

The Lloyd's Register Maritime  
Decarbonisation Hub

# Impact Report: Year Four

July 2023 to June 2024



Creating  
Impact





# Executive summary

The Lloyd's Register Maritime Decarbonisation Hub (The Decarb Hub) is an independent, not-for-profit research and action unit, working towards a safe, sustainable, and human-centric decarbonised shipping industry.

The years' activity centred around 15 main initiatives, spread across three focus areas:



1. **Fuel adoption:** techno-economic studies, policy development and facilitation of industry partnerships – driving change across the fuel supply chain.



2. **Risk and safety:** assessment and mitigation of risks to people and the environment – resulting in new approaches to ship design, fuel storage and transport, onboard operations and crew training.



3. **Impact and stakeholder engagement:** identification of critical insights, development of content and publications, communicated across the sector.

Partners we collaborated with included leading maritime businesses, regulators, governments, financiers, technology providers and NGOs. Together these initiatives delivered significant progress against all our key objectives. Key highlights include:

**Ensuring sustainable marine fuels can be adopted safely** – Deepened industry knowledge of risks and mitigations for ammonia as marine fuel.

**Supporting the managed uptake of sustainable marine fuels** – Continued to grow the Silk Alliance, a coalition of organisations driving positive change across the future fuel supply chain.

**Influencing appropriate and effective policy and regulations** – Created relationships and grew influence with international and local authorities, with several key initiatives in flight.

**Keeping the industry updated with technical and regulatory advancements** – Maintained and grew the scope of Zero Carbon Fuel Monitor – providing an independent perspective on the readiness of zero carbon fuels for deployment.

**Ensuring today's fleet is enabled for the future** – Launched the Maritime Emissions Reduction Centre to reduce barriers to the uptake of GHG reduction solutions.

In 2024, the Decarb Hub received £2.7 million in funding to support multi-year programmes, with £1.56 million recognised as income in-year and the remainder deferred in line with project delivery. We also received £347,000 in donated expertise and services, which enabled us to support the development of sustainable ocean economy finance initiatives and catalyse investment mechanisms for emissions reduction in maritime infrastructure.

During the next two years, we plan to maintain a central role in supporting the green corridor cluster, identifying sources of new fuels, developing business cases for their production, and looking for ways to further aggregate demand, making fuel production more attractive.

We also plan to broaden our portfolio of safety and risk activities. We will strengthen our activities in human safety, competencies and training to ensure that seafarers and shore-based staff are properly equipped to manage, operate and crew those vessels.



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# Letter from the Managing Director

This last year has been decisive in Maritime's ongoing energy transition to low and zero greenhouse gas emitting fuels. COP22 in Marrakech launched the Marrakech Partnership on Global Climate Action, a forum to bring industry action closer to international decarbonisation policy. But we have a way to go before the shipping industry engages at a rate that drives change at scale, an ever-present by-product of shipping and aviation's exclusion from the Paris agreement.

Trying to bridge that policy gap, MEPC 81 built upon the launch of the IMO GHG 2023 Strategy to introduce seven candidate midterm measures to legislate the reduction of emissions from existing ships, moving us towards an inevitable global price on GHG emissions at sea. Regionally, the European Union's Emissions Trading System also extended its coverage to include emissions from ships, spurring many to fear disruption and dislocation driven by regional policies competing with international ones.

Where steel meets the sea, these regulatory developments have been mirrored by some major firsts. Shipbuilding contracts have been placed for ammonia-fuelled Newcastlemax bulk carriers, and a world first bunkering event for an ammonia-fuelled technical demonstrator project, Fortescue's M/V Green Pioneer, was successfully completed in Singapore.

COSCO's 700 TEU fully electric feeder container ship hit the water, commencing regular service between Shanghai and Nanjing powered by containerised swappable batteries, whilst container lines continued to place methanol and LNG-fuelled container ships. Notably, Hapag-Lloyd won the inaugural ZEMBA tender for zero-emission shipping services, offering 17 participating ZEMBA members a 90% reduction in GHG emissions on a lifecycle basis, deploying an

entirely waste-based, certified bio-methane on the Singapore to Rotterdam route.

We still have a huge amount of work to do to meet the first significant environmental milestone: striving for 10% adoption of zero or near-zero GHG emissions solutions in shipping's energy consumption by 2030. Our advancements, though worth celebrating, are no call to slow down when we consider all the change markers we monitor to see if we are on track.

At the Decarb Hub, we continue to focus on our core areas of impact; risk, safety and human performance ensuring the safe adoption of new zero and near-zero GHG fuels, and our 'first mover' fuel adoption programmes.

Our work with our partners across industry, NGOs and NPOs, to integrate qualitative and quantitative risk studies with human factors principles, is leading to the development of comprehensive competency and training frameworks. These tools are crucial to ensure the maritime industry develops crew competency licencing structures to ensure the safe handling of ammonia, methanol and even hydrogen, as maritime fuels both at sea and ashore.

Our stewardship of the Silk Alliance, with commendable contributions from the Alliance members, continues to gain acclaim as one of the most advanced and transparent green shipping corridor initiatives within the industry, offering an implementation roadmap to organisations around the world looking to decarbonise their fleets.

I am personally very grateful for the outstanding commitment of our team and our partners, working to ensure that we continue to deliver impact against our goals. It's a race, but we aim to cross the finish line together!



**James Forsdyke**  
Managing Director



# Introduction

This report comes at a pivotal point for the Lloyd's Register Maritime Decarbonisation Hub (The Decarb Hub). During phase one (from 2020-23) we began to establish the initiative to:

- Be the renowned global capability for maritime (and supply chain) decarbonisation
- Be recognised as a leading influencer on the energy transition journey to zero emission vessels
- Become the recognised centre of excellence on the safe and practical decarbonisation of shipping and supply chains

Making made huge strides towards these goals, we embarked upon phase two in July 2023, with renewed funding and refined objectives based on the findings and experience of the first three years.

