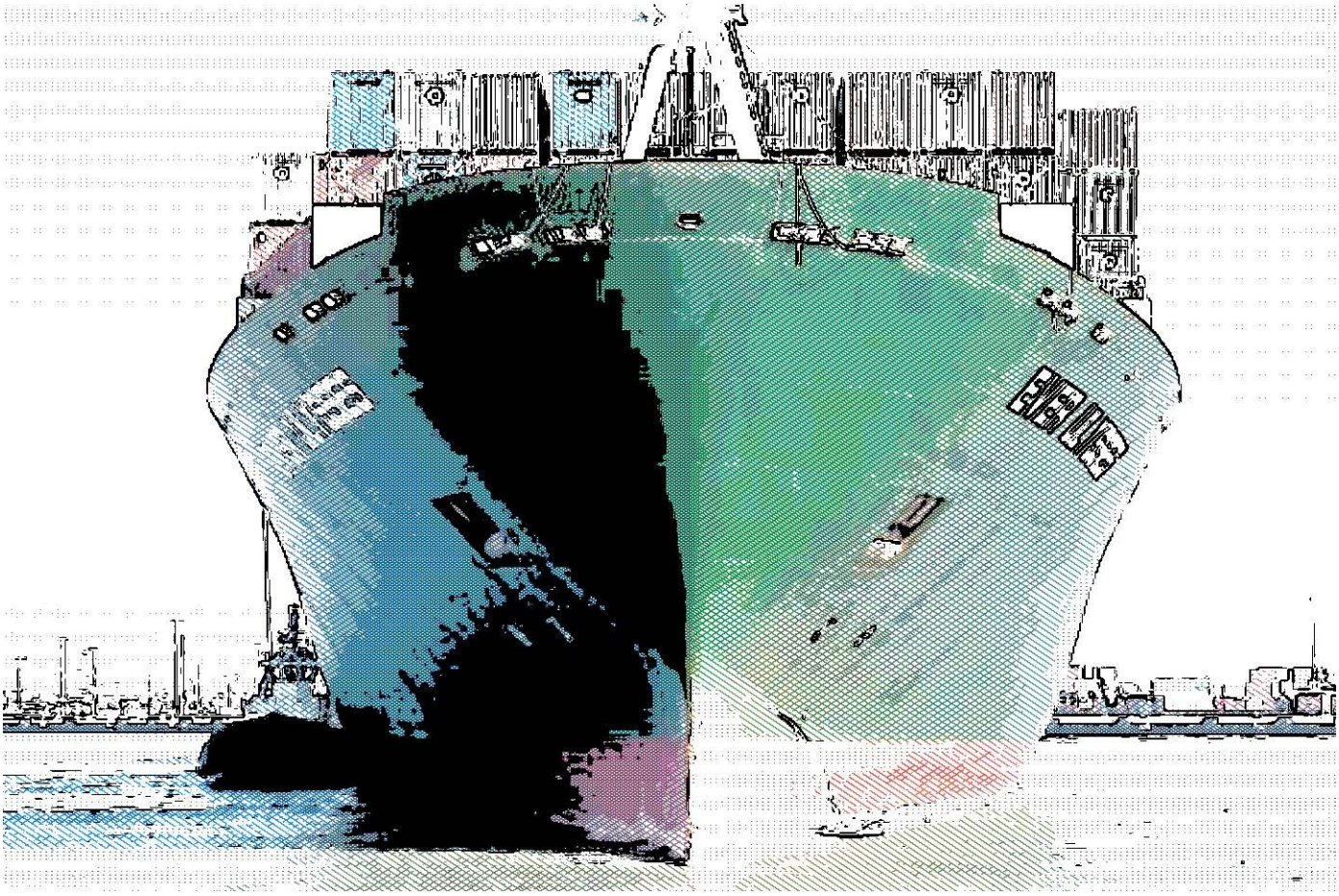
Stakeholders about deployment of renewable fuels for seagoing shipping

Assessments of possible pathways to 2030



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Assessments of possible pathways to 2030

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Table of content

Executive Summary

Background

In the context of the ongoing negotiations and deliberations in the International Maritime Organization's (IMO) on possible measures to reduce emissions of greenhouse gases from international shipping for the short, medium and long term, and in the context of the implementation of the European Renewable Energy Directive 2020-2030 (RED II) in national legislation, the Ministry of Infrastructure and Water Management commissioned the organization of two stakeholder sessions for the purpose of assessing policy options and instruments to stimulate renewable fuels in the Dutch maritime shipping sector. Furthermore, the Dutch Green Deal sea shipping, etc. has been established to promote sustainability and climate action in the shipping sectors. For the maritime shipping sector, the Dutch deal has proposed for the maritime sector an even higher overall GHG-emission reduction goal of 70 % by 2050. By comparison: the IMO has set the global goal on a 50 % reduction of the absolute volume of GHG-emissions by 2050 as compared to the reference year 2008.

Stakeholder process

The stakeholder consultation has made clear that the climate issue is a material factor with an effect on the actors. Participating stakeholders are aware of the need to prepare for operation in upcoming carbon emission reductions' regulation and are supportive of measures to increase the deployment of renewable fuels in the sector.

As maritime shipping is predominantly an international sector, stakeholders agree that an international approach to emissions' reduction is preferable, to ensure a level playing field between different countries and ports. This is also a concern that if policy measures would lead to increasing fuel prices in some ports, 'fuel flight' would occur by ships shifting to bunkering cheaper fuels in other (foreign) ports. Reaching either a mandate or obligation under the supervision of IMO or with IMO-front-running regions, is generally considered as the way to go. Still stakeholders also considered the EU as a level of analysis for the drafting and introduction of regional policies regulating the maritime sector. Take the example of the inclusion of marine in the EU-ETS as proposed in the European Green Deal (December 2019). On the short term, a support measure that best guarantees deployment of renewable fuels in the maritime sector is the opt-in for marine into the road transport obligation under RED II. However, allowing the opt-in for marine without taking extra measures might have serious draw backs.

With the input of the two stakeholder meetings and the survey we have drawn up a few key recommendations for a pathway towards 2030.

Recommendations for a pathway towards 2030

1. A temporary focus on an opt-in for marine under RED II, with a yearly volume, to be replaced by a mandate after a few years should be further assessed.
2. For the forthcoming mid-term measures that will be prepared by IMO Member States, several suggestions have been given for international alignment on measures for supporting renewable marine fuels, being:
    - A global IMO mandate on fuel suppliers, or possibly on the European level or included in Emission Control Areas regulation.
    - Decrease carbon intensity through fuel standards.
    - A CO_2 levy on fossil shipping fuels and sector fund to support innovation or deployment of renewable shipping fuels.
3. Dutch maritime sector developing a program/vision indicating what is needed for renewable marine fuels, within the context of other measures (efficiency, slow steaming, other power trains).
4. For stimulating demonstration into scale-up it is essential to develop a knowledge and innovation program about deployment of marine renewable fuels. And to have a communication program for knowledge dissemination.

Further stakeholder engagement

It was clear from the stakeholder consultation that currently some parties have already developed a lot of know-how and experience, while others are just starting to think about the options and the consequences. A regular stakeholder engagement effort will help to bridge knowledge gaps, disseminate information, improve collaboration and ensure that more parties are well-prepared to deliver the eventual solutions.

Engage stakeholders in IMO negotiations and outcomes. There seems to be a general wish to progress faster and go further than the IMO, but not at all costs. It is important both for the motivation of the stakeholders and to develop measures that can generate value in an IMO renewable energy setting, that stakeholders understand the IMO process, timelines and prevailing thoughts. Vice versa, ideas from Dutch stakeholders can inform the IMO process.

The stakeholders worked on a variety of ideas, as displayed in this document, to enable either the supply or use of renewable fuels, or to support R&D into future solutions, we advise the Ministry to collaborate with the stakeholders to further work out the ideas into a strong vision and action-oriented roadmap.

