

Gwangyang Port Leads in IMO's Decarbonization Policy



01

IMO's Policy to Climate Change



IMO's Policy to Address Climate Change

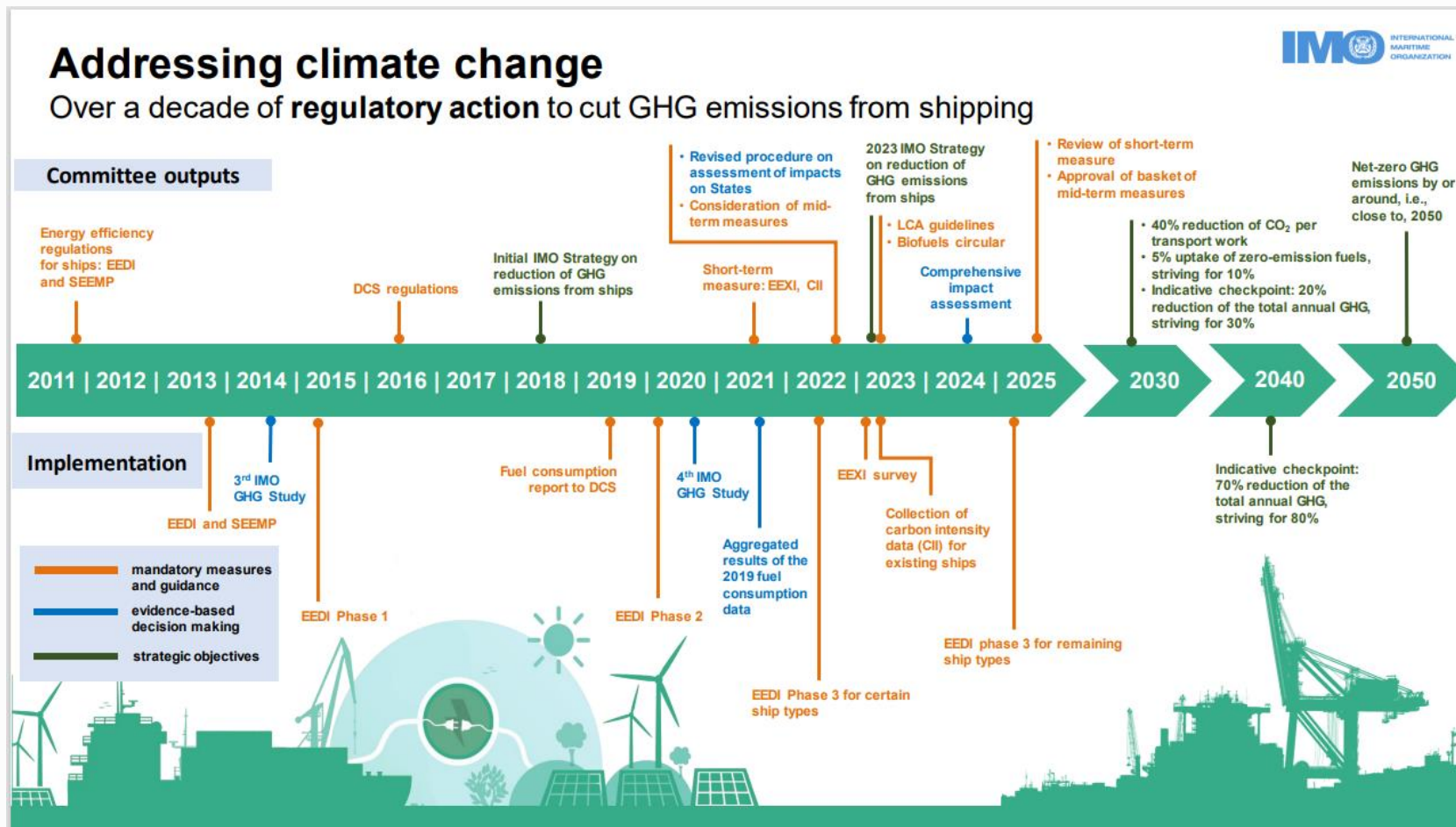
The shipping industry accounted for 2.89% of global carbon emissions, emitting 1,056 million tons of CO₂ in 2018, as highlighted in the IMO's Greenhouse Gas Study (2020). A primary reason for the high CO₂ emissions in the shipping industry is the substantial volume of world seaborne trade.

