



STEERER

STRUCTURING TOWARDS ZERO EMISSION
WATERBORNE TRANSPORT

**D 2.4. Public policy instruments and
interventions and other appropriate mechanisms,
incentives
and business models to increase the take-up and
deployment from R&I activities**



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Executive Summary

The current Task 2.5: “Public policy instruments and interventions and other appropriate mechanisms, incentives and business models to increase the take-up and deployment from R&I activities” uses the selected outcomes of the Strengths, Weaknesses, Opportunities and Threats (SWOT) analysis as the basis for the elaboration of a range of regulatory and non-regulatory instruments or combinations of instruments that may be used to reach the objectives of the intervention. In detail, STEERER has rolled out the exercise by identifying potential interventions in the following groups:

- Regulations
- Incentives
- Taxes and charges
- Other instruments

The current deliverable lists the recommended interventions around the intervention areas:

- Overarching key actions
- Use of Sustainable Alternative Fuels
- Electrification
- Energy-Efficiency
- Digital Green

The two other intervention areas – Design & Retrofitting and Ports – are included as 'transversal' aspects in the first four intervention areas listed above.

Public policy instruments and interventions and other appropriate mechanisms and incentives are key elements necessary to increase the take-up and deployment from RD&I activities since viable business cases are rarely found in the sector when it comes to zero emissions in waterborne transport technologies. This is since greening is currently still more driven by the political motivation than by the commercial interests. To close this gap, public measures are essentially needed to achieve the climate goals.

This deliverable consolidates all inputs that have been derived from the project internally and the feedback round with the Scientific Committee and the Green Shipping Expert Group members who have provided valuable updates to the consortium’s work.

1 Introduction

1.1 The STEERER Project

STEERER (Structuring Towards Zero Emission Waterborne Transport) coordinates the establishment and communication of a Strategic Research and Innovation Agenda¹ and an Implementation Plan **towards zero-emission waterborne transport, in cooperation with all key stakeholders needed to facilitate the transformation to clean waterborne transport.** In the definition of STEERER, as well as cutting greenhouse gas emissions, all harmful environmental emissions, water pollution and noise emissions have to be eliminated. STEERER's mission is to bring the various initiatives and sectors' stakeholders together to join forces for a combined effort with the maximum impact for the climate, people's health and Europe's economy.

STEERER is coordinated by the Waterborne Technology Platform, counting on the participation of a total of eight partners from six EU countries.



Figure 1: STEERER's Partners

¹ The STEERER project will provide input to the Waterborne TP regarding the development and update of the Strategic Research and Innovation Agenda of the Co-Programmed Partnership on Zero-Emission Waterborne Transport in the framework of Horizon Europe (https://ec.europa.eu/info/sites/info/files/research_and_innovation/funding/documents/european_partnership_for_zero-emission_waterborne_transport.pdf).

In sum, STEERER aims to:

- Jointly set emission targets towards 2050 (including targets for 2025 and 2030);
- Contributing to the update of the Strategic Research and Innovation Agenda of the Co-Programmed Partnership on Zero-Emission Waterborne Transport (cPP ZEWT)² in the framework of Horizon Europe, to be able to reach these targets in time;
- Develop an Implementation Plan to reach the targets in due course while staying competitive and offering a valid business case;
- Developing and implementing a communication campaign, aimed at broader awareness of the waterborne transport sector and its commitment towards zero-emission transport, to become a fully sustainable mode of transport;
- Monitoring and assessing the implementation of the Strategy defined and adapting where necessary, after the project's conclusion, by the Green Shipping Expert Group.

The consortium will function as a Secretariat, where the broader expertise is involved in the **Scientific Committee (SC)** and the **Green Shipping Expert Group (GSEG)**³, the two expert groups to be established by the project.

STEERER is funded by the European Commission research and innovation programme Horizon 2020, with an investment of 1,5 million euro over the course of 36 months, starting in December 2019. STEERER plays an important role in the execution of the Co-Programmed Partnership on Zero-Emission Waterborne Transport in the context of Horizon Europe.

² https://www.waterborne.eu/images/documents/201021_SRIA_Zero_Emission_Waterborne_Transport_spread.pdf

³ <https://www.waterborne.eu/projects/coordination-projects/steerer/green-shipping-expert-group/member-list?view=members>

1.2 Task description

The current Task 2.5: “Public policy instruments and interventions and other appropriate mechanisms, incentives and business models to increase the take-up and deployment from R&I activities” uses the selected outcomes of the SWOT analysis as the basis for the elaboration of a range of regulatory and non-regulatory instruments or combinations of instruments that may be used to reach the objectives of the intervention. In detail, STEERER has rolled out the exercise by identifying potential interventions in the following groups:

- Regulations
- Incentives
- Taxes and charges
- Other instruments

The current deliverable lists the recommended interventions around the intervention areas:

- Overarching key actions
- Use of Sustainable Alternative Fuels
- Electrification
- Energy-Efficiency
- Digital Green

The two other intervention areas – Design & Retrofitting and Ports – are included as 'transversal' aspects in the first four intervention areas listed above.

