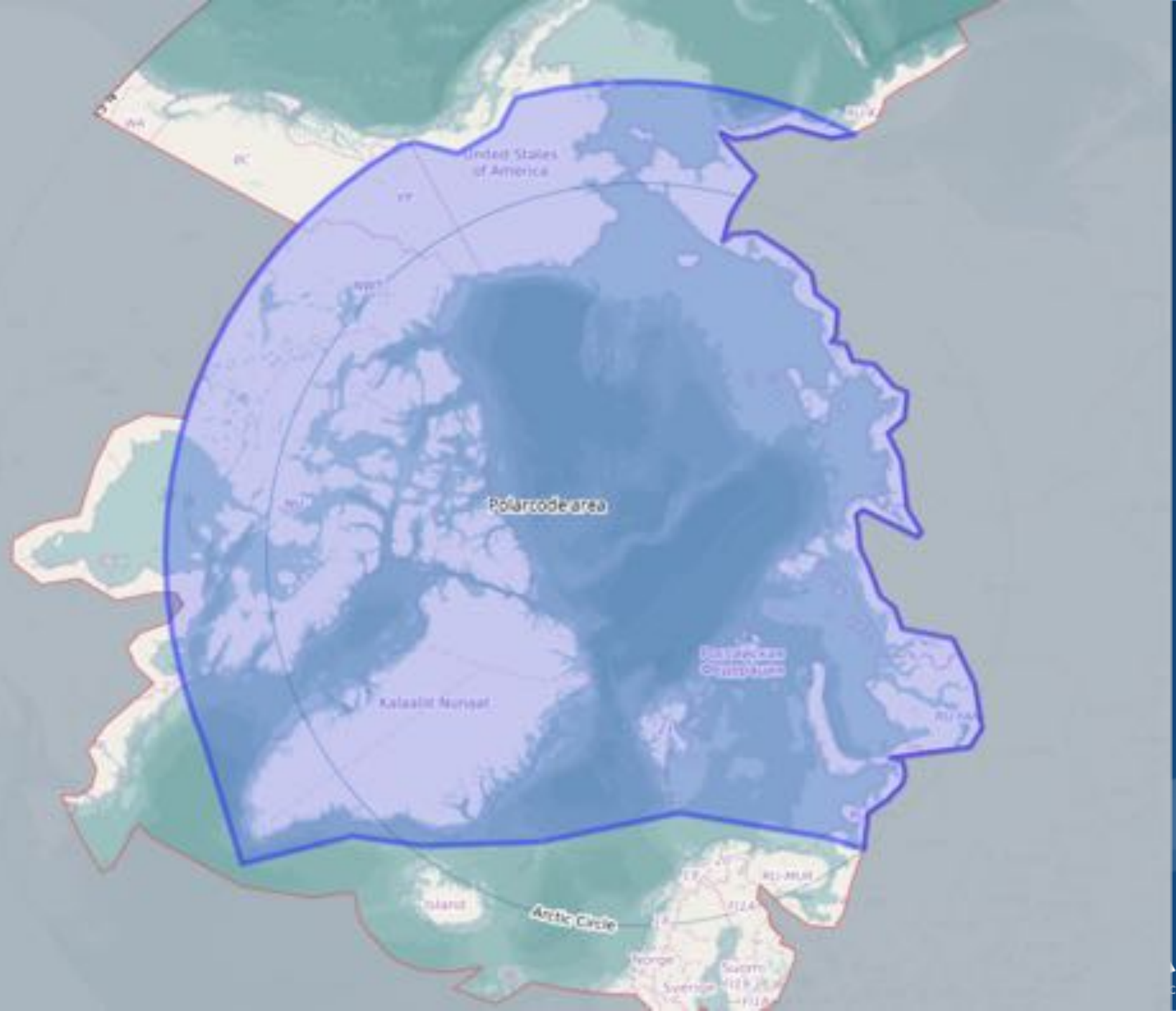

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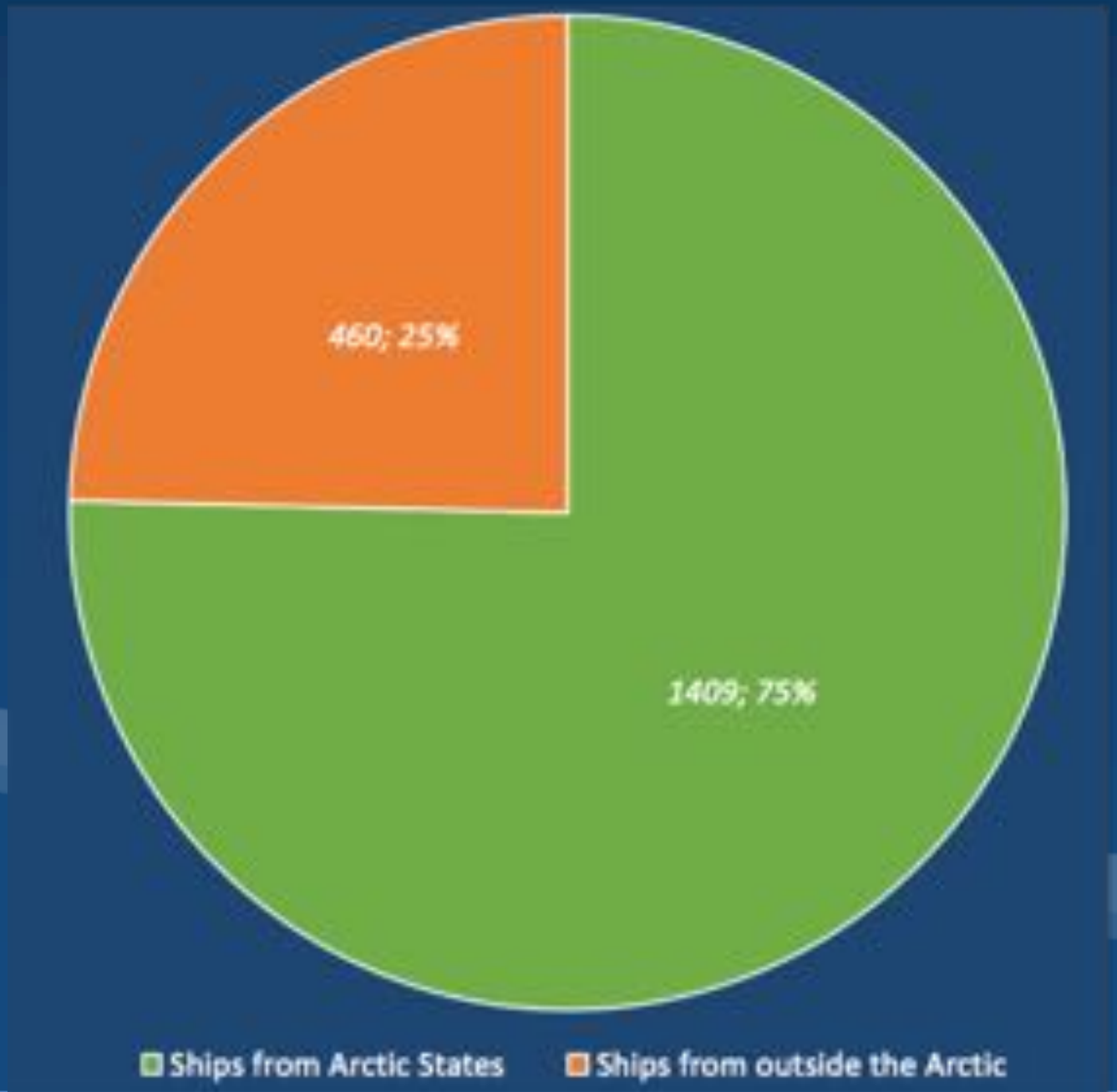
Ships in the Polar Code area 2017



1869

ships entered the Polar Code area in 2017.

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55

non-Arctic states had ship or ships in the Polar Code area 2017

Countries from outside the Arctic

More than 10 vessels

1	Panama	48
2	Bahamas	39
3	Netherlands	34
4	Marshall Islands	33
5	Liberia	30
6	Malta	21
7	Antigua and Barbuda	20
8	Cyprus	18
9	Hong Kong	17
10	Germany	17
11	Singapore	14
12	St. Kitts and Nevis	12
13	China	12
	Total	315
	(Rest of non-Arctic states)	145
	Total ships	460

Arctic Council Observers on this list:

Netherlands
Singapore
Germany
China

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Ships in the Polar Code area - By country

Nr.	Country	Total
1	Russia	774
2	USA	228
3	Norway	179
4	Canada	71
5	Denmark	59
6	Panama	48
7	Bahamas	39
8	Netherlands	34
9	Marshall Islands	33
10	Faroe Islands	30
11	Liberia	30
12	Malta	21
13	Antigua and Barbuda	20
14	Iceland	20
15	Norway (Nis)	20
16	Cyprus	18
17	Denmark (Dis)	17
18	Germany	17
19	Hong Kong	17
20	Singapore	14

Nr.	Country	Total
21	China	12
22	St. Kitts and Nevis	12
23	United Kingdom	9
24	South Korea	9
25	Italy	7
26	Spain	7
27	Bermuda	6
28	France	6
29	Gibraltar	6
30	Japan	6
31	Sierra Leone	6
32	Portugal (Mar)	5
33	Curacao	5
34	Greece	5
35	Isle of Man	5
36	Poland	5
37	Unknown	5
38	Estonia	4
39	Finland	4
40	France (Fis)	4

