INSIGHT BRIEF

Short-Term Action Opportunities

Global Maritime Forum Short-Term Actions Taskforce

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The maritime industry must peak its greenhouse gas (GHG) emissions as soon as possible and fully decarbonise by 2050. Short-term actions that improve the operational efficiency of existing vessels can play a critical role in reducing emissions today, while also making the long-term transition to more expensive zero-emission fuels more manageable. Research suggests that optimising operational efficiency has the potential to reduce annual emissions by more than 200m tonnes of CO2 and reduce annual fuel costs by $50 billion at today's prices. Unlocking this potential is not simple, yet capitalising fully on operational efficiency will be a prerequisite to achieving 2030 and 2050 emissions reduction targets in line with the 1.5 C ambition in line with the Paris Agreement. Reconciling the operational efficiency opportunity will not be simple, but it is possible.

This paper is the first in a series that explores the underutilised opportunity presented by operational efficiencies to reduce shipping emissions in the short term and pave the way for zero emission fuels and other long-term solutions. Subsequent papers will dive deeper into the identified solutions and enablers: data and digitalisation, scaling up pilots, legal and contractual changes, and policy and regulation.

1. What can we do today to reduce greenhouse gas emissions from shipping?

The shipping industry is facing a major transformation. The industry must work collectively to completely overhaul its fuel mix and fleet to achieve zero emissions by 2050. Zero-emission technologies and fuels are not commercially available at scale today and it is clear that their adoption will increase costs. Cutting down on fuel costs by improving the operational efficiency of a ship will be a prerequisite for the adoption of zero-emission fuels and setting the foundation for green corridors. Improving the operational efficiency of the ship itself will need to go hand in hand with a more efficient supply chain which will require much broader cross-value-chain collaboration.

This Insight Brief provides an overview of the short-term opportunities and barriers to operational efficiencies and takes a systems view to explore the role of operational efficiency measures as an enabler for long-term shipping decarbonisation. While the savings potential can be upwards of 20%, there are many barriers that challenge the delivery of these savings. Through a series of conversations with industry stakeholders over the past 18 months, many ambitions have been identified, which can be placed into four buckets:

- Identify existing good practices in behaviours, technologies and contracts that can be scaled up and replicated now;
- Align incentives within companies to make efficiency a priority and track emissions alongside profit;
- Engage with the full supply chain to promote transparency and build trust between charterers and shipowners;
- Shift thinking from a bilateral zero-sum game to new business models and multilateral solutions in which all parties can gain through benefit sharing.

If we look at how these ambitions can be achieved, we find four major enablers: data & transparency, pilot voyages and demonstrations, changes in legal contracts and clauses, and enabling policies and regulations. The table below summarises the opportunities provided if we cross reference the ambitions to link them with these enablers.

Table 1: Linkages between operational efficiency ambitions and specific enabling actions.

Enablers: / Ambitions:	Data	Pilots	Legal	Policy
Scaling best practice				
Internal incentives				
Value chain alignment				
New business models				

The linkages are colour-coded: green = high, yellow = medium, and blue = low linkages.

2. The speed optimisation opportunity

The manner in which vessels are operated is inextricably linked to their emissions. Speed optimisation[1] is one of the most effective short-term operational measures to cut down on shipping's GHG emissions. While owners and operators are considering zero emissions fuels and technology choices this decade, they can reduce emissions now by maximising operational efficiencies through speed optimisation, advances in data and sensing, as well as through changes in contracts including performance warranties and Just-in-Time (JiT) or virtual arrival (VA) clauses.

Historically, ships sailing by wind and steam operated in an environment dominated by uncertainty. Once a vessel left port, much was left to chance, and a vessel's progress could not be known until it arrived at its destination. Historical uncertainties around wind, weather and arrival times led to lots of waiting in port. As a result, maritime

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1 *The nomenclature with regards to speed optimisation can be confusing. Here we use the term "speed optimisation" to cover the whole range of options of speed optimisation measures across all market segments.*

contracts have developed sophisticated mechanisms that allocate the financial cost of waiting times to shipowners or charterers. With satellite tracking and route optimisation software, uncertainty in the arrival times of a vessel is largely avoidable, yet the mismatch between vessel arrival and berth availability still causes many problems, including longer waiting times, higher costs, and most importantly GHG emissions that could have been avoided.

