WHITEPAPER

How are the CII and EEXI Regulations Influencing a Strong Bulk Market?

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Introduction

The Carbon Intensity Indicator (CII) regulation provides a standardized operational efficiency metric for the shipping sector. Modelled CII data from VesselsValue shows that this metric has improved in the bulk sector since 2019. While the reasons for this are complex, the enforcement of CII and EEXI vessel efficiency standards in Jan 2023 is likely to have had an impact on this improvement.

The International Maritime Organization (IMO) adopted the CII regulations in June 2021 to measure and assign an Annual Efficiency Ratio (AER) to commercial vessels. 2023 marked the first operational year of the regulation, with all shipowners of vessels over 5,000GT being required to report attained CII ratings based on fuel oil consumption, speed and distance figures collected over the year. Vessels which fail to achieve a C rating or higher must submit an improvement plan (SEEMP) to remain compliant, and D ratings must improve within 3 years.

From 1 January 2023, the IMO made it mandatory for all existing ships to calculate their attained Energy Efficiency Existing Ship Index (EEXI) to measure a vessel's energy efficiency and initiate data collection for the reporting of CII ratings. This placed a requirement on shipowners to modify non-compliant vessels to meet the newer, more stringent efficiency design criteria stipulated in the EEXI regulation by the next due date of a vessel's International Oil Pollution Prevention (IOPP) survey. The options available for achieving EEXI compliance are the installation of Energy Saving Devices (ESDs), alternative fuel engines, or applying Engine Power Limitation (EPL) or Shaft Power Limitation (SPL) to conventional engines.

Strong market conditions, where demand is healthy and freight rates are strong, are not typically conducive to fuel efficiency, when voyage speed and capacity become important factors. However, with both the EU and IMO introducing major efficiency improvement measures to the industry, vessels without effective emissions reduction technologies are facing non-compliance and financial penalties for excessive emissions associated with higher speeds.

At Veson Nautical, we can track CII and EEXI ratings using dedicated **VesselsValue models**. With data going back to 2019, our CII model calculates AIS-derived speed and distance metrics and combines them with ship specifications from our extensive shipping database. This provides an independent fuel consumption estimate across the global fleet. As a result, we can produce a historical time series of vessel efficiency which shows how operational efficiency may have changed since the CII rating scheme came into force.

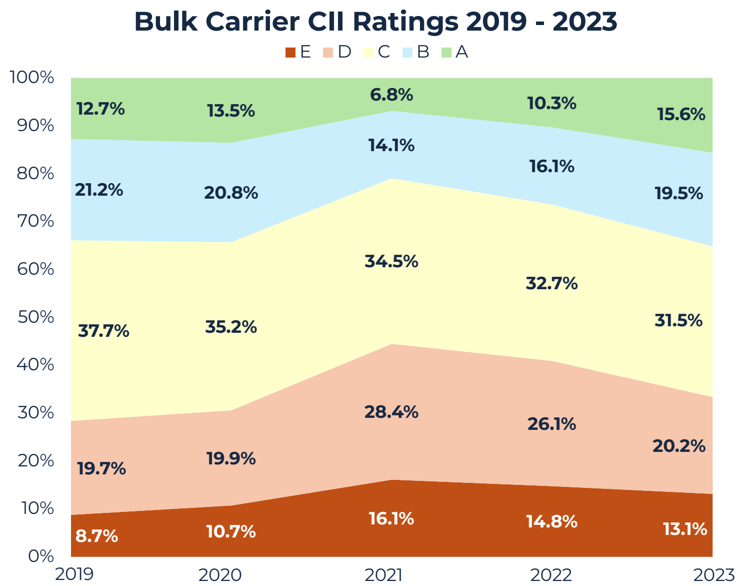
In addition, our VesselsValue EEDI/EEXI and EPL estimation tool allows users to view ratings by combining IMO calculation methodology with vessel data. Attained and required ratings can be used to assess vessel compliance with EEDI and EEXI regulations and the tool allows for instantly customizable EEXI calculations based main engine power and fuel type. As such, we have some useful macro data to hand.

In this whitepaper, data from Veson Nautical, including the VesselsValue CII and EEXI models and ship specifications database will be summarized to build a picture of the influence of these efficiency regulations amid a high-demand bulk freight market.

CII and the bulk market

With the EU ETS scheme going online this year, shipowners face increased pressure to reduce vessel emissions. Under the "polluter pays" principle, shipowners will be legally entitled to seek reimbursement of EU ETS expenses from counter-parties. Enacting these clauses into charter party agreements is expected to incentivize operators to favor low emission, efficiently operated vessels to limit EUA exposure on EU voyages, therefore increasing demand for vessels with a proven track-record of operational efficiency.

As CII is currently the only statutory measure of operational efficiency for commercial vessels amid an increasingly stringent regulatory landscape, owners may begin to consider CII as a point of negotiation in S&P deals.