The report provides a summary of our first year in phase two. It covers the operational achievements and key programmes of year four together with the outlook for years five and beyond. It highlights the continued progress and commitment of the Decarb Hub in shaping the future of shipping through collaboration, innovation, and leadership.

“

Building on the strong foundations of our previous years, this report underscores the pivotal role the Decarb Hub continues to play in driving the global transition towards zero-emission shipping. Our commitment to collaboration, transformation, and leadership remains unwavering as we navigate this crucial journey.

**Dr. Carlo Raucci, Director of Sustainable Fuels and Technologies, The Decarb Hub**







# About us

The Lloyd's Register Maritime Decarbonisation Hub (commonly known as the Decarb Hub) is an independent, non-profit initiative established through a partnership between Lloyd's Register Foundation – a global charity with a mission to engineer a safer world – and Lloyd's Register Group, a global provider of maritime professional services with over 260 years of heritage.

This partnership brings together the Foundation's public benefit mandate and focus on societal resilience, with the Group's deep technical expertise and trusted relationships across the maritime industry. Positioned at the intersection of these two organisations, the Hub is uniquely equipped to accelerate the safe, sustainable, and human-centric decarbonisation of global shipping – combining neutrality with influence, and research with real-world application.

## Vision

**A decarbonised shipping industry, with human safety and sustainability at its core.**

## Mission

**To accelerate the safe, sustainable, and human-centric transition of the maritime industry, by building coalitions that deliver programmes of research, insights, and policy to unlock shipping's decarbonisation and accelerate zero emissions fuel adoption.**





## Driving change

The challenge of decarbonising shipping is huge. Many hurdles exist which impede change, with the aggregated effect that the sector is considered to be 'hard to abate':

- The high energy requirements of ocean-going vessels
- Heavy reliance on low-grade, low-cost fuel oil
- Long ship lifetimes of 20-30 years
- Complex, decentralised commercial and regulatory structures
- Dependence on complex global fuel infrastructures

Achievement of the environmental targets set by the Paris Agreement will require international collaboration on a scale not seen before. International agencies, regulators, shipowners and shipbuilders, fuel producers, technologists and financiers all have a role to play.

Within this diverse range of actors there are two worlds that all too often operate separately. The international development and impact community is primarily focused on achieving a just and sustainable transition. By contrast, the goals of the commercial maritime sector are primarily economic. But they do have common interests, and it is critical that the activities of these two worlds align to ensure progress on the path to net zero.

The Decarb Hub has a foot in both camps, making it uniquely positioned to unite these communities. We foster cooperation through a common understanding built on the foundation of evidence-led insights. This is not about short-term fixes; we're committed to building a future where the maritime industry can thrive in a zero-emission world, safely and sustainably.

## Our work



### Fuel adoption

It's not enough to develop zero emissions propulsion for ships. New solutions must become business as usual, quickly. Our fuel adoption initiative creates a bridge between research and action. From techno-economic studies to industry partnerships, the fuel adoption team leads projects that drive change across the fuel supply chain.



### Risk

As fuels change, so do risks. That means re-thinking safety across the board. Industry approaches to ship design, fuel storage and transport, onboard operations and crew training will all evolve. Our risk team assess the risks to people and environment and identify the mitigations needed.



### Impact and stakeholder engagement

For our work to drive change it must have influence. Our impact and stakeholder engagement team ensure that outputs become impact. They identify the valuable insights, create accessible content and engage via a range of communications channels to ensure the message reaches the right stakeholders.



# Overall highlights

Our year four achievements highlight significant progress towards our five key objectives. Through extensive collaboration, research, and stakeholder engagement, we continue to lead the way in maritime decarbonisation. The table below lists some of the highlights of the year. For a summary of all the main programmes see overall impact below.

## OBJECTIVE

### Safety

Ensuring sustainable marine fuels can be adopted safely

## SELECTED ACHIEVEMENTS

- **Ammonia safety programme:** Promoted key deliverables such as “Recommendations for Design and Operation of Ammonia-Fuelled Vessels,” which included QRA and human factors studies.

“ The risks to crew of using ammonia as an alternative maritime fuel can be kept to a tolerable level if recommended technical and human measures are undertaken.

Andy Franks, Senior Decarbonisation Risk Specialist, The Decarb Hub

- **Research initiatives:** Supported fundamental research projects like SAFEN, focusing on hydrogen ignition mechanisms, and planned expansion to projects like ARISE, dealing with ammonia spills.
- **Industry engagement:** Hosted panel and presentations under the SFMI which advanced industry understanding of the environmental and social impacts of the fuels at ports.

“ The transition to clean energy supply for shipping can be achieved only if stakeholders act together. Identifying potential port locations is the first step in this process.

Carlo Raucci, Director Sustainable Fuels and Strategy, The Decarb Hub





## OBJECTIVE

# Fuel uptake

Supporting the managed uptake of sustainable marine fuels

## SELECTED ACHIEVEMENTS

- **The Silk Alliance green corridor cluster project:** Expanded to 19 members, including major industry players, and hosted workshops and events to foster commitment to sustainable fuel adoption. MFSD engaged governments and influenced them to be more active in supporting shipping decarbonisation through the integration with their energy transition plan and their national hydrogen policies.

“ The Silk Alliance has been pivotal in connecting key players in the maritime decarbonisation space. Its focus on collaboration is what the industry needs to accelerate real change.

Anju Abrol, ING Wholesale Banking

“ The Silk Alliance teamed up the brilliant members from both upstream and downstream of shipping industry, providing a unique opportunity for different stakeholders to work together towards the decarbonisation.

