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2030
BREAKTHROUGHS

CLIMATE ACTION IN SHIPPING

Progress towards shipping's 2030 breakthrough

2025 edition

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This report is a joint effort between the UCL Energy Institute, Getting to Zero Coalition, and Climate High-Level Champions.

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GETTING TO ZERO COALITION
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The Getting to Zero Coalition is a community of ambitious stakeholders from across the maritime, energy, infrastructure, and financial sectors, supported by key IGOs, knowledge partners, and other stakeholders committed to the decarbonisation of international shipping, and endorsed by several governments.

The ambition of the Getting to Zero Coalition is to have commercially viable zero-emission vessels operating along deep-sea trade routes by 2030, supported by the necessary infrastructure for scalable net zero-carbon energy sources including their production, distribution, storage, and bunkering.

The Coalition is managed by the Global Maritime Forum, who initially founded the Coalition together with the World Economic Forum and Friends of Ocean Action.

Learn more at:

www.globalmaritimeforum.org/getting-to-zero-coalition

RACE TO ZERO

2030 BREAKTHROUGHS

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The Climate High-Level Champions, mandated at COP21 and appointed by COP Presidents each year, drive ambitious climate action by connecting the work of governments with the many voluntary and collaborative solutions provided by cities, regions, businesses, investors and civil society. This includes delivering the five-year plan of the Marrakech Partnership, in collaboration with the UN Climate Change secretariat and other partners, and flagship campaigns such as Race to Zero and Race to Resilience. Ms. Nigar Arpadarai and Mr. Dan Ioschpe serve as the current Climate High-Level Champions for COP29 and COP30.

Race to Zero

Race to Zero is a global campaign rallying non-state actors – including companies, cities, regions, financial, educational, and healthcare institutions – to take rigorous and immediate action to halve global emissions by 2030 and deliver a healthier, fairer zero-carbon world. Race to Zero is led by the Climate High-Level Champions to drive real world momentum and action.

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Foreword

The next phase of climate action in shipping

From phones to food, the vast majority of what's traded and consumed around the world has travelled by ship. The shipping industry makes the global economy possible, enabling the movement of goods, materials and resources at a scale that no other sector can match. It supports livelihoods, links countries and communities, and underpins modern life in ways that are often invisible. Yet despite its central role, international shipping remains a high-emitting sector in the global economy, and its GHG emissions continue to rise at a time when rapid decarbonisation is urgently needed.

Recognising this, a breakthrough target was set in 2021 to steer investment, inform policy, and build the confidence required to accelerate change. It aims for at least 5% of the fuel used in international shipping to come from scalable zero-emission sources by the end of this decade. In the four years since, there have been signs of genuine progress, with growing alignment across the sector and all International Maritime Organization (IMO) member states adopting the target and raising ambitions to 10%.

Now in its fourth year, the Climate Action in Shipping report provides a detailed view of this progress. Encouraging signs are emerging in several areas, with a growing number of zero-emission fuel projects reaching financial closure, early infrastructure taking shape at key ports, and stronger collaboration forming between industry leaders and governments. Supply chains for scalable zero-emission fuels are beginning to form, and determined first movers are demonstrating what early transition looks like in practice.

However, that momentum has not yet translated into system-wide change. Investment is still being directed towards conventional fossil-fuelled vessels, and many shipowners remain cautious in their ordering decisions. Demand for zero-emission shipping remains limited, while the broader policy environment continues to evolve without providing the certainty needed to unlock large-scale shifts. Without greater alignment across supply and demand, finance, and regulation, the tipping point envisioned for 2030 will remain out of reach.

This year's report identifies three areas where action could have significant impact. Regulatory frameworks must prioritise fuels that meet both climate integrity and scalability criteria. Shipowners, cargo owners, and financiers must begin to account for the risks of delay and take steps to prepare fleets for zero-emission operations. Governments, particularly at national and regional levels, also have an important role to play in closing policy gaps while international measures are still under negotiation.

The months ahead will be critical. The period between COP29 and COP30 offers a valuable window to convert ambition into delivery and ensure that international shipping is ready to meet the breakthrough target. In Brazil, the COP30 Action Agenda is putting particular emphasis on sectors where climate ambition can be directly linked to resilience, employment, and long-term investment. The maritime transition is part of that picture, offering opportunities not only to cut emissions but to unlock new sustainable value chains in emerging economies and coastal regions.

We are grateful to our partners at University College London and the Getting to Zero Coalition for helping us produce this report. Their work continues to provide clear insight into where progress is being made, where barriers remain, and what actions are most likely to shift the system.

The direction of travel is understood. The challenge now is to move with greater clarity, coordination, and pace, backed by finance, shaped by fair policy, and grounded in a just transition that benefits people and communities across the maritime sector and beyond.

Dan Ioschpe
Brazil Climate High-Level Champion, COP30

Nigar Arpadarai
Azerbaijan Climate High-Level Champion, COP29

EXECUTIVE SUMMARY

Increasing clarity on regulations and ambition in the coming year will define whether shipping's 2030 breakthrough is successful

It is estimated that about 5-10% of all the fuels used by the shipping industry in 2030 need to be scalable zero-emissions fuels (SZEF) for the industry to be on track to meet the International Maritime Organization's (IMO) 2023 greenhouse gas (GHG) emissions reduction ambitions.[i] This tipping point was coined "shipping's 2030 breakthrough". Reaching this target equates to having 0.6-1.2 exa-joules (EJ) of energy coming from SZEF (approximately 15-30 million metric tonnes (Mt) per year of HFOe[1] or around 600-1200 of some of the larger[2] containerships running on SZEF). This report tracks progress across the five levers of technology and supply, demand, finance, policy, and civil society to establish whether the industry is on track towards this goal.

Since the first edition of this report in 2022, several key conditions were set for fuels to comply as SZEF. These include the need for the fuels to be:

1. scalable, such that 200-300 Mt of HFOe of current annual consumption can be matched in the foreseeable future;
2. producible with GHG intensity reductions of 90-100% relative to incumbent fossil-based fuels on a full life cycle (well-to-wake) basis; and
3. competitive in cost of production in the foreseeable future, assuming continued research and development and the adoption of viable policy support mechanisms.

This therefore excludes biofuels, less-polluting fossil fuels (including liquified natural gas), blue fuels,[3] and some e-fuels[4] (e-methane is not included because it has a higher cost to achieve equivalent well-to-wake emissions performance, given methane's potency as a GHG). The report recognises that significant information regarding scalability, emissions intensity, and costs is still emerging, and, hence, these definitions will be reviewed and updated if required, to reflect new evidence in future editions.

This year's assessment indicates some progress in moving towards the 2030 goal. Still, changes seen across the five levers taken together suggest that there is a significant risk that the transition breakthrough point of 2030 may now be delayed. Technology to support SZEF has progressed well, as have developments related to their supply and availability. However, the demand needed for the uptake of those fuels and the financial progress required to make them viable have stalled. This is despite the IMO agreeing on a Net Zero Framework (NZF) in April 2025, including defining some regulations it intends to use to achieve its 2023 GHG Strategy's ambitions. Critical pieces of the regulations, especially regarding the incentives the IMO intends to use to drive the transition, are still to be defined. As these details are central to allowing the entire value chain to develop and execute on pathways towards the IMO's ambitions, the coming months of negotiations to settle the

1 Heavy Fuel Oil-equivalent
2 Approximately 15,000 TEU (Twenty-foot equivalent unit) containerships
3 i.e., fuels derived from fossil fuel sources, such as hydrogen produced from natural gas with the application of carbon capture
4 i.e., fuels that are produced using hydrogen from renewable electricity-powered electrolysis paired with sustainable carbon or nitrogen, such as e-ammonia, e-methanol, and e-methane

details—and allow for the industry to understand and react to their implications—will determine whether there remains a plausible path towards the 2030 breakthrough.

Key developments

In terms of technology, progress remains partially on track. Technological progress on methanol and ammonia propulsion systems has remained strong. Methanol engines have progressed to a commercial phase, while ammonia engines are entering the final stages of testing. Although there are signs that methanol propulsion may have some early teething troubles, there are no indications at present that these issues cannot be fixed. However, as 2030 nears ever closer, uncertainty remains as to the availability and feasibility of the high rates of engine production, vessel newbuilding, and retrofit capacity that would be necessary to achieve the 5-10% goal.

In terms of SZEF supply, progress has been measured using green hydrogen production capacity (actual and projected) and the potential for SZEF volumes to be bunkered around the world. Government-led targets for green hydrogen production have continued to grow, but there is increasing concern that such targets are unrealistic and unlikely to be met. There is also mixed evidence as to whether production costs for green hydrogen are dropping in line with what is necessary for the 5-10% goal. Methanol bunkering infrastructure is continuing to be introduced at ports around the world and, while still playing catch-up, there are signs that ammonia bunkering may grow in availability in the coming years. Actual electrolyser, green hydrogen, and SZEF production volumes continue to scale. Production capacity for SZEF-compliant methanol and ammonia has, in some regards, improved with several new projects being announced and reaching financial investment decision (FID). However, the overall picture is somewhat ambiguous, with some project cancellations also being observed. Compared to last year, this report forecasts an increase in potential SZEF supply by 2030, growing to just under 0.8 EJ (exceeding the 0.6 EJ targeted for 5%, and representing approximately 20 Mt HFOe) in the medium growth scenario.

In terms of demand, progress is not on track. Trends towards creating the potential demand for SZEF necessary to meet the 5-10% goal have stagnated. A significant proportion of the vessels being ordered and due for delivery are not SZEF-capable, adding pressure on retrofit and yard capacity and increasing the risk of stranded assets. These trends will likely continue until there is more certainty on regulation, SZEF fuel supply, technological progress, and yard capacity. Current estimates suggest that about 0.026 EJ (or less than 1 Mt HFOe) of potential SZEF demand should exist in 2025, growing to 0.22 EJ (about 6 Mt HFOe) by 2030, and 1.54 EJ (approximately 40 Mt HFOe) by 2035. This translates to having about 25 15,000 TEU container ships using SZEF in 2025, about 200 ships in 2030 (of the 600 needed for the breakthrough goal), and 1,500 running on SZEF by 2035. Equivalently, these imply potential demand of about 1.5 million metric tonnes per year of, for example, methanol in 2025, 10 million metric tonnes per year by 2030, and 75 million metric tonnes per year by 2035. However, whether these fuels will be used depends on whether there is a business case for them, and the estimates here only indicate potential demand based on the growth in the fleet capable of using SZEF.

Progress is not on track when it comes to finance either. While more shipping debt is aligned with the trajectories needed to meet the 2023 IMO GHG Strategy objectives, there is little evidence to suggest that new or existing finance is being sufficiently channelled towards SZEF-capable vessels and SZEF-related infrastructure needed for shipping and away from conventional fuels. This is also in part because the business case for new SZEF-capable vessels or retrofits of existing vessels remains insufficiently compelling—at least without sufficient government or public financial support mechanisms. Thus, even if finance willing to go into SZEF-capable vessels existed, there is no global market incentive to make the switch. However, the IMO NZF is expected to generate revenues of $11-12 bn per year between 2028-2030,[ii] should it come into force in the coming years. The specifics as to what share of the NZF revenues will be allocated to reward the use of zero- or near-zero (ZNZ) emission fuels remain unspecified, and the absence of this detail and the associated uncertainty in the extent of support to be given for SZEF is likely delaying finance and investment needed for the 5-10% goal.[iii]

Progress with policy remains partially on track. The most significant development since 2024 has been the agreement on the IMO NZF. The new policy measures include a fuel standard, regulation of allowed emissions, and GHG emissions pricing. However, what qualifies as zero- or near-zero-emission (ZNZ) fuels remains to be defined and may be different to what is considered SZEF as per this report. Furthermore, while the NZF specifies annual GHG intensity objectives to 2035, a large part of successfully triggering early adoption of SZEF and SZEF-capable vessels now rests on the details of additional rewards and the method for revising penalties that the NZF develops in forthcoming guidelines. Only in certain specifications of the NZF guidelines is there likely to be sufficient incentive to achieve the goal.[iv] Further, there have been opposing movements in national policies around shipping and climate goals more broadly, with some countries retreating (the US, for example) and others progressing more than expected (such as the EU). This lever therefore cannot be considered on track until further clarity on the overall regulatory landscape is known.

In terms of civil society, progress remains partially on track. Indigenous participation has seen some positive movement, with the Inuit Circumpolar Council renewing its consultative status at the IMO and pursuing permanent observer recognition. Training programmes have also been initiated, such as the 'Train the Trainer' programme for alternative shipping fuels, with the first course having taken place in 2025.[v] However, meaningful engagement by many developing and indigenous groups remains constrained by limited capacity and funding. Local NGO action around ports is expanding globally, with increased advocacy for clean air and zero-emission fuels. Despite some notable wins, only eight of the world's top 50 container ports currently host active civil society campaigns, underscoring persistent gaps—especially in the Global South and among small island developing states (SIDs) and least developed countries (LDCs). Increasing participation of those championing SZEF use in shipping is key at the IMO, especially from states that are likely to be disproportionately affected by the effects of climate change. Eagerness from ports and increasing understanding of new fuels and support systems are equally key to developing enough bunkering and distribution systems to achieve the 2030 breakthrough goals.

Key recommendations

From the evidence of where current levers and actions therein appear to be, three key recommendations can be made:

1. **Ensure IMO's reward mechanism strongly supports SZEF use.** This requires, first, ensuring that IMO's ZNZ definition aligns with the SZEF definition used in this report, so that SZEF producers have a clear signal of support that ensures they will not have to compete with bio-based fuels and less-scalable alternatives. Second, the reward mechanism design must be simple and effective enough to allow users relying on it to best anticipate (and collect) revenues. Third, the ZNZ guidelines must be adopted as early as possible and no later than the end of 2026.
2. **Clarify and increase awareness of risks for the non-SZEF-aligned fleet.** The risks both to individual shipowners and the broader value chain of failing to order or retrofit sufficient SZEF-aligned tonnage need to be more clearly understood and communicated. This could help owners (and financiers, for example), but also the wider supportive actors needed (yards, engine manufacturers) to prepare for and support the actual transition towards and beyond 2030.
3. **Help national and regional actors fill policy gaps where the IMO NZF might not provide sufficient support.** Policy is catalytic to many of the wider supply, demand, and finance actions that are needed. As the details of the IMO NZF are developed and approved over the coming months, national and regional policymakers will likely need to step in and add to or improve upon it to ensure that the transition takes shape at the required rate of change.