Source: VesselsValue, a Veson Nautical solution, July 2024

Figure 1. Historical CII Banding for Bulk Carriers

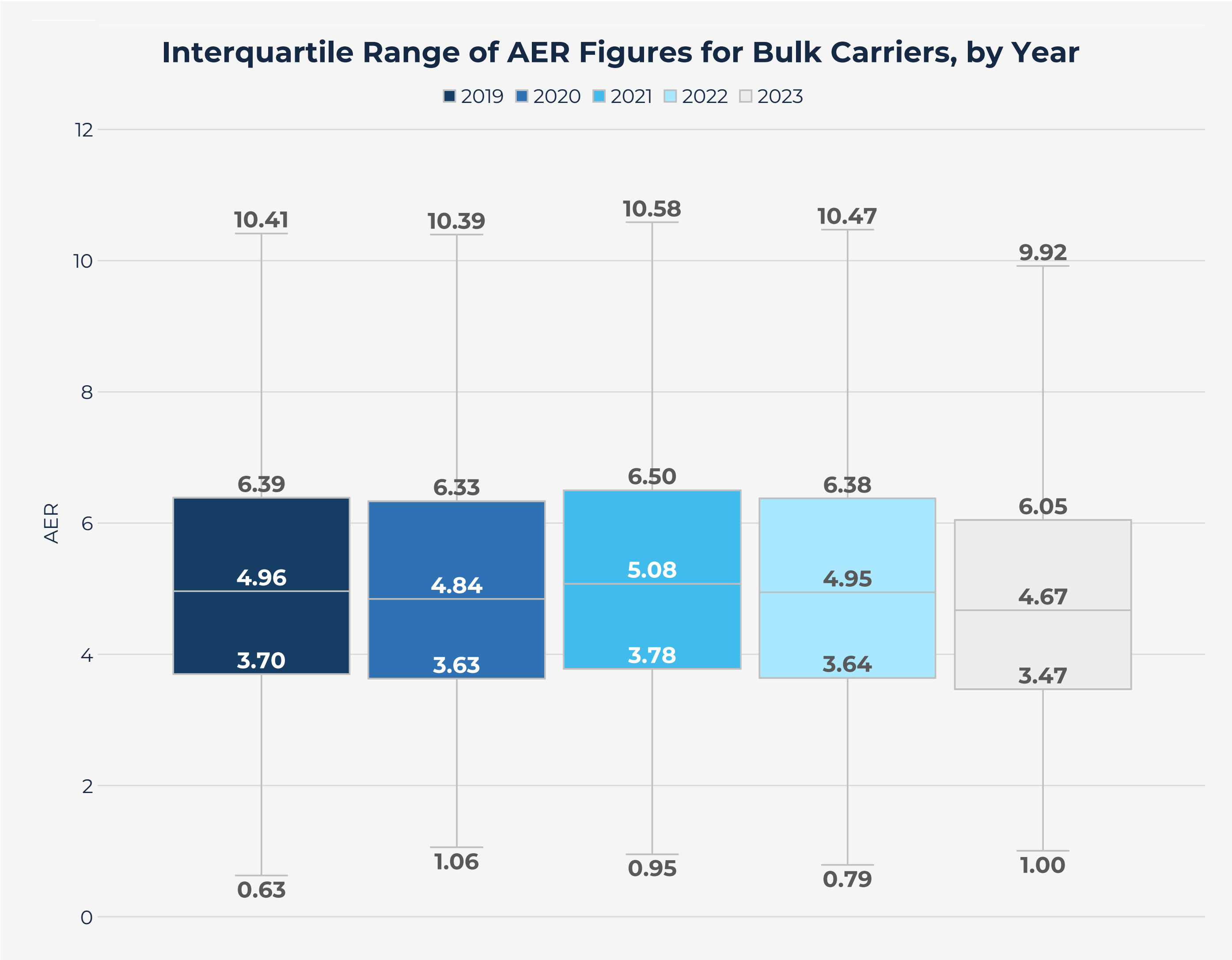


Figure 1.1 Historical AER figures, Interquartile range

Bulkers have seen an increase in vessels achieving A and B ratings and a decrease in vessels achieving D and E ratings over the period 2021-2023, according to our estimates. Over this period, total yearly CO_2 emissions peaked in 2021 (see figure 4) which is likely due to the strong market conditions and increased average speeds seen in figures 5-7.

An increase in operational efficiency since 2021 is logical given the exceptional market conditions seen that year. However, comparing 2023 figures to the more typical market conditions of 2019 and 2020 does not show any noticeable improvement in CII ratings, except for a marginal increase in A-Rated vessels.

An important aspect to consider here is the 5% reduction factor in the required AER from 2019-2023[1]. Essentially this means that the banding criteria has become stricter over this period, which in part explains the increase in vessels achieving the lowest ratings compared to 2019/2020.

[1]AER is the figure on which a CII rating is based; a lower figure gives a better efficiency rating.

Operational efficiency improvement among bulk carriers

The reduction factor is put into perspective in figure 1.1 above, which shows the interquartile range of AER figures for bulk carriers, by year. In this chart, we can see that the median AER has decreased from 4.96 to 4.67 from 2019 to 2023, a 6% improvement. The upper and lower quartiles show similar improvements. This shows that, aside from the market spike in 2021, operational efficiency has seen a consistent improvement since 2019, and that the moderate worsening of CII ratings seen over this period is primarily due to the tightening CII band criteria.

