



Creative  
Carbon  
Management

Let's walk the talk

# The Role of Carbon Insets for the Fuel and Transportation Sector

# A Few Basic Facts

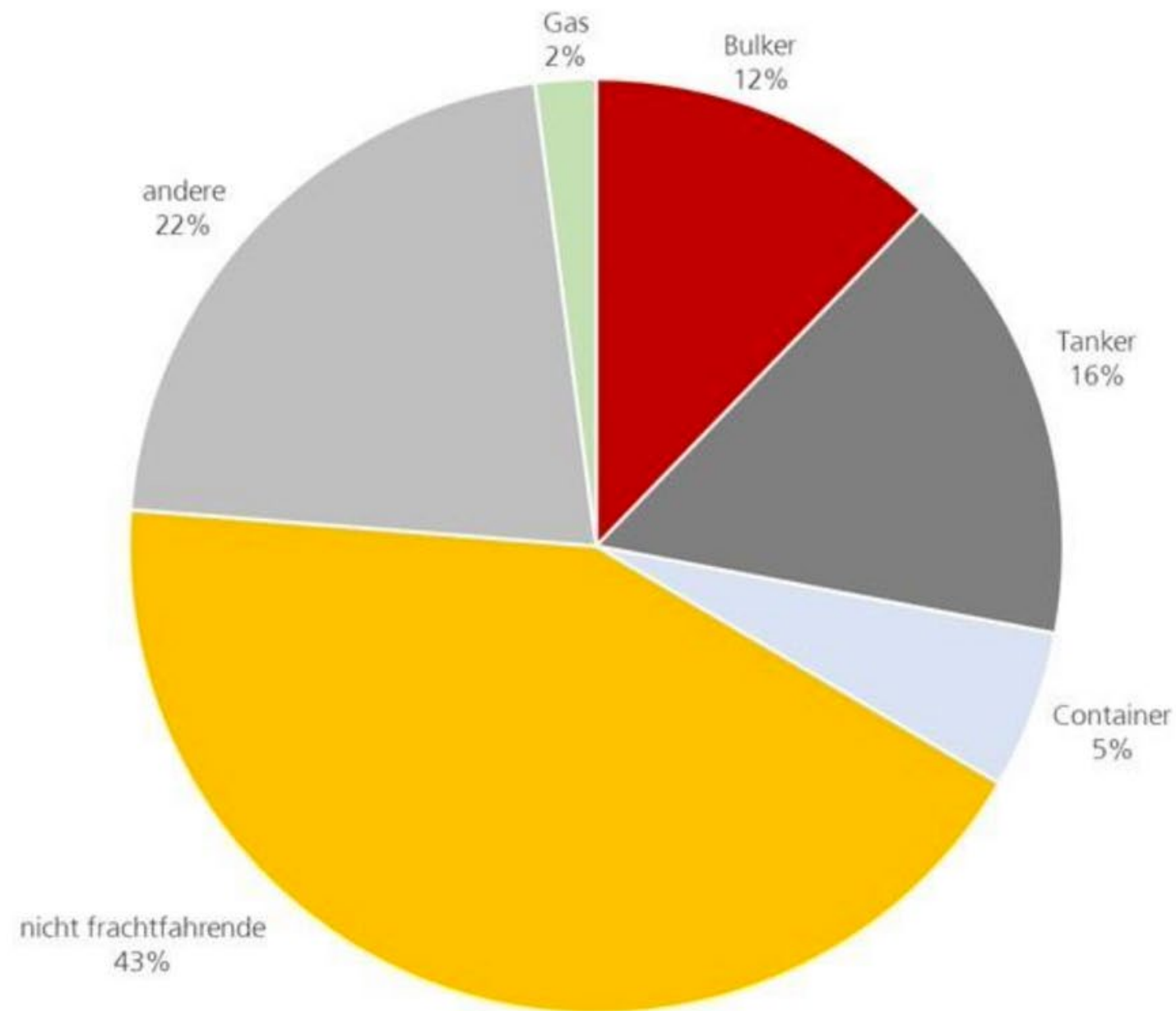
Ships are the oldest mode of transportation until the introduction of the airplane, ships were the only means of transportation for transoceanic trade

Today, approximately 85% of intercontinental trade (in tons) is still done by ship

No other mode of transportation is capable of providing even remotely the transport capacity of ships

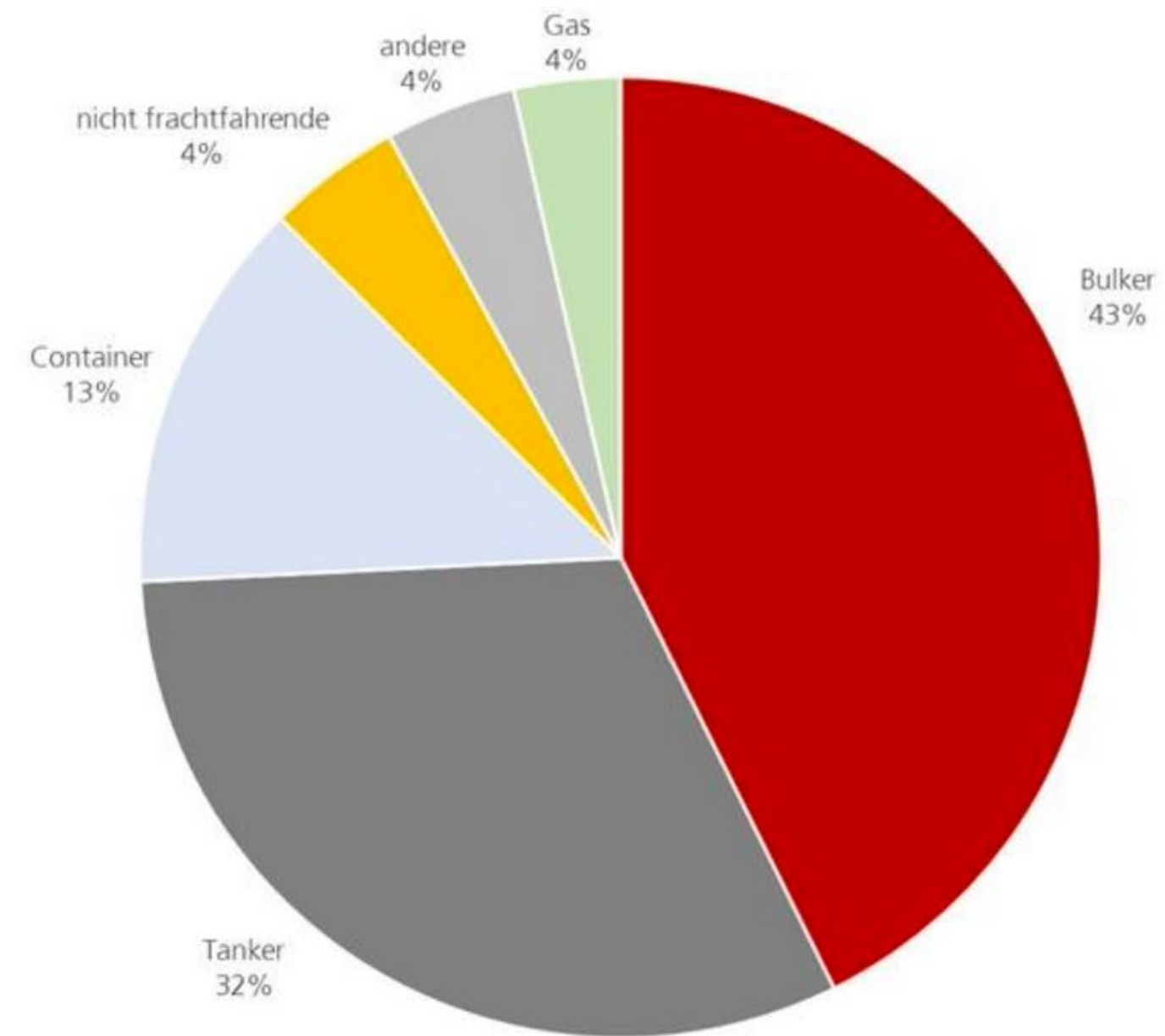
# Fleet Composition of World Trade Fleet

