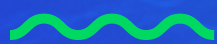




**SHIP IT
ZERO**

Shady Routes



How Big Retail and their
Carriers Pollute along Key
Ocean Shipping Corridors



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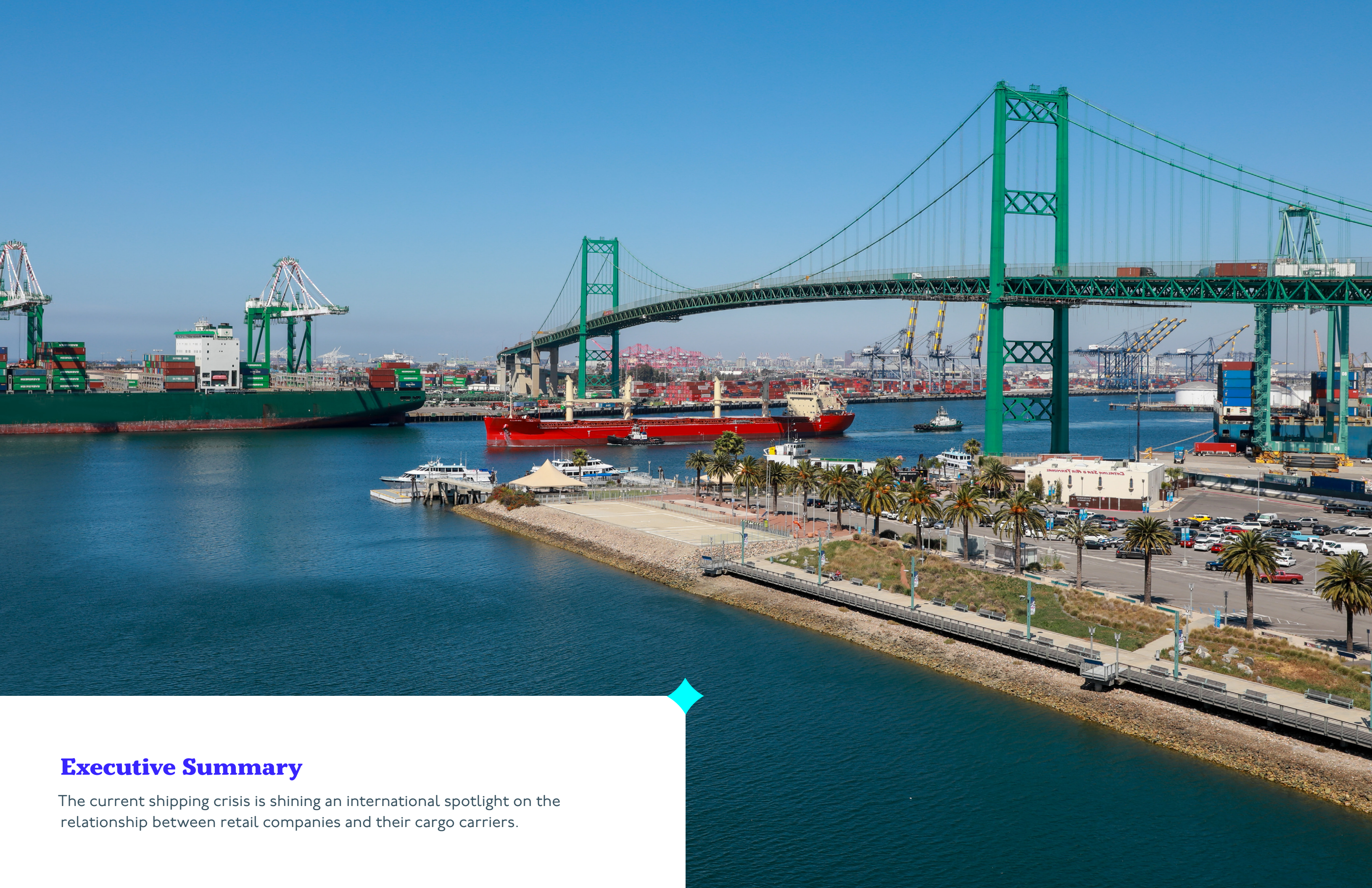
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Executive Summary

The current shipping crisis is shining an international spotlight on the relationship between retail companies and their cargo carriers.

Goods imported via maritime shipping to the U.S. by Walmart, Target, Amazon and IKEA between 2018–2020 accounted for an estimated 20 million tonnes of carbon dioxide equivalent emissions (CO₂e). These goods were predominantly shipped by a small group of major maritime cargo carriers who have long-term relationships with each company. The most common shipping routes for these goods are between Chinese and West Coast U.S. ports, where vessels left idling due to the current shipping crisis are pushing pollution levels for port communities to all-time highs. Until recently, the massive climate disrupting and human health harming emissions from international container shipping — and the companies that are buying their services — have sailed under the radar of public scrutiny.

Retail brands and cargo carriers are winning big in the current swell of consumer demand fueled by the COVID-19 pandemic, reporting record breaking profits. The shipping crisis is also an opportunity, and these companies can choose to be industry leaders and early adopters of zero-emission technology, or they could put short-term profit over public health and the climate by making empty net-zero commitments that put off action on climate change until it's too late. Retail brands and cargo carriers are both major contributors to global greenhouse gas (GHG) emissions, and both have the opportunity and the profit margins to take big strides towards zero-emission maritime shipping by taking immediate steps to



reduce their emissions and investing now in new emissions-free ship technology.

Nearly every item in our daily lives — our clothing, furniture, cleaning supplies, office supplies, electronics, food — was at some point transported across the world's oceans onboard a container ship, as approximately 90% of global trade is transported on oceangoing vessels.¹ As a result, international shipping is a major greenhouse gas contributor, accounting for 3% of global emissions.² If it were a country, it would be the world's sixth largest climate polluter. While every deep sea cargo carrier plying our oceans today burns fossil fuels, emissions-free solutions are already being scaled up. Steps can also be taken now to significantly reduce the pollution from existing ships. But, reducing and ultimately eliminating maritime emissions will not happen without bold commitments and concrete action from the companies paying cargo carriers to transport their goods. The retail brands that fill our homes and lives with their products bear a direct responsibility both for the pollution that the maritime shipping in their supply chains creates and for taking the necessary actions to demand emissions reductions now and 100 per cent zero emissions shipping this decade.

This analysis takes an in-depth look at four major retail importers into the United

States: Walmart, Target, Amazon, and IKEA. It maps the relationships between these companies and the cargo carriers they hire to transport their goods. For the first time, customers can take a look behind the curtain to see how these household brands move their products from the countries where they are produced to the U.S., the cargo carriers with whom they do business, and the emissions that result from this dirty trade.

Walmart relies heavily on one ocean carrier, CMA CGM, a French container transportation and shipping company that made \$31.5b in revenue in 2020.

CMA CGM is the biggest polluter amongst all carriers, accounting for 68% of Walmart's ocean shipping emissions in 2020 and 33% of emissions across all four companies. CMA CGM is one of the world's biggest buyers of fossil gas vessels, which emit 70–82% more lifecycle greenhouse gas emissions than those fueled with petroleum distillate marine gas oil.³ Walmart should break up with CMA and/or from fossil gas. However, if the two industry giants could work together on zero-emissions solutions, they could propel the decarbonization of ocean transport.

¹ 'Green finance for dirty ships,' The Economist, Mar. 11th, 2017. www.economist.com/finance-and-economics/2017/03/11/green-finance-for-dirty-ships

² Olmer, N., Comer, B., Biswajoy, R., Xiaoli, M., and D. Rutherford. 'Greenhouse Gas Emissions From Global Shipping, 2013 – 2015', The International Council on Clean Transport, Oct. 2017. https://theicct.org/sites/default/files/publications/Global-shipping-GHG-emissions-2013-2015_ICCT-Report_17102017_vF.pdf

³ Pavlenko, N., Comer, B., Zhou, Y., Clark, N., and D. Rutherford. 'The climate implications of using LNG as a marine fuel', The International Council on Clean Transportation, Jan. 2020. www.stand.earth/publication/climate-implications-using-lng-marine-fuel

Target's top carriers are Asia shipping specialists — Yang Ming, Evergreen and Cosco — and their U.S.-bound shipments heavily favor West Coast routes.

Target saw a swell of demand during the pandemic, with digital sales doubling. Their fulfillment by store model, doubling of their digital sales, and top sales in California suggest that they will continue to favor West Coast routes, and keep clogging these ports with harmful emissions. They are investing heavily in chartered vessels to keep stockpiling goods to keep up with elevated consumer demand due to the pandemic.

Amazon has unique control over their shipping supply chain and appears to be consolidating this control rapidly.

Their own shipping heavily favors West Coast routes from China and as they increase their control over parcel delivery, they are bringing more shipping and other transport traffic and pollution to the ports of LA and Long Beach. It remains to be seen if the company's growth in their transportation business will be an opportunity for greener technology or will outstrip their climate targets and lead to greater emissions.

Target and Amazon have played an outsized role in the current congestion and pollution crisis at the Ports of Los Angeles and Long Beach.

For months, fossil-fueled cargo container ships have idled off the shores of the San Pedro Bay Ports, bringing higher levels of asthma and cancer-associated air pollutants including particulate matter, nitrogen oxide, and sulfur oxide into the port-adjacent communities of San Pedro, Wilmington, and West Long Beach.

IKEA is increasingly shipping from China to the U.S. via Europe, predominantly with MSC.

Ocean transport from the EU to the U.S. follows rail transport from China to the EU. The use of rail transport may be why their emissions seem to be decreasing and why they favor East Coast routes to Philadelphia and Baltimore.