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Overview

The 2025 Climate Action in Shipping Report represents the fourth edition in this series. It is also the first to conclude the analysis of many of the 2025 targets that were initially set in 2022.[5]

The report also has several changes:

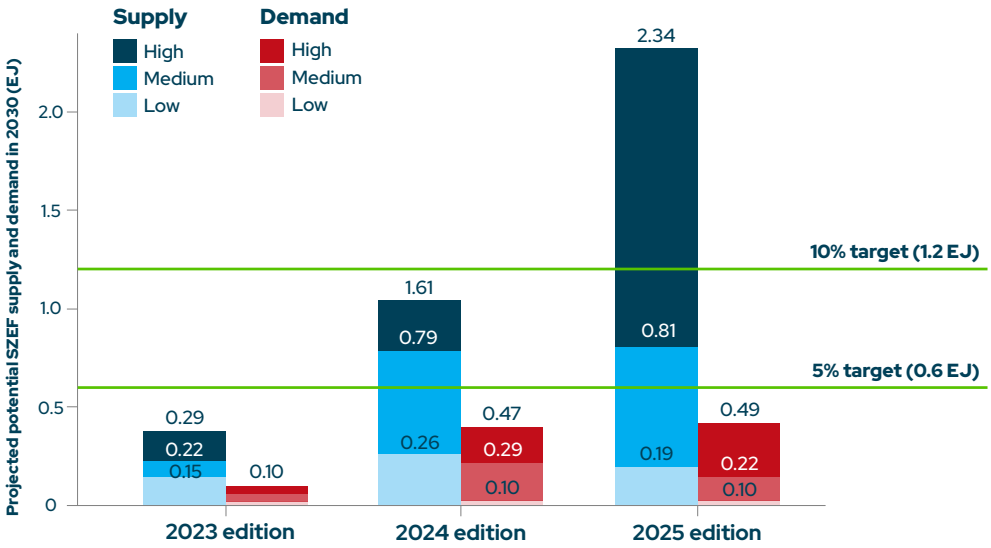
1. As 2030 is rapidly approaching, this report has been modified to consider the broader decarbonisation context beyond 2030 up to 2035. To align with the IMO's NZF that sets ZNZ guidelines until 2035, projections of potential SZEF supply and demand up to 2035 are thus now estimated.
2. The analysis has been further streamlined. This includes moving some details, such as methodology, to the appendix. Background information on the underlying logic for the creation of the 5-10% goal and the associated transition strategy can be found in previous editions of this report.[vi] Several indicators under the main levers used to track progress have been further harmonised, removed, or merged for simplicity.
3. Lastly, for the first time in the series, this report starts by considering how progress to targets has evolved since the release of the initial report in 2022, before going into more details on each lever or indicator.

Evolution of progress (2022-2025)

One consistent feature of this and the preceding two editions are the quantitative estimates of supply and demand potential for SZEF relative to the 5-10% goal. The calculations have used estimates derived from evidence available at the point of publication. Figure 1 tracks how these SZEF estimates have evolved over three reporting cycles and shows that the report's projections have remained broadly consistent, particularly over the last two years. The growing middle and upper bound estimates over time indicate a degree of conservatism.

5 Not all 2025 targets can be fully assessed part-way through 2025 and some rely on data that is a year or so behind

Figure 1: Forecasted supply and demand estimates for 2030 across report editions (EJ/year)[6]



More detailed analysis of how tracking has evolved since 2022 is available in the Appendix, but a summary of key changes per lever is given below.

Technology and supply:

- Since the first version of this report in 2022, progress across all technology and supply indicators has tended to be positive. There has remained a consistent presence of pilot or demonstration projects and related cross-industry collaboration that has translated to strong technological progress. However, concerns have more recently emerged regarding the scale of shipyard, retrofit, and engine production capacity.
- The outlook for production volumes of green hydrogen and SZEF has improved over the same time frame, owing to the rapid scaling of novel production projects in both number and size. Early optimism surrounding the publication of increasing numbers of national green hydrogen strategies has been tempered due to worries that these targets are unlikely to be met (along with growing geopolitical shifts), while production costs for Green Hydrogen present a mixed picture. Projects in the EU that have revealed production prices through auction processes are above the targeted levels, whereas there is evidence that projects in China are achieving the targeted levels.

Demand:

- Progress is still not clear, and trends between the last few editions indicate continued uncertainty about committing to new tonnage or converting existing tonnage to utilise SZEF.
- With a growing conventionally-fuelled fleet, it is increasingly evident that tracking costs, incentives, and the capacity to convert vessels to use SZEF will be critical to ensuring sufficient SZEF demand.

6 'Medium' demand forecasts for the 2023 and 2024 editions are based on averages of the 'high' and 'low' forecasts since in those editions the 'medium' demand forecast was not calculated. Similarly, the 2022 edition is not visualised in the figure since it did not include these forecasts.

Finance:

- Changes in finance correlate and (perhaps correctly) follow the downward sentiment seen in the demand levers over the past few editions of this report. Unlike demand, however, there is less transparency to know for sure if the sentiment that can be captured is fully representative of the global capital market's appetite for supporting shipping's transition.
- Although a more positive upturn in SZEF financing may occur, this may be delayed and may not be seen explicitly in data until the IMO NZF is fully approved, the framework's potential implications are understood, and key actors are able to convert those into real financing decisions.

Policy:

- Evaluation of the IMO process has moved from being on track to not being on track, with respect to the adoption of the 2023 IMO GHG Strategy. The negotiations relating to the adoption of mid-term measures in 2025 are also progressing on time. However, there is a delay in the clarification of many key details of these mid-term measures in the NZF which has led the 2025 assessment of this indicator to be 'not on track'.
- National policies to support SZEF were expected to progress from announcements and plans into more concrete actions by 2025. Although progress has been measured in subsequent reports, it is not in line with the expected needed growth in maritime SZEF supply.

Civil society:

- While civil society mobilisation has been actively developing, including at the local and national levels, and through engagement at multilateral fora such as the IMO, the growth in engagement and impact which would have been expected, especially in terms of underrepresented groups and the Global South, has not been at the level which would have been expected by 2025.
- There is growing consensus on the need for workforce development to support the transition, and several countries are increasing their efforts to support this.

Projections for 2035

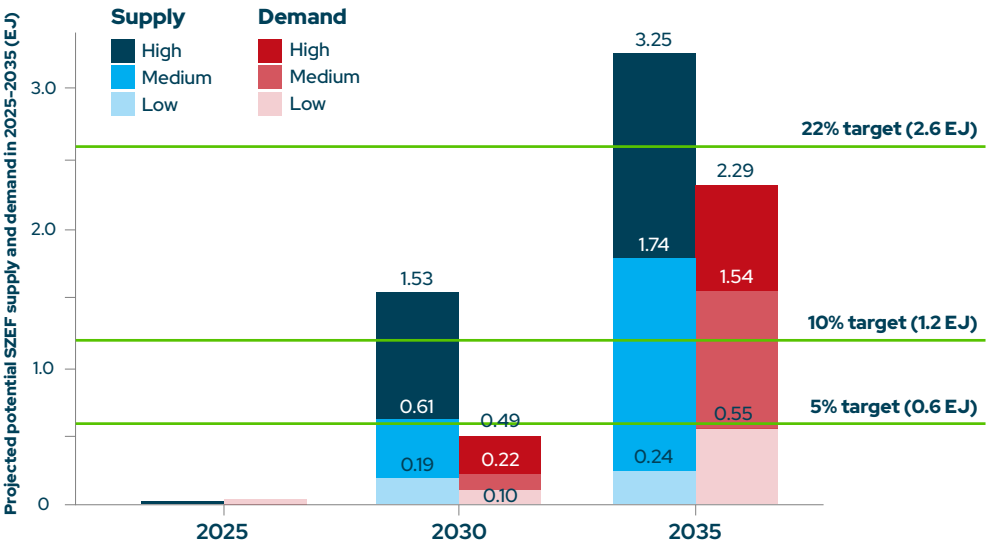
Using the 2023 IMO Strategy's ambitions, it is understood that ZNZ fuels will be needed on an increasing scale after 2030. SZEF produced using green hydrogen will likely be required to meet those ambitions. The justification for this originates in the first edition of this report, in which several key conditions were set for fuels to comply as SZEF. These include the need for the fuels to be:

1. scalable, such that 200-300 Mt of HFOe of current annual consumption can be matched in the foreseeable future;
2. producible with GHG intensity reductions of 90-100% relative to incumbent fossil-based fuels on a full life cycle (well-to-wake) basis; and
3. competitive in production costs in the foreseeable future, assuming continued research and development and the adoption of viable policy support mechanisms.

This therefore excludes biofuels, less-polluting fossil fuels (including liquified natural gas), blue fuels,[7] and some e-fuels[8] (e-methane is not included because it has a higher cost to achieve equivalent well-to-wake emissions performance, given methane's potency as a GHG). The report recognises that a lot of information regarding scalability, GHG emissions intensity, and costs is still emerging, and, hence, these definitions will be reviewed and updated, if required, to reflect new evidence in future editions.

The potential transition path of SZEF uptake between now and 2050 is modelled by calibrating an S-curve, which captures the typical pattern of new technology adoption: starting slow (called the "emergence" phase), accelerating as costs fall and confidence grows ("diffusion"), before tapering off as the market saturates ("reconfiguration"). This approach aligns with expected diffusion dynamics and system-wide transitions seen in other industries.[9] This curve establishes the 5-10% of shipping energy demand (0.6-1.2 EJ) needed by 2030,[10] but can also be used to show this needing to increase to around 22% by 2035 (2.6 EJ).[11] Relative to this target, estimates of potential supply and demand for SZEF have also been raised and are shown in the figure below.

Figure 2: Estimated total SZEF supply and demand for shipping compared to 5-10% 2030 SZEF goal (i.e., 0.6 EJ in 2030)



7 i.e., fuels derived from fossil fuel sources, such as hydrogen produced from natural gas with the application of carbon capture

8 i.e., fuels that are produced using hydrogen from renewable electricity-powered electrolysis paired with sustainable carbon or nitrogen, such as e-ammonia, e-methanol, and e-methane

9 See appendix for an explanation of the theoretical foundations of the S-curve

10 More information on the background of the 5-10% goal can be found in previous editions of the report

11 Targets based on such a curve are not meant to be prescriptive, but rather indicative, with no transition in practice usually following such a curve exactly

Summary of progress

The table below highlights the five tracked levers, where the report thinks the industry is in terms of progress, and what goals were set for 2030. The next section of this report provides more detailed analyses of each lever.

Table 1: Summary of progress and key goals by 2030

Change lever	Progress	Scale of progress on actions	Goals by 2030
TECHNOLOGY AND SUPPLY	PARTIALLY ON TRACK	• 2/7 actions on track • 5/7 actions partially on track	• Green hydrogen production cost $1.5-$2/kg depending on region. • 60 GW green hydrogen electrolyser capacity. • 0.6 EJ of SZEF supply available by 2030 and 0.1 EJ by 2025.
DEMAND	NOT ON TRACK	• 1/6 actions partially on track • 5/6 actions not on track	• 600 15k TEU containerships-equivalent of SZEF demand (0.6 EJ). • 8.75-12.5% of all TEU-miles to be on SZEF by 2030.[12] • All delivered and ordered ships to be SZEF-capable. • Majority of existing SZEF-ready tonnage to be converted to full SZEF capability.
FINANCE	NOT ON TRACK	• 2/2 actions not on track	• Increased alignment of shipping debt to a 1.5C trajectory, with at least 2/3 or more of all shipping debt to be tied to Poseidon Principles trajectories. • Continued growth in the issuance of sustainability linked loans issued to maritime actors, with the cumulative amount of sustainability linked loans and bonds to reach $50 bn.
POLICY	PARTIALLY ON TRACK	• 2/6 actions on track • 1/6 actions partially on track • 3/6 actions not on track	• Adoption of ambitious shipping economic instrument with regulatory support for 5%-10% SZEF adoption. • Top 20 countries by maritime traffic have ambitious domestic decarbonisation policies with increased hydrogen production commitments.
CIVIL SOCIETY	PARTIALLY ON TRACK	• 1/5 actions not on track • 4/5 actions partially on track	• Increase in number of SIDS/LDC co-sponsoring IMO proposals. • NGO pressure at local and national levels to drive change. • Workforce upskilling/retraining programmes in place.

12 Indicative and assuming other shipping segments also scale up proportionally to running on SZEF

Key recommendations

The assessment of each lever contains several discrete indicators which identify a shortfall, partial progress, or successful alignment, and specifies potential steps that can be taken to address gaps or a lack of progress. While improvements can continue on each lever, there is evidence that a few key recommendations could significantly hasten progress towards shipping's 5-10% goal for 2030.

ZNZ/SZEF definition alignment and IMO reward mechanism clarity

Initial analysis of the IMO's Net Zero Framework is that clarity on its included reward mechanism will be necessary for making a clear business case for SZEF.[vii] The approved policy includes a reward mechanism, and initial specifications for ZNZ, described as an energy source with a minimal GHG intensity threshold (initially 19gCO2e/MJ). However, with no clarification of exactly which fuels this covers, how the reward will be allocated, or how much revenue will be available for reward, there remains a significant uncertainty that in turn creates investment risks. These risks are coupled, including:

- That a broad set of fuel/energy sources will be included in the ZNZ definition, including GHG Fuel Intensity (GFI) compliant but less-scalable biofuels. Without distinction between these fuels and SZEF, uncertainty about the respective competitiveness of these different fuel/energy sources will persist and the associated risk will be passed to the private sector, incentivising inaction and/or delay.
- That there will not be sufficient revenue available for the reward mechanism, leading to only a constrained level of volume and/or price support.