Zusammensetzung Welthandelsflotte nach Anteil Schiffstyp



Total: 98.248 Ships

Zusammensetzung Welthandelsflotte nach Schiffstyp und Anteil Tragfähigkeit



Total: 2,047 Mio. dwt

# Flag Affiliation

**Table 2.8** Leading flags of registration by dead-weight tonnage, 2019

	Flag of registration	Number of vessels (percentage)	Vessel share of world total	Dead-weight tonnage (1,000 dwt)	Share of world total dead-weight tonnage (percentage)	Cumulated share of dead-weight tonnage	Average vessel size (dwt)	Growth in dead-weight tonnage 2019/2018 (percentage)
1	Panama	7 860	8.16	333 337	17	16.87	44 930	-0.57
2	Marshall Islands	3 537	3.67	245 763	12	12.43	69 878	3.23
3	Liberia	3 496	3.63	243 129	12	12.30	69 704	7.98
4	Hong Kong, China	2 701	2.80	198 747	10	10.06	75 083	8.17
5	Singapore	3 433	3.57	129 581	7	6.56	39 785	1.16
6	Malta	2 172	2.26	110 682	6	5.60	51 890	1.39
7	China	5 589	5.80	91 905	5	4.65	19 646	8.16
8	Bahamas	1 401	1.45	77 844	4	3.94	56 449	1.26
9	Greece	1 308	1.36	69 101	3	3.50	64 339	-4.28
10	Japan	5 017	5.21	39 034	2	1.97	10 263	4.23
11	Cyprus	1 039	1.08	34 588	2	1.75	34 110	-1.36
12	Isle of Man	392	0.41	27 923	1	1.41	71 232	2.28
13	Indonesia	9 879	10.26	23 880	1	1.21	4 674	5.54
14	Danish International Ship Register	566	0.59	22 444	1	1.14	41 717	15.86
15	Norwegian International Ship Register	611	0.63	19 758	1	1.00	32 550	1.08
16	Madeira	465	0.48	19 107	1	0.97	41 179	-1.14
17	India	1 731	1.80	17 354	1	0.88	10 633	-6.41
18	United Kingdom	1 031	1.07	17 041	1	0.86	19 930	1.64
19	Italy	1 353	1.41	13 409	1	0.68	12 015	-11.82
20	Saudi Arabia	374	0.39	13 128	1	0.66	45 583	-2.97
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX								
<b>Top 35 total</b>		<b>71 528</b>	<b>74.28</b>	<b>1 875 024</b>	<b>94.87</b>	<b>94.87</b>		
<b>Rest of world</b>		<b>24 767</b>	<b>25.72</b>	<b>101 467</b>	<b>5.13</b>	<b>5.13</b>		
<b>World total</b>		<b>96 295</b>	<b>100.00</b>	<b>1 976 491</b>	<b>100.00</b>	<b>100.00</b>	<b>25 024</b>	<b>2.61</b>

The top 20 flag states manage approx. 87% of deadweight tonnage (dwt), but only 56% of the ships

52% of the deadweight tonnage is held by 4 flag states:

- Panama
- Marshall Islands
- Liberia
- Hong Kong

# Owners and Origin

**Table 2.6 Ownership of world fleet ranked by dead-weight tonnage, 2019**

	Country or territory of ownership	Number of vessels			Dead-weight tonnage				
		National flag	Foreign flag	Total	National flag	Foreign flag	Total	Foreign flag as a percentage of total	Total as a percentage of total
1	Greece	670	3 866	4 536	60 776 654	288 418 535	349 195 189	82.60	17.79
2	Japan	875	2 947	3 822	35 532 308	189 588 907	225 121 215	84.22	11.47
3	China	3 987	2 138	6 125	90 930 376	115 370 656	206 301 032	55.92	10.51
4	Singapore	513	1 214	2 727	71 287 105	50 198 543	121 485 648	41.32	6.19
5	Hong Kong, China	890	738	1 628	72 311 219	25 817 099	98 128 318	26.31	5.00
6	Germany	212	2 460	2 672	8 365 247	88 167 113	96 532 360	91.33	4.92
7	Republic of Korea	774	873	1 647	12 418 609	4 282 908	76 701 517	83.81	3.91
8	Norway	367	1 671	2 038	1 758 664	59 356 435	61 115 099	97.12	3.11
9	United States	822	1 153	1 975	9 518 623	48 859 083	58 377 706	83.69	2.97
10	Bermuda	14	518	532	337 958	57 894 249	58 232 207	99.42	2.97
11	Taiwan Province of China	134	871	1 005	5 651 439	45 439 668	51 091 107	88.94	2.60
12	United Kingdom	327	1 000	1 327	6 665 237	42 008 100	48 673 337	86.31	2.48
13	Denmark	26	954	980	29 405	42 974 866	43 004 271	99.93	2.19
14	Monaco	-	448	448	-	42 277 013	42 277 013	100.00	2.15
15	Belgium	107	191	298	10 155 219	20 011 240	30 166 459	66.34	1.54
16	Turkey	484	1 038	1 522	7 164 081	20 445 631	27 609 712	74.05	1.41
17	India	854	165	1 019	16 602 223	8 256 940	24 859 163	33.21	1.27
18	Switzerland	30	405	435	1 225 335	23 412 718	24 638 053	95.03	1.26
19	Russian Federation	1 356	351	1 707	7 772 112	14 975 374	22 747 486	65.83	1.16
20	Indonesia	2 063	82	2 145	20 768 274	1 526 652	22 294 926	6.85	1.14
XXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXXX									
<b>Subtotal, top 35 shipowners</b>		<b>19 715</b>	<b>26 206</b>	<b>45 920</b>	<b>507 569 517</b>	<b>1 364 874 883</b>	<b>1 872 444 400</b>	<b>72.89</b>	<b>95.41</b>
<i>Rest of world and unknown</i>		<i>2 841</i>	<i>2 923</i>	<i>5 764</i>	<i>34 528 774</i>	<i>55 608 866</i>	<i>90 137 640</i>	<i>61.69</i>	<i>4.59</i>
<b>World total</b>		<b>22 556</b>	<b>29 128</b>	<b>51 684</b>	<b>542 098 291</b>	<b>1 420 483 749</b>	<b>1 962 582 040</b>	<b>72.38</b>	<b>100.00</b>

Ship owners from 4 countries own approx. 46% of world tonnage:

