OCEAN PASS

Emissions Intelligence

The Dynamic Performance Index: Turning Regulatory Metrics into Emissions Intelligence

How shipping's existing metrics - CII and EEDI - can reveal far more when viewed through a single, connected framework.

A White Paper from OceanPass

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The art of navigation is the art of knowing where you are and where you are going — not just where you’ve been.

-Maritime Proverb

Content

Executive Summary

Shipping has made major progress in measuring its carbon footprint. The IMO's Carbon Intensity Indicator (CII) and Energy Efficiency Design Index (EEDI) have given the industry a shared language for efficiency - one focused on how ships are built and how they perform in operation.

Few would argue these frameworks have failed in their purpose. They have provided structure, comparability, and accountability where little existed before. But as carbon takes on direct commercial value, the industry now needs more than static scores. Owners, charterers, and banks need to understand not just what a vessel scored, but why.

OceanPass' proposed Dynamic Performance Index (DPI) is not intended as a regulatory replacement metric or methodology, nor is it tied to any commercial offering. It is a new lens - one that uses data already reported through existing IMO frameworks to create a more meaningful, decision-ready view of vessel performance.

By pairing a vessel's operational reality (CII) with its design potential and adding visibility into the key drivers behind both - speed profile, idle days, utilization, and fuel mix - DPI reveals the context hidden within today's separate scores.

The result is a clearer, more accurate picture of vessel performance - one that helps stakeholders interpret the same data through a unified, transparent frame-work. DPI does not replace current standards; it helps the industry simplify and see more in what it already measures.

Like a credit score that translates multiple inputs into one understandable signal, DPI transforms compliance data into insight. It bridges the gap between reporting and decision-making - between scores and signals.

01

Understanding Today’s Metrics

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Over the past decade, the IMO has given shipping a common language for carbon performance through two cornerstone frameworks: the Carbon Intensity Indicator (CII) and Energy Efficiency Design Index (EEDI). Together they define how efficiency is measured - from operation to design - and have provided the foundation for how owners, banks, and charterers assess environmental performance.

The CII measures efficiency in operation. It quantifies a vessel's carbon emissions relative to the transport work it performs - The EEDI, by contrast, measures a vessel's design efficiency at the point of delivery. It represents the theoretical relationship between the ship's carbon emissions and transport capacity. Once assigned, this value remains fixed throughout the vessel's life. The EEXI, introduced later, extends this logic to existing ships using similar design-based parameters. Under today's regulations, upgrades, minor retrofits, and wear over time do not alter either of these scores.

While this structure has proven valuable, both measures share a common characteristic: they are snapshots. CII reflects its realized efficiency over the past year. EEDI and EEXI capture a ship's potential efficiency at delivery. Neither provides insight into the factors that drive those results. It's a bit like judging a company's health from its annual profit alone - without seeing the cash flow, balance sheet, or the forces behind the numbers. The headline tells you how things ended, but not what drove the result or what to expect next.

Idle days, speed management, utilization, and fuel mix all influence CII scores. A vessel that spends long periods waiting at anchor may appear less efficient than one that sails constantly, even if their engines and hulls are identical. Conversely, a vessel operating on low-carbon fuels may achieve the same CII grade as one using conventional fuels because the metric currently does not consider the emissions generated by upstream processing of fuels burned aboard ships (CO_2e).

Over years of use, the industry has learned what these frameworks reveal - and what they keep beneath the surface. CII and EEDI/EEXI are valuable for benchmarking progress, but they do not show why a vessel performs as it does or how that performance relates to its design potential. For decision-makers who must interpret and act on this data, the absence of operational context can make two vessels with the same scores appear equivalent when - in reality - their commercial and environmental profiles differ significantly.

Data only gains meaning when we understand the link between how a vessel is designed and how it actually operates. DPI is built on that insight. To illustrate, it helps to briefly revisit how CII and EEDI are defined and measured.

How CII Works

CII measures a vessel's carbon emissions per unit of transport work performed over a year. The underlying calculation is known as the **Annual Efficiency Ratio (AER)**, expressed in grams of CO_2 emitted per tonne-mile. CII then converts that numeric result into a simplified annual rating from **A** (best) to **E** (worst), based on how the vessel's AER compares to the **IMO reference line** for similar ship types and sizes.

