Staying on track

by Ewa Kochańska

As important of a role as international shipping plays economically, it is also responsible for significant environmental damage, ranking as the sixth largest greenhouse gas (GHG) emitter worldwide. To speed up its decarbonisation efforts, the International Maritime Organisation (IMO) GHG Strategy set a '2030 Breakthrough' target of having scalable zero-emission fuels (SZEF) make up 5% of international shipping fuels by that date. The newest *Climate Action in Shipping – Progress Towards Shipping's 2030 Breakthrough* report, authored by UMAS & UN Climate Change High-Level Champions and published annually, analysed SZEF adoption progress in 2023 compared to the year before. The findings show that there has been progress in areas such as IMO regulation, commitments from shipowners and governments (like national hydrogen initiatives), and the emergence of co-ops (e.g., the Zero Emission Maritime Buyers Alliance). However, full progress remains just partially on track due to challenges and uncertainty in fuel demand and technological and policy developments, among others.

The climate targets set up by various global regulatory bodies can only be achieved if sectors such as shipping accelerate their sustainability strategies and decarbonise. In 2023, progress towards achieving 5% SZEF by 2030 in maritime was noted. That said, the report suggests increasing the target to 10%, consistent with the new milestone from the 2023 IMO GHG Strategy ("5%, striving for 10% zero and near-zero GHG emission fuel use by 2030"), as it could stimulate more stakeholder action. Currently, the fleet capable of using SZEF only represents 1% of the 2030 goal.

While positive change is visible in the sector, there is still a need to ensure broader geographic representation in policy discussions and to address growing demand concerns. To illustrate its 2023 findings, the report names five levers of change – technology and supply, demand, finance, policy, and civil society – where progress is necessary for reaching the 2030 5% SZEF goal. The actions pertaining to each lever are qualified as either on, partially on, or not on track.

Navigating the technology wave along supply & demand

The report found that the maritime sector has seen significant technological advancements as it transitions to clean fuels, with a notable increase in zero-emission vessel projects: 373 in 2023 vs around 200 in the preceding year.

Equally encouraging is the prominent trend of collaboration across different industry segments, with numerous initiatives involving multiple value-chain segments. Projects related to fuel production, bunkering, and infrastructure are on the rise (mainly focusing on hydrogen-based technologies).

Furthermore, the industry has seen evident progress in ammonia and methanol internal combustion engines, already welcoming the first methanol-powered vessels. An ammonia engine should debut this year. However, concerns arise regarding the ability to manufacture these engines at a pace that meets the 5% target by 2030; for that to happen, "modelling suggests the equivalent of 600 container ships of 15,000-TEU capacity will be required," warns the report.

Additionally, cost reduction in green hydrogen production, forecasted to drop below $2 per kilogram by 2026, is crucial

Tab. 1. Summary of progression and key goals by 2030

CHANGE LEVER	PROGRESS	SCALE OF PROGRESS ON ACTIONS	GOALS BY 2030
TECHNOLOGY & SUPPLY		• 3/7 actions "on track" • 3/7 actions "partially on track" • 1/7 actions "not on track"	• 60 GW green hydrogen electrolyser capacity • Green hydrogen production cost of US$1.5-2/kg depending on the region • 0.6 EJ of SZEF supply available by 2030 and 0.1 EJ by 2025 (indicative)
DEMAND		• 2/8 actions "on track" • 1/8 actions "partially on track" • 5/8 actions "not on track"	• 600 15k TEU containerships equivalent of SZEF demand • 8.75-12.5% of all TEU-miles to be SZEF by 2030 if other segments also scale out proportionally to SZEF • All new ships to be SZEF-capable • Majority of existing SZEF-ready tonnage to be converted to full SZEF-capability
FINANCE		• All actions "partially on track"	• Alignment of shipping portfolios for as much of the US$ 500 bn+ of shipping debt to be as close to Poseidon Principles trajectories as possible – with those trajectories expected to match requirements for 1.5°C – but no higher than 10% and the majority to be under 5% • 2/3 or more of all shipping debt to be tied to Poseidon Principles trajectories, increasing coverage from APAC and Greek lenders, and continued transparency from Western lenders • Continued or increased issuances of sustainability-linked loans and bonds to, and interest from, shipowners and related segments including ports and fuel suppliers • Stricter requirements for eligibility for sustainability-linked loans and bonds and the focus to shift primarily to SZEF-related assets
POLICY		• 3/10 actions "on track" • 5/10 actions "partially on track" • 2/10 actions "not on track"	• Adoption of ambitious shipping economic instruments with regulatory support for 5% SZEF adoption • Top 20 countries by maritime traffic have ambitious domestic decarbonisation policies with increased hydrogen production commitments • International agreements on zero GHG shipping routes
CIVIL SOCIETY		• 2/5 actions "on track" • 3/5 actions "partially on track"	• Growing SIDS/LDC participation in IMO policy negotiations and or national action plans • Increased NGO pressure • Workforce upskilling/retraining programmes in place