The provisional timetable for further development of the IMO's guidelines projects the adoption of ZNZ guidelines by autumn 2026. This should resolve the current uncertainties relating to rewards and provide more detail for SZEF investors to assess this option's competitiveness and level of early-adopter support. The design of the reward mechanism itself is both a risk and an opportunity for SZEF. The reward could provide multi-year certainty on price and volume, providing important confidence for the sustained offtake of SZEF to project developers. However, for this to happen, further negotiations at the IMO will need to ensure that the reward mechanism's design is both effective and simple, and appropriate to the multiple stakeholders involved in creating commercial viability for SZEF production and use.

To maximise the effectiveness of this lever, the IMO should refine its definition of ZNZ so that it is consistent with the criteria used in this report's definition of SZEF, and urgently adopt ZNZ guidelines, including an effective reward mechanism, by autumn 2026 at the latest.

Maximise optionality and preparedness for SZEF in fleet ordering and retrofitting

An ongoing finding in these reports is that the potential demand for SZEF risks lagging potential supply. This is often counter to the repeated narrative within the demand (shipowner and shipping value chain) community, where the concern is primarily voiced that there will be insufficient supply or availability of new fuels.

Both supply and demand potentials represent risks to the overall fulfilment of the 5-10% SZEF objective. However, the demand side can retain optionality more easily than the supply side. For example, for the cost premium of a SZEF-capable dual-fuel ship that can operate on conventional fuel, equivalent biofuels, as well as SZEF, there is no commitment to use SZEF locked into the specification selection. On the supply side, at least in production, the investments are locked to SZEF production and supply.

Given the adoption of IMO's NZF, along with assessments that this regulation will give competitive advantage to SZEF-compatible vessels during the 2030s (even with a conservative interpretation of how remaining guidelines and parameters will be finalised), the key recommendation is to further clarify the risks to the demand side (shipowners, as well as ship-finance) of not significantly shifting their fleets and portfolios to SZEF, and/or the risk of leaving this too late.

Align national policies with goals of the 2023 IMO GHG Strategy

A continued theme in these reports is the need for coordinated and diversified national action through hydrogen strategies, SZEF support mechanisms, research and development funding, and maritime decarbonisation policies to ensure that SZEF adoption takes place. While there are many examples of positive change taking place at a national level, oftentimes national policies are disjointed and lack a clear and comprehensive maritime decarbonisation vision. Further strengthening domestic shipping policies could also provide the necessary springboard for domestic bunkering developments (e.g., safety and governance structures), SZEF demand build-up (e.g., guarantees/support for SZEF-DF investment)[13] and SZEF ordering confidence creation (e.g., demand-side SZEF policy or SZEF mandates) which could support the international industry segment moving forward along the same pathways.

Because the approved NZF does not clarify SZEF incentivisation, there is now a particular need for national policies to step up and ensure that ambitious domestic shipping regulations are in place to help spearhead the maritime transition. Related policies such as shipbuilding strategies, industry strategies, and energy import plans should also aim to be more closely aligned with maritime decarbonisation plans to ensure potential synergies and maximise the potential for sustained development and national opportunity.

System change levers

This section tracks progress against each action within the five system change levers, presenting the key findings and detailed breakdowns of each action and its respective timeline.

13 For example as in "UK Domestic Shipping, Mobilising Investment in Net Zero (2022). Marine Capital Ltd, UMAS and LR".

Technology and supply

Overview

The technology and supply actions in this edition continue to focus on both the sufficiency of technological development as well as the scale-up of supply to be consistent with the 5-10% goal. All other indicators remain the same, and overall, the lever remains partially on track.

1. Technology pilots and demonstration projects | **ON TRACK**

- The sixth edition of the Mapping of Zero-Emission Pilots and Demonstration Projects notes that methanol as an SZEF has progressed from the 'proof of concept' to 'initial scaling'.[ix] While further research, development, and deployment are still required, methanol has moved beyond initial pilots and demonstration projects to a phase more aligned with optimising and expanding technological availability. The number of operational methanol-powered vessels continues to increase (up to 43 vessels by the end of 2024, compared to 28 at the end of 2023), new-build orders are growing (see Demand section) and the first methanol engine retrofits are currently undergoing sea trials.[x]
- Ammonia continues to develop within the 'proof of concept' phase, with the first commercial two-stroke engine having been installed onto a liquefied petroleum gas (LPG) and ammonia carrier.[xi] Highlights include the availability of four-stroke engines, with two-stroke engines undergoing final-stage pre-commercial testing,[xii] and evidence that orders of all types are increasing in number.[xiii] Around 30 WinGD and 30 Everllence two-stroke engines are currently on order.[xiv]
- At least five ammonia-powered vessel sea trials are currently taking place, including three tugboats, an offshore supply vessel, and a demonstration vessel. These include both dual-fuel and pure ammonia engines.[xv] Bunkering pilots are also taking place at seven key ports worldwide: Dalian, Singapore, Rotterdam, Pilbara (Australia), Ngqura, Yokohama, and Pilbara (USA).[xvi]
- While at this stage there is no quantitative target set for 2030, as the primary aim of this indicator was in the shorter term, it is still considered a good qualitative proxy of continued collaborative developments and progress has continued.
- Pilots and demonstration projects related to deep-sea methanol- and ammonia-based internal-combustion engines have continued to make progress since the last edition of this report, and this indicator is therefore on track.

SIGNAL OF CHANGE

Recent progress in battery systems is exemplified by the launch of the ferry 'China Zorilla' in May 2025. Built at the Incat Shipyard in Hobart, Australia, it can carry 2,100 passengers and 225 vehicles. Intended for use between Buenos Aires and Uruguay, the vessel holds 250 tonnes of batteries as part of a 40 megawatt-hour energy storage system, four times larger than any similar system built before it.[viii]

2. Key technological developments | **PARTIALLY ON TRACK**

- Methanol-based propulsion systems are proving relatively simple to adopt and are being positively received by facilitating crews.[xvii] However, there have been teething problems surrounding material selection and the availability of spare parts.[xviii] In addition, supplies of methanol are proving to be a constraint, with production volumes dominated by grey methanol (methanol produced with natural gas) and the first electrolytic volumes only just starting to be bunkered.[xix]
- Ammonia systems have continued to progress well in terms of technological development yet remain in the 'proof of concept' phase. Trials of ammonia bunkering are progressing well. However substantial work remains to prepare ports for the deployment of ammonia. Public perception has also been highlighted as a critical enabling factor for the adoption of ammonia, and it is expected that substantial collaborative effort will be required to foster acceptance.[xx]
- While there has been no change in the International Energy Agency's (IEA) Technology Readiness Level (TRL) score of 5.8 for maritime fuel-cell technologies, battery-electric propulsion has transitioned from a TRL score of 8.5 to 9.0 since the last edition of this report.[xxi]
- Methanol-based internal combustion engine (ICE) propulsion and short-sea technologies are therefore progressing well within respective scaling phases. However, while ammonia-based ICE propulsion has been successfully demonstrated in testing facilities, the technology remains to be validated in real-world conditions and is yet to allay concerns associated with safety and operational emissions. Furthermore, concerns remain surrounding the newbuild and retrofit capacity of shipyards and engine manufacturers to facilitate the 2030 breakthrough goal, and this indicator is therefore thought to remain partially on track.

3. Government hydrogen strategies | **PARTIALLY ON TRACK**

- The IEA's Global Hydrogen Review 2024 indicated that 19 new hydrogen strategies have been published since last year, principally in emerging markets and developing economies. The revised total of 60 strategies, typically outlining the potential for hydrogen development and some initial short-term actions, now accounts for 84% of global energy-related CO2 emissions.[xxii]
- In terms of implementation, almost $100bn of public funds have been announced, entered into force or been allocated to improve business cases, indicating progress towards implementation of ambition.[xxiii]
- However, many older strategies have been criticised for their anticipation of volumes that no longer seem realistic, and it's becoming clear that many objectives stated in published strategies are unlikely to be realised. Such issues are likely to be compounded by recent geopolitical shifts that are resulting in increased volatility of government-led funding streams. This indicator is therefore thought to be partially on track, a negative change from last year's report.

4. Cost of green hydrogen production | **PARTIALLY ON TRACK**

- The 5-10% goal includes an indicator to achieve green Hydrogen production costs of $2/kg by 2025 and $1.5/kg by 2030. While there are some positive indications that the 2025 target could be reached for a small selection of projects this year, there remains substantial uncertainty associated with this indicator.
- In terms of modelling forecasts, the IEA's Global Hydrogen Report 2024 suggests that the cost of electrolytic hydrogen in 2030 is likely to drop below $2/kg only for certain projects in Patagonia and central China under its large-scale deployment 'NZE by 2050' scenario. Such projects would cumulatively amount to less than 1 Mt, while the large majority of volumes would cost between $2-4/kg. Furthermore, the IEA expects virtually no production capacity under $3/kg by 2030 under its less optimistic 'stated policies' scenario.[xxiv]
- Having previously predicted that the levelised costs of green hydrogen would drop below $2/kg in China, Brazil, the US, Germany, Japan, and Indonesia by the mid 2030s, BNEF's recently revised forecasts indicate this is now only likely to occur in India and China in 2050.[xxv]
- In terms of projects, the NEOM green hydrogen plant located in Saudi Arabia, reaching a financial close amounting to $8.4bn in 2023 and now around 80% complete, is expected to produce green Ammonia at $825-850/t, or $4.5/kg of green Hydrogen.[xxvi]
- Bids submitted to the first auction of the EU Hydrogen Bank by the end of 2024 indicate green hydrogen production costs ranging from $5.7/kg in Greece to $14.6/kg in Poland.[xxvii]
- Fertiglobe, which secured the first-ever H2Global pilot auction for 397,000 tonnes of renewable ammonia in 2024, has indicated that production costs at its retrofitted EBIC plant in Ain Sokhna, Egypt, will amount to $878/t, translating to a green hydrogen production cost of just under $4.9/kg.[xxviii]
- While far above the breakthrough targets of $1.5-2/kg set for this decade, there have been some more positive indications that achieving these goals could be feasible. Envision Group recently released details of a large-scale green ammonia production project intending to produce 300,000 tonnes of green ammonia annually under an initial phase and scaling to 1.5 Mt upon final completion.[xxix] The project recently secured a historic offtake agreement with Marubeni Corporation,[xxx] and, while official estimates aren't available, there is discussion that its green ammonia could be produced at less than $600/t.[xxxi]
- Overall, evidence indicates a geographic disparity in terms of green hydrogen production costs. Those implied by modelling forecasts and European-led projects are far in excess of 5% breakthrough targets, while costs associated with production located in more favourable regions (such as the Envision Group project in Inner Mongolia) are much more aligned. This indicator is therefore classified as partially on track.

5. Electrolyser and hydrogen production capacity | **ON TRACK**

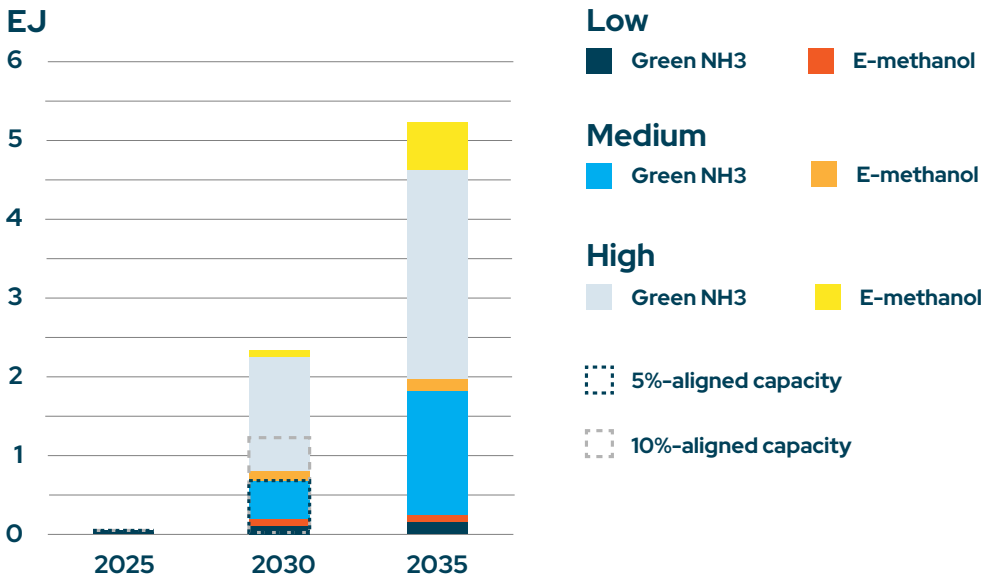
- In its annual Global Hydrogen Review 2024, the IEA suggests that the number of announced low-emission hydrogen projects is expanding rapidly and would amount to 49 Mt by 2030 should all projects be realised. Up from 38 Mt the previous year, this figure is almost 30% greater than that published previously and indicates substantial acceleration is occurring in early-phase plans for green hydrogen supply projects.[xxxii]
- In addition, more than 45% of capacity is recorded as undergoing a feasibility study, with a similar share recorded as in the earliest stages of project development. However, the 7% (3.4 Mt) of this capacity that is 'committed' (defined as 'passed FID' or 'under construction') is up from the 4% (1.7 Mt) reported in the 2023 Review. Driven by an increase in uptake of carbon capture, utilisation, and storage (CCUS) (35%), committed low-emission production projects are now split roughly equally between electrolysis (55%) and CCUS (45%) pathways.[xxxiii]
- While there are clearly signs of positive change with regards to the scale of 'announced' and 'committed' low-emission hydrogen production, it's clear that absolute volumes will have to increase significantly in order to achieve 2030 breakthrough targets. However, the positive traction demonstrated in the latest IEA Hydrogen Review suggests that the indicator remains on track.

