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ENERGY EFFICIENCY OF SHIPS

Position paper on the use of the CII rating to measure the energy efficiency of ships trading in the Caribbean region

Submitted by Antigua and Barbuda, Jamaica, Saint Kitts and Nevis, Saint Vincent and the Grenadines, and Trinidad and Tobago

SUMMARY

Executive summary:	This document provides information on the executive summary of a study conducted on the use of the Carbon Intensity Indicator (CII) rating to measure the energy efficiency of ships trading in the Caribbean region.
Strategic direction, if applicable:	3
Output:	3.2
Action to be taken:	Paragraph 10
Related documents:	Resolutions MEPC.352(78), MEPC.353(78), MEPC.338(76), MEPC.354(78), MEPC.355(78) and MEPC.377(80)

Background

1 Caribbean Small Island Developing States (SIDS) rely heavily on maritime transport for their imports and exports, rendering this transportation mode paramount to the sustainable development of the region. However, the small size, remoteness and insularity of SIDS pose challenges in transport and trade logistics and hinder their ability to achieve their decarbonization and sustainable development goals (SDGs).

2 Initiatives towards meeting the sector-wide GHG emissions reduction targets outlined in the *2023 IMO Strategy on Reduction of GHG Emissions from Ships* have been implemented. From 1 January 2023, ships are required to measure their energy efficiency and to initiate the collection of data for the reporting of their annual operational CII and CII rating (for ships of 5,000 GT and above).

3 IMO has allowed for adjustment and correction factors to be used by certain ship types, and during some operations and voyages, where ships under certain conditions can have corrections to their CII calculation by removing certain periods of their operation or by reducing the CII value based on specific criteria.

Caribbean region

4 The implementation of this measure has brought operational concerns for the ships operating in the Caribbean region. There are aspects of maritime trade in the region which negatively impact the trading ships' CII rating. For example, ships with trading routes that involve short voyages, such as those operating between the Caribbean islands and serving small ports, and the lack of modern infrastructure result in ships spending a significantly higher percentage of their voyage time in ports.

5 This impact on the CII ratings of these ships could lead to social and economic implications for the Caribbean region. Given the geographical constraints of the Caribbean region, where ships will be required to continually service small islands, research into the impact of short distances and port waiting time on the attained CII was required.

The use of the CII rating to measure the energy efficiency of ships trading in the Caribbean region

6 The Inter-American Development Bank (IDB) commissioned a study conducted by MTCC Caribbean and its host institution, the University of Trinidad and Tobago (UTT), towards a Position paper on the implications of the use of the CII rating to measure the energy efficiency of the ships trading in the Caribbean region.

7 Resolutions MEPC.352(78), MEPC.353(78), MEPC.338(76), MEPC.354(78), MEPC.355(78), provided information and guidance in the development of the study.

8 The executive summary of the study is provided in the annex to this document.

9 Recommendations emerging from the study include:

.1 the review of the current CII framework to consider factors such as short voyage distances and the application of an associated correction factor during the review of the CII regulations and associated guidelines;

.2 support future studies focusing on the varying impacts on different types of ships operating in the region;

.3 support future studies on the energy efficiency assessment and ports' performance indicators for ports of the Caribbean region;

.4 support the implementation of port operational measures to improve the energy efficiency of ships while in port in the Caribbean region; and

.5 support Caribbean ports' infrastructure developments towards more carbon-efficient operations.

Action requested of the Committee

10 The Committee is invited to note the information provided in this document.

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ANNEX

EXECUTIVE SUMMARY OF THE POSITION PAPER ON THE USE OF THE CII RATING TO MEASURE THE ENERGY EFFICIENCY OF SHIPS TRADING IN THE CARIBBEAN REGION

Executive summary

Caribbean small island developing states (SIDS) rely heavily on maritime transport for their imports and exports rendering this transportation mode paramount to the sustainable development of the region. However, the small size, remoteness and insularity of SIDS pose challenges in transport and trade logistics and hinder their ability to achieve their SDGs.[1]

IMO is the UN specialized agency responsible for regulating safety and pollution prevention from maritime shipping. It is actively working towards combating climate change aligned to the UN's SDG 13. In 2018, IMO adopted the Initial Strategy on the reduction of GHG emissions from ships. This Initial Strategy contained short-term GHG reduction targets, and technical and operational measures, requiring ships to improve their energy efficiency in the short term and thereby reduce their GHG emissions. These technical and operational amendments make it mandatory from 1 January 2023 for ships to measure their energy efficiency and to initiate the collection of data for the reporting of their annual operational CII and CII rating (for ships of 5,000 GT and above), as outlined in chapter 4 – regulation 28 – operational carbon intensity of the amendments to MARPOL Annex VI.[2] IMO has allowed for adjustment and correction factors to be used by certain ship types, and during some operations and voyages, where ships under certain conditions can have corrections to their CII calculation by removing certain periods of their operation or by reducing the CII value based on specific criteria.