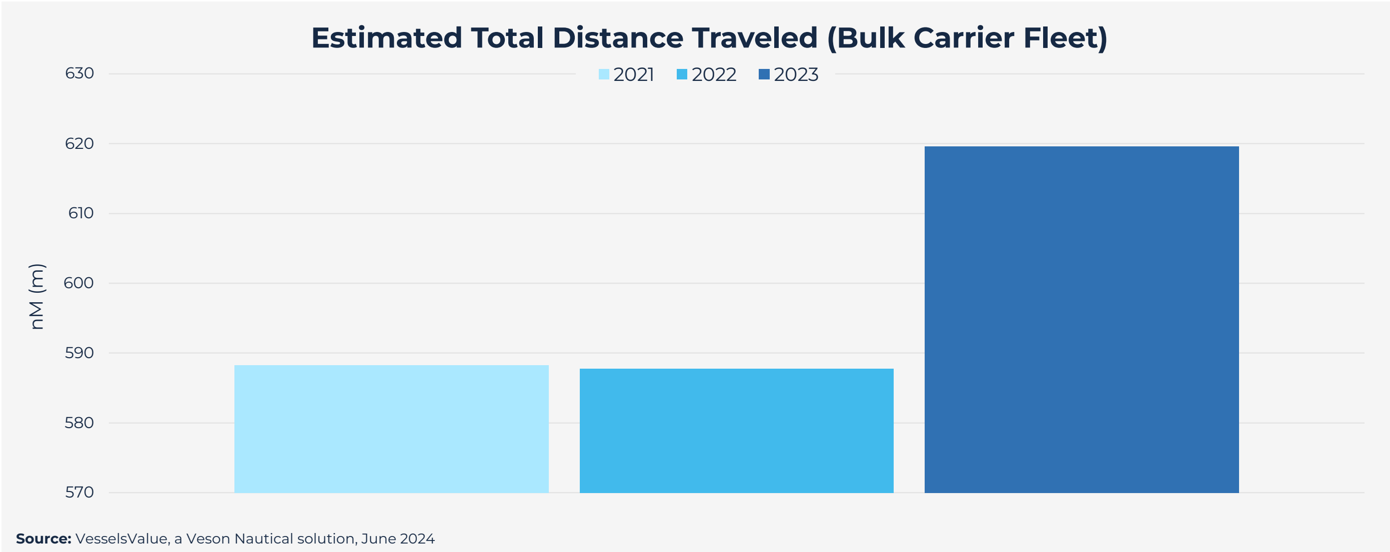


Figure 2. Total Distance Travelled (Bulk Carrier Fleet)

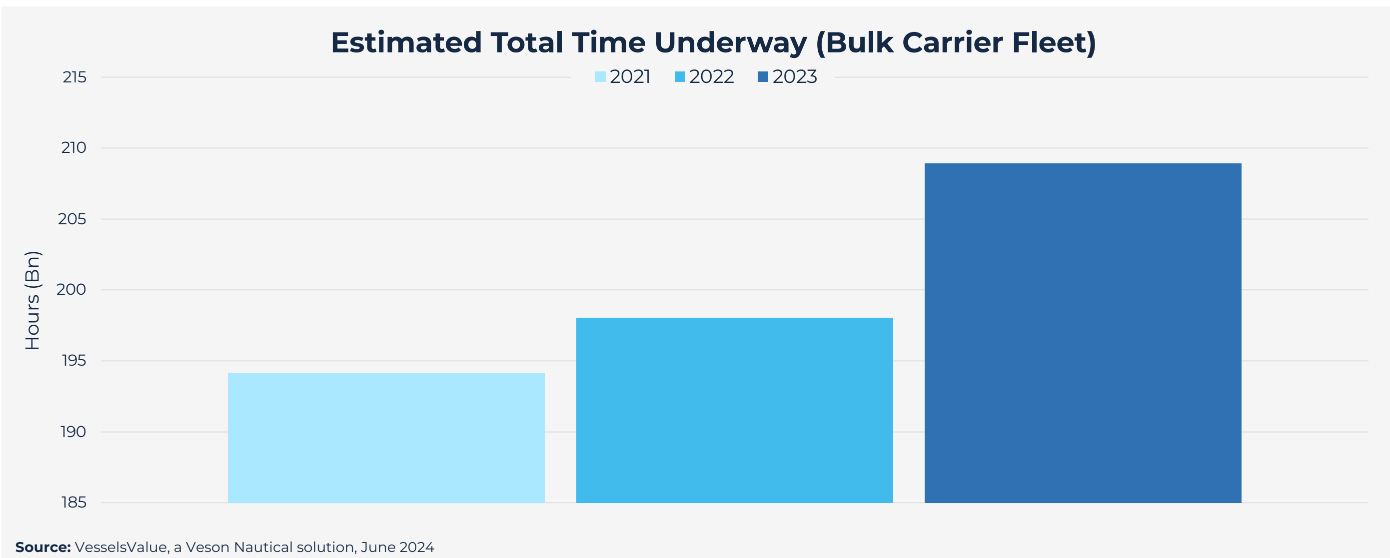


Figure 3. Total Time Underway (Bulk Carrier Fleet)