World seaborne trade increased by 83% over the past 21 years, from 6 billion tons in 2000 to 11 billion tons in 2021. In comparison, the population increase was only 28% during the same period, highlighting the relative surge in world seaborne trade.

This increasing trend in seaborne trade naturally leads to larger CO₂ emissions from the shipping industry. To mitigate the greenhouse gas emissions from the shipping sector, the IMO began amending MARPOL Annex VI in 1997 and has since rolled out various policies.

IMO's Policy to Address Climate Change

Recently, through IMO's 2018 Initial Strategy on Reduction of CO₂ Emissions from ships, there's an objective to decrease carbon intensity across all ships by 40% by 2030, taking 2008 levels as the baseline. Going further, the plan is to reduce total annual GHG by 50% and carbon intensity by 70% by 2050.





EEXI, CII the New Policies Effective In 2023

As part of this policy, the IMO (2022) states that international shipping must calculate two ratings: their attained Energy Efficiency Existing Ship Index (EEEI) to determine energy efficiency, and their annual operational Carbon Intensity Indicator (CII) with its corresponding CII rating.

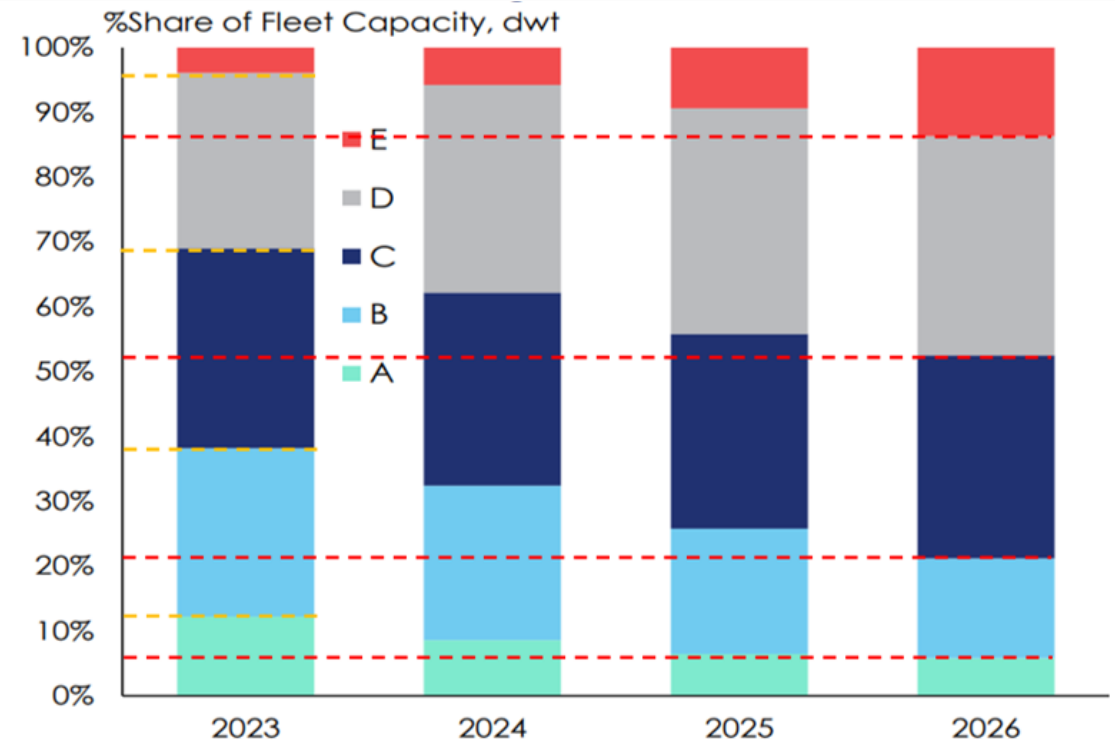
The EEXI and CII took effect on 1st January 2023, with the first annual reporting scheduled for completion in 2023 and initial ratings will be released in 2024.

Challenges to Shipping Companies

However, the pathway to a greener shipping industry is challenging. According to Clarksons Research (2023), globally, 71% of ships are projected to meet the EEXI requirement unconditionally.