Captain James Jeng, Chief Marine Technology Officer, Yang Ming Marine Transport Corp

- **Maritime Fuel Supply Dialogues:** The initiative has achieved engagement and support from public sector bodies, private industry, finance institutions, and NGOs. Recognising the value of open exchange, participating ministries have committed to further communication and collaboration through future MFSD at the next roundtable meeting in September 2024, as a pre-cursor.” to COP29.

“ There are great opportunities for countries to build and upscale hydrogen-based maritime fuel production infrastructure. This roundtable is representative of the efforts that both the energy and transport sectors need to make to achieve our common goals. I am devoted to supporting shipping’s net-zero transition.

Arsenio Dominguez, Secretary General, International Maritime Organization

“ By bringing countries together, the Maritime Fuel Supply Dialogue will lead to coordinated policies that encourage investment in hydrogen-based fuels for shipping.

Charlie McKinlay, Fuels and Technologies Lead, The Decarb Hub

- **Influencing newbuilds:** Engaged with shipyards and finance sectors to ensure vessels are built ‘future-ready’, focusing on green corridor implementation and scalable impact research, including direct design development work with Maersk, DFDS and the CASTOR initiative.
- **NextGEN Connect-GreenVoyage2050 project:** Developed and published a toolkit for route-based action plans, which was recognised and used by the IMO, promoting safe and managed fuel transitions.

“ We extend our warmest congratulations to Lloyd’s Register Maritime Decarbonisation Hub for their winning proposal in the IMO-MPA NextGEN Connect Challenge. This proposal reaffirms the pragmatic and inclusive approach needed to accelerate the adoption of low and zero-emission solutions through the development of green and digital shipping corridors.

Mr. Teo Eng Dih, Chief Executive, Maritime and Port Authority of Singapore



#### OBJECTIVE

## Policy influence

Influencing appropriate and effective policy and regulations

#### SELECTED ACHIEVEMENTS

- **Policy engagement:** Worked with policymakers and regulators, including the IMO and national governments to ensure effective regulations.
- **RLCF project:** Produced “The Future of Marine Fuels” report, influencing policy and investment decisions, and becoming a key reference for the industry and international bodies such as the IMO and the World Bank.
- **Zero Ready Framework project:** Developed technical and contractual working papers to integrate standard readiness frameworks into commercial contracts, facilitating smooth transitions.

#### OBJECTIVE

## Knowledge transfer

Keeping the industry updated with technical and regulatory advancements

#### SELECTED ACHIEVEMENTS

- **Zero Carbon Fuel Monitor (ZCFM):** Launched a new website and update report, enhancing the tool's functionality and accessibility, and driving significant web traffic.

“ There has been an increase in readiness levels across the key fuels and their supply chain stages, notably ammonia, methanol and hydrogen. A foremost priority is to develop demand profiles to minimise investment risks and create commercially viable business cases for zero-emission shipping.

Amelia Hipwell, Decarbonisation Innovation Manager, The Decarb Hub

- **Industry presentations:** Delivered presentations at major forums like COP28, Singapore Maritime Week, London International Shipping Week, and others, updating stakeholders on key advancements.
- **Content creation:** Produced and published regular update reports, engaging stakeholders on safety, environmental, legal, and financial topics.

#### OBJECTIVE

## Fleet evolution

Ensuring today's fleet is enabled for the future

#### SELECTED ACHIEVEMENTS

- **Fleet optimisation:** Focused on retrofitting existing vessels with new fuels safely, ensuring minimal environmental impact.
- **Ammonia safety programme:** Implemented QRA findings in current vessel designs, providing a basis for safer operations with alternative fuels.
- **Strategic partnerships:** Proposed the establishment of a joint industry institute in Athens to influence ship owner/operators and optimise fleet performance and efficiency.
- **Maritime Emissions Reduction Centre (MERC):** Launched the MERC in Athens with five ship owning co-founders, with a combined fleet of more than 500 vessels. Convened the first Advisory and Governing Committee meetings and have delivered a draft framework of the organisation's strategic roadmap and impact strategy.



# Programme impact

The Decarb Hub's programmes have made substantial progress in advancing maritime decarbonisation, fostering collaborations, and influencing industry standards and policies. The accomplishments and achievements detailed in this report reflect our dedication to sustainability and innovation, setting the stage for continued impact in the years to come. The table lists the main projects, showing how they contributed to our overall goals.

	1. Safety Ensuring sustainable marine fuels can be adopted safely	2. Fuel uptake Supporting the managed uptake of sustainable marine fuels	3. Policy influence Influencing appropriate and effective policy and regulations	4. Knowledge transfer Keeping the industry updated with technical and regulatory advancements	5. Fleet evolution Ensuring today's fleet is enabled for the future
The Silk Alliance	-	✓	✓	✓	-
IMO NextGEN Connect Challenge	-	-	✓	✓	-
The Maritime Fuel Supply Dialogues	-	✓	✓	-	-
The Renewable and Low-Carbon Fuels Value Chain Industrial Alliance	-	✓	✓	✓	-
The Sustainable First Movers Initiative	✓	-	✓	✓	-
Creating a Green Marine Fuel Market in South Africa	-	✓	✓	✓	-
The Zero Emission Maritime Buyers Alliance (ZEMBA)	-	✓	-	✓	-
The Ocean Investment Protocol	-	-	✓	✓	-
The West Coast Green Corridor	-	-	✓	✓	-
The Ammonia Safety Program	✓	-	✓	-	✓
Tanker Quantitative Risk Assessment for Castor	✓	-	✓	-	✓
Feeder Container Quantitative Risk Assessment for Maersk	✓	-	-	-	✓
Green Steel in Shipping	-	-	✓	-	✓
Zero Ready Framework	-	✓	✓	-	✓
Zero Carbon Fuel Monitor	-	-	-	✓	-

The Appendix lists our major initiatives, highlighting activities, output and impacts and showing alignment against our five key objectives.