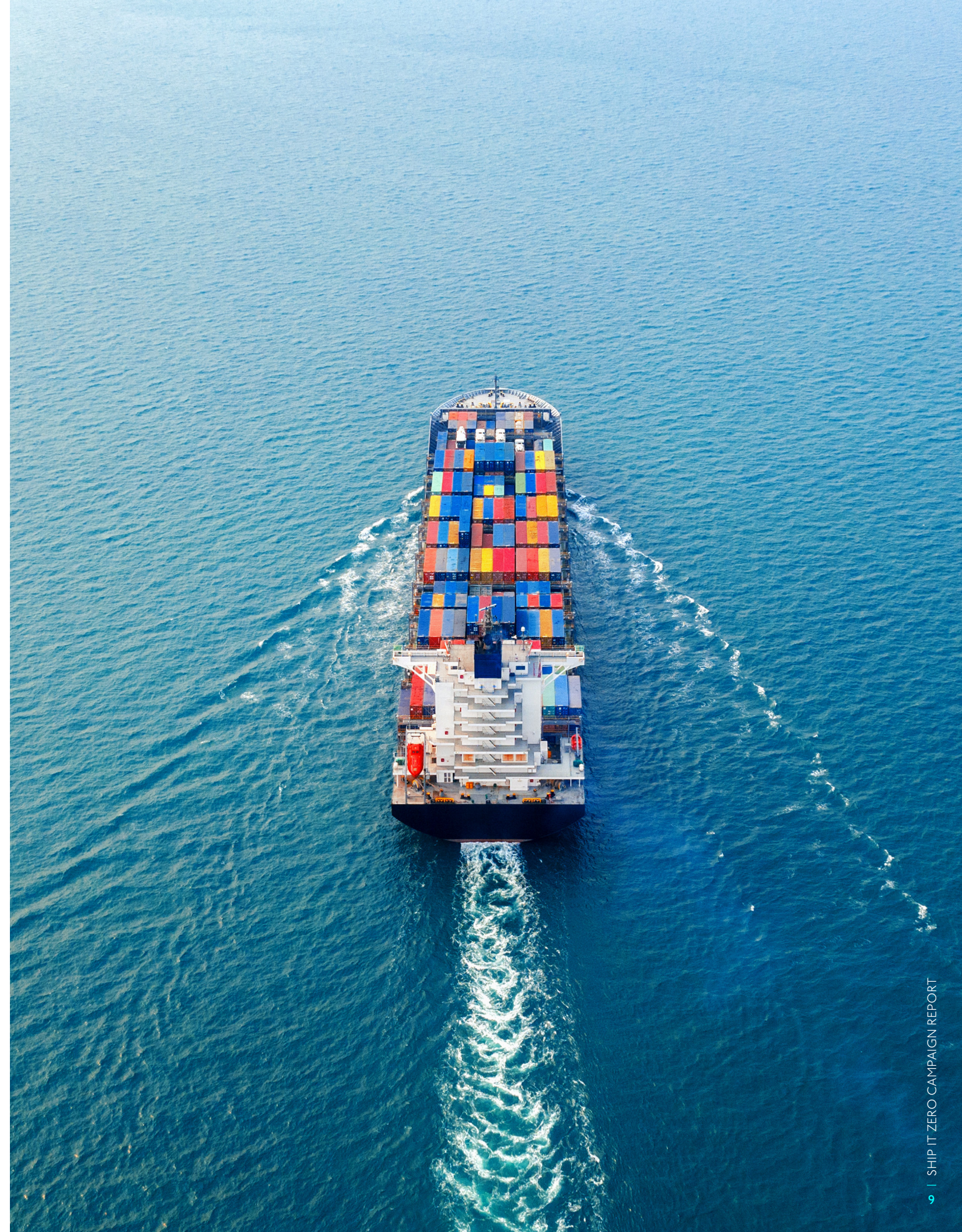




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Introduction

As of 2021, the shipping industry accounts for nearly 3% of the world's greenhouse gas (GHG) emissions, more than the emissions from global air travel and equivalent to the annual electricity usage of almost 200 million homes.⁴ Since maritime shipping was not part of the Paris Agreement, the effort to reduce emissions in the industry has been slower than in other sectors. The West's appetite for consumer goods, exacerbated by the impact of the pandemic, is driving the growth in the industry and increasing its portion of global GHG emissions. Current business-as-usual (BAU) scenarios project emissions will grow up to 50% over 2018 levels, an increase of up to 500 million tonnes of CO₂.⁵ Additionally, while the IMO noted that increased ship size and operational improvements aimed at creating better fuel efficiency have resulted in a decrease in emissions intensity, annual absolute emissions are still increasing.⁶ With net zero goals aimed at reductions by 2050 deemed insufficient under a 1.5C warming scenario and the first zero-emissions ships expected to become available by 2024, the shipping industry has a responsibility to decarbonize this decade.⁷

This report reveals the close relationship that major retailers have with key carriers and the intensification of those relationships in 2020. Major retailers represent long-term, steady income for carriers, and supporting retailer shipping capacity needs through the crisis has been an important aspect of carriers' strategies. CMA CGM recently stated that their capacity priority was for long-term relationship customers, suggesting that their relationships with key retailers is more important than the spot-market capacity sales to smaller companies.⁸ Hapag-Lloyd quickly followed suit. Arguably, as more business goes to fewer carriers, the effort to curb the industry's emissions becomes a joint venture. Since shipping is such an integral part of global supply chains, companies looking to achieve net zero goals must engage the sector and find ways to reduce the climate impact of getting their goods to market, and their increasing relationship with key carriers is the opportunity they need.

Approximately 90% of the world trade is transported by sea, a method of transport that has historically been so cheap that



“The pandemic has fueled the growth in e-commerce and consumption of these consumer goods”

even the most low value goods could be shipped without concern for the impact on business profits. The pandemic has fueled the growth in e-commerce and consumption of these consumer goods, as people stuck at home who had the disposable income to afford travel and entertainment in non-pandemic times spend that money on goods they can use at home. Over 18 months from the start of lockdowns in the U.S., retail sales are still 18% above pre-pandemic levels, and winter holiday shopping is still to come.⁹ Companies such as Walmart, Target, Amazon and Ikea have responded to the demand by increasing

supply, but the supply chains to move the products to market have been hampered by Covid-19 related delays that have limited effective shipping capacity. The competition for limited maritime shipping space has driven costs sky-high.¹⁰ The delays and demands have also led to troubles at ports, especially in China and the U.S. In most major U.S. ports, ships are lining up for days to drop off cargo and containers (full and empty) are stacking up to beyond port capacity.

Target and Amazon have played an outsized role in the current congestion and pollu-

⁴ Saul, J. 'Shipping industry proposes levy to speed up zero carbon future', Reuters, Sept. 6, 2021. www.reuters.com/business/sustainable-business/shipping-industry-proposes-levy-speed-up-zero-carbon-future-2021-09-06/; Whieldon, E. 'Your climate change goals may have a maritime shipping problem', S&P Global, Accessed Nov. 10th, 2021.

www.spglobal.com/esg/insights/your-climate-change-goals-may-have-a-maritime-shipping-problem; Research by Stand.earth Research Group converting shipping annual CO₂ emissions of 1,056 M mt using the United States Environmental Protection Agency, 'Greenhouse Gas Equivalencies Calculator' www.epa.gov/energy/greenhouse-gas-equivalencies-calculator

⁵ International Maritime Organization. 'Fourth IMO Greenhouse Gas Study'. 2020. wwwcdn.imo.org/localresources/en/OurWork/Environment/Documents/Fourth%20IMO%20GHG%20Study%202020%20-%20Full%20report%20and%20annexes.pdf

⁶ Ibid.

⁷ Whieldon, E. 'Your climate change goals may have a maritime shipping problem', S&P Global, Accessed Nov. 10th, 2021.

⁸ Almendral, A. 'Shipping companies are tapping the breaks on skyrocketing container prices', Quartz, Oct. 6th, 2021

⁹ 'A perfect storm for container shipping', The Economist, Sept. 18th, 2021. www.economist.com/finance-and-economics/a-perfect-storm-for-container-shipping/21804500

¹⁰ Miller, G. 'CMA CGM caps its rates. What does this mean for container shipping?', Freightwaves, Sept. 9th, 2021 www.freightwaves.com/news/cma-cgm-just-capped-rates-what-does-this-mean-for-container-shipping

tion crisis at the Ports of Los Angeles and Long Beach. For months, due to COVID-19 era and holiday season increase in demand for imported goods, a record-breaking 100 fossil-fueled cargo container ships have idled off the shores of the San Pedro Bay Ports, bringing higher levels of asthma and cancer-associated air pollutants including particulate matter, nitrogen oxides, and sulfur oxides into the port-adjacent communities of San Pedro, Wilmington, and West Long Beach. With Target and Amazon focusing much of their fossil-fueled shipping through these ports, they are directly responsible for harming these communities.

Full containers of goods are waiting for trucks and trains that also cannot keep up with demand, while empty containers cannot be ‘back-hauled’ fast enough from some ports and are scarce at others.¹¹ The mayhem in the shipping industry is a sign of the times, and most analysts do not expect a return to pre-pandemic shipping, with its low costs and available capacity.

The silver lining in this situation is that the industry is ripe for transformation. The current supply chain crisis has revealed that there is room in the industry and its customers to absorb the cost of the transition to fossil-free zero emissions shipping.

The sky-high cost of shipping and maxed-out capacity has resulted in the highest ever profits for carriers, lining their pockets with profits while the system strains under the weight of the overload. Maersk, Hapag-Lloyd and CMA CGM all reported over \$3 billion USD in profits in the first half of 2021, an estimated 2500 percent increase over the first half of 2020.¹² For the same period, cargo volumes were up 27% over pre-pandemic levels.¹³ Carriers are using their profits to invest heavily in their fleets, buying up available capacity (used ships) and setting records for new orders for container ships.¹⁴ Flush with cash and needing to invest in their fleets, carriers should invest in building out the technology to bring zero emissions shipping to scale, rather than doubling down on fossil fuel technology that is out of step with emissions reductions targets.¹⁵ Smaller, zero-emissions ships would support net zero as well as respond to the need to diversify the maritime shipping map, by reducing the number of large ships in favor of smaller, more versatile, zero-carbon vessels.¹⁶

Meanwhile, Walmart, Target, and Ikea are spending money on chartered shipping — a costly and unusual move that reveals the



willingness for these companies to spend more on maritime transport to get their products to market.¹⁷ They are also shipping earlier, paying premium rates of up to \$20,000 USD/ FEU, and paying for warehouse storage to ensure that products are on the shelves in time.¹⁸ Likewise, Amazon invested over 30 billion in shipping and supply chain infrastructure in 2020.¹⁹

The shipping industry and major customers such as Walmart, Target, Amazon, and Ikea must invest in a zero emissions future by absorbing the cost of transition. Meanwhile, the pressure to decarbonize is intensifying, and the window to act is closing. If companies and their carriers don’t use this crisis as an opportunity to build back better now, they will have to shoulder the much larger economic, environmental,

and social costs and burdens of going back to business as usual. This includes the stranded assets of buying new and used fossil-fuel vessels now to address capacity demand, as well as the short-sightedness of investments in LNG technology and infrastructure, which does not have a long-term role in decarbonizing maritime transport.²⁰

The message is starting to sink in. New commitments from top companies and actions by governments are putting pressure on the industry. These companies have an opportunity to act especially when representatives from all four have been appointed to the Federal Maritime Commission’s National Shipper Advisory Committee (NSAC) where they will directly advise federal shipping policies.²¹

¹¹ Baraniuk, C. ‘Why even giant ships can’t solve the shipping crisis’, BBC News, Sept. 14th, 2021. www.bbc.com/news/business-58479148

¹² Almendral, A. ‘Shipping companies are tapping the breaks on skyrocketing container prices’, Quartz, Oct. 6th, 2021. qz.com/2068678/shipping-lines-tap-the-brakes-on-skyrocketing-container-prices/

¹³ ‘A perfect storm for container shipping’, The Economist, Sept. 18th, 2021.

¹⁴ Waters, W. ‘CMA CGM caps ocean freight spot prices’, Lloyd’s Loading List, Sept. 10th, 2021. www.lloydsloadinglist.com/freight-directory/news/CMA-CGM-caps-ocean-freight-spot-prices/79867.htm#.YXjm3tnML9E; ‘Rallying Across the Board: Each week of 2021 is setting new benchmarks for second hand prices’, Splash247.com, Apr. 28th, 2021. <https://splash247.com/rallying-across-the-board/>

¹⁵ Baraniuk, C. ‘Why even giant ships can’t solve the shipping crisis’, BBC News, Sept. 14th, 2021.

¹⁶ Ibid.

¹⁷ Almendral, A. ‘Shipping companies are tapping the breaks on skyrocketing container prices’, Quartz, Oct. 6th, 2021; Waters, W. ‘CMA CGM caps ocean freight spot prices’, Lloyd’s Loading List, Sept. 10th, 2021.

¹⁸ Ibid.