6. SZEF production | **PARTIALLY ON TRACK**

- Since last year, announcements of new green ammonia and e-methanol production capacities have provided some optimism that supply is going in the right direction.[xxxiv] In addition, the first e-methanol facility opened this year in Denmark.[xxxv]
- The updated information shows that under the medium 2030 scenario, the 0.6. EJ (15.8 Mt HFOe) figure is easily surpassed with supply reaching 0.8 EJ (21.1 Mt HFOe) and in the high scenario reaching 2.3 EJ (60.6 Mt HFOe). In all three scenarios, the supply of green ammonia in 2030 is performing better than e-methanol since significantly more new green ammonia projects have been announced.
- Based on current forecasts in both the medium and high scenarios, the 0.6 EJ (15.8 Mt HFOe) figure could potentially be reached only with green ammonia projects at 0.63 EJ (16.6 Mt HFOe) and 2.07 EJ (54.5 Mt HFOe), respectively. This is an interesting result as it suggests that under such a scenario, shipowners could possibly explore more market security around a singular fuel option. However, this is based purely on current supply growth trends and does not take into account other possible considerations for fuel choice.
- In terms of blue pathways,[14] there has also been traction in terms of CCUS project development and application. For the first time in its history, the Green Climate Fund has awarded funding associated with a CCUS project to Trinidad & Tobago, the world's largest ammonia export hub. The funding covers the assessment of storage potential in deep saline formations and the creation of a national storage atlas, which contains detailed topographical and geological data.[xxxvi]

14 Pathways where SZEF hydrogen feedstock is produced from natural gas and the associated carbon byproduct is addressed by carbon capture and storage (CCS) instead of releasing it into the atmosphere

Figure 3: Estimated total supply of SZEF for maritime usage compared to 0.6-1.2 EJ 2030 requirement in line with the 5%-10% SZEF 2030 goal



7. SZEF bunkering and supply chains at key ports | **PARTIALLY ON TRACK**

- Development of infrastructure and supply chains associated with SZEF bunkering will be critical to achieving the 5-10% goal. While nearly all currently available non-fossil fuel bunkering is associated with either grey or bio-production pathways, SZEF supply chains are being developed, as evidenced by Singapore's recent RfP for ammonia bunkering.[xxxvii]
- Clarksons Research indicates that there were 19 ports offering some type of methanol bunkering as of April 2025, up from 15 at the end of the preceding year. Another six ports are scheduled to begin offering methanol bunkering services in both 2025 and 2026, with the total number of ports either currently offering or planning to offer methanol bunkering totalling 38.[xxxviii]
- Clarksons Research indicates that four ports had established the ability to provide bunkering of ammonia as of April 2025, up from three at the end of 2024. A further 28 ports were noted to be developing the capacity to offer ammonia bunkering in the near future, including three due in 2025 and 12 due in 2026. Overall, there are a total of 32 ports currently offering or planning to offer ammonia bunkering.[xxxix]Overall, the 19 ports currently offering methanol bunkering services are approaching a level that may boost the feasibility of methanol uptake for vessel operators worldwide. In addition, while still catching up to the number of ports offering methanol bunkering, projections indicate a growing availability of ammonia bunkering services. These statistics also indicate good progress with respect to the Zero-Emission Shipping Mission 2030 target of having 20 key ports offering well-to-wake zero-emission bunkering by 2030 across at least three continents. This indicator is therefore thought to be partially on track.

Tracking progress: Partially on track

Table 2: Technology and supply lever progress

Key actions:	Progress	Target by	
		2025	2030
Technology pilots and demonstration projects	ON TRACK	10 projects on track. 20 collaborations.	
Key technological developments	PARTIALLY ON TRACK	Ammonia engines commercially available.	
Hydrogen strategy developments	PARTIALLY ON TRACK	50 hydrogen strategies.	100 hydrogen strategies.
Cost of green hydrogen production	PARTIALLY ON TRACK	Green hydrogen production cost $2/kg.	Green hydrogen production cost reaching $1.5/kg in some regions.
Electrolyser and hydrogen production capacity	ON TRACK		60 GW green hydrogen electrolyser capacity for shipping offtake.
Scale-up of SZEF production	PARTIALLY ON TRACK	0.1 EJ (indicative target).	0.6 EJ (equating to 29.8 Mt ammonia or 28.1 Mt of methanol).
SZEF bunkering and supply chains at key ports	PARTIALLY ON TRACK		20 key ports covering at least three continents offering well-to-wake zero-emission bunkering by 2030.

Demand

SIGNAL OF CHANGE

BHP Group has continued with its plans to deliver an ammonia-fuelled bulk carrier in 2028,[xl] while Höegh Autoliners has partnered with the energy company Fortescue to explore the development of a maritime green ammonia supply chain and jointly call on global shipping to speed up the adoption of green ammonia as a maritime fuel.[xli]

Yara has chartered both an ammonia-fuelled container ship (i.e., Yara Eyde) and an ammonia-fuelled medium gas carrier to speed up clean ammonia adoption and is expected to become operational as early as 2026.[xlii]

Overview

Demand for SZEF from stakeholders across the value chain plays an important role in moving shipping towards the 5-10% goal, setting the pace and ambition of the transition, and stimulating supply. Demand is tracked by looking at the existing fleet capable or ready[15] for SZEF and how these fleets are likely to grow, together with a few (more qualitative) indicators on actions being taken by key industry actors.

It was estimated that by 2025 there would need to be demand for (and use of) about 0.1 EJ (2.6 Mt HFOe) worth of SZEF from shipping, with this increasing quickly to approximately 0.6-1.2 EJ by 2030. These targets would be the equivalent of about 100 15,000 TEU containerships running on SZEF for a year in 2025 and about 600 similar ships in 2030, if no other shipping sectors take up SZEF. As of now, the 2025 target has not been reached and the 2030 goal is not on track.

The latest projections[16] for the potential demand for SZEF remain short of the 0.6-1.2 EJ (15.8-31.6 Mt HFOe) needed to meet the 5-10% goal for 2030. Expectations for potential SZEF demand for 2025 and 2030 are similar to the previous report, but it is unlikely that the 2025 target will be met by the end of the year. Currently, there is potential demand equivalent to what would be generated from about 25 15,000 TEU containerships (of the 100 ships required to meet the goal) in 2025.

Roughly 600 15,000 TEU containerships would need to run entirely on SZEF all year to hit the 0.6 EJ target for 2030, but current projections suggest that the industry could only reach the equivalent of around 200 ships. The table below highlights low, medium, and high scenarios based on the modelling and methodology developed in this and previous editions of this report. Comparisons of these projections to required targets for 2030 are shown in Figure 4.

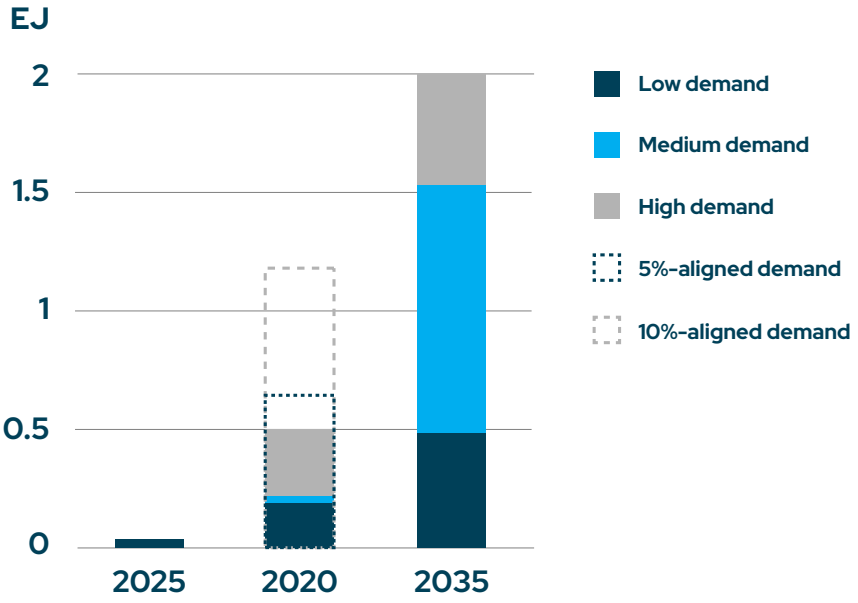
Table 3: Demand potential for SZEF in EJ

	SZEF demand potential (EJ)		
	2025	2030	2035
Low	0.025	0.10	0.55
Medium	0.026	0.22	1.54
High	0.028	0.49	2.29

15 A vessel that is classed as SZEF-capable is expected to be able to already use SZEF fuels with little to no modifications, whilst an SZEF-ready vessel is expected to potentially need a significant retrofit to become fully able to use SZEF.

16 Projections utilise trends seen in ordering and delivery of SZEF-capable vessels in the fleet, as in the previous reports, and are extrapolated over an S-shaped growth path where about a 1/3 of the vessels delivered in 2030, about 2/3 of the vessels delivered in 2035, and close to all vessels delivered in 2040 and beyond are SZEF-capable. For context, at present about 6% of total GT to be delivered in 2025 and 9% to be delivered in 2026 is expected to be SZEF-capable

Figure 4: Estimated total potential SZEF demand based on fleet growth, compared to targets for 2030



1. Industry actors set and commit to net-zero targets | **PARTIALLY ON TRACK**

- Several new stakeholders have now set long-term net-zero targets compared to 2023, indicating positive momentum towards potential SZEF demand in the coming years. Those publicly committing to these targets have also increased, with the total now meeting the ambitions for five to ten shipowners and one to five ports and shipyards that were set to be achieved by 2025. Committed actors remain on the low end for both groups, and, thus, a rapid increase will be needed to meet stronger ambitions. This net increase in stakeholders publicly committing to net zero targets occurred despite a few retreating from their targets, their commitments, or both.
- This year, this indicator has been expanded to show more detail (short- and long-term targets and commitments, for example) and incorporate data from members of the Getting to Zero Coalition and the Climate High-Level Champions' Race to Zero Initiative.

Table 4: Stakeholder targets and commitments to net zero

Stakeholder	Short-term targets set	Committed to short term targets	Long term target set to net zero	Committed to long term net zero	Under SBTi tracking
Shipowners, operators, and charterers	13	7	6	6	16
Ports, shipyards, and related facilities	12	3	2	2	12
Total	**25**	**10**	**8**	**8**	**28**

2. Zero-carbon freight use grows | **NOT ON TRACK**

- Several shifts appear to be taking place, suggesting that demand (and willingness to pay) for zero- or low-carbon freight may be growing and that cargo owners are being offered more options for such freight.
- Boston Consulting Group's latest Shipping Decarbonisation Survey (2025) suggests that four out of five cargo owners report a willingness to pay (WTP) at some level for low-carbon freight, with an average WTP premium of 4.5%. However, this WTP premium is short of what is necessary and significant constraints remain with transparency, traceability, and trust in green fuels.
- The Getting to Zero Coalition's Action Framework (2025) has also tracked progress in this area within their membership by collecting data on the action "commercialising zero-emission shipping services" (Action 13). This action looks at the extent to which Coalition members—specifically shipowners, operators, and freight forwarders—offer such services. Their actions were graded and categorised into tiers: the lowest tier (Tier 3) means that a zero-emission product is offered, Tier 2 entails that these products are growing annually, and the highest one (Tier 1) means that their zero-emission products constitute at least 10% of the total products they offer. Based on all responses and their associated tiers, this action reached a score of 6% of the maximum possible score. While more progress is required across the membership, several members have made significant strides in offering such services. Two companies reported year-on-year growth for these services, suggesting an emerging and growing market, despite indicating a lack of demand for their services as a critical challenge.
- Action 12 of the Getting to Zero Coalition Action Framework tracks the development and use of the related approach of book and claim. A book-and-claim system allows the emissions savings of low-emission fuels to be tracked separately from the physical use of the fuel, enabling a customer to pay for and "claim" the emissions savings even if they don't physically receive the fuel. This action received a total score of 20% of the maximum possible score, with ten companies active in this area. More than half already offer verified versions of this solution, and a few also add verified additionality assurance. The higher level of progress in this action compared to the commercialisation of zero-emission shipping services suggests that it may be working as a bridging mechanism that helps match demand for low-carbon fuels to an underdeveloped, scarce, and geographically sparse supply of such fuels. Some independent systems are emerging, like Katalist,[17] which can enable smaller companies to take advantage of book-and-claim services without building one internally.
- Companies offering either direct use of low-carbon fuels or utilising book and claim systems—often referred to as "insetting"—include CMA CGM, Hapag-Lloyd, Höegh Autoliners, Maersk, MSC, Mitsui O.S.K. Lines, Norden, Stena Line, and Wallenius Wilhelmsen, amongst others.[18] Although offerings have been growing, it's worth noting that a product offered doesn't imply it was used. Moreover, most—if not all—of such solutions have relied on the use of biofuels (or blends of biofuels with conventional fuels) to reduce emissions. At present, biofuels do not meet the criteria set to qualify as SZEF as defined in this report.

17 See here for more details: https://www.katalist.org/

18 Based on internal analysis of publicly available data

- There are no significant known cases of cargo being moved in practice on SZEF, though active tenders to buy and use SZEF aim to correct this in the near future.[19] Therefore, this indicator is still not on track. As global regulation on the life cycle emissions of different fuels, fuel standards, and SZEF supply increases, the current crop of product offerings should provide a set of ready-made platforms allowing customers to make use of SZEF.