Nr.	Country	Total
41	Lithuania	4
42	Luxembourg	4
43	Sweden	4
44	Barbados	3
45	Belize	3
46	Cayman Islands	3
47	Faroe Islands (Fas)	3
48	Vanatu	3
49	Falkland Islands	2
50	India	2
51	Latvia	2
52	Portugal	2
53	Unknown	1
54	Argentina	1
55	Chinese Tapei	1
56	Cook Islands	1
57	Cameroon	1
58	Comoros	1
59	Indonesia	1
60	Kazakshtan	1

Nr.	Country	Total
61	Nigeria	1
62	Peru	1
63	Sri Lanka	1
64	St. Vincent and Grenadines	1
65	Switzerland	1
66	Tuvalu	1
67	Togo	1
68	Ukraine	1
69	Venezuela	1
	Grand Total	**1869**

Note: Some countries are listed twice, as some have more than one ship registry. This includes Norway and Denmark for example.

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Ship types

Individual countries from non-Arctic states with 10 or more ships

Country	Fishing vessel	Chemical tanker and product tanker	Refrigerated cargo vessels	Container vessels	Oil tanker	Ro Ro cargo vessel	Offshore supply vessel	Other offshore service vessels	Gas tankers (LNG/LPG)	General cargo vessel	Passenger vessel, including cruise	Dry bulk vessel	Other	Grand Total
Panama	2			27	2			1	2	4	1	9		48
Bahamas	1		2		1				31			4		39
Netherlands					24				7			2	1	34
Marshall Islands	2	5		18	1				3	1	1	2		33
Liberia	4	5		15	3			1	1			1		30
Malta	5	2		9					4	1				21
Antigua and Barbuda				1	17	1						1		20
Cyprus	1	5	4	2				1	1			4		18
Germany	3				1							5	8	17
Hong Kong	2			10	5									17
Singapore	1			8	1					1		3		14
China					6							3	3	12
St. Kitts & Nevis				1	1			7			2		1	12

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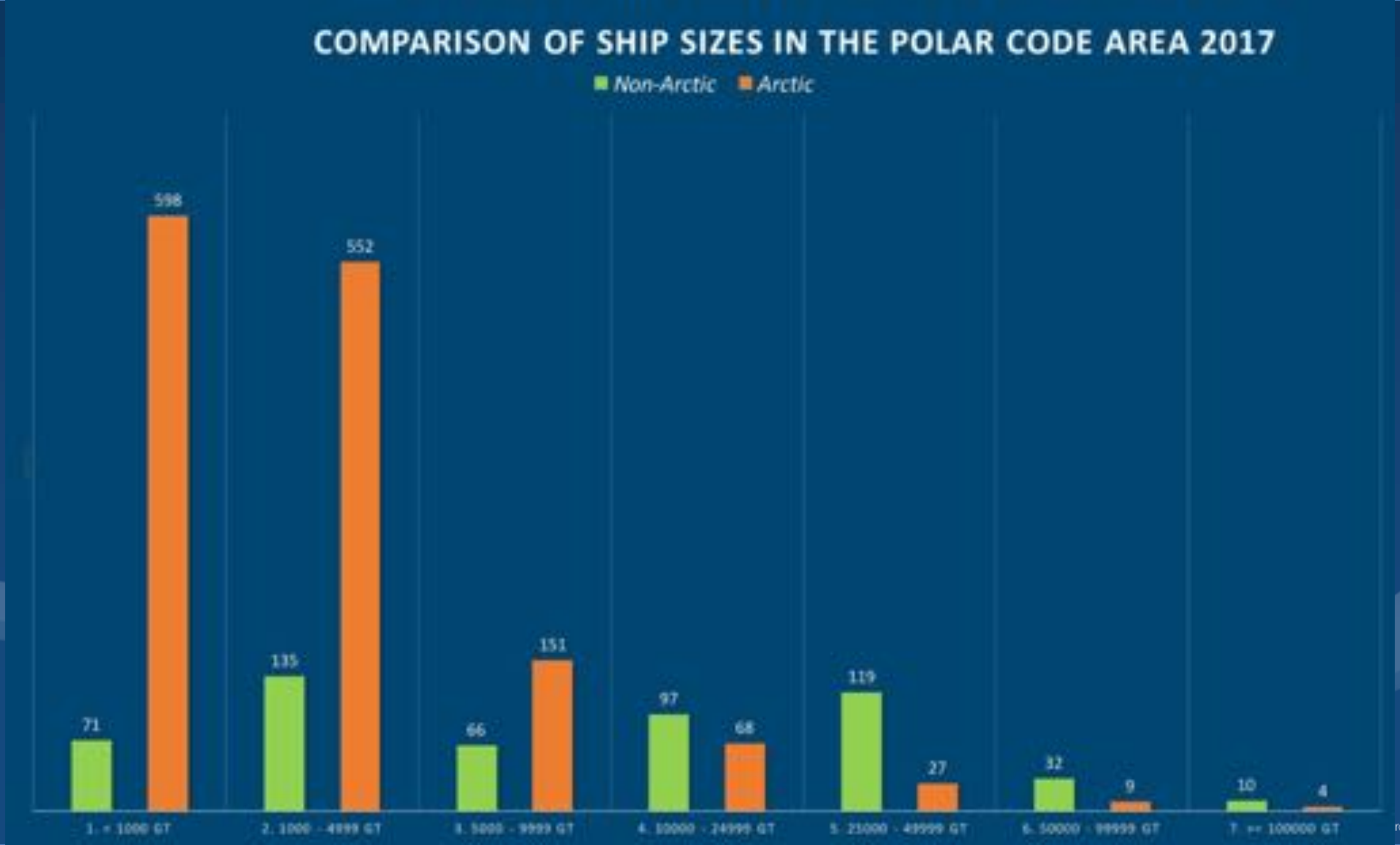
COMPARISON OF SHIP SIZES IN THE POLAR CODE AREA 2017
Non-Arctic
Arctic
598
552
135
151
66
97
68
119
27
32
9
10
4
1. < 1000 GT
2. 1000 - 4999 GT
3. 5000 - 9999 GT
4. 10000 - 24999 GT
5. 25000 - 49999 GT
6. 50000 - 99999 GT
7. >= 100000 GT