¹⁹ Greene, J. ‘Amazon’s big holiday shopping advantage: An in-house shipping network swollen by pandemic-fueled growth’, The Washington Post, Nov. 27, 2020. www.washingtonpost.com/technology/2020/11/27/amazon-shipping-competitive-threat/

²⁰ The World Bank. ‘Charting a Course for Decarbonizing Maritime Transport.’ Apr. 15th, 2021. www.worldbank.org/en/news/feature/2021/04/15/charting-a-course-for-decarbonizing-maritime-transport

²¹ Miller, G. ‘Amazon, Walmart to advise Washington on ocean freight policy,’ Freightwaves, Sept. 9th, 2021. www.freightwaves.com/news/amazon-walmart-to-advise-washington-on-ocean-freight-policy

The following recent developments are promising:

Cargo Owners for Zero Emissions Vessels (coZEV)

CoZEV is a cargo-owner led platform with the goal of accelerating maritime shipping decarbonization. They aim for companies to decarbonize their maritime freight by 2040 and catalyze full sector decarbonization by 2050. In October 2021, Amazon and Ikea joined 7 other major brands in signing the coZEV 2040 Ambition Statement.²²

First Movers Coalition

The First Movers Coalition is a group of companies who are signalling that they are ready to jumpstart global demand for clean technologies, to make emerging solutions more more scalable and accessible. They are targeting ‘hard-to-abate’ sectors such as shipping to begin their transition to net-zero emissions. Shipping members commit to using zero-emissions

fuels in new and retrofitted vessels by 2030. They also set a target that at least 5% of their deep-sea shipping will be powered by zero-emissions fuels by 2030 and Cargo Owners commit to sending at least 10% of the volume of their goods shipped internationally on ships using zero-emissions fuels by 2030, and 100% by 2040.²³

Clydebank Declaration

At COP 26 in Glasgow, 22 countries committed to support the creation of zero-emissions shipping routes — at least 6 ‘green corridors’ by 2025 with the ambition to scale up by 2030.²⁴ The declaration set out a number of ways to achieve this goal including partnerships between ports and operators to accelerate decarbonization and identification of barriers to decarbonization such as regulations and infrastructure. The group also plans to create incentives to switch to zero-emissions shipping.

These are examples of a tide that is turning. Will major retailers like Walmart, Target, Amazon, and IKEA and their preferred carriers be the first companies to ride the wave of zero-emissions technology, or will they continue to steer towards a false horizon of short-term gain at the expense of the global climate?

“New commitments from top companies and actions by governments are putting pressure on the industry.”

²² Cargo Owners for Zero Emissions Vessels. ‘Initiatives’, accessed Nov. 10th, 2021. www.cozev.org/initiatives

²³ First Movers Coalition. ‘Sectors: Shipping’, Accessed Nov. 10th, 2021. www.weforum.org/first-movers-coalition/sectors

²⁴ Countries include: Australia, Belgium, Canada, Chile, Costa Rica, Denmark, Fiji, Finland, France, Germany, Ireland, Japan, the Marshall Islands, the Netherlands, New Zealand, Norway, Sweden, the UK and the US.



Methods

The shipment data underpinning these analyses was gathered from U.S. Vessel Manifest Data for imports over the period of 2018–2020. Data was collected for each company by querying for shipments from each company and all of its subsidiaries. Information on subsidiaries was gathered through various public sources including company websites, SEC filings, and shipping databases.^{25 26 27}

Given Amazon’s role as both company and carrier, their TEU query included “Amazon”, as well as over 20 of its subsidiaries (i.e. Audible, Shopbop, Zappos) and its shipping subsidiary: Amazon Global Logistics (AMZD)/ Beijing Century Joyo Courier Services. AMZD is a non-vessel operating common carrier (NVOCC) that operates internationally. In China, they operate Beijing Century Joyo Courier Services as a freight forwarder. AMZD was associated with Amazon.com for ~100,000 shipments in the dataset. Around 40,000 of these did not have TEUs and were removed from the analysis. The 60,000 remaining shipments were reviewed for their association with Amazon.com. Approximately 95% of the 102,000 TEUs in these shipments were confirmed to be related to Amazon, one of its subsidiary fulfillment centres, or a major Amazon seller through either the consignee or notifying party in the dataset.

For all companies, shipments and companies that appeared in the queries that were unrelated were filtered out. In total, approximately 1.3 million individual transactions were collected. Each transaction includes data on the company, carrier, vessel, volume in Twenty-foot Equivalent Units (TEUs), and route between the origin country and the destination at a U.S. port. Even with 1.3 million transactions that total over 2 million TEUs, the dataset accounts for only 37% of the estimated TEUs recorded in the Journal of Commerce (JOC), the official public database of U.S. import volumes and emissions.²⁸ However, the coverage also varies by company. While approximately 23% of Walmart’s TEUs and 28% of Target’s TEUs are in the database, it contains 100% of Ikea’s and Amazon’s TEUs, according to the JOC estimates for the

TEUs shipped per year for these companies. For analysis of Walmart and Target, only trends and relationships that could be corroborated were used since the lack of complete shipping data can skew results.

Each shipment was assigned an origin port, LOCODE²⁹, country of origin and coordinates based on where the shipment came from (using either the port of lading, port of receipt, or shipment origin) from as well as a destination port, LOCODE, and coordinates based on the port of unloading in the U.S. The destination port was also assigned a coast (West or East/ Gulf). This allowed for analysis of the most common and preferred routes used by each carrier and company according to port, country, and preference for routing to West or East/ Gulf ports in the U.S. Additionally, the difference between the port of lading and the shipment origin was analysed to reveal transshipments and trade routes overland. Changes in trade routes between West and East/Gulf ports were also studied to assess whether routes were changing to avoid backed up ports. Although shipments received in all ports across the U.S. were collected, this report digs in deeper on shipments that arrived in ports along the West Coast of the U.S., including the ports of Los Angeles, Long Beach, Seattle, Oakland, and San Diego.

To estimate the total emissions emitted by these companies’ maritime imports over the three-year period, the verified TEUs for Walmart and Target were scaled to match TEUs reported by JOC. For Ikea and Amazon, the total TEUs from the dataset were used since the dataset captured the estimated emissions reported by JOC for these companies. Emissions were estimated per company by multiplying each company’s TEUs by the CO2e emissions intensity (tCO2e/TEU) established for each country in previous research.³⁰ These estimates were established using 2019 data only, and this methodology assumes that these estimates are static throughout the study period (2018–2020), although this limits the accuracy of the emissions estimates for major shifts in routing between 2018 and 2020.

TABLE 1 | For each company, the research identified the TEUs in the dataset versus JOC estimates for the same time period and the resulting ‘research coverage’. By scaling the TEUs by the research coverage and then applying the emissions intensity rates, total estimated CO2e emissions for each company are estimated.

	(2018–2020)			(UMAS) (tCO ₂ e/TEU*)	
	TEUs* from research	JOC TEU* Estimates	Research Coverage	Emission Intensity	Est. CO ₂ e Emissions
Walmart	626,012	2,763,800	22.7%	4.164	11,508,463
TARGET	533,134	1,881,661	28.3%	3.418	6,431,517
amazon	463,524	297,633	100%	3.182	1,474,932
IKEA	393,941	388,480	100%	3.131	1,233,428
Totals	2,016,610	5,331,574			20,648,341

* Twenty-foot Equivalent Units, the size of a typical shipping container

25 Target. ‘All about Target’. Accessed Nov. 10th, 2021. <https://corporate.target.com/about>; Ikea. ‘One brand – many companies’. Accessed Nov. 10th, 2021. www.ikea.com/ca/en/this-is-ikea/about-us/one-brand-many-companies-pub07af8e71 ; Amazon. ‘Amazon Subsidiaries and Tax’. Accessed Nov. 10th, 2021.

26 Walmart subsidiaries: www.sec.gov/Archives/edgar/data/104169/000102140801500157/dex21.htm

27 Amazon Global Logistics China/ Beijing Century Joyo Courier Service Co., Ltd. www.dpiusa.com/tariffs/fmc_organization_show/025852

28 ‘JOC Top 100 US importer and exporter rankings 2020’, The Journal of Commerce, May 25th, 2021. www.joc.com/maritime-news/trade-lanes/joc-top-100-us-importer-and-exporter-rankings-2020_20210525.html

29 LOCODE is the UN system to identify port locations across the world: unece.org/trade/uncefact/unlocode/history-1981

30 Rose, M. ‘Shady Ships, Retail Giants Pollute Communities and Climate with Fossil-fueled Ocean Shipping’. Pacific Environment and Stand.earth shipitzero.org/wp-content/uploads/2021/07/Shady-Ships-Report.pdf



Findings

Ranking companies by their carbon emissions

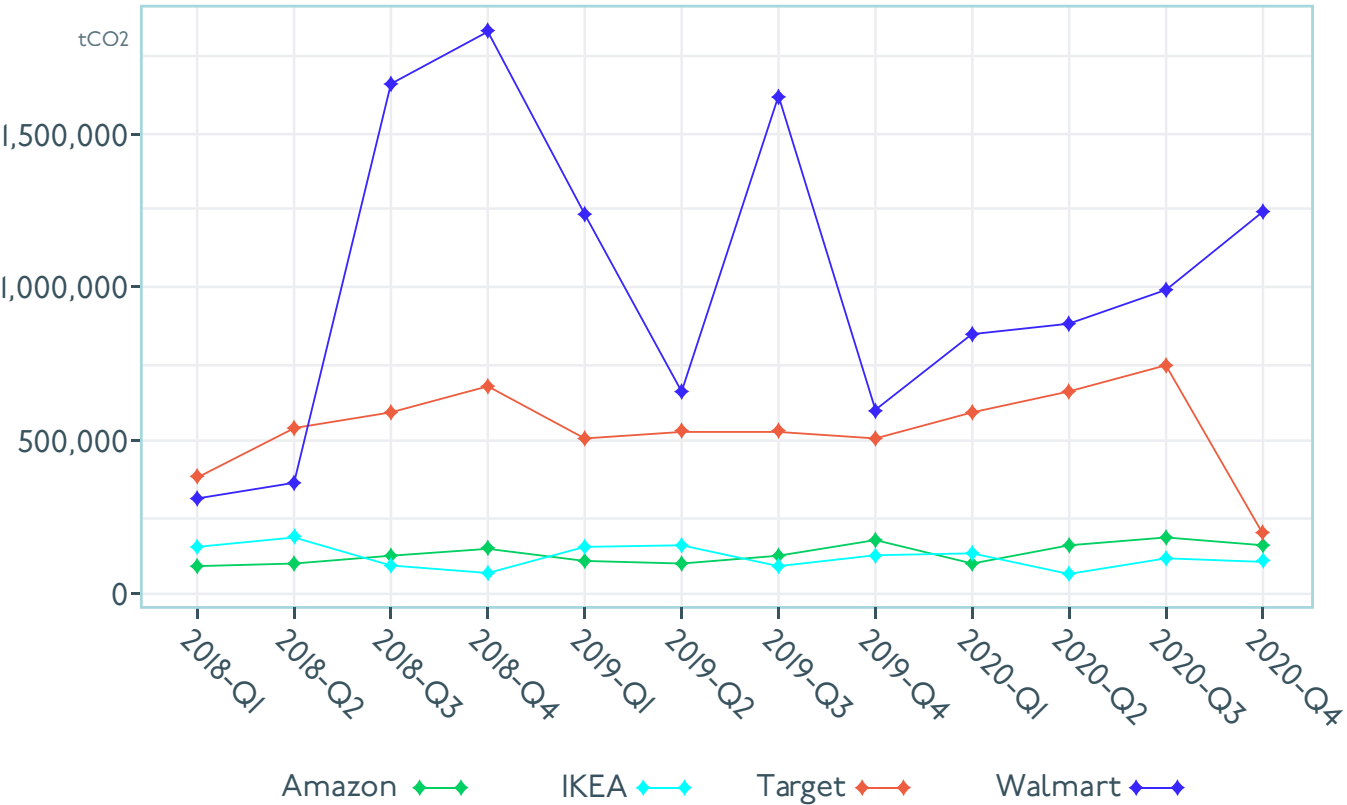
Walmart topped the list of companies with the highest volumes traded and the most emissions. They are also the number one goods importer in the U.S.³¹ The company emitted almost double the emissions of Target, number two on the list (see Figure I), even though their TEUs are less than double (see Table I). This is likely due to the combination of higher TEUs and longer shipment routes for Walmart. Based on JOC TEU estimates, Walmart is responsible for around 8 times as many ocean ship-

ping emissions as Amazon or IKEA, who maintained a steady trend comparable to the size of their shipments (see Figure I).