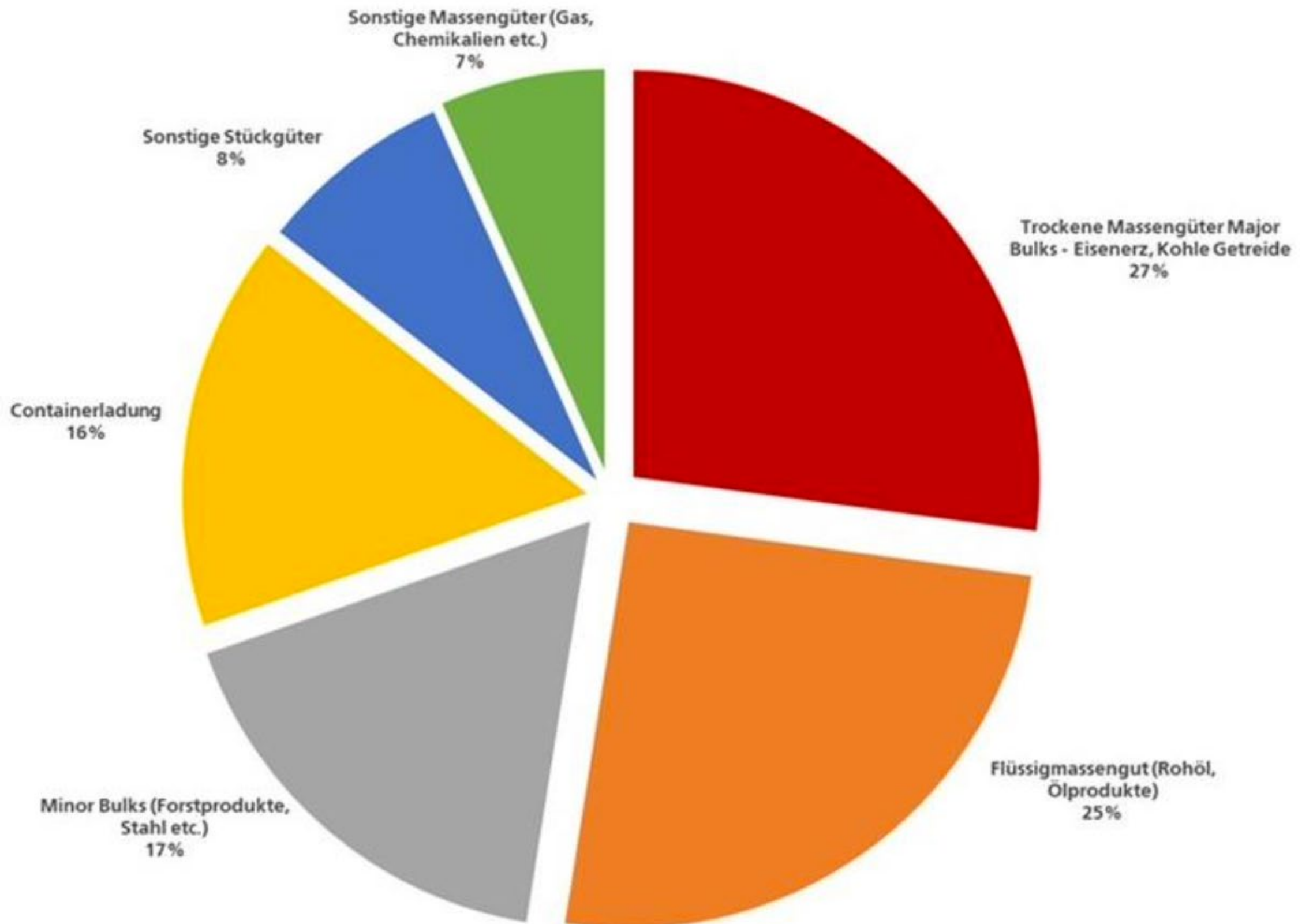
- Greece
- Japan
- China
- Singapore

Owners from Germany hold approx. 5%

# Shipped Tonnage

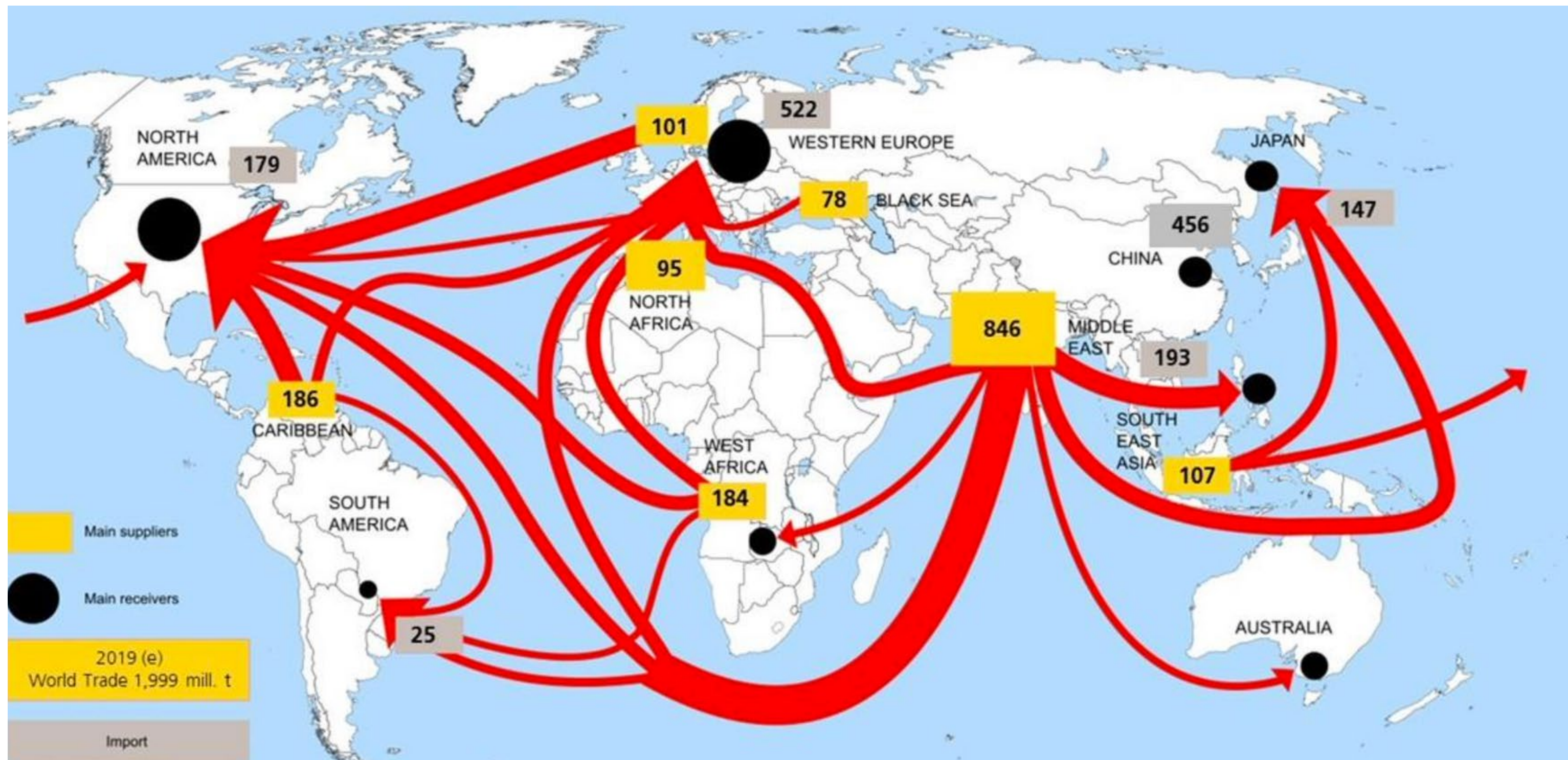
Global maritime trade by categories of goods in 2019 (%)