STEERER has collected several business models / examples for the identified most important priorities with the highest impact to facilitate the uptake of innovation in the European waterborne transport sector in an economically viable way, thus ensuring its competitiveness. Further to this STEERER, where appropriate, identified opportunities for innovative business models / examples for investments in greening the fleet (e.g. pay-per-use), paving the way for Connecting Europe Facility / Innovation Fund / European Investment Bank (CEF/EIB) or other funding/financing sources applications. The deliverable follows the well-established SRIA / cPP ZEWT / STEERER methodology.

2 Relation to the SWOT results

In Task 2.4 of the STEERER project, the Consortium had delivered a SWOT analysis. The respective document presents Strengths, Weaknesses, Opportunities and Threats analysis of the recommended actions to achieve Zero Emission Waterborne Transport (ZEWI).

These actions have been defined for each intervention area earlier on in Deliverable 2.3 Areas of intervention and related actions - “implementation plan” of STEERER. The SWOT analysis lists the results and findings for the actions and provides a clear insight in the internal and external factors that can have an impact on the different actions contributing to zero-emission pathways for the waterborne transport sector. This concerns actions in the field of RD&I and beyond (supporting measures).

The current task takes elements further from the SWOT which have been clustered as selected specific actions in individual intervention areas from the D2.3 deliverable. The topics for these key actions have been selected by the Scientific Committee members and given priority to discuss in the 3rd GSEG meeting (12 January 2022). Furthermore, there are overarching key actions taken over from the SWOT and paired with potential interventions.

3 Need for intervention

Public policy instruments and interventions and other appropriate mechanisms and incentives are key elements necessary to increase the take-up and deployment from RD&I activities, since viable business cases are rare to find in the sector when it comes to zero emissions in waterborne transport. This is since greening is currently still more driven by the political motivation than by the commercial interests. To close this gap, public measures are also needed to achieve the climate goals.

Chapter 4 lists potential measures that have been identified by the STEERER consortium and validated / updated / amended (with italics) by the Scientific Committee.

Despite the current Task 2.5 is primarily about non-research measures, the STEERER Consortium finds it important to comprehensively consolidate the inputs received from the various experts (project consortium and SC members) and thus list research-related instruments. Furthermore, policy and research shall function together in order to drive technological solutions towards a systematic and viable direction.

It has to be noted that in the topic of wind assistance, there has been principal feedback received during the adjustment with the GSEG, however, the feedback cannot be directly incorporated in the methodology of the current deliverable. The feedback states and derives

inputs from the principal that “wind is a direct source of additional energy” and this is not fully in line with the methodology applied in STEERER.

The outcomes of this task are embedded into the further work of STEERER, especially when elaborating the input to the Strategic R&I Agenda (STEERER Agenda) and Implementation Plan (Task 2.6) and in the work of the Co-Programmed Partnership on Zero-Emission Waterborne Transport.

4 Public policy instruments and interventions

During the process of elaborating the current deliverable, the STEERER consortium has set up a file that has taken over the selected specific actions and key actions from the SWOT analysis and delivered the first inputs of partners for the recommended public policy instruments and interventions in the field of **regulations, incentives, taxes and charges** and **other instruments** per intervention area and specific action and in the overarching field (chapters 4.2-4.6).

However, during the adjustment with the Scientific Committee, there were several inputs received which are important on the higher level, therefore it was decided to list those as a separate chapter in the lead, namely chapter 4.1 – General findings.

The inputs and updates received from the Scientific Committee and the Green Shipping Expert Group members are listed with *italics*. The STEERER Team is thankful for the valuable inputs.

4.1 General findings listed by the SC

SC members have listed the following general findings during the feedback round:

- *The main driver for adoption of green fuels and energy solution is political/regulatory – The International Maritime Organization (IMO), EU, Kyoto protocol, Paris agreement, etc. – therefore, even though important, cost is not the main or sole driver.*
- *Regulations are to be aligned with other transport sectors.*
- *Focus on assimilating /unifying the knowledge from other industries maybe time saving and beneficial.*
- *Current taxonomy only favours zero tailpipe emissions. This should be changed to a well-to-wake approach.*

- *Regulations should be fuel neutral and not mandate the use of a specific fuel.*
- *IMO already developed guidelines for use of methanol as a fuel. Development of guidelines for hydrogen and ammonia has started.*
- *Techno-economic assessment of each alternative fuel would be beneficial, with life cycle costs/benefits for different maritime and inland vessels, and ultimately demonstrate which fuel works best for the respective maritime and inland applications (e.g. passenger vs cargo carriers, tugs vs ships, long vs short distance etc.)*
- *For all green fuel producers, having contracts in place or showing a demand for the green fuel can be key to financing the production facility.*
- *Classification societies are interested in general in developing rules to have an advantage over the competition and aim for a high number of authorised ships. The quick development of rules for ammonia (NH₃) is an example for the fast progress which might speed up the uptake of the research results.*
- *Business cases without funding are still really rare. One example might be the day cruise sector, where the operator of a ship teams up with the local energy supplier to use “sponsored” green electricity in batteries also attracting passengers. Ammonia projects are popping up everywhere, while some stakeholders seem to have really strong concerns about the use of a toxic chemical. For methanol, the carbon content and taxonomy may be the most relevant challenges.*

