

Reducing CO₂ Emissions in Maritime Transport

Starting Point for Climate Policy and Options for EU Measures

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For the first time, the EU wants to take measures to reduce carbon emissions in maritime transport. Whilst the EU Commission is aiming to extend the existing EU emissions trading system to include maritime transport, the EU Parliament is also calling for regulatory requirements, financial support and carbon taxes.

Key propositions

- ▶ In view of the global nature of both the climate and maritime transport, carbon reduction measures should be taken at global level if possible.
- ▶ By contrast with regulatory requirements, financial support and carbon taxes, emissions trading will reliably achieve the reduction volumes that have been designated by policy. In addition, emissions trading is cost effective: it achieves this reduction at the lowest possible cost.
- ▶ The revenue generated in each case is no criterion for choosing between carbon taxes and emissions trading because the carbon reduction effects of both instruments occur irrespective of whether the revenue is used for climate-policy objectives in maritime transport or flows e.g. into the general EU budget.

Contents

1	Introduction.....	3
2	Starting point for climate policy: Carbon emissions and measures in the shipping sector.....	4
2.1	Carbon emissions from shipping	4
2.2	Operational and technical measures in shipping sector	4
2.3	Climate-policy measures in the shipping sector	5
2.3.1	IMO climate policy measures	5
2.3.2	EU climate policy measures.....	6
2.3.2.1	EU Strategy: Reduction of CO ₂ emissions from shipping (2013).....	6
2.3.2.2	MRV Regulation Recording of CO ₂ emissions from shipping (2015).....	7
2.3.2.3	EU Commission: Extending the EU ETS to cover shipping (2019).....	7
2.3.2.4	European Parliament: Proposals for carbon reduction measures (2020)	7
3	Climate policy-based carbon reduction measures.....	8
3.1	Regulatory rules and prohibitions	9
3.2	Financial support	9
3.3	Carbon pricing: Carbon taxes and the Emissions Trading System (ETS)	9
3.3.1	How carbon pricing works	9
3.3.2	Carbon tax: Controlling the price of carbon	9
3.3.3	Emissions Trading System (ETS): Controlling the quantity of carbon	10
3.3.4	Use of revenue	10
4	Assessment.....	11

1 Introduction

Maritime transport (“shipping”) is the only sector in which the EU has yet to regulate the reduction of carbon emissions. Members of the UN International Maritime Organisation (IMO), which include the EU, have been working on strategies for a global reduction in carbon emissions from shipping since 1997.¹ Although, in the EU Commission’s opinion, in view of the global problem of climate change and the international nature of the sector, a global approach to reducing its carbon emissions would be “the most effective and therefore preferable”, it believes there is a necessity for EU measures due to the “relatively slow progress of the IMO”.² In the Reform of EU climate policy for the period 2021–2030, only passed in 2018, the EU clearly decided against the inclusion of shipping in the existing EU Emissions Trading System (EU ETS), which currently reduces carbon emissions from industrial companies and power producers.³ In July 2019, however, that is precisely what EU Commission President Ursula von der Leyen announced she would be doing in the future.⁴ For this purpose, the EU Commission now wants to develop a legislative proposal by mid-2021 as part of the “European Green Deal”.⁵ At the same time, the European Parliament is already proposing specific provisions for the expansion of the EU ETS to cover shipping and also for limits on carbon emissions for shipping fleets as well as a fund to finance carbon reduction measures.⁶ By contrast, the international shipping industry, which is calling for a global carbon tax, has expressed significant scepticism about the EU’s unilateral carbon reduction measures, in general, and EU emissions trading in particular.⁷

Due to the lack of any up-to-date analysis by the EU Commission,⁸ the sector-specific factors and requirements for reducing carbon emissions from shipping in the EU remain largely undefined. This **cepInput** identifies the issues that are relevant to the growing discussion and provides guidance on how to deal with them. It therefore aims to take stock of the current starting point for climate policy at global and EU level (Section 2). Against this backdrop, we set out the various types of climate policy measures, that have already been discussed, and the way in which they aim to reduce carbon emissions from shipping: regulatory requirements (rules and prohibitions), financial support, carbon taxes, emissions trading (Section 3). To conclude, these measures will be assessed (Section 4).