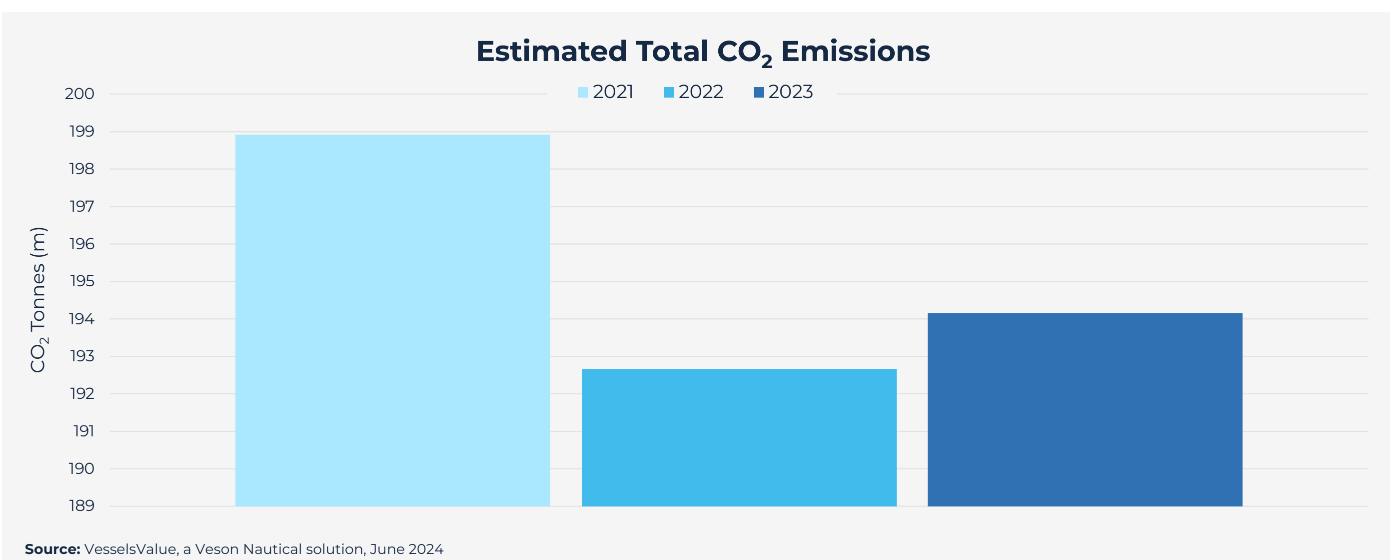


Figure 4. Estimated Total CO_2 Emissions (Bulk Carrier Fleet)