As of 2023, approximately 70% of ships are expected to achieve a CII Rating of grade C or above, but this is anticipated to drop to about 50% by 2026. Even when focusing on the top 10 global container shipping companies, the outlook is concerning. By 2023, only 74.4% of their ships are predicted to achieve a grade C or higher, and this drops to 53.5% by 2026 (Clarksons SIN 2023).

< Fleet Capacity Split by Theoretical CII Ratings in 2023-2026 >



(Source: Clarksons Research 2023)

02

Decarbonization of Ships Calling at Gwangyang Port

Investigating 2,946 Ships Calling at Gwangyang

The research conducted a decarbonization analysis on 3,326 container ships that called at Gwangyang Port in 2022, to see whether the decarbonization degree of these ships is lacking compared to comparison groups. And after analyzing all 3,326 container ships that called at Gwangyang Port in 2022, a total of 2,946 ships for which data could be confirmed via Clarksons Shipping Intelligence were ultimately used in the analysis.

The screenshot displays the Shipping Intelligence Network interface. At the top, it shows global trade statistics: World Seaborne Trade: 12.3 bt (2.3%/Yr), ClarkSea Index: 20,018\$/day, Newbuild Price Index: 171.3, CO2 Emissions: 857.7 Million Tonnes, and Container Port Congestion Index: 31.7%. The user is logged in as Sangyong Lee.

The main content area is titled "Fleet > Androusa (Ex:ALS Jupiter) 4,250 TEU Fully Cellular Container Built 2010 (In Service)". It provides a comprehensive overview of the vessel's specifications and operational details.

Field	Value	Field	Value
CVN:	16059230	Flag:	Liberia
IMO:	9431769	Call Sign:	D5Z33
Built:	2010	MMSI:	636020610
Builder:	Jiangsu New YZJ	Class:	DNV
Design:	MARIC 4250 TEU	P & I:	The Swedish Club P&I
Primary Reference Company:	Costamare Shipping	Power Type:	Diesel 2-Stroke
Fuel Type:	VLS IFO	Last Port Call:	Lorne (Togo)
AIS Destination (ETA):	Port Klang (Malaysia) (22-Jul-2023)		

Standard Details: IMO Number 9431769, Owners are Costamare Shipping, Built at Jiangsu New YZJ delivered in May 2010, Liberia Flagged, DNV Classed, P&I insurance with The Swedish Club P&I, Length Overall of 261.00 m, Length Between Perpendiculars of 247.09 m, Draught of 12.60 m, Beam Mid of 32.20 m, Gross Tonnage of 40,541, Design MARIC 4250 TEU by MARIC, MAN B. & W. Engine, Speed of 21.70 kts at 105.00 tonnes per day, Intermediate Fuel Oil - Very Low Sulphur (VLS IFO), Horsepower of 49,674, Power Type: Diesel 2-Stroke, BWTS (Fitted).

Company Details: Owner: Costamare Shipping Co SA, 60 Zephyrou & Syngrou Avenue, Athens, Greece, 175 64, Telephone Number: +30 (0) 210 949 0000, Fax Number: +30 (0) 210 940 9051, E-mail Address: info@costamare.com, URL: http://www.costamare.com. Technical Manager: V. Ships (Greece) Ltd, 3 Agiou Dionysiou Street, Piraeus, Greece, 185 45, Telephone Number: +30 (0) 21 0410 2210, Fax Number: +30 210 429 4240, E-mail Address: hellas@vships.com, URL: http://www.vships.com. Operator: Orient Overseas Container Line Ltd (OOCL), 31st Floor, Harbour Centre, 25 Harbour Road, Hong Kong, Telephone Number: +852 2833 3888, Fax Number: +852 2531 8234, E-mail Address: webmaster@ooclgroup.com, URL: http://www.oocl.com. P&I insurance with: The Swedish Club, Gullbergs Strandgata 6, Gothenburg, Sweden, SE-411 04, Telephone Number: +46 31 638 400, Fax Number: +46 31 156 711, E-mail Address: swedish.club@swedishclub.com, URL: http://www.swedishclub.com. Registered Owner: Novara Shipping Co, Liberia.