11.887.234.766 tons



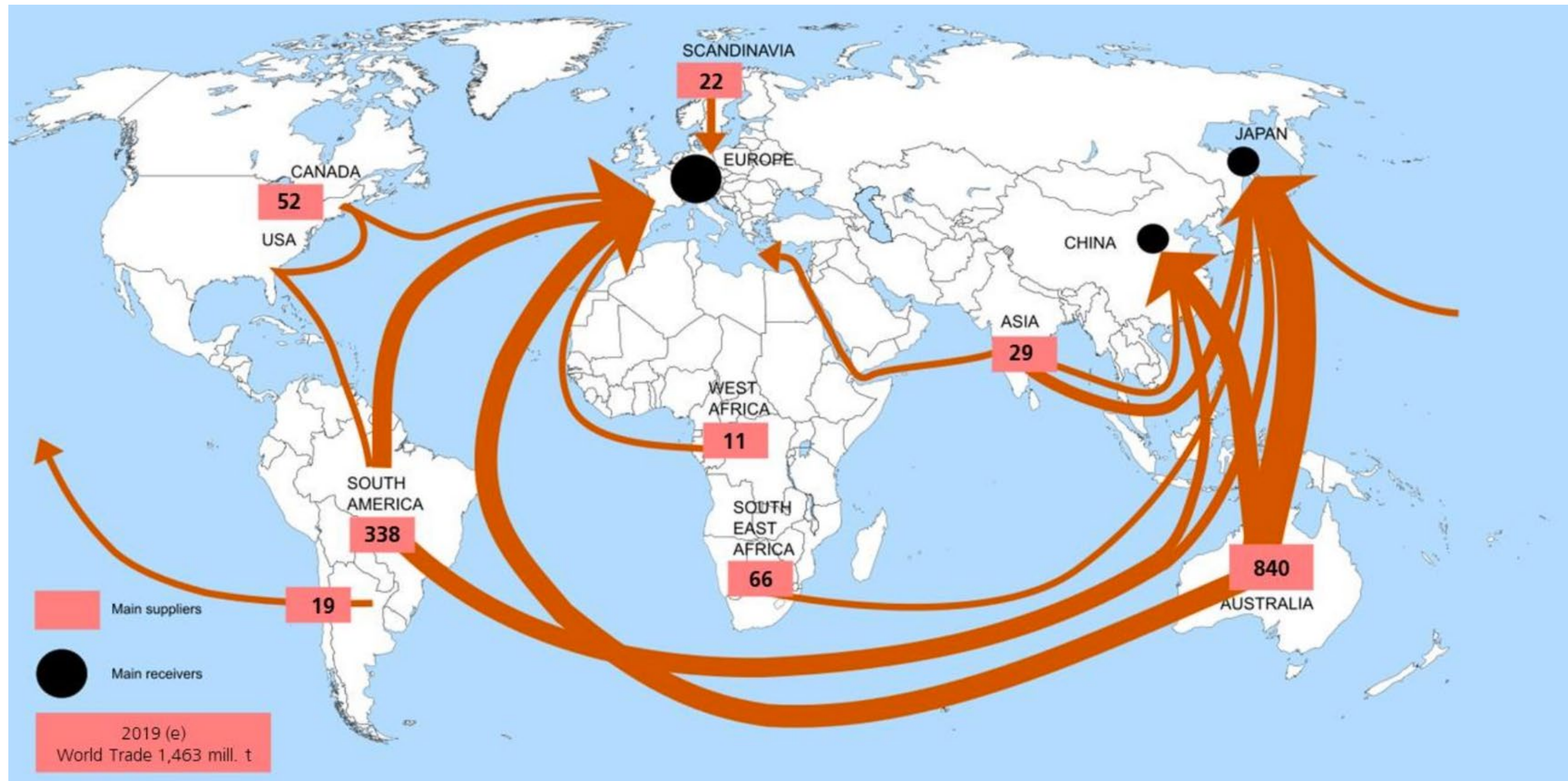
# Maritime Trade Routes

## Crude Oil - Shipping Routes and Volumes (Mio. tons)



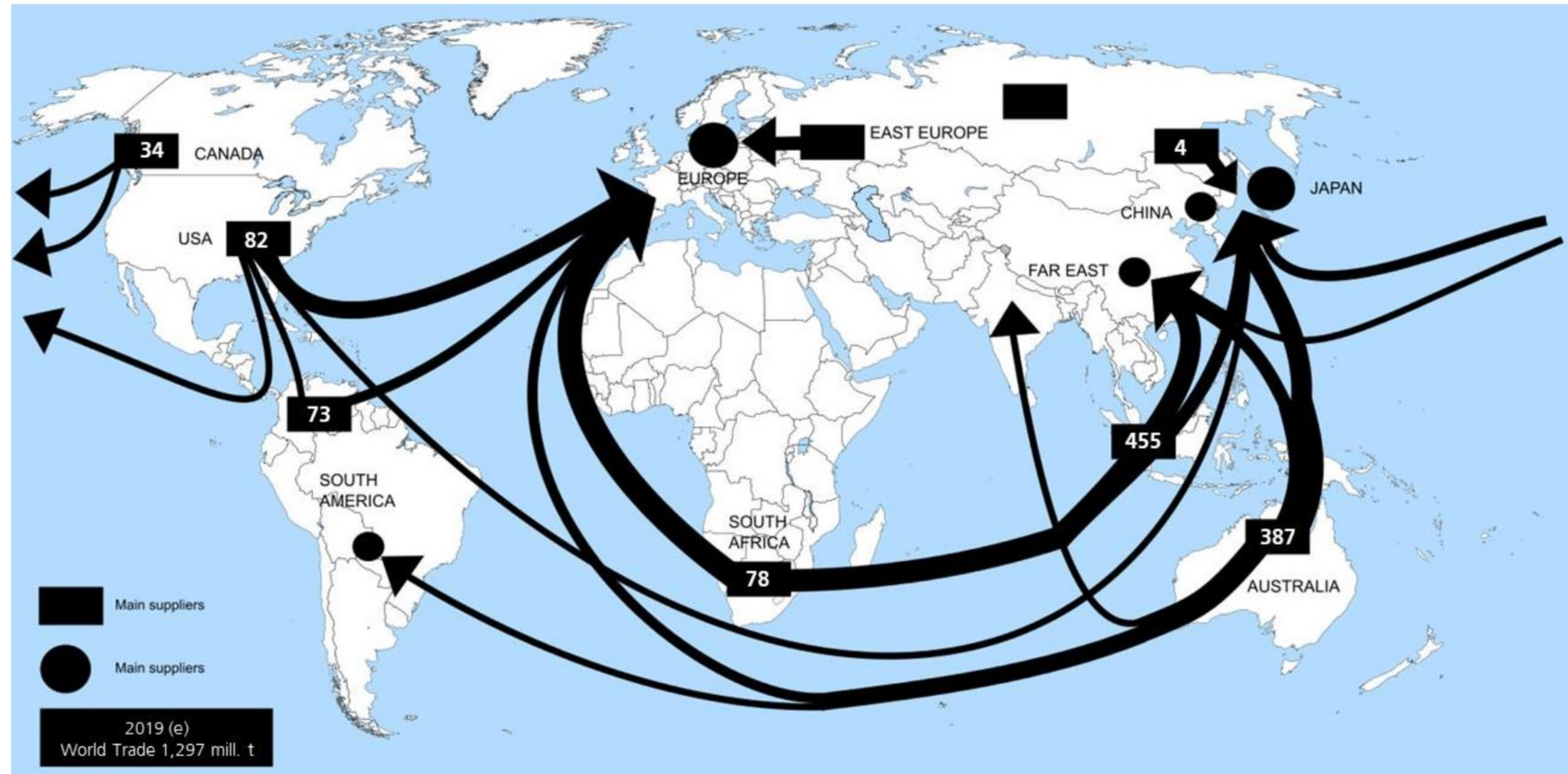


# Maritime Trade Routes



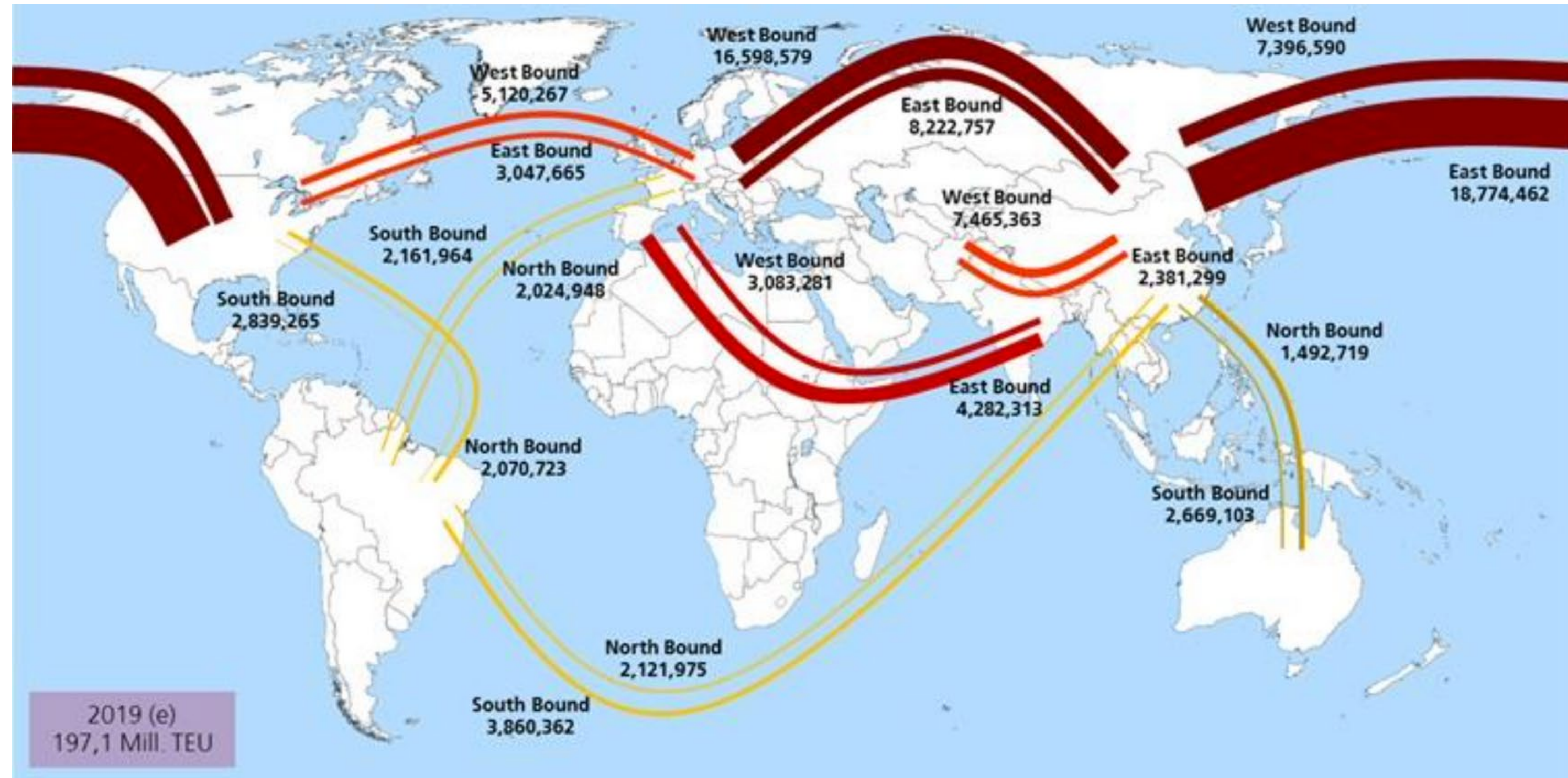
# Maritime Trade Routes

## Coal - Shipping Routes and Volumes (Mio. tons)



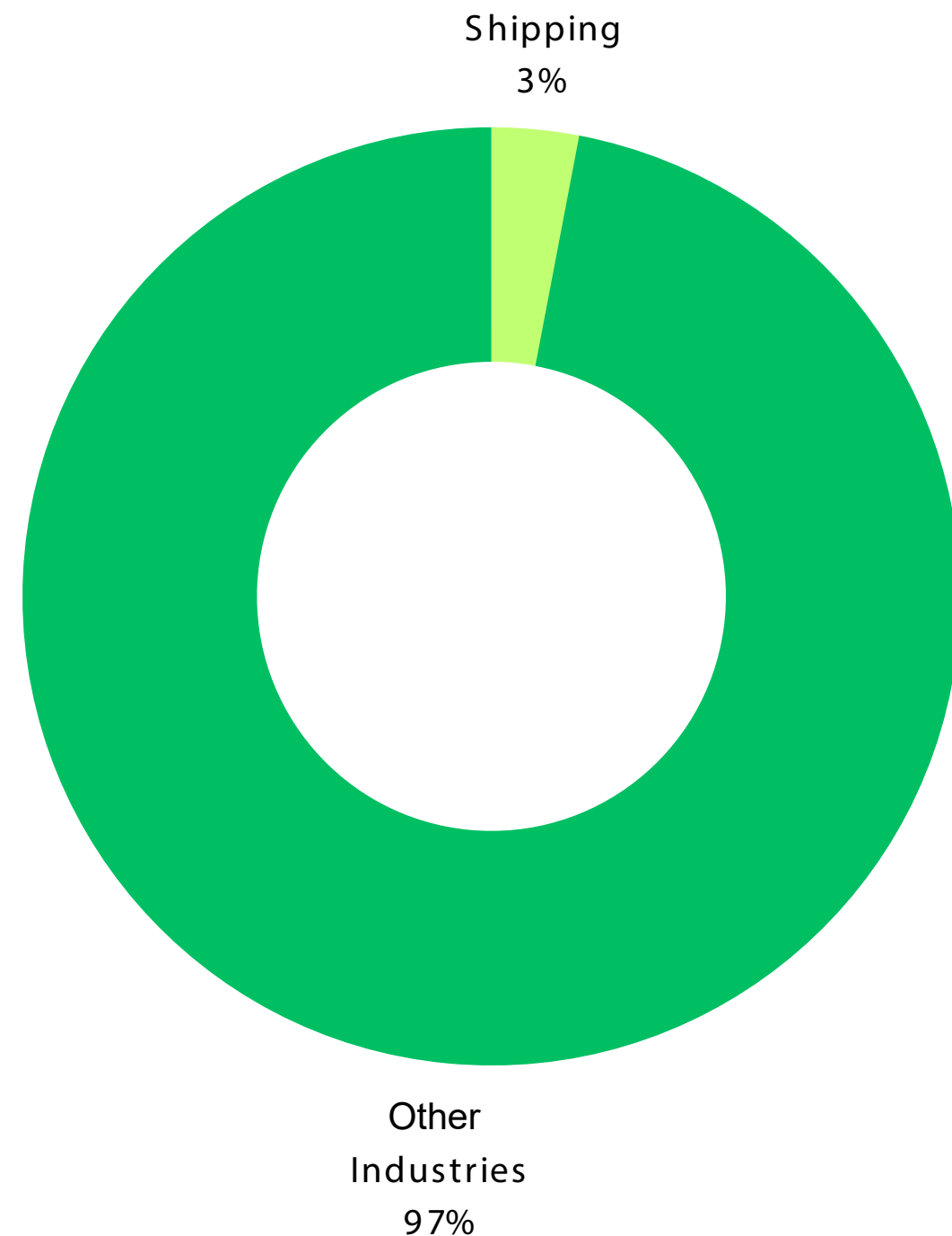
# Maritime Trade Routes

## Containers - Shipping Routes and Volumes (TEU)



# Various Fuel Consumptions

# Various Fuel Consumptions



For 2021, the reported fuel oil consumption for ships in international trade was 280 Mtoe.

Almost all (99.9%) the fuel that was reported was either heavy fuel oil (HFO), light fuel oil (LFO), marine gas oil (MGO) or liquefied natural gas (LNG 7%).

Total: approx. 280 Mtoe (incl. of LNG)

Co<sub>2</sub>: approx. 8 10 Mtoe Mt Co<sub>2</sub>eq

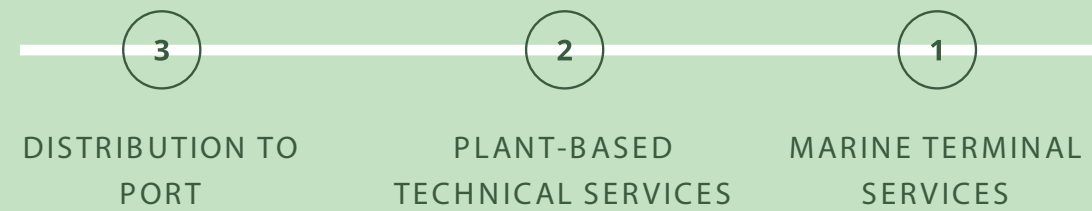
# Shipping / Logistics - Opportunities to Decarbonize Along the Supply Chain

# Opportunities to Decarbonize Along the Supply Chain

Landbased- Upstream

Ocean

Landbased- Downstream



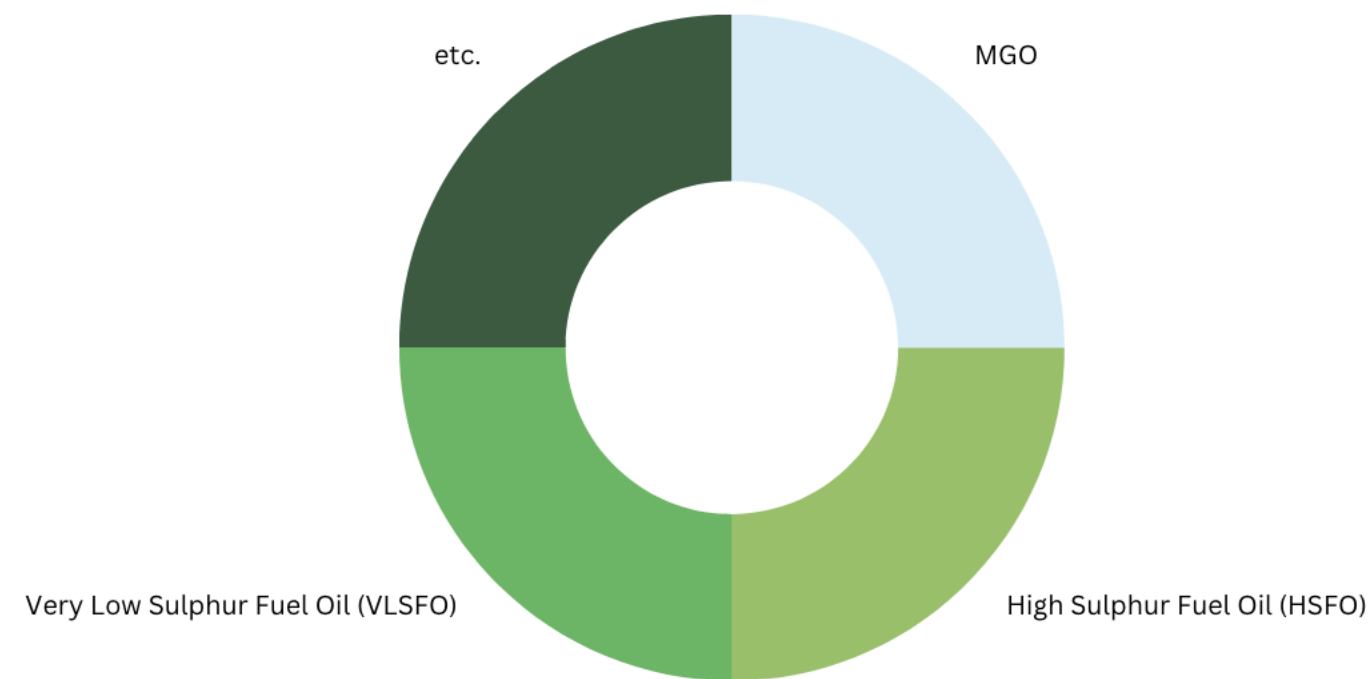
OCEAN TRANSPORTATION