The failure to optimise speed is often driven by pressure from customers and contractual chartering arrangements, where a cost for one party becomes a profit opportunity for the other. Voyage charters incentivise shipowners to steam fast then wait (SFTW), earning demurrage[2] to compensate the shipowner for the consequences of the delay, without regard for the conditions at the port or for other ships sailing to the same destination. Consequently, the environmental cost of demurrage across the shipping industry is driven by contractual artifacts that incentivise owners to burn fuel to speed faster and thereby maximise laytime. Under time charter parties, the charterers are responsible for providing and paying for the fuel, leading to a disincentive for the owners to optimise the operation.

Capitalising fully on operational and technical efficiency will be a prerequisite to achieving 2030 and 2050 emissions reduction targets in line with the Paris Agreement. Research suggests that eradicating SFTW and introducing JiT practices would result in annual emissions savings in the order of 20-25%[3], or over 200m tonnes of CO2[4]. This equates to 64 million tonnes of potential fuel savings worth $50 billion at today's prices – a significant incentive for optimisation.

The theoretical savings are impressive. However, a year of dialogue and workshops in a taskforce set up by the Global Maritime Forum has shown that it is much more difficult to quantify the amount of emission savings that can be achieved in practice through operational improvements. A 20% opportunity is in fact composed of 20 x 1% efficiency opportunities, each with frictions and vested interests in keeping the status quo. Nevertheless, it remains clear that there is a tremendous opportunity, and while many opportunities have been identified, the taskforce suggests that more research needs to be done to quantify the potential on a sectoral basis based on hindcast data, pilots, and the replicability and scalability of isolated examples.

3. Barriers and opportunities

There are no new technologies or complex regulatory leaps required to optimise shipping operations. However, to capture the significant potential offered by operational efficiencies and achieve the fuel economies that come with it, the maritime industry will need to overcome the inertia of hundreds of years of tradition and century-old contracts. Taskforce members identified four main areas that currently constitute barriers but that become critical enablers of improvement: **data, monitoring, and software; limited pilot voyages; legal or contractual limitations; and policies and regulation.**

a. Data, monitoring, and software

Barriers: Awareness of the carbon intensity of vessels at all times will be a prerequisite to optimising the vessel performance and can even be a lever to a more efficient supply chain as well. The basis for a robust company decarbonisation strategy will be leadership by top management supported by a strong tool that allows the benchmarking of ship performance through a robust data tracking from one year to the next. As the sector needs to move to rapid decarbonisation, disappointment will emerge as the industry comes to see that it doesn't have the right data it needs for different use cases. The data that does exist has room for improvement in quantity and quality. In the path to decarbonisation, owners and operators will quickly realise that they are missing the key information they need to report on emissions, or that they are not getting enough of the right data to fully optimise their vessel.

One consequence of inaccurate or insufficient data is that it perpetuates a lack of trust between charter parties. As mentioned earlier, today's performance clauses have built in split incentives for owners and charterers, leading to

2 *"Demurrage" refers to the time that a shipowner has lost because the charterer could not complete required cargo operations within an agreed time frame. If the charterer fails to load or discharge as per the load/discharge rates allowed in the contract, the shipowner will hold them liable for demurrage.*

3 *Jia, H., Adland, R., Prakash, V., & Smith, T. (2017). Energy efficiency with the application of Virtual Arrival policy. Transportation Research Part D: Transport and Environment, 54, 50–60.*

4 *Zografakis, H. (2021). The third pillar: A contractual architecture for maritime decarbonisation. Gard.*

vessels running inefficient speeds. Time charterers frequently bring claims against owners for underperformance, which often go hand in hand with claims for “overconsumption”, which means that the vessel is using more fuel per day than specified in the charter-party.

