

## New Maritime Decarbonization Regulations: Background & Market Effects (Part 1)

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*New United Nations' International Maritime Organization (IMO) regulations require existing maritime vessels to meet a minimum energy efficiency design standard, while also requiring that larger vessels be graded on their carbon intensity (beginning in 2024). In response, ocean carriers are modifying their fleets, with compliance costs expected to increase total maritime logistics costs and alter freight rates and have a small but negative impact on total global trade and a minimal impact on GDP. This EBOT is the first in a series that examines the market impacts of a new wave of global maritime decarbonization initiatives.*

### Background on the IMO's New Maritime Energy Efficiency and Carbon Intensity Regulations

In April 2018, the IMO adopted a roadmap for reducing maritime vessel CO<sub>2</sub> emissions, which comprise roughly 3 percent of all global greenhouse gas (GHG) emissions, with a short-term target of a 40 percent drop in emissions intensity by 2030 (relative to a 2008 baseline).<sup>1</sup> On January 1, 2023, amendments to this roadmap entered into force, requiring companies operating maritime vessels to both: (i.) calculate an attained Energy Efficiency Existing Ships Index (EEXI) value for every existing vessel of 400 tonnage (in cargo capacity) or more, and (ii.) collect fuel consumption and voyage data for ships of 5,000 gross tonnage or more in order to calculate an annual operational Carbon Intensity Indicator (CII).

A vessel's EEXI describes its CO<sub>2</sub> emissions per cargo ton and mile and is solely based on the technical *design* and theoretical potential CO<sub>2</sub> output of a ship, not its real-world operational output.<sup>2</sup> Per the IMO's new rules, each vessel's attained EEXI, will be compared to the Energy Efficiency Design Index (EEDI) baseline that all ships built since 2013 have been required to meet and will either receive a one-time EEXI approval or be required to take steps to improve its efficiency.<sup>3</sup>

A vessel's CII is an *operational* measure of its Annual Emissions Ratio (AER), which is its annual fuel consumption multiplied by a CO<sub>2</sub> emissions factor set by the IMO, divided by its total annual deadweight distance traveled.<sup>4</sup> This value will be compared with a baseline and each ship will be given a rating of A to E (A being best), with the threshold for higher grades becoming increasingly stringent through 2030. Ships receiving D or E grades for three consecutive years will be required to submit a corrective action plan or face potential penalties, though the IMO has not agreed upon specific punitive measures.

### Ocean Carriers are Modifying Their Fleets to Meet EEXI and CII Requirements

More than three-quarters of both the global dry bulk and tanker vessel fleets would not meet the IMO's required EEXI score if tested in 2022, and more than half of existing large vessels would receive a failing CII score of D or E in 2023, per multiple industry reports. Ocean carriers are thus in the process of modifying their existing vessels to meet these new standards. Depending on the inefficiency of a ship's

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<sup>1</sup> Emissions intensity is measured by unit good per unit distance.

<sup>2</sup> A ship's attained EEXI considers the power of a ship's main engine, its main and auxiliary engine's fuel consumption, and a conversion factor between the fuel and the CO<sub>2</sub> mass produced by the engines.

<sup>3</sup> Enforcement of IMO rules are the responsibility of the signatory country in which a ship is flagged, as the IMO does not itself enforce rules or levy penalties.

<sup>4</sup> The AER assumes that a vessel is continuously sailing laden (carrying cargo), which may underestimate its carbon intensity by volume as many ships often operate on ballast (empty) legs for several voyages a year without cargo onboard. An alternative measure, the Energy Efficiency Operational Indicator (EEOI), will be considered in 2026.

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design and the severity of its real-world carbon output, these modifications may include the installation of speed limiters such as engine power limiters and shaft power limiters, the use of 3<sup>rd</sup>-party fuel optimization software, hull cleaning to reduce drag, low-energy lightbulbs, waste heat recovery systems, solar and/or wind auxiliary power, and/or adopting lower and zero carbon fuels. For many vessels, meeting EEXI requirements and improving their CII grade only requires limiting their speed (referred to as “slow steaming”), since a 20 percent reduction in speed can lower emitted CO<sub>2</sub> by roughly 50 percent.

### Market Effects in 2023 and Beyond

The United Nations Conference on Trade and Development (UNCTAD) estimates that EEXI and CII regulations will increase maritime logistics costs by 3.1 to 7.6 percent in 2030, depending on the carbon reduction necessary for the fleet to meet CII requirements, with a potential small but negative effect on world trade and a minimal effect on GDP (Table 1). The increase in maritime logistics costs is tied to the costs of modifying the fleet, as well as costs associated with longer supply chain lead times due to slow steaming.

**Table 1. Estimated Effect of EEXI and CII Regulations on Total Maritime Costs, Global Trade, and Global GDP in 2030**

Change, in percent	Low-GHG	High-GHG
Total Maritime Logistics Costs	2.7	7.2
Total Global Trade	-0.2	-0.5
Global GDP	-0.02	-0.04

Source: Bourgeon and Hoenders, "[Assessing possible impacts on States of future shipping decarbonization](#)," April 13, 2021.

Note: Low-GHG denotes a 10.2 percent reduction in CII from 2019 to 2030 compared to an estimated level with no EEXI or CII requirement. High-GHG denotes a 21.5 percent reduction.

EEXI and CII regulations will also affect freight rates and vessel routing. Since higher vessel speeds require more fuel per unit traveled, a contract requiring a vessel to operate at high speeds may lower its annual CII grade and result in higher freight rates. Routes with consistently poor weather and/or turbulent waters also require comparatively more fuel and shippers are expected to either charge a premium to sail these routes or find alternatives. Vessels also continue to emit CO<sub>2</sub> at port, so those that make many short trips and/or carry larger cargo loads will also receive lower CII grades than similar vessels transporting fewer goods and/or travel on longer voyages, incentivizing longer routes with fewer stops.<sup>5</sup>

Industry analysts also expect an acceleration in the scrapping of older ships that are more costly to modify and retrofit. For instance, CII regulations have already affected the secondary market for vessels, with vessels in band E having substantially lower liquidity than vessels operating in bands A to D. The shift is most notable in the tanker market, with only 3.3 percent of tankers in band E traded in 2022, three times lower than the average. This suggests that shippers are factoring in CII compliance costs when purchasing used vessels, effectively shortening the lifespan of ships with worse expected CII grades.

Sources: IMO, "[Rules on Ship Carbon Intensity and Rating System Enter into Force](#)," (11/1/2022); UNCTAD, "[Assessing Possible Impacts on States of Future Shipping Decarbonization](#)," (4/13/2021); Watson et al., "[The CII Conundrum – Will It Sink or Swim?](#)" (12/5/2022); The Maritime Executive, "[Secondhand Vessel Pricing Shows Impact of the New CII](#)," (3/19/2023); Hellenic Shipping News, "[EEXI Compliance Found Lacking](#)," (9/7/2022); DNV, "[EEXI Calculation](#)," (accessed 4/5/2023); Miller, "[New Shipping Regulation to Combat Global Warming Is under Fire](#)," (12/21/22); Holmstad, "[More than Half of Global Fleet Likely to Receive Worst Climate Ratings](#)," (1/18/2023); Vakili et al. "[Assessing the macroeconomic and social impacts](#)" (2/27/2023). UNCTAD, "[2021 Amendments to the International Convention](#)," (6/2021).

<sup>5</sup> Critics of the CII have argued that shippers can utilize their less efficient vessels on longer voyages and more efficient vessels on shorter voyages to achieve acceptable CII grades for their fleet, despite higher net GHG emissions than a more efficient but lower graded fleet strategy.

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