A vessel performing significantly better than its reference line receives an A or B rating, while one performing worse falls into the D or E range.

FORMULA (SIMPLIFIED)

$$CII = \frac{\textbf{Total CO Emissions (grams)}}{\textbf{Cargo Capacity (DWT)} \quad \textbf{Distance Sailed (nautical miles)}}$$

Inputs

DATA POINT	SOURCE	WHAT IT CAPTURES
Fuel consumption (tonnes)	Noon reports	How much fuel the vessel burned
Fuel type	Noon reports	Determines CO_2 emission factor
Distance sailed	AIS / noon reports	Reflects activity level
Cargo capacity (DWT)	Design data	Fixed, not actual cargo carried

Why Context Matters

CII is reported annually, using design deadweight capacity (DWT) rather than the actual cargo carried.

A vessel that spends long periods idle or operating below capacity may appear inefficient - even if those decisions made commercial sense. In practice, two vessels with identical CII grades can represent very different realities: one may have operated efficiently between charters, the other may have been underused for much of the year. Conversely, a ship running continuously at high utilization may score well, even if its total emissions are far higher. CII captures the result, but not the reasons behind it.

How the EEDI and EEXI Measure Design Efficiency

What They Measure

EEDI measures a vessel's theoretical carbon efficiency at the time of its design. It represents the amount of CO_2 a ship is expected to emit per unit of transport work under standardized conditions, based on its installed engine power, fuel type, and design speed. Each vessel's EEDI is compared against an IMO reference line for ships of similar type and size to determine how far above or below the regulatory baseline it falls.

Unlike CII, which is recalculated each year from operational data, EEDI is fixed at delivery and remains unchanged throughout the vessel's lifetime.

METRIC	APPLIES TO	WHEN CALCULATED	CHANGES OVER TIME	PRIMARY INPUTS	PURPOSE
EEDI	Newbuilds	At vessel delivery	✘ Fixed	Design power, capacity, speed	Benchmark newbuild design efficiency
EEXI	Existing ships	Once pr. vessel	✘ Fixed	Existing design data, verified by class	Aligns existing ships with design standards

Why It Matters

EEDI and EEXI provide a universal baseline for design efficiency, allowing comparisons across ship types and ages.
However, because they are calculated only once and never updated, they don't capture how a vessel's performance evolves over time.

Hull degradation, equipment upgrades, or minor retrofits that improve efficiency are not reflected in the score - meaning a vessel delivered a decade ago carries the same EEDI value today, regardless of investment or wear.

CII and EEDI/EEXI have given the industry a vital foundation for comparing efficiency. What they do not show is how these dimensions relate to one another - or how operational choices affect a vessel's standing across both.

This is where the Dynamic Performance Index (DPI) begins to add value.

02

Why This Matters Now

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Carbon now carries a direct financial cost.

Under the EU ETS and FuelEU Maritime, every tonne of fuel consumed translates into monetary exposure. Misreport fuel use, and you misprice that exposure.

At the same time, the IMO continues to refine the Carbon Intensity Indicator (CII) framework and is preparing to expand from tank-to-wake (CO_2) to well-to-wake (CO_2 equivalents) accounting, capturing the full upstream impact of processing alternative fuels.

As this evolution unfolds, the accuracy and consistency of emissions data will determine not only compliance but also competitiveness. Reliable, verifiable data has become the currency of credibility.

Banks are already experiencing this shift. Under the Poseidon Principles, they have committed to disclose the climate alignment of their loan portfolios. While voluntary, that transparency carries reputational weight. If reported performance diverges from reality, investor confidence and capital access can erode quickly.

Charterers face the same dependency from a different angle. They aim to move cargo at the lowest possible emissions footprint, but the tools they are given - annual CII grades or static EEDI scores - mask the variables that truly drive performance: speed, idle time, utilization, and fuel mix. Without operational context, charterers must make pricing and routing decisions with incomplete information.