Although the use of real-time sensors and data flow meters is becoming more common, there is, perhaps surprisingly, no standard way of gathering data from vessels. Vessel noon reports filed daily by the chief engineer are one of the best sources of information. The way in which shipping companies currently gather data from ships via noon reports, however, lacks the standardisation and sophistication levels that are required to match the modern data needs of the industry to optimise voyage, vessel, and bunker operations, as well as minimise its carbon emissions. This creates the risk of information gaps and creates a requirement for significant manual intervention to cleanse the data input. It is time for noon reports to transform in line with how the rest of the industry’s data landscape is maturing.

Opportunities: Greater trust is necessary for coordination and benefit sharing across stakeholders and charter parties. This will be enabled in part by better vessel data being shared and reported across the industry. High-quality data can provide a link to voyage and vessel optimisations, but must go beyond what is provided by noon reports today. Continuous monitoring systems with advanced sensors are another part of the solution, though uptake is currently low and most companies do not have the resources in place to manage and analyse the increased amount of data.

Modern software and modeling can also help speed, route, weather and bunkering optimisation. To demonstrate the benefit of such optimisation, service providers are doing backtesting on thousands of voyages of anonymised data against historic benchmarks. To ensure good outputs from such digital services and platforms, data input must be high-quality, standardised, interoperable, and more transparent. A first step towards improving the accuracy of vessel performance would be to improve data collection and reliability. For example, standardising definitions of terms for noon reports and increasing use of continuous monitoring equipment, including sensors. Cross-industry collaboration will be necessary to develop standardised data protocols, some of which are under development and are explored in a separate paper.

Today’s performance clauses have built in split incentives for owners and charterers, leading to vessels running at sub-optimal speeds and thereby working against decarbonisation. In time-charter parties it is not unusual for the slow steaming/eco speed and consumption warranty to be given “without guarantee”, whereas the general speed and consumption will usually be given on an “about” basis. More accurate vessel performance and weather data can also enable increased tolerances in speed warranties in the charter parties (CP) between owners and charterers.

b. Scaling up pilot voyages

Barriers: The weighting of financial metrics and differing incentives across company departments create internal frictions to operational efficiency, limiting the availability of real-world evidence that could be provided by pilot voyages. Energy efficiency literature indicates complex decision-making processes for ship operations[5], but has not adequately explored the importance of agency for energy efficiency. For example, there is often a lack of engagement from chartering desks whose aim is to maximise a ship’s time charter equivalent (TCE)[6], influencing priorities both onshore and at sea. Meanwhile, legal counsels have stated that “anything can be done as long as the contracts are not changed”, while external legal experts have indicated that nothing can be changed without changing the contracts.

Opportunities: Usually, the role of pilots is to demonstrate the viability of a measure. In this case, we know speed optimisation leads to significant gains, so the role of pilots is to create mechanisms with which a measure’s uptake can be scaled. Several members of the Short-Term Actions taskforce have started conducting pilots to build the learnings around speed optimisation, the frictions stopping it, and its enabling environment. Learnings from the

5 *Poulsen, R. T., Viktorelius, M., Varvne, H., Rasmussen, H. B., & von Knorring, H. (2022). Energy efficiency in ship operations—Exploring voyage decisions and decision-makers. Transportation Research Part D: Transport and Environment, 102, 103120.*

6 *TCE is defined as the gross freight income minus voyage costs (fuel, port, and canal charges) divided by the round-trip voyage duration in days.*

pilot so far have underscored that it has been slower / more difficult than expected for companies to get the pilots up and running. Learnings from pilots, including the real-world challenges, are being captured as case studies in a subsequent paper. These lessons are critical to taking operational efficiencies from isolated occurrences to common practice across the industry.

