

STUDY

Requested by the TRAN Committee



The aviation and maritime sectors and the EU ETS: challenges and impacts

Final study



Transport and Tourism



Policy Department for Structural and Cohesion Policies
Directorate-General for Internal Policies
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RESEARCH FOR TRAN COMMITTEE

The aviation and maritime sectors and the EU ETS: challenges and impacts

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Abstract

Based on the EU Commission's Fit for 55 proposals published in July 2021, this report discusses the challenges and impacts resulting from the integration of the maritime sector in the EU ETS, and a more stringent EU ETS for aviation. It considers implementation challenges and consequences for the competitiveness of European stakeholders, e.g. caused by carbon leakage, and impacts on sectoral employment. Based on the initial analysis and the results of stakeholder consultations, recommendations on how to overcome implementation issues and adverse competitive and societal effects are provided.

This document was requested by the European Parliament's Committee on Transport and Tourism.

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LIST OF ABBREVIATIONS

ANSP	Air Navigation Service Provider
AOC	Air Operator Certificate
CBAM	Carbon Border Adjustment Mechanism
CDA	Continuous descent approach
CER	Certified Emission Reduction
CIF	Cost, insurance, freight
CII	Carbon intensity indicator
CO₂	Carbon dioxide
Coreper	Permanent Representatives Committee
CORSIA	Carbon offsetting and reduction scheme for international aviation
DCS	Data collection system
dwt	Deadweight tonnage
EASA	European Union Aviation Safety Agency
EEA	European Economic Area (EU-27+ Iceland, Norway and Liechtenstein)
EFTA	European Free Trade Association (EEA countries + Switzerland)
EEDI	Energy Efficiency Design Index
EEX	European Energy Exchange
EEXI	Energy Efficiency Existing Ship Index
EMSA	European Maritime Safety Agency
ERU	Emission Reduction Unit
ETD	Energy Taxation Directive
EUA	European Union Allowance
EUAA	European Union Aviation Allowance

EU ETS	EU Emissions Trading System
EU-27	27 EU Member States (post-Brexit)
FOB	Free on board
GHG	Greenhouse gas
GJ	Gigajoule
GT	Gross tonnage
IA	Impact assessment
IATA	International Air Transport Association
ICAO	International Civil Aviation Organization
ICAP	International Carbon Action Partnership
IMO	International Maritime Organization
int'l	international
ISM Code	The International Management Code for the Safe Operation of Ships and for Pollution Prevention
kt	kilo tonne
LCC	Low Cost Carrier
LDC	Least Developed Countries
MBM	Market Based Measure
MEPC	Marine Environment Protection Committee
MRV	Monitoring, reporting and verification
MS	Member State
Mt	Mega tonne
MTOM	Maximum Take-Off Mass
n.a.	Not applicable

NC	Network Carrier
OD	Origin-destination
p.a.	per annum
PSC	Port State Control
PSO	Public service obligation(s)
RPK	Revenue passenger kilometres
RTK	Revenue tonne kilometres
SAF	Sustainable alternative fuel
SARPs	Standards and Recommended Practices
SEEMP	Ship Energy Efficiency Management Plan
SIDS	Small Island Developing States
SME	Small and medium-sized enterprise
t	tonne
TTP	Tank-to-Propeller
UAE	United Arab Emirates
WTT	Well to tank

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EXECUTIVE SUMMARY

KEY FINDINGS

Maritime shipping

- Including maritime shipping in the EU ETS leads to an increase in transportation costs on routes within the scope, especially for Ro-pax, passenger and Ro-ro ships. The additional costs may be borne by various actors in the value chain, depending on their ability to pass them on.
- To prevent that a potential reduction of extra-EU seaborne import trades is related to a market distortion, the external costs of all transport modes should be internalized to the same extent.
- Competitiveness of extra-EU seaborne exports may deteriorate for specific trades, not necessarily affecting the sector negatively.
- A shift of employment among shipping companies operating in the system scope is conceivable.
- Port evasion and shift of transshipment hubs cannot be ruled out entirely; especially the latter may have a large impact on specific ports and regional communities.

Aviation

- The proposed cap reduction and phase out of free allowances will result in cost increases mainly for intra-EEA air services and for routings via EEA hubs.
- Stakeholders support the co-existence of ETS and CORSIA, but have criticized 'double-taxation' caused by the proposed combination of kerosene taxes, blending quotas, CORSIA and the ETS.
- Competitive distortion between EEA and non-EEA carriers and hubs will increase on indirect routings between EEA and non-EEA airports. This may lead to carbon leakage and 10-35 thousand fewer jobs if passenger flows are further shifted to non-EEA routings.

In July 2021 the EC presented the Fit for 55 policy package, including a revision of the European Emissions Trading System (EU ETS). New sectors are proposed for inclusion: For buildings and road transport a separate ETS would be established, while maritime shipping would be included in the current system. For aviation, EU ETS is proposed to be tightened and the elements and rules of ICAO's global Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) are proposed to be implemented.

This report analyses the potential challenges for and socio-economic impacts on the maritime shipping and aviation sectors resulting from this proposal. It considers implementation challenges, consequences for the competitiveness of European stakeholders and impacts on sectoral employment, also based on stakeholder consultations. Recommendations on how to overcome implementation issues and adverse competitive and societal effects are provided (see Chapter 7). Together, this should support Members of the European Parliament in systematically assessing the EC proposal.

Maritime shipping

- Proposal in a nutshell

It is proposed to include maritime shipping in the existing EU ETS, with the Union-wide quantity of allowances being raised. The system would be open, allowing sectors to use all allowances for compliance. The sector would receive no free allowances, but would have to cover only some of its emissions with allowances in the first 3 years. The system would rely on the EU Monitoring, reporting and verification (MRV) Regulation. In line with this Regulation, companies would be the responsible entity and Tank-to-Propeller CO₂ emissions would be covered. The geographical scope would be narrower (50 % of emissions on extra-EEA voyages) and companies would also have to report the aggregated in-scope emissions per ship and the associated aggregated emissions at company level. Companies are proposed to be assigned to administering authorities.

- Implementation issues

Including maritime shipping in the EU ETS may lead to certain implementation issues, solutions to which may be controversial, given the divergent interests at play. E.g., while working with the company as responsible entity minimizes administrative costs, some companies propose working with the 'ship commercial operator' instead, fearing they will be unable to fully pass on compliance costs. Some of the issues are not easy to resolve because of the specifics of the sector. E.g., issuing expulsion orders for ships of non-compliant companies might be complex, since vessels regularly change companies. This report specifies various potential issues and discusses the divergent interests.

- Socio-economic impacts

Including maritime shipping in the EU ETS will increase transportation costs, especially for Ro-pax, passenger and Ro-ro ships, which have high average per-vessel emissions within the scope. Irrespective of vessel type, the additional costs could be borne by different actors in the value chain, depending on their ability to pass them on.

To avoid market distortions, the external costs of all transport modes should be internalized to the same extent. This can also prevent that a potential reduction of extra-EU seaborne import trades would be related to a market distortion.

Since the EU ETS is a measure that corrects a market distortion on a regional level, beyond that region the playing field may become uneven. While the competitiveness of extra-EU seaborne exports may deteriorate for specific trades, the impact on the sector need not necessarily be negative, as vessels could also move into those trades, the sectors thus gaining a competitive advantage.

Port evasion and shift of transshipment hubs cannot be ruled out entirely, however, and especially the latter may have a major impact on specific ports and regional communities.

A shift of employment among shipping companies operating on routes to and from EEA ports is conceivable, despite the flag-neutral design of the system. There may be a shift from small to large companies and from companies with ships above the size threshold to those with ships below the threshold.

Aviation sector

The EEA aviation sector can be roughly divided into a liberalized intra-EEA market, where direct flights by 'pan-European' low cost carriers compete with hub services of network carriers like Air France or Lufthansa, and various extra-EEA markets served by both EEA and non-EEA carriers and hubs.

- Proposal in a nutshell

According to [COM\(2021\) 552 final](#), the EU ETS will remain in force on most intra-EEA routes and on routes to Switzerland. The system will be tightened, with no free allocation of allowances from 2027 onwards, and a reduction of European Aviation Allowances (EUAA) by 4.2 % annually. In addition, EU ETS will become effective on routes to the UK, on routes to and from countries that do participate in CORSIA for carriers from countries not participating in it, and on routes to countries not participating in CORSIA for all carriers from 2027. CORSIA will not be implemented on international routes within the EEA, only on routes between the EEA and CORSIA-participating extra-EEA countries.

- Socio-economic impacts

Despite rising operational costs due to the increased auctioning share and despite the lower cap and higher CO₂ prices expected, direct competitive effects of the revised EU ETS on intra-EEA routings are likely to remain limited, as virtually all intra-EEA routes fall under the scheme, whether flown by low cost or network carriers.

However

- for a limited number of intra-EEA origin-destination combinations (ODs), passengers may also select indirect services via non-EEA hubs, which would not be subject to EU ETS but to the softer CORSIA scheme only. Only if the Swiss and UK ETS were less strict than the EU ETS might this hold for the non-EEA hubs London and Zurich.
- Increased air fares due to intra-EEA ETS costs could induce shifts in holiday demand to non-EEA destinations. While this is not necessarily a competitive disadvantage for EEA carriers, it is an example of carbon leakage.
- Only domestic flights to outermost regions will remain exempt from ETS obligations, while flights between those regions and other EEA territories will become subject to the scheme. This may give a competitive advantage to network carriers based in Portugal and Spain.