Owners face a similar challenge. Investments in retrofits, clean-technology upgrades, or alternative fuels often go unrecognized within current frameworks. Even when operational efficiency improves, a vessel's CII score may not reflect the change for more than a year. EEDI, for its part, remains fixed at the ship's launch design and never evolves. The result is an incentive system that blurs the line between improvement and inaction.

Together, these pressures are transforming emissions data from a reporting obligation into a strategic asset. The question is no longer whether a vessel is compliant, but whether its data accurately represents real performance - and whether stakeholders can interpret that information in ways that lead to faster, smarter, and more confident decisions.

03

The Dynamic Performance Index – A New Lens, Not a New Metric

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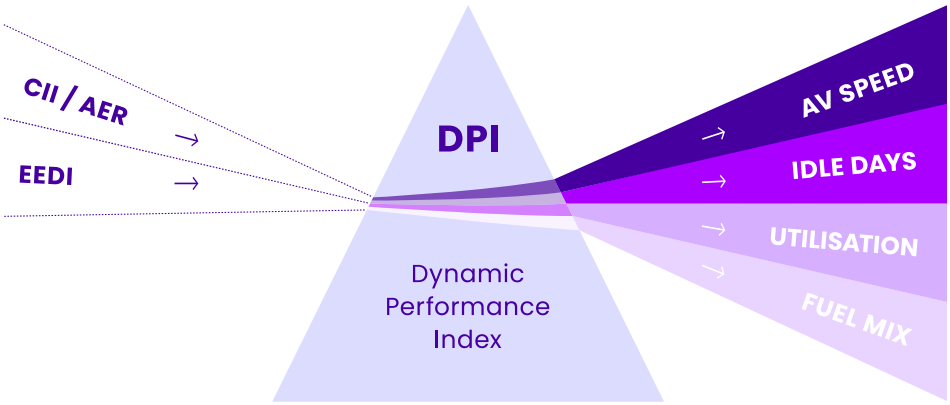
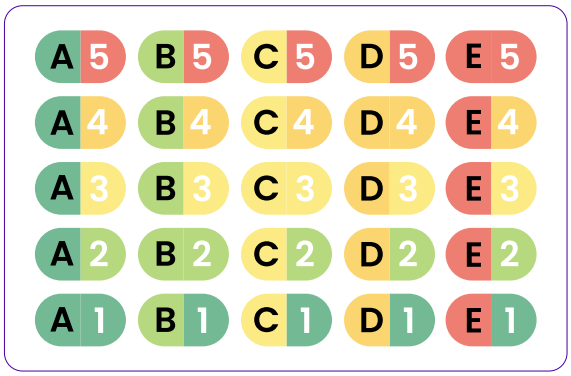


The answer lies in viewing what we already measure through a new lens - the Dynamic Performance Index (DPI).

DPI merges the Carbon Intensity Indicator (CII) and the Energy Efficiency Design Index (EEDI), to show not only how compliant a vessel is, but how well it actually performs. The outcome is a living vessel profile that brings technical and operational performance into one clear, decision-ready view.



Seeing Both Dimensions at Once

Today's A–E scoring for CII is simple and widely understood. By contrast, EEDI and its counterpart for existing ships, EEXI, are far more technical. They measure how efficiently a ship was built to perform, expressed as a percentage reduction from an IMO reference line that represents the baseline efficiency for a given vessel type and size.

For example, a newbuild tanker might have an EEDI of 4.67 against a reference line of 6.22, meaning it is 25 percent more efficient than the baseline. While this data is meaningful for engineers, it is less intuitive for commercial stakeholders.

To make design efficiency readable at a glance, DPI follows a similar approach to translating AER into CII and converts EEDI and EEXI results into a simple 1–5 design score:

Design Score	EEDI/EEXI vs. IMO Reference Line
1	≥ 35% better
2	30–35% better
3	25–30% better
4	20–25% better
5	< 20% or worse

The purpose is not to replace technical data, but to make it visible - so that design efficiency becomes part of every operational and commercial conversation.

Viewed alongside the operational score (CII), the combination of letter + number tells a richer story:

A2: Strong operations and relatively high design efficiency. The vessel performs well in service and has strong design fundamentals. It should command a premium over market rates.