Vessel Type Description: Narrow beam containerhips between 3,000 and 5,300 TEU are able to transit the Panamax ("old") locks at the Panama Canal, with a typical beam of 32.2m. Ships in this size range are deployed very broadly, across a range of non-mainline and some mainline routes.

Environmental Summary

(Image: Clarksons Shipping Intelligence Network (2023))

Decarbonization of Ships Calling at Gwangyang

Through Clarksons Research, data on Expected CII Rating of 2023, CO2 Emission, Ship's Built Year, DWT, Operation Speed(Knot) for a total of 2,946 container ships that called at Gwangyang Port in 2022 was collected. Below is the data for a sample of 10 ships out of the 2,946.

< Detail Data of Ships Calling at Gwangyang Port >

No	Ship's Name	Expected CII Rating(2023)	CO2 (ton)	EEXI	Built Year	DWT	Speed (Knot)	Port Calls	Distance (NM)
1	ANDROUSA	C(35-39%)	44,201	12.32	2010	50,300	13.70	109	63,285
2	CELSIUS NAIROBI	C(45-49%)	43,679	11.73	2003	50,500	14.20	62	60,119
3	CMA CGM JAMAICA	C(45-49%)	43,679	11.59	2006	53,627	15.10	60	82,484
4	HONGKONG BRIDGE	C(45-49%)	43,679	11.71	2001	50,953	14.30	97	59,788
5	KMTC XIAMEN	A(95-99%)	23,619	10.80	2020	33,000	14.90	116	88,651
6	PANCON VICTORY	A(90-94%)	14,333	16.73	2016	12,631	13.80	157	59,333
7	SHECAN	D(10-14%)	22,812	27.47	2008	12,562	14.30	194	62,371
8	WAN HAI 286	A(90-94%)	18,552	13.04	2021	23,789	16.20	155	75,701
9	ASIATIC NEPTUNE	D(15-19%)	22,031	26.20	2007	12,477	12.30	66	63,064
10	KMTC INCHEON	A(85-89%)	19,710	14.04	2019	22,387	14.70	130	87,271

Characteristics of Ships Calling at Gwangyang Port

Looking at the averages of the container ships that called at Gwangyang Port in 2022, the size of the ships is about 2,664 TEU with a DWT of 33,108 tons. Most of them were built in 2010, and there's a 48% likelihood that they were built in a Korean shipyard. As for the CII Rating, it is grade C, and based on Clarksons' 100% conversion method, it stands at 56.83%.

< Average data of Ships Calling at Gwangyang Port >

The CO2 emissions amount to 28,797 tons per year. The EEXI stands at 17.36 gCO2/dwt-mile. There's a 95.6% probability that they meet EEXI compliance. The average annual operating speed is 14.07 knots, and they call at a total of 134 ports per year covering a total travel distance of 71,093NM.

Variables	N	Minimum	Maximum	Average	Std. Deviation
TEU	2,946	653	23,656	2,664.28	3,090.10
DWT	2,946	7,932	228,406	33,108.20	34,451.98
Built Year	2,946	1992	2022	2010.43	7.17
CII Rating	2,946	E	A	C	-
CII 100%	2,946	2.50	97.00	56.83	30.96
CO2 Emission (ton) yearly	2,946	14,078	112,806	28,797.84	18,359.23
EEXI (gCO2/dwt-mile)	2,946	4.06	32.16	17.36	6.48
Speed (Knot) in 2022	2,946	9.90	17.40	14.07	1.04
Port calls in 2022	2,946	26	359	134.46	58.61
Voyage (NM) in 2022	2,946	23,279	110,403	71,093.17	15,127.00
Valid N (listwise)	2,946				

Size Distribution of Container Ships Calling at Gwangyang

Looking first at the size of ships calling at Gwangyang Port, feeder lines of 2,000 TEU and below dominate, with 2,094 vessels, accounting for a staggering 71.1% of total arrivals. When including Feedermax ships of up to 3,000 TEU, which add 264 more ships, the figure reaches a massive 80.1% of all ships. This implies that many of the ships calling at Gwangyang Port primarily operate within Asia, including countries like South Korea, China, and Japan.

However, at the same time, Gwangyang Port, equipped with a deep draught and 24-row container cranes, is capable of accommodating ships of up to 23,656 TEU.