# Key indicators

## Finance

### External Funding

#### Funding

<b>Grants Received*</b>	<b>£2,736,699</b>
Income Recognised in Year	£1,557,966
Income Deferred**	£1,178,733
<b>Benefits-in-Kind Received***</b>	<b>£346,741</b>
Of which were donated from LR Group	£114,760

\* For the purposes of this report, the term 'grant' is used to describe funding received to support mission-aligned activities, regardless of legal form. All funding is accounted for in accordance with applicable UK financial reporting standards.

\*\* During the reporting period, we received funding intended to support a multi-year programme. A portion of this funding remained unspent at year-end, as our model recognises income only when the associated work is delivered. This balance is held on our balance sheet and will be drawn down in future periods in line with project delivery. This approach ensures that 100% of the funding is used to support our mission and that expenditure reflects actual activity.

\*\*\* The Decarb Hub defines Benefits-in-Kind (BiK) as any non-financial contribution from our partners to help us deliver our programs, engage and inform our stakeholders, or amplify our impact



## Operational costs and expenses

### Operational costs

Total	£1,557,966
Salaries and Employment Costs	£877,473
Events	£101,637
Platforms and Software	£39,685
Subcontractors	£31,611

### Expenses

Total	£107,419
Compared to a Budget Of:	£160,000
Programs	Reporting Target: 2024/25
General And Administrative	Reporting Target: 2024/25
Stakeholder Engagement	Reporting Target: 2024/25

## Research and donations

### Research and donations

Total	£251,902
Industry Safety & Risk Programs	£251,902
Maritime Emissions Reduction Centre	£-
Academic (PhD) & Industry Research	£-
Donations of Expertise	Reporting Target: 2024/25

In year four, in addition to the programs that the Decarb Hub has run, we have donated our expertise to several significant programmes to achieve qualitative leverage of our resources.

The Decarb Hub provided strategic advisory support to advance sustainable ocean economy finance initiatives, helping address the private sector funding gap for climate-aligned maritime infrastructure. Our in-kind contributions supported the development of new investment mechanisms and funds totalling hundreds of millions of dollars. This included engagement with international institutions to catalyse finance for emissions reduction in ports and shipping, as well as support to blue bond issuers across sectors such as offshore renewables and port infrastructure, contributing to the growth of blue-themed investment products in the climate finance landscape.



In the case of our donations in support of research, we can demonstrate leverage through consortia, where the research we conduct, or fund has a multiplier effect in the industry as it gains traction as reference. There is also a financial quantifier, by valuing the full research budgets committed by all partners:

Project	Total budget	Decarb Hub contribution
<b>SAFEN Phase 2 (runs to end 2025)</b>	£1.64m (NOK 22.5m)	£117k (NOK 1.6m) total
<b>ARISE (runs to end 2025)</b>	€3.5m of which €2.15m has been secured so far	€400k total
<b>Univ of Surrey / Hy-RES ammonia modelling (at bid stage) 30 months</b>	£540k	£65k equivalent (in-kind) total

## Summary

### Impact financial measures

Average Cost Per Programme*	£85,072
Average Cost Per Beneficiary	Reporting Target: 2024/25
Average Cost Per Outcome	Reporting Target: 2024/25
Donations of Expertise	Reporting Target: 2024/25

**\*NOTE: 16 Decarb Hub Programmes & 5 LR Group Programmes = 21 Total**

## Notes

1. The entity was incorporated on the 3rd of March 2023 in the United Kingdom
2. Financial years run from 1st of July to 30th of June
3. The first set of audited accounts for the period from incorporation to July 2024 are due by 3 December 2024
4. The entity is registered as a Private Company Limited by Guarantee, whose income provisions prevent the distribution of income or capital to members or shareholders. Therefore, all income and capital may be used solely for the promotion of the company's object. On this basis the entity operates as a Not-For-Profit under UK Law





# Sustainability

## International programme delivery

The global nature of the shipping industry means that decarbonisation efforts cannot be contained within national borders; they require a collaborative, multinational approach.

As a nonprofit dedicated to advancing sustainability in shipping, our programmes aim to reduce the environmental impact of shipping. Our work involves facilitating cross-border partnerships, conducting on-site workshops, and participating in international conferences that foster knowledge exchange.

## Air travel

Effective implementation sometimes requires our team to travel and work directly with international partners, including port authorities, shipping companies, regulatory bodies, and environmental organisations.

Face-to-face collaboration enables us to build strong, trust-based relationships, navigate complex regulatory environments, and align our efforts with the specific needs of each region.

Air travel, while essential to the mission, is a major contributor to our carbon footprint. This year, our team took 60 flights, resulting in an estimated total of 32,537 kg CO<sub>2</sub>e emissions.

## Our commitment

We are committed to reducing the environmental impact of our operations and balance travel needs with environmental responsibility. Where possible, we:

- **Conduct virtual meetings** – many of our workshops are now entirely run online
- **Leverage local expertise** – using partner organisations to extend our on the ground presence
- **Consolidate travel** – arranging as many activities as possible in a single trip
- **Explore alternative transportation methods** for shorter distances

We work with partners who share our commitment to sustainability, including those that prioritise best environmental practice in logistics and transportation choices.

Our commitment to sustainability is integral to our mission of decarbonising shipping. We continue to seek innovative ways to reduce our emissions while continuing to deliver vital impact.