C1: Average operations and excellent design fundamentals. Likely under-utilized or inconsistently deployed. A charterer could unlock value through steadier employment.

D4: or below: Both design and operations are lagging. This may indicate a vessel nearing the end of its economic life - or one that requires significant intervention to remain competitive.

Stakeholder Impact Summary: Owners gain recognition for investments; Charterers can differentiate efficient tonnage; Banks can link financing to measurable improvement.

Two Phases of Implementation

Establishing this living vessel profile delivers immediate value, while setting the stage for future enhancement. Implementing any change across a global, multi-stakeholder industry requires pragmatism. DPI therefore introduces its evolution in two phases - balancing speed-to-value with a roadmap for deeper insight.

Phase I delivers transparency using the data already collected and methodologies already in place under existing IMO rules. This facilitates adoption without disruption.
Operational Score (A–E): Calculated exactly as CII is today, updated continuously from validated onboard data. No new rules, just higher-frequency reporting for near-real-time visibility.

Design Score (1–5): Derived from EEDI/EEXI and translated through the scale above to make design efficiency commercially legible.

Transparency Layer: Key operational drivers - idle days, speed profile, utilisation, and fuel mix - reveal the why behind each score, transforming static results into decision-ready intelligence.

Phase II builds on that foundation. It represents a natural progression - evolving established IMO methodologies while unlocking greater commercial and operational value.

Operational Score: Enhanced through integration of cargo-carried data (EEOI methodology) to show true efficiency per tonne-mile.

Design Score: Recalibrated at each five-year special survey, capturing deterioration, maintenance, and retrofit improvements (Energy Saving Devices).

This recalibration allows the market to recognise progress, not just compliance. Owners who invest in efficiency upgrades can finally prove measurable gains in both emissions and asset value. Charterers gain confidence that upgraded tonnage performs as promised. And banks obtain verifiable evidence that targeted financing drives genuine decarbonisation impact.

In this way, DPI transforms continuous improvement into visible, tradable performance - bridging the gap between operational results and commercial reward.

04

DPI in Practice

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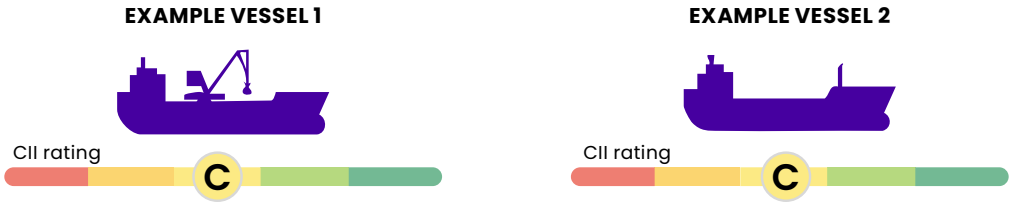
How DPI Turns Blunt Scores into Actionable Signals. Same CII Grade. Different Reality.
To see how this comes together in practice, consider the two example ships below. Both are 82,000 DWT Kamsarmax bulk carriers - same vessel type, similar age, comparable trading patterns. On paper today, they look nearly identical. Both have a CII rating of "C" for 2024, indicating an acceptable level of emissions performance.



But this is a shortcoming of considering CII alone: it compresses an entire year of operational nuance into a single letter. It doesn't show what's behind the number, or where the opportunity lies. Look beneath these two C ratings and it's clear these two vessels are anything but the same.

Exposing Emissions Subfactors

Key Emissions Drivers	
EX. VESSEL 1 	Avg. Speed: 12.2 kts Idle Days: 160 DWT Utilization: 65% Fuel Mix: VLSFO Only

Emissions Drivers reveal generally poor operations driven by a high number of idle days and 1 knot more in average speed.