ronment

DEMO: *Fuel use of ships in the Arctic*

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Consumption of fuel by ships: Methodology

- The calculations are done for each individual ship
  - We know what fuel type each ship uses
- Use the information about the:
  - Engine
  - KW
  - speed over ground is used in the calculations

$$E_{i,j} = \sum_{t=0}^{t=n} ((P_{ME_i} \cdot \left(\frac{SOG_{i,t}}{V_{max_i}}\right)^3 \cdot EF_{ME_{j,k,l,m}} + D_{AE_{p,i}} \cdot EF_{AE_{j,k,l,m}} + D_{BO_{p,i}} \cdot EF_{BO_{j,m}}) \cdot 1\,\text{hour})$$

Where:

i = ship

j = pollutant

t = time (operating hour, h)

k = engine type

l = engine tier

m = fuel type

p = phase

$E_{i,j}$ = emissions (g) for ship i and pollutant j

P_{ME_i} = main engine power (kW) for ship i

$SOG_{i,t}$ = speed over ground (knots) for ship i at time t

V_{MAX_i} = maximum speed (knots) for ship i

$EF_{ME_{j,k,l,m}}$ = main engine emission facor (g/kWh) for pollutant j, engine type k, engine tier l, and fuel type m

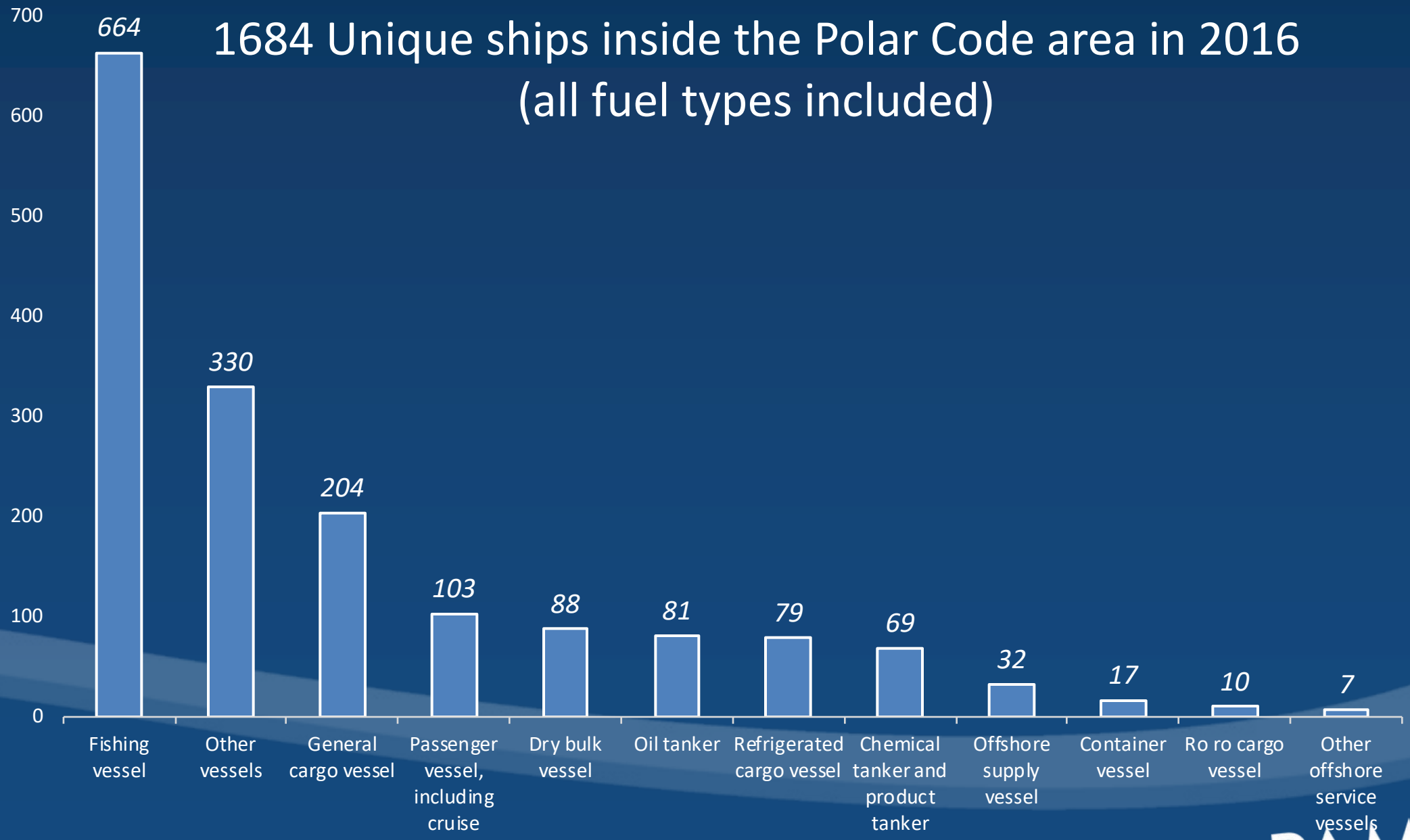
$D_{AE_{p,t}}$ = auxiliary engine power demand (kW) in phase p for ship i

$EF_{AE_{j,k,l,m}}$ = auxiliary engine emission factor (g/kWh) for pollutant j, engine type k, engine tier l, and fuel type m

$D_{BO_{p,i}}$ = boiler power demand (kW) in phase p for ship i

$EF_{BO_{j,m}}$ = boiler emission factor (g/kWh) for pollutant j and fuel type m

1684 Unique ships inside the Polar Code area in 2016 (all fuel types included)



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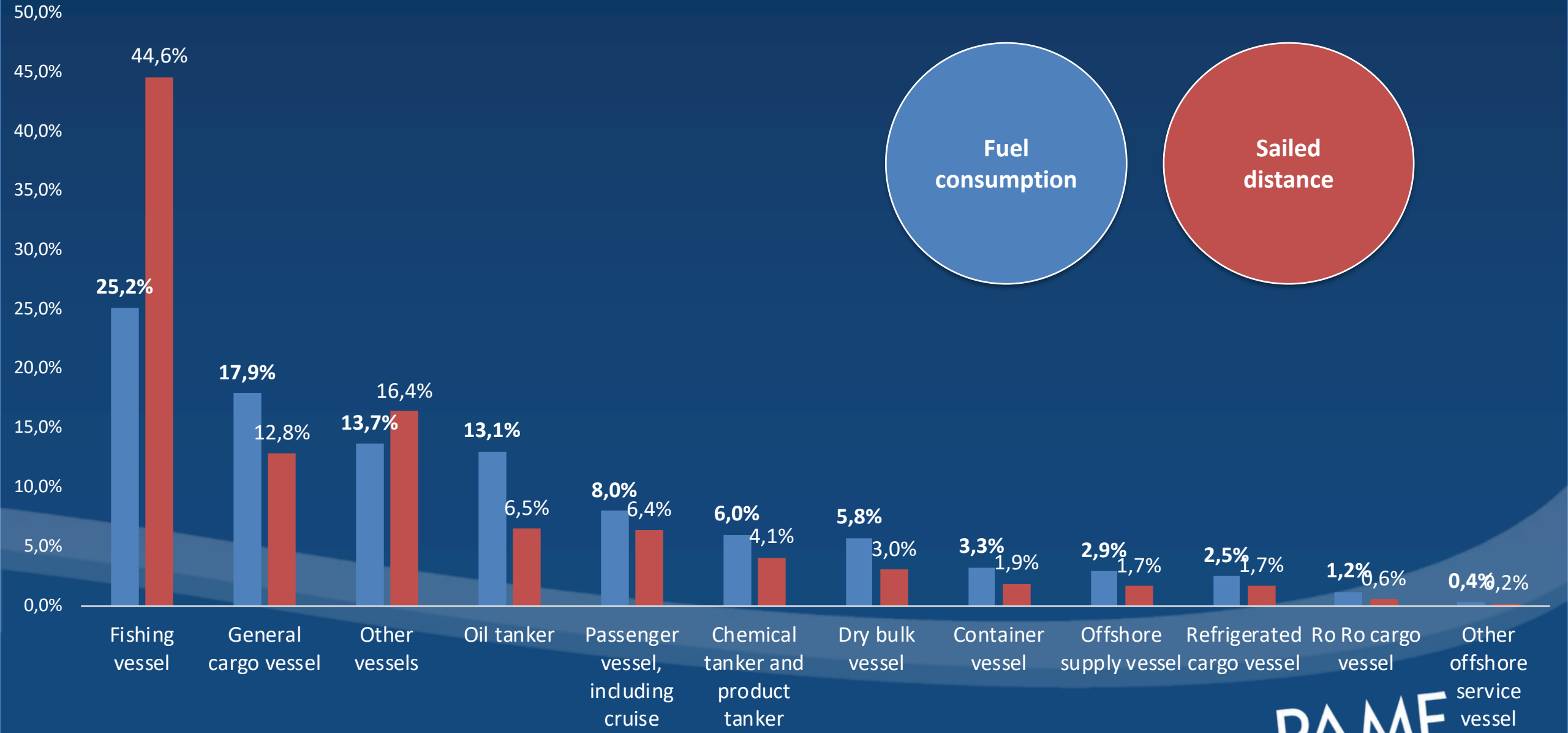
Total fuel consumption (independent of fuel type) in metric tons and sailed distance in nautical miles in 2016 per ship type