< Size Distribution of Container Ships Calling at Gwangyang Port >

Total	Feeder	Feedermax	Panamax	Post-Panamax	New Panamax	Ultra-large
	~2,000 TEU	2,000~3,000 TEU	3,000~5,000 TEU	5,000~10,000 TEU	10,000~14,500TEU	14,500 TEU ~
2,946 ships	2,094	264	242	187	112	47
Ratio	71.1%	9.0%	8.2%	6.3%	3.8%	1.6%

Built Year of Ships Calling at Gwangyang

Looking at the built years of ships calling at Gwangyang Port, 48.8% were built after 2011 and are within 12 years of service life. The average year of the built is 2010, making them 13 years old this year. The percentage of ships built before 2000 and over 23 years of service life is as low as 12.6%, which indicates that the age of the majority of ships is relatively young.

< Distribution by Year of Built for Ships Calling at Gwangyang Port >

Total	~2000	2001~2005	2006~2010	2011~2015	2016~2022
2,946	370	324	813	555	884
Ratio	12.6%	11.0%	27.6%	18.8%	30.0%

Shipbuilding Country of Ships Calling at Gwangyang

When observing the shipbuilding countries of ships calling at Gwangyang Port, 1,421 ships, or 48.2%, were built in South Korean shipyards, followed by China and Japan, respectively.

< Distribution by Shipbuilding Country for Ships Calling at Gwangyang Port >

Total	S.Korea	China	Japan	ETC
2,946	1,421	706	624	195
Ratio	48.2%	24.0%	21.2%	6.6%

CO2 Emissions from Ships Calling at Gwangyang

When categorizing the ships calling at Gwangyang Port based on their CO2 emissions, ships that emit less than 30,000 tons annually account for 2,302 vessels or 78.1% of the total. This is because the average size of the ships is small at 2,664 TEUs, leading to relatively less CO2 emissions.

< Distribution by CO2 Emissions from Ships Calling at Gwangyang Port >

Total	14,078 ~ 30,000 ton	30,001 ~ 70,000 ton	70,001 ~ 112,806 ton
2,946	2,302	529	115
Ratio	78.1%	18.0%	3.9%

EEXI of Ships Calling at Gwangyang

The EEXI of ships calling at Gwangyang Port is mainly between 10 ~ 20 gCO₂/dwt-mile, accounting for 1,761 vessels or 59.7%. Vessels exceeding 20 gCO₂/dwt-mile also account for 27.6%, due to the relatively larger EEXI of smaller vessels.

< Distribution by EEXI from Ships Calling at Gwangyang Port >

Total	4.06~10.00	10.01~15.00	15.01~20.00	20.01~25.00	25.01~32.16
2,946	373	930	831	217	595
Ratio	12.7%	31.5%	28.2%	7.4%	20.2%

Operation Speed of Ships Calling at Gwangyang

The average operating speed of ships calling at Gwangyang Port is 14.07 knots, with a standard deviation of only 1.04 knots, indicating a similar average operating speed among the ships. The probability that ships operate between 13.5~14.5 knots is 37.4%, and the probability increases to 93.3% when the range is expanded to 12~16 knots.

< Distribution by Operating Speed for Ships Calling at Gwangyang Port >

Total	9.0~12.0	12.01~13.50	13.51~14.5	14.51~16.0	16.01~17.4
2,946	146	702	1,102	947	49
Ratio	5.0%	23.8%	37.4%	32.1%	1.7%

Number of Port Calling for Ships Calling at Gwangyang

The average number of times a ship calls at ports annually is 134 times, which is approximately once every 2.7 days. And the probability that a ship will call at ports 81~200 times a year is 69.8%.

< Distribution by the Number of Port Calling for Ships Calling at Gwangyang Port >

Total	~80	81~120	121~160	161~200	201~359
2,946	576	686	742	627	315
Ratio	19.5%	23.3%	25.2%	21.3%	10.7%

Travel Distance of Ships Calling at Gwangyang

Finally, the average annual operating travel distance of ships calling at Gwangyang Port is 71,093NM. And the probability that a ship operates between 60,000~90,000NM annually is 63.1%.