¹ IMO, [Greenhouse Gas Emissions](#) and [Historic Background](#) [this and all other links were last accessed on 15 October 2020].

² EU Commission, [Reducing Emissions from the Shipping Sector](#); EU Commission (2020), Communication COM(2020) 562 of 17 September 2020, Stepping up Europe’s 2030 climate ambition, p. 18 et seq.; Impact Assessment SWD(2020) 176 of 17 September 2020, p. 10.

³ Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading in the Union [EU-EHS Directive]; for detailed analysis see Bonn, M. / Reichert, G. (2018), Climate protection by way of the EU-ETS, [cepInput 03/2018](#).

⁴ von der Leyen, U. (2019), A Union that strives for more: My Agenda for Europe – Political Guidelines for the Next European Commission 2019–2024, p. 6.

⁵ EU Commission (2019), The European Green Deal, Communication COM(2019) 640 of 11 December 2019, p. 13; Reichert, G. (2019), A European Green Deal, [cepAdhoc](#) of 26 November 2019.

⁶ EU Parliament (2020), Amendments [P9_TA-PROV\(2020\)0219](#) of 16 September 2020 on Commission Proposal COM(2019)38 of 4 February 2019 amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data.

⁷ International Chamber of Shipping (2018), [Reducing CO₂ Emissions to Zero: The “Paris Agreement for Shipping”](#), p. 13.

⁸ Cf. most recently EU Commission (2013), Impact Assessment – Accompanying document to the Commission proposal COM(2013) 480 for the inclusion of GHG emissions from maritime transport in the EU’s reduction commitments, Commission Staff Working Document SWD(2013) 237 of 28 June 2013.

2 Starting point for climate policy: Carbon emissions and measures in the shipping sector

Carbon emissions from shipping can – aside from a reduction in sea trade – be reduced by way of operational and technical measures. As shipping is global in nature, EU climate-policy measures relating to shipping must be considered in close conjunction with the corresponding developments at global level under the auspices of the IMO.

2.1 Carbon emissions from shipping

Shipping handles over 80% of global trade.⁹ Shipping currently causes approx. 2% of global carbon emissions¹⁰ and 3% of the EU's carbon output.¹¹ If no measures are taken to reduce CO₂, the IMO and EU Commission estimate that, as a result of the IMO's forecast increase in global shipping by 2050, global carbon emissions will increase by up to 39.5% as compared with 2018¹² and in the EU by up to 86% as compared with 1990¹³. Around 85% of carbon emissions from shipping are caused by ships of 5,000 gross tonnage and above.¹⁴

2.2 Operational and technical measures in shipping sector

With regard to the operational and technical measures for reducing fuel consumption and the associated carbon emissions caused by shipping,¹⁵ it must be borne in mind that a ship is often leased by the ship owner to a "charterer". "Ship operators" – those who actually undertake the journey – may be ship owners, charterers or third parties. Ships together with their crews are often chartered based on the route ("voyage charter") or on the time ("time charter"). Fuel costs are paid, in the case of a voyage charter, by the shipowner, and in the case of a time charter, by the charterer.¹⁶

- **Operational measures** can be taken by the ship operators. Comparatively low-cost options are e.g. to travel more slowly ("slow steaming") or to optimise the route according to the weather. Thus, reducing the speed of a ship by 10% can bring down its fuel consumption and carbon emissions by approx. 19%.¹⁷ More costly is the use of low-carbon fuels such as liquid gas (LNG), biogas, hydrogen and synthetic fuels.
- **Technical measures** relating to the ship can be taken by the ship owner. Comparatively low cost options are e.g. friction-reducing paint, modified propellers or a towing kite on the front of the

⁹ UNCTAD (2019), [Review of Maritime Transport 2019](#), p. 4.