1 Introduction

1.1 Process

1.1.1. Path to 2030

Next to the ongoing negotiations and deliberations in the IMO-context on possible measures for the short, medium and long term, a question of high concern is whether the Netherlands should include deployment of renewable fuels for the maritime sector in national legislation, making use of the European Renewable Energy Directive for the period 2021-2030[1]. At the moment, the IMO-agreement for halved reductions in 2050 does not as such provide a strong enough driver for renewable marine fuel uptake. Many stakeholders expect that binding IMO-measures will still take time. However, the IMO frames the urgency and there is, for instance, the possibility to propose mandatory targets on lower carbon intensity of fuels as soon as in 2023. Deliberations for deciding on which measures are needed to meet the medium-term IMO target in 2030 have just been started.

The Netherlands has an interest in making international shipping more sustainable. Therefore, possibilities of using biofuels and other renewable fuels have been included as actions in the Dutch Green Deal on Maritime and Inland shipping and Ports[2].

In this context the Ministry of Infrastructure and Water Management has asked for the organization of two stakeholder sessions for the purpose of assessing the use of renewable fuels in maritime shipping. The target is to develop a supported path towards the deployment of renewable fuels in maritime shipping towards 2030.

The aim of the stakeholder process is to involve stakeholders in a review of measures that are supportive for the deployment of renewable fuels in maritime shipping. The expertise of stakeholders will be used in the policy-making process and will be taken into account for developing a pathway to 2030 and beyond.

1.1.2. About the stakeholder process

Questions have been addressed in two stakeholder meetings. An expert meeting in October 23, 2019 with 16 participants and a broader stakeholder meeting in November 18, 2019. A total of 42 people participated at the stakeholder meeting held in November. In order to involve stakeholders that could not be present at the stakeholder meeting a survey was sent to the 'marine' participants of the Green Deal on Maritime, etc.

During the stakeholder process, stakeholders have been asked their opinion on the impacts on the international position of the Netherlands that could result from Dutch policy measures for stimulating renewable fuels in the maritime sector. An economic analysis on this matter was, however, out-of-scope for this research project. This project has resulted in an overview of measures that could be taken to stimulate deployment of renewable fuels in international seagoing shipping. These have been reviewed by stakeholders to assess feasible actions for the period up to 2030.

The Platform has involved *Navigant* consultancy to advise the project and to chair the expert meeting and stakeholder meeting. It is important to note that the Dutch Platform for sustainable biofuels is an independent knowledge and innovation centre. In this process, the Platform's role is to inform decision making processes. Platform members have been involved as separate stakeholders and expressed their own position based on their interests in the market.

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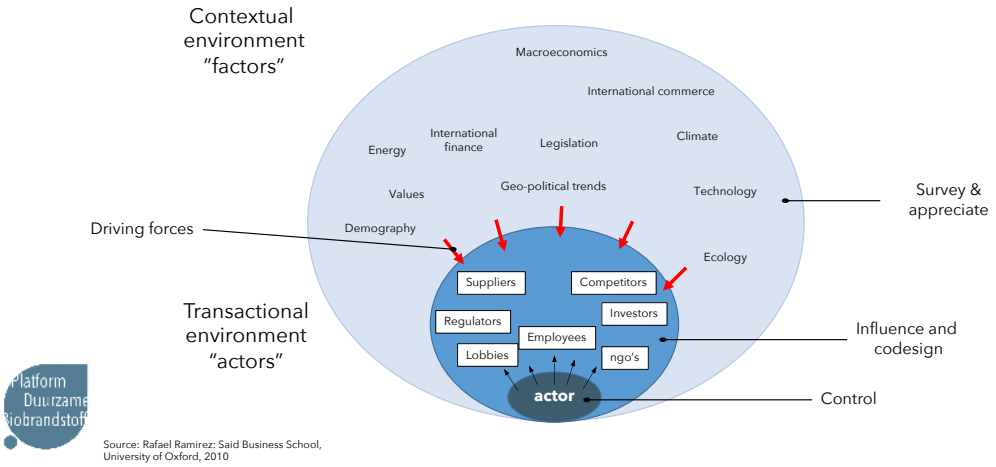
[1] The opt in marine is already in use under RED I. Therefore this would be a renewal of current practices

[2] https://www.greendeals.nl/sites/default/files/2019-11/GD230 Green Deal on Maritime and Inland shipping and Ports.pdf

1.1.3. Drivers

The key question at hand is how the sector can prepare for plausible futures without fossil energy. The maritime sector will have to prepare for changes in the wider context, the so-called factors in the contextual environment, as shown in the graph.



A number of factors can be identified as driving forces to prepare a low carbon strategy. Climate change is amongst the most pronounced, together with forthcoming international regulations, a shift in consumer demands and the expectation of technologies that enable climate neutral operations.

But also, other factors matter, like (i) Dutch and European policies towards a climate-neutral, low-carbon and circular economy in 2050, (ii) keeping the economic importance of the Dutch position as the gateway to Europe and (iii) the contribution to the transition to climate-neutral operation of petrochemical and chemical-industrial ecosystems that produce and process for international markets.

2 Three policy levels: IMO, EU, NL

Although the global sector produces as much CO_2 emissions as the whole of Germany (in total, like the aviation sector, about 2,5% of total global CO_2 emissions)[3], the international shipping sector remained outside the Paris Climate Agreement. The international sea shipping is also out of scope for the Dutch Climate Agreement[4]. The Dutch agreement is looking for CO_2-emission reduction to fulfil its commitments under the Paris Agreement and the National Climate Act[5]. GHG-emissions reductions realised in international maritime sector don't count towards the national goals. The international Maritime Organization (IMO) has taken up leadership and agreed, on April 2018, on the Initial IMO Strategy on reduction of GHG emissions from ships. Framing the urgency, the IMO is committed to start reducing GHG-emissions from this sector as soon as possible. The Dutch Maritime sector will have to prepare for the proposed short-term measures and the upcoming mid and long-term measures. In this context, how to best prepare? And what is the best level to act?

2.1 IMO

For the IMO GHG Strategy, Member States seek on the short term for agreements that focus on increasing efficiency. For the mid-term the IMO looks into measures to stimulating carbon emission reduction to achieve the 2030 target. There is a need to explore in IMO and with stakeholder in the Dutch maritime sector to explore what actions and incentives could stimulate

[3] https://ec.europa.eu/clima/policies/transport/shipping_en

[4] Calculations of national emissions are following the NEV (Nationale Energie Verkenning) calculation methodology.

[5] https://www.government.nl/topics/climate-change/climate-policy

carbon emission reductions for reaching this mid-term target. Emission reductions from renewable fuels could potentially play a major role in this.

IMO is following a Roadmap for developing a comprehensive IMO strategy on reduction of GHG emissions from ships[6]. It aims to adopt a revised IMO strategy with mid-term measures in 2023. In the current discussions, assessments will be made of opportunities for emission reductions, including the use of alternative fuels. From the roadmap, it can be inferred that in the year 2023 there is the possibility of taking IMO mandatory measures for reducing GHG-emissions, like mandatory targets for instance on lower carbon intensity of fuels.

The strategy identifies three levels of ambition for CO_2-reductions that are important to understand well.

1. The first measure concerns the carbon intensity of the ship. All new ships need to improve on energy efficiency performance, following the Energy Efficiency Design Index (EEDI). The EEDI is a technology open mechanism as long as the required energy efficiency level is attained7. Latest amendments (May 2019) have proposed to increase the reduction rates for several ship types. This shows that the Dutch maritime sector needs to be prepared for increased ambition levels.
   Fuel information including information about the carbon intensity of the fuels used is already collected for the IMO energy efficiency measures. Each ship has to keep on board a ship specific Ship Energy Efficiency Management Plan (SEEMP). This is mandatory for all ships, existing and new ships. It manages efficiency performance over time. As the amount of CO_2 emitted from a ship is directly related to the consumption of bunker fuel oil, it is important to monitor a ship's performance with regard to fuel efficiency. The Energy Efficiency Operational Indicator (EEOI) or an equivalent tool can be used as a monitoring tool for measuring the fuel efficiency of a ship. This indicator is based on data collection that includes information on the quantity and type of fuel used, and fuel information about the amount of carbon dioxide emitted. Fuel information is required on the bunker delivery notes.[8]
2. The second level of ambition focuses on CO_2 emissions per ship (transport work) as an average across international shipping. It proposes an ambition of at least 40% CO_2-reduction by 2030, and 70% by 2050, compared to 2008. This ambition levels needs to be studied well: what reductions are expected to be reached by efficiency, and what needs to be done with lower CO_2 emissions from the part of the fuels. This requires marginal abatement cost curve analysis for how to reach these targets with the various technologies. As was raised in the expert meeting, it is still unclear how.
3. The third level of ambition targets the total annual GHG emissions of the international shipping sector, which will need to be at least half in 2050 as compared to 2008, including further growth of the sector. IMO aims to phase GHG-emissions out as soon as possible in this century.