Carbon intensity links the GHG emissions to the amount of cargo carried over distance travelled (transport work). However, the implementation of this measure has brought operational concerns for the ships operating in the Caribbean region. There are aspects of maritime trade in the Caribbean region which negatively impact the trading ships' CII rating. For example, ships with trading routes that involve short voyages such as those operating between the Caribbean islands and serving small ports that lack modern infrastructure spend a significantly higher percentage of their voyage time doing non-transport work. Such a scenario results in fuel consumption for non-propulsion purposes which equates to emissions without transport work as defined by the CII, and negatively impacts the CII ratings. This impact on the CII ratings of these ships could lead to social and economic implications for the people of the Caribbean region. Given the geographical constraints of the Caribbean region, where ships will be required to continually service small islands, research into the impact of short distances and port waiting time on the attained CII was required.

A study was commissioned by the IDB and conducted by UTT and MTCC Caribbean towards a Position paper on the implications of the use of the CII rating to measure the energy efficiency of the ships trading in the Caribbean region. A shipping company that operates extensively in the region partnered with the centre to supply data and information for eight of their container ships to carry out the study.

1 https://unctad.org/system/files/official-document/cimem7d8_en.pdf

2 Resolution MEPC.328(76) on the A*mendments to the Annex of the protocol of 1997 to amend the MARPOL Convention, as modified by the protocol of 1978 relating thereto (2021 revised MARPOL Annex VI)*.

The methodological approach utilized the Committee's work; the CII guidance publications to compute an energy efficiency performance indicator (EEPI). The EEPI analysed for each voyage, port to port including all the different operational modes of the ships was the supply based CII as detailed in resolution MEPC.352(78) on the *2022 Guidelines on operational carbon intensity indicators and the calculation methods (CII Guidelines, G1)* which uses DWT as the capacity, and is referred to as the annual efficiency ratio (AER). This indicator provides a gauge of the CII rating of the ships as the CII has the same units of this EEPI and is calculated in the same manner but for a full calendar year. The EEPI is calculated using the equation:

$$Voyage\ EEPI = \frac{Total\ Mass\ of\ Voyage\ CO_2\ emissions}{Voyage\ Transport\ Work}$$

$$= \frac{Total\ Mass\ of\ Voyage\ CO_2\ emissions}{DWT.NM}$$

$$CII\ and\ EEPI\ Units \equiv \frac{g\ CO_2}{DWT.NM}$$

The focus was not on the actual energy efficiency of the ships. The higher the EEPI value, the less energy-efficient the ship is labelled to be. In this regard, the relationship between the EEPI and voyage distances for each of ship was analysed. EEPI was determined for each voyage undertaken by the ships in the calendar year 2023. The relationships between the average EEPIs for the specific voyages and other variables: voyage distance and percentage of time no transport work is done were established for three different classes of the container ships of the study. The classes were defined by the sizes of the ships: Sea class (8,300 DWT), Marine class (12,400 DWT) and Ocean class (20,300 DWT). Graphs showing the relationship between EEPI and voyage distance for the three classes of ships are illustrated in figures 1 to 3. **It must be noted that a single point on these graphs do not represent one voyage but the average of the EEPI for all the voyages of that particular distance.**