EU ETS will also create no competitive distortions on non-stop extra-EEA routes, such as Barcelona-New York, where CORSIA will be in operation rather than the EU ETS. The same applies to indirect routings between non-EEA locations via the EEA.

Extra-EEA routings that include intra-EEA feeder segments are the main transport segments where the competitive position of EEA carriers and hub airports will be adversely affected by a tightened EU ETS. E.g., only the intra-EEA portion of the routing Gothenburg via Frankfurt to Bangkok will be subject to the EU ETS, while a direct flight or a routing via a non-EEA hub falls under the less stringent CORSIA scheme, if at all. As a result, competitive distortion and carbon leakage due to shifts to non-EEA carriers and routings are likely.

The above described effects are likely to reduce EEA-based carriers' market shares and employment and also affect EEA tourism destinations. For EU air transport services, tightening the EU ETS may potentially result in the loss of 10 to 35 thousand jobs out of a total of 633 thousand jobs in 2018.

1. INTRODUCTION

1.1. Aim and scope of project

In July 2021 the European Commission presented the Fit for 55 package with the aim of making the EU's climate, energy, land use, transport and taxation policies fit for reducing net greenhouse gas emissions by at least 55 % by 2030, compared to 1990 levels (European Commission, 2021a).

A proposal for the revision of the European Emissions Trading System (EU ETS) ([COM\(2021\) 551 final](#)) forms part of the Fit for 55 policy package. New sectors are proposed for inclusion to the EU ETS: For buildings and road transport, a separate ETS ('new ETS') would be established, while maritime shipping would be gradually included in the current EU ETS, with a 3-year phase-in period until 2026. Monitoring, verification and reporting of maritime shipping emissions for the purpose of the EU ETS is proposed to build largely on [Regulation \(EU\) No 2015/757](#) ('EU MRV Regulation'), although the proposed geographical scope of the EU ETS is narrower. It is not proposed to integrate the EU MRV Regulation into the EU ETS Directive ([Directive 2003/87/EC](#)), but rather to revise the former as a complement to the EU ETS revision proposal. [COM\(2021\) 552 final](#) proposes to amend Directive 2003/87/EC in such a way as to tighten the EU ETS for the aviation sector and to implement and harmonize the elements and rules of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), the global offsetting scheme introduced at International Civil Aviation Organization (ICAO) level.

This report presents the results of the study 'Research project on the aviation and maritime sectors and the EU ETS: challenges and impacts' commissioned by the Committee on Transport and Tourism. With this project the TRAN Committee wants to inform its members on foreseeable key challenges and impacts (economic and social implications) stemming from an inclusion of maritime shipping in the EU ETS and a tightened EU ETS for aviation, as proposed by the European Commission.

The study thus focuses on the EU ETS. Other measures that have been proposed as part of the Fit for 55 package, like FuelEU Maritime, RefuelEU Aviation and amendments to the Energy Taxation Directive (ETD), will have an impact on the maritime shipping and aviation sectors too, but an analysis of those measures is not part of the present study.

While an analysis of the economic implications of the proposed amendments to the EU ETS Directive on the two sectors is within the scope of the study, a comprehensive quantitative impact assessment is not: the implications are analysed qualitatively, with quantitative examples being provided where possible.

1.2. Approach

The report considers implementation challenges, consequences on the competitiveness for European stakeholders, e.g. caused by carbon leakage, and impacts on sectoral employment. Based on a desk top analysis and on results from stakeholder consultations, recommendations on how to overcome implementation issues and adverse competitive and societal effects are provided.

Section 2 introduces the two sectors' key market characteristics as well as relevant GHG regulations. Section 3 presents the existing EU ETS in a nutshell and Section 4 summarizes the revision proposal as published on 14 July, 2021. Section 5 and 6 discuss implementation and socio-economic impacts, Section 7 draws conclusions and provides policy recommendations. Key findings are provided at the beginning of each section.

2. MARKET CHARACTERISTICS AND GHG REGULATION

KEY FINDINGS

Maritime shipping

- Certain characteristics of/business models in the sector need to be considered for the design of the EU ETS. The sector is, e.g., characterized by a relatively high number of SMEs and a small number of very large companies.
- Maritime shipping is currently not included in the EU ETS; the EU MRV Regulation is an important basis for the inclusion of the sector into the EU ETS.
- At EU level, other measures, proposed as part of the Fit for 55 package, can be expected to also incentivize the supply and uptake of GHG reduction measures.
- At IMO level, there are some measures, but so far there is no global market-based measure to reduce GHG emissions of ships in place.

Aviation

- The civil aviation sector consists of different, commercial and non-commercial market segments and business models.
- Within the EEA, direct point-to-point flights by pan-European, 'homeless' low cost carriers operating between airports all across Europe compete with network carriers which have a strong market presence on flights to, from and via their hubs, usually the European capitals.
- On extra-EEA routes, there is growing competition on direct or indirect routings between European carriers and extra-EEA carriers. The role of hubs in non-EEA countries, and here especially in fast-growing aviation markets in Asia and the Middle East (incl. Istanbul), has increased in the past.
- Aviation activities within the EEA have been included in the EU ETS from 2012. The EU ETS emissions cap for aviation has been defined as 95 % of the sector's average 2004-2006 emissions. From 2021 onwards, an annual linear reduction factor of 2.2 % is applied. 82 % of the aviation allowances are freely allocated, 3 % make a special reserve for new entrants and 15 % are auctioned. Since the beginning of 2020, the EU ETS is linked to the Swiss ETS.
- Extra-EEA flights have been 'temporarily' derogated from the ETS until the end of 2023 to allow for the introduction of ICAO's CORSIA offsetting scheme, which requires carriers to offset their post-2019 (from 2024: post-2019/2020) emission growth on international routes between participating states (incl. all EEA states) from 2021.
- Compared to the EU ETS, CORSIA has a global approach (except for domestic flights and flights between non-participating states), but is less ambitious due to the relatively high (late) baseline. Another drawback of CORSIA is the questionable environmental effectiveness of the offsets, along with a need for double MRV – both at the airline and at the offsetting project levels.

2.1. Maritime shipping

2.1.1. Market segments and business models

Ship types

The commercial maritime shipping fleet¹ can be divided into three main **categories of ships**. First, ships that carry cargo, passengers or a combination thereof; second, work and service vessels; and third, fishing vessels.

There is a whole range of different types of cargo carrying ships.² These ships are designed to carry a specific category of cargo but are either flexible or are further specialized to carry different, specific types of cargo within a category. To give an example: dry bulk ships are designed to carry dry bulk cargo (cargo category), but are able to/are specialized to carry different types of dry bulk cargo such as grain, coal, iron ore, etc.

Smaller cargo carrying ships are mainly used for coastal/short-sea shipping, while larger ships are generally engaged in ocean-going voyages.

Ships that transport passengers can be divided into two main categories: ferries and cruise ships. Ferries operate on fixed routes and according to fixed time schedules whereas cruise ships have annually scheduled routes which can vary highly between years.

Examples for work and service vessels are dredging vessels, offshore supply vessels or pilot boats. In general, work, service and fishing vessels have a specific home port, but work and service vessels operate globally and might thus not call on a regular basis at this home port. This means that their activity within the scope of a regional measure can vary highly between years.

The maritime shipping fleet is thus quite heterogeneous and the ships that are calling at EU/EEA ports can differ highly between years.

International versus domestic maritime shipping

Depending on the route a ship is operating on, domestic and international shipping can be differentiated. A voyage between two ports of the same country falls under domestic shipping, whereas a voyage between ports of two different countries under international shipping. Intra-EEA voyages can therefore be both domestic and international voyages.

Ships can be active on both types of routes, which is why the differentiation between emissions related to domestic and international shipping is not straight forward. The EU annually submits a GHG inventory report to the UNFCCC Secretariat, differentiating between international emissions from marine bunkers (1D1d) and emissions from domestic navigation (1A3d). For 2018, the EU reported around 169.7 Mt CO₂ emissions from navigation, including domestic and international navigation. The according share of the CO₂ emissions from domestic navigation amounted to around 13 %; but also covers 'all water-borne transport from recreational craft to large ocean-going cargo ships.' (EEA, 2020)

Energy efficiency

The maritime shipping fleet is relatively heterogeneous and the energy consumption and energy efficiency of the different ships also varies greatly. The energy efficiency of ships depends on several factors, such as the size of the ships, the technical efficiency of the ships, operational factors

¹ Next to commercial vessels, there are navy vessels and pleasure crafts which are not considered in this context.

² In the Fourth IMO GHG Study (CE Delft et al., 2020), eleven different main categories of cargo carrying ships are differentiated.

(such as speed) and environmental conditions, which can vary structurally between shipping routes and seasons. As a consequence, the operational energy efficiency of ships sailing to and from EEA ports can be expected to vary between voyages and the annual operational energy efficiency of the ships may vary between years too.

Business models

Different business models are applied in maritime shipping and have to be considered for the allocation of the legal obligations and their enforceability in the EU ETS³ and for the assessment of the environmental and economic effects of the inclusion of maritime shipping into the EU ETS.