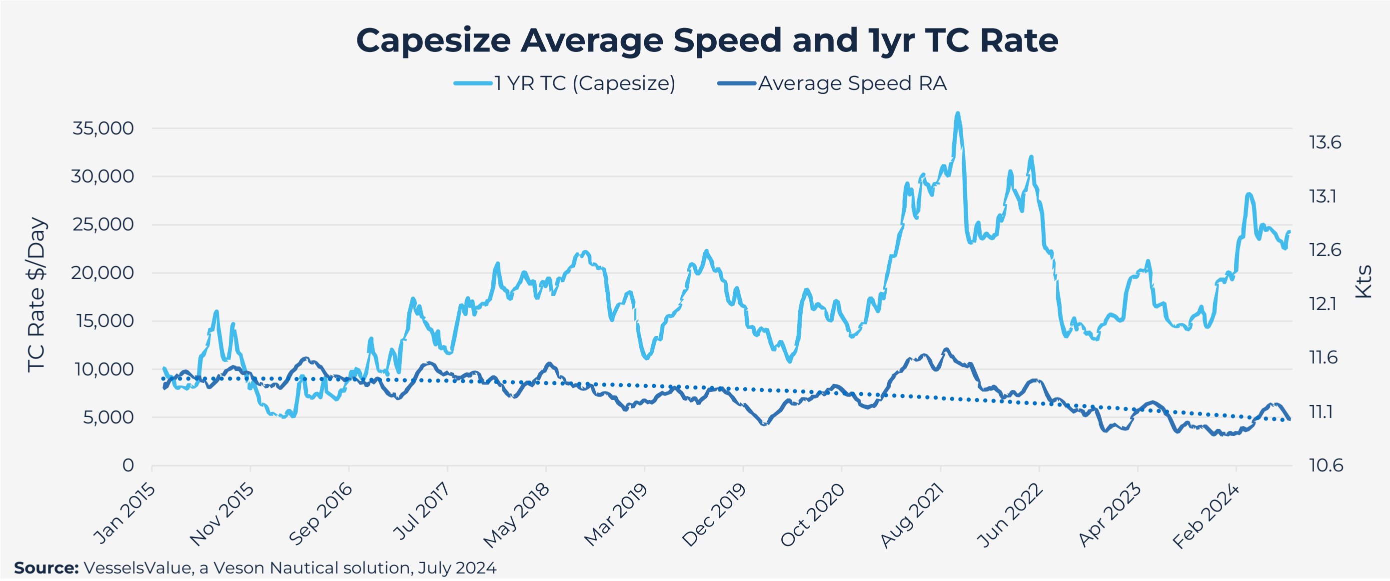


Figure 5. Capesize Average Speed and 1YR TC Rate

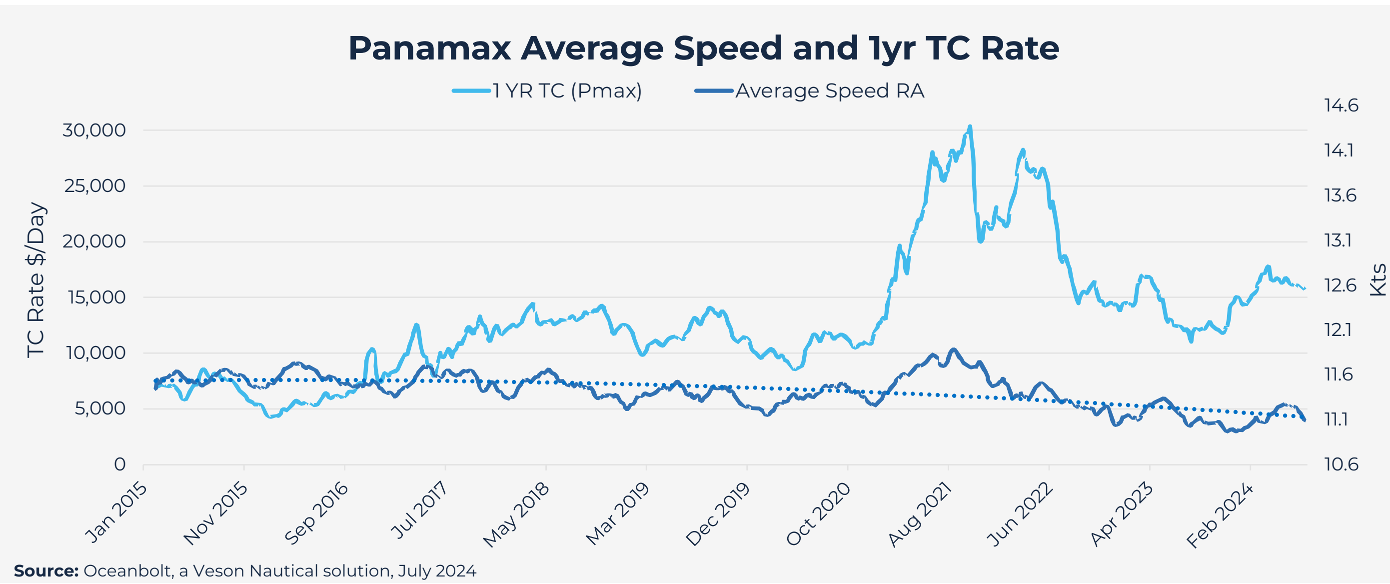


Figure 6. Panamax Average Speed and 1YR TC Rate

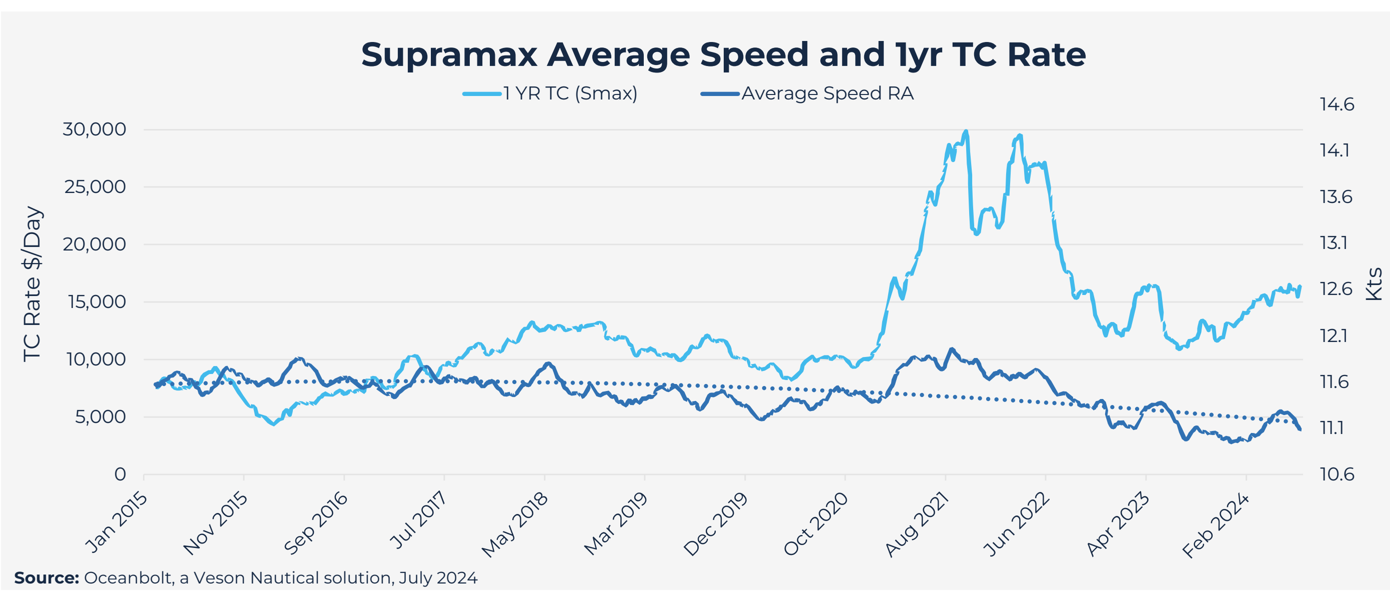


Figure 7. Supramax Average Speed and 1YR TC Rate

Efficiency has improved despite longer voyages

Figures 2 and 3 show that time underway and distance travelled have climbed steadily in recent years, reaching their highest levels in 2023. Reduced port congestion combined with increased diversions around the Suez and Panama Canals — particularly in the latter half of 2023 (see figure 8) — are contributing to this extra distance. Rerouting of coal cargos from Russia to India and the Far East because of the Ukraine crisis, as well as China's lifting of the Australian coal import ban in Jan 2023, and increasing exports of bauxite to China from Guinea have also increased bulk carrier ton-mileage.

Remarkably, despite this increase in distance and time underway, estimated CO_2 emissions declined over this period by 2.5% (5 million tons). The cubic relationship between speed and required power means that higher speeds result in proportionally higher fuel consumption. The consistent decrease in average speed across the fleet from 2021 is therefore a key contributory factor in the decrease in total CO_2 emissions. Declining average speed is also assumed to be a key influence on the improvement in AER since 2019.

The efficiency-rate relationship

A key takeaway from figures 6 and 7 is the noticeable decline in average speeds compared to historical figures over the past 10 years. There is a clear short-term relationship between the peaks and troughs of Time Charter (TC) rates and average speed amongst all three bulker categories. However, over the long term, an overall decline in average speed has been evident since 2015.

Looking at 2024 so far, a 1YR TC peak of $17,815/day was reached in April for Panamax vessels, an increase of 23% compared to peak rates of $14,500/day reached in 2018. Despite the stronger market seen in 2024, peak average speeds have seen a decline from 11.66kts in 2018, to 11.27kts in 2024 YTD, a decrease of 3.3%.

Similar trends are observed in the Capesize and Supramax sectors. This suggests that a reduction of sailing speed has been a driving factor in the overall increase in operational efficiency observed amongst the bulk carrier fleet. This is potentially due to the CII (and EEXI) regulations that were enacted in 2023, suggesting they have been effective in increasing carbon efficiency.

