

# Zero Emission Shipping

IEA Bioenergy ExCo96 Workshop, 19 November 2025, Oslo, Norway

## Introduction

On 19 November 2025, IEA Bioenergy organized a workshop - both in-person and online - to discuss the decarbonization of the maritime sector, addressing it both from a policy and from an industry and stakeholder perspective. The workshop was held at the Headquarters of the Research Council of Norway, in Lysaker (Oslo), back-to-back with the 96<sup>th</sup> meeting of the IEA Bioenergy Executive Committee. It focused on the activities to move toward zero emission shipping in the international policy arena, how involved stakeholders prepare themselves to the new development, and how various bioenergy options could contribute to achieving the climate neutral goals for the maritime sector.

## The climate policy context of the maritime sector

The maritime sector is responsible for approximately 3% of global greenhouse gas emissions, and as such is similar in impact to the global aviation sector. Up until recently, priorities and regulatory developments in relation to climate change mitigation seemed to lag in the maritime sector compared with aviation, where activities for the development of sustainable aviation fuels have been ongoing for over a decade and regulation is maturing.

Following the first publications by the European Commission in 2021, the European Union implemented two regulations for driving down GHG emissions in both the maritime and aviation sectors, with clear pathways to lower the carbon intensity of these sectors towards 2050.

At global level, in April 2025, the International Maritime Organisation (IMO) made an important leap forward at the Marine Environment Protection Committee (MEPC 83) meeting, where the Committee finalized and approved the draft legal text for the “IMO Net-Zero Framework”, to be included as a new chapter in Annex VI to the International Convention for the Prevention of Pollution from Ships. The draft regulations aim to set mandatory marine fuel standard and GHG emissions pricing for shipping to address climate change.

Adoption of these draft amendments was expected at the extraordinary session of MEPC in October 2025, but the meeting resulted in pausing the decision for at least one year.

This rather uncertain regulatory landscape, the perspectives by stakeholders in the maritime sector on the upcoming regulations as well as the possible contribution that sustainable biofuels could provide, were explored at the workshop on “Zero Emission Shipping” that IEA Bioenergy held at the Headquarters of the Research Council of Norway, in Lysaker (Oslo).

## Setting the Scene

The workshop started with a session on ‘Setting the Scene’. The presenters from University College London, DNV and the International Energy Agency (IEA) emphasised how IMO took up the responsibility to work towards a lower greenhouse gas intensity performance of the international maritime sector by 2023, opening up the exploration on the portfolio of pathways of renewable fuels and energy carriers (biofuels and renewable electricity based fuels, so called e-fuels). From the presentations, all of which had a forward-looking focus, it became clear that from today’s rather small share of biofuels, the market needs to grow rapidly. Most likely, the pathway options first will diverge for several years, before it will become clear which (set of) fuels and energy carriers will suit best the ‘dominant design’ by 2050 and beyond, to serve a future zero-emission shipping sector.

## Stakeholders are preparing themselves in advance of upcoming international regulation

In the second session, stakeholders from different positions in the maritime sector, reacted to the upcoming and expected landscape. The international collaboration ‘Zero Emission Shipping Mission Innovation’ emphasised the need for public private partnerships to accommodate the transition. Brazilian fuel producer and supplier Petrobras explained how they strategically prepare by diversifying and expanding their biofuel production portfolio to serve road, maritime and the aviation sectors, in advance of implemented regulation. Also, the Norwegian Shipowners Association has already formulated a clear trajectory for climate mitigation ambitions. At the same time, they emphasised that, among the wide range of ships and vessels currently in operation, each requires specific fuel solutions. The presentation from Wärtsilä provided confirmation of that, as they have been continuously adapting engines for liquid and gaseous fuels based on changing settings in the sector. Similarly, it became clear from the Nort Sea Port presentation that preparatory measures are necessary to be able to read and subsequently ‘ride the regulatory wave’, in the understanding that a local patchwork is needed to serve industrial symbiosis among the chemical, food and syngas clusters present in the port. Zespri International, the New Zealand based global exporter of kiwis, via a video-contribution, highlighted the strategic importance of being prepared for the transition to climate-neutral transport, as an elementary condition to be able to secure, or even strengthen, its business position operation to be prepared for the transition to climate neutral transport. This transition is particularly important in their case, as international shipping accounts for the majority of the total carbon intensity of the kiwis which are delivered worldwide. Their focus is on international collaborative efforts, and the establishment of ‘green corridors’, to learn how to shape the transition to keep their products attractive also from an environmental/climate perspective.

## A variety of biofuel options exist that can contribute

In the last workshop session, presenters from the various Tasks (or programmes) of IEA Bioenergy, from the University of Ghent and from the start-up company Biowave, provided an overview of developments of existing and new advanced liquid and gaseous biofuel options, such as drop-in renewable diesel for heavy fuel oil engines, development of a new all-in-one catalytic fast pyrolysis process that turns lignocellulosic feedstock into a drop-in maritime fuel alternative, and last but not least the production of liquified biomethane as replacement for natural gas based LNG. The overview provided confidence that such options can well contribute to achieving climate mitigation objectives, based on clear sustainability criteria throughout the supply chain.



## Key takeaways from the workshop:

### International regulation on climate mitigation is at the brink of implementation

- International regulations to mitigate the climate impact of international shipping are under advanced preparation. The European Union has implemented regulation to lower the carbon intensity of international shipping, providing increasing targets towards 2050. Even though in October 2025 the International Maritime Organisation halted the adoption of the 'Net-Zero Framework' for at least a year, workshop participants stated that they expect implementation to follow in due time.

### Stakeholders are prepared to act on climate mitigation measures

- The stakeholders already act in advance of regulations, and it remains important to keep supporting those initiatives and learn from these experiences, e.g., by building public private partnerships.

### Strategies and regulations are required to drive investments and demand creation

- Clear and transparent strategies and regulations are required to drive investments and demand - especially for nascent markets (e.g., synthetic fuels).

### Sustainable biofuels and renewable e-fuels have a role to play

- Sustainable liquid and gaseous biofuels and e-fuels have a clear role to play in the sector's transition in the short- and long-term.

### The transition is more than changing energy carriers alone - the maritime sector may have to redesign its whole value chain

- The transition will require more than just fuels and energy carriers. The whole value chain and all players along it will need to focus on efficiency and may have to redesign port and ship infrastructure to comply with future climate-neutral operation, to secure sustainability and solve safety issues.

### The bioenergy and biofuels sector is ready and able to contribute

- The bioenergy and biofuels sector proves to have developed tangible solutions, and it is important to bring those findings to the outside world.

This summary report, the video registration and the presentations are available [here](#)