A ship may be owned, operated, employed and managed by separate entities (HandyBulk, 2021): A ship may be owned by a bank that provided financing, by a single company or by separate companies/individuals who are each holding a partial interest in the ship. Shipowners operate their own ships or lease the ships out. And the charterer may, in turn, lease out the vessel to a third party. Depending on the charter contract, the responsibilities are differently distributed between the entities. Ships can be chartered for short, but also for long periods of time, such as several years. Ship owner and operator can employ ship managers/management companies for different purposes.

Some of the cargo-carrying ships operate on fixed routes and according to fixed time schedules (**liner trade**) while others are used flexibly according to demand (**tramp trade**). Many larger cargo ships operate all over the world.

In the different segments of the fleet, **chartering** plays a role to varying degrees. In liner shipping, the cruise and ferry sector for example, vessels are either operated by the owner or chartered for a long period of time, while in tramp shipping short term charter contracts play an important role.

'Broadly, **transshipment** refers to the movement of goods to an intermediate destination before transportation to the final destination' (Munim et al., 2021) Transshipment plays an important role in the container trade. At transshipment hubs, smaller ships (feeders) that transport cargo regionally over short distances (spokes) connect with large ocean going ships that sail long distances. These hubs, for example Gioia Tauro in Italy or Marsaxlokk in Malta, rely on a central location. Transshipment hubs can also act as a point of interchange between several long-distance shipping routes. 'The most suitable locations tend to be bottlenecks, such as Singapore, Algeciras, or Tangier Med' (Notteboom et al., 2021).

Size of shipping companies

What is also characteristic for the shipping market is that there are many shipping companies that own only a small number of ships, while a relatively small share of shipping companies own a relatively large fleet (see Table 1).

³ The current EU MRV Regulation designates companies as responsible person; company thereby means the shipowner or any other organisation or person, such as the manager or the bareboat charterer, which has assumed the responsibility for the operation of the ship from the shipowner.

Table 1: Number of shipping companies located in EEA countries per size category (number of vessels)

Number of vessels	Number of companies per size category (rounded)	Share in total
Extra Large (100+)	10	0.2 %
Very Large (51-100)	35	0.8 %
Large (21-50)	130	3 %
Medium (11-20)	235	6 %
Small (6-10)	350	8 %
Very Small (1-5)	3,550	82 %

Source: Authors' own table based on Clarksons Research (2021)

Table 2 gives an overview of the largest shipping companies located in EEA countries.

Table 2: Largest shipping companies, owning more than 100 ships, located in EEA countries

	Main vessel type owned	Nationality
Maersk	Post-Panamax Container	Denmark
Bourbon Offshore	Offshore Supply	France
Briese Schifffahrts GmbH & Co. KG	General Cargo	Germany
Solstad Offshore	Offshore Supply	Norway
Star Bulk Carriers	Bulker	Greece
Wagenborg Shipping	General Cargo	Netherlands
Oldendorff Carriers	Bulker	Germany
Hapag-Lloyd Cont	Post-Panamax Container	Germany
CMA CGM	Post-Panamax Container	France

Source: Clarksons Research (2021)

2.1.2. Fleet monitored under the EU MRV system

[Regulation \(EU\) No 2015/757](#) requires ships above 5 000 GT to monitor, report and verify (MRV) their CO₂ emissions on voyages to and from EEA ports, serving the purpose of transporting cargo and or passengers for commercial purposes as well as in EEA ports (for further information on the regulation please see Subsection 2.1.3).

In 2020, the European Commission (2020b) published the '2019 Annual Report on CO₂ Emissions from Maritime Transport'. According to this report,

- The fleet monitored under the EU MRV Regulation in 2018 consisted of **11 653 ships**, performing more than 400 000 voyages and travelling 323 million nautical miles within the scope of the regulation.
- The fleet monitored under the EU MRV Regulation in 2018 emitted more than **138 million tonnes of CO₂ emissions** within the scope of the regulation. 62 % of the emissions were related to extra-EEA voyages, 32 % to intra-EEA voyages and 6 % to ships at berth in an EEA port. With a share of 30 %, container ships were the ship type with the highest CO₂ emissions within the monitored fleet.
- Ships operating within the system also operated on voyages outside the system. Especially for bulk carries, the share of voyages outside the scope of the system was relatively high.
- Close to **2 000 shipping companies** reported data in 2018. Around half of these shipping companies were European. In terms of GT⁴, EU companies owned more than 50 % of the monitored fleet and around two-thirds of the monitored ships were non-EU flagged.⁵

According to the latest data published by EMSA (August 2021), the fleet monitored under the EU MRV Regulation in 2018 consisted of 12 233 ships and emitted 145 million tonnes of CO₂ within the scope of the regulation.

A comparison of the monitored fleet in 2019 and 2018 shows⁶ that around 9 390 of the approximately 12 200 ships monitored in 2019 were also part of the monitored fleet in 2018.

IVL and University of Gothenburg (2020) have analysed the data as published for the EU MRV fleet and monitored in 2018. The analysis confirms that the **average energy efficiency differs highly between ship types**.⁷

To put the EU MRV fleet into perspective: In 2018 the world fleet consisted of around 119 626 ships of 100 GT and above, emitting around 1 056 million tonnes of CO₂ (CE Delft et al., 2020). CO₂ emissions reported in the EU MRV system represented thus around 13 % of the global maritime shipping CO₂ emissions.

Since large ships operate worldwide, one cannot identify a fleet that structurally operates on EU-related routes – a comparison between an EU-related and a global fleet is thus only possible for a specific period of time.

⁴ Shipping statistics are either in terms of number of ships or in terms of the carrying capacity of the ships, measured in gross tonnage (GT) or dwt.

⁵ Merchant ships have to register in a country. The ships sail under the flag of this country and are obliged to comply with the national laws of this country.

⁶ Own comparison based on the emissions report data as published by EMSA in February 2021.

⁷ To give an example, the median of the average CO₂ emissions per transport work of container ships amounts to around 20 g CO₂ per tonne nautical mile, while for bulkers ships to around 8.5 g CO₂ per tonne nautical mile.

2.1.3. GHG regulation – EU level

With the adoption of [Regulation \(EU\) No 2015/757](#) on the monitoring, reporting and verification of carbon dioxide emissions from maritime transport in April 2015, in the following referred to as '**EU MRV Regulation**', the European Commission has accomplished the first step of its strategy to integrate maritime transport emissions in the EU greenhouse gas reduction policies.⁸

The EU MRV Regulation provides valuable information for the potential integration of maritime shipping into the EU ETS. The EU MRV Regulation requires companies, as of January 2019, to monitor the fuel consumption and other parameters of their ships above 5 000 GT⁹ within all ports under the jurisdiction of a Member State and on voyages to or from a port under the jurisdiction of a Member State that serve the purpose of transporting passengers or cargo for commercial purposes. From 2019 on, for each of these ships, the companies have to annually submit an emissions report to the Commission and to the authorities of the flag States concerned, reporting the ships' CO₂ emissions and other relevant information on an aggregated basis for the previous calendar year.

The EU MRV Regulation is currently being revised to take account of the global Data Collection System as implemented at the IMO level. In February 2019, the European Commission published a proposal for a revised EU MRV Regulation and in September 2020, the European Parliament adopted its position on the Commission proposal, including a proposition for the extension of the EU ETS to maritime shipping ([P9_TA-PROV\(2020\)0219](#)). The ensuing inter-institutional negotiations on the revision of the EU MRV system have not started yet.¹⁰

The decarbonisation of the maritime shipping sector requires the use of post-fossil fuels. It is expected that, should EU ETS be extended to maritime shipping, the CO₂ price would not be high enough to stimulate the uptake of these fuels by the sector – the expected price differential with conventional fossil fuels is expected to be higher. As part of the **Fuel EU Maritime Initiative**, the European Commission therefore also proposed additional measures to stimulate the uptake of post fossil fuels.

In addition, the ongoing [revision of the Energy Taxation Directive](#), [the Renewable Energy Directive](#), and the [Alternative Fuels Infrastructure Directive](#) can also be expected to set extra incentives for the supply and use of low-/zero-carbon fuels.

2.1.4. GHG regulation – IMO level

At the IMO level, there are two global measures in force that aim to improve the energy efficiency of maritime shipping and one global measure that aims to facilitate the implementation of global GHG reduction measures: the **Energy Efficiency Design Index (EEDI)**, the **Ship Energy Efficiency Management Plan (SEEMP)**, and the **Data Collection System (DCS)**.

Regulation 21 of MARPOL Annex VI, which entered into force in January 2013, sets, by means of the EEDI, a minimum standard for the technical energy efficiency of new ships of certain ship types and sizes.

⁸ [COM\(2013\) 479](#) (European Commission, 2013b); The subsequent steps of the three-step strategy are: 1. The definition of greenhouse gas reduction targets for the maritime transport sector and 2. The implementation of further measures, including market-based measures like EU ETS.

⁹ According to Article 2 of the regulation, it does not apply to warships, naval auxiliaries, fish-catching or fish-processing ships, wooden ships of a primitive build, ships not propelled by mechanical means, or government ships used for non-commercial purposes. The following fifteen ship type categories are differentiated: Bulk carrier, chemical tanker, combination carrier, container ship, container/ro-ro cargo ship, gas carrier, general cargo ship, LNG tanker, oil tanker, passenger ship, refrigerated cargo carrier, Ro-pax ship, Ro-ro ship, vehicle carrier, other ship type.