Although it takes time for IMO regulation to come into force, see for example reduction of Sulphur out of emission control areas[9], it should be taken into account that if agreement is reached within IMO enforcements can be in place in about 1,5 years. Thus, if Member States agree on measures concerning deployment of renewable fuels in 2023, they could come into force as soon as in 2025.

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[6] IMO Annex 11 Roadmap

[7] The EEDI is developed for the largest and most energy intensive segments of the world merchant fleet and embraces emissions from new ships covering the following ship types: tankers, bulk carriers, gas carriers, general cargo ships, container ships, refrigerated cargo carriers and combination carriers. See relevant section on the IMO-website

[8] Fuel information is provided on the bunker delivery notes that are required under regulation 18 of MARPOL Annex VI. In 'GUIDELINES FOR VOLUNTARY USE OF THE SHIP ENERGY EFFICIENCY OPERATIONAL INDICATOR (EEOI)' (2009)

[9] regulation targeting the worldwide reduction of sulphur in fuel outside emission control areas, has been decided upon with the revision of MARPOL Annex VI in 2008, only to come into force on the first of January 2020

Next to the deployment of renewable fuels, the IMO has agreed on increasing efficiency of ships through several measures. Some stakeholders pointed out that by combining the savings reached by efficiency and slow steaming, funding for the price difference of renewable fuels compared to the fossils could be freed up. This requires a holistic approach.

In the discussion of IMO-regulations and negotiation process, an important distinction was made between IMO that regulates ships and fuel for shipping, and land based national or European legislation governing the fuel production.

Participants of the expert meeting considered decreasing carbon intensity of maritime fuels through fuel regulation as the most promising path to take. This has therefore been identified as a possible action to propose for the IMO mid-term measures. Also, it is recommended to create a European coalition of member states that are willing to act on this. In this respect, the operational index under IMO-EEDI regulates, besides speed, also consumption of fuel. It needs to be better understood if this could also be applied for regulating the carbon intensity of fuels.

In this regard, it was mentioned that currently the ISO-norm[10] for marine fuels requires "fuel composition predominantly of hydrocarbons primarily derived from petroleum sources while it may also contain hydrocarbons from synthetic or renewable sources". The requirement for petroleum hampers high blends or 100% renewable fuels for shipping. Getting fuel specifications in place that allow renewable fuels or (high) blends is an important condition for a pathway towards 2030 and beyond.

2.2 EU-level

In the Green Deal on Maritime and Inland shipping and Ports its signatories take the position to aim at an absolute 70% emission reduction in the international shipping sector by 2050. Looking back, that requires substantial reductions from 2030 onward. Within IMO, could a coalition of European countries be identified, such that it co-operates on identifying measures to take on the European level to be able accelerate action on this higher ambition?

Stakeholders considered the EU as a level of analysis for the drafting and introduction of regional policies regulating the maritime sector. However, most stakeholders involved in this process have made it clear that these policies and targets should be targeted at an international level instead. Preferably, through the IMO. This is, mostly, due to the internationality of the maritime sector and the need to maintaining a level playing field.

The specifications regulating the Emission Control Areas (ECAs) could serve as an example of measures regulating fuel usage and quality internationally. As part of this regulation, flag states issue certificates of compliance with the regulations to the ships. These certificates refer to the sulphur content of the fuel or equivalent measures[11]. Following the example of measures and provisions included for the ECAs, it would be interesting to explore similar possibilities for regulating the carbon content of the fuels. Explore the option of a low carbon intensity area analogous to low sulphur regulations in existing Emission Control Areas.

Another option is the inclusion of marine in the EU-ETS. The EU ETS is an emission trading system that works on the 'cap and trade' principle. The government sets a cap[12] on the total amount of certain greenhouse gases that can be emitted by, in this case, the marine transport sector. Within the cap, the sector receives or buys emission allowances (permits) which they can trade with one another as needed. Aviation is already included in the EU-ETS and it could serve as an example guiding the inclusion of the marine transport sector in the EU-ETS. In the meanwhile, it has been proposed to include marine in the EU-ETS in the European Green Deal

[10] ISO-norm 8217:2017, 5.1. ISO 8216 include up to 7,0 volume % FAME.

[11] Measures that 'clean' the fuels before they are released, e.g. scrubbers.

[12] A main advantage of the EU ETS is that under this system, the quantity of CO_2 emitted is known. However, the price of these emissions is unknown. This is a measure with a high stringency potential.

(December 2019). However, stakeholders mentioned that a carbon pricing system could be quite complicated.

A third option to act at European level could be the introduction of a levy or carbon tax by the European maritime sector as an incentive to invest in cleaner technologies that would decrease the price premium with fossil. An optimal scenario would be that the money would be reinvested in the sector. It is important to exempt renewable fuels from the levy/tax. A levy has also the possibility to target specific segments. In discussion, the example of the Norway GreenVoyage-2050 fund was made. This Norwegian funded R&D programme promotes global efforts to demonstrate and test technical solutions for reducing such emissions, as well as enhancing knowledge and information sharing to support the IMO GHG reduction strategy. This could be either set up on European Level or on the Dutch national level. It is noted that some stakeholders prefer a levy on a global level, for example through the IMO. In the Dutch Green Deal on Maritime and Inland shipping and Ports, the Ministry of Infrastructure and Water management and other stakeholders have agreed to pursue the introduction of a global carbon emissions tax within the framework of the IMO.

It is recommended to further develop the knowledge base with stakeholders on reducing carbon intensity of marine bunkers through using fuel standard regulation, either ISO or possibly through a European low carbon fuel standard. This could follow the example of the Fuel Quality Directive (FQD), or alternative the FQD could be expanded to better address the carbon content of the fuels. It is necessary to further investigate the available options to address a low carbon standard. Note, however, that most stakeholders seemed positive about this option.

Finally, it is recommended that any follow up of European directives should take into account the marine sector.

2.3 National level

With the input of the two stakeholder meetings and the survey we have drawn up a few key recommendations for possible Dutch policy measures and Dutch sector actions.

Dutch Climate Agreement

The Dutch Climate Agreement (June 2019) aims for approximately 65 PJ renewable fuels in 2030 which covers the transport sectors on Dutch territory. Bunkers for international marine (like aviation) are excluded. The Climate agreement has explicitly set a goal for 27 PJ renewable fuels in transport on Dutch territory[13]. This volume for renewable fuels has been capped. The remaining 33 PJ[14] for sustainable biofuels is a relative number, depending on the total amount of transport fuels used. This volume is based on calculations of existing and intended policy measures. Fuels used for inland shipping that can be attributed to Dutch territory have been included in the Climate Agreement. A minimum of 5 PJ of sustainable fuels is agreed upon for inland shipping. All bunkers for international marine are reported to the IMO and emissions are regulated within the IMO. As such these emissions are not part of the Dutch Climate Agreement.

Short introduction to RED II

The European Renewable Energy Directive imposes on Member States to provide 14% renewable energy in the transport sector by 2030. Road and rail transport sectors are subject to the obligation. The obligation is on the fuel suppliers. In order to provide fuel to the market, suppliers must ensure that they meet the annual renewable energy obligation for transport.

A market-based system has been established in the Netherlands to demonstrate that renewable fuels and energy have been supplied. For each batch of renewable fuel supplied to the market, parties receive an administrative unit, a renewable fuel unit or bio ticket (in Dutch 'hernieuwbare brandstofeenheid (HBE)'. These are tradeable. Some parties deliver more than they need and

[13] The Mobility chapter of the Dutch Climate Agreement can be found here: https://www.klimaatakkoord.nl/mobiliteit/documenten/publicaties/2019/06/28/klimaatakkoord-hoofdstuk-mobiliteit

[14] The number of 33 PJ was taken from the PBL National Energy Outlook 2017 (NEV 2017). In the meantime PBL has published the KEV Climate and Energy Outlook, in which the 33 PJ is increased to 35 PJ. This would increase the total amount of renewable fuels to 68 PJ.

can sell the surplus of renewable fuel units. Parties that are short of or do not supply renewable fuels themselves can buy units of others to meet their obligation.