3. Growth in the share of SZEF-capable vessels in the active fleet | **NOT ON TRACK**

- SZEF-capable vessels are vessels that can utilise SZEF without any further modifications, while SZEF-ready vessels are those that would require some level of modification or retrofitting to enable SZEF use. Both of these fleets are tracked separately, as SZEF-ready notations are less well understood, moderated, and harmonised, such that there remains uncertainty on the level of modifications needed to go from "ready" to "capable" for individual vessels.
- Total gross tonnage (GT) of active or in-service vessels[20] grew by 3% to the end of 2024, but the share of SZEF-capable GT has stayed relatively constant (at 0.2%, down slightly from the end of 2023). The largest increase was in tonnage capable of utilising liquefied natural gas (LNG), which now accounts for about 7% of the total fleet. LNG, however, does not meet the criteria required for being a SZEF today. Methanol-only and methanol dual-fuelled vessels increased their share slightly, from 0.06% to 0.16% of total GT and have spread to more shipping segments. The shares of most other SZEF-capable vessels remain close to zero.

4. Growth in the share of SZEF-ready vessels in the active fleet | **NOT ON TRACK**

- Tonnage classed as being "ready" for SZEF has grown from 0.3% to 2.2% of the total fleet since the previous report. Despite a large increase, the fleet remains in its infancy. Total SZEF-ready tonnage now outweighs SZEF-capable tonnage in the current fleet. This is to be expected, in part because the up-front difference in capital expenditure for a fully SZEF-capable ship is greater than that for an SZEF-ready ship.
- Clarity and consensus on what these notations mean remain uncertain,[21] and hence, "ready" tonnage is not considered a sure sign of potential demand for SZEF and is therefore not included in potential demand calculations.
- There continues to be a high level of diversity in terms of the types of fuels owners are opting to have their ships ready for, with no clear or obvious candidates emerging across the overall fleet.

19 The Zero Emission Maritime Buyers Alliance (ZEMBA), as discussed in previous iterations of this report, remains the closest initiative that connects cargo owners with SZEF. Their tender for e-fuel started accepting bids in Q1 2025

20 Vessels counted are those above 5000 GT and cover dry bulk carriers, chemical tankers, containerships, crude tankers, cruise ships, ferries, general cargo vessels, LNG carriers, LPG carriers, pure car carriers, product tankers, and Ro-Ro vessels. This includes both international and domestic carriers

21 Attempts to streamline "ready" notations have started, including, for example, Lloyds Register's Zero Ready Framework: Zero Ready Framework | The Decarb Hub

5. Share of order book with SZEF-capable vessels | **NOT ON TRACK**

- Only 54% of the order book in 2024 opted for conventional fuel-only tonnage, compared to around 75% seen in the previous year's order book (measured to the end of 2023). The shift away from conventional-only tonnage is significant, and potentially a sign of an increase in awareness of the need to reduce emissions and the greater likelihood of forthcoming policy interventions. Deliveries of these vessels, however, are unlikely until 2026 and beyond, so their effect on the fuel landscape is not immediate.
- LNG and LNG dual-fuel tonnage were the major benefactors of the shift away from conventional fuel-only tonnage and now represent 31% of total ordered GT (290 vessels) compared to 10% last year. Methanol-only and methanol dual-fuel orders come third, taking 8.3% of the share (105 ships), while ammonia and ammonia dual-fuel ships are up slightly from 0.1% to 0.6% (18 ships).

Table 5: 2024 Capable and ready order book profile

	Share of the order book (% of GT)		
	2022	2023	2024
SZEF-capable	3	6	9.5
SZEF-ready	15.9	14.1	19.8
Total	**18.9**	**20.1**	**29.3**

Note: Ordered vessels can often update their notation towards SZEF before delivery.

Table 6: Fuel preferences in the order book

Fuel capability	Share of the order book (% of GT)	Ships*
Ammonia dual-fuel	0.6	18
Conventional only	54	1134
Hydrogen and hydrogen dual fuel	0.6	7
LNG and LNG dual fuel	30.8	290
Methanol and methanol dual fuel	8.3	105
Other gas dual fuel	4.6	103

Fuel readiness	Share of the order book (% of GT)	Ships*
Ammonia	8.71	95
Ammonia-LNG	0.26	4
Ammonia-Methanol	1.43	19
Ammonia-Methanol-LNG	0.37	14
LNG	1.71	22
LNG-Methanol	1.24	13
Methanol	8.21	184

*Note: The numbers shown here may not be exhaustive and are based on a single source taken to include orders up to the end of 2024 (Clarksons World Fleet Register, 2025)

6. Share of order book with SZEF-ready tonnage | **NOT ON TRACK**

- Ammonia-ready and methanol-ready orders continue to dominate orders listed as SZEF-ready. New triple-fuel notations are present in 2024 orders, for instance, for ammonia-methanol-LNG-ready vessels. SZEF-ready orders have grown compared to the previous year, but to a lesser extent in relative terms than SZEF-capable orders. Given the uncertainty around what readiness implies, SZEF-capable tonnage leads the way in determining how well the industry is moving towards SZEF.

Tracking progress - not on track

Table 7: Demand lever progress

Key actions:	Progress	Target by	
		2025	2030
Industry actors set and commit to net-zero targets	PARTIALLY ON TRACK	20-30 shipowners or operators, as well as 10-20 ports or yards, committed to both near- and net-zero 2050 targets.	30+ shipowners or operators have net-zero targets and commitments, with at least half already taking stated actions.
Zero-carbon freight use grows	NOT ON TRACK	5-10% of TEU-miles to be SZEF if transition led by container ships alone. If other shipping segments also scale proportionally then about 1.5-3% of TEU-miles need to be SZEF.	8.75–12.5% of all TEU-miles to be SZEF if other shipping segments also take up SZEF.
Growth in the share of SZEF-capable vessels in the active fleet	NOT ON TRACK	100 15,000 TEU containerships running on e-methanol, or 20-30 15,000 TEU ships, if other shipping segments scale their use of SZEF proportionally.	600 15,000 TEU equivalent ships running e-methanol or ammonia, or about 150 ships if other segments take up SZEF at a similar pace. 18-36 Mt a year of SZEF to be demanded by the alternative fuel capable fleet. All delivered ships in 2030 to be SZEF-capable.
Growth in the SZEF-ready vessels in the active fleet	NOT ON TRACK	SZEF-ready ships in the fleet to become SZEF capable at their first dry dock on or before 2025.	All SZEF-ready vessels ordered before 2030 have been converted to SZEF capability.
Share of order book with SZEF-capable vessels	NOT ON TRACK	All new orders to be SZEF capable or SZEF only.	All new orders to be SZEF capable or SZEF only.
Share of order book with SZEF-ready vessels	NOT ON TRACK	All new orders to be SZEF capable or SZEF only.	All new orders to be SZEF capable or SZEF only.

Finance

Overview

Finance is a critical change lever in facilitating the transition to SZEF, both by encouraging and facilitating uptake and by discouraging the uptake of fuels, vessels, and related infrastructure that do not support SZEF.

Two indicators measure the changes that finance is having on the transition towards SZEF. The first covers the transparency and alignment of existing shipping debts with IMO targets (for example, via the Poseidon Principles and the Net Zero Banking Alliance). The second tracks the appetite for lenders to provide sustainability-linked loans, bonds, and other instruments to the shipping industry, which can help identify changes to the flow of capital required to critical areas of the industry and changes in the importance of sustainability put upon that capital.

SIGNAL OF CHANGE

In 2025, the Asian Development Bank launched its 'Sustainable and Resilient Maritime Fund' to "promote a just transition toward sustainable and resilient maritime infrastructure." Other mechanisms, like H2global[xliii] and the EU's hydrogen auctions,[22] are also coming online to help link supply to demand and enable funds to be available to prevent the "chicken-and-egg problem".

1. Increase in the share of shipping debt aligned with the IMO's decarbonisation trajectory | **NOT ON TRACK**

- The Poseidon Principles had 35 signatories at the end of 2024, a notable improvement from the previous year. This suggests there is consistent interest in measuring and reporting the climate alignment of shipping debt. Growing transparency ought to encourage further investigation and movement towards alignment.
- Membership in the Poseidon Principles allows financial institutions to compare where they are relative to two trajectories, one that reflects where they need to be to meet the 2023 IMO GHG Strategy's "minimum" targets and the other to meet the stronger "striving" targets. Each signatory is given an alignment score for its portfolio relative to these targets, with the goal of being as close to or below them as possible. An alignment score of 5% is better than 10% and indicates the portfolio is closer to where it needs to be to meet 2050 targets.
- It was possible to know or otherwise estimate the size of the shipping portfolios for 24 of the 35 signatories, covering over $192 billion in debt.[xliv] For these portfolios, the weighted alignment score (weighted by the size of their portfolios) is 16% for the "minimum" trajectory and 23% for the "striving" trajectory. There is a notable improvement compared to the minimum trajectory in the previous edition (24%), but less of a change in the "striving" score (28% in the previous edition).
- Petrofin now provides additional insights on sustainability-linked loans, showing European and Japanese banks leading the way in using such instruments.[xlv] However, this is deemed to still be in its nascency.
- As the trajectories get progressively steeper in the coming years, it remains to be seen whether gains made will be sustained. Alignment is likely to worsen given the steepness of the trajectory between 2025 and 2030, the slow pace of fleet renewal, and subdued changes seen in the order book (please see the Demand section). Some of the alignment improvements shown by Poseidon Principles signatories may have been achieved by energy efficiency measures taken on conventionally-fuelled vessels, so it is unclear how much of these improvements represent capability for SZEF uptake. Taken together, this indicator was deemed to remain off track.

22 See here for more details: https://climate.ec.europa.eu/eu-action/eu-funding-climate-action/innovation-fund/competitive-bidding_en

2. Increase in the issuances of sustainability-linked loans and bonds to the shipping industry | **NOT ON TRACK**

- Approximately $3.4 billion was issued through sustainability-linked loans or green bonds to shipping-related entities in 2024, almost all of it going to shipowners and operators. This is up from the $2.4 billion seen in the calendar year 2023.[23]
- $12 billion was issued to energy producers and technology providers, bringing the total tracked to over $15 billion for 2024. None of these issuances guarantees or implies an application to the development of SZEF, vessels that could use such fuels, or the infrastructure, products, or services required for their distribution and uptake.
- GSS+ (green, social, and sustainability) bonds totalled $1.05 trillion in 2024, up significantly from $871.6 billion in 2022.[xlvi] Shipping's share has, however, remained relatively similar to the end of 2023. The cumulative total recorded is up from $10.1 billion at the end of 2022 to $12.5 billion at the end of 2023, and $15.9 billion at the end of 2024; however, it is unclear how much (if any) of these funds went to SZEF-related activities.
- These remain lower than expected for 2025, and growth will need to multiply significantly over the coming years to reach the target for 2030.

Tracking progress - not on track

Table 8: Finance lever progress

Key actions:	Progress	Target by	
		2025	2030
Increase in the share of shipping debt aligned with the IMO's decarbonisation trajectory	NOT ON TRACK	Alignment of known portfolios to be below 10% for as much of observed shipping debt as possible. A greater percent of this to be below 5% than in 2022 (more than 14%).	Given stricter targets for 2030 Poseidon Principles trajectory, same requirement as in 2025 to stay below 10% and a larger share to be below 5%.
Increase in the issuances of sustainability-linked loans and bonds to the shipping industry	NOT ON TRACK	Maintain or increase the share of total sustainability-linked debt issued to shipping. Total cumulative amount to reach at least $20 bn (twice the 2022 level).	Increasing amount of funds issued to maritime actors, with the cumulative total of sustainability linked loans and bonds to reach $50 bn.

23 These numbers for issuances totalling $3.4 billion (shipping entities) and $12 billion (energy producers and technology providers) are based on Clarksons SIN (2025) data. This dataset is likely not exhaustive and hence the numbers here ought to be taken to be the lower bound of known issuances in the shipping industry

Policy

SIGNAL OF CHANGE

The past 12 months have seen growing national-level commitments to promote the creation of renewable hydrogen supply chains, including the support of several organisations and governments (e.g., Germany, Netherlands, Canada, Australia, and the European Union) towards the H2Global mechanism.[xlvii]

Overview

Policy actions are related to multiple industry actions, national/international commitments, and regulatory developments that facilitate the decarbonisation of domestic (i.e., coastal and short-sea shipping) and international shipping. When thinking of SZEF adoption, it is important to consider a range of not only global developments but also national and regional actions, as the combined actions on multiple levels can lead to positive reinforcement and create multiple pathways towards decarbonisation.[xlviii]

1. Classification societies research and set operational, bunkering and safety standards for SZEF | **ON TRACK**

- Classification societies have continued to play an important role in setting SZEF standards for safety, operations, and bunkering. Multiple examples have been observed of continued progress in this regard over the past 12 months, including Class NK's release of new guidelines for the safe operation of ammonia-fuelled vessels,[xlix] the collaboration between Yara and DNV on ammonia safety that led to the development of a recommended practice,[l] and ABS's publication of 'Safety Insights for Ammonia as a Marine Fuel'.[li]
- This is happening at an important time when the first trials of ammonia ship-to-ship (STS) bunkering are taking place,[lii] and classification societies and organisations such as SGMF have continued making progress in guidelines.[liii] Similarly, other organisations have continued developing a better understanding of SZEF safety and bunkering guideline requirements, with the Korean Register of Shipping signing a memorandum of understanding in late 2024 on the development of safety standards of ammonia STS bunkering together with four other organisations.[liv]