Top routes by TEUs and emissions

The pacific routes between China and the U.S. are the top routes for carbon emissions when looking at all four companies combined (see Table 2). The top ten routes account for 34% of emissions of the four companies investigated (21% West Coast; 13% East and Gulf Coasts). For context, there are over 1400 unique routes in the dataset,

FIGURE I | Trend in company emissions over time. Note that for Walmart and Target, emissions are scaled using annual TEU reporting from JOC. For Target, Q4 2020 emissions are likely inaccurate as a major drop in emissions could not be corroborated.



³¹ 'JOC Top 100 US importer and exporter rankings 2020', The Journal of Commerce, May 25th, 2021.

TABLE 2 | Top ten routes overall by total emissions from all company TEUs

Rank	Origin Port	Destination Port	Total Emissions for Route (tCO ₂ e)
1	Yantian (Shenzhen), China	Los Angeles	990,448
2	Shanghai, China	Seattle	836,375
3	Shanghai, China	Houston	772,556
4	Yantian (Shenzhen), China	Savannah	731,519
5	Ningbo, China	Long Beach	705,801
6	Hong Kong	Norfolk, Virginia	647,002
7	Yantian (Shenzhen), China	Seattle	625,572
8	Shanghai, China	Long Beach	590,073
9	Yantian (Shenzhen), China	Long Beach	580,359
10	Ningbo, China	Savannah	523,920
Total			20,648,341

so 34% of emissions concentrated over 10 routes is significant. Over three years, almost a million tonnes of CO₂e was emitted by ships carrying about 291,349 TEUs from Yantian to Los Angeles, a distance of about 6500 nautical miles (nm). The longest route in the list, Shanghai to Houston, had emissions of about 772,556 tCO₂e to carry 186,164 TEUs over a distance of 10,000 nm. Carriers on the shortest route, from Shanghai to Seattle, emitted about 836,375 tCO₂e to ship 231,349 TEUs over a distance of 5000 nm.

Transpacific routes from China to the U.S. West Coast are the most common across all four companies (see Figure 2). However, examining the top ten routes per company highlights differences in trade patterns and reveals the preference that Walmart has for East Coast routes (see Figure 3) and the prevalence of West Coast routes for Target and Amazon (see Figures 4 and 5 respectively). IKEA's routes are much different than the rest, with an emphasis on trade from Europe (especially Poland) to the East Coast, including Philadelphia and Baltimore (Figure 6).

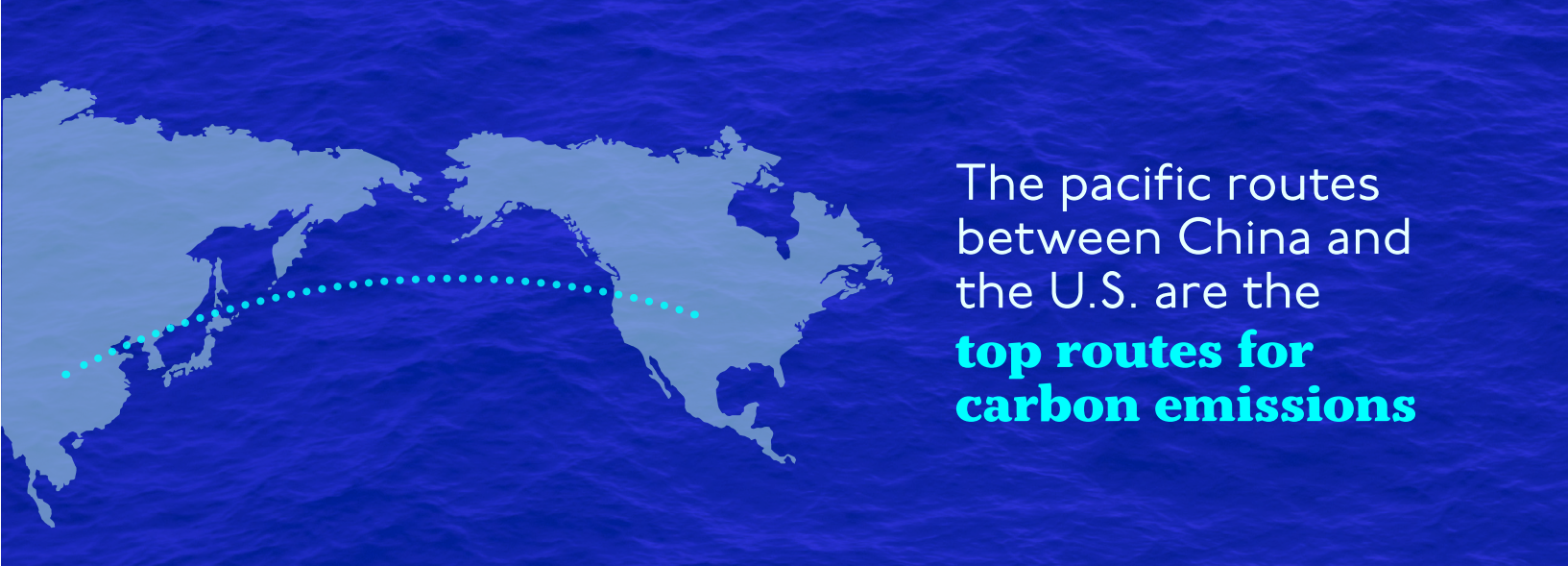
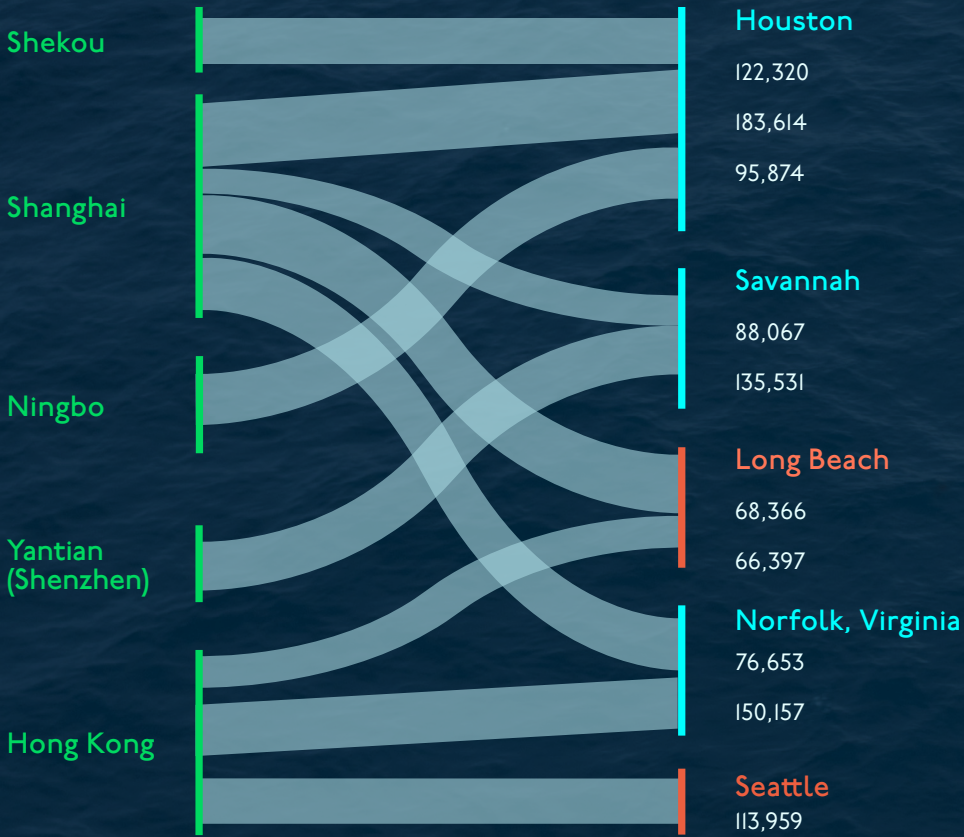


FIGURE 2 | TEU trade flows for the top ten routes overall. Origin ports in green are in China. Destination ports in red are on the West Coast, while blue ports are on the East or Gulf Coast.

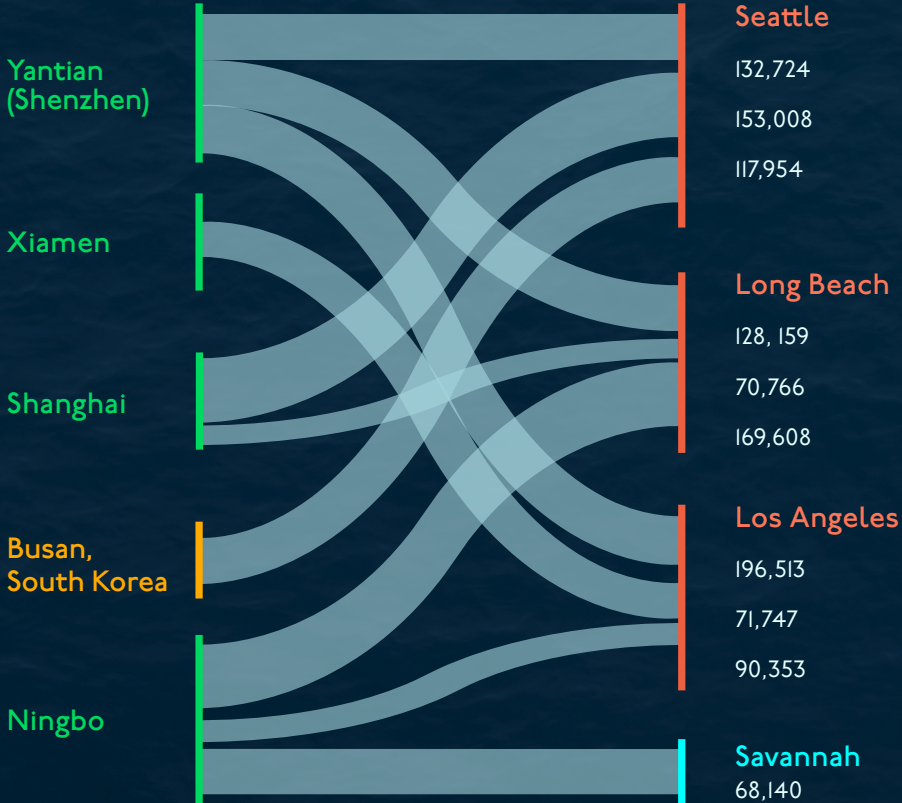
Walmart

Figure 3
Walmart's TEU trade flow for the top ten routes. All routes start in China and most end at East or Gulf Coast ports, with a minority going West.