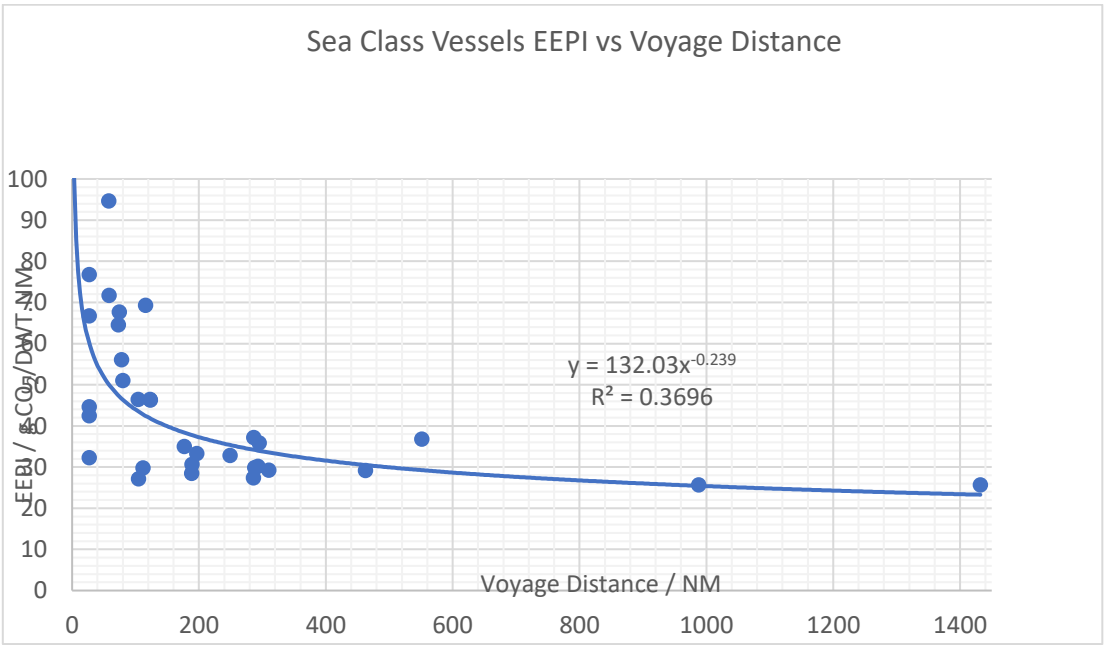

Figure 1: EEPI vs. voyage distance for Sea class ships

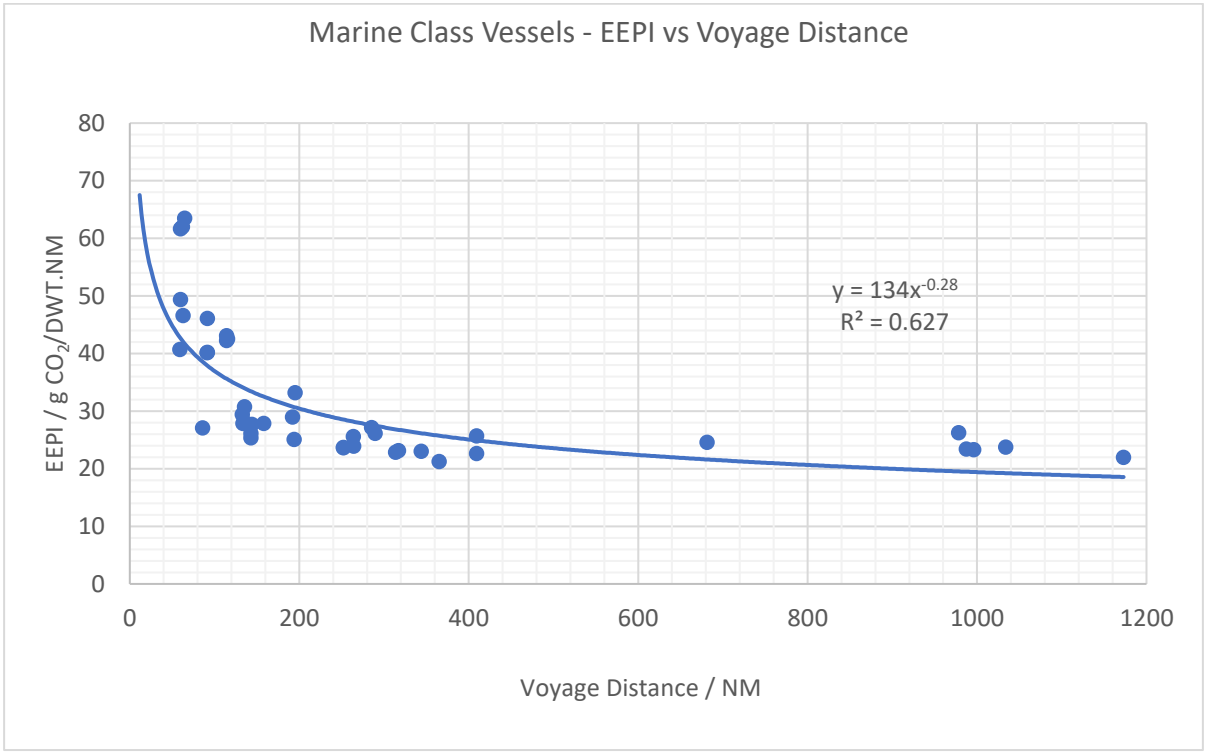

Figure 2: EEPI vs. voyage distance for Marine class ships

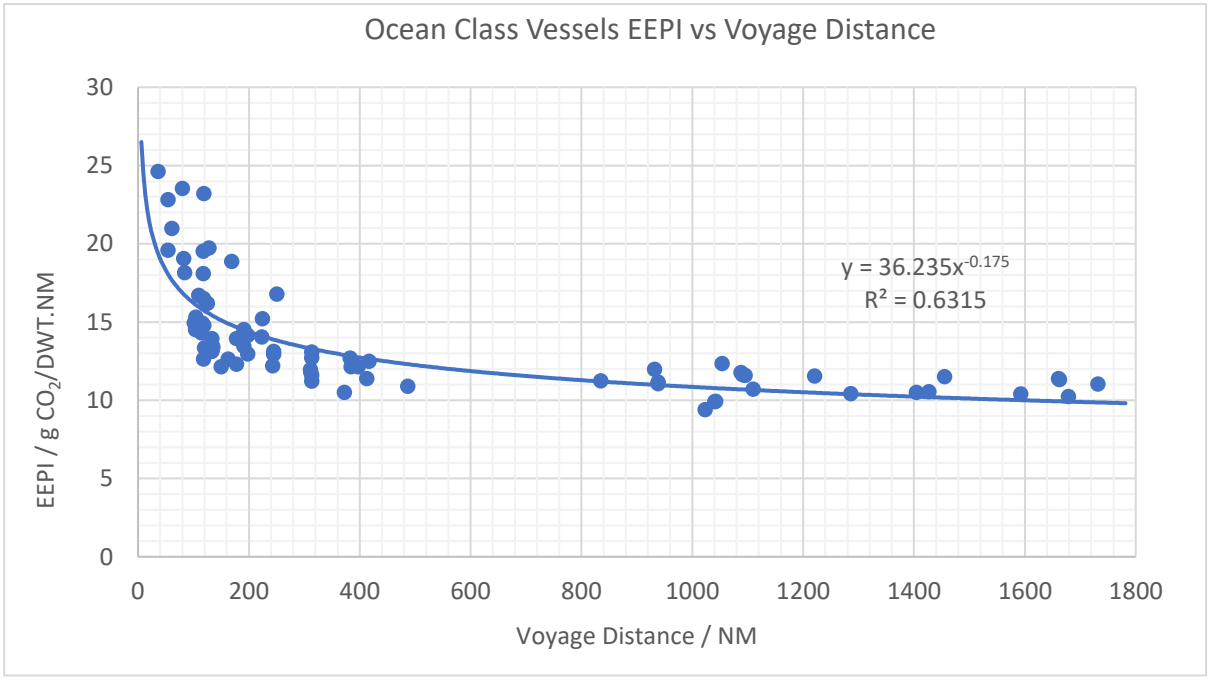

Figure 3: EEPI vs. voyage distance for Ocean class ships

The relationship between EEPI and voyage distance for all the eight containerships of the study is a decaying polynomial function. The results indicate that as the voyage distances decrease, the EEPI values increase. This relationship is independent of all other factors that can influence the EEPI of the ships. The coefficient of determination (R^2) increases as the ship sizes increase signifying that the mathematical argument of the relationship between the variables is stronger for the larger ships of the study. There is a threshold value for the different classes of ships where the ratio of increase of the EEPI value becomes relatively more significant as the voyage distances decrease. This value was defined by the data.

For the two classes with the ships of smaller DWT, the threshold value is 250 NM and for the larger DWT class the value is 350 NM. Only three classes of container ships by ship size were analysed therefore, the study cannot convincingly determine a function to represent the relationship between ship size and this threshold voyage distance. The results convincingly indicate that the Annual EEPI (AER) values, hence the CII ratings of the container ships operating in the Caribbean region will be negatively impacted due to the short sea shipping (SSS) nature of the voyages. This impact will be magnified if the majority of the voyages of the ship are lower than the threshold voyage distance as is the case with seven out of the eight ships analysed in this study. These observations convincingly indicate that the shorter the voyage distances, the higher the EEPI values hence, with all other factors being constant, SSS nature of the Caribbean intraregional shipping routes will negatively impact the CII ratings of the containerships operating in the region.

