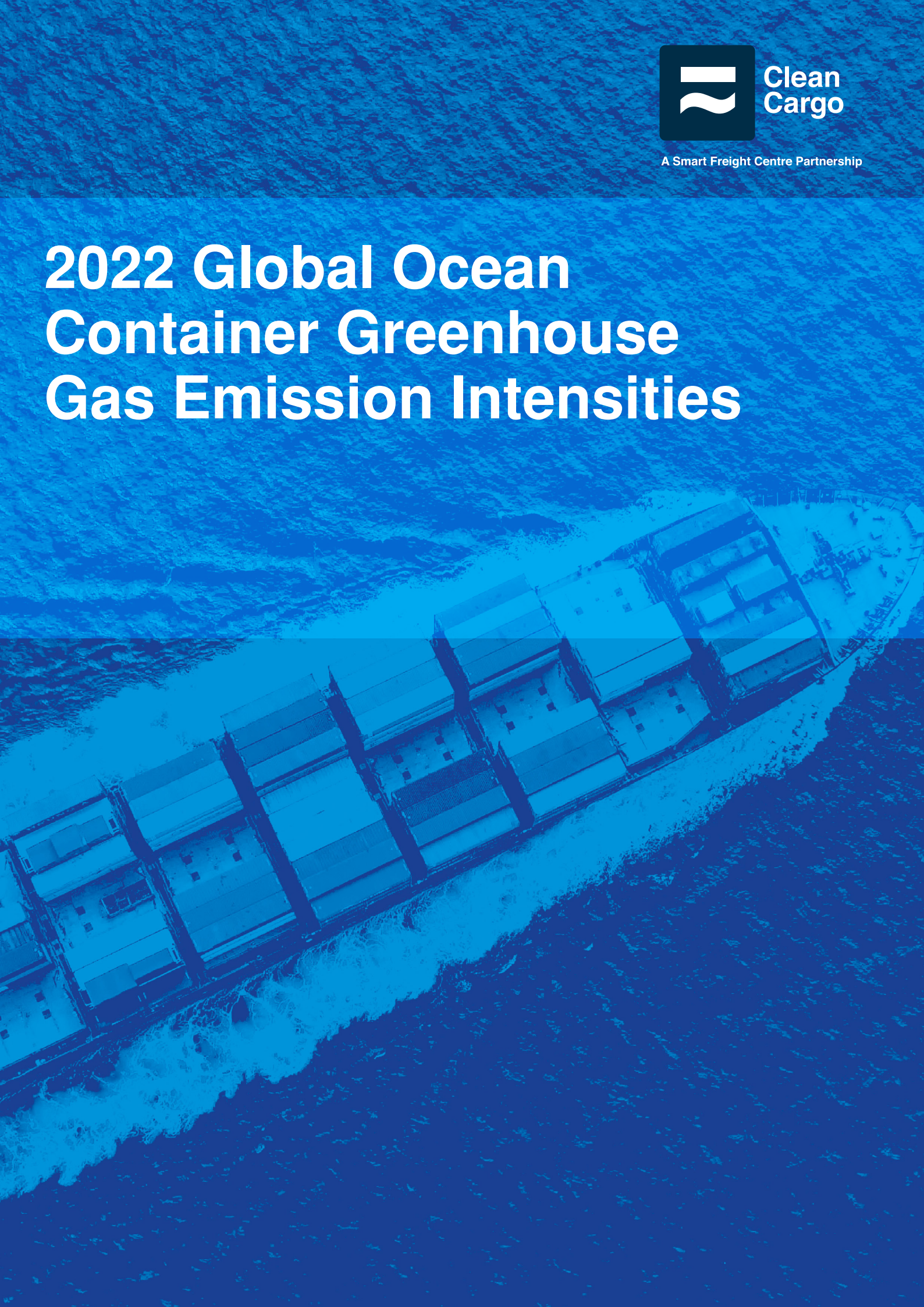
Clean Cargo

A Smart Freight Centre Partnership

2022 Global Ocean Container Greenhouse Gas Emission Intensities



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About Smart Freight Centre

Smart Freight Centre

Smart Freight Centre is an international nonprofit organization focused on reducing greenhouse gas emissions from freight transportation. Smart Freight Centre's vision is an efficient and zero emission global logistics sector. Smart Freight Centre works to guide the global logistics industry in tracking and reducing the industry's greenhouse gas emissions by one billion tonnes by 2030 and to reach zero emissions by 2050 or earlier, consistent with a 1.5°C future.

Clean Cargo

About Clean Cargo

Clean Cargo is a collaborative initiative between ocean container carriers, freight forwarders, and cargo owners.