The European Member States have the possibility, in this European Directive, to bring the aviation and shipping sectors under the RED II obligation. That's possible in two ways. The first option is to set up an obligation for these sectors as well. Another way is to make it possible for fuel suppliers to physically supply the mandatory amount of renewable fuels to aviation and shipping. These then count towards the targets for the sectors with an annual obligation, i.e. road and rail.

The European Directive 'rewards' renewable fuels to air and sea shipping by having the commitment administratively counted more, with a factor of 1.2. This is called an opt-in.

A supplier receives for 1 PJ renewable fuel delivered to road, 1 administrative unit, 1 HBE. If this 1 PJ of renewable fuel is supplied to aviation and/or shipping then it will get 1.2 administrative units, 1.2 HBE. This has a value, because the fuel supplier needs lower amounts of physical biofuels to meet the same administrative supply obligation.

It is important to fully understand the advantages and disadvantages of both the options. It is recommended to take into account impact assessments by the Netherlands Enterprise Agency.

RED II mandate or opt-in

For the short term, support measures that best guarantee deployment of renewable fuels in the maritime sector are (1) a separate obligation (also known as blend mandate) for the maritime sector under the European Renewable Energy Directive (RED II), and (2) the opt-in into the road transport obligation.

Stakeholders have identified pro's and con's for either using RED II mandate or opt-in for renewable marine fuels

Mandate

The separate obligation would guarantee that a certain volume of renewable fuels is indeed placed in the maritime sector.
Key advantages of the mandate are:

- Guarantees a certain volume of renewable fuels to be deployed in the maritime sector
- Guarantees that solutions will be developed especially for the maritime sector.

Key drawbacks of the mandate are:

- It would lead to higher prices for bunker fuels in the Netherlands. Strong international price competition could drive sales to leak to other countries.

Opt-in

The opt-in would allow parties that have an obligation to place renewable fuels in the road transport sector, to fulfil this obligation (partially) by selling fuels in the maritime sector

Key advantages of the opt-in are:

- It is cheaper to introduce renewable fuels in the maritime sector than in the road sector. The opt-in allows operators to choose the cheapest way to decarbonize transport.
- It does not increase the costs of marine fuels (because the costs will be drawn by the road transport sector) and therefore there is less risk for sales leaking to other countries.

Key drawbacks of the opt-in are

- Road vehicle drivers will effectively pay for decarbonization of the marine sector. This abandons the principle that the polluter pays. It may also be undesirable from a communication point of view.
- Operators in road transport fuels will face higher costs in complying with the obligation (higher costs when they comply in road transport or have to buy HBEs from organizations that are active in renewable marine fuels), which translates in unfair competition.
- Also, the opt-in instrument is not necessarily aimed at developing cost reductions of maritime fuels

Further considerations on RED II

With a mandate or opt-in under the European Renewable Energy Directive the fuels must comply with sustainability requirements as set out in the RED II. In this way the sustainability of biofuels is secured.

In case of applying an opt-in, take into consideration to increase the annual obligation to secure accordingly the volume that is used for road transport.

Possibly, combinations can be made between the two options. For instance, this could be done through a temporary focus on an opt-in, to be replaced by mandate after a few years. Preferably an IMO measure, or a global mandate or perhaps a mandate on the level of European Emission Control Area's. Other options considered were a combined mandate with sub-targets for road and marine, together with a flexible part. This all should be further assessed.

3 Dilemma's

In the stakeholder discussions, some dilemmas emerged.

3.1 Level playing field

The first dilemma concerns the international level playing field. Renewable fuel availability is identified as a serious barrier by stakeholders. An incentive obviously organizes supply but how to move in an international playing field? To avoid market disturbance, measures should ideally apply to the international sector as a whole. Any instrument to stimulate renewable fuels in shipping with a cost effect on marine fuel price might cause 'fuel flight', that's to say that fuels are bunkered elsewhere for lower costs.

Some participants have pointed out that in the absence of these international instruments to create an international level playing field, voluntary actions will be supported by the use of an opt-in under RED II. In this way the RED II opt-in stimulates demonstration of renewable marine fuels.

At the Dutch national level the use of an opt-in for marine might contribute to a considerable shift of renewable fuels deployed in road transport to the marine sector due to the generally lower production costs of marine renewable fuels. See also Platform study (2018) "Sustainable Marine Biofuel for the Dutch Bunker Sector"[15].

The national level playing field is affected if it is much easier for a small number of economic operators active in both road and marine sector, to fulfil their obligation for the road sector by de facto supplying to the maritime sector.

Suppliers to both the marine and road transport sectors can benefit from the lower cost of deploying renewables, mainly biofuels, in marine since they will create bio tickets at lower costs. The assumption is that costs for renewable fuels for road transport will be higher due to higher requirements in fuel standards for the road segment. Economic operators that do not have activities in both road fuels and maritime bunkering don't have this benefit.

3.2 Who can claim the CO_2-emission reductions

With deploying renewable fuels in international seagoing shipping, the international shipping sector receives the GHG emission reductions.

In the Dutch Climate Agreement, it is agreed to reduce 2 Mtonne CO_2 emissions with the deployment of renewable fuels in road transport by 2030.

The Netherlands will have difficulties to reach these specific emission reduction targets in 2030 for transport in case the opt-in for renewable fuels in marine is applied. The opt-in allows counting the share of renewable energy to the road transport targets, but the CO_2 emission

[15] https://platformduurzamebiobrandstoffen.nl/infotheek-item/sustainable-marine-biofuel-for-the-dutch-bunker-sector/

reduction is to be attributed to the international maritime sector according to international carbon accounting rules.

The same implications apply for the Dutch reporting with respect to non-ETS reduction targets for 2030. The Dutch specific country target is 36% GHG emission reduction in 2030 compared to 2005. Transport is the largest emitter in the non-ETS sector, setting high priority for emission reductions in transport. For those countries with a high target, there will be no chance of meeting the 2030 targets without deployment of renewable fuels in transport. Renewable fuels for the international shipping sector don't count for the national targets.

3.3 Economic opportunity for greening Dutch petrochemical sector

Supporting scale-up of renewable marine fuels could stimulate a strong biobased sector and contribute to a competitive position for green chemistry. However, this is to a large extent dependent on the strategy followed in bunkering for shipping and aviation[16]. The minimalist option is that, as soon as international air and shipping obligations come, the Netherlands will solve its share of bunkering. In this case, stakeholders have pointed out that they could contract the biofuels on a world market. This does not necessary lead to investment in the Dutch economy.

The more ambitious option is that the Netherlands proactively decides to develop a non-fossil alternative to the amount of fossil fuels that it now supplies to national and international aviation and shipping. With the choice of the last option, or at least for significantly more than the first, minimalist option, the Netherlands could develop into a nexus in the field of biofuels and bio-based economy and gain visibility to develop into a strong player in the field of synfuels / e-fuels /Power-to-X. Such options thus have the advantage of contributing to a good positioning of the Netherlands in the non-fossil economy.

To develop this economic opportunity for the Netherlands, a strategic vision is needed that links the deployment of renewable fuels in the maritime sector with creating a strong biobased economic position.

Investments in biobased production require a strong vision on the economic opportunity, stable incentives and long-term policies.

3.4 How can demonstration projects contribute to secure future markets

The last dilemma identified in the stakeholder sessions concerned the question of how to move from demonstration to scale-up, that was one of the key questions discussed. Stimulating demonstration is no guarantee for scaling-up availability of renewable marine fuels and innovations.

If the option for opt-in for marine fuels is renewed in the national implementation of RED II, what conditions are necessary to support-scale up? Support for R&D is necessary. It is necessary to have more innovation and demonstration of dedicated renewable fuels in marine and to build up knowledge and capacities in the sector.

4 Strengthening Dutch leadership in renewable maritime fuels

The stakeholder process has made clear that the climate issue is a material factor with an effect on the actors. Participating stakeholders are aware of the need to prepare for operation in upcoming carbon emission reductions' regulation and are supportive of measures to increase the deployment of renewable fuels in the sector.