The current CII framework associates the times in port when the ships continue to use fuel for cargo transfer operations at berth, and hoteling services while at anchorage, as times when "no transport work is being done." The percentage of total voyage time no transport work is done is directly related to the total voyage distance, the shorter the voyage distance, the higher the percentage of voyage time spent in the port. The results of the data analysis indicate that the EEPI value increases as the percentage of voyage time in port increases. Graphs illustrating the relationship between EEPI and the percentage of voyage time "no transport work is done" for the three classes of ships are illustrated in figures 4 to 6.

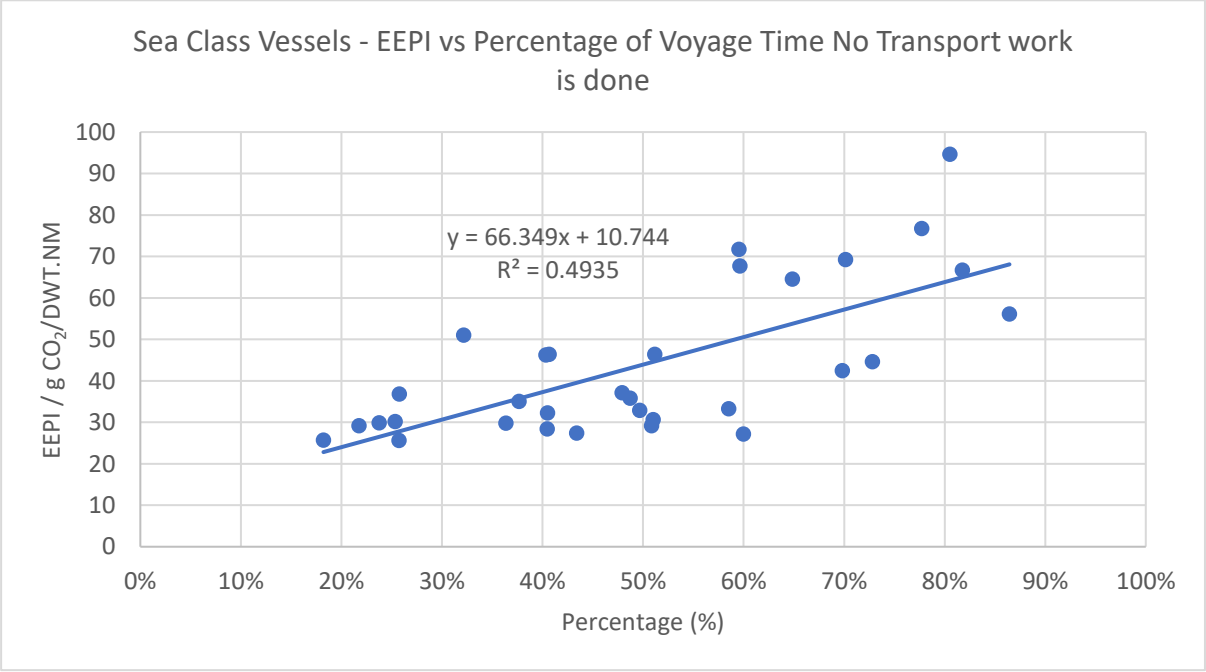

Figure 4: EEPI vs percentage of time "no transport work is done" for the Sea class ships