¹⁰ Ibid., p. 1.

¹¹ EU Commission (2020), [2019 Annual Report on CO₂ Emissions from Maritime Transport](#), SWD(2020) 82 of 19. May 2020, p. 3.

¹² That corresponds to "30% as compared to 2008" according to the underlying study: IMO (2020), Fourth IMO GHG Study 2020, p. 29.

¹³ EU Commission (2019), Proposal COM(2019)38 of 4 February 2019 amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data, p.1.

¹⁴ IMO (2018), [Initial IMO Strategy on Reduction of GHG Emissions from Ships](#), Resolution MEPC.304(72), p. 3.

¹⁵ On the following see Balcombe, P. et al. (2019), [How to decarbonise international shipping: options for fuels, technologies and policies](#), Energy Conversion and Management 182, pp. 72–88.

¹⁶ On the various contractual situations and allocation of fuel costs in the shipping sector cf. EU Commission (2013), Impact Assessment, SWD(2013) 237 of 28 June 2013, Annex I, p. 83; Rehmatulla, N. / Smith, T. (2015), [Barriers to energy efficiency in shipping: A triangulated approach to investigate the principal agent problem](#), Energy Policy 84, p. 44–57.

¹⁷ European Environment Agency (2013), [The impact of international shipping on European air quality and climate forcing](#), p. 14.

ship. More costly are changing the hull design, installing energy-efficient engines and equipping ships to use low-carbon fuels.

2.3 Climate-policy measures in the shipping sector

The international shipping sector is endeavouring to achieve global carbon reduction measures and has expressed significant scepticism regarding a unilateral approach by the EU.¹⁸ By contrast, the EU Commission criticises the “relatively slow progress of the IMO” and therefore sees a need for EU measures.¹⁹

2.3.1 IMO climate policy measures

In 2011²⁰, for the first time and following years of preparation, the IMO decided to introduce as from 2013, global mandatory minimum requirements on fuel consumption in new ships of 400 gross tonnage and above (Energy Efficiency Design Index, EEDI). Thus, as of 2025, new ships must be 30% more energy efficient than new ships built in 2014. In addition, all ships of 400 gross tonnage and above must prepare and carry a Ship Energy Efficiency Management Plan, SEEMP showing the operational measures being used to increase energy efficiency.²¹

In 2016, in order to prepare an IMO strategy to reduce emissions of CO₂ and other greenhouse gases (GHG) from shipping, the IMO passed a three-stage roadmap.²² This envisages the recording and analysis of data and then the development of concrete emission reduction measures. For this purpose, a global Data Collection System (DCS) was created which, from 2019, requires ships of 5000 gross tonnage and above to record and report their fuel consumption and transport volumes.²³ The IMO intends to publish its first analysis report in 2021.

The IMO passed a first “Initial Strategy” on the reduction of GHG emissions (IMO-GHG Strategy) in 2018.²⁴ According to the strategy, as compared with 2008, global carbon intensity in shipping – i.e. total carbon emissions relative to total transport volume – are to fall by at least 40% by 2030 and annual GHG emissions by at least 50% by 2050.²⁵ The IMO-GHG Strategy identifies the following “possible” measures for achieving the agreed reduction targets:

- short-term measures (2018–2022): including further increasing energy efficiency by tightening the energy efficiency requirements (EEDI) and additional operational measures (SEEMP);
- medium term measures (2023–2030): including the introduction of low-carbon alternative fuels or economic incentives for reducing CO₂ such as by way of “market-based measures”; and

¹⁸ International Chamber of Shipping (2018), [Reducing CO₂ Emissions to Zero: The “Paris Agreement for Shipping”](#), p. 13.

¹⁹ EU Commission, [Reducing Emissions from the Shipping Sector](#).