# Opportunities to Decarbonize Along the Supply Chain

Among low carbon fuels, biofuel (EN 14214) is the most widely used in shipping today and often used as a blend-in with fossil fuels.

Biofuels can be blended with a variety of different marine fuels:



The typical blending ratio of biofuel is currently in the range 20% to 30% but is also available as 100% biofuel.



# Opportunities to Decarbonize Along the Supply Chain

The bio-blended fuels represent an available decarbonization option, as it is possible to use the infrastructure in the same way as for conventional marine bunkering fuel today. Additionally, biofuels already have an established infrastructure due to their use in multiple sectors.

Rotterdam sold more than 500,000 tons

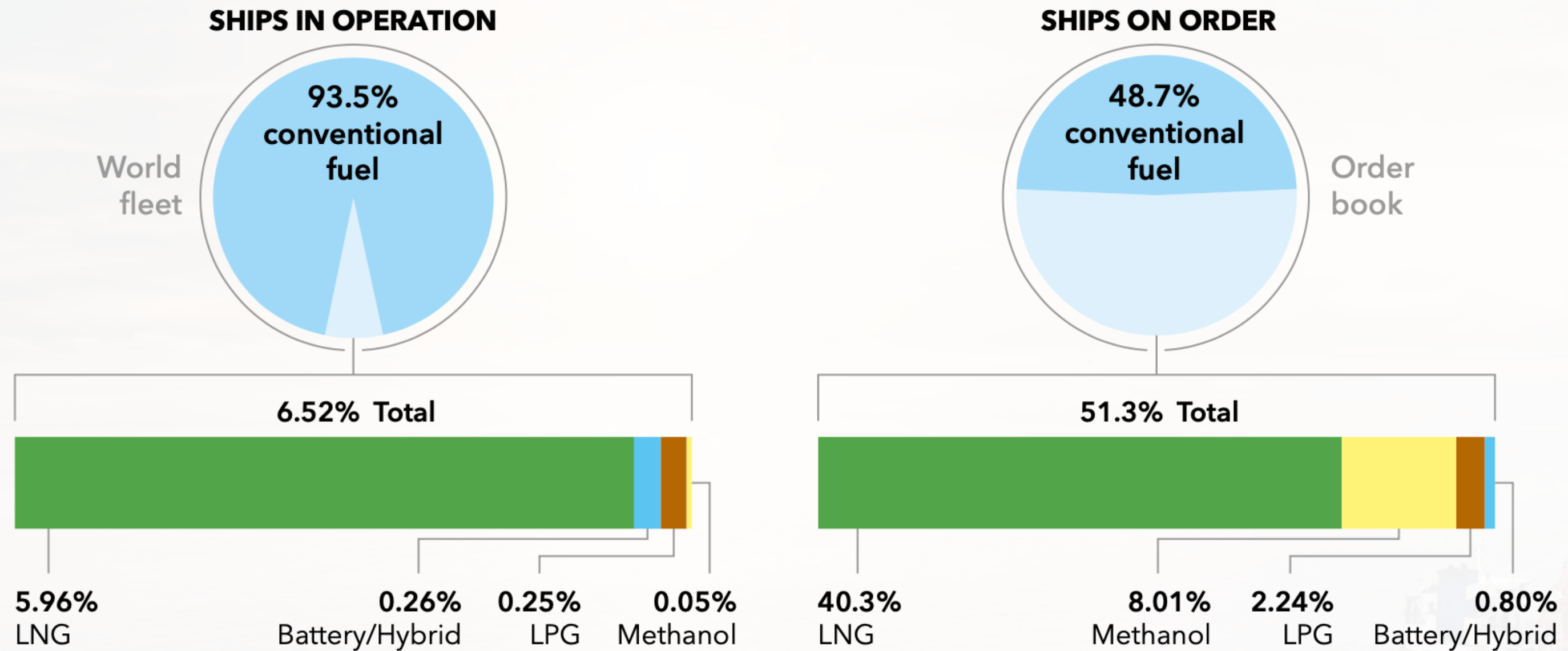
Singapore more than 150,000 tons

Overall, the sales of bio-blended fuels increased by more than 70% between 2021. Locomotives ,Trucks, being part of the value chain, incl. of equipment being used on container terminals, fueled by Road diesel EN 590 have an identical opportunity. i.e VPS, foundry owned railways service has converted from EN 590to HVO, reducing emissions by approx. 90%.