< Distribution by Yearly Travel Distance for Ships Calling at Gwangyang Port >

Total	~60,000NM	60,001~70,000 NM	70,001~80,000 NM	80,001~90,000 NM	90,001~110,403 NM
2,946	732	700	561	599	354
Ratio	24.9%	23.8%	19.0%	20.3%	12.0%

Expected 2023 CII Ratings of Ships Calling at Gwangu

Comparison Analysis of Decarbonization Level of Ships Calling at Gwangyang Port

Upon individually analyzing the CII Rating of ships calling at Gwangyang Port, the expected CII Rating in 2023 is most commonly A rating, with 1,129 ships (or 38.3%) receiving this grade, followed by C rated ships accounting for 27.8%. Overall, A~C grades account for 79.1% of all ships, with D~E grades only making up 20.9%. Overall, these are very positive results.

< Distribution of Expected 2023 CII Ratings for Ships Calling at Gwangyang Port >

Total	A	B	C	D	E
2,946	1,129	381	819	585	32
Ratio	38.3%	12.9%	27.8%	19.9%	1.1%
	79.1%			20.9%	

Expected 2026 CII Ratings of Ships Calling at Gwangu

Looking at the expected CII Rating for these vessels in 2026, A grade still dominates, covering 35.8% (or 1,055 vessels). However, D grade vessels come in a close second, accounting for 33.5%. Overall, grades A~C make up 64.1%, with D~E grades increasing to 35.9%.

< Distribution of Expected 2026 CII Rating for Ships Calling at Gwangyang Port >

Total	A	B	C	D	E
2,946	1,055	237	596	988	70
Ratio	35.8%	8.1%	20.2%	33.5%	2.4%
	64.1%			35.9%	

03

**Comparison between Gwangyang
and World TOP 10 shipping
companies**



CII Rating of World Top 10 Shipping Companies

To objectively assess the degree of decarbonization of the ships calling at Gwangyang Port, a comparative analysis was carried out with a comparison group. The strictest comparison group was created by investigating the CII Rating of the fleets of the world's top 10 container shipping companies. The relevant data was collected from the Clarksons Shipping Network (2023).

One point to note is that this data is not solely about the container fleet but the entire fleet's CII Rating of these companies. That is, it includes all types of ships, such as Bulk, Chemical Carrier, etc. Nevertheless, it's not an inferior data as the CII Rating of Maersk's fleet, which consists only of container ships, is almost similar to the average CII Rating of the top 10 shipping companies. In other words, whether it's the CII Rating of Maersk Fleet, which consists only of container ships, or the Fleet's CII Rating of other top 10 shipping companies, the trend is similar.

CII Rating of World Top 10 Shipping Companies

Upon examining the CII Rating of the Fleet of the top 10 container shipping companies from MSC to Yang Ming, the expected rating in 2023 is 74.4% for grades A~C and 25.6% for grades D~E, while in 2026, grades A~C make up 53.5% and D~E grades increase to 46.5%.

< Expected CII Rating of Fleet of World Top 10 Shipping Companies >

Rank	Company	2023		2026	
		A-C	D-E	A-C	D-E
1	MSC	68.9%	31.1%	50.0%	50.0%
2	Maersk	77.1%	22.9%	53.6%	46.4%
3	CMA-CGM	71.3%	28.7%	61.6%	38.4%
4	COSCO	46.9%	53.1%	27.7%	72.3%
5	Hapag-Lloyd	59.8%	40.2%	44.3%	55.7%
6	ONE	76.2%	23.8%	49.3%	50.7%
7	Evergreen	93.8%	6.3%	60.9%	39.1%
8	ZIM	85.7%	14.3%	71.4%	28.6%
9	HMM	75.4%	24.6%	47.5%	52.5%
10	Yang Ming	88.5%	11.5%	68.9%	31.1%
Average of World Top 10 Company		74.4%	25.6%	53.5%	46.5%

CII Rating of Gwangyang Port and Top 10 Companies

A direct comparison was made between the CII Ratings of ships calling at Gwangyang Port and the fleets of major shipping companies. It was found that the CII Ratings of ships calling at Gwangyang Port are higher than the average of the top 10 shipping companies.

Furthermore, they are also higher than the ratings of the MSC and Maersk fleets, which are ranked 1st and 2nd in the world. It's also notable that these ratings exceed the Fleet CII Rating of HMM, which is the largest national shipping company in Korea.