4.2 General findings listed by the GSEG

The consultation with the GSEG has revealed the following considerations on the overarching level:

- *Policy interventions shall be technology neutral.*
- *The necessity of integration of all measures and intervention areas under a common framework through which the strategic plan for key actions is adjusted, and the actions are prioritised and timely ordered.*
- *Regulations should be reviewed for applicability on various vessel types, as e.g. tugs often have specific functional requirements restricting aircraft and compact sizing (limited available space), which often make it (close to) impossible to adhere with developed (general) regulations. Result is that it remains extremely difficult to comply or even a new set of rules needs to be developed, increasing costs / risks and delaying the uptake of the technology.*

- *Incentives which are offered for SAFs can/shall also be applied to other zero-emission technologies, whereas limitations imposed for vessels/ships not using SAFs shall also be imposed on vessels/ships not using any other zero-emission technologies.*

4.3 Overarching key actions

SWOT key action: Knowledge platform

There is an enormous amount of technological knowledge available, but unfortunately, it's scattered. By further developing and refining the Waterborne TP website in close collaboration with the waterborne members, the website can serve as a knowledge platform by better collecting, assessing and diffusing information. Concrete examples are providing a clear overview of the waterborne research projects, including potential challenges, opportunities and conclusions. The platform can serve as a means to find information faster and connect people which are working on similar technologies, and it can also benefit possible future research projects that aim to further decarbonize the entire waterborne supply chain. Besides having a knowledge platform, it's also recommended to regularly set up knowledge sharing sessions related to the projects on the knowledge platform and physically bringing together different consortia and experts that have been working on similar topics. This could also help to increase awareness on topics such as safety concerning sustainable alternative fuels that come with different risks.

Field of interventions	Potential interventions
Incentives	Sharing of information, best practices, etc. between the sector members/stakeholders can ensure a widespread adoption of solutions while at the same time ensuring the non-disclosure of sensitive information. Participants share the amount of data that they feel comfortable with in the presence of their peers. The platform enables them to better understand the challenges ahead and the need to cooperate between themselves and with other connected sectors.
Other instruments	Matchmaking platform for the creation of voluntary projects, focused initiatives, etc. starting from the WaterborneTP platform.

SWOT key action: Technical and safety regulations and class guidelines

With new technologies (i.e., sustainable alternative fuels and hardware) technical/safety regulations and class guidelines are often missing, making it difficult to actually use these new technologies and fuels due to lacking licenses/permits. There are possibilities for getting exceptions on the short term and adjustments to regulations on the longer term to enable the deployment of new technologies on a larger scale. However, such processes take a long time and eventual guidelines of individual classification societies are not always aligned. New initiatives in the waterborne transport sector such as RD&I programmes and projects should always address the (foreseen) challenges and gaps as regards class guidelines, technical regulations, standards and safety and environment guidelines.

Field of interventions	Potential interventions
Regulations	Once 3 class societies approved a technology, the technology should be approved for all associations. <i>Whereas it was remarked by the SC that regulating technology based on acceptance by 3 class societies seems risky with the current level of knowledge in these sectors. Scale and specific application of technology should be considered before giving blanket clearance. It may be better referring to International Association of Class Societies (IACS) for their further consideration to develop IACS unified regulations.</i>
	The development of international regulations needs to be addressed as a matter of priority at the IMO for the maritime sector, at CESNI for the inland navigation bringing their ambitions closer to those of the EU; EU policy will need to be aligned in order to have a global level playing field. When stakeholders (e.g. ports, fuel suppliers or ship owners) are non-compliant with the international standards (once available/into force), a penalty should be imposed.
Other instruments	Make it mandatory for projects using public funding to involve classification societies/flag states/European Committee for Drawing Up Standards in the Field of Inland Navigation (CESNI) in the early stage. Alignment and coordination (among class societies, regulators and experts e.g. from shipyards) will reduce administrative burden at all levels and incentivise the production, distribution, uptake and use of all alternative fuels on board. This will be a win-win for all stakeholders involved on the longer term.

SWOT key action: Earmarked fund

New fuels come with high investment costs as well as operational costs. Therefore there is a need to incentivise the use of sustainable alternative fuels. A possible approach is to set up a dedicated fund to cover the additional costs and thus to create a competitive business case for green technologies and fuels compared to conventional technologies and fossil fuels. There are two relevant initiatives in this respect. First, there is the development concerning the Ocean Fund proposed by MEP Peter Liese, rapporteur on the EU ETS in the European Parliament. Second, there is a draft blueprint for a dedicated IWT fund for vessel owners, being a topic in the PLATINA3 project and being considered in the CCNR Roadmap. Furthermore, the EP report of 2021 "towards future-proof inland waterway transport in Europe"⁴, addresses the need for such a fund.

Such dedicated funds will accelerate the fuel transition by for example bridging the price gap between conventional and sustainable alternative technologies and fuels. Frameworks such as the "First movers in shipping's decarbonisation", published by Lloyd's Register 9 December 2021, can be used to identify which key ports and vessel types to target per sustainable alternative fuel initially.

