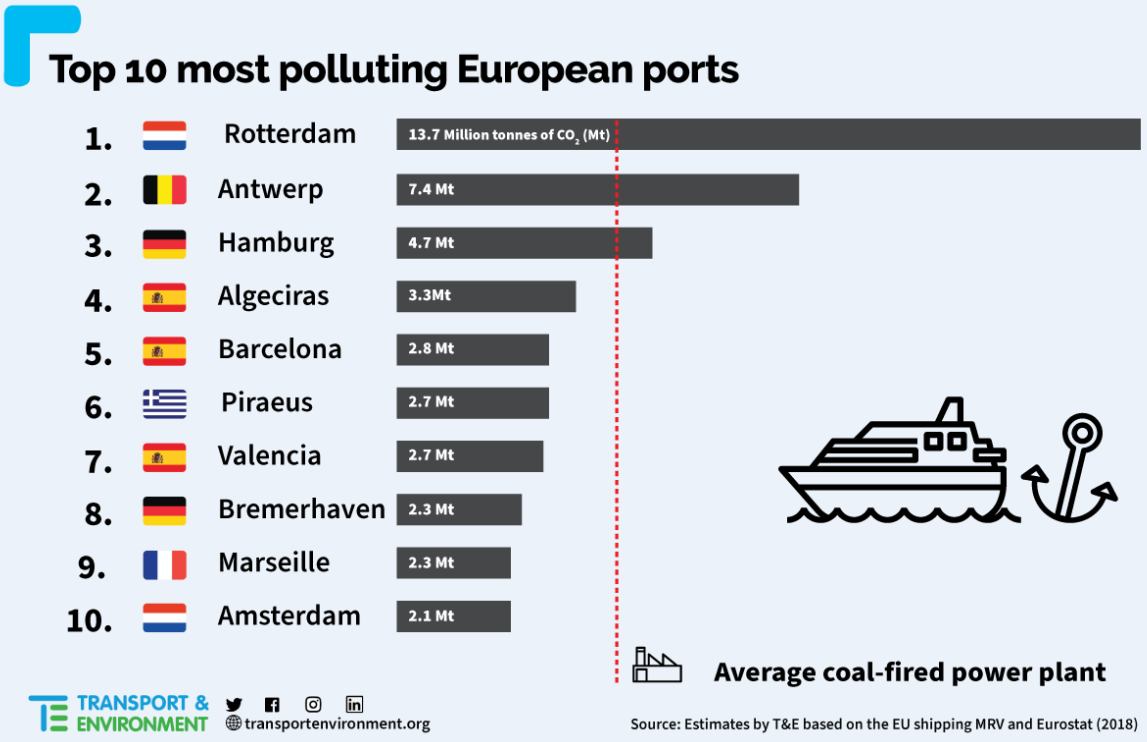
EU Ports' Climate Performance

An analysis of maritime supply chain and at berth emissions

February 2022

Policy-makers must act to address EU ports' climate impact

New analysis from Transport & Environment quantifies emissions for the first time to ships at berth (i.e loading, unloading or refuelling in ports) and attributes maritime supply chain emissions - often referred to as scope 3 emissions for the land sector - to European ports. The results show the extent to which European ports currently facilitate GHG emissions along the shipping supply chain and the need for ports and policy-makers to commit to green solutions such as port electrification and e-fuel bunkering infrastructure.



Maritime supply chain emissions from Europe's largest port, Rotterdam are significant at 13.7Mt, nearly twice its largest competitor, Antwerp and comparable to the biggest coal plants. But while the

Dutch government has promised to shut down its coal plants by 2029,[1] investments in clean port infrastructure remain low with few credible plans to provide clean fuel to the highly polluting ships operating in their ports. Spain is also shown to have a large shipping climate problem: 3 of the top 10 ports for maritime supply chain emissions are Spanish. Algeciras has the highest emissions, responsible for 3.3 million tonnes (Mt) of CO_2, while Barcelona and Valencia follow closely behind with 2.8 Mt and 2.7 Mt respectively.

Rotterdam similarly scores highly in emissions from ships at berth, with 640 thousand tonnes (kt), followed by Antwerp and Piraeus in second and third place. Despite having no individual ports in the top 10, Italy comes out top in the country rankings for emissions at berth, with a total of 1,165 kt, followed by Spain (1,039 kt) and the Netherlands (1,001 kt). Containerships are the largest source of emissions at berth in 7 out of the top 10 ports, with oil tankers the highest emitters in the other 3 (Rotterdam, Antwerp and Vlissingen). Oil tankers similarly make up the highest single emitting ship type in Italy, Netherlands, UK and France, compared to containerships in Spain, Belgium and Germany.

The results show the urgent need to abate supply chain emissions related to European ports. To address the problem, T&E recommends, among others, a large geographical scope of EU carbon pricing scheme to cover all inbound/outbound voyages, more stringent SSE requirements and alternative fuel targets to focus on sustainable e-fuels in the ongoing Alternative Fuels Infrastructure Regulation (AFIR) revision.[2] In detail, European policy-makers should:

- Ensure that at least half, ideally, all inbound and outbound shipping emissions are covered by the EU Emissions Trading Scheme (ETS).
- Require all European ports to provide shore-side electricity (SSE) to ships at berth:
    - From 2025 at all passenger terminals;
    - From 2030 at all terminals for containerships, tankers and refrigerated-bulk carriers;
    - From 2035 at all remaining terminals.
- Discontinue the mandate on maritime ports to install LNG infrastructure to avoid stranded assets in fossil fuels.
- Introduce targets for the installation of hydrogen and ammonia refuelling infrastructure in ports, to enable ships to use green e-fuels. ETS revenues should also contribute to funding this infrastructure.