Source for all tabs.: Climate Action in Shipping – Progress Towards Shipping's 2030 Breakthrough

Tab. 2. Technology and supply lever progress

KEY ACTIONS	TIMELINE: 22	25	30	PROGRESS	TARGET BY: 2023	2025	2030
Pilot and demonstration projects				ON TRACK		10 projects on track	
Cross-industry collaboration on SZEF ship projects				ON TRACK		20 collaborations	
Key SZEF technological developments				NOT ON TRACK		Ammonia engines commercially available	
Government-energy industry collaboration				ON TRACK	20 collaborations	50 collaborations	
Decrease in green hydrogen production costs				PARTIALLY ON TRACK		Green hydrogen production cost US$2/kg.	Green hydrogen production cost reaching US$1.5/kg in some regions
Increase in electrolyser and green hydrogen production capacity				PARTIALLY 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 equates to: 29.8 Mt of ammonia or 28.1 Mt of methanol

for scaling up supply. Yet even at a favourable production price of $1.5/kg, significant cost differences with fossil fuels persist for maritime use, and the report points out that "policy support mechanisms" will be essential to overcome the cost difference. Over 30 countries have released their hydrogen roadmaps, and 13 national hydrogen strategies have been published. "The current pipeline of project announcements in the IEA's [International Energy Agency] hydrogen database represents up to 24 million tonnes of green hydrogen capacity by 2030," says the report, before adding that just approximately 9.6% of the pipeline is either up & running or being constructed. Overall, reaching the requirements for scale and proportion by 2030 is "uncertain," and, therefore, electrolyser and green hydrogen capacity is just partially on track.

Additionally, green ammonia and e-methanol production announcements amount to around 192mt (4.3 exajoules) and 6.0mt (0.1EJ), respectively. Then again, only a fraction of this capacity is currently operational or under construction, and quite a few more projects will be needed to reach the 2030 goal of 5%, especially considering the potential competition for clean fuels from other sectors. Further, uncertainties remain regarding how much of this announced capacity will actually materialise and align with the requirements. Future scenarios for capacity depend on various factors, including growth rates and allocation for maritime use. Despite these uncertainties, overall production is partially on track.

Domestic shipping also has the potential to significantly contribute to the SZEF target. Its decarbonisation efforts serve as research, development & demonstration cases for tech advancements that benefit both local and international shipping without competing for the same fuels. Developed nations could achieve a 15% reduction domestically and a 2-3% reduction of total shipping energy via a 30% transition to zero-emission sources. This underscores how short-sea technologies like battery-electric and fuel-cell propulsion systems could indirectly aid in reaching the 5% target. It is important to note that while battery-electric propulsion is technologically advanced, fuel-cell propulsion lags. Despite progress, scaling up the adoption of these technologies is necessary to meet the emission reduction goal by 2030. Overall, the technology and supply lever progress has been evaluated as partially on track.

The report also highlights that the demand for SZEF needs to increase significantly by 2025 and 2030 to meet the sector's emission goals. Here, various stakeholders play a crucial role in achieving the 5% target by driving the speed of production and supply of clean fuels.

Progress on SZEF demand is tracked through several indicators, including commitments to net-zero targets, actions promoting zero-emission freight traffic, and the growth of SZEF-capable fleets.

Tab. 3. Demand lever progress

KEY ACTIONS	TIMELINE: 22	25	30	PROGRESS	TARGET BY: 2023	2025	2030
Key industry actors commit to net zero by 2050 based on SBTi requirements and actions				ON TRACK	5-10 shipowners and operators committed 1-5 ports or yards committed	20-30 shipowners or operators, as well as 10-20 ports or yards, committed to both near and 2050 targets and have actions set per SBTi requirements	30+ ship owners join "Race to Zero" 30+ have SBTi commitment, at least half of whom are already taking stated actions
Zero-emissions freight becomes increasingly commonplace				NOT ON TRACK	Commitments from freight purchasers to secure zero-emissions tonnage for at least 1% of all TEU-miles	5-10% of TEU-miles to be SZEF if transition led by containerships. If other segments also scale up, 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 segments also take up SZEF
Owners, freight purchasers, fuel producers, ports, finance, and other stakeholders take part in pilots and demonstrations to unlock SZEF potential				ON TRACK	Over 150 projects on fuel production, and similar number on bunkering and infrastructure	200+ fuel production and bunkering and infrastructure projects ongoing, at least 20 going beyond pilot stage into development	Slowdown in piloting and significant increase in capital deployment to build out fuel production and bunkering systems
"Dark green" corridors for zero-emission shipping start to materialise				PARTIALLY ON TRACK		3-6 "dark green" corridors on major deep-sea routes functioning with multiple vessels on each using SZEF on a regular basis 3-4 routes have a roadmap in place, 2-3 routes further routes are being considered for development	30+ deep sea "dark green" corridors in operation, contributing substantially to the 0.6 EJ SZEF fuel target