Field of interventions	Potential interventions
Regulations	<p>Use momentum with strong political support and legal pressure from EU Green Deal and FF55 to implement the required legal framework for the fund.</p> <p>For IWT, the Mannheim Act and the Belgrade Convention prohibit the introduction of charges on fuels. Hence, an earmarked fund is (for now) only possible on a voluntary basis. In order to remove this bottleneck new legislation is required on international level.</p> <p>The fund should be accessible for everyone since shipping is an international industry and fuels should be produced in places where there is abundant renewable energy.</p> <p>For maritime, the proposed ETS could be the driving mechanism to fill the Ocean Fund. Frunrunners will be incentivised in two ways: they will need to pay less since they will emit less (or no) CO₂ + the additional cost of using sustainable alternative fuels can be bridged.</p>
Incentives	<p>The fund is the incentive, i.e. in providing funding to vessel owners/operators for investments in clean sustainable technologies/fuels. In addition, the contribution to the funding can be made dependent on the volume of emissions (internalising external costs) produced by the vessel, and therefore creating an incentive to reduce</p>

⁴ https://www.europarl.europa.eu/doceo/document/TA-9-2021-0367_EN.html

	<p>emissions and consequently to reduce the financial contribution made by the respective vessel owner/operator.</p> <p>The fund concept can also be used for co-financing to be made by European and national public bodies. Therefore strengthening the impact of the fund in order to create the business case for green technologies and fuels on board of vessels.</p>
Taxes and charges	<p>The fund will be filled with earmarked contributions to be paid by vessel owners/operators. For seagoing vessels this can already be done by means of ETS. Whereas for IWT a new regulation would be required.</p> <p>Potentially, also the ETD revenues could be earmarked by Member States to the fund.</p>
Other instruments	<p>For IWT, the idea is to have a differentiation of the contribution to the fund through a label for the vessel expressing the environmental performance (both GHG and pollutant emissions).</p> <p>For seagoing vessels, the idea to implement differentiation is to use the ETS revenues, which are directly linked to the GHG emissions. The fund supports other initiatives such as the FuelEU Maritime by bringing together the different stakeholders and by guarantying demand and supply of sustainable alternative fuels through a contract (= contracts for difference, this is an example of a financial mechanism that could be applied under the Ocean Fund). Under a Contract-for-Difference, the fuel supplier commits to bring a specific amount of sustainable alternative fuel available which will be dedicated to the maritime sector within x years. In this way, risk can be reduced for all parties investing in new technologies related to the use of sustainable alternative fuels.</p>

SWOT key action: Ecolabels

The development of international standards or eco-labels for vessels translated into product labels could impact consumer choices on the one hand and might also incentivise cargo-owners to choose the more sustainable vessels on the other hand.

Field of interventions	Potential interventions
Regulations	Regulations developing eco-labels for vessels shall support the approach to internalise external costs, including environmental factors, in order to raise transparency.
Incentives	Vessels with applicable Ecolabels shall be provided with incentives (e.g. tax benefit, reduction of port dues), which are benefitting to the complete logistics chain
Taxes and charges	Tax benefit, reduction of port dues, etc. applied in a way, that the consumers and the manufacturers realise benefits out of it
Other instruments	Roll out promotion campaigns to inform the consumers about the environmental impacts, generated by the transport of the applicable goods Potentially, also the ETD revenues could be earmarked by Member States to the fund

SWOT key action: Long-term engagement

Vessels and ships are substantial financial assets that have a life span of 20 years and more. Bringing new frontrunner technologies into the market and onboard vessels and ships therefore comes with considerable financial risks for certain stakeholders and in the first place the owner of the vessel / ship. Long term engagement from other stakeholders involved, such as charterers, cargo-owners and fuel suppliers through for example long-term chartering contracts could provide more certainty to the market and facilitate further investments in these new technologies.

Field of interventions	Potential interventions
Regulations	Fuel suppliers should have the required permits for long term to be able to guarantee to their clients a reliable supply of fuels at certain locations.
Incentives	Horizon Europe RD&I project to study and develop cooperation models (through simulations and serious gaming) fostering long term contracts and stable market functioning.
	CEF funding to ensure a sufficient dense network for alternative fuel supply for waterborne transport.
Taxes and charges	Long-term and stable taxation policy, to ensure predictability and the development of business cases. Preferential taxation policy for the supply of SAFs to decarbonize (transport) sectors.
Other instruments	Matchmaking between vessel owners/operators and fuel suppliers and stimulating collaborative models for cooperation/coming up with de-risking strategies.

SWOT key action: Business case and new business models

There is a need for new initiatives and projects that address the business case for sustainable innovations in all intervention areas facilitating the circular economy principle, taking into account the different waterborne transport segments, and come up with new business models to finance these innovations.

Field of interventions	Potential interventions
Regulations	Regulations shall support the reasonable publication of relevant data. Support the implementation of the Combined Transport Directive.
	Support the adoption and implementation of the Offshore Renewable Energy Strategy.
Incentives	Stakeholders shall be motivated with incentives to share relevant data, e.g. promotion benefits.
	<i>Support investment of the public and private stakeholders into circular economy in shipping</i>
	Multi-modal transport solutions shall be incentivised Incentivise new sources of energy (e.g. off-shore wind), the modular use of WAPS, marinization of land-transport technologies where feasible.
Taxes and charges	Standardised energy taxation for all sectors.
Other instruments	Anonymised big data sharing, for all interested stakeholders.
	Open match-making platforms to combine cargo loads and transport modes.