[1] Beyond Coal (22 March 2021). Overview: National coal phase-out announcements in Europe. Retrieved at https://beyond-coal.eu/wp-content/uploads/2021/03/Overview-of-national-coal-phase-out-announcements-Europe-Beyond-Coal-22-March-2021.pdf

[2] Transport & Environment (18 November 2021). AFIR: How can the EU's infrastructure law make Europe 'fit for 55'? Retrieved from https://www.transportenvironment.org/discover/afir-how-can-the-eus-infrastructure-law-make-europe-fit-for-55/

1. Introduction

Europe stands at an important moment in its efforts to achieve climate neutrality. The Commission has proposed its landmark climate package - fit-for-55 - and attention now turns to the European Parliament and Council to ensure the proposals are on track with Europe's climate goals and obligations as per the Paris Agreement. To support that process, T&E has analysed data on port emissions to understand the nature of contributions to climate action that will be required from European ports.

We firstly looked into maritime supply chain emissions, allocating emissions from ships calling at European ports, from the 2019 Monitoring, Reporting and Verification (MRV) Regulation,[3] to different ports based on the cargo and passengers handled in each of them, provided by Eurostat.[4] Secondly, we investigated emissions at berth: pollution emitted while ships are at berth, loading, unloading or refuelling. We calculated total emissions at berth for European ports using the auxiliary engine emissions calculated in a recent study by Stolz et al.[5], which used MRV and Automatic Identification System (AIS) data. Full results are listed in the Annex.

INFO BOX: Calculating ports' maritime supply chain emissions

The calculation of maritime supply chain emissions of ports can be complicated, given the uncertainty of shipping emissions on individual voyages and the complexity of global logistics. Ideally, in the case for freight, each product delivered to or sent from a port would have its origin and destination known, the type of ship it was shipped on with its fuel consumption on that route, with emissions associated to it. In lieu of that data, there are several ways to approximate these emissions.

Emissions can be attributed to ports based on fuel sales, however this can over allocate emissions to ports with high bunkering capacity and underallocate to those without bunkering capacity. An alternative method - a route-based allocation method consists in attributing emissions of the full voyages of ships to the ports in which they call. This would require modelling ship voyage emissions using AIS data, as was done in the IMO Fourth GHG study.[6] However, this method doesn't account for products that are transhipped to ports despite originating from other continents. Without allocating trade data to the voyages, it is also not trivial to determine the origin of the goods nor differentiate the final destination port from the intermediate port calls for a given voyage.

[3] It should be noted that emissions reported in the MRV do not reflect the entirety of maritime emissions; emissions from ship types including yachts, fishing, service and offshore vessels as well as from ships under 5,000GT are not recorded in the MRV. The true climate impact of ports will therefore be higher. See here for more details.

[4] Eurostat databases mar_go_am_* (for each country) and mar_pa_qm_* (for each country)

[5] B. Stolz, M. Held, G. Georges, and K. Boulouchos, 'The CO2 reduction potential of shore-side electricity in Europe', *Applied energy*, 285 (2021), 116425.

[6] J. Faber, A. Kleijn, S. Hanayama, S. Zhang, P. Pereda, B. Comer, E. Hauerhof, W. S. van der Loeff, T. Smith, Y. Zhang, H. Kosaka, M. Adachi, J.-M. Bonello, C. Galbraith, Z. Gong, K. Hirata, D. Hummels, D. S. Lee, Y. Liu, A. Lucchesi, X. Mao, E. Muraoka, L. Osipova, H. Qian, D. Rutherford, S. S. de la Fuente, H. Yuan, C. V. Perico, L. Wu, D. Sun, D.-H. Yoo, and H. Xing, *Fourth IMO Greenhouse Gas Study*, (2020).

At the time of writing, however, we did not have this data at our disposal. **The method used in this paper allocates emissions reported in the MRV to individual ports via freight data.**[7] Total emissions are calculated from each ship type (e.g. gas carrier, containership…), then allocated to ports depending on how much of the cargo related to that ship type (e.g. LNG, containers) is handled in every port. A standard amount of emissions is therefore allocated to every unit of good handled. This method may penalise ports that receive goods from nearby areas: a port that trades 1 million containers exclusively with local ports will be allocated the same amount of emissions as a port that trades 1 million containers with a port on the other side of the globe. Also, this methodology is limited to operational emissions of ships in the MRV scope, covering only the last and first leg of journeys to and from the EU and all emissions between the EU ports. As such, the emissions allocation does not necessarily cover the full extent of shipping emissions associated with the product transportation from the production to the consumption site.

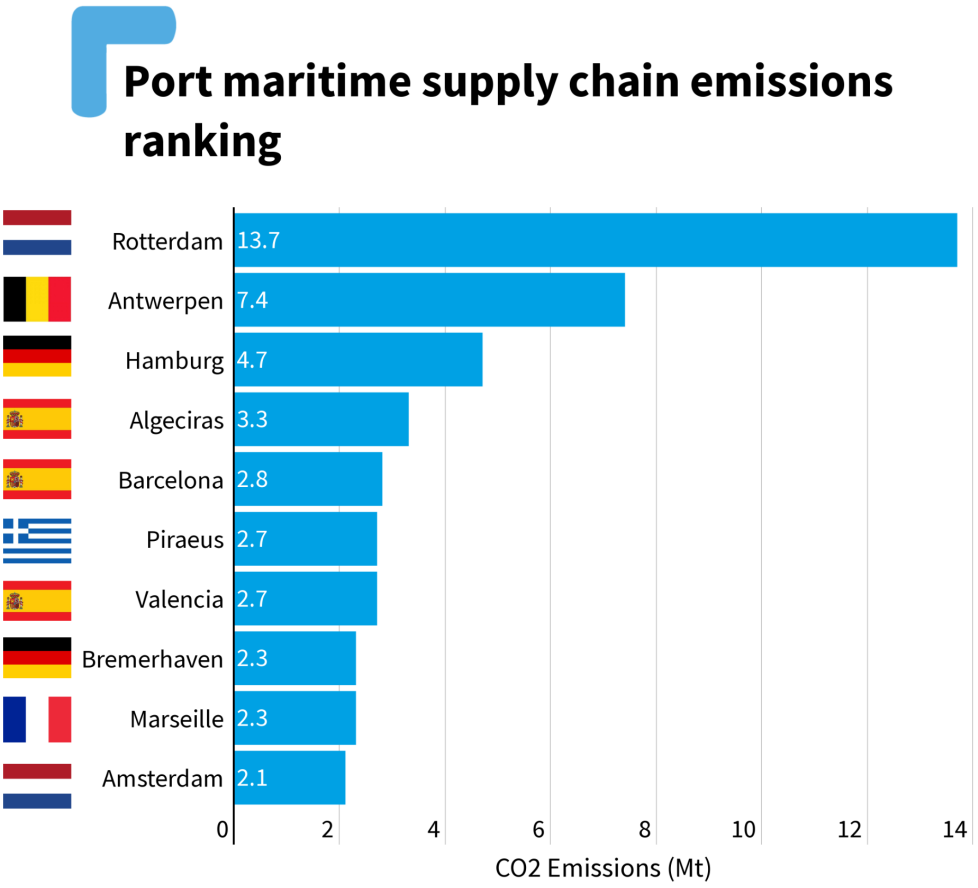
More information on the methodology used can be found in a previous publication.[8] This method should not be considered as the *ideal* way to calculate these emissions, but rather as a balanced and simple way to investigate the maritime supply chain emissions of the cargo and passengers transiting through and calling at EU ports under the geographical scope of the EU MRV. The analysis uses 2018 MRV data, which included emissions of the EU 27, but also the emissions linked to the United Kingdom, Norway and Iceland.