Tab. 4. System change levers

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 segments in line	600 15k TEU equivalent ships running on e-methanol or ammonia, or about 150 ships, if other segments take up SZEF at a similar pace 18-36 Mt/year of SZEF to be demanded by the alternative fuel capable fleet
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 to have been converted to SZEF capability
Share of orderbook 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 orderbook 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

While some indicators are on track or partially on track, such as commitments to actions as defined by the Science Based Targets initiative, others, like green corridors, are still a bit ambiguous; progress on the latter as a driver for demand is just partially on track. As such, despite some positive trends, uncertainties remain regarding SZEF adoption, especially considering that the current demand trajectory falls short of even the 2025 targets. Various segments of the industry need to contribute significantly to meet SZEF demand goals (not least shipping's clients through, e.g., energy insetting), although actual uptake is uncertain due to the potential of continued use of fossil fuels.

The growth in the number of alternative fuel ships has been primarily driven by liquefied natural gas (LNG), which has more than doubled its capacity between 2015 and 2022. However, LNG-powering and -capability are not SZEF compliant. At the same time, methanol-capable tonnage has grown from 0.01% to 0.06% – a substantial year-on-year growth, albeit to a tiny percentage of the fleet. Similarly, vessels liquefied petroleum gas- or ethane-capable have increased from 0.02% to 0.27% of total gross tonnage. Ammonia-capable ships are expected to enter the market not until late 2024.

Tighter regulations from the IMO and local authorities could increase demand for low-emission fuels beyond current projections. There must be a shift towards low-emission fuel-capable vessels, conversion of existing ships, and scrappage of older, high-emission tonnage to meet targets. While these changes are not yet fully evident, they are expected to progress in the coming years. As for now, the demand lever progress checks in at not on track.

Intersection of finance, policy, and civil society

Financing is another critical lever for reaching clean fuel targets because of its ability to promote the use of SZEF as well as discourage the use of polluting fuels and vessels. Four indicators have been used to track the changes that the finance sector has had on the SZEF transition, covering issues such as the alignment of shipping debt with 2030 and 2050 targets (e.g., via the Poseidon Principles), transparency in debt alignment, sustainability-linked loans and bonds, and public finance availability. For years now, a significant portion of shipping debt has been linked to the Poseidon Principles, with a slight improvement in alignment scores. However, these Poseidon trajectories fall short of the 5% SZEF by 2030 goal; that is why "updating the Poseidon Principles to be in line with a 1.5°C pathway should be considered a priority," advise the report's authors.

Debt transparency and alignment have improved, but the growth in debt coverage might slow down, especially if Asia Pacific and Greek lenders, who are increasing their lending to shipping, do not entirely comply with the Poseidon Principles. "Western banks' exposure to shipping, in contrast, has been declining, so progressive mandates from the EU, US, or UK lenders may be outweighed by less progressive behaviour by Asia Pacific or Greek lenders, and the correct balance could be missed in these indicators if their debts are not captured," underscores the report.

Sustainability-related loans and bonds issued to shipowners and operators have progressed, reaching about $10 billion since 2021. However, not all the financing