# Looking forward

During the next two years, we plan to maintain a central role in supporting the green corridor cluster, identifying sources of new fuels, developing business cases for their production, and exploring ways to further aggregate demand, making fuel production more attractive. The Silk Alliance is looking at how to design economic incentives for decarbonisation and how ship financing mechanisms could be used to enable investment in zero-emissions ships and retrofits. It aims to continue developing techno-economic analyses and scenarios, and to produce a stronger demand signal by finding ways of aggregating demand for zero-emission fuels across sectors.

We also plan broaden our portfolio of safety and risk activities. This year the focus has primarily been on identifying the risks of using alternative fuels for propulsion and mitigating those risks on board the vessel. In line with our objective of enabling today's fleet, we will strengthen our activities in human safety, competencies and training to ensure that seafarers and shore-based staff are properly equipped to manage, operate and crew those vessels.

“ Ensuring the availability of more sustainable materials in shipbuilding will play a key role in facilitating shipping's energy transition. By embedding key circularity principles into design and build, and providing material traceability, we can collaborate with broader circularity efforts across the maritime value chain to achieve GHG reduction and decarbonisation targets.

**Amelia Hipwell, Decarbonisation Innovation Manager, The Decarb Hub**





# Acknowledgements

We would like to extend our deepest gratitude to Lloyd's Register Foundation, our partners, and the maritime community for their unwavering support. Together, we are creating a safer, more sustainable future for the global maritime industry.

“ Up to 800,000 seafarers will require training to safely handle alternative fuels. Regulations need to be updated for the use of these new fuels and the industry must scale up training for all roles: both seafarers and onshore personnel

Natassa Kouvertari, Senior Lead – Human Competency, The Decarb Hub

“ The successful completion of ZEMBA's historic inaugural tender was greatly facilitated by the technical expertise, innovative spirit, and excellent collaboration from the team at the Lloyd's Register Maritime Decarbonisation Hub.

Ingrid Irigoyen, President & CEO, ZEMBA, Senior Director – Ocean and Climate, The Aspen Institute







# Glossary

<b>ADB</b>	Asian Development Bank
<b>AfDB</b>	African Development Bank
<b>ARISE</b>	Ammonia Response in Sea Emergencies
<b>BIK</b>	Benefits-in-kind
<b>COP</b>	United Nations Climate Change Conference
<b>DMC</b>	Developing member countries
<b>DSF</b>	Danish Ship Finance
<b>EDF</b>	Environmental Defense Fund
<b>GEAPP</b>	Global Energy Alliance for People and Planet
<b>GHG</b>	Greenhouse gas
<b>GMF</b>	Global Maritime Forum
<b>ICCT</b>	International Council on Clean Transportation
<b>IMarEST</b>	Institute of Marine Engineering, Science and Technology
<b>IMO</b>	International Maritime Organization
<b>ISWG-GHG 16</b>	16th meeting of the IMO Intersessional Working Group on reduction of GHG emissions from ships
<b>LCA</b>	Lifecycle analysis
<b>LR Group</b>	Lloyd's Register Group
<b>LRF</b>	Lloyd's Register Foundation
<b>MEPC</b>	Maritime Environment Protection Committee
<b>MERC</b>	Maritime Emissions Reduction Centre
<b>MFSD</b>	Maritime Fuel Supply Dialogues
<b>MJTTF</b>	Maritime Just Transition Task Force
<b>MPA</b>	Maritime and Port Authority of Singapore
<b>NGO</b>	Non-governmental organisation
<b>NPO</b>	Non-profit organisation
<b>OIP</b>	Ocean Investment Protocol
<b>PIL</b>	Pacific International Lines
<b>QRA</b>	Quantitative risk analysis
<b>RFI</b>	Request for information
<b>RINA</b>	The Royal Institute of Naval Architects
<b>RLCF</b>	Renewable and Low-Carbon Fuels Value Chain Industrial Alliance
<b>RMI</b>	Rocky Mountain Institute
<b>SAFEN</b>	Safe Energy Carriers
<b>SFMI</b>	Sustainable fuels in maritime initiative
<b>TEU</b>	Twenty-foot equivalent unit
<b>UNGC</b>	United Nations Global Compact
<b>WEF</b>	World Economic Forum
<b>ZCFM</b>	Zero Carbon Fuel Monitor
<b>ZEMBA</b>	Zero Emission Maritime Buyers Alliance



# Appendix

	1. Safety Ensuring sustainable marine fuels can be adopted safely	2. Fuel uptake Supporting the managed uptake of sustainable marine fuels	3. Policy influence Influencing appropriate and effective policy and regulations	4. Knowledge transfer Keeping the industry updated with technical and regulatory advancements	5. Fleet evolution Ensuring today's fleet is enabled for the future
The Silk Alliance	-	✓	✓	✓	-

## Description

The Silk Alliance is one of the leading maritime green corridors among the four or so that have been proposed since the Clydebank Declaration at COP26. It launched in May 2022 and is a green corridor cluster involving a fleet that primarily refuels in Singapore. The Alliance is coordinated by the Decarb Hub and has members from across the value chain in shipping, including ship builders, charterers, financiers, fuel companies, academic researchers, and the MPA. The long-term goal is to create a regional market, through the creation of demand in a specific geographic area, leading to increased investment in zero-emission fuels, new technologies and infrastructure.

## Activities

Activity through the year included in-person workshops in Singapore, member webinars, a social event and regular progress reviews. Wärtsilä hosted a demonstration event for a two-stroke methanol engine conversion. A progress report was published, detailing the implementation plan. Several activities led to increased industry awareness. A dedicated Silk Alliance website was launched and an open letter was published, outlined the initiative's intentions and requests to the community. The Decarb Hub and Alliance members delivered numerous conference presentations and engaged with public and private stakeholders through one-on-one calls and task force groups. Wilhelmsen Ship Management hosted a half-day meeting in Singapore attended by 40 participants and sponsored a networking event during Singapore Maritime Week (SMW) that attracted over 105 attendees. Membership was broadened, ensuring robust representation of both fleet and fuel supply sectors. The Alliance expanded to 19 members, welcoming Yara, Woodside Energy, and the Methanol Institute and the MPA.