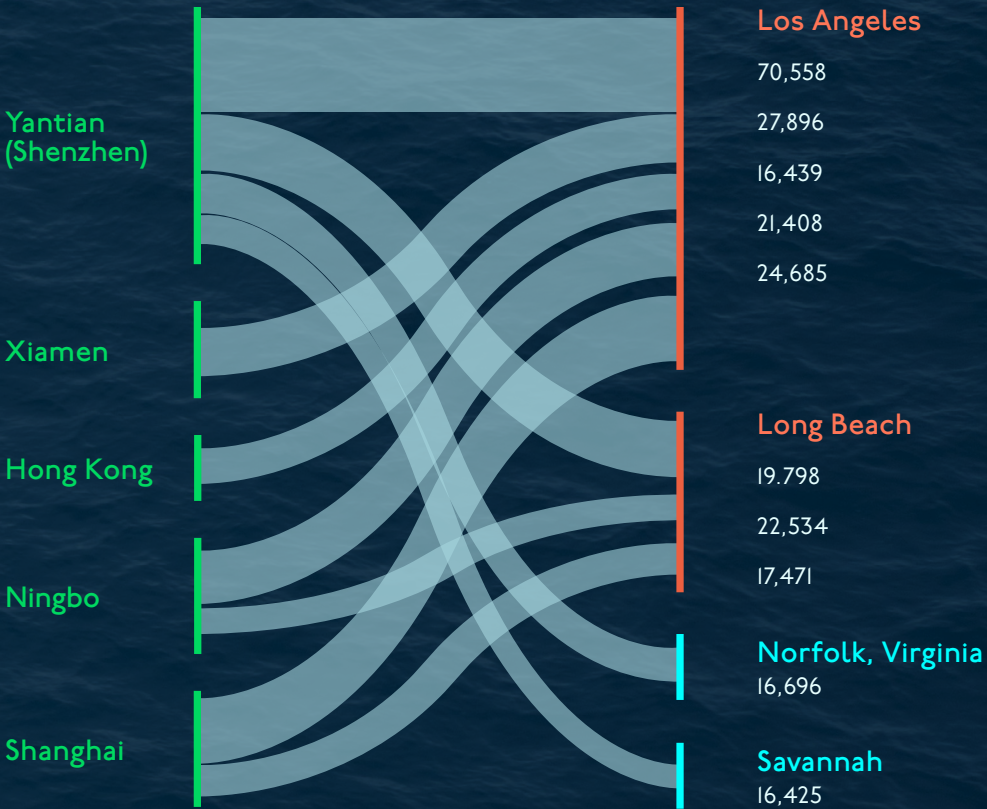
TARGET

Figure 4
Target's TEU trade flows for their top ten routes.



amazon

Figure 5
Amazon's TEU trade flow for their top ten routes.



IKEA

Figure 6
IKEA's TEU trade flow for their top ten routes.





95%

of Target's U.S. imports come into West Coast ports.

Target is the biggest contributor to West Coast port pollution of all the companies studied.

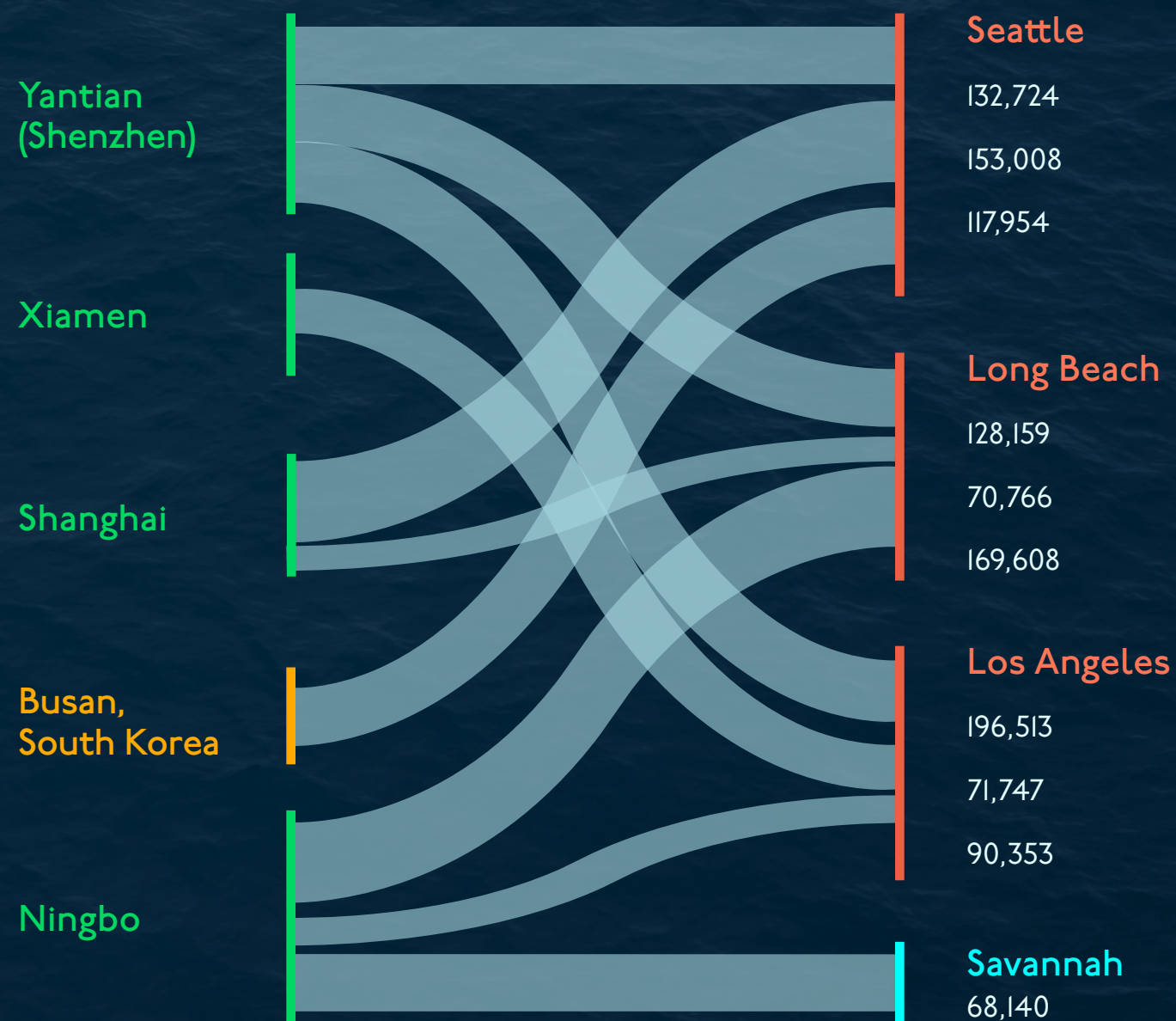


FIGURE 4 | Target's TEU trade flows for their top ten routes.

Ranking Carriers by CO₂e Emissions

CMA CGM leads the list of the top 15 carriers that move goods for Walmart, Target, Amazon and IKEA, with a staggering 33% of the total emissions (see Table 3). This is as much as the next four carriers in the list combined. If American President Lines,

12th on the list and a subsidiary of CMA CGM, is added to their total, the company's share goes up to 35%.

The top 15 carriers account for 97% of total emissions in the dataset, indicating a heavy

TABLE 3 | Top 15 carriers by their share of all company carbon emissions (tCO₂e)

Rank	Carrier	Total Est. Emissions (tCO ₂ e)	% of Total Emissions
1	CMDU CMA CGM	6,726,277	33%
2	MAEU Maersk Line	1,893,595	42%
3	MEDU Msc Mediterranean Shipping Company Sa	1,869,485	51%
4	EGLV Evergreen Line	1,798,750	60%
5	ONEY Ocean Network Express Pte Ltd	1,424,900	66%
6	COSU Cosco Shipping Lines Co Ltd	1,418,856	73%
7	YMLU Yang Ming Marine Transport Corp	1,320,180	80%
8	HLCU Hapag Lloyd A G	884,827	84%
9	HDMU Hyundai Merchant Marine	706,359	87%
10	OOLU Orient Overseas Container Line Ltd	512,640	90%
11	ZIMU Zim Integrated Shipping Services Ltd	497,375	92%
12	APLU American President Lines Llc	404,917	94%
13	AMZD Amazon China Amazon.Cn Amazon Global Logistics China	327,448	96%
14	CHSL Christal Lines	125,153	96%
15	MOLU Mitsui O S K Lines Ltd	82,004	97%

FIGURE 7 | Trends in emissions for the top 5 carriers across all companies



reliance by Walmart, Target, IKEA, and Amazon on a few major players in the shipping industry — even though almost 600 different carriers were found in the data. In the data collected for this report, CMA CGM and MSC Mediterranean Shipping are the major carriers on East or Gulf routes whereas Evergreen Line, Cosco Shipping, Yang Ming, and Amazon Global Logistics are the major carriers on West Coast routes (see Table 4). This breakdown is a function of the companies selected for the study and data coverage per company, but it highlights that the emissions that carriers release in port is a function of their major customers' logistics needs.

If Walmart favors Savannah and Amazon favors Los Angeles, each carrier's emissions in port will reflect this. Amazon's own carrier (a non ves, Amazon Global Logistics (AMZD), overwhelmingly ships via West Coast routes (95% of its shipments for Amazon), reflecting the emphasis on California as a hub for domestic U.S. delivery fulfilled by Amazon and also as a major market for Amazon's sales. For East and Gulf Coast routes, Amazon uses a variety of different carriers.

While company emissions have stayed stable, emissions per carrier have changed with changes in market share. CMA CGM

The top 15 carriers account for

97%
of total emissions
in the dataset

indicating a heavy reliance by Walmart, Target, IKEA, and Amazon on a few major players in the shipping industry.



has seen their share of company emissions rise substantially from Q2 2019 to Q4 2020 while MSC’s share has declined over the same period (see Figure 7). MSC’s dramatic drop in 2019 may be in part due to their temporary suspension in 2019.³²

TABLE 4 | Proportion of emissions per carrier that are for routes ending on the East or Gulf Coasts vs. the West Coast

Carrier	East or Gulf Coast	West Coast	Strongest Company Connections	Company Coast Preference
CMDU CMA CGM	71%	29%	Walmart	East/ Gulf
MAEU Maersk Line	61%	39%	Walmart, Target, Amazon, IKEA	East/Gulf, West, West, East/Gulf
MEDU Msc Mediterranean Shipping Company Sa	64%	36%	Walmart, IKEA	East/Gulf
EGLV Evergreen Line	16%	84%	Target, Amazon, IKEA	West, West, East/Gulf
ONEY Ocean Network Express Pte Ltd	74%	26%	Walmart	East/ Gulf
COSU Cosco Shipping Lines Co Ltd	8%	92%	Target	West
YMLU Yang Ming Marine Transport Corp	19%	81%	Target	West
HLCU Hapag Lloyd A G	47%	53%	IKEA	East/Gulf
ZIMU Zim Integrated Shipping Services Ltd	85%	15%		
APLU American President Lines Llc	36%	64%	Amazon	West

32 Szakonyi, M. ‘Temporary MSC suspension shakes confidence in C-TPAT’, The Journal of Commerce, July 16th, 2019. www.joc.com/maritime-news/container-lines/mediterranean-shipping-co/temporary-msc-suspension-shakes-confidence-c-tpat_20190716.htm2021.