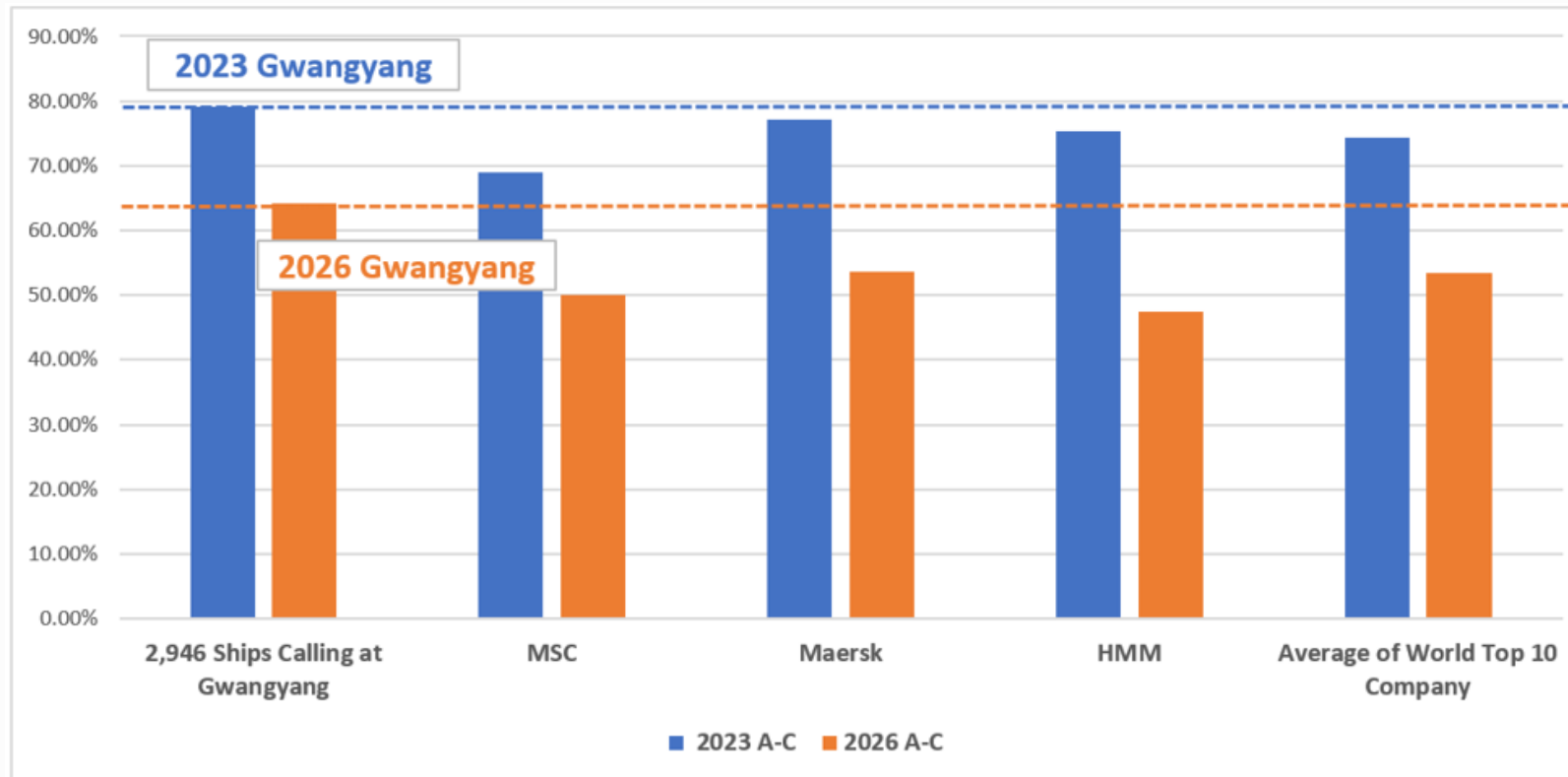
< CII Ratings of Ships Calling at Gwangyang Port and Fleets of the World's Major Shipping Companies >

Rank	Company	2023		2026	
		A-C	D-E	A-C	D-E
2,946 Ships Calling at Gwangyang		79.1%	20.9%	64.1%	35.9%
1	MSC	68.9%	31.1%	50.0%	50.0%
2	Maersk	77.1%	22.9%	53.6%	46.4%
9	HMM	75.4%	24.6%	47.5%	52.5%
Average of World Top 10 Company		74.4%	25.6%	53.5%	46.5%

CII Rating of Gwangyang Port and Top 10 Companies

Again, the CII Ratings of ships calling at Gwangyang Port are higher than the average of the top 10 shipping companies.