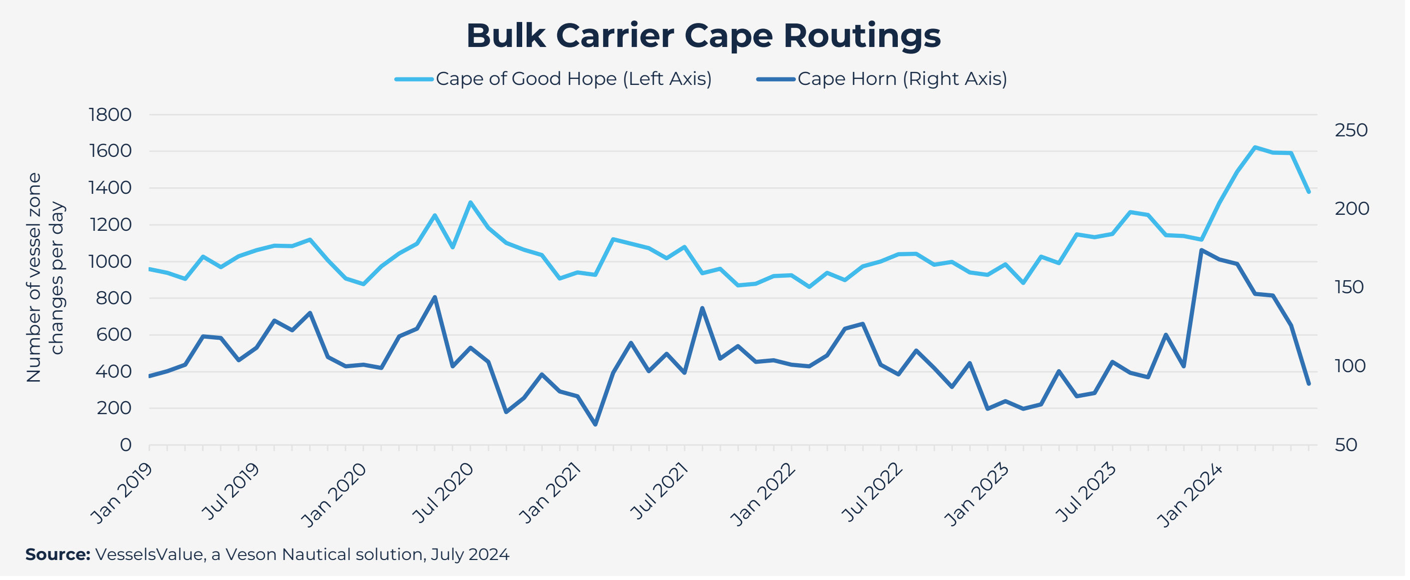


Figure 8. Bulk Carrier Cape Routings

Summary of bulk carrier CII ratings

The increase in vessels achieving A or B ratings from 2021 – 2023 is due to greater time underway, greater distance travelled and a decline in average speed. In CII terms, these factors will generally improve a vessel's rating, as more transport work per ton of CO_2 is carried out, compared to a vessel which has less time or distance underway, or which sails at a higher speed. It is here that we encounter a well-known criticism of the CII formula, which is that the cargo carrying aspect of the formula considers total Dead Weight Tonnage (DWT) capacity, instead of actual cargo carried. Long, slow repositioning voyages in ballast conditions, which are typical in quieter markets, will greatly benefit a vessel's efficiency rating, despite no cargo transport work occurring.

Nevertheless, the total CO_2 emissions seen in figure 4 have decreased overall since 2021. The key point here is that, despite the highest distance and time underway being recorded in 2023, total CO_2 emissions did not follow suit due to efficient speeds being maintained across the fleet. A consistent decline in average speeds has also resulted in an overall improvement in operational efficiency since 2019. Furthermore, strong market fundamentals in 2024 appear to have had a noticeably lesser effect on average speeds compared to previous years.

What about EEXI?

Since 2023, the EEXI has placed existing ships on a defined pathway towards improving design efficiency. Engine Power Limitation (EPL) provides the most effective and economic way to correct the EEXI calculation to provide a compliant result. In short, the EEXI formula has a heavy weighting on both main engine power and reference speed. EPL provides a direct way to adjust both parameters to achieve compliance.

Conversely, installing Energy Saving Devices (ESDs) can have a much lesser effect on EEXI ratings. Estimates from Class NK[2] show that a typical ESD can reduce main engine load up to 7%, which would only result in a maximum 2.3% improvement in attained EEXI. Furthermore, EPLs are simple to install via a software update on electronically controlled engines, or by a "stop screw" on older mechanical engines, both of which are considerably more cost effective when compared to installation of an ESD such as a fixed wing sail or exhaust gas recirculation.

However, the question remains whether EPL installation has an overall impact on fleet efficiency. The effect of EPL is to limit the maximum possible speed of the vessel, with an option to override the limitation in emergency situations. Thus, a noticeable increase in vessel efficiency would only occur if the EPL was sufficient to reduce the upper limit of the vessel's typical operational speed.

Figure 9 illustrates the typical scenario for a pre-EEDI Supramax bulk carrier built in 2011, using the VesselsValue EEDI/EEXI and EPL estimation tool. A power reduction of 34% is required to make this vessel EEXI compliant. This is consistent with a study by the International Council on Clean Transportation (ICCT) which found that EPL of over 30% could result in CO_2 reductions of up to 3% for bulk carriers. This suggests that EPLs may have contributed towards reducing average operational speeds, with the greatest effect expected amongst older vessels built before the increasingly stringent EEDI regulations were phased in.