¹⁰ Coreper agreed the [Council mandate for negotiations with the Parliament](#) on 25 October 2019. The position was limited to the EU MRV system and did touch on a potential inclusion of shipping into EU ETS. See the [Legislative Observatory](#) for a documentation of the process.

According to MARPOL Annex VI, Regulation 22, each ship of 400 GT and above has to keep a SEEMP on board. The SEEMP has to be ship specific and has to be set up in accordance with the IMO guidelines. The measure relies on self-evaluation and no binding reduction targets are set, which is why the effect assessed is limited.

The DCS, which is a facilitating measure only, requires ships to annually report to their flag State the amount of fuel consumed, distance travelled, and hours underway ([Resolution MEPC.278\(70\)](#)). Flag State administrations or Recognised Organisations verify the data and transfer them to the IMO Secretariat, which maintains a database.

In April 2018, IMO's Marine Environment Protection Committee (MEPC) adopted the '**Initial IMO Strategy on Reduction of GHG Emissions from Ships**' ([MEPC 72/17/Add.1, Annex 11](#)).

The strategy aims to phase out GHG emissions from international shipping as soon as possible in this century. In addition, the strategy sets the ambitions to:

- improve the carbon intensity of shipping by at least 40 % by 2030, relative to 2008 and pursue efforts to improve it by 70 % by 2050; and
- reduce the greenhouse gas emissions of shipping by at least 50 % by 2050, relative to 2008.

To achieve these levels of ambition, short-, medium- and long-term policy measures will be developed as part of the strategy.

Two specific short-term measures have recently been adopted by MEPC. For ships already subject to the IMO DCS requirements, a mandatory **Carbon Intensity Indicator (CII)** and a rating scheme based on the CII has been agreed upon¹¹ as well as the **Energy Efficiency Existing Ship Index (EEXI)** which requires existing ships to meet similar design standards as new ships.

The **medium- and long-term GHG reduction measures are still to be developed** at this stage. A revised IMO strategy, including an implementation schedule for the different measures, is planned to be approved in spring 2023 at MEPC 80.¹² The indicative timing as part of the current strategy assumes that mid-term measures are finalized and agreed between 2023 and 2030 and long-term measures beyond 2030. The work plan for the mid-term measures as adopted by MEPC 76 envisages that proposals for measures are collated and initially considered in the period between spring 2021 and spring 2022, that in the period spring 2022 to spring 2023 measures are assessed and selected for further development and that in the subsequent Phase 3, a measure/measures are developed to be finalized within (an) agreed target date(s).

2.2. Aviation

2.2.1. Market segments and business models

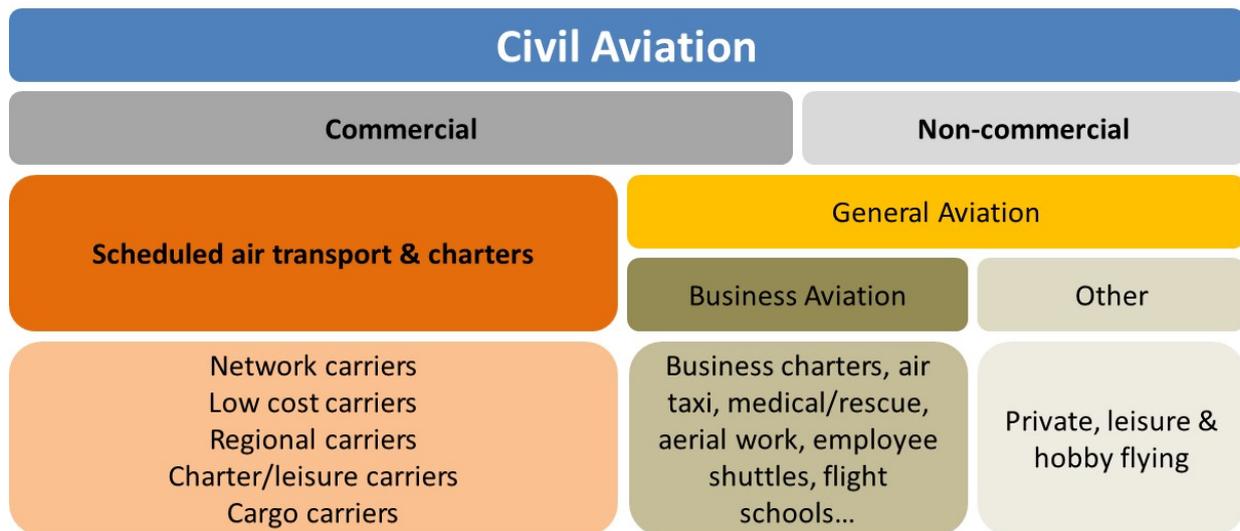
The civil aviation sector consists of a number of different market segments and business models which spread over commercial and non-commercial activities, as summarized in Figure 1. This report focuses on commercial activities where companies from Europe and other world regions compete for customers. These are dominated by **scheduled air transport activities**, which can be described as publicly available flights operated according to fixed schedules. Other commercial aviation activities

¹¹ Each year, the actual achieved CII and the according ranking of the ships (A to E) will be determined, with the rating thresholds becoming increasingly stringent towards 2030. For ships that achieve a D rating for three consecutive years or an E rating, a corrective action plan needs to be developed and approved as part of the Ship Energy Efficiency Management Plan.

¹² See Roadmap for developing a comprehensive IMO Strategy on reduction of GHG emissions from ships ([MEPC 70/18/Add.1, Annex 22](#)).

contain **passenger charters** on behalf of tour operators and ad-hoc, on-demand **business aviation** services.

Figure 1: Civil aviation market segments



Source: Authors' own illustration

In scheduled passenger traffic, the **network carrier** (NC) and the **low cost carrier** (LCC) business models prevail. While these business models have been converging in recent years, there are still fundamental differences when it comes to, e.g., the network design and the pricing structure (Table 3 below).

Network carriers

Network carriers like Air France, Alitalia, British Airways, Finnair, Iberia, KLM, LOT, Lufthansa, SAS or TAP operate so-called **hub-and-spoke** networks in Europe where they route all passengers from, to or through a central node, the hub. Both **'local' and 'indirect' passengers** travel in the same aircraft. The former fly from a spoke to the hub or vice versa, while the latter travel from a spoke to another spoke, via the hub where they change planes.

NCs are less dependent on local point-to-point demand as they fill their aircraft both with local, point-to-point passengers and with indirect or transfer passengers coming from different origins or flying on to different destinations. All this allows network carriers to operate relatively **dense networks at high frequencies** and often also larger airplanes, especially on long-hauls. However, this comes at a cost in a way that a large number of passengers has to change planes and to take two or more flights to get to their destination, causing **higher specific emissions**. Another drawback of the hub-and-spoke system is **high capacity utilization at the hubs** in peak times, caused by 'waves' of arriving and departing flights. So-called **slot allocation** systems are in operation in Europe and other parts of the world which allocate scarce airport slots (time slots for take-offs and landing determined by an airport's infrastructure and other factors) to the airlines. Hereby, grandfather rights have led to a situation where incumbent (usually network) carriers can manage to hold their slots as long as they use 80 % of them in each scheduled period, making it difficult for new entrants (often LCCs) to access larger (hub) airports.

Table 3: Key business model characteristics of European Low Cost and Network Carriers

	Network carriers	Low cost carriers
<i>Network structure</i>	Hub-and-spoke from few hub airports	Point-to-point between various bases and non-base airports
<i>Geographical scope</i>	Worldwide	Europe and vicinity
<i>Fleet structure</i>	Mixed fleet of short-, medium- and long-haul aircraft	Homogenous fleet of just one short-haul aircraft type or family
<i>Inflight service</i>	Complementary snacks/drinks at least on long-hauls	Snacks/drinks à la carte at extra cost
<i>Travel class(es)</i>	Economy, Business; sometimes also Premium Economy or First	Usually Economy only
<i>Fares</i>	Complex pricing based on, e.g. advance booking, length of stay, rebooking options	Simple, dynamic one-way based pricing; different fare types (not) containing bundles of additional extra services

Source: Authors' own table

Note: A base is a home airport where aircraft, staff and technical services are based

Network carriers offer **short, medium- and long-haul services** from their hubs and interconnect with their alliance partners based in other countries and world regions, which allows them to offer their passengers **large networks at the global scale**. They operate a **complex, booking-class based fare structure** where discount fares are usually subject to, e.g., advance booking rules or minimum stay requirements at the destination. In addition, they usually offer **two or more service classes**, from Economy to First, especially on longer routes.

Low cost carriers and leisure carriers

LCCs like easyJet, Eurowings, Ryanair, Volotea or Wizz Air usually do not offer transfers at hubs in Europe. They rely entirely on **local point-to-point** demand and are able to operate at much **lower average cost** as they route all passengers directly, which also causes **lower specific emissions**. To fill their planes, they have to operate at much **lower average frequencies** per route, meaning less choices for business travellers in terms of departure times. Also, they usually offer **one service class** with a low seat pitch, allowing them to sell more seats per flight, which brings average costs and CO₂ (and other) emissions further down. Pricing-wise, LCC usually offer **simple one-way fares** only which increase with a rising load factor. However, in recent years, both LCC and an increasing number of (European) NC have introduced additional fare types where bundles of additional services, like seat reservation or checked baggage, are or are not included.