## Outputs

The Alliance has expanded to become one of the most popular green corridors globally. It is now one of only four corridors (of over 44 worldwide) moving into the execution phase. It has become a leader in driving public-private partnerships and collaborations, building a stronger community with common goals. Key achievements include agreement on a 2030 implementation plan, a focus on methanol and ammonia, and targets for carbon intensity. Increased partnerships among members have led to higher ambitions and more transparency in decarbonisation strategies. The members of the alliance have changed their strategies towards a more progressive view around the use of sustainable fuels and reducing or abandoning strategies based on fossil fuels.

## Impact

The annual GMF Green Corridors Progress Report commended the Silk Alliance for its transparency and the commitment of its members. The project garnered academic interest, with researchers using the Silk Alliance as a case study and referencing it in various papers. The Silk Alliance was also featured in the Iron ore position paper and the corporate sustainability reports of companies like Woodside and MSC. The demand analysis results from the Silk Alliance were included in the RMI report "Ocean of Opportunities." The Mission Innovation website showcased the Open Letter, Implementation Plan, and Progress Report for wider distribution. In addition, PSA and PIL launched a bilateral agreement on a similar initiative, and the Hub was invited by the ADB to advise on new funds and green maritime programs. This collaboration led to the Hub playing a critical role in shaping a region-wide decarbonization initiative. Yara, along with a shipping company in the Silk Alliance, responded to an ammonia provision Expression of Interest from MPA, and the Panama Canal expressed interest in potential collaborations.



## IMO Nextgen Connect Challenge

### Description

Organised by the MPA and the IMO, the IMO NextGEN Connect Challenge was an invitation for submissions to develop a robust methodology that stakeholders could use to develop specific, route-based action plans to reduce GHG emissions between specific points along a shipping route in the Asia Pacific region.

### Activities

The Decarb Hub's winning proposal was selected for pilot implementation in collaboration with the IMO. The project convened 40 participants, including representatives from ports and national administrations in Asia, for a workshop that served as a training exercise. A toolkit for route-based action plans was developed and published on the IMO website. A concept note for phase two was submitted to the IMO and MPA.

### Outputs

Industry engagement was achieved through presentations delivered at COP28, and the Innovation Forum organised by UNEP and Norway. The project won an award during Singapore Maritime Week 2023.

### Impact

The results of the project have been influential in shaping further activities across the industry. The MPA used the findings to explore bilateral agreements in India. The IMO recognised the toolkit's value and incorporated it into several other activities. The toolkit was also published on the Mission Innovation platform. Workshop participants developed capacity on decarbonisation methodologies and received certification from MPA and IMO. The findings also spawned a new project, the Maritime Fuel Supply Dialogues.

## The Maritime Fuel Supply Dialogues

### Description

The Maritime Fuel Supply Dialogues (MFSD) aims to unlock the potential for clean and sustainable maritime fuels through dialogue and collaboration amongst energy and transport ministries across Asia Pacific and Africa. It focuses on how to drive regional green hydrogen fuel supply development at scale to support maritime decarbonisation across the Indian and Pacific Ocean.

### Activities

The dialogue was Launched on April 16th, 2024, through a roundtable hosted by the Ocean Stewardship Coalition of the UNGC in partnership with Decarb Hub. Energy and transport ministries convened to discuss fuel supply development for maritime decarbonisation, with nine energy and transport ministries in Africa and Asia Pacific attending and providing contributions and statements to the meeting.

### Outputs

The summary statement was published, in which nine ministries in Africa and Asia, committed to continued dialogues and participation in cross-industry roundtables as part of the MFSD. The World Bank, EDF, ICCT, Climate Works Foundation, UNGC, AfDB, Singapore MPA, ADB, IMO, and other NGOs supported the logistics of this event. Multiple introductory calls were held with fuel producers to provide expertise for the next roundtable.

### Impact

The initiative has achieved engagement and support from public sector bodies, private industry, finance institutions, and NGOs. Recognising the value of open exchange, participating ministries have committed to further communication and collaboration through future MFSD discussions at the next roundtable meeting in September 2024, as a pre-cursor to COP29.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
-	-	✓	✓	-

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
-	✓	✓	-	-





## The Renewable and Low Carbon Fuels Value Chain Alliance

### Description

The Renewable and Low-Carbon Fuels Value Chain Industrial Alliance (RCLF) is an initiative advancing the production and supply of renewable and low-carbon fuels in the aviation and waterborne sectors. It is a component of the FuelEU Maritime and RefuelEU Aviation Regulations.

### Activities

The Decarb Hub has been an active participant and contributor in the RCLF, directly developing and shaping several key outputs. The Decarb Hub was voted in and took the role of vice-chair of the RCLF Roundtable 3 (RT3) on "Production Pathways and Value Chain – Waterborne Transport".

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
-	✓	✓	✓	-

### Outputs

A paper assessing fuel demand for EU ports was submitted to the European Commission. Building on the analysis provided for RCLF, a report titled "The Future of Maritime Fuels" was developed and published, assessing global demand and supply of alternative fuels.

### Impact

The work has provided the industry with a valuable reference for global and European fuel mix projections, both with RT3 members and more widely. The fuel demand assessment for EU ports informed strategies for RT3 and the European Commission. The report "Future of Maritime Fuels" created several avenues of engagement. Extensive one-on-one meetings were held with companies such as EPS, Maersk, Seaspac, and Hanwha Ocean. The World Bank will use the results for their work in South Africa, and ZEMBA has used the results to educate and inform its members. The IMO utilised it for their impact assessment.