2. Maritime supply chain emissions

Ports are central to the green transition due to their role as bunkering facilities for the ships importing and exporting our goods. Their role as energy hub is to become increasingly important during the green transition, given that much green hydrogen will be produced, refined and used near ports, as well as imported and exported via the ports. Ports therefore have an important responsibility to provide clean energy infrastructure to the share of the maritime supply chain they are responsible for. Arguably, they also have an ethical responsibility to deploy their political resources to promote regulatory policies that will speed up green transition in maritime transport.

Figure 1 shows the top 10 European ports by maritime supply chain emissions covered by the EU MRV (2018). Spain has three ports in the top 10, whilst Germany and the Netherlands each have two. The biggest ports of Belgium, France and Greece - Antwerp, Marseille and Piraeus - complete the ranking. Rotterdam's climate impact is notable at 17.6 Mt, nearly twice that of second-placed Antwerp with 7.4 Mt.

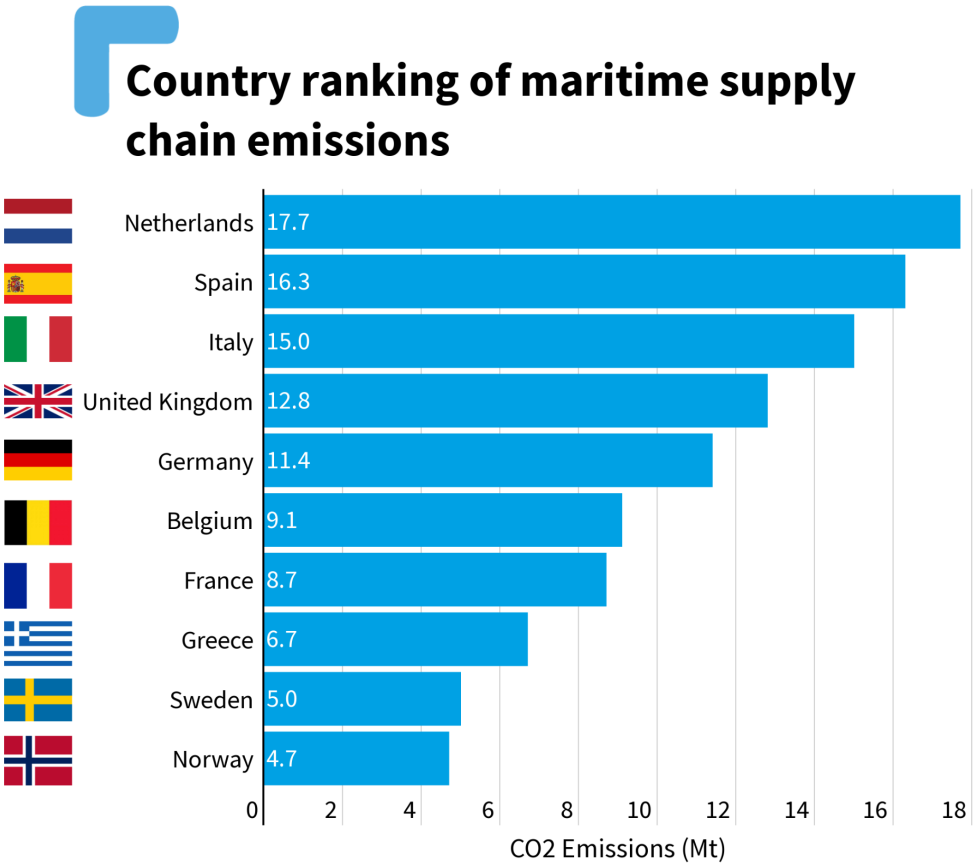
[7] Eurostat databases mar_go_am_* (for each country) and mar_pa_qm_* (for each country)
[8] Transport & Environment (December 2019). EU shipping's climate record. Retrieved from https://www.transportenvironment.org/wp-content/uploads/2021/07/Study-EU_shippings_climate_record_20191209_final.pdf



Note: This includes emissions associated with ports across the maritime supply chain in 2018 falling under the scope of shipping emissions reported in the EU MRV. Calculations are based on MRV figures and ports' cargo trade from Eurostat databases mar_go_am and mar_pa_qm.

Figure 1: Maritime supply chain emissions ranking by port

Given the large emissions from Rotterdam, it is therefore unsurprising that the Netherlands comes first in the top 10 when looking at the national results in Figure 2. Spain takes second place, aided by the large emissions of its top three ports. Italy and the United Kingdom take third and fourth place in spite of having no single port in the top 10. This is a result of the large number of ports for the UK, an island nation and the high emissions from oil tankers in Italy.