# Opportunities to Decarbonize Along the Supply Chain

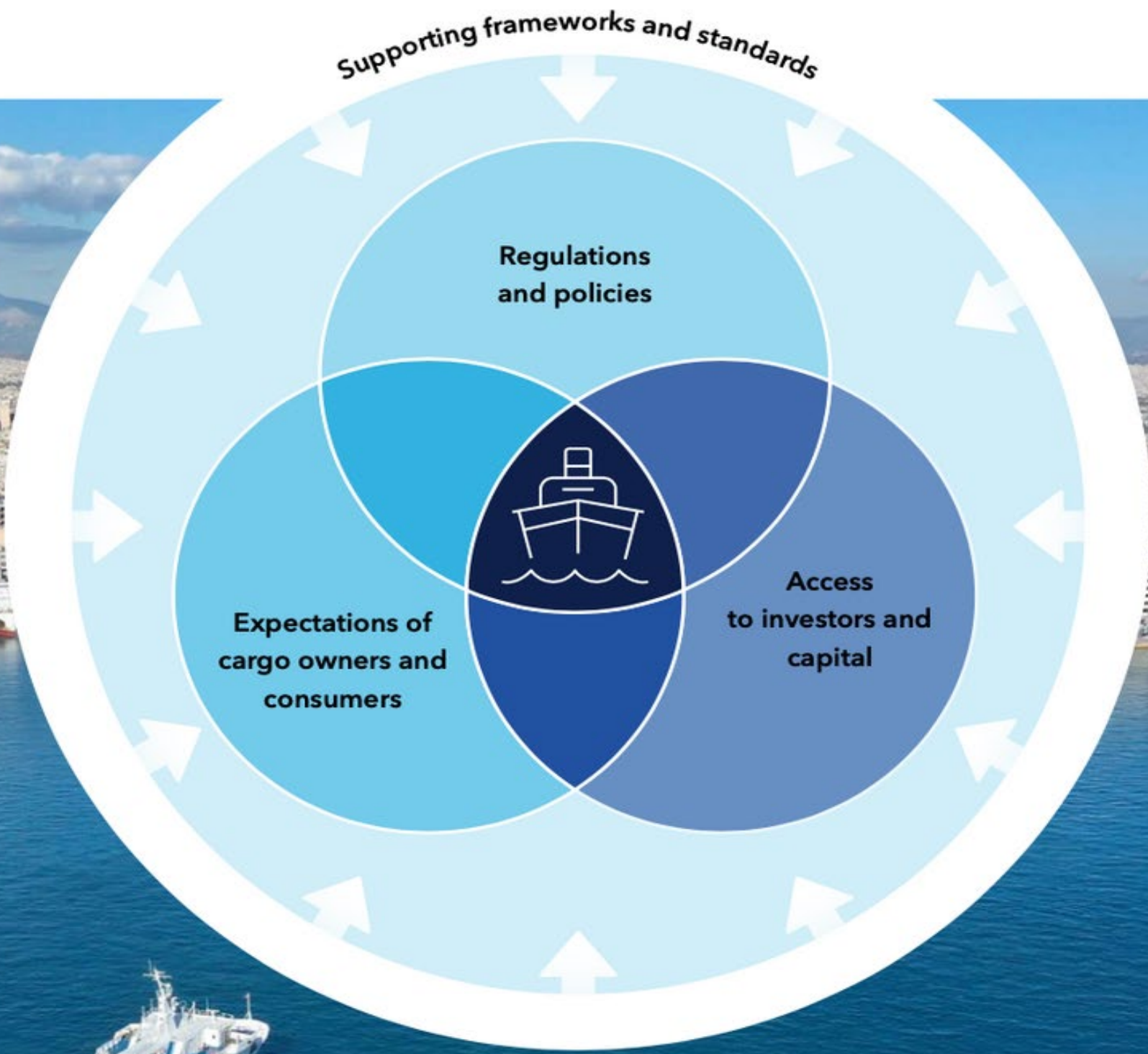
FIGURE 1-1

## Alternative fuel uptake in the world fleet by gross tonnage



Sources: IHSMarkit (ihsmarkit.com) and DNV's Alternative Fuels Insights for the shipping industry - AFI platform (afi.dnv.com)

# Drivers of Decarbonization



**FIGURE 3-1**  
**Three key fundamentals are driving ship decarbonization, supported by frameworks and standards specifying sustainability evaluation criteria and targets, GHG emission calculation methods, and reporting requirements**

# Drivers of Decarbonization

The EU has agreed to include shipping in its Emission Trading Scheme (EU ETS) from 2024 and on setting requirements on well-to-wake GHG emissions (FuelEU Maritime) from 2025.

The IMO has revised its GHG Strategy, strengthening the ambitions for international shipping.

The new targets include a 20% reduction in emissions by 2030, a 70% reduction by 2040 (compared with 2008 levels), and the ultimate goal of achieving net-zero emissions by 2050.

New regulations are expected to enter into force around mid-2027.

# ETS and its Implication for International shipping

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Vessel owners will have to surrender ETS allowances for :

40% of their GHG emissions reported for 2024

70% of their GHG emissions reported for 2025

100% of their GHG emissions reported for 2026

100% for voyages within the EU monitoring zone

50% for in/out EU monitoring zone sailings.

# ETS and its Implication for International Shipping

## MACS B100 ready Ships data 2022

	Verbrauch gesamt	CO2 Total	CO2 innerhalb EU	CO2 in EU Häfen	CO2 aus EU raus	CO2 in EU rein	Total ETS emission	2024 (40%)	2025 (70%)	2026 (100%)
<b>Blue Master II</b>	5635.57	17638.39	3823.37	801.29	6368.89	6644.85	11131.53	4452.612	7792.071	11131.53
<b>Golden Karoo</b>	5880.71	18402.73	4046.22	765.29	6648.6	6942.62	11607.12	4642.848	4859.834	11607.12
<b>Bright Sky</b>	5571	17430.94	3581.07	802.93	6520.93	6526	10907.465	4362.986	7635.2255	10907.465
<b>Green Mountain</b>	5817	18213.61	3685.43	688.62	6740.5	7099.06	11293.83	4517.532	7905.681	11293.83
<b>Total</b>	22904.28						44939.945	17975.978	28192.8115	44939.945

# ETS and its Implication for International Shipping

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<b>Total</b>	22904.28						44939.945	17975.978	28192.8115	44939.945