Tab. 5. Finance lever progress

KEY ACTIONS	TIMELINE: 22	25	30	PROGRESS	TARGET BY: 2023	2025	2030
Increase the share of shipping debt aligned to trajectories needed to meet 2030/50 targets				PARTIALLY ON TRACK		Alignment of known portfolios to be below 10% for as much of observed shipping debt as possible. A greater percentage of this to be below 5% than in 2022 (more than 14%)	Given stricter targets for 2030 Poseidon trajectory, the same requirement as in 2025 to stay below 10% and a larger share to be below 5%
Increase in willingness to report financing attached to shipping and its alignment to climate targets				PARTIALLY ON TRACK		Greater transparency of debt from APAC and Greek lenders through inclusion in Poseidon Principles Continued or improved transparency from Western lenders 50% of total ship financing to be covered under Poseidon Principles targets.	2/3 of total shipping debt to be transparent about alignment to Poseidon Principles targets.
Increase or maintain sufficient issuances of sustainability-linked loans and bonds to ship owners and operators				PARTIALLY ON TRACK		Maintain or increase the share of total sustainability-linked debt issued to shipping Total cumulative amount to reach at least US$20 bn (x2 2022 level) Conditions for eligibility and use of sustainability-linked loans to strengthen towards SZEF	Cumulative amount of sustainability-linked loans and bonds to US$50 bn Conditions for eligibility and use of sustainability-linked loans to become focused on SZEF-related assets
Mobilise industry funding for SZEF bunkering and production investment				PARTIALLY ON TRACK		US$1 bn/year by 2025	US$25 bn/year by 2030
Increase public finance (i.e., grants, loans) for SZEF-related activities				PARTIALLY ON TRACK		US$2-4 bn in total by 2025	US$6-10 bn in total by 2030

is consistent with or even linked to SZEF and related assets; therefore, at this point, these financing trends show "only an appetite to acquire such financing mechanisms in the industry," highlights the report. Sustainability-linked loans and bonds to ports and shipyards have also been issued, but it is unclear if they are being directed towards SZEF-related projects. More funding, estimated at $7.7b, has been declared by governments for shipping decarbonisation; yet, it needs to be distributed more evenly (geographically speaking, as most commitments are coming from the EU and US) and explicitly allocated to SZEF adoption.

Going forward, national policies should ensure better alignment of funds with SZEF goals, considering uncertainties such as revenue from shipping's inclusion in the EU Emissions Trading System (EU ETS). "This would mean that a portion of the funding will depend on the carbon price at the time, the actual or alternate usage of those revenues, as well as the rate at which shipping gets included into the EU ETS," the report points out. Generally, the progress of the finance lever is partially on track.

Policy actions across various sectors, both domestically and internationally, have an excellent opportunity to accelerate shipping decarbonisation. Naturally, the best course is a comprehensive approach that includes global, national, and regional initiatives, which have a combined impact on driving progress.

Several classification societies are showing positive signs of improvement in developing frameworks and guidelines compatible with SZEF. The IMO is actively working on bunkering safety standards, which will also influence safety developments related to SZEF within the International Association of Classification Societies. Nationally, many countries are advancing regulations to support domestic maritime decarbonisation and increase SZEF production. Among the top 20 countries, 16 have released hydrogen strategies or roadmaps, and the majority already have policies benefiting domestic decarbonisation and, thus, greening the maritime sector. Notably, the UK and EU have integrated shipping into their carbon pricing mechanisms alongside other EU initiatives like FuelEU Maritime.

However, progress in SZEF decarbonisation is predominantly within developed economies, indicating a regional bias. Greater participation worldwide, especially from the Global South and developing economies, is essential to achieve broader international advancement towards the 5% target by this decade's end.

Similarly to 2022, governments aiming for 1.5°C-aligned decarbonisation plans are still just partially on track. For instance, "only" 5% of IMO Member States submitted their National Action Plans regarding shipping decarbonisation (but that 5% accounts for over 29% of ownership and more than a quarter of registered tonnage).

In terms of progress towards production targets for SZEF and the availability of green hydrogen by 2030, about 55mt of green hydrogen would be needed to achieve the required amount for the 5% SZEF goal. However, most optimistic forecasts suggest only 24mt of green hydrogen supply by 2030, while non-maritime annual hydrogen demand by that year is estimated at 130-200mt. Considering the need for other sectors to decarbonise along the 1.5°C trajectory, a significant portion of the estimated 24mt of green production capacity will likely be required to meet non-maritime hydrogen demand. Thus, it's crucial for governments to continually review their hydrogen strategies and policies to sustain maritime demand.

Progress has been notable within the multilateral policy arena, particularly with the adoption of the 2023 IMO GHG Strategy during the 80th meeting of the Organization's Marine Environment Protection Committee. The Strategy, with its "indicative checkpoints" (the target of achieving net-zero shipping GHG emissions before/around 2050) and the consideration of viewing emissions from the well-to-wake perspective, signifies international advancement compared to the year before. Such progress underscores the necessity for national governments and industry stakeholders to prepare for a decarbonised future through increased national actions and sector commitment to SZEF.