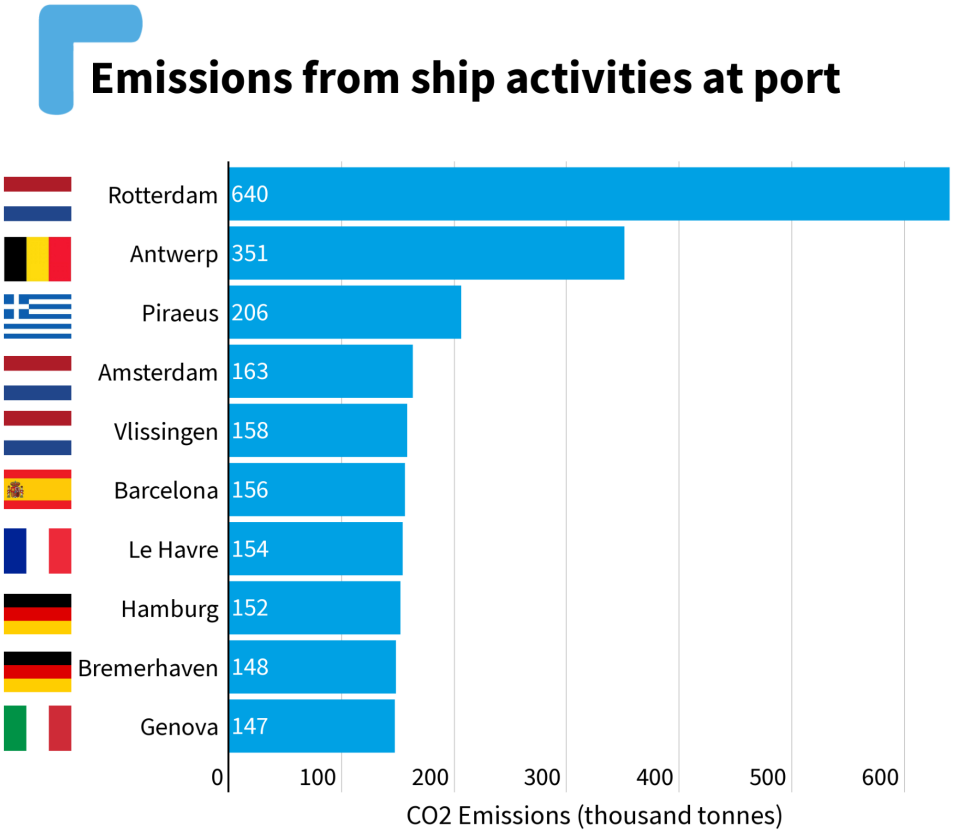
Note: This includes emissions associated with ports across the maritime supply chain in 2018 falling under the scope of shipping emissions reported in the EU MRV. Calculations are based on MRV figures and ports' cargo trade from Eurostat databases mar_go_am and mar_pa_qm.

Figure 2: Maritime supply chain emissions ranking by Member States

3. Emissions at berth

The analysis on maritime supply chain emissions include emissions from ships while at berth in ports, loading, unloading or refuelling. It is of interest to take a granular look at this data for two reasons: firstly, emissions at berth are easiest for ports to address through the use of shore-side electrification (SSE); and secondly because pollution from ports is significant for the health of the local populations.

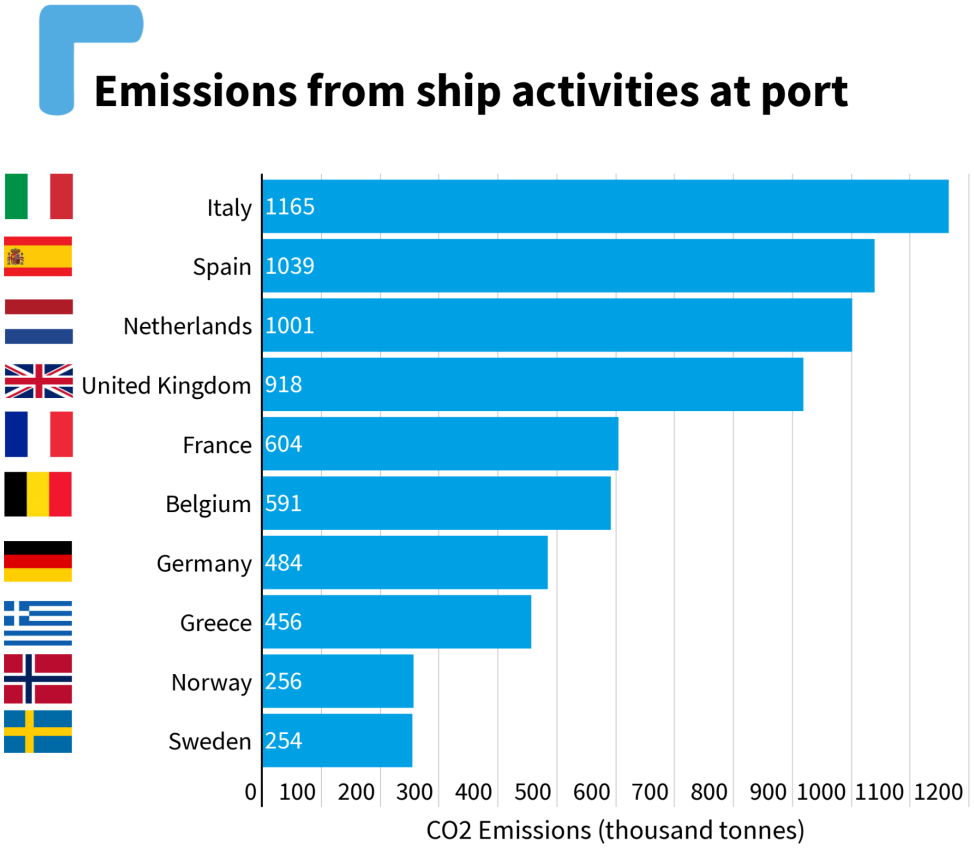
The results in Figure 3 reveal significant amounts of pollution in the main European ports. Rotterdam and Antwerp lead the ranking, with Piraeus third. Emissions at berth are fairly similar - around 150 kt - for the other ports in the top 10: Amsterdam, Vlissingen, Barcelona, Le Havre, Hamburg, Bremerhaven and Genova. Rotterdam's berth emissions are conspicuous: at 640 kt, far higher than any of its competitors. Containerships are the most polluting shipping segment in all of the top 10 ports but three: Antwerp, Piraeus, Barcelona, Le Havre, Hamburg, Bremerhaven and Genova. Oil tankers have the highest emissions per ship type in the remaining three ports, Rotterdam, Amsterdam and Vlissingen.