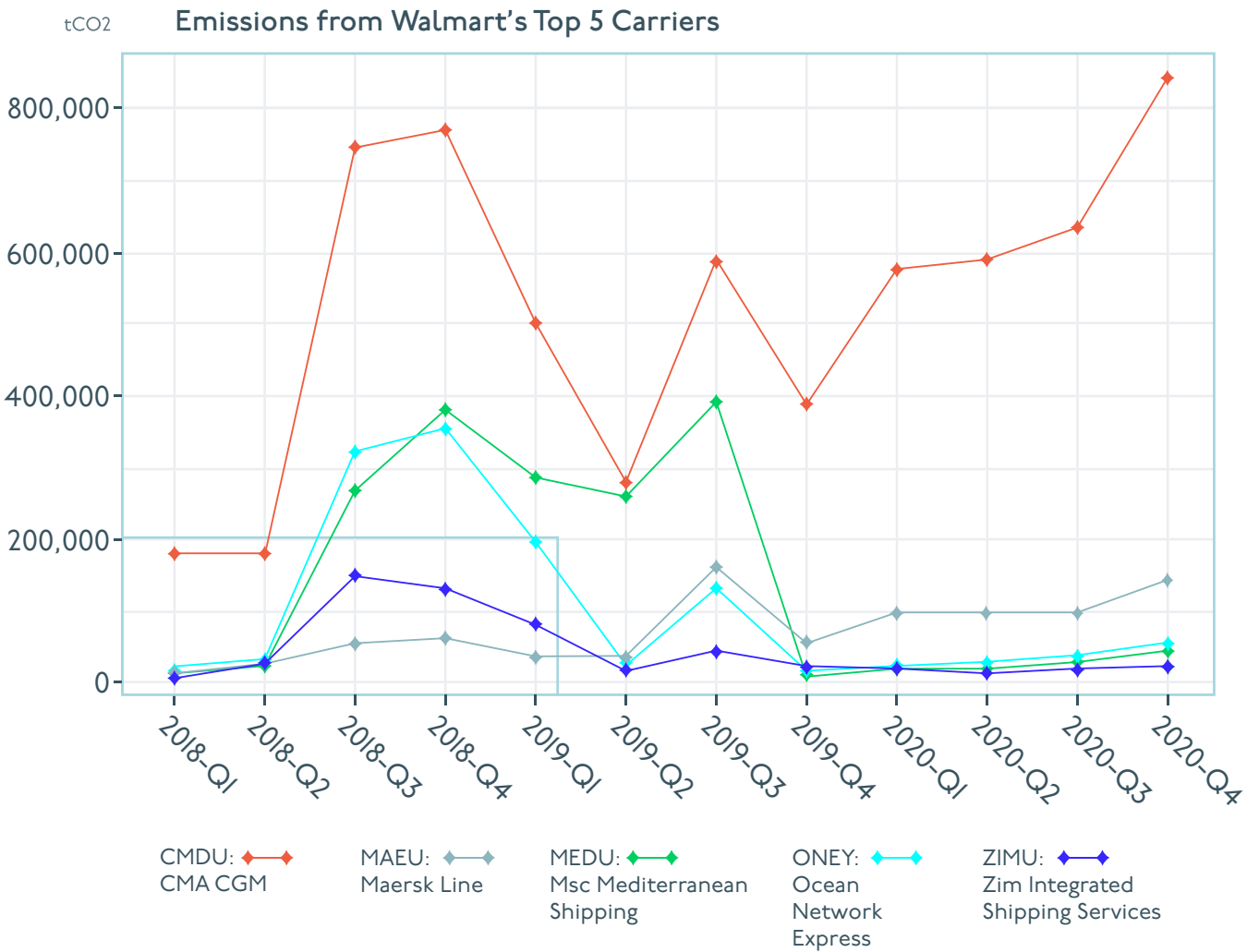
Company Profiles

Walmart

Walmart emitted an estimated 11.5 million tonnes of CO₂e to ship 2.76 million TEUs between 2018 and 2020. Emissions increased 4% in 2020 over 2019, and also concentrated heavily on CMA CGM as a key carrier, accounting for 68% of Walmart's emissions in 2020, an increase of 21% over 2019 (see Figure 10). At the same time, other major carriers used by Walmart experienced significant decreases, with MSC decreasing 17% (perhaps in part due to their temporary suspension in 2019)³³ and Ocean

Network Express decreasing 6% over 2019 levels. While other carriers held on to a small portion of Walmart's business, only Maersk made any gains in 2020, increasing from 3% to 11% of Walmart's ocean shipping emissions. Additionally, in 2020 and again in 2021 Walmart has been chartering vessels to secure capacity and maintain inventory for the peak in demand as the shipping market continues to see capacity issues and backlogs at ports.³⁴

FIGURE 10 | Trend in estimated CO₂e emissions for the top 5 carriers for Walmart, 2018–2020.



³³ Szakonyi, M. 'Temporary MSC suspension shakes confidence in C-TPAT', The Journal of Commerce, July 16th, 2019.

But despite the increase in charters, Walmart is still primarily focused on one carrier. For one of the world's largest retailers to do that is significant, and the concentration of this relationship in 2020 suggests that Walmart is a dedicated customer for CMA CGM and the Ocean Alliance. According to CMA CGM, their clients like Walmart are looking for integrated supply chain solutions for all their shipment needs as consumer demand shifts increasingly to e-commerce and consumers require more warehousing and last mile services, rather than brick and mortar stores.³⁵ CMA CGM sees this model as one where major retailers get all their shipping and delivery services from one integrated system from factory to front door.³⁶

As Walmart's routes more often go from China to the East Coast (see Figure 2), their emissions are larger per TEU than the other companies in this study and are likely to continue to be higher over time. The routing trends with the locations of their distribution centres, which are more concentrated in the Eastern U.S.³⁷ We expect Walmart's emphasis on China manufacturing will continue as Walmart began a \$1.16 billion USD investment in new warehouse space in China in 2019, planning 10 spaces in the next decade.³⁸ On the U.S. side, Walmart recently invested in a distribution center near the Port of Charleston, South Carolina and opened a 2.6 million square foot intermodal distribution centre near the Port of Mobile in Alabama.³⁹

³⁴ Leonard, M. 'Walmart charters ships to ensure freight capacity, inventory for peak season', Supply Chain Dive, Aug. 18th, 2021. www.supplychaindive.com/news/walmart-charter-ships-cargo-peak-inventory/605170/

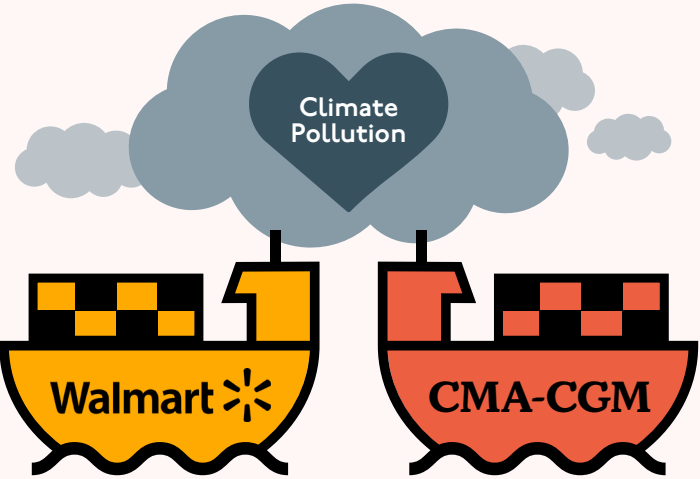
³⁵ Paris, C. 'E-Commerce Growth Driving Shipping Surge, Investments at France's CMA CGM', The Wall Street Journal, Sept. 11, 2020. www.wsj.com/articles/e-commerce-growth-driving-shipping-surge-investments-at-frances-cma-cgm-11599849910

³⁶ Ibid.

³⁷ MWPVL. 'The Walmart Distribution Centre Network in the United States'. Accessed Nov. 10th, 2021. www.mwpvl.com/html/walmart.html

³⁸ Cosgrove, E. 'Walmart to invest \$1B in China logistics', Supply Chain Dive, July 3rd, 2021. www.supplychaindive.com/news/walmart-to-invest-1b-in-china-logistics/558152/

³⁹ Ashe, A. 'New Walmart distribution centre to drive Charleston port volumes', The Journal of Commerce, July 20th, 2020. www.joc.com/port-news/us-ports/port-charleston/port-charleston-looks-boost-retail-bco-business_20200720.html; Nodar, J. 'Despite trade friction, Mobile port expansion continues', The Journal of Commerce, May 15, 2019.



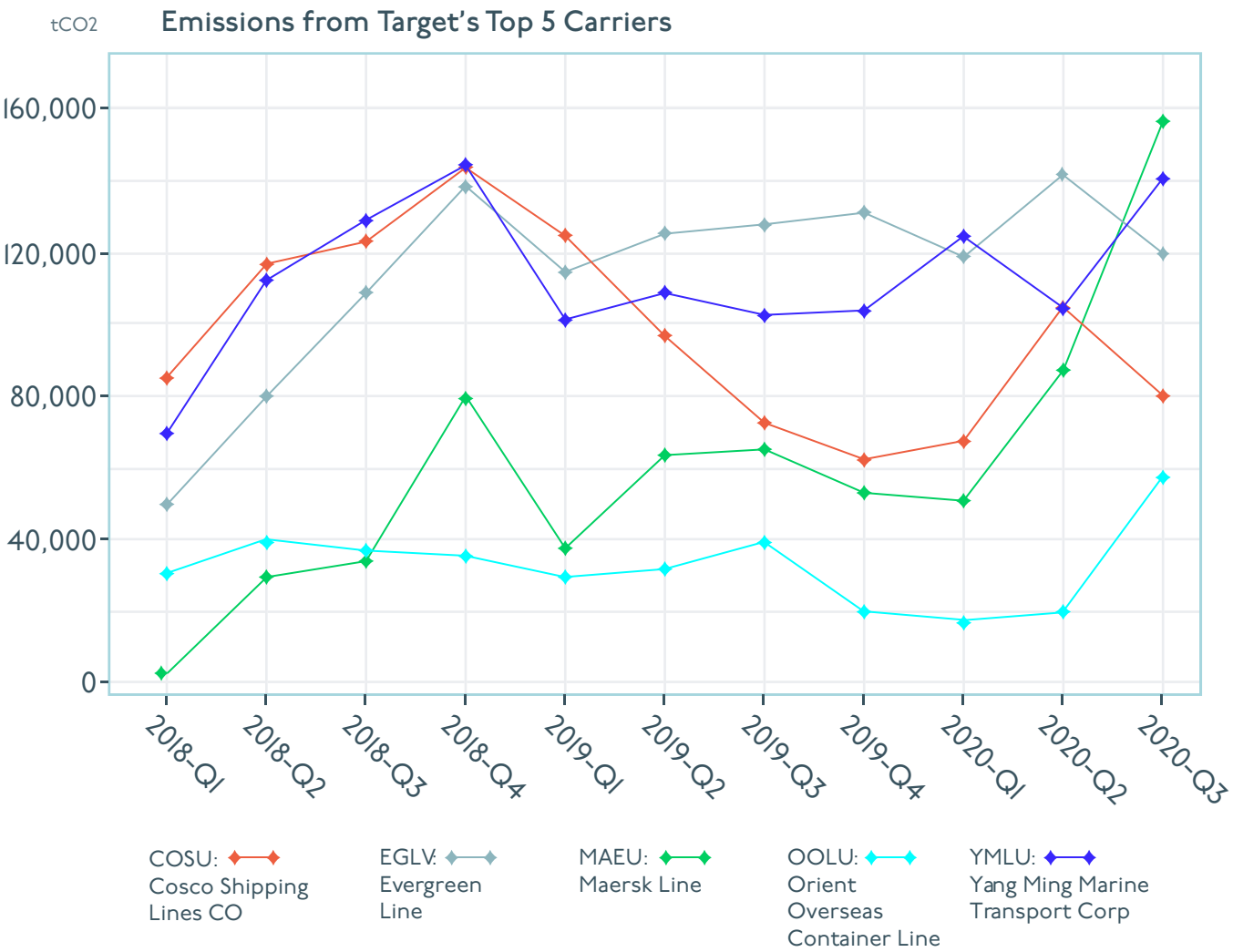
Walmart and cargo carrier CMA-CGM have the shadiest route relationship, making the retailer and carrier **super polluters in U.S. ocean shipping.**

The relationship between Walmart and CMA CGM is the single largest source of carbon emissions in this dataset.