Ship type	Sum fuel consumption in metric tons	Sum sailed distance in nautical miles
Fishing vessel	126708	4181120
General cargo vessel	90337	1203282
Other vessels	68863	1535955
Oil tanker	65819	610974
Passenger vessel, including cruise	40346	602930
Chemical tanker and product tanker	30407	385686
Dry bulk vessel	29031	284491
Container vessel	16466	176128
Offshore supply vessel	14747	155564
Refrigerated cargo vessel	12804	159482
Ro Ro cargo vessel	6192	52371
Other offshore service vessel	1881	19403
Total	**503.601**	**9.367.386**

Analysing the fuel consumption vs. the sailed distance



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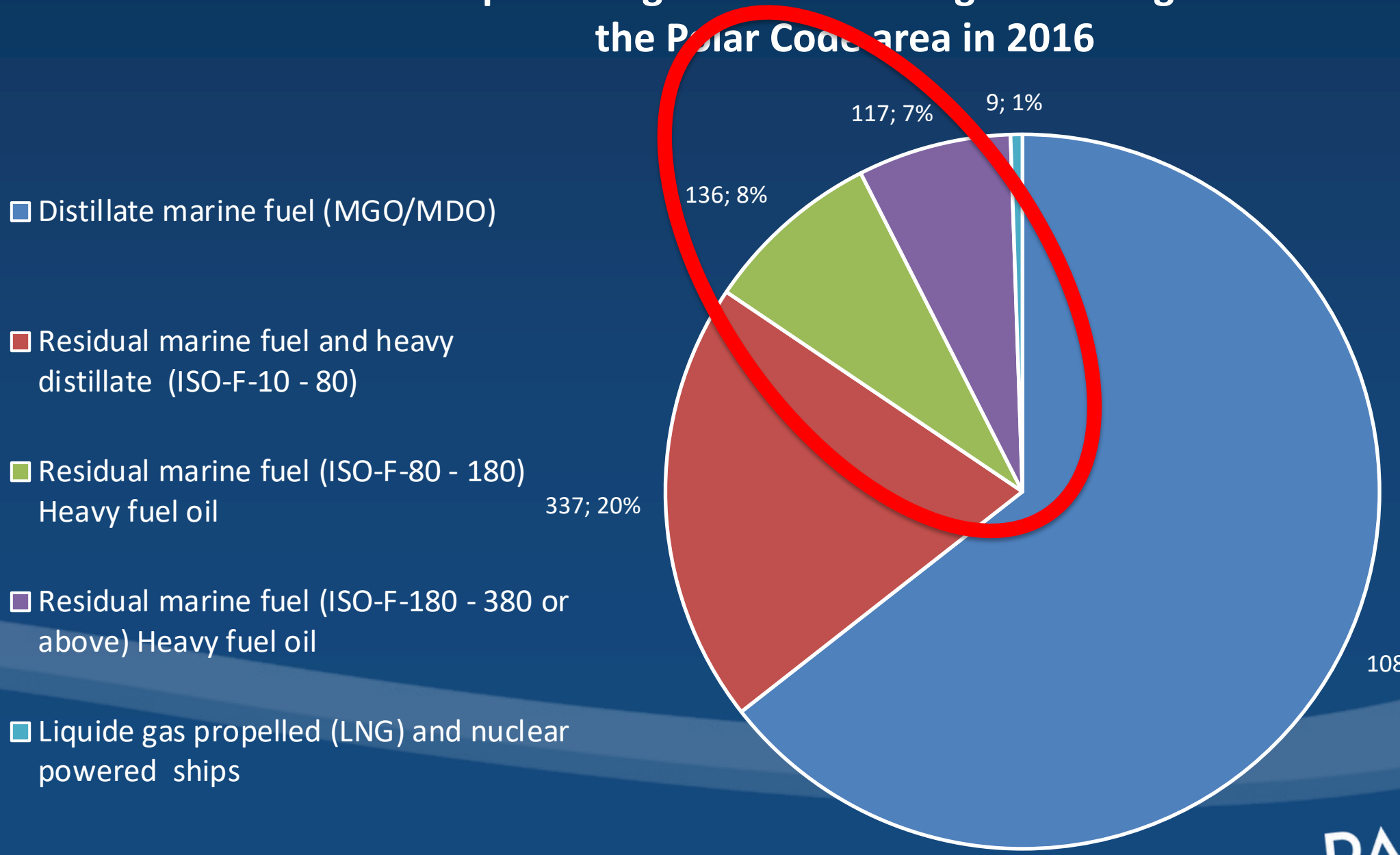
Number and percentage of vessels using different grades of fuel in the Polar Code area in 2016