Key Emissions Drivers	
EX. VESSEL 2 	Avg. Speed: 11.2 kts Idle Days: 40 DWT Utilization: 92% Fuel Mix: 30% biofuel blend

Emissions Drivers reveal that extremely high utilization and use of biofuels obscures comparatively week design fundamentals, as indicated by slower average speed

Design Potential and Operational Reality: How DPI ties it all together

Dynamic Performance Index	
EX. VESSEL 1  C 2	**Key Emissions Drivers** Avg. Speed: 12.2 kts Idle Days: 160 DWT Utilization: 65% Fuel Mix: VLSFO Only C = Actual CII rating per IMO framework. No change 2 = 1–5 EEDI score gives quick view of design strength

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EX. VESSEL 2  C 4	**Key Emissions Drivers** Avg. Speed: 11.2 kts Idle Days: 40 DWT Utilization: 92% Fuel Mix: 30% biofuel blend C = Actual CII rating per IMO framework. No change 4 = 1–5 EEDI score gives quick view of design strength

DPI doesn't replace existing metrics – it clarifies them. By linking drivers to CII grades, it makes efficiency transparent and actionable, translating EEDI into a simple 1–5 score. Compared to CII, EEOI is more accurate and commercially relevant, reflecting real fuel use, cargo, and distance – a path OceanPass supports for future IMO discussions.

Understanding the Stories Behind the Scores

The contrast between these two vessels shows why context matters. Both carry the same CII grade, yet the paths they took to reach it - and what those paths imply for owners, charterers, and banks - are entirely different. Vessel 1, with strong design fundamentals but uneven utilization, holds untapped potential.

Vessel 2, by contrast, achieves compliance only through slower steaming and higher-cost fuels. Each story reveals how operational choices and design efficiency interact, shaping not just emissions outcomes but commercial performance. The Dynamic Performance Index makes these relationships visible, turning what was once a flat annual score into a continuous signal of opportunity and risk.

For Owners

DPI exposes unrealized value. Example Vessel 1's average operational performance (C) despite strong design fundamentals (2) highlights an opportunity to improve its standing with modest adjustments in utilization and fuel management.
With 160 idle days and a higher carbon output driven by conventional fuel, it is not overambitious to lower its CII while increasing average service speed. The result would be both operational savings and stronger commercial appeal. DPI turns this potential into a measurable improvement path - one that can be tracked, verified, and ultimately monetized through higher charter premiums or efficiency-linked financing.

For Charterers

DPI provides transparency where static scores obscure trade-offs. Example Vessel 2 achieves the same "C" grade, but only by operating slowly and using a 30% biofuel blend. While this reduces emissions intensity, it does so at a significant cost. For many operators, the fuel premium would outweigh any rate advantage. Unless supported by a "green freight" contract or specific ESG commitment, this vessel may deliver compliance at the expense of competitiveness. DPI makes such trade-offs visible, allowing charterers to choose vessels that align with both their emissions goals and commercial realities.

For Banks

DPI adds a new dimension to portfolio visibility. By showing the interplay between design and operational performance, it distinguishes vessels that can improve through operational discipline from those that require structural intervention. This clarity enables more precise allocation of green loans and retrofit financing.

A low design score but strong operational grade may signal candidates for targeted investment, while a vessel with both low design and operational scores may represent higher transition risk. For lenders committed to decarbonization alignment, DPI provides the intelligence needed to link capital directly to measurable, verifiable improvement.

05

From Regulatory Compliance to Emissions Intelligence

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The IMO's frameworks—CII, EEDI, and EEXI—brought standardization, comparability, and accountability to vessel emissions reporting. That purpose has largely been fulfilled. What remains is context.

As emissions data becomes a determinant of commercial value, financing, and operational strategy, the question is no longer what to measure, but how to interpret what we already do.

Progress rarely comes from counting new things. It comes from seeing old things differently. In finance, static accounting ratios evolved into predictive credit scores. In aviation, compliance logs became the basis for predictive maintenance.