Within companies, it is already clear that there is an opportunity to align incentives and key performance indicators (KPIs) while increasing connectivity and alignment across business units. The capital expenditure needed to optimise the speed will be relatively low, especially when compared to the opportunities that can be gained. While incentives to remove some of these internal frictions have been historically insufficient, higher fuel costs, a price on carbon, and new environmental regulations are providing additional impetus. Once companies acknowledge the opportunity offered by operational efficiency measures, they can start to shift their contracts and their operations accordingly. This includes engagement in pilots to learn firsthand about the various frictions and obstacles that must be removed to capture the speed optimisation and energy efficiency opportunity.

c. Legal changes

Barriers: Many of the frictions outlined above come from factors across the value chain and beyond. The maritime supply chain is operating within a web of contracts, which is a major challenge for the broader uptake of efficiency measures on a larger scale. Head contracts for the sale of goods have an influence on charter party contracts, and the terms set by the terminals cascade into the contracts further down the supply chain. It has become clear through conversations with stakeholders that amending contracts, or fundamentally shifting contractual architectures, will be necessary to substantially reduce emissions.

However, it was also noted that there are existing contractual clauses that could be used more. Several of the large charterers involved in this work have tracked at most dozens of instances in a given year in which vessels were able to slow down, compared to hundreds of voyages. Also, because existing contractual clauses are bilateral, any change requires that the whole supply chain be included, not only charter parties. How to increase uptake of virtual arrival clauses is more challenging. There are several barriers to this, the most important being that the profit-maximisation and the contractual architecture that is strongly linked to this does not allow for a broader uptake. More transparency across the value chain would help the process and uptake of virtual arrival.

Opportunities: Using best practice in contracts and addressing split incentives: Clauses that try to alleviate split incentives have been tested between cargo owners and ship-owners with success, but very little uptake. When executed, these have led to significant savings, but in general only work if the charterer is also the owner of the terminal. However, even with benefit sharing, such bilateral clauses do not fully solve the issue and will require unprecedented engagement across the whole supply chain beyond charter parties. Multilateral contracts are part of the solution, and ultimately there is a need for new business models and a new contractual architecture to support them.

The emergence of Green Corridors may provide the testing grounds for such new contracts, as the legal frameworks for such corridors will need to be built from the ground up. Efficiency measures must be built into the contractual architecture for Green Corridors, as wasting 20% of the (initially) much more expensive zero emission fuels will not be in the interest of any party involved. Such changes to the contractual architectures, however, are not short term actions, but rather fundamental changes to the industry that will require long-term commitment and action. Nevertheless, any insights gained from improvements in operational efficiency in the short term will be useful learnings for the broader long-term changes towards decarbonisation.

d. Policies and regulations

Barriers: The IMO 2030 target to improve the carbon intensity of international shipping by at least 40% by 2030 compared to 2008 can be met with available technologies through a mix of short- and mid-term measures. Operational measures such as speed optimisation and energy efficient designs will be critical to meeting these targets, but the measures imposed by the IMO do not take into account the complexity of interests along the value chain. The simple description of what the company plans to do that is currently mandated through the IMO SEEMP (Ship Energy Efficiency Management PLan) is not sufficient.

The IMO has made several attempts to benchmark individual ship performance for over a decade now. So far, the EEOI (Energy Efficiency Operational Indicator)[7] is the only indicator that represents the carbon intensity of the actual transport work done. All other indicators approximate transport work done in some way, but do not evaluate the performance of a ship as the EEOI[8] does.

Opportunities: The discussions with industry have shown the need for data standardisation, data sharing, and transparency, and they have also shown a number of weaknesses on how regulators are dealing with those issues. Improving operational and technical efficiency on a much larger scale will require more ambitious and robust regulation on how to monitor and report data regarding fuel consumption and transport work. A stronger IMO ambition on short-term measures would help unravel the carbon tangle. It will be interesting to further explore how scope three emissions, carbon intensity improvements, carbon credits, and other regulatory measures could incentivise the use of virtual arrival.

One new opportunity is the positive impact that speed optimisation has on the Carbon Intensity Indicator (CII) rating[9] of a ship. Despite controversy around CII, it will factor into decision making and the whole sector can use operational efficiency to make progress towards these ratings. Ships will get a better CII from reducing speed, but the CII regulatory regime on its own will not sufficiently incentivise ships to reduce their speed and make more use of virtual arrival clauses, nor does the CII bring insight on the actual performance of a ship. EEOI and CII both serve as key metrics to evaluate performance, but they remain disconnected under the IMO umbrella. Regardless of its flaws, however, the CII will challenge the priorities of shipping companies and affect their operations and help them to decarbonise.