²⁰ IMO (2011), Inclusion of regulations on energy efficiency for ships in MARPOL Annex VI, [Resolution MEPC.203\(62\)](#) of 15 July 2011; IMO, [Historic Background](#); IMO, [Energy Efficiency Measures](#).

²¹ Ibid.

²² IMO (2016), [Roadmap for developing a comprehensive IMO strategy on reduction of GHG emissions from ships](#).

²³ IMO (2016), Data collection system for fuel oil consumption of ships, [Resolution MEPC.278\(70\)](#) of 28 October 2016.

²⁴ IMO (2018), Initial IMO Strategy on reduction of GHG emissions from ships, [Resolution MEPC.304\(72\)](#) of 13 April 2018; IMO, [Historic Background](#).

²⁵ Originally, the USA, Brazil and Saudi Arabia wanted weaker targets. Cf. EP Think Tank (2018), [The first climate change strategy for shipping](#); European Commission (2018), 72nd session of the Marine Environment Protection Committee (MEPC 70) at the International Maritime Organization (IMO), [Memo](#) of 13 April 2018.

- long-term measures (after 2030): including the introduction of carbon-free alternative fuels.

In May 2019, in order to implement the IMO-GHG Strategy,²⁶ the EEID energy efficiency requirements, which in the IMO context were also regarded as too weak²⁷, were tightened for some ship categories. In addition, the decision to create a GHG Trust Fund for Technical Cooperation (GHG-TC Trust Fund) was passed, which will support technical measures for reducing GHG emissions from shipping in the future and will be financed by voluntary contributions from the shipping industry. Furthermore, in December 2019, leading shipping industry associations, representing over 90% of shipping companies worldwide, proposed the creation of an “International Maritime Research Fund” (IMRF).²⁸ Under the supervision of IMO Member States, the IMRF would support research and development, as well as the use of low-carbon fuels and technologies, for the benefit of the shipping industry, over a period of ten years. The IMRF budget of at least USD 5 billion would be financed inter alia by those companies in the shipping industry who cover the fuel costs by way of an IMRF compulsory contribution of USD 2 per tonne of fuel oil sold.

2.3.2 EU climate policy measures

Although, in the opinion of the EU Commission, a global approach to reducing carbon emissions in shipping would be “the most effective and therefore preferable”, it still sees a necessity for its own measures.²⁹ The European Parliament and the Council are calling on the EU Commission to carry out regular assessment of the IMO’s progress in adopting and implementing an “ambitious emissions reduction target” and call for concrete carbon reduction measures to be adopted by the IMO, or the EU, by no later than 2023.³⁰

2.3.2.1 EU Strategy: Reduction of CO₂ emissions from shipping (2013)

In 2013, the EU Commission proposed a three-step strategy for carbon emissions reduction in shipping:³¹ The first step involves setting up an EU system for monitoring, reporting and verifying carbon emissions from shipping in the EU (“MRV” system). On that basis, the second step is to establish a carbon reduction target for shipping. The third step is to achieve this target by introducing concrete carbon reduction measures either by way of a “market-based measure” – e.g. a tax on carbon emissions or an emissions trading system – or by way of “efficiency standards” for ships.³²

²⁶ IMO, UN agency pushes forward on shipping emissions reduction, [Briefing](#) of 20 May 2019; IMO, [Greenhouse Gas Emissions](#).

²⁷ IMO (2016), An analysis of readily achievable EEDI requirements for 2020, [Submission MEPC 70/INF.36](#) of 19 August 2016.

²⁸ IMO (2019), Proposal to establish an International Maritime Research and Development Board (IMRB), [MEPC 75/7/4](#) of 18 December 2019.

²⁹ EU Commission, [Reducing Emissions from the Shipping Sector](#); (2020), Commission (2020), Communication COM(2020) 562 of 17 September 2020, Stepping up Europe’s 2030 climate ambition, p. 18 et seq.; Impact Assessment SWD(2020) 176 of 17 September 2020, p. 10.