Four actions are recommended and described in the next sections.

[16] Platform Duurzame Biobrandstoffen(5 juni 2018) Fiche Duurzame Biobrandstoffen voor mobiliteitstafel

4.1 Actions to stimulate true demand and lower costs

At the moment, the main market barrier for renewable marine fuels is the price difference with fossil fuels and lack of regulation that has resulted in a limited amount of renewable fuels' supply. For a scale up of sustainable supply, a stimulating policy needs to be in place.

Policy should be aimed at incentivizing renewable fuels' demand and stimulating innovation and capacity building at the same time (see 4.4). With a more significant demand for renewable fuels, the offer of this product will start growing as suppliers would be sure that there is a market for their product. Ultimately, this would lead to lower costs for the alternative fuels (through economies of scale, effect of learning, and increased competition if there are multiple suppliers).

Stakeholders were in favour of entering a mandate on fuel suppliers, under the condition that an international level playing field is guaranteed. It has been pointed out that voluntary measures are supported by the use of the RED II opt-in for marine. How could the highlighted draw-backs of the opt-in be addressed?

A temporary focus on an opt-in, with a yearly limit, to be replaced by a mandate after a few years should be further assessed. For these combined measures, these are the considerations:

- From 2020-2030: both transport sectors (road and marine) see a growing volume of renewable fuels.
- The international bunkering sector will initially start with an opt-in which is gradually replaced by a mandate.
- Most years, the fuel suppliers have both an (over the years decreasing) opt-in and, next to that, an annually growing mandate.
- The opt-in for marine is capped to prevent a full shift from the national market to the international shipping sector.
- The mandate starts either as soon as 2021 or alternatively in 2025, when an IMO mandate could be possibly introduced.

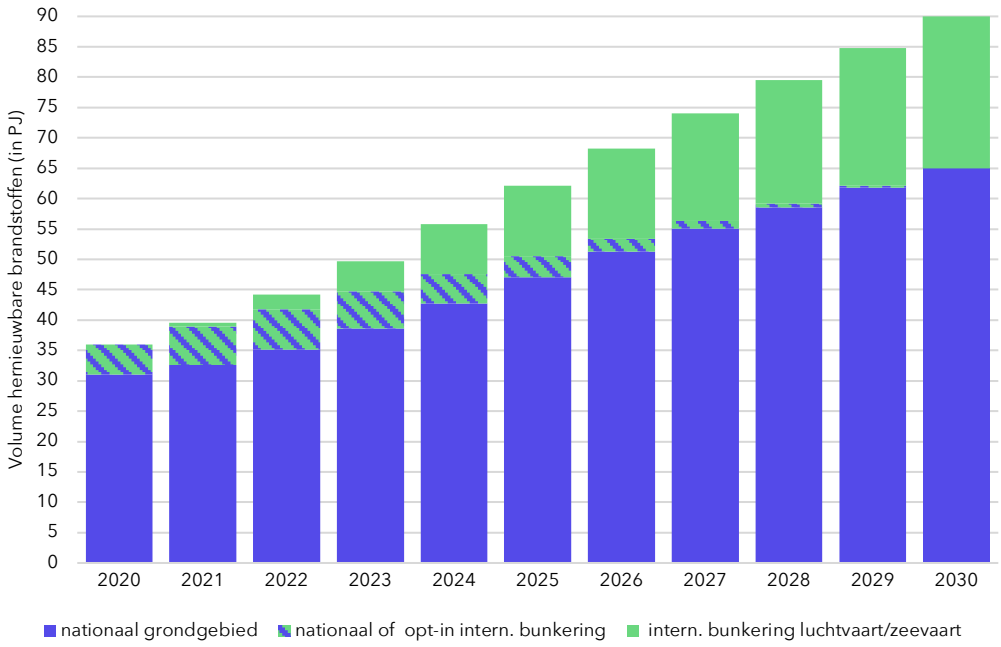

Figure 1 Development of volume renewable fuels between fuels on Dutch territory (mainly road transport) in blue and the international maritime transport sector in green by a capped and decreasing opt-in for marine and a growing additional volume following a mandate as from 2021

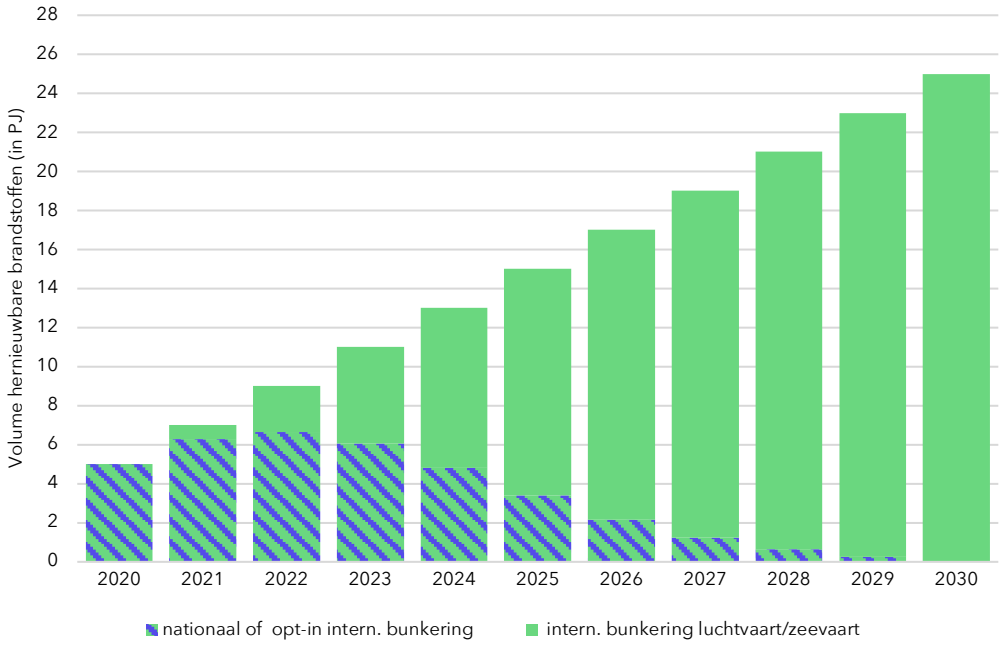

Figure 2 Development of volume renewable fuels for marine with a capped and decreasing opt-in for marine and a growing additional volume following a mandate as from 2021

To be successful, as a stimulating tool for demonstration and scale-up, it is essential for the opt-in that a knowledge and innovation program is developed in tandem (see 4.4.).

4.2 Working on international alignment

For the forthcoming mid-term measures that will be prepared by IMO Member States, several suggestions have been given for international alignment. First, stakeholders are positive on working on lower carbon intensity through fuel standards. Some have underlined the importance to make sure that renewable fuels will be stimulated. Others have mentioned that fuel requirements should be made more specific to the characteristics of the different fuels available and be less generic. There is a lot that can be done by setting the right standards and there is room to work in this area. As stakeholders pointed out, similar standards have already been placed determining the characteristics that fuels should comply with and they work well. Technical standards should be agreed upon through lobbying in the IMO. The ISO is also a good mechanism to set these standards. These standards and protocols should apply to the OEMs. In this respect, it is important to also take into account developments at the engine side.

Many stakeholders were also in favour of entering a mandate for renewable fuels on fuel suppliers. Preferably as a global IMO measure. But it was proposed to also look into the possibilities of building a coalition with relevant European Member States, trade lane actors or in European Emission Control Area's.

Some stakeholders support a CO_2 levy, provided the revenues are invested in the sector like in R&D and/or accelerated fleet renewal and innovation. Another way is by creating a sector fund, in which participating sector parties pay a small extra amount, like 1 cent per litre, combined with a volumetric target on use of renewable fuels. Costs will be payed from the created fund. It is recommended to discuss with fuel suppliers what amount could be blended in with no or only a limited price increase. Given the considerable volume of bunkered marine fuels, a small blend could bring about new supply-chains and contribute to better availability of renewable fuels.

Several stakeholders see a good position for the Netherlands, possibly together with Denmark, to take the lead in coordinating a European approach, based on the strong Dutch position in the European and international bunker markets for marine. Note that IRENA (International

Renewable Energy Agency) mentioned at the Platform autumn seminar that "the Netherlands is widely considered to be in a better position to create renewable fuels for shipping"[17].