Clean Cargo serves as a source of high-quality containership greenhouse gas emission performance information that supports members in their work to decarbonize containerized ocean cargo transportation. Specifically, the Clean Cargo secretariat collects operational and technical data from ocean container carriers to generate containership emission performance information that:

- **Facilitates accurate greenhouse gas emissions inventory calculations for Clean Cargo members.**
- **Guides member companies in making educated ocean freight procurement decisions.**

Clean Cargo also serves as a forum for decarbonization best practice sharing amongst members.

2022 Greenhouse gas emission performance information

The emission performance information presented in this report is calculated according to the Clean Cargo methods for a series of Clean Cargo ocean container transportation trade lanes. The information in Table 1 represents average annual performance[1] across all reporting Clean Cargo ocean container carrier members. For 2022, there were 17 reporting Clean Cargo carriers. These carriers were responsible for approximately 85% of global ocean container freight capacity (by volume).

Clean Cargo emission intensities are based on emission factors that incorporate greenhouse gas emissions resulting from all United Nations Framework Convention on Climate Change Kyoto Protocol greenhouse gases (currently, carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), and nitrogen trifluoride (NF_3)). The emission factors that underly the Clean Cargo emission intensities include emissions associated with the entire life cycle of the production and use of each energy source[2].

Clean Cargo greenhouse gas emission intensities shown in Table 1:

- **Are calculated based on each vessel's nominal capacity, assuming a 70% vessel capacity utilization factor.**
- **Differentiate between emission intensities for refrigerated cargo (refrigerated) and non-refrigerated cargo (dry) based on each vessel's nominal refrigerated container capacity and the vessel's reported number of days of operation.**
- **Reflect emissions associated with the entire life cycle of the fuel consumed in the carriers' vessels (that is, the Table 1 emission intensities are "Well to Wake" intensities).**

Clean Cargo carrier member data used in calculating the emission intensities undergoes third-party verification.

Additional information on the methods behind the emission intensities included in Table 1 is accessible here.

1 Ocean cargo shippers and freight forwarders interested in carrier-specific emissions performance information are welcome to contact Smart Freight Centre at info@smartfreightcentre.org to learn more about membership in Clean Cargo.

2 Except in selected instances, where the emission intensities will be clearly marked "Tank to Wake," or "TTW."

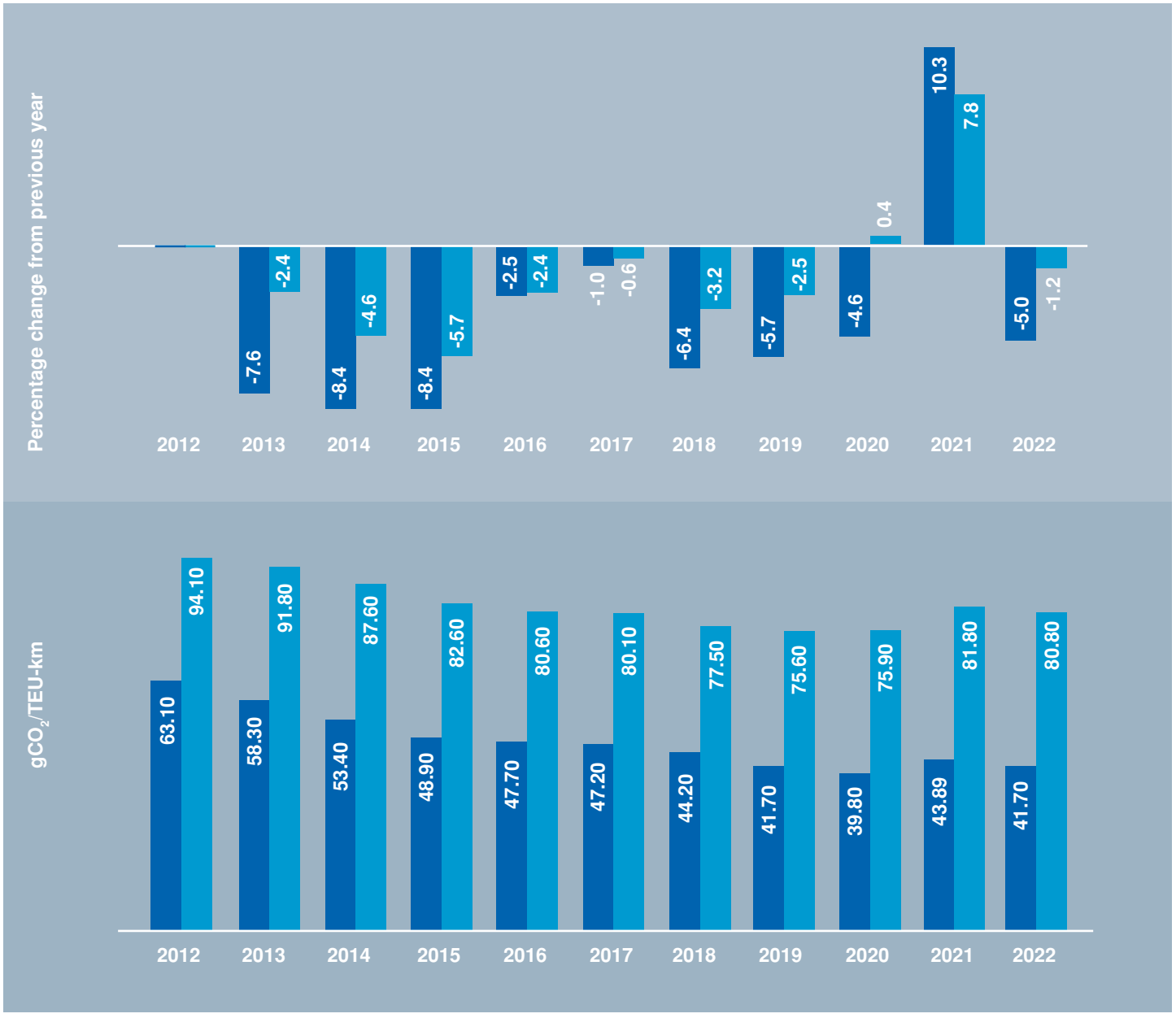
Table 1 **Average carrier dry and refrigerated container emission intensities in grams of carbon dioxide equivalent per twenty foot equivalent unit-kilometer (gCO_2e / TEU-km). Intensities reflect Well to Wake emission factors and assume 70% vessel capacity utilization.**