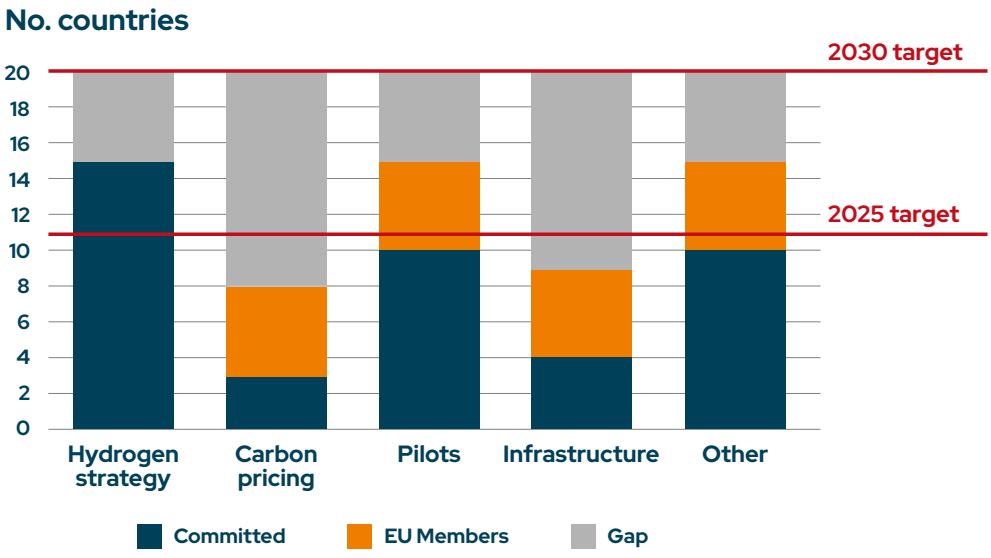
2. National/regional governments publish action plans to decarbonise shipping | **PARTIALLY ON TRACK**

- Commitments made in previous years on a national level have remained in place. These provide a positive trend of continued national-level policy movements in the right direction. There have been growing movements in terms of the continued engagement of national and plurilateral carbon prices for shipping with the EU Emissions Trading System (EU ETS). There have also been some positive developments in the Global South, such as work by Kenya,[lv] Ghana,[lvi] and Egypt,[lvii] to develop national action plans to decarbonise shipping, while more and more countries are including domestic shipping in their Nationally Determined Contributions (NDCs) under the Paris Agreement.[lviii]
- The first full year of shipping's inclusion in the EU Fuel Maritime showed no significant evidence of rule evasion,[lix] while other countries, such as the UK and Turkey, are also exploring or implementing carbon pricing for shipping.[lx] These examples highlight positive trends in terms of national regulation, but with the IMO Net-Zero Framework now under agreement, it is more important than ever for more stringent national action to take place to galvanise support for supply and demand growth. Of the five broad policy areas being tracked, only three of the top ten shipping nations have some form of sufficient national action. With this in mind, progress can only be assessed as being partially on track.

3. Governments policies targeting SZEF adoption in maritime | **NOT ON TRACK**

- SZEF adoption in shipping has generally continued to be covered mostly indirectly through the adoption of various hydrogen strategies and associated mandates, which coupled with private sector and port-level bunkering commitments, have made some movement in the right direction. FuelEU Maritime came fully into force on 1 January 2025 and provides an additional level of regulatory support in the direction of maritime decarbonisation.[lxi] Part of this is the additional incentive for renewable fuels of non-biological origin (RFNBO) as written within the directive, which covers SZEF as defined in this report.
- Several examples exist of growing support for hydrogen projects, such as funding for a range of EU projects with funds from the EU ETS that include hydrogen for maritime use.[lxii]
- There have been multiple examples of various national and subnational public policy entities supporting SZEF adoption through various pilot projects, but there have been limited maritime-specific actions directed specifically towards wider SZEF adoption. Examples of such pilots include a methanol-powered tugboat at the Port of Antwerp-Bruges[lxiii] and funding for a short-sea ammonia bulk carrier in Norway.[lxiv] Because of this, and in the context of 2030 being closer, the indicator is considered to be not on track.

Figure 5: Regulatory developments in top 20 countries[24]



24 Based on an analysis of publicly-available information from press releases, government-issued reports, and other associated documents for the 20 countries outlined: Belgium, Brazil, China, Germany, India, Indonesia, Italy, Japan, Malaysia, Netherlands, Philippines, Singapore, South Korea, Spain, Thailand, Turkey, United Arab Emirates, United Kingdom, United States, and Vietnam

4. IMO to agree mid- and long-term measures for shipping (e.g., market-based and non-market-based measures) which are aligned with 5% SZEF and decarbonisation by 2050 | **NOT ON TRACK**

- In April of 2025, the IMO approved a draft International Convention for the Prevention of Pollution from Ships (MARPOL) amendment to its Net Zero Framework (NZF). This specifies legally-binding policy measures for further driving shipping's GHG emission reductions (in addition to existing policies intended for incentivising energy efficiency improvement in the short term). The policy measures include a fuel standard and GHG pricing (i.e., a combination of market-based and technical or non-market based measures as specified in the key action). Under the basic parameters incentivising compliance (which include credit trading for incentivising "over performance"), there is no expectation of SZEF demand until around 2040.[lxv] In acknowledging this, the measures include a reward mechanism for supporting the early adoption of zero- or near-zero-emission fuels. The IMO is set to adopt the approved measures in October 2025. Assuming adoption, this outcome can be considered relative to the two discrete objectives in the key action as:
  - *Does the adopted measure align with 5% SZEF by 2030?* The NZF specifies ZNZ as achieving at least a maximum GHG intensity of 19g/MJ (e.g., at least 80% lower GHG intensity than conventional fuels). This stringency further reduces to 14g/MJ from 2034. Further definition of ZNZ (e.g., whether it will be defined as fuels/energy that are scalable, in line with this work's classification of SZEF), and specification of how ZNZ will be rewarded will become clear in guidelines yet to be developed. The scale of total revenue available in IMO's NZF is estimated as $11-12 billion per annum during the period to 2030.[lxvi] However, the details as to what share of that total will be allocated to the ZNZ reward are also as yet unspecified. It is positive that a policy to support the early adoption of certain fuel/energy, including SZEF, has been approved. However, the absence of detail and therefore uncertainty that remains in the extent of support means that the approved policy is not on track for unlocking investment into the 5% SZEF objective.[lxvii]
  - *Does the adopted measure align with decarbonisation by 2050?* The NZF specifies annual GHG intensity objectives to 2035, as well as for the period to 2040. The absolute GHG emissions reductions are estimated to approach but fall short of the 2023 IMO GHG Strategy objectives in 2030, and in the absence of specification of detail beyond 2040, it cannot be certain that they will drive decarbonisation by 2050. However, with a review in 2030, the framework has the potential for strengthening within a time period that could still result in that outcome.

5. IMO adopts guidelines to estimate well-to-tank GHG emissions and regulation/ incentives for SZEF | **NOT ON TRACK**

- The IMO has already adopted a set of guidelines that include methods for the estimation of well-to-wake GHG emissions (most recently in 2024). The guidelines, however, remain incomplete (for example, they lack default values for the large majority of fuels listed, including SZEF). The IMO agreed to delegate further analysis to a scientific committee, which is expected to provide an interim report on its progress in October 2025, but its full report is not expected until 2026 and uncertainty remains as to how much further work will then be needed before a more complete set of life cycle assessment (LCA) guidelines can be approved. In the current draft workplan, there are adoption milestones for LCA guidelines at the Marine Environment Protection Committee meeting in spring 2026 (MEPC 84) and at MEPC 86 in summer 2027. Alongside LCA guideline development, the same workplan projects an ongoing evolution of the default emission factors, as well as the evolution of guidelines and processes for recognition of certification schemes. The consequence of these processes and their timescale is to prolong uncertainty in the market on the relative competitiveness of different fuel/energy options, including SZEF and its competitors, and therefore adding risk to investment, or causing decision-making to be postponed. This key action is not on track.
- The previous key action includes a discussion on including incentives for SZEF and assesses that this is not on track.

6. IMO agrees on a comprehensive decarbonisation strategy and zero-by-2050 target | **ON TRACK**

- IMO developments since 2024, specifically the approval in principle of its Net Zero Framework on schedule in April 2025, represent substantial progress, even with significant detail and clarification still needed. The 2023 IMO GHG Strategy remains the foundation for the IMO NZF and, as such, continues to offer the foundation for the decarbonisation of shipping by 2050. With this in mind, this indicator can be considered on track.
- The IMO has committed to a five-yearly review of its 2023 IMO GHG Strategy. The next "review with a view to adoption" is due at MEPC 88 in the autumn of 2028. The tracking action is to monitor that this revision and adoption happen on time as planned, and that it reinforces and builds on the 2023 IMO GHG Strategy—including ensuring that the objectives that relate to SZEF remain clear and at their current ambition or higher. At this point in time, the evidence that the IMO is already planning and scheduling this revision is sufficient to classify this as on track.

Tracking progress: Partially on track

Table 9: Policy lever progress

Key actions:	Progress	Target by	
		2025	2030
Classification societies research and set operational, bunkering and safety standards for SZEF	ON TRACK	In place at least five large classification societies.	
National/regional governments publish action plans to decarbonise shipping	PARTIALLY ON TRACK	In place for ten of the top 20 shipping countries.	In place for 20 out of top 20.
Governments policies targeting SZEF adoption in maritime	NOT ON TRACK	In place for 10 out of top 20 shipping countries across the board.	In place for 20 out of top 20 countries across the board.
IMO to agree mid- and long-term measures for shipping (e.g., market-based mechanisms (MBMs) and non-MBMs) which are aligned with 5% SZEF and decarbonisation by 2050	NOT ON TRACK	Mid-term measures agreed.	Long-term measures agreed.
IMO adopts guidelines to estimate well-to-tank GHG emissions and regulation/incentives for SZEF	NOT ON TRACK	In place.	
IMO agrees on comprehensive decarbonisation strategy and zero-by-2050 target	ON TRACK	In place.	The IMO adopts a 2028 IMO GHG Strategy (e.g., a further revision), reinforcing and building further ambition relative to the 2023 IMO GHG Strategy.

Civil society

Overview

The importance of the civil society lever continues to be critical. Tracking this lever utilises insights from the Maritime Just Transition Task Force (MJTTF), a ten-point action plan to achieve a just transition for seafarers. Additionally, some indicators have been modified and further quantified to better understand developments in ports, NGO and local community engagements, and within national and multilateral fora such as the IMO. Overall, the lever is partially on track.

1. SIDS and LDCs become more active and prominent in shipping decarbonisation negotiations | **PARTIALLY ON TRACK**

- A coalition of climate-vulnerable states—the "6PAC+" alliance of Pacific, Caribbean, and African small island nations—actively co-sponsored ambitious IMO proposals in 2025. Notably, they submitted a unified draft text for a GHG emissions levy, which received broad support. Indigenous voices also maintained a presence. The Inuit Circumpolar Council (ICC), the first indigenous NGO to participate at the IMO, had its consultative status renewed through 2025.
- The ICC is also working toward achieving permanent observer status, helping ensure that indigenous communities remain represented in international maritime negotiations. Despite this progress, many developing states and indigenous groups still lack the full capacity to engage meaningfully—for example, few can submit proposals or occupy formal roles within the IMO. While influence is growing, truly global representation has yet to be achieved.

2. Fundamental just transition principles in terms of global labour standards, gender/diversity, and health/safety | **PARTIALLY ON TRACK**

- While there has been progress in regard to labour standards, gender diversity, and health/safety in the context of seafarers, progress can only be considered partially on track. While in theory the 5-10% goal can be reached in a scenario where such standards are not fully met, such a transition would not be aligned with the wider IMO aim of achieving a just and equitable transition, nor would it meet the labour standards under the Maritime Labour Convention (MLC). It is estimated that around 450,000 seafarers need to be retrained and upskilled by 2030.[25] Some progress in training has been observed, an example is the support by ITF and ICS to recognise seafarers as 'key workers' under international law. This was an outcome of the fifth ILO special tripartite committee (STC5) meeting. Additionally, other training programmes have also been initiated, such as the 'Train the Trainer' programme for alternative fuels in sustainable shipping, with the first course having taken place in 2025.[lxix]

SIGNAL OF CHANGE

The Port of Seattle and the Port of Vancouver have both collaborated with indigenous peoples on land stewardship, recognition, and understanding on several projects.[lxviii] The joint discussions and work on these projects aim to ensure that a diverse range of voices are taken into account while also putting emphasis on traditional knowledge, practices and traditions.

25 Based on insights from the Maritime Just Transition Taskforce (MJJT)

3. Seafarer recruitment with support for career pathways and reduced attrition | **PARTIALLY ON TRACK**

- In the context of SZEF adoption, and within the wider economic hardships many maritime workers might face, the combined challenge of recruiting seafarers into a changing industry while ensuring they become well-trained and stay on is paramount. Progress towards establishing various mobility frameworks to develop transferable skills has been observed. Similarly, there is growing evidence that seafarers are willing to sail on vessels fuelled by SZEF.[lxx]
- There have been several MJTTF case studies and reports showing that progress has continued in this area, while various initiatives in the area have also been observed. The MJJT report 'Considerations of training aspects for seafarers on ships powered by ammonia, methanol and hydrogen' outlines work on risk assessment workshops, competencies, and industry views.[lxxi] Others, such as the Maritime and Port Authority of Singapore, are in the process of establishing a facility for training seafarers in the use of alternative marine fuels.[lxxii] However, with the IMO Net Zero Framework and imminent need to develop SZEF, significant progress in this area will be needed. Therefore, this indicator remains only partially on track.

4. Skills and training investment, strengthening of training standards, delivering fair training and monitoring skills | **PARTIALLY ON TRACK**

- Some progress within this indicator has been observed, and several relevant areas of the IMO Convention on Standards of Training, Certification and Watchkeeping for Seafarers have been highlighted for revision, including replacing and updating obsolete competencies, understanding, and proficiency in line with shipping's digitalisation evolution and decarbonisation trajectory.
- Work on the IMO's Subcommittee on Human Element Training and Watchkeeping has continued with a new foundation for standard development and a safety-first approach that is especially important in the context of SZEF development. The results of some of this work should be publicly available later this year.
- However, progress can only be considered partially on track since significant work remains to bring seafarer training and skills into line with what is needed to safely operate and bunker SZEF vessels.