While awaiting progress at the IMO, the EU has implemented GHG regulation for ships calling EU ports. The EU ETS (accompanied by the EU MRV for benchmarking) will have an impact on operations, costs and contractual agreements. It is designed to encourage shipping companies to reduce emissions through measures such as operational efficiencies, investments in low-carbon technologies and adopting alternative fuels.

4. Taking a systems view

Many of the above barriers relate to vessel- or voyage-level inefficiencies. While optimisation of any voyage presents a positive opportunity, there are diminishing returns if inefficiencies are not addressed at the system level, in this case looking at the fleed and land-based infrastructure such as ports, terminals and berths. Solutions at the fleet level can deliver efficiencies across the full maritime system, but these system-level shifts require multilateral solutions and collaboration between stakeholders across the value chain.

The Global Industry Alliance to Support Low Carbon Shipping of the International Maritime Organisation (IMO) outlines a broad approach to reduce GHG emissions in its "Just In Time Arrival Guide–Barriers and Potential Solutions"[10]. This important document outlines the full range of decisions in supply chains that affect port call optimisation and therefore the level of anchorage. However, the Guide recognises JIT arrival is most likely to be realised for scheduled services such as container services for which the (normal) availability of containers to load can be assumed.

The Port of Rotterdam performed a desktop trial in 'Just-In-Time' (JIT) ship operations which yielded positive results, showing emissions can be cut considerably. The exercise was conducted by representatives from the

7 *The EEOI was developed by the IMO in order to allow ships to monitor the carbon emissions of their shipping activities. The EEOI is the total carbon emissions in a given time period per unit of revenue ton-miles. Variations in the index are mainly caused by three factors: the technical efficiency of the ship, the amount of cargo transported per unit of time and variations in speed. However, as the EEOI is an aggregate number, it is difficult to identify the influence of these factors.*

8 *Parker, S., Raucci, C., Smith, T. W. P., & Laffineur, L. (2015). Understanding the Energy Efficiency Operational Indicator: An empirical analysis of ships from the Royal Belgian Shipowners' Association. In Royal Belgian Shipowners' Association (RBSA) [Report]. Royal Belgian Shipowners' Association (RBSA).*

9 *The IMO Carbon Intensity Indicator (CII) is an indicator of how the ships operate. CII is an operational index based on the Annual Efficiency Ratio (AER), which measures all the carbon emissions from all ballast and laden voyages, anchorage, port stays, all divided by the deadweight and distance sailed in a year (grams of CO2 per DWT mile). Based on these AER results, ships are grouped into different CII ratings, ranging from A to E.*

10 *IMO (2022). Just In Time Arrival Emissions: Reduction potential in global container shipping.*

Port of Rotterdam, ship companies Maersk and MSC, and IMO. For the calculations, 26 vessels which called at one particular terminal in the Port of Rotterdam were analysed (one month of data). The 26 ships received an update on when they were requested to arrive at the Pilot Boarding Place: in one scenario they were notified 24 hours before arrival at the pilot boarding place and in the other 12 hours, and subsequently optimised their speed. Comparing the real case with the two JIT scenarios, on average, the 26 ships consumed 9% less fuel in the JIT scenario where speed was optimised in the last 12 hours. These results show the significant fuel and emission savings that can be achieved through JIT, even when a relatively advanced port is called by relatively efficiently operated ships.

The port of Newcastle in Australia has gone a step further. The beaching of the Pasha Bulker in 2007, brought to a head concerns in the port of Newcastle over the number and time of vessels at anchor and the risks they represented. The port of Newcastle commenced to manage coal vessel movements and anchorage under the Vessel Arrival System (VAS) which optimises the ships speed prior to arrival by issuing a notice of readiness seven days in advance. Any measure which effectively controls congestion and reduces the number of ships waiting at anchor in the queue also reduces the risks to the ships, the port, and the environment. In Newcastle, the involvement of players along the entire chain enabled better connectivity and reduced uncertainty in the performance of the mine, rail, terminal and shipping components of the chain.