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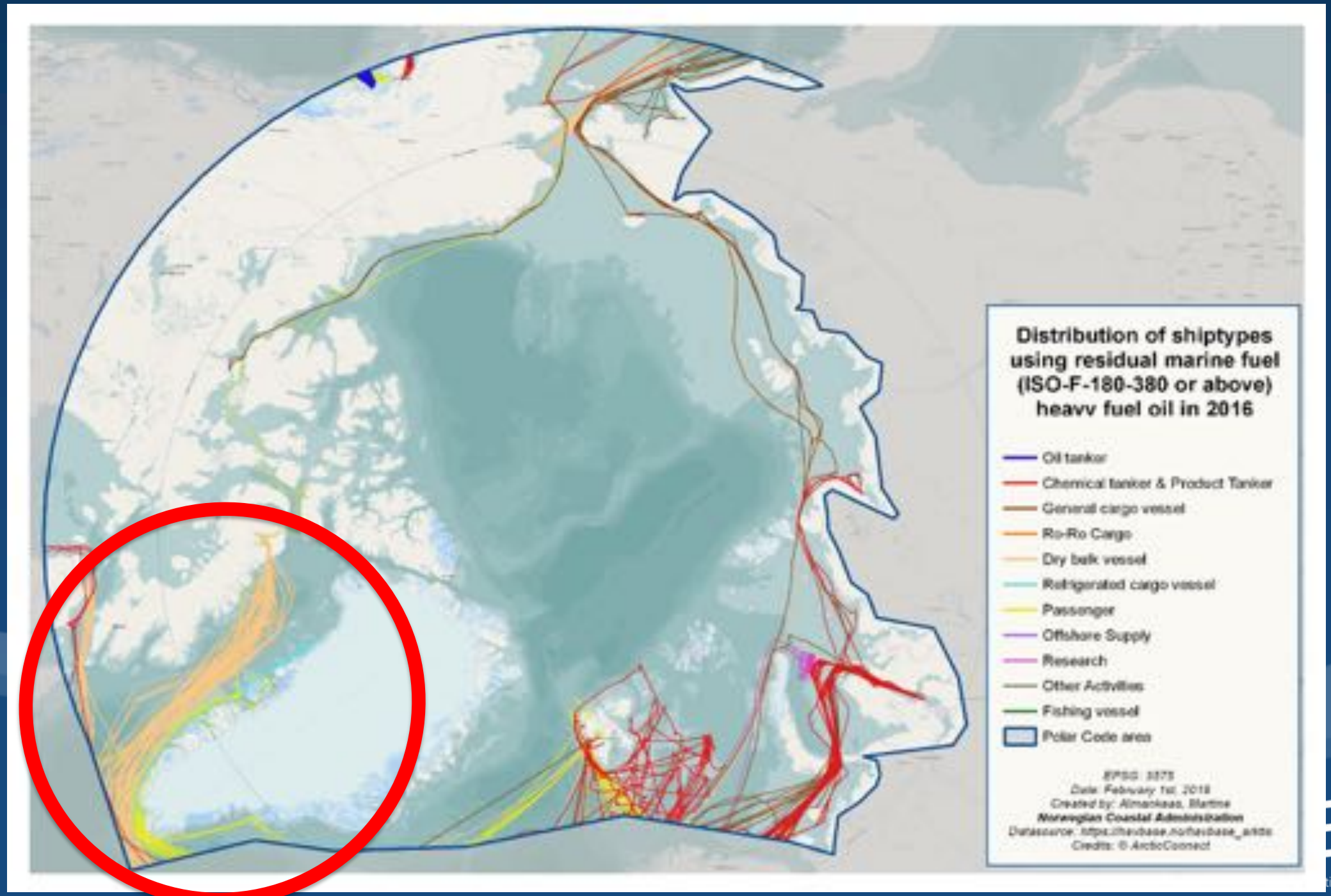
Distribution of shiptypes using residual marine fuel (ISO-F-180-380 or above) heavy fuel oil in 2016
Oil tanker
Chemical tanker & Product Tanker
General cargo vessel
Ro-Ro Cargo
Dry bulk vessel
Refrigerated cargo vessel
Passenger
Offshore Supply
Research
Other Activities
Fishing vessel
Polar Code area
EPSG: 3575
Date: February 1st, 2018
Created by: Almaraas, Martine
Norwegian Coastal Administration
Datasource: https://arcticdata.no/metadata/...
Credits: © ArcticConnect