5. Local civil society actors surrounding the top 50 global ports calling for air pollution mitigation, GHG reduction, and adoption of zero-emission fuels | **NOT ON TRACK**

- Local civil society engagement around ports has grown in both intensity and geographic reach. More port communities—in the Americas, Europe, and beyond—are now vocally demanding clean air measures, GHG reduction, and the adoption of zero-emission fuel strategies. Some notable victories have been achieved, ranging from stricter regional regulations to the formation of voluntary decarbonisation alliances.
- For example, the Dutch legal NGO Advocates for the Future, together with climate activists from Extinction Rebellion, launched a campaign demanding the Port of Rotterdam phase out fossil-fuel operations due to its massive carbon footprint. Separately, Extinction Rebellion protesters blocked a cruise ship in Rotterdam, calling for a ban on highly polluting cruise vessels until zero-emission fuels are in use. This highlights the ongoing NGO scrutiny of polluting port projects. While the number of active port community movements is increasing—with new entrants emerging in late 2024 and 2025—an analysis of the top 50 container ports revealed that only eight have active campaigns advocating for air pollution mitigation, GHG reduction, and the adoption of zero-emission fuel strategies.

Tracking progress - Partially on track

Table 10: Civil society lever progress

Key actions:	Progress	Target by	
		2025	2030
Indigenous groups, SIDS and LDCs become more active and prominent in shipping decarbonisation negotiations	PARTIALLY ON TRACK	Participating and co-sponsoring key IMO proposals.	
Fundamental just transition principles in terms of global labour standards, gender/diversity and health/safety	PARTIALLY ON TRACK		Transition planning aligned with the Maritime Labour Convention.
Seafarer recruitment with support for career pathways and reduced attrition	PARTIALLY ON TRACK	Address seafarer attrition.	Support seafarer career pathways.
Skills and training investment, strengthening of training standards, delivering fair training and monitoring of skills	PARTIALLY ON TRACK		450,000 seafarers to be retrained and upskilled.
Local civil society actors surrounding the top 50 global ports calling for air pollution mitigation, GHG reduction and adoption of zero-emission fuels	NOT ON TRACK	NGOs at eight of top 50 ports.	NGOs at 25 of top 50 ports.

Acronyms

Bn – Billion

CfD – Contracts for Difference

COP – Conference of the Parties

DF – Dual fuel

DNV – Det Norske Veritas

EEDI – Energy Efficiency Design Index

EEXI – Energy Efficiency Existing Ship Index

EJ – Exajoule

EU – European Union

FID – Final Investment Decision

GHG – Greenhouse gas

GT – Gross tons

GT/y – Gross tons per year

GW – Gigawatt

H2 – Hydrogen

HFOe – Heavy fuel oil -equivalent

ICE - Internal combustion engine

IGO – Intergovernmental organisation

RFNBO – Renewable fuels of non-biological origin

IMO – International Maritime Organization

ITF – International Transport Workers Federation

LCA – Life cycle analysis

LCOE – Levelised cost of electricity

LDCs – Less Developed Countries

LPG – Liquified Petroleum Gas

LR – Lloyd's Register

MarSTF – Maritime Sustainability Transitions Framework

MBM – Market Based Mechanisms

MEPC – Marine Environment Protection Committee

MJTTF – Maritime Just Transition Task Force

Mn – Million

Mt – Million tons

MtHFOe – megatons of HFO -equivalent

MW – Megawatt

MWh – Megawatt-hour

MJ – Megajoule

MJ/Mt – Megajoule/million tons

Acronyms

Mt – Megaton (million tonnes)
NAP – National Adaptation Plan
NDC – Nationally Determined Contribution
NGO – Non-Governmental Organization
NH3 – Ammonia
NZF – Net Zero Framework
PP – Poseidon Principles
PV – Photovoltaic
RfP – Request for Proposal
SBTi – Science Based Targets Initiative
SEEMP – Ship Energy Efficiency Management Plan
SGMF – Society for Gas as a Marine Fuel
SIDs – Small Island Developing States
SZEF – Scalable Zero Emission Fuel
TCO – Total cost of ownership
TEU – Twenty Foot Equivalent Unit
TRL – Technology Readiness Level
TWh – Terawatt-hour
UK – United Kingdom
UN – United Nations
UNEP – United Nations Environment Programme
ZEMBA – Zero Emission Maritime Buyers Alliance
ZEV – Zero Emission Vessel
ZNZ – Zero or Near-Zero fuels

Endnotes

i Smith et al., 2022; DNV, 2024.

ii Rehmatulla, 2025a.

iii Rehmatulla, 2025b.

iv Global Maritime Forum, 2025.

v LR Foundation, 2025.

vi Smith et al., 2021; DNV, 2024.

vii Rehmatulla, 2025b.

viii INCAT, 2025.

ix Getting to Zero Coalition, 2025.

x MAN, 2024.

xi WinGD, 2025a.

xii AEA, 2025b; TradeWinds, 2024.

xiii MAN, 2025a; MAN, 2025b; WinGD, 2024; WinGD,2025b.

xiv Getting to Zero Coalition, 2025.

xv Amogy, 2024; Fortescue, 2025; NYK, 2024; iMarine, 2025; Marine Insight, 2025.

xvi Getting to Zero Coalition, 2025.

xvii Getting to Zero Coalition, 2025.

xviii TradeWinds, 2025.

xix Getting to Zero Coalition, 2025.

xx Getting to Zero Coalition, 2025.

xxi IEA, 2025.

xxii IEA, 2024.

xxiii IEA, 2024.

xxiv IEA, 2024.

xxv Hydrogen Insight, 2024; Hydrogen Insight, 2025a.

xxvi NEOM, 2023.

xxvii Hydrogen Europe Research, 2024; Bruegel, 2024.

xxviii H2Global, 2024; AEA, 2024.

xxix Hydrogen Insight, 2025b.

xxx Envision Group, 2025; Marubeni Corporation, 2025.

xxxi S&P Global, 2025.

xxxii IEA, 2024.

xxxiii IEA, 2024.

xxxiv AEA, 2025a; Methanol Institute, 2025.

xxxv Reuters, 2025.

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xl Reuters, 2024; BHP, 2025.

xli Hoegh, 2024.

xlii Yara, 2023; Yara, 2025.

xliii H2Global, 2025.

xliv Petrofin, 2025.

xlv Petrofin, 2025, p. 11-12.

xlvi Climate Bonds Initiative, 2025.

xlvii H2Global, 2025.

xlviii Smith et al., 2021.

xlix Class NK, 2025.

l Yara, 2025b.

li ABS, 2025.

lii Port of Rotterdam, 2025; Yara, 2024.

liii SGMF, 2024.

liv Lloyd's List, 2024b.

lv GreenVoyage 2050, 2025.

lvi IMO, 2025a.

lvii IMO, 2025b.

lviii WRI, 2025.

lix EC, 2025a.

lx Lloyd's List, 2024c; UK Government, 2024.

lxi EC, 2025b.

lxii EC, 2025c.

lxiii EC, 2025d.

lxiv Ocean Highway Cluster, 2025.

lxv Rehmatulla, 2025a.

lxvi Rehmatulla, 2025a.

lxvii Rehmatulla, 2025a.

lxviii Port of Vancouver, 2025.

lxix LR Foundation, 2025.

lxx MMMCZCS, 2024.

lxxi MJJT, 2024.

lxxii MPA, 2024.

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Appendix

Changes in the indicators (2022-2025 editions of this report)

Table 11: Progress over time on key indicators

Lever	Indicator	Edition			
		2022	2023	2024	2025
Technology and supply	SZEF pilots and demonstration projects (now 'Technology pilots and demonstration projects')	Partially on track	On track	On track	On track
	Cross-industry collaboration (now Technology pilots and demonstration projects')	On track	On track	On track	
	Key technological developments	On track	Not on track	Partially on track	Partially on track
	Government hydrogen strategies	Partially on track	On track	On track	Partially on track
	Cost of green hydrogen production	-	Partially on track	Partially on track	Partially on track
	Electrolyser and green hydrogen production capacity	-	Partially on track	Partially on track	On track
	SZEF production	Not on track	Partially on track	Partially on track	Partially on track
	SZEF bunkering and supply chains at key ports	-	-	-	Partially on track
Demand	Industry actors set and commit to net zero targets	-	On track	Partially on track	Partially on track
	Zero-carbon freight use grows	Not on track	Not on track	Not on track	Not on track
	Growth in the share of SZEF-capable vessels in the active fleet	-	Not on track	Not on track	Not on track
	Growth in the SZEF-ready vessels in the active fleet	-	Not on track	Not on track	Not on track
	Share of order book with SZEF-capable vessels	-	Not on track	Not on track	Not on track
	Share of order book with SZEF-ready vessels	-	Not on track	Not on track	Not on track
Finance	Increase the share of shipping debt aligned to trajectories needed to meet 2030/50 targets	-	Partially on track	Not on track	Not on track
	Increase in the issuances of sustainability linked loans and bonds to the shipping industry	-	Partially on track	Not on track	Not on track

Appendix

Policy	Classification societies research and set operational, bunkering and safety standards for SZEF	Partially on track	On track	On track	On track
	National/regional governments publish action plans to decarbonise shipping	Partially on track	On track	On track	Partially on track
	Governments policies targeting SZEF adoption in maritime	Partially on track	Partially on track	Partially on track	Not on track
	IMO to agree mid- and long-term measures for shipping (e.g., MBMs and non-MBMs) which are aligned with 5% SZEF and decarbonisation by 2050	Partially on track	Partially on track	On track	Not on track
	IMO adopt guidelines to estimate well-to-tank GHG emissions and regulation/ incentives for SZEF	Partially on track	Partially on track	Partially on track	Not on track
	IMO agrees on comprehensive decarbonisation strategy and zero by 2050 target	Partially on track	On track	On track	On track
Civil society	Indigenous groups, SIDS and LDCs become more active and prominent in shipping decarbonisation negotiations	Partially on track	Partially on track	Not on track	Partially on track
	Fundamental just transition principles in terms of global labour standards, gender/ diversity and health/safety	-	-	Partially on track	Partially on track
	Seafarer recruitment with support for career pathways and reduced attrition	-	-	Partially on track	Partially on track
	Skills and training investment, strengthening of training standards, delivering fair training, and monitoring of skills	-	-	Partially on track	Partially on track
	Local civil society actors surrounding the top 50 global ports calling for air pollution mitigation, GHG reduction and adoption of zero-emission fuels	On track	On track	Partially on track	Not on track

Definition of actions

i. *Technology and supply* – Key actions relating to the development of necessary on-board and shore-based infrastructure and technology for SZEF fuelled ships, such as electrolysers, fuel cells, internal combustion engine modifications, bunkering infrastructure, and production facilities.

ii. *Demand* – Necessary developments in terms of demand for SZEF so that – alongside a supportive policy environment – a viable market for SZEF fuels can be developed over time in a gradual manner, avoiding supply issues and facilitating a possibility for rapid production scale-up.

iii. *Finance* – Financial mechanisms necessary for the creation of a viable SZEF market, such as transparent ship finance, climate bonds, blended financing products, subsidies and other associated financial mechanisms.

iv. *Policy* – Necessary policy developments both at the national and international levels to facilitate the adoption of SZEF, such as economic and technical measures, guidelines, and agreements.

v. *Civil society* – Individual, workforce, and community engagement and action including the provision of future decent work, increasing participation of underrepresented groups in shipping climate change discussions such as small island developing states (SIDS) and least-developed countries (LDCs), indigenous communities, and a range of other diverse communities.

Actions are evaluated as:

a. **On track** – The actions and targets of the actions are progressing in line with requirements. All the actors involved are progressing with their respective developments in line with reaching the 5-10% goal.

b. **Partially on track** – The criteria related to these actions are progressing in a promising direction and are close to being met. However, there is either insufficient evidence to adequately ascertain target progress, significant progress that still falls short of the set target, or significant informal discussions/developments point to future progress, but no official announcements have yet been made.

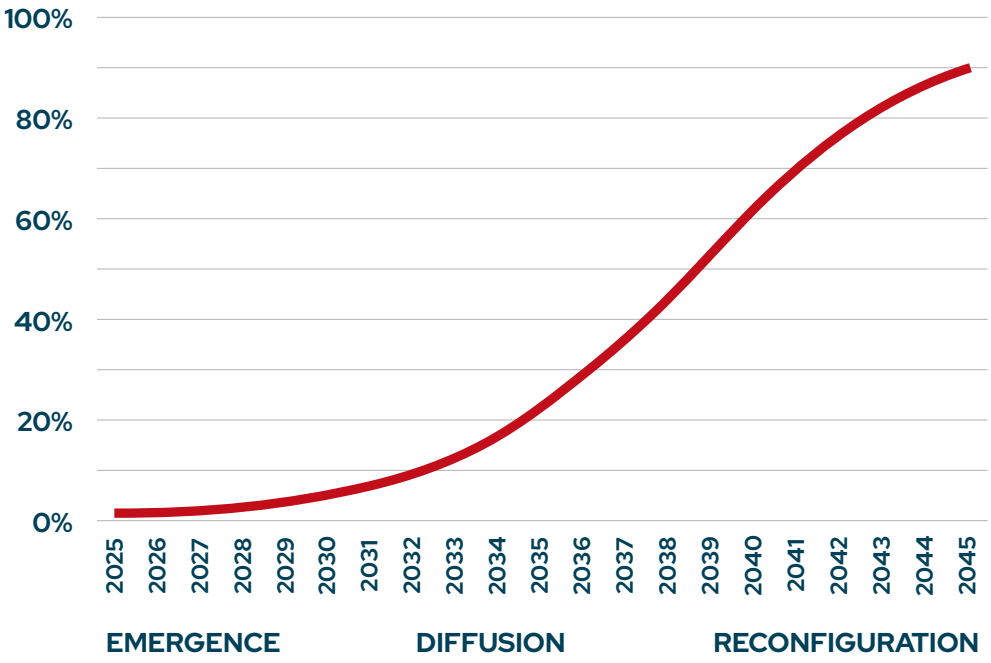
c. **Not on track** – The action and associated targets are not progressing in line with requirements necessary to reach the 5% goal.