Note: Ship emissions at port, referred to as 'at-berth' emissions, are those that come from port activities like loading, unloading and refuelling. An alternative to running the ship engine using traditional fuels would be to plug in to shore-side electrification infrastructure at port. Data from 2018.

Figure 3: Emissions from ship activities at port

The results in Figure 4 gather the emissions from all European ports into national totals. Italy, without any port within the top 10 at berth polluters, scores highest with 1.2 Mt. Oil tankers account for the highest emissions from a single ship type in Italy. Oil tankers similarly account for the highest emissions in the Netherlands, the United Kingdom, France and Greece. Containerships account for the highest at berth emissions in Spain, Belgium and Germany, while Norway and Sweden's largest polluting ship types are passenger ships and ro-pax ships respectively, a result of Norway's distinctive geography and both Nordic country's reliance on shipping for transport to the European mainland.



Note: Ship emissions at port, referred to as 'at-berth' emissions, are those that come from port activities like loading, unloading and refuelling. An alternative to running the ship engine using traditional fuels would be to plug in to shore-side electrification infrastructure at port. Data from 2018.

Figure 4: Emissions from ship activities at port by Member State

4. Discussion and Conclusions

Results from emissions in ports and in the maritime supply chain lay bare the climate impact of ports and the need for that sector to invest in green solutions. One limitation of the data analysed is that the only greenhouse gas reported is CO_2. Air pollutants such as nitrogen oxide (NO_x) and sulphur dioxide (SO_x) are not reported in the MRV, but the high CO_2 emissions should nonetheless convince policy-makers of the need to secure the right regulatory framework to apply carbon pricing to all maritime emissions in Europe, as well as for the rollout of comprehensive port electrification and e-fuel bunkering infrastructure. This will not only bring down ports' climate impact, but immeasurably improve the air quality and health of port-city residents. Carbon pricing under the EU ETS will also generate a significant amount of revenues, part of which can be used to finance port infrastructure for shipping's green transition.

Currently, the European Commission has proposed 2030 as the deadline for ports to install shore-side electricity to some shipping sectors: containers, passenger vessels and cruise lines. However, the

Commission proposal includes exemptions depending on the number of port calls for certain types of ships and completely excludes other ship types, such as oil tankers and bulk carriers. The amount of emissions exempted is significant: the limited scope of the current SSE mandate to passenger and container ships only as part of the FuelEU Maritime proposal leaves out 57% of EU emissions at berth, or 5 Mt of CO_2 and 3 kt of sulphur oxide (SO_x) per year, equivalent to the SO_x emissions of the entire EU passenger car fleet (250 million cars).[9]

Electrification, while important, will only go so far in addressing ports' climate problem. The huge power needs of individual sea-going vessels make ship electrification for sea operations unlikely, so there is a clear need to build up infrastructure for the clean liquid fuels of the future. While fossil liquid natural gas (LNG) and biofuels have been erroneously proposed as sustainable options, the only sustainable and scalable fuels for the maritime sector are hydrogen based e-fuels, such as e-ammonia, e-methanol or hydrogen itself (all made from renewable energy and whenever relevant from direct air capture).

However, there is currently an unfortunate chicken and egg problem where ports will not invest in clean fuels infrastructure until they are sure there will be demand from shipowners for that fuel, yet shipowners hold off investing in zero-emission vessels until there is a clear supply infrastructure of clean fuels. The package of legislation proposed by the European Commission, in particular the FuelEU Maritime legislation and the AFIR, may hold the key for de-risking investments. But the current proposals mandate LNG infrastructure and no clean fuel infrastructure whatsoever. This will bind the hands of port authorities to invest in fossil gas, running the risk of stranded assets and locking Europe's shipping industry into fossil gas for decades to come.

The fit-for-55 shipping proposals are without a doubt the most important legislative package for shipping in history. It presents a golden opportunity to provide European shipping with the green refuelling and recharging infrastructure that will finally address its climate impact. With the right requirements, the shipping proposals can chart the course now for a clean maritime future. Port authorities and representatives of the European Parliament and the EU Council must now get behind ambitious targets for clean port infrastructure to ensure shipping's green transition.

4.1 Recommendations

- Ensure that at least half, ideally, all inbound and outbound shipping emissions are covered by the EU Emissions Trading Scheme.
- Require all European ports to provide shore-side electricity (SSE) to ships at berth:
    - From 2025 at all passenger terminals.
    - From 2030 at all terminals for containerships, tankers and refrigerated-bulk carriers.
    - From 2035 at all remaining terminals.
- Discontinue the mandate on maritime ports to install LNG infrastructure, to avoid stranded assets in fossil fuels.

[9] See T&E's forthcoming report *"FuelEU Maritime: T&E analysis and recommendations: How to drive the uptake of sustainable fuels in European shipping"*

- Introduce targets for the installation of hydrogen and ammonia refuelling infrastructure in ports, to enable ships to use green e-fuels. ETS revenues should also contribute to funding this infrastructure.