< Comparative Analysis of CII Ratings of Ships Calling at Gwangyang Port >



EEXI Compliance of Ships Calling at Gwangyang

In addition to the CII Rating, the overall compliance rate with the EEXI regulations, another key indicator for measuring a ship's decarbonization, is as high as 95.8% for ships calling at Gwangyang Port. Among these, 78.1% meet the requirements unconditionally, while 17.7% comply but require major or minor adjustments.

According to Clarksons Research(2023), globally 71% of the existing ships met the EEXI requirements at their current operating speeds. This means that the EEXI compliance of container ships calling at gwagyang Port is 7.1% higher.

< Distribution by EEXI Compliance for Ships Calling at Gwangyang Port >

Total	Compliant	Major Adjustment	Minor Adjustment	Likely Non-Compliant
2,946	2,301	218	304	123
Ratio	78.1%	7.4%	10.3%	4.2%

04

Role of Port Authority to Climate Change

AMP System at Gwangyang Port

One of the various efforts to decarbonize Gwangyang Port includes a technical approach where electricity is supplied from land while ships are loading and unloading cargo. This is known as Alternative Marine Power (AMP).

By using AMP, ships can stop the engine and receives electricity from the port when docking at the berth.

This can avoid sulfur dioxide and carbon dioxide emissions as they do not use fossil fuels while in port.



Automated Port Working 24/7

Another technical method involves expanding port facilities to enable swift docking for ships at the terminal without congestion and enhancing terminal handling equipment to reduce CO2 emissions by shortening the time required for loading/unloading and other operations.

The most advanced form of enhancing terminal handling equipment or facilities can be regarded as the Automated Container Terminal.

Gwangyang Port plans to develop Automated Container Terminal.





Vessel Speed Reduction(VSR) Program

The Yeosu Gwangyang Port Authority announced the operation results of the 2023 Vessel Speed Reduction (VSR) program, implemented to reduce fine dust and GHGs emissions from ships.

The VSR program is an environmentally friendly initiative that has been operated for four years since its official launch in 2020. It aims to improve port's air quality by offering reductions in port facility usage fees to vessels that operate below a certain speed.

In 2023, the participation rate for the VSR program at Yeosu and Gwangyang ports was 80.38%, with a compliance rate of 82.29%. The program saw an increase of 312 vessels compared to the previous year, with a total of 3,396 vessels participating.

Sinokor was selected as the outstanding participating shipping company for the fourth consecutive year, consistently ranking first in terms of the number of participating vessels and contribution.

Starting this year, the outstanding participating agent award was given to Panstar which achieved the highest participation and compliance rates among local agents.

The top three shipping companies in terms of the number of participating vessels were Sinokor with 615 vessels, KMTC with 462 vessels, and Hyundai Glovis with 305 vessels.



Self-sufficiency Rate in Renewable Energy

Yeosu-Gwangyang Port Authority (YGPA), Achieves 65% Self-sufficiency Rate in Renewable Energy in 2023

Yeosu-Gwangyang Port Authority (YGPA) announced on the 20th that it had achieved a 65% self-sufficiency rate in renewable energy in 2023, an 8% increase from the previous year.

The authority established an ESG plan for decarbonization, aiming to achieve 100% self-sufficiency in renewable energy by 2030 for eco-friendly port development in 2021. To this end, it implemented solar power generation projects (with a total capacity of 1.7 megawatts) by 2023.

Furthermore, the authority stated that it is making efforts to improve its energy self-sufficiency rate by expanding renewable energy facilities through mutual agreements with companies in the Gwangyang Port hinterland.

CEO Park Sung-hyun stated, "By gradually expanding renewable energy generation projects until 2030, we aim to achieve a 100% self-sufficiency rate in energy, contributing to the reduction of greenhouse gases and fine dust in Yeosu-Gwangyang Port."

THE END