SWOT key action: Policy implementation FF55

An initiative could be launched on policy implementation of the Fit-For-55 package for the whole waterborne transport sector, from a business/economic viewpoint in relation to policies. This needs to provide insights into the business/economic impact of the Fit-For-55 package on the waterborne transport segments, to raise stakeholder acceptance and support for detailed implementation plans.

Field of interventions	Potential interventions
Regulations	A more detailed planning of and calculations for the adoption of the FF55 package. Regulations to speed up the uptake of vessels that are best suited for certain types of technologies (newbuilds and retrofits).
Incentives	A political and technical set of solutions to the climate change challenges, and the introduction of new economic models <i>considering time as a key metric: how fast can one or the other solution drive out emissions.</i>
Incentives	<i>Support investors to invest in early-stage tech companies.</i>
Taxes and charges	Reduced taxation for investments in SAF and WAPS technologies (newbuilds & retrofits). Reduced taxation for SAF (bulk) acquisition.
Other instruments	Private/sector initiatives that move at the same pace or faster than the EU initiatives, including without EU financing.

4.4 Intervention area: Use of Sustainable Alternative Fuels (SAFs)

Specific action: Green hydrogen as fuel for ships

Field of interventions	Potential interventions
Regulations	<p>Applicable safety regulations have to be drafted and codified.</p> <p><i>It was noted by the SC that both IMO and class societies are working on this: A Correspondence Group chaired by Germany is established at IMO with the following (among others) terms of reference (ToRs):</i></p> <ul style="list-style-type: none"> • <i>Initiate the development of guidelines for the safety of ships using hydrogen as fuel</i> • <i>Collect information on the safe use of ammonia as fuel</i> <p><i>Additionally, research projects, early adopters, pilot projects, etc are needed to build up experience and know how upon which base the rules and regulations.</i></p> <p><i>For inland waterways transport (IWT), rules for fuel cell (FC) systems will be included in the European Standard laying down Technical Requirements for Inland Navigation vessels (ES-TRIN) 2023, for hydrogen storage in ES-TRIN 2025.</i></p> <p><i>GSEG members highlighted that the issuance of derogation for pilot projects shall be eased and speeded up.</i></p>
	<p><i>Regulations shall be harmonised all over Europe, whereas an overall international harmonisation is preferred.</i></p>
	<p>Funding & port dues and terminal fees, etc. & positive evaluation for bank loans, backed by the EIB. <i>To be noted that incentives could address the vessel owners to make the investment viable, but also some funding schemes could support shippers as well to experiment sustainable solutions and alternative solutions paving the way forward. Fundings for transport infrastructure can also improve the business cases in the vessel/ship-related investment.</i></p>
Taxes and charges	<p>As (green) hydrogen is an emission-free SAF, its use in the waterborne transport sector should be supported by a reduction in the taxes applicable to the fuel itself and the connected operations (transport, distribution, storage) for the waterborne sector.</p> <p>Principles of energy taxation shall be harmonised all over Europe Fuel taxation in the EU shall be harmonized for the SAFs, while at the same time introducing measures to dissuade the use of fossil fuels.</p>
Other instruments	<p>Further research on overall weight performance of the vessel, incl. tanks and other components.</p> <p>Standardised crew training and competences (for all type of crafts)</p>
	<p>Positive evaluation for bank loans, backed by the EIB, by means of setting (minimum) requirements for eligibility / admissibility and in the technical evaluation to apply SAFs.</p>

Other instruments	Limitations in ports and terminals for entering and mooring for ships / vessels not using SAFs and incentives for the ones using those.
	Support of production facilities in Europe to bundle energy and transport projects and potential other sectors.

Specific action: Green methanol as fuel for ships

Field of interventions	Potential interventions
Regulations	Regulation(s) introducing a compulsory minimum quota at EU/regional/national level(s) of large sea-going ships (cruise, cargo) that run on methanol, as this is the fuel most adapted for their needs.
	Regulations shall be harmonised all over Europe, <i>whereas an overall international harmonisation is preferred.</i> <i>It is also to be noted that IMO´s Maritime Safety Committee (MSC) issued (end of 2020) MSC.1/Circ.1621 “Interim Guidelines for the Safety of Ships using Methyl/Ethyl Alcohol As Fuel”.</i> <i>In the IWT sector rules for storage and engines will be included in ES-TRIN 2025.</i>
Incentives	Funding for retrofitting and upgrading of new engines.
Taxes and charges	Reduction of labour taxes (crew) while the ship is being retrofitted. Tax reduction for the retrofitting expenses, as the retrofit may be seen as not profitable, especially for ships above a certain age.
	<i>As green methanol is an emission-free SAF, its use in the waterborne transport sector should be supported by a reduction in the taxes applicable to the fuel itself and the connected operations (transport, distribution, storage) for the waterborne sector.</i>
Other instruments	Further research of carbon capture in connection with waterborne transport.