LCCs usually only operate **homogenous fleets** of single-aisle aircraft like Airbus A319/A320/A321 or Boeing 737-800, while Network Carriers require mixed fleets consisting of short-, medium and long-haul aircraft.

LCC focus on **short- to medium-haul services** from a large number of **base and non-base airports**. In the case of Europe, LCC like easyJet, Ryanair or Wizz Air connect many airports all over Europe and in Europe’s vicinity, like e.g. Morocco.

The large number of bases and departure airports allows **pan-European LCCs** to be **more flexible than NCs** as they can relatively easily switch their aircraft between bases and routes, all of which have only a relatively small market share within the carriers’ operations, while the NCs are bound to their hubs. For example, Amsterdam-Schiphol accounts for about 50 % of all passengers of KLM, as it is the airline’s single hub, while the biggest airport in the Ryanair network, London Stansted, only represented 7.8 % of Ryanair’s total passenger numbers in 2019. This means Ryanair is less locked-in at its key airports and hence more flexible in terms of network adjustments.

Holiday or **leisure carriers**, sometimes better known as charter airlines, used to fly mostly charters on behalf of tour operators in the early days of regulation, until the 90s, without significant direct, ticket-only sales to passengers. Nowadays, most intra-EEA flights to the typical seaside holiday destinations are offered by LCCs, but a number of leisure carriers is still operating both within the EEA and from the EEA to medium-haul destinations like Morocco or Egypt (e.g. TUIfly or Sund Air from Germany, or Sunclass Airlines, the former Thomas Cook airline from Denmark). In addition, some ‘leisure’ airlines like Germany-based Condor operate also a significant share of long haul services to holiday destinations in the Americas, Africa and Asia.

Air Cargo

Air cargo is transported in dedicated cargo aircraft or in passenger aircraft as belly freight and is typically characterised by high-value goods. Table 4 gives an overview of the types of goods with the highest share in value of extra-EU imports and exports by air in 2019. In terms of total value, extra-EU imports and exports by air accounted for around 23 and 31 % of the total extra-EU imports and exports in 2019 ([Eurostat, DS-1262527](#)).

Air cargo services are much more concentrated at few airports than passenger services. These are the big passenger hubs, where the cargo divisions of the network carriers make use of both the belly of passenger aircraft and dedicated cargo aircraft, and some additional express cargo hubs like Cologne, Liège and Leipzig/Halle which are used as European bases by the leading integrators DHL, FedEx, TNT and UPS.

Table 4: Types of goods with highest share in value of extra-EU airborne imports and exports in 2019 (descending order)

Extra-EU airborne imports		Extra-EU airborne exports	
Type of good	Share in total value	Type of good	Share in total value
Gold	13.7 %	Medicaments	9.3 %
Telephone sets	10.0 %	Human blood, animal blood, antisera, vaccines, toxins and cultures of micro-organisms	8.2 %

Extra-EU airborne imports		Extra-EU airborne exports	
Type of good	Share in total value	Type of good	Share in total value
Turbojets, turbopropellers and other gas turbines	8.1 %	Turbojets, turbopropellers and other gas turbines	6.6 %
Automatic data-processing machines	6.0 %	Gold	3.8 %
Electronic integrated circuits	4.3 %	Electronic integrated circuits	3.2 %

Source: Eurostat (DS-1262527), HS2-4-6, 4-digit code classification

2.2.2. EEA aviation in the international context

According to the Sabre MI database, which publishes air transport demand data based on booking data from reservation systems and statistical sources, 17 % of all passengers worldwide in 2019 departed from an EEA airport, 5.4 % departed from a non-EEA airport to an EEA airport, and just 11.5 % flew within the EEA. In other words: almost 90 % of all air passengers in 2019 did not travel within the EEA, and about 78 % entirely outside the EEA.

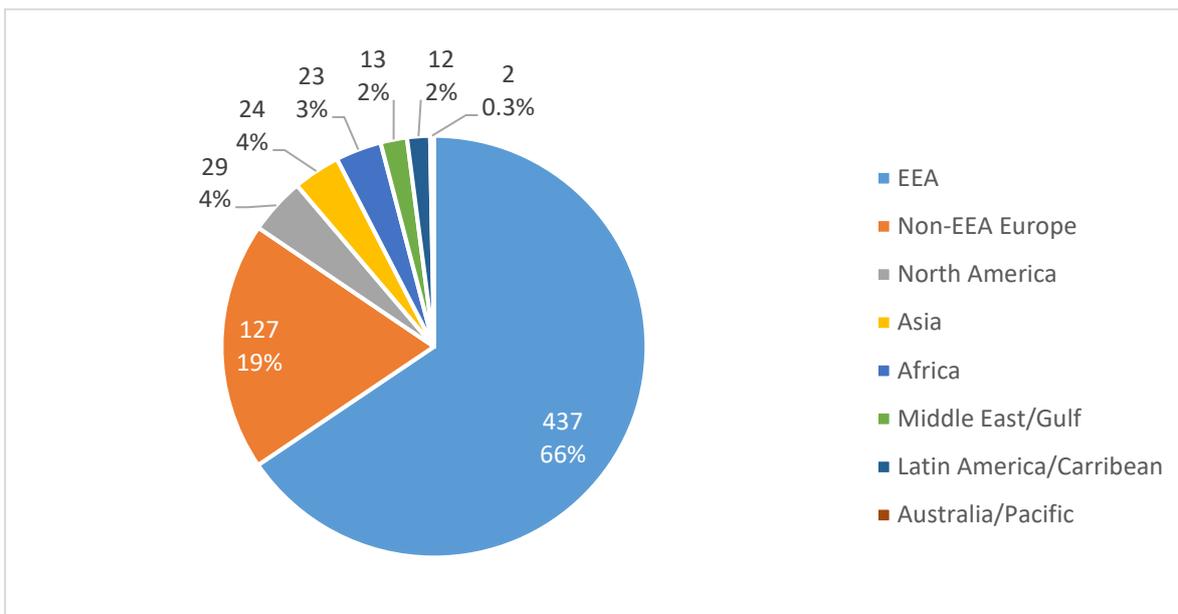
Table 5: EEA passenger share in international aviation (2019)

	Total (billion)	% of worldwide total
Departing passengers worldwide	4.6	100 %
Departing passengers from the EU (without UK)	0.75	16.3 %
Departing passengers from the EEA (without UK)	0.78	17.0 %
Departing passengers flying within the EEA (without UK)	0.53	11.5 %

Source: Sabre MI database

These figures by passengers carried are to be distinguished from passenger figures by origin-destination (OD) trips, where an origin-destination trip may comprise several flight segments. According to Sabre MI demand data, 667 million OD air passengers in 2019 started their trip in the EEA. Of these passengers, 66 % had their destination in the EEA, followed by 19 % in other European countries, 4 % in North America, 4 % in Asia, 3 % in Africa, 2 % in the Middle East/Gulf, 2 % in Latin America/Caribbean, and 0.3 % in Australia/Pacific. Thus, 34 % or 230 million OD passengers had a destination outside the EEA.

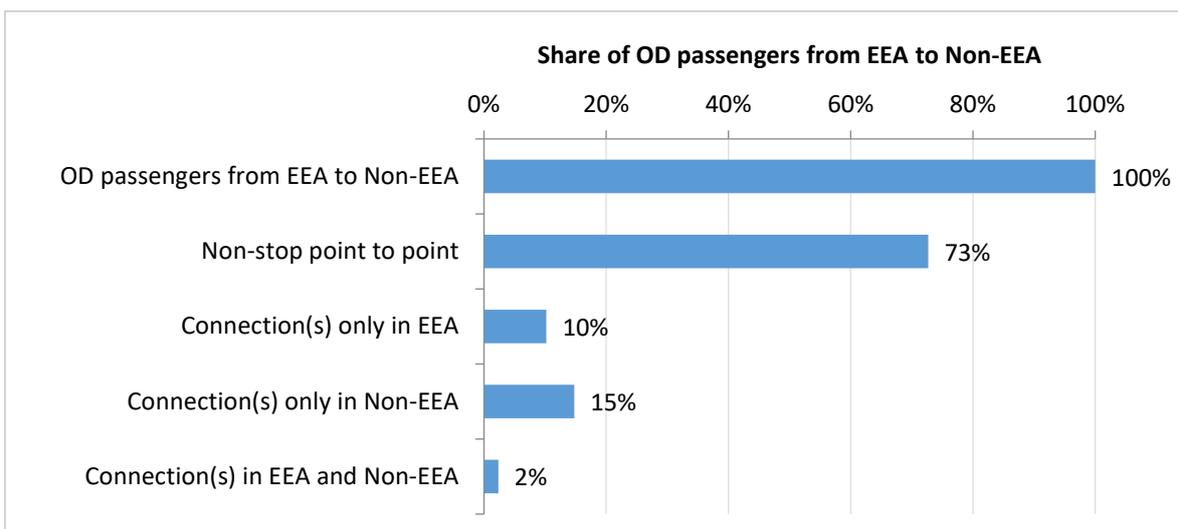
Figure 2: OD passengers departing from EEA by destination region, 2019 (in millions)



Source: Sabre MI database

Of the 230 million OD passengers who had a non-EEA destination, 73 % or 167 million flew non-stop to their destination and 27 % or 63 million used connecting flights. Relative to the total number of EEA-to-non-EEA passengers, 10 % had stopovers exclusively in EEA countries, 15 % exclusively in non-EEA countries, and 2 % in both EEA and non-EEA countries.