TRADE LANE	2022 Number of vessels: 3,971		2021 Number of vessels: 3,737		2020 Number of vessels: 3,740		2019 Number of vessels: 3,493		2018 Number of vessels: 3,275	
	Dry	Refrigerated	Dry	Refrigerated	Dry	Refrigerated	Dry	Refrigerated	Dry	Refrigerated
Asia to-from Africa	83.8	151.0	87.7	155.4	75.3	143.5	74.3	133.1	72.9	128.4
Asia to-from Mediterranean/Black Sea	48.7	114.5	48.0	111.4	46.6	104.7	50.3	104.8	56.9	108.9
Asia to-from Middle East/India	68.6	133.1	73.7	137.5	60.5	121.3	56.2	111.1	64.0	116.9
Asia to-from North America East Coast/Gulf	63.1	123.4	64.7	120.4	57.8	111.6	60.2	107.4	63.7	111.1
Asia to-from North America West Coast	65.7	131.7	71.3	138.2	64.1	121.7	67.1	116.5	71.0	120.1
Asia to-from North Europe	39.6	102.1	42.3	102.0	44.1	100.5	42.3	93.1	43.4	92.1
Asia to-from Oceania	96.0	165.6	100.7	168.6	88.4	149.2	86.4	138.6	89.4	141.5
Asia to-from South America (Including Central America)	70.8	127.3	71.5	125.9	63.1	118.2	60.5	109.9	63.4	111.7
Europe (North and Mediterranean) to-from Africa	99.7	172.7	102.2	174.0	100.2	171.3	100.9	164.9	91.6	151.8
Europe (North and Mediterranean) to-from South America (Including Central America)	81.6	142.8	79.6	139.7	68.8	126.2	67.4	121.2	77.5	132.5
Europe (North and Mediterranean) to-from Middle East/India	63.2	129.5	68.5	132.6	58.9	119.2	55.8	108.3	58.5	111.5
Europe (North and Med) to-from Oceania (via Suez/via Panama)	81.9	141.4	82.8	139.5	81.9	138.7	80.0	131.2	94.5	146.5
Mediterranean/Black Sea to-from North America East Coast/Gulf	92.0	167.0	88.4	154.0	77.1	139.2	80.1	136.6	89.1	143.9
Mediterranean/Black Sea to-from North America West Coast	48.9	122.8	62.3	131.1	71.9	129.9	77.8	134.4	96.5	153.9
North America East Coast/Gulf/West Coast to-from Africa	131.7	192.2	134.2	193.5	124.3	201.1	138.9	190.7	83.4	133.4
North America East Coast/Gulf/West Coast to-from Oceania	80.0	145.1	109.7	173.7	103.5	156.0	106.4	156.7	111.0	158.9
North America East Coast/Gulf/West Coast to-from South America (Including Central America)	88.1	153.3	91.6	156.5	82.5	143.2	82.3	134.7	89.8	141.1
North America East Coast/Gulf/ West Coast to-from Middle East/India	75.3	138.6	79.9	137.7	70.9	125.9	66.0	115.9	74.0	121.1
North Europe to-from North America East Coast/Gulf	88.9	160.6	92.2	159.5	84.5	144.4	86.9	141.1	88.8	141.1
North Europe to-from North America West Coast	76.4	142.0	88.6	170.0	75.9	134.2	64.0	117.5	70.6	122.9
South America (Including Central America) to-from Africa	138.2	206.6	110.6	186.8	122.4	200.0	115.9	174.0	68.6	118.5
Intra Africa	133.7	224.9	135.2	233.0	127.1	219.0	118.3	201.2	115.7	186.9
Intra North America East Coast/Gulf/West Coast	202.9	283.0	171.5	233.7	177.6	241.8	143.2	203.3	118.2	175.8
Intra South America (Including Central America)	116.4	193.0	108.4	176.0	103.9	177.0	103.1	169.9	112.2	181.3
South East Asia to-from North East Asia	98.6	169.6	98.1	168.3	84.0	148.4	91.3	150.6	94.5	154.5
Intra North East Asia	110.7	184.8	118.9	187.8	103.5	182.8	101.7	173.7	72.5	129.2
Intra South East Asia	125.2	202.1	117.4	193.2	112.5	194.2	102.6	176.8	109.3	178.9
North Europe to-from Mediterranean/Black Sea	73.1	140.5	104.2	173.9	95.8	160.1	98.8	158.0	103.3	163.0
Intra Mediterranean/Black Sea	158.8	264.8	148.2	250.2	134.3	239.4	128.3	220.6	100.2	174.3
Intra North Europe	140.3	232.9	143.3	233.2	138.4	221.6	139.8	221.4	98.3	162.7
Intra Middle East/India	117.6	197.1	126.1	223.2	108.9	197.1	95.9	171.6	96.7	169.5
Other	85.9	164.3	106.7	179.2	110.9	182.5	78.3	139.9	68.2	120.5
Average Across all Trade Lanes	70.6	136.5	74.4	138.3	66.4	126.5	66.2	120.1	70.6	123.5