ZNZ uptake by 2035

While the objective of 5-10% of ZNZ by 2030 in shipping is part of the 2023 IMO's Strategy, there is no quantified target for 2035. ZNZ fuels will be needed at a large scale by the 2040s, in particular e-fuels, as the energy efficiency gains and fuels with limited carbon benefits (e.g., LNG, food crop biofuels) are insufficient to meet the 2040 target and to meet carbon neutrality by 2050 (Smith et al, 2022; DNV, 2024). What the uptake of ZNZ between 2030 and 2050 could look like is largely uncertain, as new technologies uptake do not tend to be linear over time but characterised by setbacks, accelerations and tipping point (Geels & Ayoub, 2023, Geels et al, 2016).

Technology uptake has often been represented by a S-curve in the literature, where a phase of early development and experimentation characterised by a slow growth is followed by an accelerated phase, and the final phase being slower as the technology becomes dominant in the market. This shape is based on a strand of literature explaining the diffusion of a technology by learning effects and economies of scale, which means that the technology attractivity increases and therefore diffusion accelerates as the technologies gains ground, with has some resonance with the theoretical framework of socio-technical transitions (Geels & Ayoub, 2023) which serves as the theoretical framework for this report based on the MarSTF framework (Smith et al. 2021). However, the MLP literature insists on the agency of actors and the limits in projecting a technology uptake which is driven by social processes and sometimes unpredictable events (Geels et al, 2017). Furthermore, this shape has been empirically observed in the uptake of various low-carbon technologies, such as electricity generation from wind and solar (Speelman & Namuta, 2022, Way et al, 2022) and more recently in shipping regarding the uptake of electronic engines and LNG as a marine fuel (Fricaudet, 2025). Furthermore, the concept of non-linear S-curve-like uptake based on learning effects has been used to represent shipping technology uptake by Chica et al (2023), Karslen et al. (2019), Franz & Bramstoft (2024), Rehmatulla et al. (2015) and Fricaudet (2025) - although with a different mathematical modelling than the one presented below.

Figure 6: S-Curve depiction



We therefore calibrate an S-curve to the 2030 target (5-10% of the energy demand) and so that the uptake enters its final phase of expansion with a slowdown of growth in the 2040s. The formula of the curve is represented as follows:

$$share\ ZNZ\ = \frac{1}{1 + \ a\ \times e^{-b \times year\ from\ start}}$$

With a = 30, b = 0.3

Technology and supply

This edition of the report sees the combination of the 'SZEF Pilots and Demonstration Projects' and 'Cross-industry Collaboration' into a single indicator titled 'Technology Pilots and Demonstration Projects'. One additional indicator has been introduced into the Technology and Supply section representing 'SZEF Bunkering and Supply-chains at Key Ports'.

Ammonia and methanol supply estimate up to 2030

The ammonia and methanol supply estimates are based on data of announced projects obtained from the Ammonia Energy Association (AEA) and the Methanol Institute. The data is used to develop three scenarios of future supply for ammonia and methanol as marine fuels. In all cases, the assumption is based on projects relating to the development of green ammonia (i.e., from electrolysis using renewable electricity) and e-methanol (i.e., synthetic methanol produced using electrolysis and excluding usage of bio-methanol) as these fuels are in line with the definition of SZEF used for the purposes of this report. The scenarios are based on the following assumptions:

i. **Low scenario** – based on the assumption that 10% of all existing and planned green ammonia projects and 40% of all e-methanol projects which are currently planned to be operational by 2030 (i.e., mostly including post-FID projects, but also some pre-FID projects that are analysed as being under firm development) will be utilized for the supply of SZEF for international shipping.

ii. **Medium scenario** - based on the assumption that 20% of all existing and planned green ammonia projects and 50% of all e-methanol projects which are currently planned to be operational by 2030 will be utilized for the supply of SZEF for international shipping. In addition, this scenario also assumes a compounded annual growth rate of new capacity (i.e., based on average of previous annual growth rate of announced projects) between now and 2030 will take place based on historical rates of announced capacity changes over the years as observed in databases for green ammonia and e-methanol projects modified with the removal of outliers from the average (i.e., observed annual growth over 500% in some early years for some categories).

iii. **High scenario** - based on the assumption that 50% of all existing and planned green ammonia projects and 75% of all e-methanol projects which are currently planned to be operational by 2030 will be utilised for the supply of SZEF for international shipping. In addition, the scenario also assumes a compounded annual growth rate of new capacity announcements/ construction of 150% annually between now and 2030 will take place based on historical rates of announced capacity changes over the years as observed in databases for green ammonia and e-methanol projects modified with the removal of outliers from the average (i.e., observed annual growth over 500% in some early years for some categories). The proportions of 10%, 20%, and 50% of maritime supply vs. non-maritime for green ammonia and 40%, 50%, and 75% for e-methanol are based on historical trends in project announcements based on information obtained from the Methanol Institute and the Ammonia Energy Association, desk-based research of available data on planned usage of projects under development and discussions with methanol and ammonia experts on the likely breakdown of future demand.

Demand

Ship-equivalent fuel demand estimates

The equivalent number of 15,000 TEU vessels that would be needed to reach 0.1 and 0.6 EJ is calculated by using fuel consumption estimates from the 4th IMO GHG Study for an average vessel of this size and type and then comparing to the total amount of fuel needed if it were, for example, methanol to cover 0.1 or 0.6 EJ in energy. A 5% efficiency improvement is added to cover changes since 2018. 20,000 MJ/Mt is used for the energy content of methanol, 18,800 MJ/Mt for ammonia, and 40,490 MJ/Mt for HFO, to help with conversion.

2025, 2030 and 2035 required TEU estimate

Using data from the 4th IMO GHG Study on the days at sea, average speed, and median TEU capacity in each size category, it is possible to estimate the average expected TEU miles sailed for each size class of container ship. This is multiplied by the total number of vessels in each size class, to get to an estimate of the total TEU miles provided in 2018 by the whole fleet. Similarly, based on 600 15,000 TEU ships being needed to cover 0.6 EJ in 2030, the total TEU miles these 600 ships would sail in a year is estimated and used to work out the relative share of total TEU miles that would then potentially need to be SZEF-capable. This comes to about 40% of all TEU miles, but since the container fleet contributes about 25% of all merchant shipping emissions (based on 2018 estimates), the required TEU miles are reduced proportionally. An error margin is added to account for uncertainty on TEU-mile growth (or decline) from 2018 to 2025 and 2030, fuzziness in the average speed and time spent at sea, the resolution loss when using size-class level averages, and uncertainty in how size classes themselves might evolve. This leads to the 8.75-12.5% TEU-miles estimate for 2030, and the similar estimate of 1.5-3% for 2025 targets, both of which hold if other segments take up SZEF proportionally to their contribution in global emissions.

Estimated total SZEF-capable tonnage and potential SZEF demand for 2025, 2030 and 2035

The average growth in GT over the last five years (2020-2024) for the fleets with different fuel capabilities is calculated based on Clarksons WFR (2025) data, combined with the average GT ordered based on the same source, and then extrapolated to get 2025, 2030, and 2035 estimates of total SZEF-capable GT. This defines the "low" trajectory for 2030 onwards. For the "high" scenarios, an S-shaped growth path is used, allowing 1/3 of all delivered tonnage in 2030 to be SZEF-capable, 2/3 in 2035, and close to all delivered tonnage being SZEF-capable from 2040 onwards. The "medium" scenario sits roughly in between the "low" growth path and the "high" paths.

Table 12: Civil society actors at the top 50 container ports

Port	Active NGO(s)	Focus area(s)	Campaign description
Shanghai (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Singapore	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Ningbo-Zhoushan (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Shenzhen (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Guangzhou Harbor (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Busan (South Korea)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Qingdao (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Hong Kong (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025. (Hong Kong's port emissions are addressed mainly by government policies.)
Tianjin (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.

Rotterdam (Netherlands)	Advocates for the Future; Extinction Rebellion (NL)	GHG reduction; Air pollution; Zero-emission shipping	A Dutch legal NGO Advocates for the Future, together with climate activists (Extinction Rebellion), launched a campaign demanding the Port of Rotterdam phase out fossil-fuel operations due to its massive carbon footprint. Separately, Extinction Rebellion protesters even blocked a cruise ship in Rotterdam, calling for a ban on highly-polluting cruise vessels until zero-emission fuels are in use.
Jebel Ali, Dubai (UAE)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025 (civic space for such activism is very limited).
Port Klang (Malaysia)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Xiamen (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Antwerp (Belgium)	ClientEarth (with Belgian & Dutch partners)	GHG reduction; Air pollution	Environmental law NGO ClientEarth – supported by Belgian and Dutch non-profits – filed a legal challenge to stop a new ethane cracker project in the Port of Antwerp, citing cross-border pollution and huge CO_2 emissions if built. This campaign aims to halt fossil-fuel expansion and mitigate climate and air-quality impacts.
Kaohsiung (Taiwan)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Dalian (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Los Angeles (USA)	Coalition for Clean Air; Earthjustice	Air pollution mitigation; Zero-emission trucks & equipment	Local environmental groups have long pushed the LA port to clean up diesel emissions. In 2025, Coalition for Clean Air and Earthjustice criticized weak proposed rules and urged stronger mandates for zero-emission trucks and cargo handling equipment to protect port-adjacent communities. They continue to campaign for strict air pollution controls and electrification of port operations.
Hamburg (Germany)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Tanjung Pelepas (Malaysia)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Laem Chabang (Thailand)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.

Keihin Ports (Japan)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at these ports in 2025.
Long Beach (USA)	Pacific Environment (Ship It Zero coalition)	GHG reduction; Zero-emission shipping	Pacific Environment's Ship It Zero coalition has been actively campaigning for zero-emission maritime freight. In 2023, Long Beach's city leaders – responding to NGO advocacy – passed a resolution calling for 100% zero-emission ocean shipping by 2030. This reflects ongoing NGO pressure on the San Pedro Bay port complex to adopt cleaner fuels and electrify operations.
Tanjung Priok, Jakarta (Indonesia)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
New York–New Jersey (USA)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Colombo (Sri Lanka)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Ho Chi Minh City (Vietnam)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Suzhou (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025. (Note: Suzhou's port operations are primarily industrial and not known for NGO activity.)
Piraeus (Greece)	Transport & Environment (T&E)	Air pollution mitigation; Zero-emission fuels	European NGOs have turned attention to pollution from ships in the Mediterranean. In late 2024, Transport & Environment reported that Athens' port of Piraeus is again "choking on toxic air pollution from cruise ships" and urged authorities to require shore power and accelerate zero-emission fuels to protect public health. An alliance of Mediterranean NGOs is also lobbying for a NOx Emission Control Area to cut ship exhaust around ports.
Yingkou (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Valencia (Spain)	Local environmental activists (Extinction Rebellion, etc.)	Air pollution mitigation (cruise ships)	Valencia has seen grassroots activism against cruise ship pollution. In mid-2024, environmental protesters gathered at the Port of Valencia demanding an end to dirty cruise ships docking there, citing air pollution and impact on the city. These campaigns urge port authorities to limit cruise calls until cleaner, less-polluting ships are used.

Manila (Philippines)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025. (Manila's port pollution is recognized, but activism is not prominently reported.)
Taicang (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Hai Phong (Vietnam)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Algeciras (Spain)	None reported	N/A	No specific NGO-led campaigns were identified at Algeciras in 2025. (The port authority has its own "Green Strategy," but no notable external NGO campaign was reported.)
Jawaharlal Nehru Port (India)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025. (Major campaigns in India have focused on other environmental issues.)
Bremerhaven (Germany)	None reported	N/A	No specific NGO campaigns reported in 2025 for Bremerhaven. (German NGOs' port clean-air efforts have largely focused on Hamburg and cruise emissions.)
Tanger Med (Morocco)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025. (Civic environmental activism is limited in this region.)
Lianyungang (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Mundra (India)	Centre for Financial Accountability (CENFA)	Air pollution; Health impacts	Indian NGO CENFA highlighted environmental and health concerns at Mundra. In 2024 it reported that a planned PVC plastics plant in the Adani-run Mundra Port complex would compound pollution, noting authorities approved it without assessing cumulative impacts on local air quality and community health. This reflects ongoing NGO scrutiny of polluting port projects.
Savannah (USA)	Friends of the Earth; Community advocates	Air pollution mitigation; Environmental justice	Friends of the Earth has an active ports campaign on the U.S. East Coast. In 2024–2025, FoE organizers met with Port of Savannah officials alongside local community representatives, pushing for use of new federal funds to cut port diesel emissions. They urged the port to install better air monitors, electrify equipment, and address the health concerns of nearby neighborhoods long suffering from port-related air pollution.

Tokyo (Japan)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at the Port of Tokyo in 2025. (Japan's port decarbonisation efforts are primarily government-led.)
Rizhao (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Foshan (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Jeddah (Saudi Arabia)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025 (public environmental campaigning is minimal under local laws).
Colón (Panama)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Santos (Brazil)	None reported	N/A	No notable NGO campaigns were found at Santos in 2025 focusing on port air emissions or GHG. (The port and companies have internal sustainability initiatives, but no external NGO-led campaign was identified.)
Salalah (Oman)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025. (Civic environmental activism is very limited in Oman.)
Dongguan (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Guangxi Beibu (China)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.
Cai Mep (Vietnam)	None reported	N/A	No documented NGO campaigns related to air pollution, GHG, or zero-emission fuels at this port in 2025.

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