Their close connections and possibility of expanding their working relationship into warehousing and last mile transport is an opportunity for both businesses to build zero-emission shipping into their growth model. Both companies have profited from the increased consumer demand for goods

and the subsequent increase in demand for and price of shipping. Both could use the opportunity of this windfall to invest in zero emissions technologies. Already in 2021, CMA CGM announced that they would offer low-carbon shipping using bio-methane, but the routes chosen (between European ports) will have no impact on transoceanic shipping for Walmart in the near-term.⁴⁰

FIGURE II | Trend in estimated CO2e emissions for the top 5 carriers for Target, 2018 – 2020.



⁴⁰ 'CMA CGM to invest in biomethane production for shipping', Bioenergy Insight, Apr. 13th, 2021. www.bioenergy-news.com/news/cma-cgm-to-invest-in-biomethane-production-for-shipping/

Target

Target emitted around 6.4 million tonnes of CO2e from 2018 – 2020 to ship an estimated 1.8 million TEUs. Target relies consistently on Yang Ming, Evergreen and Cosco, with approximately 58% of their ocean shipping emissions coming from these three carriers. While Target has the most diversity in its top carriers, using carriers from different alliances, they focus on transpacific specialists. The top ten carriers for Target account for 95% of the company's emissions.

As with Walmart, Maersk is one of the few carriers for Target whose share of TEUs and emissions were increasing between 2018–2020, with Maersk's share of Target's emissions increasing 10% from 2018–2020, from 7% to 16% (see Figure II). In general, Maersk has profited greatly during the pandemic, with Q3 2020 being their best quarter on record ever and their pool of money for acquisitions more than doubling from 9 billion USD to 20 billion.⁴¹ Maersk is also using the current shipping conditions to bring more clients into long-term contracts, which supports the increasing trend in both Walmart and Target's use of the carrier.

There is also a strong relationship between ports and store distribution for Target, as

75% of their e-commerce is fulfilled by stock in stores. The model of the store as a 'micro-distribution' centre predicates that the most popular shipping routes for the company would link to regions of the U.S. with higher densities of Target stores. The data suggests that Target shipments are weighted towards West Coast ports, and this is corroborated in their sales data, where California is the region with the highest sales per capita for the retailer.⁴²

Target saw a swell of demand during the pandemic,⁴³ with digital sales doubling. The company is also holding more inventory than normal due to COVID-19 related supply chain and shipping delays.⁴⁴ By the end of Q2 2021, they had 26% more inventory than the same time the previous year, an additional 2.5 billion USD in merchandise.⁴⁵ In order to create this stockpile, Target has chartered its own vessels. As co-managers onboard the vessels, the company can avoid additional stops and backed-up ports and bring their products to market as quickly as possible.⁴⁶ This has led to shipments shifting away from backed up ports such as Los Angeles and Long Beach in favor of other routes. Imports through the ports

⁴¹ Miller, G. 'Shipping giant Maersk continues buying spree after best quarter ever,' Freightwaves, Nov. 2nd, 2021. www.freightwaves.com/news/shipping-giant-maersk-continues-buying-spreed-after-best-quarter-ever

⁴² Target. '2020 Annual Report: Sales per Capita'. Accessed Nov. 10th, 2021. corporate.target.com/annual-reports/2020/financials/sales-per-capita

⁴³ Target. 'Target Corporation Reports Second Quarter Earning,' Target Financial News Release, Aug. 19, 2020. investors.target.com/news-releases/news-release-details/target-corporation-reports-second-quarter-earnings

⁴⁴ Shoulberg, W. 'What Walmart, Target, and Home Depot are trying for their supply chain meltdowns', Forbes, Aug. 25th, 2021. www.forbes.com/sites/warrenshoulberg/2021/08/25/what-walmart-target-and-home-depot-are-trying-for-their-supply-chain-meltdowns/?sh=55648bb54d35

⁴⁵ Ibid.

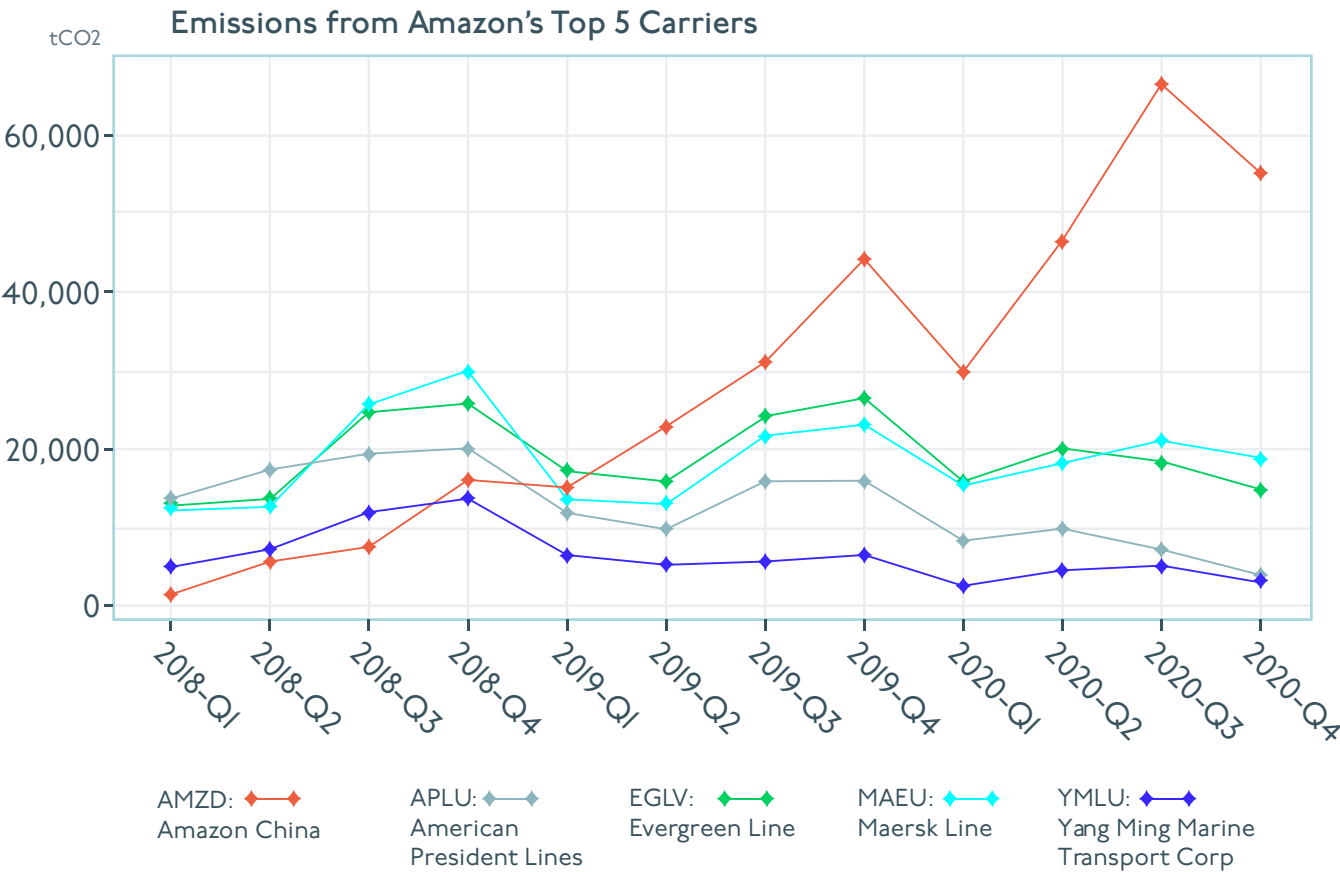
⁴⁶ Repko, M. 'Target is testing a new approach to get packages to customers' doors even faster', CNBC, Apr. 15th, 2021. www.cnbc.com/2021/04/15/target-tests-new-approach-to-get-packages-to-customers-faster.html; Target. 'Peek Behind the Scenes at How Target's Prepping Our Supply Chain to Deliver Holiday Joy All Season Long,' Sept. 1st, 2021. corporate.target.com/article/2021/09/supply-chain-prep

of Seattle and Tacoma are up 40% versus 2019 and East coast ports are up 36%.⁴⁷

Target’s reliance on West Coast shipping routes and their increase in shipping and sales due to the pandemic makes Target

a major contributor to the ongoing port pollution crises at Los Angeles, Long Beach, Seattle, and Tacoma.

FIGURE 12 | Trend in estimated CO2e emissions for the top 5 carriers for Amazon, 2018–2020.



Amazon

Amazon.com emitted an estimated 1.5 million tonnes of CO2e from 2018–2020 to ship approximately 463,500 million TEUs of goods. The most common ocean shipping routes are between manufacturing hubs

in China and the Ports of Los Angeles and Long Beach. In 2018, more of Amazon’s shipping landed at ports on the East Coast, but by 2020, West Coast routes were used more often, with shipments and emissions

at the twin ports of Los Angeles and Long Beach surpassing East and Gulf Coast ports in 2019. Over the same period, shipments to Oakland and Seattle stayed steady. This is indicative of the concentration of Amazon’s shipments via Amazon Global Logistics China (AMZD), operating predominantly between China and LA. This is reflected in the increased emissions associated with AMZD between 2018 and 2020 (see Figure 12).

AMZD is a non-vessel operating common carrier (NVOCC), or ocean forwarder, which means that other carriers are shipping cargo on the company’s behalf under bills of lading issued by AMZD.⁴⁸ AMZD carries Amazon orders plus other ‘fullment by Amazon’ shipping (for example, Chinese companies selling to the U.S. market) which creates additional complexity regarding how to allocate TEUs and emissions to the company for TEUs associated with AMZD. In this study, >95% of the TEUs carried by AMZD were delivered to Amazon fulfilment centres and major Amazon sellers, so the TEUs and emissions associated with AMZD were allocated to Amazon.com.⁴⁹

By using AMZD, Amazon is exerting more control over its internal supply chain and marketplace network, and even building out the capacity to sell its end-to-end service to shippers outside of its marketplace.⁵⁰ AMZD is now among the top ten NVOCCs on the transpacific route, disrupt-

ing what was once highly volatile and out of their control and replacing it with something they can master and capitalize on.⁵¹

As Amazon focuses on building its own shipment and parcel delivery services, AMZD dramatically increased its share of Amazon’s ocean shipping emissions. This is while the company’s overall emissions stayed relatively stable over the study period. In 2018, AMZD was only 7% of Amazon’s ocean shipping emissions, but by 2020 they accounted for 33%.