## The Sustainable First Mover Initiative

### Description

The Sustainable First Mover Initiative (SFMI) is an initiative to identify port locations with the potential to deliver significant emission reductions while generating co-benefits, such as improved air quality, economic resilience and environmental sustainability.

### Activities

To help shipping stakeholders align with a carefully managed transition, the Decarb Hub and Environmental Defense Fund, in collaboration with Arup, designed and developed the SFMI Identification Tool to enable the development of sustainable first mover initiatives that maximise benefits to port communities and the environment. SFMI scores are included in the OneOcean port database tool. A report on the work was published.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
✓	-	✓	✓	-

### Outputs

Presentations were delivered at the IMO, and the Green Ammonia Summit. During COP28, the report was presented and discussed in a panel where high level representative of the World Bank, EDF, UNGC and Arup participated and endorsed the findings of the report. A lecture was given at Solent University, organised by RINA and IMarEST. A presentation was made at the Asian Development Bank's regional knowledge-sharing workshop on port greening and maritime decarbonisation.

### Impact

This initiative influenced investment decisions and policymaking. Fuel producers and policymakers, including the EU, requested underlying data and further information. The report was viewed by over 8,800 people on LinkedIn. The SFMI paper was mentioned by two energy ministers during the MFSD, and it was submitted to the IMO and referenced during ISWG-GHG 16, the World Bank's project on ports in South Africa referenced SFMI.



## Creating a Green Marine Fuel Market in South Africa

### Description

As part of its Mobility and Transport Connectivity Series, the World Bank created an initiative to support the maritime sector to unlock the potential of the country's hydrogen economy.

### Activities

The Decarb Hub carried out country specific analysis for shipping decarbonisation, ports and the hydrogen economy, for South Africa. It focused on demand estimation in eight ports and their implications for the hydrogen economy.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
-	✓	✓	✓	-

### Outputs

The Decarb Hub contributed a chapter to the final report, reviewed the report and attended and presented at a workshop organised by the WEF in Cape Town. The summary report of the workshop included insights from the Hub's contribution.

### Impact

The project influenced investment decisions, policymakers, and fuel producers' strategies. Follow-up meetings were held with key stakeholders, including the WEF, the World Bank, and the GMF.

## The Zero Emission Maritime Buyers Alliance (ZEMBA)

### Description

The Zero Emission Maritime Buyers Alliance (ZEMBA) is a first-of-its-kind buyers group working to accelerate the most sustainable, scalable and economically viable solutions for the maritime sector.

### Activities

The Decarb Hub co-led an RFI alongside ZEMBA to assess the market readiness of near-term commercial deployment of e-fuel and e-fuel-capable vessels to inform the design of ZEMBA's second tender. The Decarb Hub also supported the successful completion of ZEMBA's historic inaugural tender – the results of which was announced during Singapore Maritime Week – and supported the design, launch, and continued operations of ZEMBA's second, e-fuel-focused tender.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
-	✓	-	✓	-

### Outputs

Nearly 50 ship operators and fuel suppliers from around the world responded to the RFI. The project received coverage from major maritime media outlets such as Tradewinds, Splash, Bunkerspot, and WorldCargo News. A new memorandum of understanding between the Aspen Institute and the Hub was established to continue collaboration.

### Impact

Together ZEMBA and the Hub have developed and demonstrated the power of collective, forward procurement mechanisms and demand-side initiatives in general for more sustainable fuel deployment in the maritime sector. The RFI identified sufficient predicted supply of both e-methanol and e-methanol-capable vessels in the container segment to support ZEMBA's focus on e-fuel deployment in its second tender. ZEMBA's inaugural tender resulted in the first ever deployment of entirely waste-based, certified biomethane which achieved a 90% emissions reduction on a well-to-wake basis.



1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
-	-	✓	✓	-

## The Ocean Investment Protocol

### Description

The Ocean Investment Protocol (OIP) is a roadmap for governments, finance, and industry to enable a pipeline of sustainable ocean investments for a thriving blue economy. It is an initiative of the UNGC Ocean Stewardship Coalition.

### Activities

The Decarb Hub sits on the Advisory Group with the role of Advisory Board member for Blue Bond Principles. A concept note for a standalone shipping-focused paper was led by the Hub.

### Outputs

Recommendation from the Decarb Hub contributed to the OIP guidance on Blue Bond principles.

### Impact

The initiative is enabling finance for a sustainable ocean economy by influencing investment decisions, policymakers, and fuel producers' strategies. The recommendations were presented to governments in June and to a wider audience during the United Nations General Assembly (UNGA) in September.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
-	-	✓	✓	-

## The West Coast Green Corridor

### Description

The Canadian Government has initiated a project to develop a green shipping corridor between Canada's West Coast and ports in the United Arab Emirates, Korea and Japan.

### Activities

The Decarb Hub assessed three ports and presented its findings to Transport Canada in a roundtable, engaging over 15 industry and government representatives.

### Outputs

We published a report on Green Shipping Corridors in collaboration with Arup and Oceans North. Lessons from the Silk Alliance green corridor cluster initiative were shared at the GreenShip Conference 2023 in Vancouver, Canada.

### Impact

The outcomes influenced investment decisions, policymakers, and fuel producers' strategies. The World Bank has used it as input to further initiatives.



1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
✓	-	✓	-	✓

## The Ammonia Safety Programme

### Description

In collaboration with the Maersk McKinney Moller Centre for Zero Carbon Shipping (MMMCZCS), the Decarb Hub is engaged in a long-term multi-stage programme to deepen understanding of the risks of using ammonia as marine fuel and to design mitigations.