³⁰ Directive (EU) 2018/410 of the European Parliament and of the Council of 14 March 2018 amending the Emissions Trading Directive 2003/87/ EC, Recital 4.

³¹ EU Commission (2013), Communication COM(2013) 479 of 28 June 2013 on integrating maritime transport emissions in the EU’s greenhouse gas reduction policies, p. 5.

³² EU Commission (2013), Impact Assessment – Accompanying document to the Commission proposal COM(2013) 480 for the inclusion of GHG emissions from maritime transport in the EU’s reduction commitments, Commission Staff Working Document SWD(2013) 237 of 28 June 2013, p. 25 et seq.

2.3.2.2 MRV Regulation Recording of CO₂ emissions from shipping (2015)

In 2015, in order to implement the first step of the EU strategy, the MRV Regulation³³ established rules for the monitoring, reporting and verification of carbon emissions from shipping in the EU: Since 2018, shipping companies – ship owners and operators according to the legal definition in the MRV Regulation³⁴ – have had to report annual carbon emissions and other information such as the fuel consumption and energy efficiency of their ships of 5,000 gross tonnage and above. The reporting obligation applies to carbon emissions on journeys from the last port of call outside the EU to EU ports, journeys from EU ports to the next port of call outside the EU, journeys between EU ports and during a stay in EU ports.³⁵ This means that data from over 11,600 ships – 38% of the global trade fleet of 5,000 gross tonnage and above – is covered.³⁶ About two thirds of the reported carbon emissions come from journeys from or to a port outside the EU and one third from journeys inside the EU.

Consequently, since 2019, ships of 5,000 gross tonnage and above, involved in shipping the EU, must meet the EU's monitoring and reporting obligations both under the EU's MRV Regulation and the IMO's global Data Collection System (DCS). In 2019, in order to reduce red tape for shipping companies and authorities, the EU Commission proposed a comprehensive harmonisation of the MRV Regulation and the DCS.³⁷ The Council and European Parliament have yet to agree on this proposal.

2.3.2.3 EU Commission: Extending the EU ETS to cover shipping (2019)

In July 2019, EU Commission President Ursula von der Leyen made the surprising announcement that, in order to realise the second and third steps of the EU strategy on carbon emissions reduction in shipping, she wanted to extend the existing Emissions Trading System (EU ETS), aimed at reducing carbon emissions from industrial companies and power producers, to include shipping.³⁸ For this purpose, the EU Commission intends to develop a legislative proposal by mid-2021 as part of the “European Green Deal”.³⁹

2.3.2.4 European Parliament: Proposals for carbon reduction measures (2020)

In November 2019, the European Parliament (EP) called on the EU Commission to reduce carbon emissions from shipping, explore carbon pricing and propose actions “such as the inclusion of the maritime sector in the ETS and the introduction of a ship efficiency standard”.⁴⁰ The right to initiate legislative proposals in the context of the EU legislative process lies exclusively with the EU Commission.⁴¹ Nevertheless, on 16 September 2020, the European Parliament submitted several

³³ Regulation (EU) 2015/757 of the European Parliament and of the Council of 29 April 2015 on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport [MRV Regulation]; on the Commission Proposal COM(2013) 480 of 28 June 2013 cf. [cepPolicyBrief 49/2013](#).

³⁴ “Shipping companies” under Art. 3 (d) MRV Regulation refers to both the “ship owner” and any other organisation or person which has assumed the responsibility for the operation of the ship (“ship operator”).

³⁵ In addition to the EU, the MRV Regulation also applies to the Member States of the European Economic Area (EEA) Iceland, Liechtenstein and Norway.

³⁶ EU Commission (2020), Report C(2020) 3184 of 19 May 2020, 2019 Annual Report on CO₂ Emissions from Maritime Transport.

³⁷ EU Commission (2019), Proposal COM(2019)38 of 4 February 2019 amending Regulation (EU) 2015/757 in order to take appropriate account of the global data collection system for ship fuel oil consumption data, p. 3.