4.3 Sector program for renewable marine fuels

This stakeholder consultation has not received enough information and insights about what the Dutch Maritime sector needs with regards to renewable fuels to achieve the IMO targets. The industry has committed to the IMO GHG-strategy requiring 40% CO2-reduction per transport work in 2030 and reducing net CO_2 emissions to 50% below 2008 levels by 2050. With the Dutch Green Deal for sea shipping, the Dutch maritime sector has committed itself to a higher target of 70% reductions in 2050. To what extent can efficiency improvements be sufficient to reach industry goals for 2030? What volume of renewable fuels is required to reach the goals for 2030 and beyond?

About the 2030 IMO target of '40% CO_2-reduction per transport work' answers are needed on:

- How much can be done by increasing efficiency and other measures?
- What is the need for reducing emissions towards 2030 with renewable fuels?

About the 70% absolute sector reductions in 2050, consider back casting what volume of renewable marine fuels should be available as from next year.

Furthermore, it is important to gain insights on the fuel types that are and will be needed in a net-zero emission pathway. It is important that actors understand the various fuels' specifications, the conversion technologies available and their requirements in terms of technology, operations and infrastructure improvements. As it was mentioned, facilitating multi-motor design and robust criteria concerning the emission intensity of the vessel is needed.

Compare the fuel requirements for developing a sectoral program for renewable marine fuels, based on what was presented in the stakeholder meeting by participants from the Ministry of Defense.

Figure 3 Slide from presentation at Nov 19th stakeholder meeting, Netherlands Defence Materiel Organisation, 'Pilot HVO/F-76,'DEMO F-34/HEFA' F-76 = marine distillate fuel / F-34 = Jet fuel

4.4 Government actions

In the need for scaling up of the uptake of renewable fuels, it is important from a governmental perspective to create a knowledge and innovation program for renewable marine fuels. It is recommended to stimulate companies and knowledge organization to address[18] the main innovation challenges together through a learning community.

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[17] https://platformduurzamebiobrandstoffen.nl/infotheek-item/seminar-the-necessary-focus-on-fossil-free-fuels/

[18] https://www.topsectoren.nl/human-capital [19] Green Deal on Maritime and Inland shipping and Ports, Part II, 12,7 Before 1 January 2021 KVNR, Evofenedex, BOZ and NMT will jointly develop a targeted strategy for

TUDelft together with a consortium of companies and organizations has received NWO funding for a clean shipping program that aims for the development of dedicated sustainable marine fuels and sustainable feedstock supply. The Maritiem Kenniscentrum is reviewing renewable fuel options for the sector. Netherlands Defense has lab facilities for fuel testing. There is knowledge on engine development. GoodFuels, Boskalis, VanOord, Port of Rotterdam, de Rijksrederij and several other actors have developed showcases and visible demonstrations of renewable fuels in marine which will help to inspire more stakeholders. This shows how the Netherlands is well positioned to lead developments in renewable marine fuels.

Engage stakeholders in developing a shared vision on renewable marine fuels that will connect levels (IMO, EU, NL) and measures. This engagement could shape the way they contribute to the energy transition in the marine sector, strengthen the main port and how they relate to creating the biobased economy. This will also stimulate investments in renewable marine fuels.

Communicate demonstration and good practices. The proposed Dutch Green Deal's blue shipping label[19] could address the need of disclosure by making it easy to identify what products are shipped 'well or 'better'. It will underline the importance of consumer's choice to spark initial scale deployment of renewable fuels and lead by example. BICEPS network, Heineken, Maersk, Nike, among others, have developed showcases to underline this. Green Award[20] is also a valuable label for showing the climate achievements of a ship.

5 Conclusions

As maritime shipping is predominantly an international sector, stakeholders agree that an international approach to emissions' reduction is preferable, to ensure a level playing field between different countries and ports. This is also a requirement to avoid 'fuel flight' through ships shifting to bunkering fuels in other ports. Reaching either a mandate or obligation under the supervision of IMO or with IMO-front-running regions, is generally considered as the way to go. Yet, stakeholders still considered the EU as a level of analysis for the drafting and introduction of regional policies regulating the maritime sector. Take the example of the inclusion of marine in the EU-ETS as proposed in the European Green Deal (December 2019). For the short term, the support measure that best guarantees deployment of renewable fuels in the maritime sector is the opt-in for marine into the road transport obligation under RED II. However, allowing the opt-in for marine without taking extra measures might create serious draw backs.

With the input of the two stakeholder meetings and the survey we have drawn up a few key Recommendations for a pathway towards 2030.

Recommendations for a pathway towards 2030

1. A temporary focus on an opt-in for marine under RED II, with a yearly volume, to be replaced by a mandate after a few years should be further assessed.
2. For the forthcoming mid-term measures that will be prepared by IMO Member States, several suggestions have been given for international alignment on measures for supporting renewable marine fuels, being:
    - A global IMO mandate on fuel suppliers, or possibly on the European level or included in Emission Control Areas regulation.
    - Decrease carbon intensity through fuel standards.
    - A CO_2 levy on fossil shipping fuels and sector fund to support innovation or deployment of renewable shipping fuels.

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encouraging industry and consumers to sell and buy products transported by water with zero emissions. This 'Blue Shipping' marketing strategy may include 'Blue Shipping: zero emissions' product labelling.

[19] Green Deal on Maritime and Inland shipping and Ports, Part II, 12,7 Before 1 January 2021 KVNR, Evofenedex, BOZ and NMT will jointly develop a targeted strategy for encouraging industry and consumers to sell and buy products transported by water with zero emissions. This 'Blue Shipping' marketing strategy may include 'Blue Shipping: zero emissions' product labelling.

[20] https://www.greenaward.org

3. Dutch maritime sector developing a program/vision indicating what is needed for renewable marine fuels, within the context of other measures (efficiency, slow steaming, other power trains).
4. For stimulating demonstration into scale-up it is essential to develop a knowledge and innovation program about deployment of marine renewable fuels. And to have a communication program for knowledge dissemination.

Further stakeholder engagement

It was clear from the stakeholder event that currently some parties have already developed a lot of know-how and experience, while others are just starting to think about the options and the consequences. A regular stakeholder engagement effort will help to bridge knowledge gaps, improve collaboration and ensure that more parties are well-prepared to deliver the eventual solutions.

Engage stakeholders in IMO negotiations and outcomes. There seems to be a general wish to progress faster and go further than the IMO, but not at all costs. It is important both for the motivation of the stakeholders and to develop measures that can generate value in an IMO renewable energy setting, that stakeholders understand the IMO process, timelines and prevailing thoughts. Vice versa, ideas from Dutch stakeholders can inform the IMO process.

The stakeholders worked on a variety of ideas, as displayed in this document, to enable either the supply or use of renewable fuels, or to finance R&D into future solutions. We advise the Ministry to collaborate with the stakeholders to further work out the ideas into a strong vision and action-oriented roadmap.

Annex 1 – Matrix of measures

Potential Measures:	Level	Mechanism	Who is responsible?	Who is the 'obligated' party?	Who is paying?	Who gets the CO_2 emission reduction?	What are the main barriers?	Solutions to overcome these barriers?	Scale-up possible?	Time horizon for application?
Include Maritime in EU ETS	EU	Cap & Trade, carbon pricing	EU	Shipowner	Shipowner - customer	Shipowner or cargo owner	Level playing field - intercontinental? Enforcement Buying reduction can be deemed easier than truly reducing emissions	limitation to European waters	highly unlikely on intercontinental level- only possible within European waters	If decision making process has started, it could short term, within 1 or 2 years
IMO Global CO_2 emission reduction target (market based mechanism with cap and trade)	IMO/Global	Cap & Trade	IMO	Shipowner	Shipowner - customer	Shipowner or cargo owner	Enforcement Level playing field, are all members active for IMO? Voluntary scheme?	IMO should guarantee enforcement by member states	If all members participate large upscaling potential	Long term solution
Levy (carbon tax) for maritime as a whole, or for certain subsectors	National, EU, Global	Carbon pricing	Member state, Dutch government	Shipowner / cargo owner	Depends	Shipowner or cargo owner	Level playing field, money doesn't stay within the sector	Mandatory reinvestment of the levy in the sector	If member states are willing to join	Mid/Long term solution, requires consensus among MS
Voluntary contribution by a coalition of willing (such as Green Deals)	EU, National									
Opt-in (vol % renewable energy) under RED 2	National	Minimum requirement & trade (road transport)	Fuel supplier automotive industry	Fuel supplier engine industry	Fuel users	Shipowner or cargo owner			Scale up possible, larger multiplier for marine	Already applicable from 2021 - 2030
Separate mandate for Maritime (vol % renewable energy) under RED 2	National	Minimum requirement & trade (marine)				Shipowner or cargo owner				either from 2021 or introduced from 2023/2024
The Energy Efficiency Design Index (EEDI) or Operation Index (EEOI)	Global /IMO	Minimum efficiency standards (performance based)				Shipowner or cargo owner				
Low carbon fuel standard (similar to FQD: require increasingly lower carbon footprint for all fuels sold)	National, EU or IMO	Command and control +emission trading				Shipowner or cargo owner				
Port fee discounts	National, EU, Global	Differentiated port fee tariffs				Shipowner or cargo owner				
Fund for production of low carbon fuels	National, EU	Competition				Shipowner or cargo owner				