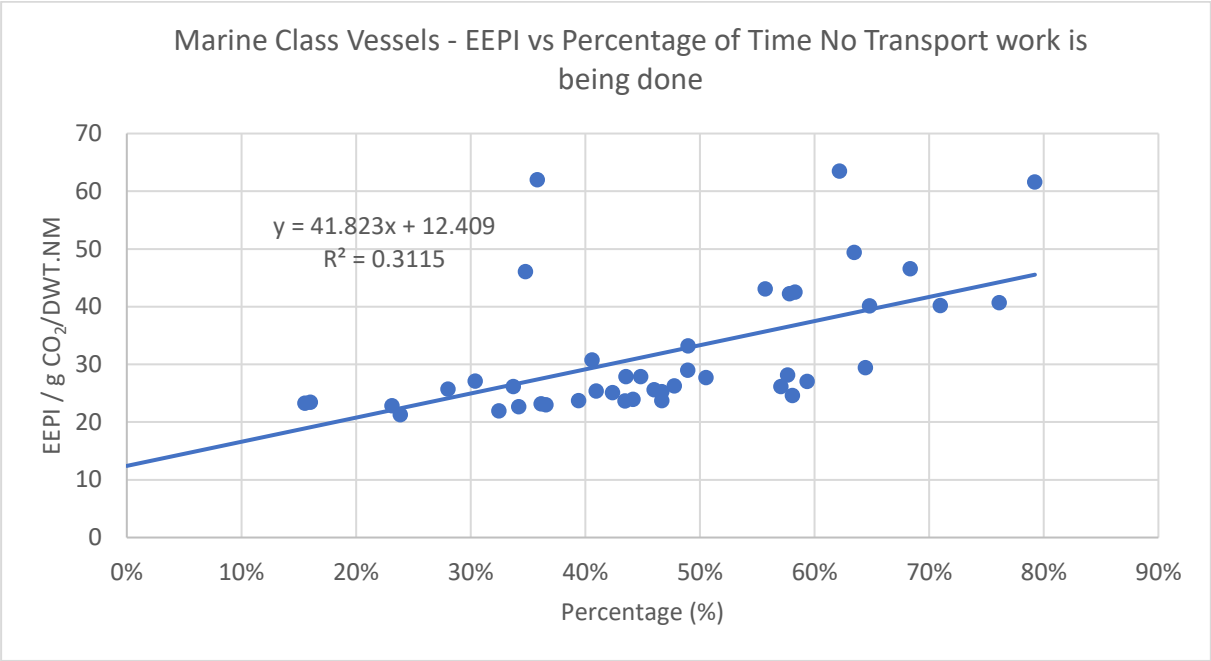

Figure 5: EEPI vs. percentage of time "no transport work is done" for the Marine class ships

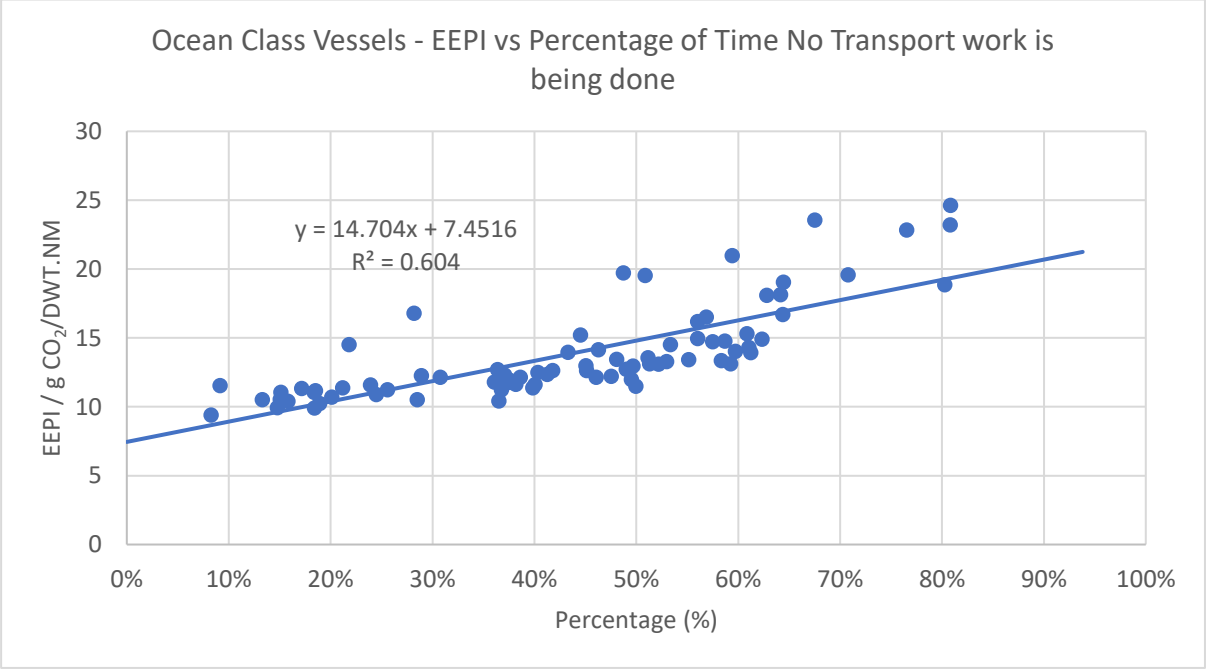

Figure 6: EEPI vs. percentage of time "no transport work is done" for the Ocean class ships

It was noticed that the ratio of increase of the EEPI as the percentage of voyage time when no transport work is done is negative (decreases) as the DWT of the ships increases, indicating that the percentage of time in ports of voyages has a greater impact on the EEPI (CII ratings) of ships with smaller DWT. The effect on the CII of this factor was not as significant as the effect of voyage distance, especially the voyage distances below the threshold values determined by the data.