## ETS Preis

EUR / MT CO2

90.00 €

## Kosten

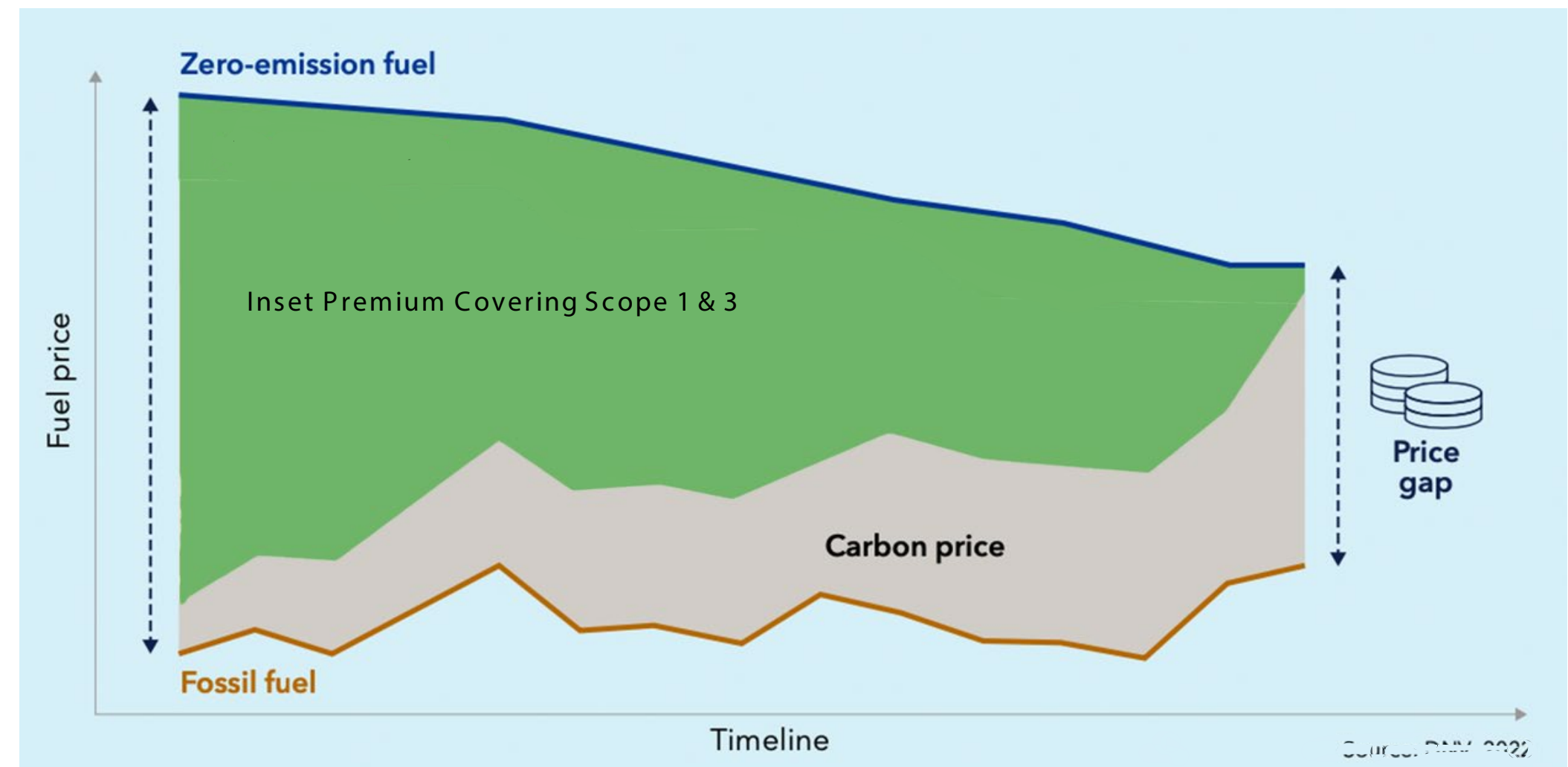
	2024	2025	2026
Mehrkosten gesamt	1,617,838.02 €	2,537,353.04 €	4,044,595.05 €
Merhkosten /mt fuel	70.63 €	110.78 €	176.59 €



# ETS and its Implication for International Shipping

Reduction of the annually reported CO2 emissions. If biofuel is certified to meet the EU RED's sustainability and GHG emission saving criteria, CO2 emissions shall be taken as zero.

The remaining "Green Spread" commercial difference between Fossil incl. ETS and Biofuel is where Insets would kick in, allowing to create additional value for verified and certified Emission reduction according to EU legislation, covering Scope 1 & 3 Emissions



# ETS and its Implication for International Shipping

## The scope emissions being relevant to bridge the Green Spread

<sup>z</sup>

**The scopes are defined by the GHG Protocol framework that includes standards and tools to calculate GHG emissions for companies, supply chains, and countries. The framework is often used as basis for ESG (Environmental, Social, Governance) reporting, and has a global reach.**

The framework divides the emission of a company into:

- **SCOPE 1**, the direct emissions from the company's operations
- **SCOPE 2**, the indirect emissions from production of electricity and heat generated elsewhere but used by the company

– **SCOPE 3**, other indirect emissions due to the operation of the company, upstream and downstream, and would include emissions from production of fuels used by the company.

For a shipping company, the direct emissions from combustion of non-biogenic fuels on owned or operated

ships are part of Scope 1, while emissions from fuel production, including biofuels, should be reported as Scope 3 emissions. Direct CO<sub>2</sub> emissions from combustion of biofuels are not part of any of the scopes but should be reported in a separate memo. Emissions related to production of biofuels, including land-use, should be accounted for as part

of Scope 3 as for fossil fuels. Scope 3 emissions would also include emissions from manufacturing ships, but there are not yet any specific methods for calculating this. For a wide range of businesses like cargo owners, banks, insurance and so on, ship emissions, including the lifecycle emissions from fuels, are part of their Scope 3 emissions.

# Bridging the Green Spread with Insets

# Bridging the Green Spread with Insets

## What are Insets?

As opposed to Offsets, Insets reflect an integrated actual CO2 emission reduction along a supply/ value chain.

Providing a cargo owner, shipowner, or logistics company, an opportunity to achieve comprehensive carbon emission reductions (Insets) within their supply and value chain.

An “inset” approach” allows to directly influence an individual carbon footprint, contributing to global emission reductions, this up to 100% CO2 emission reduction, in relation to the actual mode of transportation being chosen.

Insets cover the spread between a lower priced fossil fuel compared to a high priced bio fuel.

# Bridging the Green Spread with Insets

## Challenging Insets

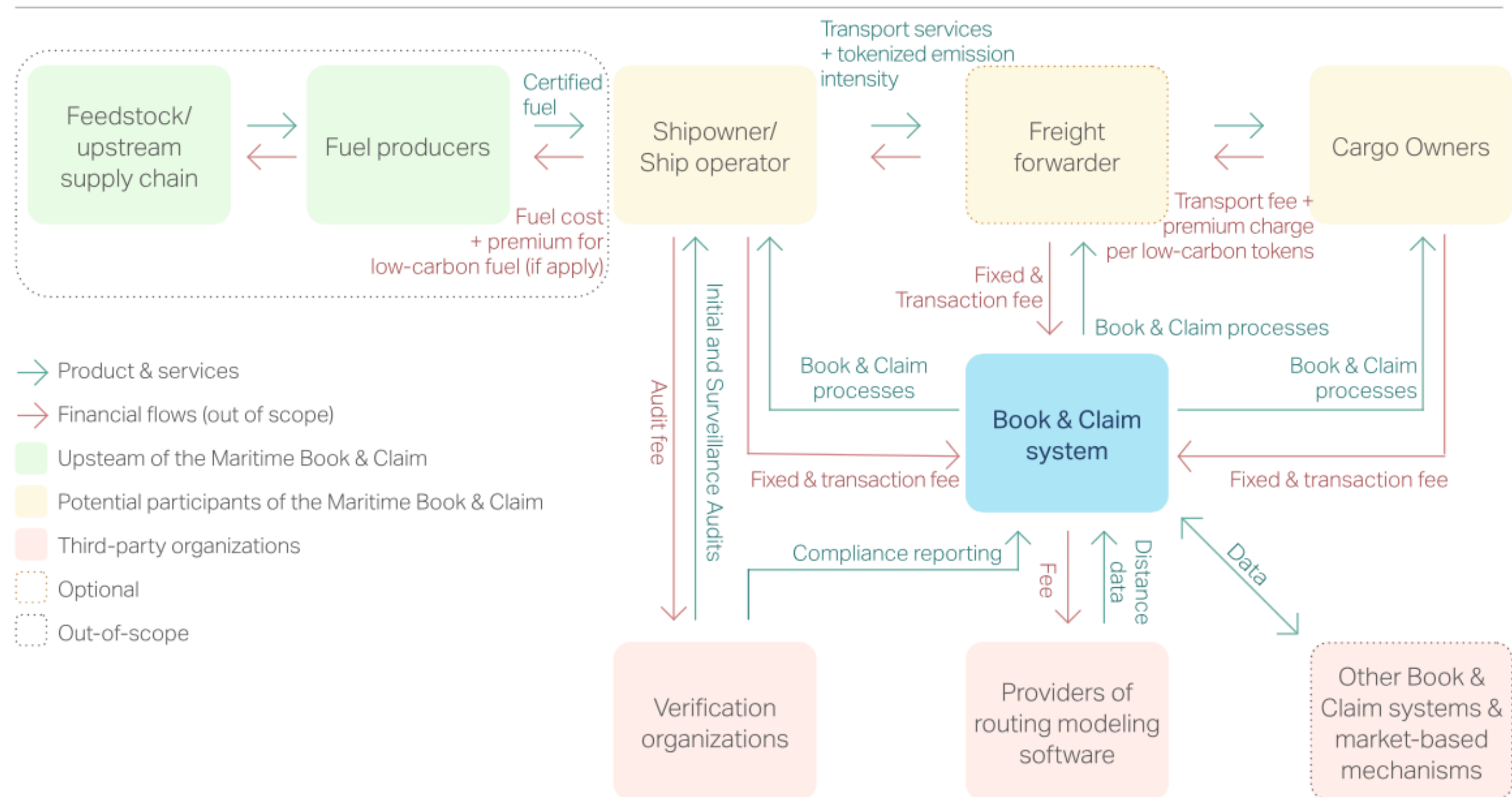
In order for cargo owners to be more concrete in their demand for Inset, they firstly face the challenge of obtaining assurance related to the sustainability attributes of the fuel (e.g., emissions) from the feedstock to the bunkering facility (BF / RCF – Sustainability declaration).