Further information

Jacob Armstrong
Sustainable Shipping Officer
Transport & Environment
jacob.armstrong@transportenvironment.org
Mobile: +32(0)470 83 55 17

Annex: Results

1. Maritime supply chain emissions per port

Ranking	Port	Maritime supply chain emissions (tCO2)
1	Rotterdam	13,667,915.61
2	Antwerpen	7,358,992.76
3	Hamburg	4,729,824.27
4	Algeciras	3,277,576.08
5	Barcelona	2,799,464.30
6	Peiraias	2,715,212.07
7	Valencia	2,669,889.63
8	Bremerhaven	2,332,026.06
9	Marseille	2,311,628.08
10	Amsterdam	2,106,698.81
11	Genova	1,815,859.89
12	Le Havre	1,788,123.78
13	Southampton	1,641,540.68
14	London	1,522,598.63
15	Sines	1,500,334.53
16	Gioia Tauro	1,333,486.04
17	Trieste	1,287,140.52
18	Felixstowe	1,284,554.01
19	Immingham	1,265,173.05
20	Gdansk	1,225,057.81
21	Klaipeda	1,118,608.35
22	Zeeland Seaports	1,104,293.85
23	Dunkerque	1,074,295.39

24	Göteborg	1,032,516.83
25	Livorno	1,002,031.49
26	Zeebrugge	958,028.05
27	Nantes Saint-Nazaire	938,568.05
28	Bilbao	902,050.65
29	Dover	865,490.46
30	Liverpool	853,789.29
31	Las Palmas	853,662.76
32	Riga	847,112.67
33	Huelva	844,662.17
34	Constanta	810,249.02
35	Napoli	809,313.25
36	Dublin	795,034.85
37	Helsinki	794,652.86
38	Rostock	792,613.20
39	Gent (Ghent)	781,166.35
40	Bergen	773,655.70
41	Civitavecchia	767,779.97
42	Ravenna	764,367.00
43	Palma Mallorca	758,684.17
44	Tallinn	751,710.87
45	Tees & Hartlepool	729,007.39
46	La Spezia	721,728.46
47	Koper	714,219.19
48	Wilhelmshaven	702,403.84
49	Italy - other ports	690,403.25
50	Sweden - other ports	688,206.45

51	Milford Haven	671,962.57
52	Venezia	656,003.18
53	Calais	634,600.33
54	Forth	632,711.59
55	Gdynia	630,276.05
56	Messina	619,633.41
57	Cartagena	595,103.65
58	Tarragona	569,893.38
59	HaminaKotka	525,652.32
60	Santa Cruz de Tenerife	522,978.18
61	Savona	513,952.51
62	Belfast	504,261.94
63	Leixões	487,004.09
64	Castellón	484,613.56
65	Helsingborg	463,968.68
66	Norway - other ports	459,129.73
67	Lübeck	455,809.79
68	Stockholm	453,711.94
69	Rouen	452,492.13
70	Narvik	447,529.47
71	Swinoujscie	447,447.47
72	Gijón	442,467.89
73	Haugesund	436,497.73
74	Taranto	431,658.82
75	Cagliari	429,901.92
76	Porsgrunn, Rafnes, Herøya, Brevik, Skien, Langesund, Voldsfjorden	422,396.75
77	Reggio di Calabria	413,484.91

78	Sköldvik	398,150.95
79	Agioi Theodoroi	395,199.37
80	Augusta	383,250.36
81	Århus	381,370.90
82	Porto Foxi	373,953.63
83	Ventspils	370,794.76
84	Medway	370,326.54
85	Kiel	365,577.62
86	Thessaloniki	365,297.02
87	Milazzo	357,753.41
88	Ferrol	354,336.03
89	Københavns Havn	350,752.80
90	Palermo	347,809.56
91	Hull	341,453.55
92	Hammerfest	338,882.28
93	Rødby (Færgehavn)	336,626.82
94	Burgas	331,321.57
95	Vlaardingen	325,421.25
96	Helsingør (Elsinore)	322,866.06
97	Elefsina	315,678.52
98	Lisboa	303,699.30
99	Perama	302,054.31
100	Trelleborg	290,530.42
101	Puttgarden	277,958.50
102	Italy (offshore installations) - other ports	275,437.00
103	Bremen	273,074.42
104	Bari	271,249.70

105	Varna	270,455.13
106	La Coruña	261,622.25
107	Paloukia Salaminas	241,422.80
108	Moerdijk	236,660.18
109	Salerno	236,409.90
110	Oslo	232,943.52
111	Szczecin	232,689.69
112	Olbia	227,748.89
113	Limerick	225,717.58
114	Brindisi	225,635.33
115	Megara	216,401.26
116	Cork	211,003.16
117	Sillamäe	202,074.93
118	Ancona	201,700.45
119	Brunsbüttel	199,797.06
120	Piombino	197,443.53
121	Split	196,364.85
122	Pointe-à-Pitre (Guadeloupe)	189,532.14
123	Rauma	189,371.63
124	Cirkewwa	186,070.34
125	Mgarr, Gozo	186,070.34
126	Bristol	185,273.77
127	Molde	183,666.80
128	Almería	183,002.73
129	Esbjerg	181,653.96
130	Stade	180,702.48
131	Setúbal	175,251.58

132	Malmö	173,965.06
133	Holyhead	173,047.70
134	Kokkola	172,208.74
135	Luleå	168,622.88
136	Catania	167,553.72
137	Port Réunion (ex Pointe-des-Galets) (Réunion)	163,981.10
138	Clydeport	161,582.07
139	Delfzijl	158,290.69
140	Santa Panagia	156,587.87
141	Gävle	155,722.66
142	Igoumenitsa	155,631.62
143	Capri	154,994.86
144	La Rochelle	154,398.47
145	Manchester	153,843.03
146	Emden	153,771.55
147	Tyne	152,633.02
148	Turku	149,913.93
149	Fredericia (Og Shell-Havnen)	149,907.39
150	River Hull & Humber	149,165.59
151	Portsmouth	149,109.05
152	Bordeaux	148,657.14
153	Valletta	148,625.75
154	Stenungsund (Ports)	146,626.79
155	Svelgen	146,221.01
156	Port Talbot	146,197.70
157	Kristiansund N/Grip	145,222.76
158	Tønsberg	142,514.25

159	Butinge	140,669.26
160	Ystad	139,282.62
161	Brake	139,190.64
162	Heysham	138,670.13
163	Garrucha	136,833.11
164	Naantali	135,491.88
165	Volos	134,598.63
166	Santander	133,995.77
167	Lemesos	132,917.75
168	Hanko	131,679.58
169	Fort-de France (Martinique)	131,629.20
170	Glensanda	130,949.95
171	Aveiro	130,882.73
172	Vigo	130,706.60
173	Málaga	130,151.08
174	Liepaja	129,239.03
175	Avilés	126,399.07
176	Porto Torres	124,573.95
177	Harwich	124,418.83
178	Porto d'Ischia	124,380.82
179	Aigina	124,103.23
180	Raahe	124,037.19
181	Statoil-Havnen	123,096.38
182	Irakleio	122,963.83
183	Omisalj	122,594.77
184	Midia	120,690.27
185	Cairnryan	119,459.39