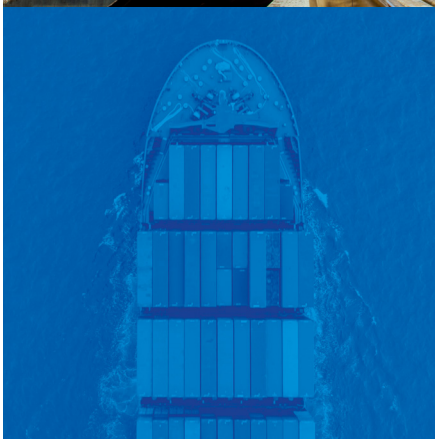
Emission intensity trends

Clean Cargo carrier carbon dioxide emission intensities for 2022, when averaged across all reporting carriers and across all trade lanes, were approximately 5% (dry) and 1.2% (refrigerated) lower than the 2021 emission intensities.[3]

Figure 1 2012-2022 trend in global average Clean Cargo carrier emission intensities (grams CO_2 / TEU-km, assuming 100% vessel capacity utilization, and using Tank to Wake emission factors).



3 For most of the years between 2012 and 2022, Clean Cargo emission intensities were reported based on CO_2 (versus CO_2e), Tank to Wake emission factors, assuming 100% vessel capacity utilization. In order to present the longest meaningful time series, the percent change information discussed here (and the information shown in Figure 1) therefore reflects Tank to Wake CO_2 emissions and a 100% vessel capacity utilization factor.



Potential drivers of the intensity changes

The decreased fleetwide average greenhouse gas emission intensity for 2022 is likely to be the result of several related factors. It is difficult to determine the contribution of each factor to the decreased intensity without conducting a detailed analysis of global container fleet activities in 2022. However, contributing factors could include:

- **Stabilization of marine transportation supply chains following COVID-induced disruptions that impacted vessel activities in 2021. Congestion and port delays, although still present (especially at the start of the year), reduced in 2022 (compared to 2021). Reduced supply chain disruptions may also be associated with decreased vessel speeds. Above a certain threshold, decreases in vessel speeds can be associated with increases in the energy efficiency (per transport activity) of a vessel.**
- **A slight increase of the average capacity of vessels for 2022 activities as reported through Clean Cargo. Provided that vessel capacity utilization is high, larger vessels can often operate at lower emission intensities than can smaller vessels. This factor has been a significant driver in overall sector efficiency during the past decade.**

Using the 2022 emission performance intensities

For further information on how to apply the 2022 Clean Cargo greenhouse gas emission intensities in greenhouse gas emission footprint calculations, please see the Global Logistics Emissions Council Framework.

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Information

For more information on Smart Freight Centre or Clean Cargo, please visit our website at www.smartfreightcentre.org.

You can also contact Smart Freight Centre directly by email at info@smartfreightcentre.org, or by phone at +31 6 4695 4405.