Figure 3: OD passengers from EEA to Non-EEA by route type, 2019 (in %)

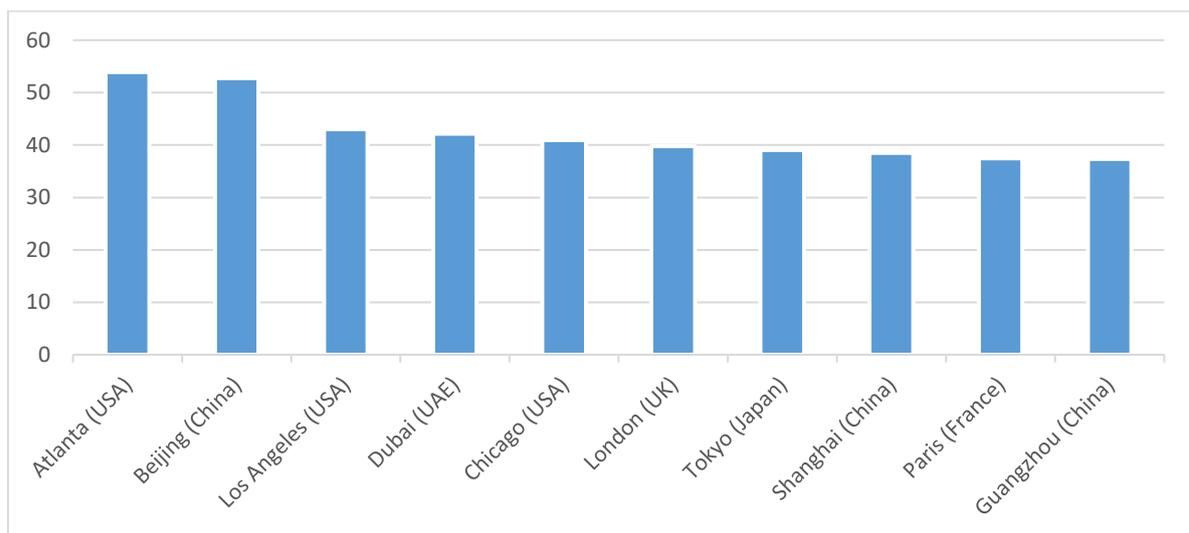


Source: Sabre MI database

The role of hubs in non-EEA countries, and here especially in fast-growing aviation markets in Asia, has increased in the past. According to ACI EUROPE (2019), the hub connectivity of airports like Doha (+501 %), Moscow-Sheremetyevo (+446 %), Istanbul (+353.3 %), Shanghai (+340 %) and Dubai (+251 %) has rocketed between 2009 and 2019, while European hubs like Amsterdam-Schiphol (+73 %), Zurich (+45 %), Munich (+44 %), Frankfurt (+28 %), Madrid-Barajas (+18 %) or London-Heathrow (+14 %) increased their connectivity more moderately or even lost pace (Paris-CDG, -8 %).

Just two of the largest ten airports in 2019 are located in Western Europe (Paris Charles de Gaulle and London Heathrow). Three airports among the largest ten are in the United States (Atlanta, Los Angeles, Chicago), three in China (Beijing, Shanghai, Guangzhou), one in the UAE (Dubai), and one in Japan (Tokyo Haneda).

Figure 4: Top 10 airports worldwide, 2019 (number of departing passenger in millions)



Source: Sabre MI database

Accordingly, most of the largest airlines in the world are also based outside Europe. If ranked by passenger numbers, the only European airlines in the Top 10 are Ryanair and easyJet, along with airlines from the USA, China, and India. If ranked by revenues passenger kilometres (RPK), taking in account also the distances flown, only Ryanair reaches the global Top 10, along with carriers from the USA, UAE, China and Qatar.

Table 6: Top 10 airlines worldwide, 2019 (number of passenger and RPK)

#	Airline Name	Passengers	Airline Name	RPK (millions)
1	Southwest Airlines (USA)	166 388 753	Delta Air Lines (USA)	349 233
2	Delta Air Lines (USA)	162 654 234	United Airlines (USA)	339 278
3	American Airlines (USA)	154 906 318	American Airlines (USA)	338 229
4	Ryanair (Ireland)	122 848 116	Emirates (UAE)	292 481
5	China Southern Airlines (China)	117 059 802	Southwest Airlines (USA)	210 980

#	Airline Name	Passengers	Airline Name	RPK (millions)
6	United Airlines (USA)	115 674 382	China Southern Airlines (China)	193 794
7	China Eastern Airlines (China)	109 666 187	Qatar Airways (Qatar)	169 660
8	easyJet (UK)	92 358 969	China Eastern Airlines (China)	161 949
9	Air China (China)	76 563 160	Ryanair (Ireland)	159 071
10	Indigo (India)	74 517 428	Air China (China)	156 375

Source: Sabre MI database

2.2.3. GHG regulation – EU level

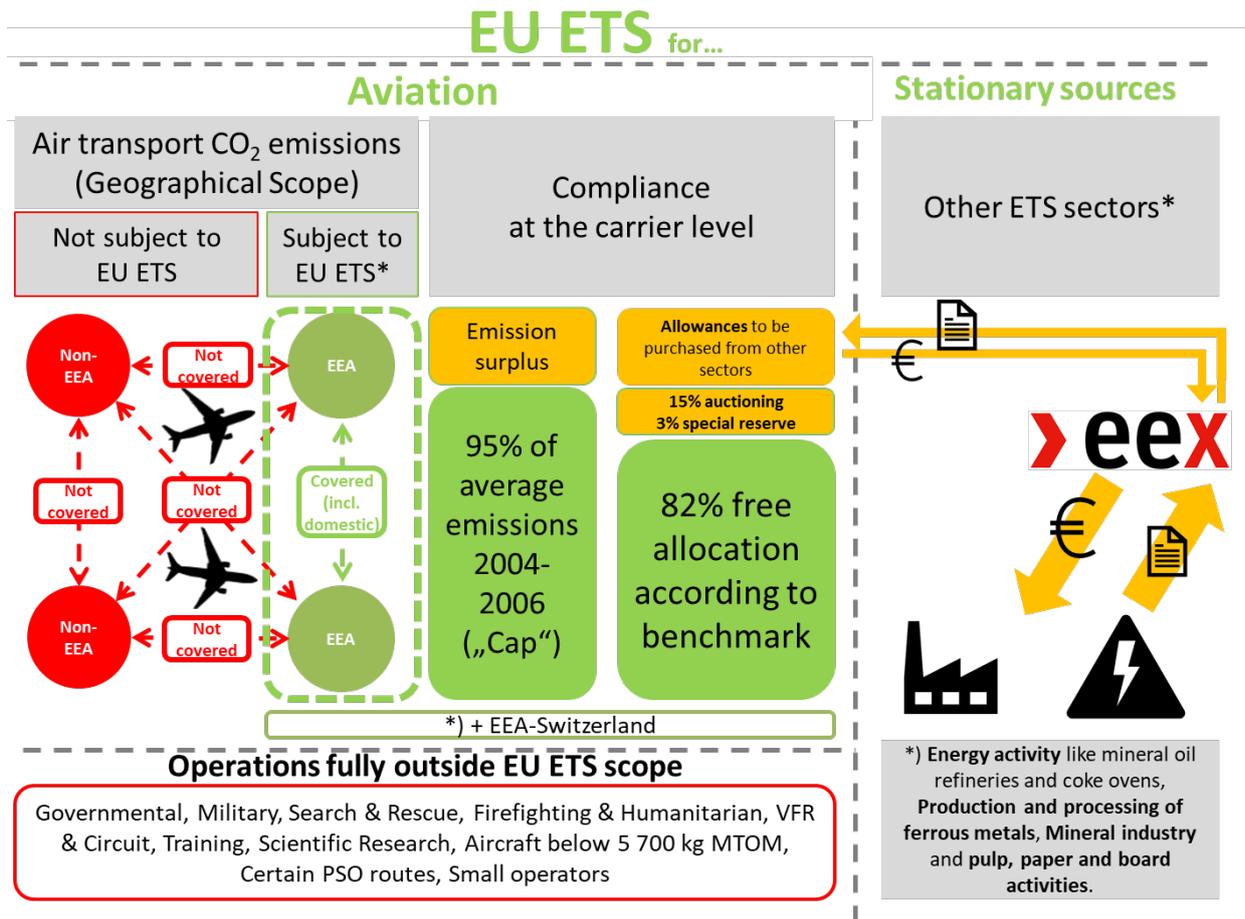
In 2005, the EU implemented the EU ETS to ensure that EU countries would meet the GHG emissions reduction targets as laid down in the Kyoto Protocol (first commitment period: 2008-2012). Since then, the EU ETS has been a key tool for meeting EU GHG emissions reduction targets, which have been set internationally and at the EU level.

Aviation activities within the EEA have been included in the EU ETS from 2012. Extra-EEA flights have been ‘temporarily’ derogated until the end of 2023. Geographical exceptions are air services from continental EEA to the EU outermost regions¹³ and between, but not within, these EU outermost regions. Furthermore, non-European countries and territories of Member States like Greenland, Faroe Islands, French Polynesia or Svalbard are excluded.¹⁴ Since the beginning of 2020, the EU ETS is also linked to the Swiss ETS. According to the linking agreement for aviation, flights from EU-27, Iceland and Norway to Switzerland are subject to the EU ETS, whereas flights from Switzerland to the EEA fall under the Swiss ETS.