Solving for voyage inefficiencies will allow for certain progress to be made, but there are additional gains that can only be had at a systems level through collective action. JIT arrival, for example, only works if vessels coming into port at an agreed time can "jump the queue" of those at anchor that arrived in a more conventional SFTW fashion. Without the equivalent of centralised "air traffic control", the problem just moves farther away from shore, but may largely remain the same. The Blue Visby Solution consortium[11] is testing a new digital platform, like an ocean-going air traffic control system, which aims to eradicate SFTW by optimising arrival times for all vessels arriving at a terminal, which of course reduces carbon emissions at the same time.

In order to implement JIT arrival, relevant stakeholders in the port call business process will need to work closely and collaboratively, to ensure that information and updates are always communicated to the necessary parties. It is this efficient exchange of information that optimises the port call process. The optimisation of port calls and all the related processes would increase the competitiveness of the ports concerned. As the industry increasingly looks for ways to lower GHG emissions, shipping lines and charterers may favour ports which can provide more accurate and reliable information about the availability of its services, enabling ships to arrive Just In Time, thereby reducing fuel consumption. If delays and inefficiencies in the port are minimised, it would improve the port's reputation and possibly lead to growth in turnover and trade.

5. Shifting from interest to action

In a recent workshop, participants mapped out how specific commitments between now and 2025 can accelerate uptake of operational efficiencies through the four enablers identified: better transparency and standardisation of performance data; scaling up pilots and best practices; contractual changes to encourage virtual arrival practices when there is a delay at the discharge port; and policies and regulations to enable new business models. With further input, these levers for action will be refined, and rallying industry leaders around them will bring awareness and momentum to cashing in on the operational efficiency opportunity.

Now, as much of the shipping world dissects the outcomes of the intersessional working group (ISGW GHG-14) and anxiously watches the preparations for MEPC 80, this event is likely to be a slingshot that accelerates operational efficiencies. While the jury is hung about which outcomes can be expected, in the case of either low ambition and high ambition, the need for short term operational efficiencies will be underscored. If ambitions are low, there will be a need to move quickly and independently of the IMO to reduce emissions, and operational efficiencies are one of the most apolitical means we have. If ambitions are high, this just highlights the need to reduce emissions from every source possible, and the real first movers will do this through their operations.

While being a first mover in a competitive industry is a challenge for any company looking to drive change, working with peers in a pre-competitive setting can bring assurance and confidence to act together. Currently, the industry

*11 **The Blue Visby Solution** combines technology with a multilateral solution across the supply chain to eradicate SFTW through deployment of a sharing mechanism to remove split incentives while supporting any individual port's just-in-time projects.*

faces challenges to get beyond isolated examples of speed optimisation to scale up from isolated pilots to fleet-level changes. For speed operational efficiencies, collective action requires a mix of ship-owners, charters, and terminals to send a strong signal to both industry and regulators. There is thus an opportunity to start catalysing the broader structural changes needed to introduce speed optimisation at scale.

6. References and further readings

Debatin, Maximilian (2021). Why Slow-Steaming is not a Zero-Sum Game

IMO (2022). Just In Time Arrival Emissions: Reduction potential in global container shipping.

Jia, H., Adland, R., Prakash, V., & Smith, T. (2017). Energy efficiency with the application of Virtual Arrival policy. Transportation Research Part D: Transport and Environment, 54, 50–60.

Parker, S., Raucci, C., Smith, T. W. P., & Laffineur, L. (2015). Understanding the Energy Efficiency Operational Indicator: An empirical analysis of ships from the Royal Belgian Shipowners' Association. In Royal Belgian Shipowners' Association (RBSA) [Report]. Royal Belgian Shipowners' Association (RBSA).

Poulsen, R. T., Viktorelius, M., Varvne, H., Rasmussen, H. B., & von Knorring, H. (2022). Energy efficiency in ship operations—Exploring voyage decisions and decision-makers. Transportation Research Part D: Transport and Environment, 102, 103120.

ZeroNorth (2022). Vessel Reporting and Data Quality White Paper.

Zografakis, H. (2021). The third pillar: A contractual architecture for maritime decarbonisation. Gard.