186	Hirtshals	118,729.72
187	Karlshamn	117,992.66
188	Rijeka	116,660.84
189	Sevilla	113,412.57
190	Frederikshavn	112,197.06
191	Fredrikstad	108,073.16
192	Portoferraio	107,263.18
193	Bastia	105,771.24
194	Sjællands Odde	104,248.51
195	Oulu	104,033.54
196	Trondheim/Flakk	103,214.41
197	Aberdeen	103,209.59
198	Oxelösund (ports)	102,692.53
199	Norrköping	102,439.90

2. Maritime supply chain emissions per country

Ranking	Port	Maritime supply chain emissions (tCO2)
1	Netherlands	17,658,816.3
2	Spain	16,319,290.4
3	Italy	15,035,309.7
4	United Kingdom	12,827,339.2
5	Germany	11,424,915.0
6	Belgium	9,137,064.2
7	France	8,657,705.1
8	Greece	6,653,000.9
9	Sweden	4,975,682.5

10	Denmark	3,322,630.4
11	Finland	3,292,816.6
12	Portugal	2,633,733.90
13	Poland	2,573,549.31
14	Ireland	1,371,055.84
15	Latvia	1,343,969.82
16	Croatia	1,298,895.19
17	Lithuania	1,258,903.74
18	Estonia	1,192,670.83
19	Romania	958,505.83
20	Slovenia	714,966.97
21	Bulgaria	601,845.55
22	Malta	593,515.38
23	Cyprus	204,228.61

3. At berth emissions per port

Ranking	Port	Total berth emissions (kt)	Top polluting ship type
1	Rotterdam	640	Oil tanker
2	Antwerpen	351	Container ship
3	Piraeus	206	Container ship
4	Amsterdam	163	Oil tanker
5	Vlissingen	158	Oil tanker
6	Barcelona	156	Container ship

7	Port Of Le Havre	154	Container ship
8	Hamburg	152	Container ship
9	Bremerhaven	148	Container ship
10	Genova	147	Container ship
11	Algeciras	133	Container ship
12	Southampton	122	Container ship
13	Zeebrugge	119	Vehicle carrier
14	Valencia	112	Container ship
15	Porto Di Lido-Venezia	109	Passenger ship
16	Livorno	100	Container ship
17	Europa Point (Gibraltar)	97	Oil tanker
18	Chatham Docks	93	Container_ro-ro cargo ship
19	Harwich	91	Container ship
20	Port-De-Bouc	87	Oil tanker
21	Oostende	86	Oil tanker
22	Las Palmas	83	Ro-pax ship
23	Siracusa	80	Oil tanker
24	Valletta Harbors	80	Container ship
25	Trieste	73	Oil tanker
26	Constanta	66	Bulk carrier
27	Sarroch Oil Terminal	63	Oil tanker
28	Port Saint Louis Du Rhone	63	Container ship

29	Tallinn	62	Ro-pax ship
30	Marseille	62	Ro-pax ship
31	Napoli	57	Container ship
32	Puerto De Bilbao	56	Oil tanker
33	Sines	55	Container ship
34	Immingham	54	Ro-ro ship
35	Lisboa	54	Container ship
36	Cuxhaven	53	Container ship
37	Goteborg	53	Oil tanker
38	Huelva	51	Oil tanker
39	Civitavecchia	51	Passenger ship
40	Helsinki	50	Ro-pax ship
41	Liverpool	50	Bulk carrier
42	Santa Cruz De Tenerife	50	Ro-pax ship
43	Klaipeda	48	Bulk carrier
44	Gdansk	48	Container ship
45	Gioia Tauro	46	Container ship
46	Milford Haven	46	Oil tanker
47	La Spezia	45	Container ship
48	Cartagena	44	Oil tanker
49	Grimsby	43	Oil tanker
50	Skagen Havn	42	Oil tanker
51	Ventspils	42	Oil tanker
52	Navplio	41	Oil tanker
53	Dublin	41	Ro-pax ship

54	Palma De Mallorca	41	Passenger ship
55	Stockholm	41	Ro-pax ship
56	Koper	40	Container ship
57	Porto Di Corsini	39	Bulk carrier
58	Teesport	38	Container ship
59	Gdynia	37	Bulk carrier
60	Rada Di Vado	37	Passenger ship
61	Montoir	37	LNG carrier
62	Cadiz	36	Container ship
63	Milazzo	36	Oil tanker
64	Dunkerque Port Ouest	36	Bulk carrier
65	Kotka	36	Container_ro-ro cargo ship
66	Rostock	34	Passenger ship
67	Porto Di Palermo	32	Ro-pax ship
68	Olbia	31	Ro-pax ship
69	Burgas	31	Oil tanker
70	Poole Harbour	30	Ro-pax ship
71	Tarragona	30	Oil tanker
72	Ghent	29	Bulk carrier
73	Terneuzen	29	Chemical tanker
74	St Nazaire	28	Oil tanker
75	Belfast	28	Ro-pax ship
76	Porto De Leixoes	28	Container ship
77	Taranto	27	Bulk carrier

78	Leith	27	Oil tanker
79	Malmo	27	Ro-pax ship
80	Lubeck	26	Ro-pax ship
81	Salerno	26	Container ship
82	Kerkira	25	Passenger ship
83	Limassol	24	Oil tanker
84	Littlehampton Harbour	23	Oil tanker
85	Thessaloniki	22	Container ship
86	Swinoujscie	22	Ro-pax ship
87	Porvoo	22	Oil tanker
88	Lavrio	21	Oil tanker
89	Bristol	21	Vehicle carrier
90	Kobenhavn	21	Passenger ship
91	Malaga	20	Passenger ship
92	Mongstad	20	Oil tanker
93	Varna	20	Bulk carrier
94	Tynemouth	20	Vehicle carrier
95	El Grao	20	Oil tanker
96	Messina	20	Ro-pax ship
97	Ceuta	19	Oil tanker
98	Rijeka Luka	18	Oil tanker
99	Brindisi	18	Ro-pax ship
100	Bergen	18	Passenger ship
101	Fort De France	18	Passenger ship
102	Pointe A Pitre	17	Container ship