¹³ Like the Canary Islands, the Azores and Madeira, and the French Overseas territories like Guadeloupe, Martinique and La Réunion, as defined in Article 349 of the Treaty on the Functioning of the European Union.

¹⁴ The full list can be found here: https://www.dehst.de/SharedDocs/antworten/EN/Aviation/LV_005_scope.html

Figure 5: Schematic overview of the current EU ETS for aviation



Source: Authors' own illustration, adapted from Maertens et al. (2019); EEX logo published under public domain on https://commons.wikimedia.org/wiki/File:European_Energy_Exchange_logo.svg and taken from there.

The current EU ETS knows two types of emission allowances: EUAs (European Union Allowances) and EUAAs (European Union Aviation Allowances). So far, aviation has been allowed to submit both types of allowances to comply with the regulation, whilst operators of stationary installations have been bound to EUAs. In the past, aviation turned out to be a net buyer of allowances, i.e. also submitted EUAs for compliance (European Commission, 2020c).

Since 2013, the emissions cap for aviation has been defined as 95 % of the sector's average 2004-2006 emissions and the cap has stayed at this level until 2020. From 2021 onwards, an annual linear reduction factor of 2.2 % is applied to the emissions cap for both stationary installations and aviation.

82% of the aviation allowances are freely allocated based on a benchmark of 0.6422 emission allowances per 1 000 tonne kilometres; 3 % make a special reserve for new entrants and 15 % are auctioned.

The monitoring, reporting and verification of greenhouse gas emissions from aviation in the context of the EU ETS is laid down in [Commission Implementing Regulation \(EU\) 2018/2066](#) of 19 December 2018 on the monitoring and reporting of greenhouse gas emissions pursuant to Directive 2003/87/EC of the European Parliament and of the Council and amending Commission Regulation (EU) No 601/2012.

In brief, [Directive 2003/87/EC](#) – in its most current version – applies to all flights which depart from or arrive in an EEA Member State (even though actual allowances are in the currently applied reduced

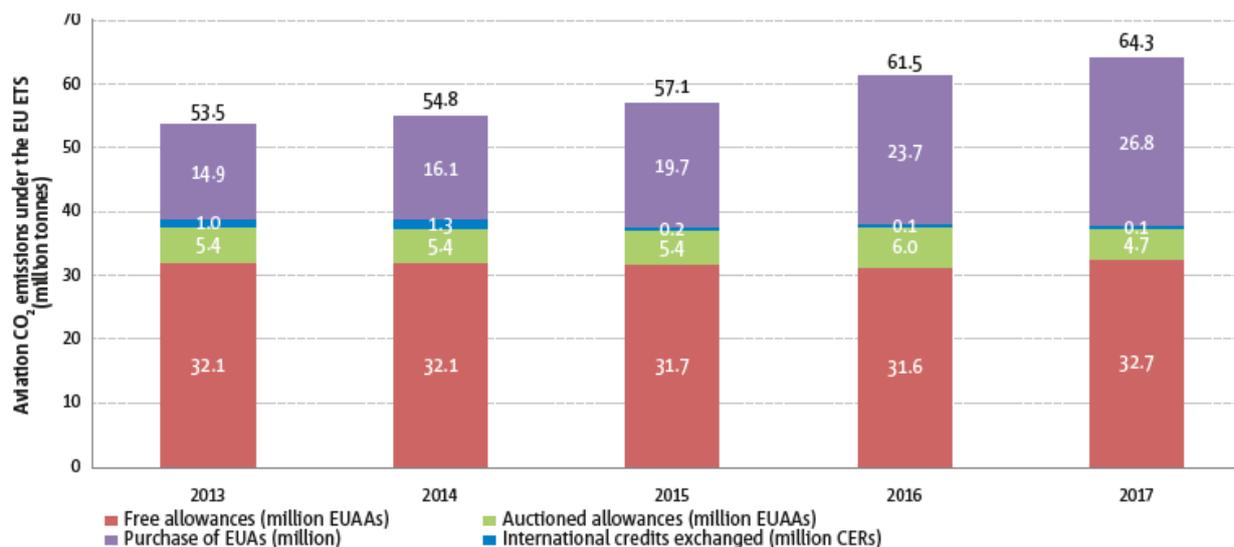
scope regime only needed for intra-EEA flights), except for those listed under Annex I. These exemptions include ‘small’ aircraft, ‘small’ and ‘non-commercial’ operators, certain flights under the rules of public service obligations (PSO), and governmental, military, search & rescue, firefighting, humanitarian and medical service flights as well as circuit, VFR, training and research, check and testing flights.

[Commission Implementing Regulation \(EU\) 2018/2066](#) requires operators to monitor, report and verify their CO₂ emissions from all non-excluded flights to and from EEA airports and aerodromes. Guidance document [‘The Monitoring and Reporting Regulation – General guidance for Aircraft Operators’ \(European Commission, 2018\)](#) supports the implementation of [Regulation 601/2012](#) in providing in- detail guidance on the monitoring and reporting process (scope, compliance cycle, monitoring approaches for emissions and tonne kilometre data, biofuel determination, small emitters, monitoring plans, etc.).

EEA-based carriers are administered and monitored by the relevant authority of the country that issued their operating licence, while those based outside the EEA are administered by the most relevant EEA state in terms of the operator’s emissions in the base year. The most current list of aircraft operators subject to the EU ETS along with the administering Member States is provided in [Commission Regulation \(EU\) 2021/662](#) of 22 April 2021. However, a large part of these carriers does not regularly operate into or within the EEA.

In the year 2017, according to EASA’s latest European Aviation Environmental Report from 2019, 677 aircraft operators, including more than 200 non-European ones, actually operated under the scope of the system ([EASA, 2019](#)).

Figure 6: Aviation CO₂ emissions under the EU ETS in 2013-2017



Source: EASA (2019)

Note: 1 EUAA or EUA equals 1 tonne of CO₂

In 2017, these operators emitted some 64.3 million tonnes of CO₂ covered by the EU ETS in its current, reduced scope. For 37.5 Mt, operators could use EUAs (with an auctioning share of 15 %), while for the remaining 26.8 Mt operators had to purchase EUAs from other sectors (Figure 6). Expected operator costs for the purchase of these allowances amount to EUR 189 million for 2017, which equals 0.3 % of total operating costs within the scope of the EU ETS ([EASA, 2019](#)).

In its Fit for 55 proposal, which is presented in more detail in the next section, the EC proposes to further reduce the cap and to stepwise increase the share of auctioning until full auctioning would be reached from 2027.

2.2.4. GHG regulation – ICAO level

In 2009, aviation stakeholders agreed on the following global climate goals for the international aviation sector: average annual improvements in fuel efficiency of 1.5 % between 2009 and 2020 and carbon-neutral growth from 2020, i.e. a freeze of the sector's net CO₂ emissions at 2020 levels followed by a reduction to 50 % of 2005 levels until 2050 (IATA, 2018). Accordingly, the ICAO as the UN agency responsible for international civil aviation is pursuing a 'basket of measures' to reduce GHG emissions (ICAO, 2019):

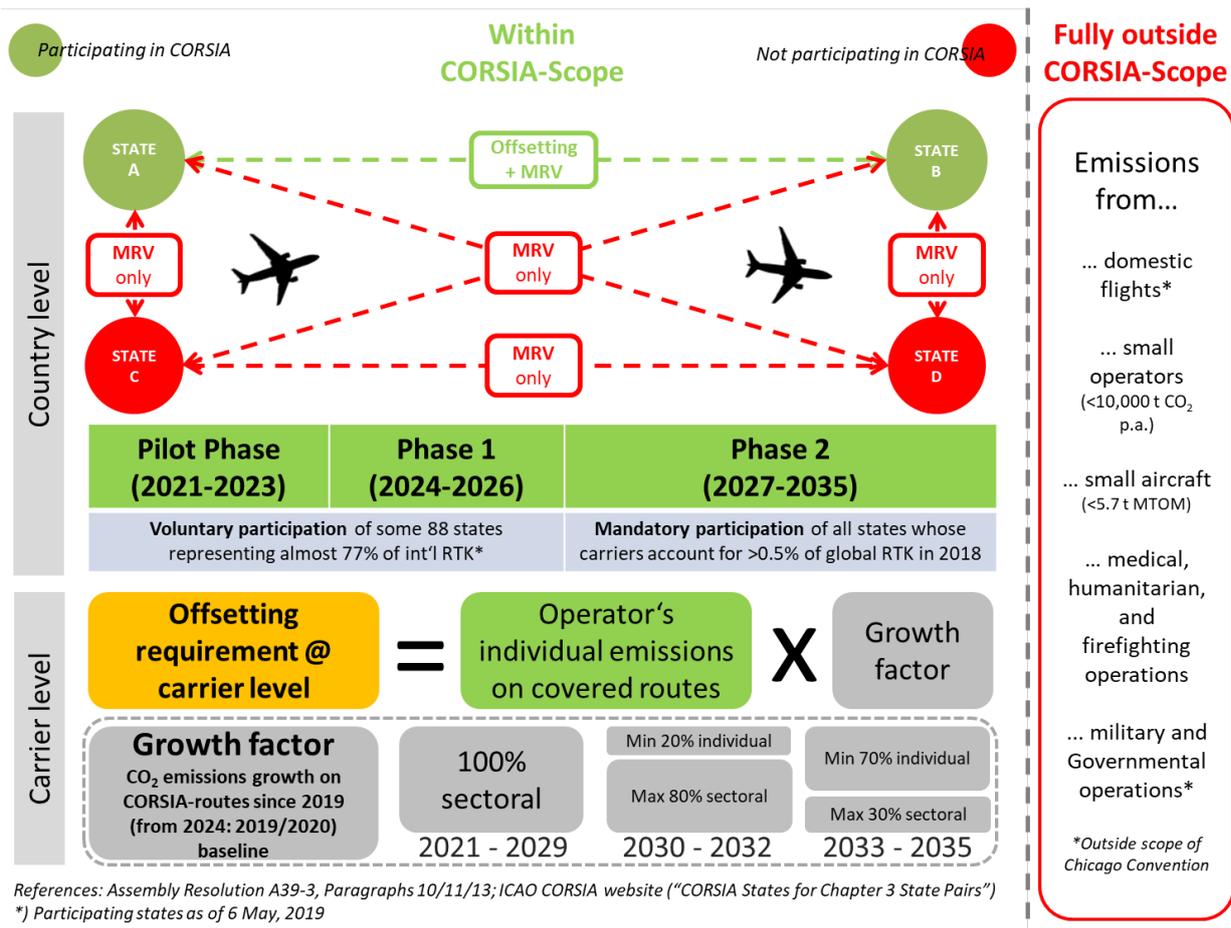
1. New technologies, including alternative fuels.
2. Fuel-saving operations like continuous descent approaches (CDA), allowing for smooth, constant-angle descent to landing.
3. Modernization of air traffic management and other infrastructural improvements.
4. A single global market-based measure to fill any remaining emission gap.