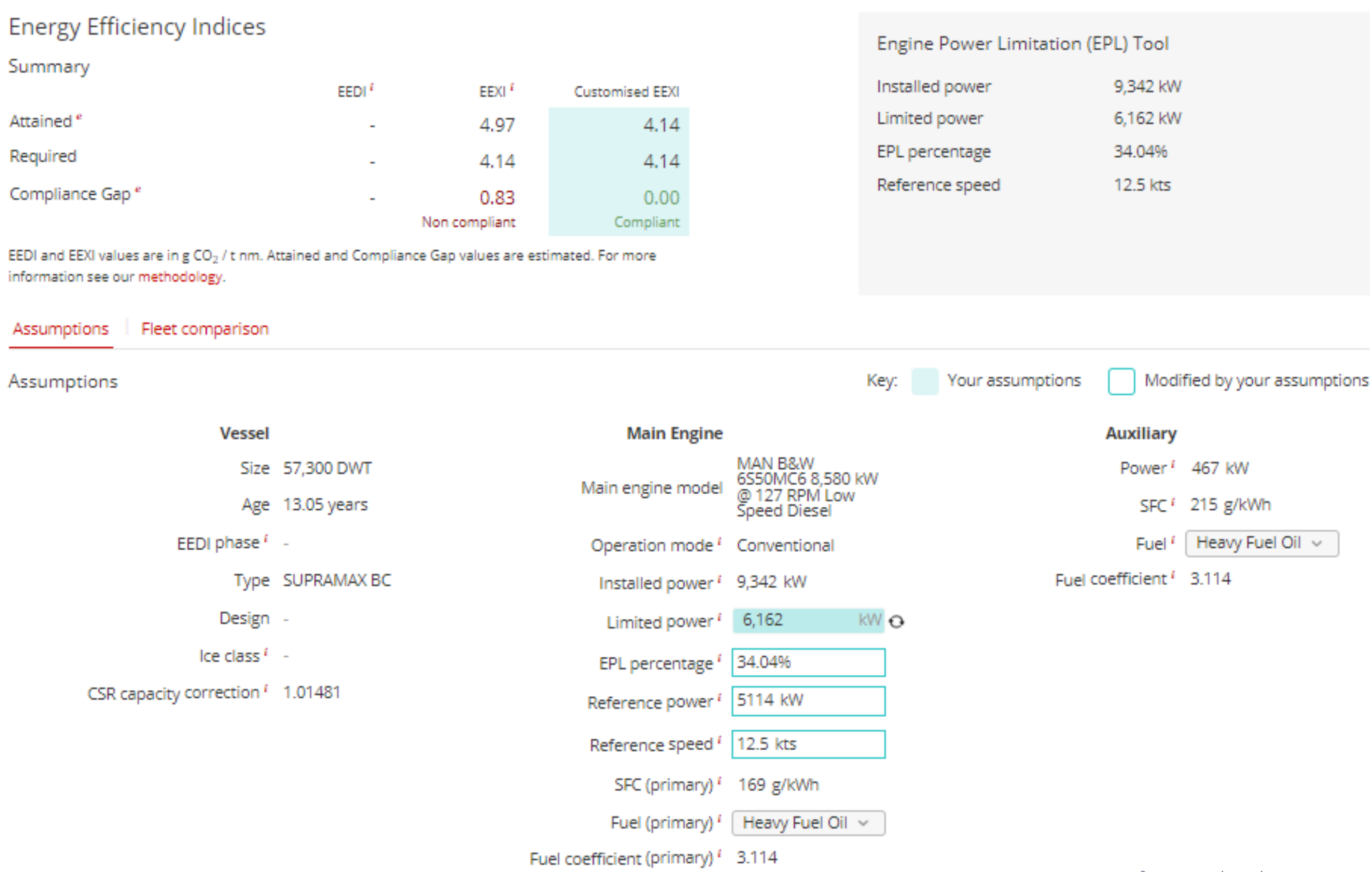


Figure 9. VesselsValue EEDI/EEXI Estimation and EPL Calculation Tool

[2]ClassNK. (2021). EEXI Support Services Presentation (Slide 27) [Review of EEXI Support Services Presentation]. https://www.classnkcs.co.jp/en/eexi/pdf/service-detail.pdf

Outlook

An interesting consideration for the future is whether capital-intensive, low emission vessel designs will be able to forge a commercial advantage over cheaper, standard specification vessels, by achieving increased operational speeds at a lower CO_2 emission intensity. As discussed in this report, existing Heavy Fuel Oil (HFO) vessels without additional ESD measures will now be required to install EPL/SPL speed restrictions to remain compliant with EEXI. In strong market conditions this could negatively affect their commercial competitiveness. Furthermore, in terms of CII ratings and EUA exposure on EU voyages, these standard spec vessels will be heavily penalized for operating at higher speeds, compared to more carbon-efficient vessels.