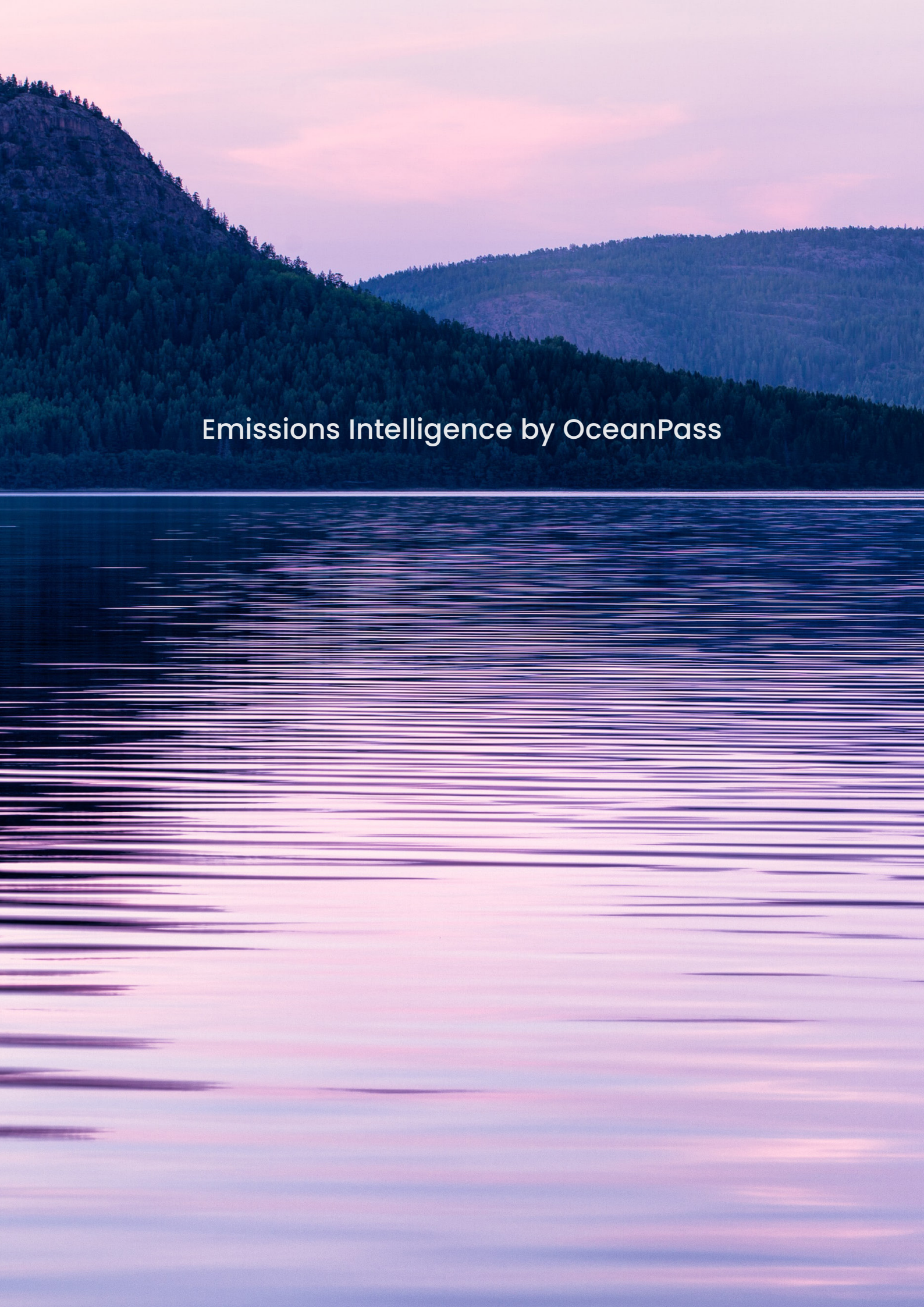
DPI marks the same kind of shift for shipping

It translates regulatory data into operational insight—revealing the relationship between design potential and real-world performance, and the factors that shape both. Through this lens, owners, charterers, and banks can evaluate efficiency, risk, and opportunity across fleets and portfolios with unprecedented clarity.

Whether or not DPI becomes a formal industry standard, the capability exists today. OceanPass has already built the infrastructure to make it accessible — linking verified onboard data with AIS intelligence to benchmark performance across the global fleet.

DPI provides the framework; OceanPass delivers the visibility. Together, they turn emissions data from a record of compliance into a foundation for strategy, investment, and collaboration.

The real question is no longer which ships are efficient, but how global tonnage can be deployed most efficiently to move the world's goods. Those who act first on better signals will not just comply faster. They will shape the benchmarks others follow and lead the market in a decarbonizing world.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