### Activities

Phase One performed a QRA investigating the risk of fatality due to unintended leaks of ammonia from fuel system designs for a container feeder vessel, Panamax bulk carrier and an MR tanker. A separate workstream identified human factors considerations related to the use of ammonia as fuel for these reference designs. Phase Two, now underway is developing a multi-stakeholder view on the necessary mitigating actions and safeguards. A QRA of ammonia-fuelled very large crude carriers (VLCC) was also completed.

### Outputs

Several reports were published, including recommendations for ammonia-fuelled vessels, technical details of the methodology employed and studies on human factors and dispersion of ammonia releases. The findings were presented at several conferences and received widespread press coverage.

### Impact

The recommendations and results are being used to inform specific regulations, guidelines, and best practices for ammonia-fuelled vessels, ensuring crew safety. These recommendations have been implemented in vessel designs currently in development, including Maersk's ammonia vessel concept. The QRA methodology developed during the project has been applied to other projects, such as Maersk's ammonia concept design and the Castor Initiative.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
✓	-	✓	-	✓

## Tanker Quantitative Risk Assessment for Castor

### Description

The Castor initiative is a multinational coalition of maritime expertise enabling the complete ecosystem required for ammonia-fuelled tankers to operate sustainably and safely.

### Activities

The Decarb Hub performed a QRA investigating the risk of fatality due to unintended leaks of ammonia from fuel system designs for an Aframax tanker. This was a further application of the QRA methodology developed during the ammonia safety programme.

### Outputs

A report detailing the methods and findings was published and presented to stakeholders.

### Impact

The industry has recognised that QRA can be a useful part of the risk-based classification process to demonstrate that risks to the crew are at an acceptable level. This recognition is evidenced by the application of QRA to future projects.





## Feeder Container Quantitative Risk Assessment for Maersk

### Description

The Decarb Hub partnered with A.P. Moller – Maersk, a global conglomerate and a leading international container shipping company too assess the risks of ammonia as a fuel.

### Activities

The Decarb Hub performed a QRA investigating the risk of fatality due to unintended leaks of ammonia from fuel system designs for a feeder container vessel. This was a further application of the QRA methodology developed during the ammonia safety programme.

### Outputs

A report detailing the methods and findings was published and presented to Maersk.

### Impact

The industry has recognised that QRA can be a useful part of the risk-based classification process to demonstrate that risks to the crew are at an acceptable level. This recognition is evidenced by the application of QRA to future projects.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
✓	–	–	–	✓

## Green Steel in Shipping

### Description

The Decarb Hub worked with the Sustainable Shipping Initiative (SSI) explore the potential for 'green' steel to reduce a ship's environmental impact.

### Activities

A study was carried out, looking at how to reduce a ship's environmental impact over its complete lifecycle, from design to construction and eventual recycling, through manufacture of steel without the use of fossil fuels.

### Outputs

The project contributed to a report launched during London International Shipping Week, raising awareness of Scope 3 emissions, green steel, and circularity in shipping. A network of partners and collaborators was established, and the forecast steel demand and emissions reduction analysis were co-authored for a side event at COP28.

### Impact

The project raised awareness about green steel production opportunities within the shipping industry. The outcomes engaged strongly with around 75 delegates at an awareness event. Steps were taken to address the supply/demand challenge, and networks were built, such as with the Roundtable on the Responsible Recycling of Metals.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
–	–	✓	–	✓



## Zero Ready Framework

### Description

The Zero Ready Framework (ZRF) is a mechanism to give the industry clarity over the zero-carbon fuel readiness of vessels, supporting a successful energy transition.

### Activities

The Decarb Hub developed a draft framework to provide a standard readiness definition for new and existing vessels. We published a white paper to initiate a dialogue amongst key stakeholders. Interest from the Comité Maritime International (CMI) led to a collaboration to apply the framework to legal texts.

### Outputs

Several working papers were produced including a technical definitions paper, a working paper on contractual and technical considerations and a mapping document showing how Class Societies rules and notations can be used to evidence readiness levels.

### Impact

The results were incorporated into a CMI Green Vessels working paper and presented and debated at the CMI annual colloquium. The CMI is now evaluating options for creating widespread adoption within the shipping industry. Discussions are underway with BIMCO.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
-	✓	✓	-	✓

## Zero Carbon Fuel Monitor

### Description

Zero Carbon Fuel Monitor (ZCFM) is an insights-based assessment of the readiness of zero carbon fuels for maritime applications which considers the entire fuel supply chain, from natural resources through to vessel propulsion.

### Activities

Readiness assessments were carried out across the year, via workshops involving subject matter experts from the Decarb Hub, LR and our partner organisations. We developed a new ZCFM website with improvements to the tool's functionality and accessibility, including a new design and additional dashboard functionality. The scope of coverage was increased to include battery electrification and nuclear power.

### Outputs

The new website was launched in September. In October we published an update report with across the board updates to fuel readiness assessments. Continuous content updates were published on the website and via update reports.

### Impact

ZCFM positioned the Decarb Hub as a thought leader, providing an evidence base for conversations and discussion within the industry around strategy and transition plans for zero carbon fuels. It has reached a wider audience through adoption by the IMO as an online reference and by inclusion in various Decarb Hub and Lloyd's Register reports. Regular feedback from stakeholders highlighted the tool's on-going value.

1. Safety	2. Fuel uptake	3. Policy influence	4. Knowledge transfer	5. Fleet evolution
Ensuring sustainable marine fuels can be adopted safely	Supporting the managed uptake of sustainable marine fuels	Influencing appropriate and effective policy and regulations	Keeping the industry updated with technical and regulatory advancements	Ensuring today's fleet is enabled for the future
-	-	-	✓	-



For more information or to contact visit  
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