103	Patrai	17	Ro-pax ship
104	Kiel	17	Ro-pax ship
105	Ibiza	17	Passenger ship
106	Vrakhonisis Kallonis	16	Oil tanker
107	Dover Harbor	16	Ro-pax ship
108	Emden	16	Vehicle carrier
109	Lowestoft	16	Oil tanker
110	Funchal	15	Passenger ship
111	Ancona	15	Oil tanker
112	Turku	15	Ro-pax ship
113	Santander	15	Vehicle carrier
114	Calais	15	Ro-pax ship
115	Oslo	15	Ro-pax ship
116	Split	15	Passenger ship
117	Thamesport	14	LNG carrier
118	Nynashamn	14	Ro-pax ship
119	Mikonos	14	Passenger ship
120	Porto Torres	14	Ro-pax ship
121	Karsto	14	Oil tanker
122	Port Of Rouen	14	Bulk carrier
123	Frederikshavn	13	Oil tanker
124	Port Est	13	Container ship
125	Catania	13	Oil tanker
126	La Coruna	13	Oil tanker
127	Brofjorden	13	Oil tanker
128	La Pallice	13	Bulk carrier

129	Paldiski	13	Ro-pax ship
130	Ramsgate	12	Chemical tanker
131	Bari	12	Ro-pax ship
132	Riga	12	Bulk carrier
133	Hanko	12	Ro-ro ship
134	Honningsvag	12	#N/A
135	Bremen	12	Bulk carrier
136	Pozzallo	12	Oil tanker
137	Narvik	12	Bulk carrier
138	Stavanger	12	Passenger ship
139	Lysekil	11	Oil tanker
140	Villanueva Y Geltru	11	Oil tanker
141	Arhus	11	Container ship
142	Horten	11	Oil tanker
143	Gijon	11	Bulk carrier
144	Stura	11	Oil tanker
145	Reykjavik	11	Passenger ship
146	Falmouth Harbour	11	Oil tanker
147	Sagunto	11	Ro-ro ship
148	Arrecife	10	Passenger ship
149	Kalundborg	10	Oil tanker
150	Sete	10	Ro-pax ship
151	Toulon	10	Ro-pax ship
152	Kirkwall	10	Oil tanker
153	Sillamae	10	Oil tanker

154	Midia	10	Oil tanker
155	Motril	10	Ro-pax ship
156	Grangemouth	10	Container ship
157	Rosslare	10	Ro-pax ship
158	Szczecin	10	Bulk carrier
159	Rauma	9	General cargo ship
160	Rodhos	9	Ro-pax ship
161	Lyness	9	Oil tanker
162	Holyhead	9	Ro-pax ship
163	Vigo	9	Container ship
164	Brunsbuttel Canal Terminals	9	Bulk carrier
165	Visby	9	#N/A
166	Ferrol	9	Bulk carrier
167	Eemshaven	9	Bulk carrier
168	Butinge Oil Terminal	9	Oil tanker
169	Porsgrunn	9	Bulk carrier
170	Esbjerg	9	Ro-ro ship
171	Otranto	9	Oil tanker
172	Puerto De Gandia	9	Oil tanker
173	Gavrio	8	Oil tanker
174	Tolkkinen	8	Oil tanker
175	Rade De Cherbourg	8	Ro-pax ship
176	Almeria	8	Ro-pax ship
177	Grisslehamn	8	#N/A

178	Cobh	8	Container ship
179	Caernarvon	8	Oil tanker
180	Orstav	8	Passenger ship
181	Ystad	8	Ro-pax ship
182	Hammerfest	7	LNG carrier
183	Alesund	7	Passenger ship
184	Bastia	7	Ro-pax ship
185	Stenungsund	7	Gas carrier
186	Fiumicino	7	Oil tanker
187	Rade De Brest	7	Vehicle carrier
188	Fredericia	7	Oil tanker
189	Mariehamn	7	Ro-pax ship
190	Puerto Del Rosario	7	Passenger ship
191	Fenit	6	Bulk carrier
192	Saint-Malo	6	Ro-pax ship
193	Aviles	6	Bulk carrier
194	Liepaja	6	Bulk carrier
195	Soudha	6	Ro-pax ship
196	Degrad Des Cannes	6	Container ship
197	Liverpool Bay Terminal	6	Oil tanker
198	Trondheim	6	Ro-pax ship
199	Ardalstangen	6	Passenger ship

4. At berth emissions per country

Ranking	Country	Total emissions (kt)	Top polluting ship type
1	Italy	1165	Oil tanker
2	Spain	1039	Container ship
3	Netherlands	1001	Oil tanker
4	United Kingdom	918	Oil tanker
5	France	604	Oil tanker
6	Belgium	591	Container ship
7	Germany	484	Container ship
8	Greece	456	Oil tanker
9	Norway	256	Passenger ship
10	Sweden	254	Ro-pax ship
11	Finland	199	Ro-pax ship
12	Portugal	172	Container ship
13	Denmark	142	Oil tanker
14	Poland	116	Bulk carrier
15	Gibraltar	97	Oil tanker
16	Estonia	85	Ro-pax ship
17	Malta	80	Container ship
18	Romania	79	Bulk carrier
19	Ireland	78	Ro-pax ship
20	Latvia	62	Bulk carrier
21	Lithuania	57	Oil tanker
22	Bulgaria	51	Oil tanker
23	Croatia	48	Passenger ship
24	Slovenia	44	Container ship
25	Cyprus	31	Oil tanker

26	Iceland	21	Passenger ship
27	Guadeloupe	18	Passenger ship
28	Martinique	18	Passenger ship
29	Réunion	16	Container ship
30	French Guiana	6	Container ship