³⁸ von der Leyen, U. (2019), A Union that strives for more: My Agenda for Europe – Political Guidelines for the Next European Commission 2019–2024, p. 6.

³⁹ EU Commission (2019), The European Green Deal, Communication COM(2019) 640 of 11 December 2019, p. 13; Reichert, G. (2019), A European Green Deal, [cepAdhoc](#) of 26 November 2019.

⁴⁰ EU Parliament, resolution of 28 November 2019 UN Climate Change Conference in Madrid (Spain), para. 75.

⁴¹ Art. 17 (2) TEU and Art. 294 (2) TFEU.

legislative proposals for measures⁴² going beyond simple harmonisation with the IMO rules on the recording of carbon emissions from shipping, and in fact aimed at bringing about actual reductions in carbon emissions:

(1) Establishing CO₂ emission limits on shipping companies' shipping fleets:⁴³ Shipping companies would be obliged to linearly reduce carbon intensity – annual carbon emissions relative to transport work – “as an average across all ships under their responsibility” by at least 40% by 2030 compared to the average carbon intensity for the corresponding category of ship. If a shipping company fails to achieve the annual reduction for its shipping fleet, a financial penalty would be imposed.

(2) Extending EU emissions trading (EU-ETS) to include shipping:⁴⁴ In addition, the existing EU ETS is to be extended to include shipping. For this purpose, the total number of carbon emission rights (allowances) for shipping would be determined and auctioned to shipping companies that are subject to emissions trading; thus, there would be no free allocations. This would apply – according to the scope of the MRV Regulation – to carbon emissions from ships of 5,000 gross tonnage and above, on journeys from the last port of call outside the EU to EU ports, journeys from EU ports to the next port of call outside the EU, journeys between EU ports and during a stay in an EU port. A corresponding number of allowances is to be acquired and cancelled in respect of the carbon emissions caused by these journeys.

(3) Financing climate policy measures by way of an “EU Ocean Fund”:⁴⁵ An Ocean Fund “to decarbonise the maritime transport sector” is to be established for the period from 2022 to 2030 and would be used to fund measures to increase the energy efficiency of ships, investments in low-carbon (propulsion) technology and infrastructure, the use of “sustainable alternative fuels” – e.g. hydrogen produced from renewable energy – and the cancellation of EU ETS allowances acquired by the fund. The EU Ocean Fund would be financed, firstly, by at least 50% of the revenue from auctioning EU ETS allowances for shipping. Secondly, shipping companies would have the option to pay an annual membership fee to the EU Ocean Fund for the carbon emissions which they cause in a year - instead of having to submit allowances under the EU ETS. This “opt-out” would allow small and medium-sized shipping companies to avoid the red tape associated with the EU ETS. The annual membership fee in the form of a carbon tax charged per tonne of carbon emissions would at least correspond to the highest EU ETS allowance price of the previous year. The money generated by these membership fees is to be used exclusively for the purchase and subsequent cancellation of allowances.

3 Climate policy-based carbon reduction measures

Climate policy-based carbon reduction measures, that have already been partially adopted at a global level by the IMO or are currently under discussion at EU level, can be divided into the following categories: regulatory rules and prohibitions, financial support and carbon pricing by means of a

⁴² EU Parliament (2020), Amendments [P9_TA-PROV\(2020\)0219](#) of 16 September 2020 to the MRV Commission proposal COM(2020) 38.

⁴³ Ibid., Amendment 48: new Art. 12a (1) and (2) MRV Regulation.

⁴⁴ Ibid., Amendment 60: new Art. 3ga and Art. 3gb (1) EU ETS Directive.

⁴⁵ Ibid., Amendment 60: new Art. 3gb (3) and Art. 3gc (1) and (2) EU ETS Directive.

carbon tax or emissions trading. The following sets out and assesses the functioning of the different types of CO₂ reduction measures which have relevance for shipping.⁴⁶

3.1 Regulatory rules and prohibitions

Regulatory rules and prohibitions on carbon reduction make it mandatory for potential carbon emitters to behave in a certain way. Any violation of the rules and prohibitions may give rise to sanctions, particularly fines. Examples of this at global level are the IMO's EEID energy efficiency requirements and at EU level, the carbon emission limits for shipping company shipping fleets proposed in the EP MRV report of 29 July 2020.