Specific action: Green ammonia as fuel for ships

Field of interventions	Potential interventions
Regulations	Ensure that proper safety regulation is in place to ensure that there are no risks for human and environmental damage.
	Regulations that allow the application of ammonia as mono-fuel engines only in the 'safest possible' conditions. <i>It was noted by the SC that IMO has started the work on the safety of use of ammonia as a marine fuel. Guidelines should be goal based, not technology specific. Pending pilot projects, no regulatory work is foreseen for IWT.</i>
	Regulations shall be harmonised all over Europe, whereas an overall international harmonisation is preferred. <i>It was noted by the SC that both IMO and class societies are working on this: A Correspondence Group chaired by Germany is established at IMO with the following (among others) ToRs:</i> <ul style="list-style-type: none"> • <i>Initiate the development of guidelines for the safety of ships using hydrogen as fuel</i> • <i>Collect information on the safe use of ammonia as fuel</i> <i>Additionally, research projects, early adopters, pilot projects, etc are needed to build up experience and know how upon which base the rules and regulations.</i> <i>GSEG members highlighted that the issuance of derogation for pilot projects shall be eased and speeded up.</i>
Incentives	Funding for further research Ammonia as a fuel for shipping has a low technological readiness level (TRL). Substantial research and funding are needed to maybe overcome the described weaknesses (see technical review).
Taxes and charges	<i>As green ammonia is a sustainable alternative fuel, its use in the waterborne transport sector should be supported by a reduction in the taxes applicable to the fuel itself and the connected operations (transport, distribution, storage) for the waterborne sector.</i>
Other instruments	Specialised trainings and competences for crews and shore-side teams.

4.5 Intervention area: Electrification

Specific action: Electrification

Field of interventions	Potential interventions
Regulations	Taxonomy promotes zero-emission tailpipe investments already.
	Regulation to speed up the uptake of vessels that are best suited for hybrid or (preferably) fully electric, to create economies of scale and ensure a reduction in costs and greenhouse gas emissions.
	Following the proposed Trans-European Transport Network (TEN-T) revision there is need for clear national strategies and TEN-T corridor workplans and studies stipulating and stimulating the required infrastructure to facilitate the transition of the fleet towards zero-emission in 2050.
	<i>It was noted by the SC that IMO very recently (15 June 2022) issued MSC.1/Circ.1647 “Interim Guidelines for the Safety of Ships using Fuel Cell Power Installations”.</i> <i>In the IWT sector, rules for fuel cell (FC) systems will be included in the ESTRIN) 2023. Regulatory work is ongoing to ensure the safe storage of battery containers in the cargo hold.</i>
	Implementation of the FF55 proposals can provide an opportunity in creating a level playing field between fossil fuel prices and fuel prices of sustainable alternative energy/fuels. <i>Whereas it was remarked by the SC that the FuelEU Maritime proposal strongly favours electricity used for propulsion by defining its well-to-wake (WtT) GHG intensity as zero. This is not exactly a level playing field compared to liquid/gaseous fuels.</i>
Incentives	Providing funding for the further the development, deployment and enlargement of higher capacity (MWh) and power (kW) batteries and/or battery-switch systems, as well as electric propulsion systems, taking into account the safety concerns.
Incentives	Provide further CEF and national funding for capital expenditure (CAPEX) and operating expenses for the use in public service (OPEX, such as in the case of the Innovation Fund) linked with the acquisition and deployment of batteries and fuel cell systems.
	Financial incentives for the acquisition of a certain min. number of batteries, to reduce the investment costs.
Incentives	<i>Low threshold ‘quick scan’ of a vessel/fleet to obtain a vessel/company’s actual operational profile/energy use, will enable optimized battery sizing and lower the investment in electrical propulsion. With an incentive for this, companies will be stimulated to consider electrification in an earlier stage.</i>
Incentives	<i>Provide incentives for Onboard Energy Management Systems, Smart Grids potentially in combination with digital twin solutions.</i>
Incentives	CEF funding and national funding for the development, deployment and enlarging of the (alternative) energy infrastructure for waterborne transport.

Incentives	Hedging fuel/energy price differences can provide incentives to invest in clean alternative technologies/fuels. <i>GSEG members remarked that hedging might not be relevant in the IWT sector, whereas pay per use might be an option.</i>
Taxes and charges	<p>(Temporary) lower taxes and charges for green electricity to charge batteries for propulsion of vessels. Fit for 55 (FF55)/ emission trading directive (ETD) already proposed lower taxes for sustainable energy and to introduce higher minimum taxes for fossil fuels.</p> <p>(Temporary) lower taxes and/or provide tax benefits for acquisition of batteries and fuel cell systems.</p> <p>(Temporary) lower taxes and/or provide tax benefits for building charging facilities: on-shore power supply (OPS), battery charging points, battery exchange points.</p>
Other instruments	<p>Stimulate synergies for development and use of battery packs/containerised battery containers between different sectors (e.g. energy and transport sector, automotive and waterborne transport).</p> <p>Specialised training and competences for crews and shore-side teams.</p> <p>In-depth extensive studies on vessel types and operational profiles within each of the six waterborne transport segments to identify the suitable ships and operational profiles for electrification in order to stimulate those vessels/operational profiles that lend themselves to the application of this technique.</p> <p>Studies, followed by investments to strike the balance between electricity needs and production near large ports and busy routes. Same for striking the balance between electricity and SAFs.</p>