Secondly the fragmentation of their cargo across shipping lines – even if a single cargo owner is willing to pay a premium for all their shipments, in many cases this only corresponds to a fraction of the total cargo on a particular route, not to mention all the routes for a particular vessel.

# Bridging the Green Spread with Insets

## Overcoming Challenges Insets are Facing

A “Book & Claim” system, based “chain of custody” allows for the verified CO2 emission reductions to be traded and handled separately from the actual physical supply of the biofuel into a vessel.



Footnote 4: <https://rmi.org/jumpstarting-decarbonization-of-the-maritime-shipping-sector/>

# Bridging the Green Spread with Insets


## Overcoming Challenges Insets are Facing


The actual emission reduction is verified, certified and in compliance with a regulated market, carbon market outlined as per RED II based on corresponding certified biofuels.

Insets are documented and issued either in paper format or as an NFT along the Blockchain, in order to avoid fraud/duplication

# Bridging the Green Spread with Insets

## Example of RCF Sustainability Declaration Scope 3 and Corresponding Tokenisation





ENESPA Oil GmbH, Strasse A 27 a, 02997 Hoyerswerda

RCF Sustainability Declaration #00000003(S3)

Producer: Enespa Oil AG  
 Issuer: Creative Carbon Management GmbH  
 EUFEX attestation valuation date: 01.04.2023


Type of product: RCF Gasoil  
 Supplied entity: OHT Handelsgesellschaft mbH  
 Means of supply: Enespa Oil AG TKW  
 Type of raw material: Heating oil tank bottoms

Quantity of RCF: 28,54 cbm  
 Location of supply: Baudirektor-Hahn-Str. 2, 27472  
 Date of supply: 26.05.2023

GHG Emissions from consumption of the RCF\*: 7,34 mt CO2eq  
 GHG Emissions savings for the RCF\*\*: 89,239 mt CO2eq  
 Scope of the savings: Scope 3

\*According to GHG-intensity calculation performed as per EUFEX GmbH  
 \*\* Saving is calculated based on the differential to the fossil fuel comparator according to RED/BlmSchG

Signature / Stamp



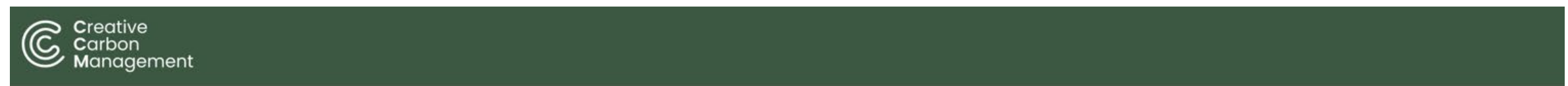
**Enespa Oil GmbH**  
 82061 Neuried  
 NL Hoyerswerda  
 Straße A Nr. 27a  
 02977 Hoyerswerda

Enespa Oil GmbH  
Gautingerstrasse 16  
82061 Neuried

Betriebsstätte Hoyerswerda  
ENESPA Oil GmbH  
Strasse A Nr. 27 a  
02977 Hoyerswerda

Geschäftsführer:  
Stefan Abele  
Cyrill Hugi

München HRB 271097  
Sparkasse Leipzig  
Konto Nr.: 1080281266  
BLZ: 86055592



From	To	Type	Date
Creative Carbon Management	Creative Carbon Management	MintNFT	19/07/2023
Creative Carbon Management	Enespa	TransferNFT	19/07/2023



# Bridging the Green Spread with Insets

## Effective Implementation of Insets in Shipping

Fees		Fuel Prices [USD/ton]		
Price Period:	16 Feb 2023 - 15 May 2023	MFO 0.5%	\$	554
Validity:	01 Jul 2023 - 30 Sep 2023	Biofuel UCOME B100	\$	1,358
Ship Green Fee (BIO) Subrelation*	100% Emissions Avoidance	50% Emissions Avoidance	25% Emissions Avoidance	
	[USD/TEU]**			
East Asia - Indian Subcontinent	\$ 145	\$ 73	\$ 36	
East Asia - Middle East	\$ 177	\$ 89	\$ 44	
East Asia - North Am East Coast incl MX East Coast	\$ 306	\$ 153	\$ 77	
East Asia - North Am West Coast incl MX West Coast	\$ 202	\$ 101	\$ 51	
East Asia - North Europe	\$ 247	\$ 124	\$ 62	
East Asia - Oceania	\$ 212	\$ 106	\$ 53	
East Asia - South Europe	\$ 224	\$ 112	\$ 56	
East Asia / Indian Subcontinent / Middle East - Central America / Caribbean	\$ 315	\$ 158	\$ 79	
East Asia / Indian Subcontinent / Middle East - South America East Coast	\$ 367	\$ 194	\$ 97	
East Asia / Indian Subcontinent / Middle East - South America West Coast	\$ 352	\$ 176	\$ 88	
East Asia / Oceania - East Africa / North East Africa	\$ 254	\$ 127	\$ 64	
East Asia / Oceania - West Africa	\$ 399	\$ 200	\$ 100	
East Asia / Oceania / ISC / ME - South Africa	\$ 275	\$ 138	\$ 69	
Europe - Central Africa	\$ 291	\$ 146	\$ 73	
Europe - Oceania	\$ 374	\$ 187	\$ 94	
Europe - South Africa / East Africa / North East Africa / IOI	\$ 356	\$ 178	\$ 89	
Europe - West Africa	\$ 243	\$ 122	\$ 61	
Indian Subcontinent / Middle East - East Africa / North East Africa	\$ 135	\$ 68	\$ 34	
Indian Subcontinent / Middle East - North Am East Coast incl MX East Coast	\$ 354	\$ 177	\$ 89	
Indian Subcontinent / Middle East - West Africa	\$ 359	\$ 180	\$ 90	
Intra Central America / Caribbean	\$ 51	\$ 26	\$ 13	
Intra East Asia	\$ 68	\$ 34	\$ 17	
Intra Indian Subcontinent	\$ 139	\$ 70	\$ 35	
Intra Middle East	\$ 58	\$ 29	\$ 15	
Intra North Europe / Intra South Europe	\$ 88	\$ 44	\$ 22	
Intra Oceania	\$ 94	\$ 47	\$ 24	
Intra South America East Coast	\$ 60	\$ 30	\$ 15	
Intra South America West Coast	\$ 83	\$ 42	\$ 21	
Middle East - Indian Subcontinent	\$ 81	\$ 41	\$ 20	
North Am East Coast incl MX East Coast - Central America East Coast / Caribbean	\$ 80	\$ 40	\$ 20	
North Am East Coast incl MX East Coast - South America East Coast	\$ 261	\$ 131	\$ 65	
North Am East Coast incl MX East Coast - South America West Coast	\$ 173	\$ 87	\$ 43	
North Am West Coast incl MX West Coast - Central America / Caribbean	\$ 141	\$ 71	\$ 35	
North America incl MX - Africa	\$ 477	\$ 239	\$ 119	
North America incl MX - Oceania	\$ 385	\$ 193	\$ 96	
North Europe - Central America / Caribbean	\$ 210	\$ 105	\$ 53	
North Europe - Indian Subcontinent	\$ 298	\$ 149	\$ 75	
North Europe - Middle East	\$ 229	\$ 115	\$ 57	
North Europe - North Am East Coast incl MX East Coast	\$ 196	\$ 98	\$ 49	
North Europe - North Am West Coast incl MX West Coast	\$ 343	\$ 172	\$ 86	
North Europe - South America East Coast	\$ 241	\$ 121	\$ 60	
North Europe - South America West Coast	\$ 287	\$ 144	\$ 72	
North Europe - South Europe	\$ 149	\$ 75	\$ 37	
Others long	\$ 230	\$ 115	\$ 58	
Others short	\$ 144	\$ 72	\$ 36	
South America - Africa	\$ 361	\$ 181	\$ 90	
South America - Oceania	\$ 479	\$ 240	\$ 120	
South America East Coast - Central America / Caribbean	\$ 227	\$ 114	\$ 57	
South America West Coast - Central America / Caribbean	\$ 107	\$ 54	\$ 27	
South America West Coast - South America East Coast	\$ 265	\$ 133	\$ 66	
South Europe - Central America / Caribbean	\$ 292	\$ 146	\$ 73	
South Europe - Indian Subcontinent	\$ 207	\$ 104	\$ 52	
South Europe - Middle East	\$ 149	\$ 75	\$ 37	
South Europe - North Am East Coast incl MX East Coast	\$ 256	\$ 128	\$ 64	
South Europe - North Am West Coast incl MX West Coast	\$ 551	\$ 276	\$ 138	
South Europe - South America East Coast	\$ 248	\$ 124	\$ 62	
South Europe - South America West Coast	\$ 359	\$ 180	\$ 90	

\*equal to reknown MFR subrelations  
 \*\* Ship Green is available for the following ISO Equipment Size Type: 22/42/45GP, 22/42/45UP, 22/20TN, 22/20KL, 22/20TD, 22/20TG

Example: Hapag Liner Service East Asia to North Europe

100 % Emission Avoidance	50% Emissions Avoidance	25% Emission Avoidance	Premium
247.00 USD	124.00 USD	62.00 USD	USD / TEU



We walk the talk



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