3.2 Financial support

The aim of financial support is to steer the behaviour of potential carbon emitters indirectly by means of economic incentives, e.g. for investment in low-carbon technology such as energy-efficient engines, rather than directly by way of rules and prohibitions involving penalties. This steering effect occurs irrespective of whether the support is financed from the public budget (subsidies) or from other sources (e.g. fines, carbon taxes, voluntary or compulsory fund contributions). Possible sources of finance at global level could be the IMRF and at EU level, the EU Ocean Fund.

3.3 Carbon pricing: Carbon taxes and the Emissions Trading System (ETS)

The pricing of carbon emissions can be achieved either by way of a carbon tax, as favoured by the international shipping industry, or an emissions trading system (ETS), as envisaged by the EU.⁴⁷ Both of these climate policy measures for carbon reduction generate revenue and as regards shipping are therefore also funding options for the global IMRF and the EU Ocean Fund.

3.3.1 How carbon pricing works

Carbon pricing aims to put a price on carbon emissions so that – in accordance with the polluter pays principle⁴⁸ – carbon emitters bear responsibility for the harmful impact of climate change on third parties caused by emissions, and the costs associated therewith, and they therefore include them in their cost calculation ("internalisation of external costs"). In this regard, the carbon price can either be established directly by way of a carbon tax or generated indirectly by way of an emissions trading system (ETS) with a market for emissions rights (allowances). In both cases, the price signal aims to provide an economic incentive for reducing emissions (steering effect). In the shipping sector, this may take place by operational and technical measures – e.g. slow steaming and investment in energy-efficient ship's engines – or by a reduction in the growth of shipping as transport services become more expensive and delivery chains adapt accordingly.

3.3.2 Carbon tax: Controlling the price of carbon

By establishing and gradually raising a price for carbon emissions (price control), a carbon tax aims to give a price signal and thus an economic incentive for the avoidance and gradual reduction of

⁴⁶ For a detailed analysis of the following see Menner, M. / Reichert, G. (2019), Effective Carbon Pricing, [cepStudy](#), p. 4 et seq.

⁴⁷ Cf. Menner, M. / Reichert, G. (2019), Carbon tax or emissions trading? – EU requirements and options for carbon pricing in Germany, [cepAdhoc](#) of 15 July 2019, p. 4.

⁴⁸ Art. 191 (2) TFEU.

emissions. Examples of carbon taxes at global level are the IMRF compulsory contribution and, at EU level, the membership fee to the EU Ocean Fund.

3.3.3 Emissions Trading System (ETS): Controlling the quantity of carbon

By contrast with a carbon tax, an emissions trading system, like the one to be applied in the shipping industry in the future, focuses directly on controlling the maximum level of carbon emissions desired under climate policy. An ETS functions according to the “cap & trade” principle: The maximum total amount of carbon emissions permitted in a specific period in the sectors covered is limited by government, i.e. “capped” (“cap”) and then gradually lowered (quantity control) until the desired level of carbon emissions, i.e. the carbon reduction target, is reached. The total quantity of carbon designated by government is distributed as emission rights (allowances) each of which entitle the recipient to emit a specific quantity of carbon. The allowances are tradable (“trade”). Due to the scarcity and tradability of the allowances, as prescribed by government, a market in carbon emission allowances is formed which balances supply and demand and gives rise to an allowance price which in turn creates an incentive for cost-effective carbon emissions reduction. Unlike carbon tax, the carbon price is not therefore determined directly by policy but arises indirectly by way of price formation on the market. A company that is able to reduce its carbon emissions cost-effectively can sell its unused allowances on the market. In the case of a company that requires additional emission allowances to cover its carbon emissions, purchasing allowances becomes attractive when their price is lower than the cost to the company of avoiding carbon emissions. Thus, the most cost-effective options for avoiding carbon emissions are determined on the market. Due to trading, cost-effective carbon avoidance by one company will at the same time make allowances available to other market operators, who will then be able to emit the corresponding amount of carbon. However, this is part of the central mechanism of an ETS and, due to the quantity control arising from the cap, which is limited from the outset and continually reduced, it has no overall adverse effect on achieving the carbon reduction target. Overall, emissions trading reduces carbon emissions with pinpoint accuracy – i.e. effectively in terms of climate policy - and at the lowest possible cost - i.e. cost effectively.