Inefficiencies of port operations do lead to increases in the operational times in ports. To better understand the possible impact that the port operations may have on the CII rating of the ships of the study, an analysis of the performance indicators of the ports of call was carried out. The data analysis did not convincingly conclude that container operations at the ports analysed in this study are less efficient than those of the top 25 countries by port calls reviewed in UNCTAD's Review of Maritime Transport 2023[3] (pages 92 and 93). The metrics compared included: container moves per hour (CMPH), total turnaround time and total time at anchorage. To reiterate, this study was done for the container ships of one shipping company. The higher percentage of "non-transport work time" in a voyage for the ships is due to the short distances of the voyages as time spent at berth is comparable to the world averages. The Ocean class ships experienced higher average anchorage and manoeuvring times in port than the smaller Sea and Marine class ships.

The CII ratings of the ships were derived from the CII values calculated for the ships in accordance with the five-grade rating mechanism (A to E) of the *2022 guidelines on the operational carbon intensity rating of ships (CII rating guidelines, G4)* (MEPC.3545(78). There were significant improvements in the CII of the ships (reductions of) between 15% to 43.70% when the SSS voyages below the threshold values (250 NM for Sea and Marine class ships and 350 NM Ocean class ships) were excluded from the analysis. Table 1 presents CII values and ratings for the ships for the calendar year 2023 and those for a scenario without the voyages of distances less than the threshold values presented and discussed; 250 NM and 350 NM for the respective class of ships.

Table 1:CII ratings for ships of the study

Anonymized ship name	Anonymized ship class name	2023 required annual operational CII	Actual operational CII (from 2023 data)	CII rating	Actual operational CII (from 2023 data)	CII rating
		Common Unit: $gCO_2/(DWT.NM)$			Voyages greater than threshold value of distance only[5]	
North A	Sea Class	22.86	37.46	E	33.12	E
Bering B		22.86	30.52	E	27.70	E
Coral C	Marine Class	18.77	27.08	E	25.32	E
Dorsal D		18.77	27.31	E	24.80	E
Atlantic E	Ocean Class	14.74	11.65	A	11.02	A
Pacific F		14.74	15.84	D	11.02	A
Indian G		14.74	11.74	A	11.16	A
Arctic H		14.74	11.31	A	10.98	A

[3] UNCTAD (2023). *Review of Maritime Transport 2023*.

[5] 250 nm for Sea and Marine class ships and 350 nm for Ocean class ships

This exercise also highlighted the significant improvement of the CII rating of one of the sister ships of the Ocean class ships from E to A when the shorter voyages were excluded, once again concluding that the SSS nature of the Caribbean intraregional shipping routes will negatively impact the CII ratings of the container ships operating in the region.

The study discusses the major limitations of the Caribbean ports: the size of ships that can be accommodated, the non-existence of green shore power, cruise ships' priority berthing and inadequate cargo handling equipment. It further reflects on the possible implications on the region of inferior CII ratings of the ships as a result of facilitating the much-needed container feeder service within the Caribbean region. The ships stand a risk of becoming "underperforming ships" and the options to meet compliance with the CII regulations are costly and/or may involve limiting operations in the region, undoubtedly leading to economic and social consequences for the region.

Recommendations emerging from the study include: the review of the current CII framework to consider factors such as short voyage distances and the application of an associated correction factor, the implementation of port operational measures to improve energy efficiency of ships while in port, stronger regional cooperation for a more cohesive maritime network, and prioritizing Caribbean ports infrastructure developments. Further studies focusing on the varying impacts of the other different types of ship operating in the region are recommended along with further exploration of ports' performance indicators.

The Committee is set to review the effectiveness of the CII and EEXI requirements by January 2026. This Position paper provides an opportunity to the Caribbean Member States to evaluate the use of the CII as a metric for operational energy efficiency for short voyages in the Caribbean region.