4.6 Intervention area: Energy-efficiency

Specific action: Wind-assisted propulsion applied on sea-going ships

Field of interventions	Potential interventions
Regulations	Incorporate the benefits of WAPS (e.g. the reduction of the amount of fuel used) in policy regulations. Therefore, possible funding will need to be judged upon design indexes, regardless the route chosen in the end. When a ship is being built it is not necessarily known where it will sail during its life span of 20 - 30 years.
	Policy should <i>promote</i> and preferably/ideally guide shipowners to install WAPS technologies in those cases where the impact is optimal.
	Policy should ensure that any installed wind assisted technology on board should not be punished, even if it turns out that the route the vessel is sailing on during a certain time is not optimal and does not reduce the vessels GHG emissions at that time. <i>The SC has reminded that this is already the case for EEDI/EEXI as well as the FuelEU Maritime proposal.</i>
Incentives	Develop sustainable finance possibilities / better interest rates for projects and technologies which reduce fuel consumption, based on international standards such as Energy Efficiency Design Index (EEDI) and Energy Efficiency existing ship Index (EEXI). It was noted by the SC that the EEDI/EEXI has recently been adjusted to better reflect the use of wind-assisted propulsion systems (WAPS).
	Bring together different shipowners that are interested in investing in WAPS & organize a group buy.
	Share experiences and data that could support return-of-investment (ROI) calculations from (funded) projects. Better define which routes are most favourable for which vessel types.
	Additional incentives for the technology to be used are flexible systems, when available and technically feasible, which can be installed/uninstalled when needed / when positive impact is to be expected.
	<i>There is a research opportunity to much more accurately map wind availability for any ship on any route (weather routing). This should be accelerated and supported financially.</i>
	<i>Incentivise R&D investment into tech demonstrators to allow the market to 'kick the tyres' of all wind solutions.</i>
Taxes and charges	<i>Provide financial incentives for crew training in wind-assistance (NB: FastRigs are designed to be intelligent so need minimal crew training, but crew can be incentivised to optimise use)</i>
	Reduce taxation for buying WAPS and/or retrofitting ships for the use of WAPS.
Other instruments	Reduce taxation for SAFs used in conjunction with WAPS in case the WAPS can cover the energy needs above a certain %.
	Allocate negative carbon units for the fuel saved.
	Specialised training and competences for crews and shore-side teams.

4.7 Intervention area: Digital Green

Specific action: Digital Twins

Field of interventions	Potential interventions
Regulations	Establish a Work Plan at the EU level for the hardware and software standardization of interfaces.
	Regulations allowing the sharing of information for such (external) datasets and part of the results, in order to ensure progress in the digital twin topics.
Incentives	<i>Incentives for monitoring energy use will stimulate (internal company) discussions on alternative energy sources and quantify alternatives, instead of remaining generic and giving room for scepticism. Next to this, discussions on energy use will also stimulate optimisation and less emissions on short term.</i>
	<i>An incentive could also be combined with a condition to share data (up to certain level / anonymised) publicly to also enable knowledge sharing. This can be view together with the knowledge platform detailed in chapter 4.6.</i>
Taxes and charges	<i>Route optimisation solutions for wind-assisted sea-going ships.</i>
	Temporary tax re/deductions for investments in such activities. Special tax cuts for small- and medium-sized enterprises (SMEs) that come up with a realistic implementation of a digital twin, in order to ensure part of the level-playing field with larger companies.
Other instruments	Specialised training and competences for specialists.
	Establishing (public or private) data sharing platforms that can ensure anonymization while at the same time enabling the sharing of relevant information between interested stakeholders, as part of a learning process.
	<i>Fault simulation and failure response studies, which will help in optimizing the cost of technology in future (by cutting down excess safety levels etc.)</i> <i>Operational optimisation tools such as Decision Support Systems that can help reducing the GHG emissions related to the ship operation. Simple examples are the Weather routing systems or the Energy Management Systems. However, also an improved connection with Ports and traffic management is helpful to minimize the waiting time of the ship in port.</i>

5 Business models / examples

The STEERER consortium collected business models, ideas and examples that might showcase the uptake initiatives of research and innovation results that are existing at the time of the elaboration of this deliverable per intervention area. Scientific Committee members have also provided valuable additional input to this collection.

5.1 Intervention area: Use of Sustainable Alternative Fuels

- Long term contracts, which ensure the confidence in the investment of new technologies
- To bundle energy and transport projects and potential other sectors, e.g. as being investigated in the Port of Vienna, where hydrogen might be stored and taken up by public transport buses, besides potentially offering it to inland vessels
- Important work on hydrogen safety (e.g. leakages, fires, explosions, releases into atmosphere) shall be carried out also taking info and know-how from other industries (automotive, industrial gases, space)
- Containerised H2 tanks, e.g. RH2INE project <https://www.rh2ine.eu/>
- The vessel Elektra <https://www.est-floattech.com/elektra-first-hydrogen-canal-tug/>
- The CESNI/PT/FC is working on rules for swappable systems which showcases the work-together of the regulatory bodies and the technology experts
- Alternative, chemical based (e.g. LOHC) storage solutions may offer opportunities to achieve good to high energy density with a much lower risk
- Collaborations between CO2 polluters (industry) and green methanol producers (there are already examples in Sweden, e.g. where CO2 is captured from exhaust gases at a steel mill to produce green methanol)
- According to the [Intergovernmental Panel on Climate Change](#) (IPCC), it is needed to capture carbon from the atmosphere from 2050 onwards to remain within the 1.5C limits → Carbon capturing is a key technology in the future and Methanol production could act as a business case to develop this technology further
- Wartsila has converted a Sulzer ZA40 (Common engine until 15-20 years ago) to burn methanol for Stena Germanica
- FASTWATER proved that a Methanol engine (97% Methanol) can comply to IMO TIER III without any after treatment