Potential Measures:	Level	Mechanism	Who is responsible?	Who is the 'obligated' party?	Who is paying?	Who gets the CO_2 emission reduction?	What are the main barriers?	Solutions to overcome these barriers?	Scale-up possible?	Time horizon for application?
Subsidies for fuel production, infrastructure and other enablers, application (such as via engine modifications), or sales	National, EU	Investments, subsidies, loans				Shipowner or cargo owner				
Support R&D	National, EU	Investments, subsidies, loans				Shipowner or cargo owner				
Green deal, Blue shipping iniative						Shipowner or cargo owner				
Other Suggestion: High modal shift multiplier from road to aviation and marine	National, EU	Minimum requirement & trade (road transport)				Shipowner or cargo owner				

Annex 2 – Sector comments on Matrix of measures

Suppliers

From the twelve possible options presented in the matrix, the suppliers agreed on the following three (not in order of preference):

1. Levy (carbon tax)
2. Opt-in or a separate mandate for Maritime
3. Low carbon fuel standards (similar to FQD)

Ideally, the carbon tax should apply to the sector as a whole. If this proves challenging, the carbon tax should at least be included in certain sectors. Either way, suppliers agree that there should be one such tax. Secondly, it is also deemed necessary to incentive the blending of renewable energy. There appears to be some disagreement on whether this should be done through an opt-in first or directly through a mandate. However, there is agreement on the need to require a percentage of renewable energy in the mix. If a separate mandate for maritime is created, this should be done under RED II. The third option is the introduction of a low carbon fuel standard requiring a lower carbon footprint for all fuels. At the moment, the IMO regulates the fuel requirements with a focus on fuels with low Sulphur rather than low Carbon. At last, one supplier suggested the introduction of a high modal shift multiplier from road to aviation and marine, where aviation and marine are at the same level.

Shipping sector

There is also agreement in the options preferred by the sector. These are (not in order of preference):

1. CO_2 levy
2. Strengthening the existing IMO instruments such as the EEDI and SEEMP
3. Support for R&D

The CO_2 levy is seen positively by the sector provided the revenues from the levy are reinvested in the sector. For instance, by creating a 'Maritime Sustainability Fund'. On the other hand, if the carbon tax is introduced globally through the IMO, it could guarantee a global level playing field, which is one of the main concerns from different groups of stakeholders. The strengthening of IMO instruments is also high in the priority list. This is due to the fact that they apply to a large part of the world fleet. However, it is worth mentioning that existing ships that do not fall under the EEDI obligation, the EEDI itself cannot offer a short-term solution. That is why it is emphasized that these existing instruments should be strengthened. Finally, support for R&D is considered necessary, especially when it refers to allowing accelerated fleet renewal and innovation. In line with the first point, support for R&D could be provided through the revenues of the carbon tax.

Annex 3 – Stakeholder meeting 18 November 2019

For the stakeholder meeting we had selected five perspectives for reviewing possible measures and identifying barriers and possible solutions.

4. "Give us an obligation"
5. Change the standards
6. Preparing for future compliance,
7. Building a coalition of the willing,
8. Consumer pressure (building green propositions)

Give us an obligation/Let us comply (e.g. RED II mandate)

Participants were in favour of going to a mandate on fuel suppliers, with two conditions: a large enough supply of alternative marine fuels to meet demand and a level playing field between all participating countries. It proposed that these conditions be met through three workstreams acting in tandem: technical standards, policy, and supply increase. This obligation should be implemented for 2023/2025 to ensure the scale up of sustainable supply.

In the Netherlands, there is probably willingness for a very 'light' extra price of 1%, that could create space for a minimum obligation. For a higher obligation there could be the disturbances to the level playing field at international, European or Member state level. This could be addressed through harmonization of the standards by the IMO in the long term. In the short term this could be done by expanding the mandate under RED II in Europe.

There is also the problem of CO_2 ownership and about who are the beneficiaries from it. This could be addressed by shifting ownership from the IMO to the country of origin or by trading carbon reduction units.

Change the standards (like working on lower carbon intensity through fuel standards)

The participants are positive on working on lower carbon intensity through fuel standards. Some have pointed out that is important though to make sure that renewable fuels will be stimulated. There is a lot that can be done by setting the right standards and that there is room to work in this area. In general, participants don't think there are significant barriers in this topic. As they pointed out, similar standards have already been placed determining the characteristics that fuels should comply with and they work well. Technical standards should be agreed upon through lobbying in the IMO. The ISO is also a good mechanism to set these standards. These standards and protocols should apply to the OEMs.

As to the concern of bacteria and funghi problems with the use of biofuels in vessels, this used to be a problem but has been solved, especially if the right 'housekeeping' is done, and by using the prescribed fuels correctly.

Standards are not always inclusive of all the different requirements, vessels and energy converters. Requirements should be made more specific to the characteristics of the different fuels available and be less generic.

Use the existing standards, like EN 590 (specification for fossil) and EN 14214 (specification for bio). Specifically, it was mentioned that the ISO standards could be extended for this purpose.

Preparing for future compliance (IMO obligation)

The participants emphasized that it could be helpful if regulation was initially driven by the IMO. The preferred solution for the IMO legislative level was to increase the cost of fossil fuel (carbon tax) on par with renewable fuels so market-based measures are deemed effective. A risk was identified upon making fossil fuels more expensive than renewable fuels as unforeseen behavioural patterns can emerge from this (i.e. bunkering elsewhere or seeking other technological alternatives).

Considering time-consuming decision-making procedures within the IMO whose enforcement methods are dispersed, European instruments should also be considered. Developing future compliance within the European Commission's level of authority triggers however distinct considerations. For example, there can be a high level of "fuel flight/carbon leakage" as well as the creation of an unlevel playing field.

Barriers mentioned are a lack of data availability and a consistent methodology for LCA and carbon accounting between regulators as, for example, the EC and IMO use distinct datasets and definitions.

Consumer pressure (building green propositions)

It was discussed on 'who is the consumer'? Is that the person who buys a shirt on Amazon? Is it the cargo owner?

The non-visibility of (a big part of) transport is seen as a big problem as it does not allow consumers to have a wide view of the means of transport used for product delivery.

Costs were initially suggested as a barrier, but this was almost immediately discarded. The extra costs on the end consumer will be so small that barely any difference in price will be noted, at least in Europe. For cargo owners other factors could have a bigger impact on price than the extra costs of using blends with renewable fuels.

Need for a general label where you can see what is shipped with lower/higher carbon emissions. With disclosure/transparency of what products are shipped 'good' or 'bad'. The Dutch Green Deal mentions a blue shipping label, what is the status?

Non-visibility of marine transport could be tackled by promoting engagement: either multi-stakeholder or consumer engagement. For this, PR might have a big role.

Building a coalition of the willing (voluntary measures)

Participants have pointed out that voluntary measures are supported by the use of an opt-in under RED II. This addresses the price difference. Although users in the road transport sector will be effectively be paying for the use of renewables in marine, this is not seen as major obstacle altough the GHG-emission reduction will be for the international shipping sector.