3.3.4 Use of revenue

Whilst the steering effect of financial support for carbon reduction is independent of how the support is financed, the steering effect of carbon pricing - whether in the form of a carbon tax or emissions trading - occurs irrespective of how the revenue which it generates, is used. Decisions by companies are influenced by price signals: Even if revenue from carbon pricing is used e.g. to finance a fund for research and development and for the application of low-carbon technologies, companies in the shipping sector will continue to have a financial incentive to reduce carbon by operational or technical measures simply due to the higher price of fossil fuels, as they could thus save money. The higher carbon price alone is the crucial factor for the steering effect of carbon pricing.

4 Assessment

Since the Earth's climate and shipping are global in nature, carbon reduction measures based on climate policy should also be taken at a global level under the auspices of the IMO. In any case, the climate policy measures of the EU and the IMO should be closely coordinated to avoid unnecessary additional costs and distortions of competition to the detriment of European shipping companies.

As the EU nevertheless wants to adopt unilateral climate policy measures on carbon reduction in shipping, these should at least effectively reduce carbon emissions as well as being as cost-effective as possible for the shipping sector. In this regard, the following aspects are relevant as regards the choice between the various types of measures - regulatory requirements, financial support or carbon pricing by way of a carbon tax or emissions trading:

- Carbon pricing is more effective in terms of climate policy than regulatory requirements such as EEID energy efficiency requirements or financial support for low-carbon technologies. This is because the carbon price signal is aimed directly at the carbon-emitting behaviour itself and can - if it is strong enough - exert its full steering effect on the originator of carbon emissions. Thus, by making fossil fuels more expensive, carbon pricing in shipping would focus on actual fuel consumption, and ships' carbon emissions resulting directly from it, and could thereby encourage more fuel-efficient and thus lower-carbon shipping operations. By contrast, regulatory requirements and financial support only aim at the potential fuel efficiency of ships without exerting any direct influence on the number of ships used in maritime transport, their actual mileage, operations or carbon emissions. They cannot therefore ensure that carbon emissions from shipping will be reduced to the desired degree. In addition, by making fossil fuel more expensive, carbon pricing will automatically cover all rather than just new ships.
- With respect to the choice between the two types of carbon pricing, the relevant consideration is that it is actually impossible to determine the "correct" carbon price for a carbon tax and gradually increase it in order to effectively reduce carbon emissions to the desired extent. This is because the extent of the carbon reduction actually achieved by way of the carbon tax is a priori unknown and subject to continual change: Firstly, the reaction to the carbon tax can only be roughly estimated in advance when it is being determined. Secondly, demand for carbon emitting activities fluctuates according to economic conditions. By contrast, in the case of carbon pricing by way of emissions trading, carbon emissions can be reduced with pinpoint accuracy due to the ability to control quantity (cap), and this takes place at the lowest possible cost by way of allowance trading (trade).
- Both types of carbon pricing equally generate revenue. The subsequent use of revenue is therefore no criterion for choosing between carbon taxes and emissions trading. Irrespective of the steering effect of both instruments, it is a political decision whether the revenue from carbon pricing is used for climate policy purposes in shipping, as envisaged by the IMRF and the EU Ocean Fund, or whether it flows into the general EU budget.

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