Additionally, the decision of the 2023 GHG Strategy to implement mid-term measures to be enforced by 2027/2028 is welcomed. However, it's essential to accompany all these ambitions with specific technical and economic instruments to achieve outcomes consistent with decarbonisation targets. Furthermore, addressing how well-to-wake emissions will factor into these measures (presently under development for the IMO Life Cycle Assessment guidelines) is imperative to ensure effective GHG

Tab. 6. Policy lever progress

KEY ACTIONS	TIMELINE: 22	25	30	PROGRESS	TARGET BY: 2023	2025	2030
Classification societies adopt robust zero-emission-ready guidelines				ON TRACK	In place – for key SZEF		
Classification societies research and set operational, bunkering, and safety standards for SZEF				PARTIALLY ON TRACK		In place – at least five large classification societies	
Governments publish 1.5°C-aligned decarbonisation plans for domestic shipping				PARTIALLY ON TRACK		In place for 10 out of top 20 countries	In place for 20 out of top 20 countries
Governments set production targets for zero carbon fuels (intermodal usage)				ON TRACK		In place for 10 out of top 20 countries Clear policy support	In place for 20 out of top 20 countries Policy to meet 0.6 EJ target in terms of hydrogen and ammonia/methanol production
Governments create policies targeting SZEF adoption in maritime				PARTIALLY ON TRACK		In place for 10 out of top 20 countries across the board	In place for 20 out of top 20 countries across the board
Submission to IMO of NAPs to address GHG emissions from international shipping				NOT ON TRACK	In place for 10	In place for 20	In place for 100
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		Mid-term measures agreed	Long-term measures agreed
IMO to require new ships to be zero-emission ready (e.g., GHG reduction plan with zero-emission (SZEF) propulsion capability)				NOT ON TRACK		In place	
IMO to adopt guidelines to estimate well-to-tank GHG emissions and regulation/ incentives for SZEF				PARTIALLY ON TRACK		In place	
IMO agrees on comprehensive decarbonisation strategy and zero emissions by 2050 target				ON TRACK		In place	

Tab. 7. Civil society lever progress

KEY ACTIONS	TIMELINE: 22	25	30	PROGRESS	TARGET BY: 2023	2025	2030
Indigenous groups, SIDS, and LDCs become more prominent, with increased participation in shipping decarbonisation negotiations				PARTIALLY ON TRACK	Observer status and attending IMO meetings	Participate in submissions	
Observers in the IMO increase focus on climate				PARTIALLY ON TRACK	IMO observers (i.e., NGOs and IGOs) publish maritime decarbonisation reports	Major NGOs push for accelerated pace on maritime decarbonisation	Campaign to phase out fossil fuels in shipping
Key labour organisations voice support for decarbonisation				ON TRACK	Public statements issued		
Green skills gaps identified and recommendations in place to address those gaps for both jobs at sea and across the supply chain				PARTIALLY ON TRACK		Policy recommendations accepted an corporate actors mobilised	
Local NGOs surrounding top 50 global ports calling for air pollution mitigation				ON TRACK		NGOs at 10 of top 100 ports	NGOs at 25 of top 100 ports

mitigation. Overall, the report finds that policy actions are partially on track.

Lastly, the report analysed civil society as a change lever in SZEF adoption. Clearly, the role of non-governmental organisations, local communities, and diverse collectives has been vital in advancing decarbonisation in the shipping industry. Civil society's involvement is crucial not only for environmental reasons but also to ensure equitable access to economic benefits from SZEF initiatives.

Bodies such as the International Transport Workers' Federation or Transport & Environment have been demonstrating a commitment to decarbonisation for several years, and communication between vulnerable states and the IMO has also continued. Various organisations, including the Inuit Circumpolar Council, have gained Observer Status at the IMO. At the same time, the Zero Emission Ship Technology Association and the Environmental Defense Fund were given the IMO Consultative Status, reflecting a trend toward inclusivity.

However, ongoing efforts – nationally and locally – are necessary at all levels to ensure transparent and inclusive decision-making processes regarding SZEF adoption and policy development. This includes stakeholder consultations, data sharing, public discussions, and increased representation of civil organisations from the Global South at IMO's floor. According to the report, while progress has been made since 2022, at the present moment, civil society involvement can be qualified as only partially on track.

Progress in motion

The 2023 analysis of the climate action in shipping shows that the overall progress in reaching the 5% by 2030 SZEF goal has remained partially on track compared to 2022. Significant global progress has been made in the past year, with commitments at the IMO, shifts in national policies, updates within industries, and technological advancements.

Nonetheless, substantial efforts are still needed to achieve the 5% target, particularly in terms of national policies that translate into concrete actions, especially in terms of increasing clean fuel supply. Furthermore, tech advancements must be utilised to ensure an adequate SZEF provision by 2030, expanding production and making significant investment decisions.

Finally, ensuring a broader range of funding sources, policies, and projects while sustaining and enhancing civil society involvement is essential to promote fairer distribution across geographic regions. □