Make a useful and practical segmentation of the different areas of the marine sector: fishing, vessels under public procurement, nations, etc.

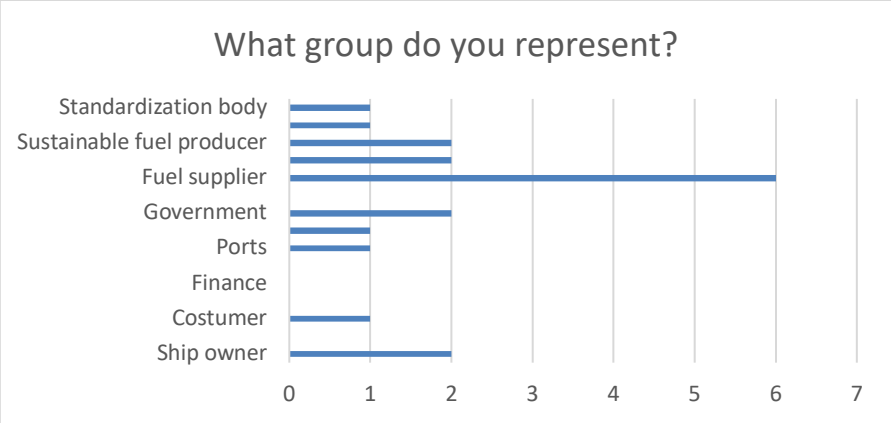
A coalition of the willing could consist of regional pacts and collaborations that connect the main ports within which segments are created. These segments could possibly be categorized into inland, coastal etc. Next to that, regulated specifications for vessels and the sector can be adopted to determine required fuel standards, greenhouse gas emissions and other standards that can aid the decarbonisation potential of this sector.

The compartmentalisation of motors is a possible solution as well as determining methods to understand the location and timing of fuel availability. To strengthen this solution, it is foreseen that a requirement to have zero-emission lay-out of the ship is most effective to tackle all posed problems. This could be achieved by facilitating multi-motor design and robust criteria concerned with the emission intensity of the vessel is needed.

Some have pointed out that a coalition brings little incentive for organisations to contribute, therefore the impact on deployment of renewable fuels is expected to be low.

Annex 4 Recommendations for the Ministry from the Survey

Respondents (N=19)



A survey[21] was carried out in addition to the stakeholder meeting in order to gather detailed-individual opinions and insights. It was sent to both people that participated in the stakeholder meeting and to people that were not able to be present. The survey was meant to understand the views on the main drivers for the introduction of renewable fuels in the marine transport sector and to identify what needs to be taken into account regarding their introduction.

Most of the respondents were fuel suppliers. 70 % of the respondents agreed that the strongest driver is CO_2 emissions' reductions, followed by the need to prepare for IMO regulations. Most participants are of the opinion that the Dutch marine sector wants to introduce renewable fuels in order to achieve CO_2 emission reductions and to take responsibility of the effects on climate change and air quality of using fossil fuels.

When asked about what factors are the most important regarding the deployment of renewable fuels in the marine sector, there were very varied answers. Availability of supply, technical feasibility and prices are the most frequently chosen of the options.

Most respondent indicated that the inclusion of an obligation (at their own costs and risks) depends on the conditions and the context in which this is done. An interesting suggestion was given, to start with 2% in all ships leaving Dutch harbours, and gradually increasing with 2%/yr, so after 50 years, 100% will be reached. Although, a level playing field is considered a pre-condition, there is also support for creating coalitions and business cases in the absence of a level playing field. Respondents opinions regarding the level obligation deemed adequate and the timeline for its implementation is also varied. Overall, there is an agreement that an obligation should be introduced as soon as possible, albeit at low levels, and be gradually increased.

Q. If it is decided to adopt either a voluntary or a mandatory obligation to deploy renewable fuels in the marine sector, what would be, according to you, a feasible percentage for this obligation? What is a feasible timing for its introduction?

- Timing, once the toolkit is ready to be deployed. A continued opt-in to the road transport obligation could support and maybe speed up the development of the tools required for an eventual marine obligation.

The top sectors call for the development of public private collaborations in learning communities in which learning, working and innovating go together to enable scaling up .

[21] The survey was sent using the online tool Survey Monkey and consisted of 7 questions in total, three of which were open questions and asked for detailed opinions. The answers, however, were anonymous. The survey was sent to130 people and answered by 21.

- Supply of renewable fuels is limited, so supply and demand will not be in balance in coming years. Deployment of renewable fuels in the maritime industry will be dependent on the demand of other industries. For example, aviation. Consequently, the market will dictate the percentage possible to deploy.
- Preferably voluntary, up to 30% renewable fuel. A feasible timing would be 2030. (IMO procedures / ISO standards -changes take a long time)
- Could be done promptly, depending on the cooperation of ministries and clarification of what we can and what we cannot use to prevent discussions / lawsuits afterwards
- The percentage is irrelevant as long as there is a level playing field created in Europe when it comes to mandatory obligations. The Netherlands can support voluntary obligations up to 100% usage, like with Bio-HFO
- 3% volume by 2030 as part of an overall 10% fossil energy consumption reduction target and with a 25% target by 2050. More than 3% doesn't seem to be feasible in terms of availability.
- A feasible percentage must be in-line with the availability and demand of the renewable fuel. Its introduction must also be in-line with the availability and should not disturb the market level playing field. Otherwise it will be a risk of placing the industry out of the market or losing market share.
- I am of the opinion that renewable fuels create a renewable network which causes damage to the earth, far bigger than fossil fuels are doing. The lowest possible percentage of renewable fuels should be obligatory.
- Start with 2% in all ships leaving NL harbours, and gradually increase with 2%/yr, so after 50 years we will reach 100%
- At the moment 7 max. (like ISO 8217:2017 describes)

Q What would be your recommendation for the ministry?

- Make an intra-sectoral carbon/renewable mechanism that enables all sectors to work together to reach the goals at the lowest marginal cost.
- It should follow a holistic approach, taking all energy consumers into consideration. A principle of achieved CO2 reductions per invested euro should be taken into account -plucking the low hanging fruits-. The maritime industry may need some more time to adjust to the technology and operational measures. Our advice would be to follow measures that would stimulate a full market deployment of renewable fuels and set a competitive price level against fossil fuels. Accelerating fleet renewal will result in the utilisation of new technology and fuels.
- Set up a support framework specifically for the marine sector.
- Avoid carbon leakage to other ports, anywhere in the world.
- Start with low hanging fruit. CM4 (Clean Mobility Quattro) is a drop-in catalyst to reduce NOx/CO2/S in all kinds of fuels. It has low costs and high savings: up to 20% fuel savings on low RPM machines like Marine vessels. It's a new technology and a working product. See www.Cleanmobility.biz
- Create a clear, level playing field by clearly stating acceptable components.
- Make it mandatory at a certain date.
- Facilitate the use of new alternative fuels. Now regulation is often seen as a bottleneck at different levels: National, CCR, EU. For the qualification and certification of methanol for marine, a closer look should be taken there where methanol offers advantages compared to LNG (handling/ pressure) and ethanol (risk of fire, solvability in water etc.). General classification as a low flashpoint fuel brings unnecessary hurdles in bringing suitable fuels to the shipping market.
- Make decisions, duels are the easiest way to start with.
- The Netherlands by itself should not opt for an obligation as long as there is no support from other West-EU countries. Level playing field is critical as otherwise the competitiveness of Dutch ports is directly negatively affected.
- Set a goal with a clear scope for 2030 and 2050. Set an investment fund from the levy of a tax on the use of fossil. Make sure that the product quality is standardized and make co-processing (also from fossil waste streams) possible so refineries can deliver products.
- Start using public procurement as a change engine. A lot of vessels are running under tendered contracts and it is here where true change can be triggered.

- Implementing a renewable fuel takes time to work its way into the industry and the industry itself has already entered the path for this renewable fuel, but right now, for the near future, the world cannot do without fossil fuels
- Have a far better control system that makes sure that rainforest is not substituted for corn or soya to produce oil, which is branded as Used Cooking Oil in the Netherlands.
- Start it.
- Invest in green methanol, hydrogen, ammonia and battery power.
- Take care of information and subsidies.
- Introduce a separate mandate for marine and aviation, apart from road transport.
- Work on it.