- The regulations establishing a minimum quota for methanol-based vessels / ships + regulations that enable the use of (near-zero) methanol can ensure a sizeable and long-term market for SAF and the associated technologies to take off
- In comparison to other alternative fuels, methanol is easy and cost efficient to retrofit

5.2 Intervention area: Electrification

- Provide flexible solutions to allow modularisation and pay-per-use for different types of power supply (Energy as a Service, models for use of containerised/modular battery packs)
- Usage of containerised/modular battery packs to benefit from synergies/economies of scale
- Zero Emission Services: all-in concept for emission-free inland shipping with exchangeable energy containers (ZESpacks): <https://zeroemissionservices.nl/>
- Current Direct Waterborne interchangeable battery; <https://www.currentdirect.eu/>
- The definition of markets dominated by hybrid/fully electric vessels can lead to the definition of new business opportunities, both within the sector but also with other sectors. Large vessels / ships can ensure peak shaving or even energy supply
- Clean energy hubs at strategic locations that provide multiple fuels to a large potential customer base (seagoing vessels, inland vessels, trucks, etc.)
- Energy hubs/nodes that provide sufficient electricity round the clock for the needs of numerous and/or large vessels / ships

5.3 Intervention area: Energy-efficiency

- Research to be undertaken on the technical feasibility of systems. Research on which routes the technology can have a positive impact and under which conditions. That info should be made available to all

5.4 Intervention area: Digital Green

- Develop new business models based on the sharing of information and virtual-real mix of conditions and simulations
- The development of 'modular' and 'scalable' digital twin parts (hardware and software) that can reduce costs while at the same time spread the use of this technology
- Cross-fertilization from other sectors can also be ensured

5.5 Overarching key actions

- Many RD&I projects actively contribute to the development and fine-tuning of several rules and regulations
- A further development and potential deployment of a dedicated fund for the maritime and IWT sectors is recommended.
- A Computational Fluid Dynamics (CfD) Fuel only mechanism solves the chicken and the egg issue: the price difference between a new and old technology is (partially) bridged. Everyone can apply for a CfD and the top submissions with the best CO2 reduction/price/volume proposal win the contract. It is a simple and straightforward solution that incentivizes front runners and ensures price stability for all parties
- Consumers shall be informed about the environmental impacts, such as it is done with energy labels for electronic products and nutri score for food products
- Procurement of long-term cargo contracts/consolidation of cargo by shippers
- Specialization of SAF suppliers based on their end-customers and geographical areas (e.g. shipping, air, etc.)
- Digital tools available to share and receive data to estimate environmental impacts of transport services
- New markets' creation through support for different technologies, SAFs, use of specific fuels for specific vessels / ships and/or routes or services, etc.

6 Conclusions

Task 2.5 with its deliverable 2.4 has taken the results from the previous SWOT tasks in order to collect proposals for public policy instruments and, where applicable, highlight business models, ideas and examples which can support the uptake of the research and innovation results.

It is clear from the work in this task as well that drawing up a positive business case in deployment projects in the waterborne transport sector when it comes to zero emissions is challenging. This is since greening is currently still more driven by the political motivation than by the commercial interests. To close this gap, public measures are also needed to achieve the climate goals. Therefore, public policy instruments and interventions, and other appropriate mechanisms and incentives are of utmost importance to support the sector to contribute to the European Green Deal objectives and to increase the take-up and deployment from RD&I activities.

Even though Task 2.5 is primarily to collect non-research measures, it is to be noted that the stakeholders consulted in the process put special emphasis on further research in several intervention areas, emphasizing the necessity of integration of all measures and intervention areas under a common framework through which the strategic plan for key actions is adjusted, and the actions are prioritised and timely ordered.

The current deliverable lists the recommended interventions around the intervention areas in line with the well-established SRIA / cPP ZEWT / STEERER methodology:

- Overarching key actions
- Use of Sustainable Alternative Fuels
- Electrification
- Energy-Efficiency
- Digital Green

The two other intervention areas – Design & Retrofitting and Ports – are included as 'transversal' aspects in the first four intervention areas listed above.

However, the main conclusion of the task can be summarised by stating that there are several technological solutions in the field, whereas the waterborne transport sector shall be supported by regulatory and non-regulatory instruments which deliver tangible benefits and / or incentives that create plannability and a minimum return on investment in order to strive for a reasonable business case.

The consolidated policy instruments, business models and incentives have been discussed and validated with the Green Shipping Expert Group.