2014 and 2017 dry bulk shipping from Baffinland's Marry river mine

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Shipping in The Arctic and resent Changes – Shuttle tankers

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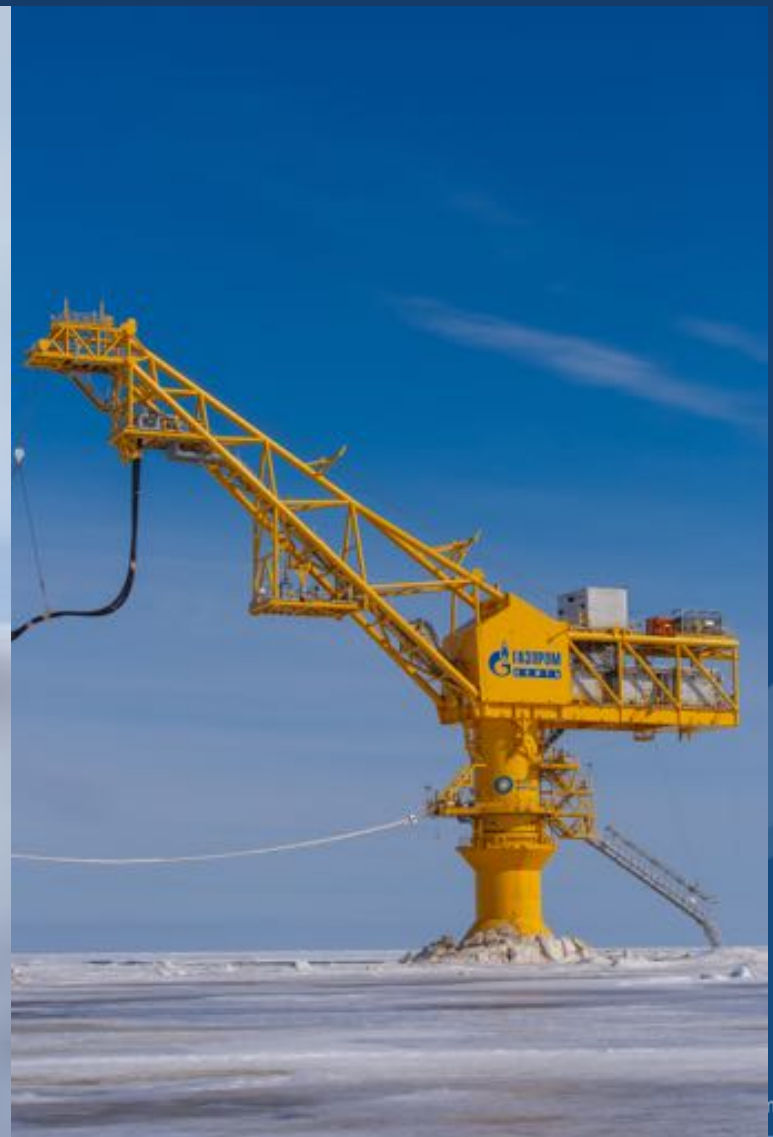
Year-round shipments of Yamal oil from the Arctic Gate (Vorota Arktiki), an Arctic oil loading terminal, (Yamal Peninsula, Yamal-Nenets Autonomous Area).



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