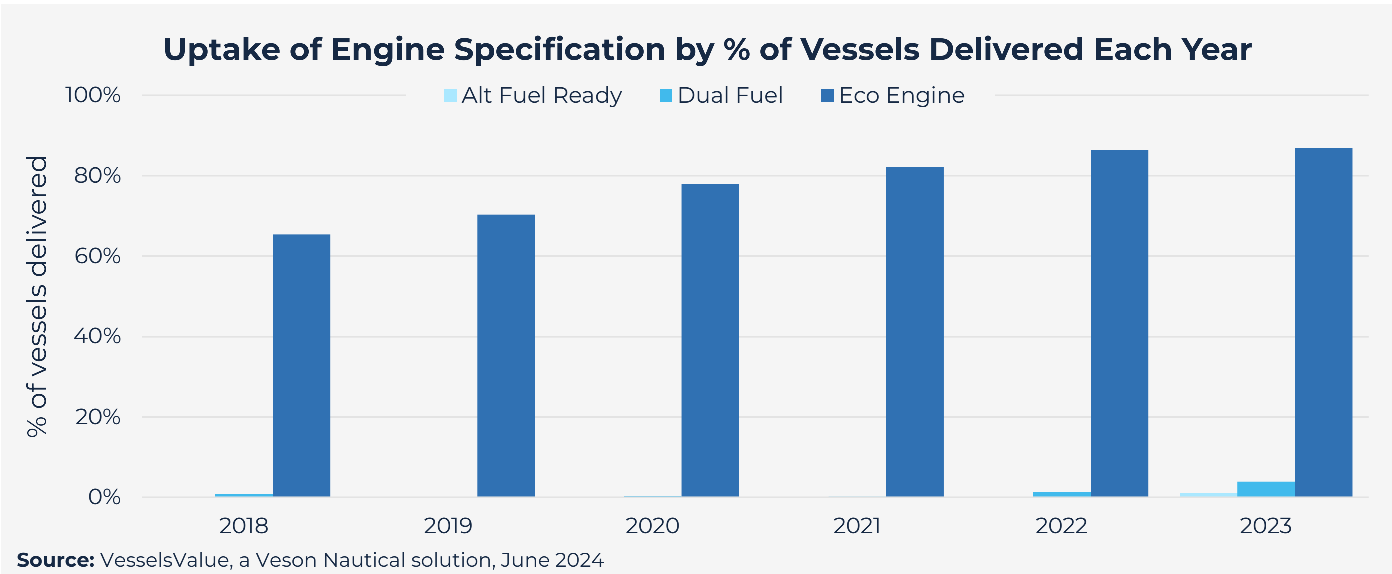


Figure 10. Uptake of Engine Type by % of Bulk Carriers Delivered Each Year

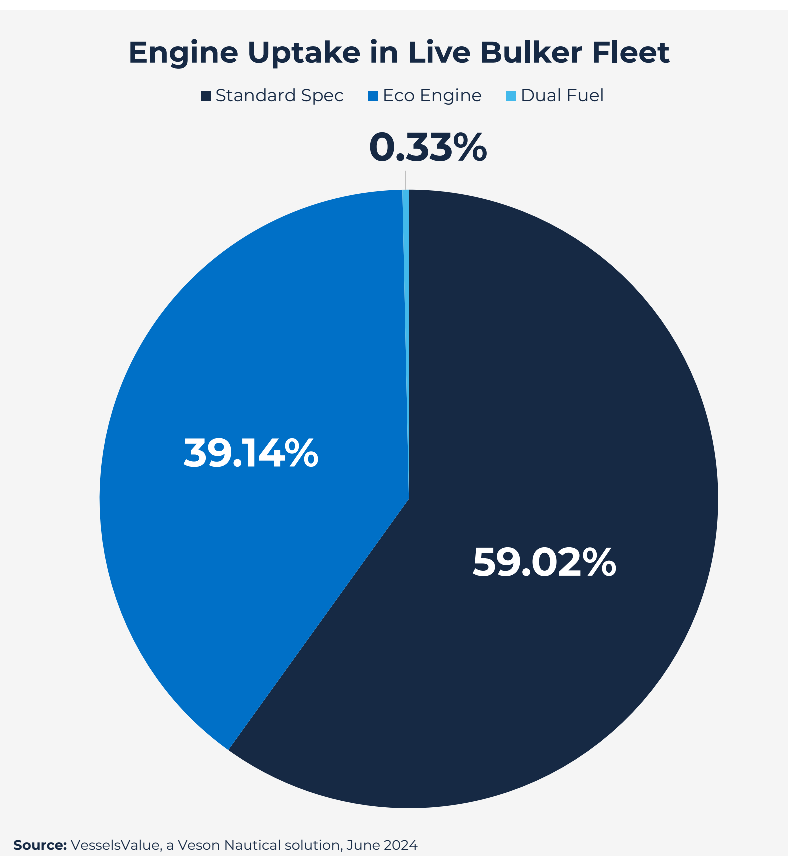


Figure 11. Engine Specification in Live Bulk Carrier Fleet

Veson is currently working on including the effects of Energy Saving Devices and alternative fuels in our CII model. Analysis of our specifications database shows that, currently, 99% of active bulk carrier vessels are operating on single fuel engines. This is a "baseline scenario" for which our verified model provides estimated fuel consumption figures. Therefore, the effect of dual fuel engines on fleet-wide CO_2 emissions is assumed to be minimal at present in the bulk carrier sector.

Veson is committed to continual improvement, making our CII model the leading independent source of estimated fuel consumption and efficiency metrics in the shipping sector.

Veson Nautical delivers maritime freight management solutions that propel the global shipping economy. Trusted by buyers and sellers of bulk marine freight in every region of the world, Veson solutions are responsible for managing **$122 billion** in freight traded and moving **6 billion tons** in annual trade each year.

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Since launching in 2011, VesselsValue has been committed to providing transparent, validated data intelligence to the maritime industry. Now a part of Veson Nautical, VesselsValue is integral to our mission to provide maritime freight management solutions that propel the global shipping economy.

About the Author

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Oliver is a valuation and efficiency analyst at Veson Nautical. He is a qualified Master Mariner (unlimited) and holds an MSc in Shipping and Logistics from Newcastle University, UK.

Before working for Veson Nautical, Oliver was a seafarer, working onboard various passenger and cargo ships as a navigation officer over the course of 9 years.