This trend came at a loss for other carriers such as APLU and ONEY, especially on West Coast routes. Amazon’s top 10 carriers account for 78% of total emissions, the lowest of any of the companies, suggesting that outside of their preference for their own shipping on West Coast routes they still use various different carriers to move products.

The growth of AMZD is perhaps a sign of the times in the shipping industry. As stated before, CMA CGM and other major carriers are aligning international operations with the demands of online retail customers to provide more end-to-end distribution services including warehouses and last mile transport. This may signal the end of alliance-based shipping as carriers move into the ‘Amazon’ model of integrating their service all along the shipping route to create tighter schedules and greater

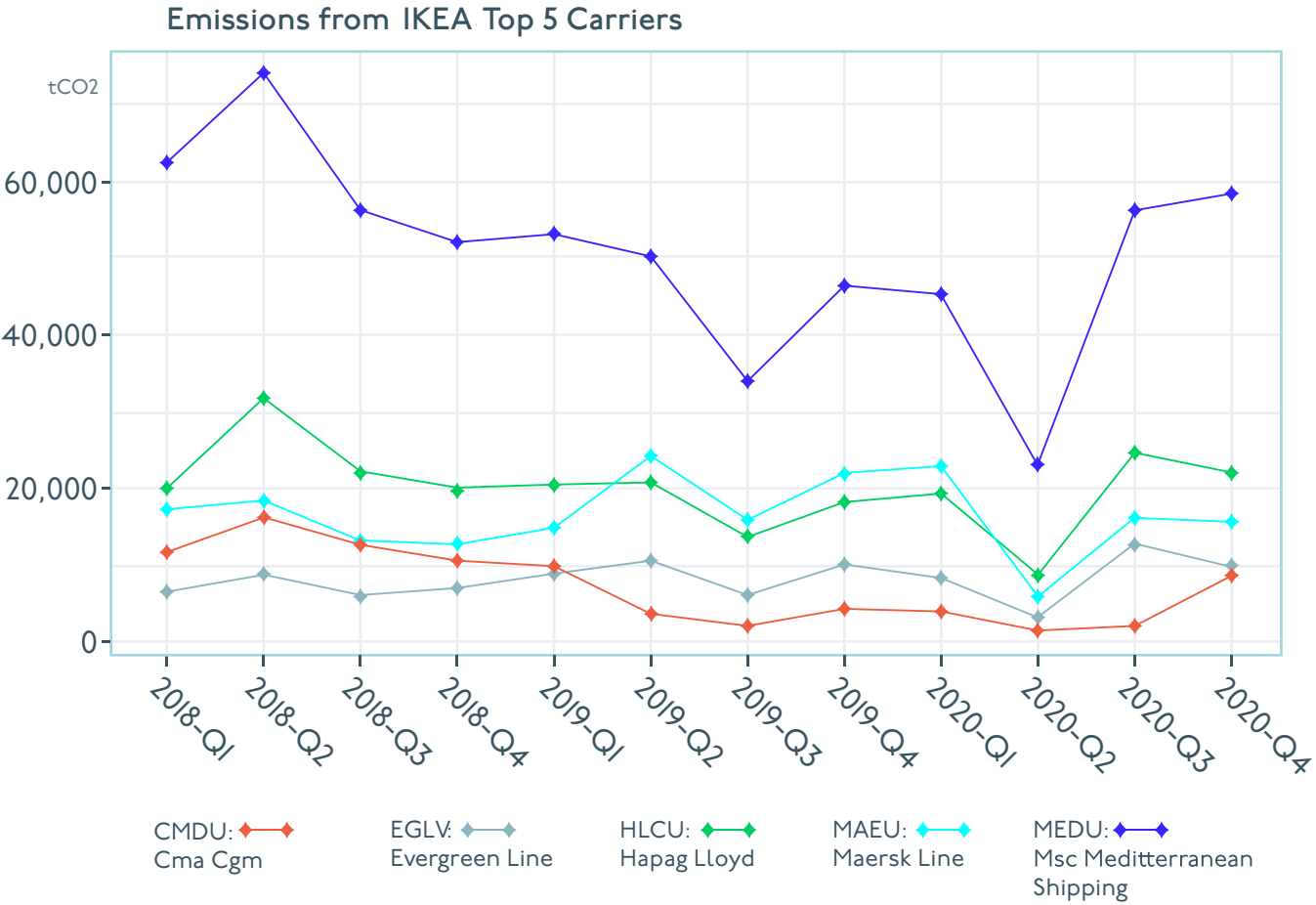
⁴⁷ Garcia, T. ‘Walmart, Target, Home Depot and other large retailers are chartering ships to bypass supply chain problems. Will the strategy save Christmas?’, Market Watch, Oct. 11th, 2021. www.marketwatch.com/story/walmart-target-home-depot-and-other-large-retailers-are-chartering-ships-to-bypass-supply-chain-problems-will-the-strategy-save-christmas-11633455167

⁴⁸ As an NVOCC AMZD can also publish tariff rates and enter into service contracts with other carriers and has international capabilities.
⁴⁹ Research by Stand.earth Research Group using U.S. vessel manifest data for 2018 – 2020.
⁵⁰ Johnson, E. ‘Amazon’s full impact on container shipping emerging’, The Journal of Commerce, Feb. 22, 2019. www.joc.com/international-logistics/logistics-providers/amazon%E2%80%99s-full-impact-container-shipping-emerging_20190222.html
⁵¹ Splash Extra: Amazon rattles forwarders on the transpacific, Splash247.com, Apr. 28th, 2021. splash247.com/splash-extra-amazon-rattles-forwarders-on-the-transpacific/

visibility in the flow of shipments to their final destination.⁵² Such changes bring opportunity for carriers to extend their zero emissions shipping commitments to their whole service offering as they build out new business and invest in various forms of transport. In this regard, Amazon is also leading the way by taking advantage of their investment and growth in end-to-

end delivery to build out fleets that are greener — as recent commitments such as Cargo Owners for Zero Emission Vessels (coZEV) attest — although it remains to be seen if Amazon is really determined to onboard new green technology for the majority of its fleets, and fast enough for its current growth trajectory.⁵³

FIGURE 13 | Trend in estimated CO2e emissions for the top 5 carriers for IKEA, 2018–2020.



⁵² Paris, C. 'E-Commerce Growth Driving Shipping Surge, Investments at France's CMA CGM', The Wall Street Journal, Sept. 11, 2020.
⁵³ Saul, J. 'Amazon and others commit to using zero-carbon shipping fuels by 2040', Reuters, Oct. 20, 2021. www.reuters.com/business/sustainable-business/amazon-others-commit-using-zero-carbon-shipping-fuels-by-2040-2021-10-19/

IKEA

IKEA emitted 1.3 million tonnes of CO2e between 2018–2020 to ship 425,201 TEUs. Emissions for IKEA are on an overall downward trend, with a decrease of 16% between 2018 and 2019 and a further decrease of 8.5% between 2019 and 2020. MSC is IKEA's top carrier — accounting for almost half of IKEA's emissions overall. The decrease in IKEA's emissions are mostly associated with MSC (see Figure 13). The top ten carriers account for 99% of IKEA's emissions, suggesting that the company concentrates most of its business among its top carriers. This is the highest proportion for top carriers among all the companies.

In response to both the demand and the delays caused by the pandemic, IKEA has also been chartering its own vessels. The historically high demand has meant that IKEA stores cannot carry stock consistently, even though they have taken extraordinary actions to keep goods flowing. IKEA has been transporting goods via rail from China to Europe, which is aligned with the company's strategy to reduce carbon emissions by using rail transport as much

as possible.⁵⁴ For example, EVR Cargo in Estonia reported securing contracts with IKEA to use the new China-Estonia route to get products into Europe. The rail option is cheaper than transporting by sea and may have fewer emissions.

The top port of lading for IKEA's shipments to the U.S. is Bremerhaven, Germany. 21% of the products shipped from this port originate in China and all of those are destined for U.S. East or Gulf Coast ports. This suggests that transshipment via rail from China and then maritime transport from Europe to the U.S. is an important route for IKEA products to reach U.S. markets.

Such a shift could be part of IKEA's strategy to reduce the carbon emissions from their shipping. They recently committed to coZEV along with Amazon, and have a decarbonization strategy for shipping and trucking. However, their strategy is to scale up biofuels for use in shipping, which presents its own issues with land-use and deforestation.

⁵⁴ Hemphill, S. 'IKEA's use of rail transport to reduce GHG emissions,' Low Carbon Freight, Feb. 5th, 2018. <http://lowcarbonfreight.eu/blogs/ikeas-use-rail-transport-reduce-ghg-emissions/>; Baraniuk, C. 'Why even giant ships can't solve the shipping crisis', BBC News, Sept. 14th, 2021.



Conclusions

This report reveals that the top retailers and their preferred maritime cargo carriers are major polluters of our climate and U.S. ports — especially those on the West coast. But there is now a moment of opportunity where record breaking profits for retailers and cargo carriers are at a nexus with increasing consumer demand for emissions-free shipping, opening up new avenues and increasing motivation for the decarbonization of the container fleet.

In order to be leaders in this new era

Amazon and IKEA must make stronger, more immediate commitments to zero-emission shipping.

While Amazon and IKEA have made initial commitments to achieve zero-emission ocean shipping by 2040 and decarbonize a small portion of their ocean shipping this decade, with Amazon committing 10% of its freight on zero-emissions vessels by 2030, these commitments do not correspond with the fierce urgency of port community health and the climate crisis. Amazon and IKEA must take steps now to reduce their emissions with wind-assisted propulsion and slow steaming and commit to 100% zero-emissions shipping this decade.

Walmart and Target must take responsibility for their maritime pollution and commit to zero-emission shipping.

We call on Walmart and Target to immediately incorporate wind-assisted propulsion and slow steaming to reduce ocean shipping emissions and commit to 100% zero-emissions ocean shipping by 2030. Thus far, Walmart and Target have been silent on the topic of their ocean shipping emissions.

In order to be leaders in this new era

Walmart, Target, Amazon, and IKEA can play leadership roles in creating fossil-free shipping corridors across the Pacific, starting with Yantian (Shenzhen) to Los Angeles and Long Beach and Shanghai to Seattle.

Policymakers and ports should join them. Transpacific shipping routes from China to the U.S. West Coast are the most common trade routes of all four companies. These findings affirm the imperative of creating fossil-free shipping corridors across the Pacific, catalyzing the phase out of all fossil-fuel maritime infrastructure along these trade lanes accordingly.

All four companies must commit to annual public reporting and transparency regarding their maritime shipping:

this report reaffirms and builds on our findings in our [Shady Ships](#) report that it is impossible for the public to conduct comprehensive oversight of ocean ship emissions without access to proprietary data sets. We urge Walmart, Target, Amazon, and IKEA to provide comprehensive annual public reports of the maritime operations in their supply chains including their cargo carriers, percentage of cargo carried on zero emission vessels, primary trade routes, and their associated maritime GHG emissions.



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