This market-based measure was, in the meantime, given birth to as CORSIA, the Carbon Offsetting and Reduction Scheme for International Aviation (ICAO, 2016). Unlike the EU ETS, CORSIA is a global measure where the international airline sector, subject to some exceptions, is obliged to offset any post-2019/2020 ('baseline') growth in CO₂ emissions on international routes from 2021 onwards. For this, tradable carbon credits are used for compliance which have to be purchased by the carriers for emissions from routes subject to CORSIA. The rationale behind the scheme is that airlines will choose to offset their emissions whenever this is cheaper than to abate them directly or where other technology options are not (yet) available.

Eligible carbon credits are issued by certified greenhouse gas reduction projects and programmes in various sectors like energy, industrial processes, agriculture and forestation, which shall deliver measurable reductions in emissions. This way, international aviation's net CO₂ emissions shall be stabilized while other emissions reduction measures will be further pursued. Emissions from domestic operations are not regulated under CORSIA as they are covered by the UNFCCC Paris Agreement, and because the ICAO is only competent for international air traffic.

Figure 7 illustrates the design and functioning of the scheme as agreed in Assembly Resolution A39-3 (ICAO, 2016) and in the related Standards and Recommended Practices (short: SARPs) document 'Annex 16 to the Convention on Civil Aviation, Vol. IV' (ICAO, 2018).

Figure 7: Schematic overview of CORSIA



Source: Authors' own illustration, adapted from Maertens et al. (2019)

In brief, CORSIA functions as follows:

- It follows a route-based approach as emissions from international routes are subject to CORSIA offsetting if they originate from flights between participating states (§10a), hereinafter referred to as 'CORSIA states'. Until 2026, participation is voluntary (§9a, §9b). As per July 2021, 106 states have agreed to participate from 2022 onwards (ICAO, 2021). Key countries that have not (yet) volunteered are Brazil, China, Russia and India (ICAO, 2021). From 2027, all countries have to participate in CORSIA offsetting, except for small islands, least developed countries, land-locked developing countries and states whose carriers account for less than 0.5 % of 2018 international revenue tonne kilometres, unless they decide to volunteer (§9e). If a 90 % global international RTK coverage is not reached through the inclusion of all countries exceeding this threshold, the 'next' largest countries in terms of RTK will have to join until 90 % are reached (§9e).
- While emissions from flights between CORSIA states and non-CORSIA states, or solely between non-CORSIA states, are not subject to any offsetting, they still have to be monitored, reported and verified under the CORSIA-scheme (§10b, §10c). This shall happen according to the internationally uniform standards ruled in Annex 16, Volume IV.
- Apart from domestic operations, emissions from small operators (< 10 000 t CO₂ p.a.), from small aircraft (< 5.7 t CO₂) and rotorcraft, and those from humanitarian, medical and firefighting

operations do not fall under the scheme (Assembly Resolution A39-3, §13). In addition, military and governmental aviation are excluded as they are not subject to the Chicago Convention.

- Offsetting requirements commenced in 2021, under supervision of the responsible competent authority. To calculate an airline’s offset obligation in each year in the period 2021-2029, this airline’s individual emissions from CORSIA-routes are to be multiplied with the sectoral global emission growth rate (over all carriers on routes subject to offsetting requirements) since the baseline period (§11).

The intention behind the uniform application of the average sector growth to all carriers was to get a certain balance between the offsetting requirements for older and new carriers, respectively. Otherwise, fast-growing airlines, e.g. from the Middle East or China, would have to shoulder most of the burden, while large but stagnating carriers like the big US, Japanese or European network airlines would hardly show any individual emission growth and therefore have no or only very limited offsetting obligations. From 2030, however, individual emission growth will be attributed to the carriers to an increasing extent. New entrants are free from any offsetting obligations for a period of up to three years if their annual emissions do not surpass 0.1 % of global emissions in 2020 at an earlier point.

The original CORSIA baseline was defined as the average of 2019/2020 emissions. To reflect 2020 demand decreases caused by the COVID-19 pandemic, the year 2019 was agreed on by the ICAO Council as new, single baseline year for the period 2021-2023 amid the COVID-19 pandemic (ICAO, 2020). As a short-term effect, there will not be any actual offsetting obligations as long as emissions from CORSIA routes remain below the 2019 level.

2.2.5. GHG regulation – Current EU ETS versus CORSIA

The following table summarizes the key differences between CORSIA and the EU ETS in its current form. In brief, CORSIA has a global approach (except for domestic flights and flights between non-participating states) but is less ambitious due to the relatively high (late) baseline. Another drawback of CORSIA is the questionable environmental effectiveness of the offsets, along with a need for double MRV – both at the airline and at the offsetting project levels.

Cames et al. (2016) found that ‘73 % of the Certified Emissions Reduction (CER) supply have a low likelihood’ and only 7 % have a high likelihood of ensuring that emission reductions are additional and not over-estimated’. These quality-related issues of CORSIA are not further dealt with in this report.

CORSIA and the EU ETS in its current form both apply to, and hence overlap on, international intra-EEA operations. Hence, in its EU ETS revision proposal for aviation, the EC proposes not to apply CORSIA within the EEA.

Table 7: EU ETS versus CORSIA – key differences

		EU ETS	CORSIA
Fundamental differences	Methodology	Cap & Trade	Baseline & Offsetting
	Environmental integrity	Not critical, overall cap is fixed	Dependent on offset unit quality standards and enforcement
	Need for verification by authorities	Only at emitter level	Both at emitter and at offsetting project level

		EU ETS	CORSIA
Differences in current implementation and application (coverage & baseline)	Cap/Baseline	95 % of avg. 2004-2006 emissions; stepwise further reduction of cap through linear reduction factor of 2.2 % from 2021 onwards	Avg. 2019/2020 emissions; no further reduction envisaged <i>(until 2023: 2019 emissions)</i>
	Scope	Intra-EEA including domestic flights and flights to Switzerland (derogation for flights to/from third countries until 2023); fixed-wing and rotorcraft	International routes between participating states; fixed-wing only
	Affected carriers	All airlines operating on covered routes, unless exceptions apply	

Source: Authors' own table

2.2.6. GHG regulation – national levels

At national levels, there are emission trading schemes also addressing air transport in operation in a couple of non-EEA countries. The **Swiss ETS** has been in operation since 2008 for stationary sources (BAFU, 2021). Aviation was included in 2020 and the system has been linked to the EU ETS. The **United Kingdom** is now outside the scope of the EU ETS (Environment Agency, 2021; Verifavia, 2021) but has put its own UK ETS in place which applies to flights from the United Kingdom to the United Kingdom, Gibraltar and the EEA. As, so far, no linking agreement with the EU ETS has been concluded, aircraft operators are currently exempted from obligations under the EU ETS for flights from the EEA to the UK. This gap is going to be fixed in the EU ETS revision proposal presented in the next chapter. Since 2015, **South Korea** has an ETS in place, which also includes domestic aviation. **China's** ETS was established in 2021 but does not (yet) include domestic or international aviation (ICAP, 2021).

Ticket taxes are levied in various EU Member States. They are simply charged per passenger, depending on the destination and/or travel class, and not on the basis of actual emissions. Hence, they could be regarded as an indirect way to internalise external costs of aviation but do not create incentives for operators to use more climate-friendly technology or sustainable fuels.

Other ideas to reduce aviation activities include **fuel taxes, bans of domestic flights** on routes which are served by trains within certain journey time limits¹⁵, or the mandatory introduction of **minimum airfares**.¹⁶

Mandatory **blending quotas for sustainable aviation fuels** are in discussion on national and EU levels. As such fuels are more expensive than fossil fuels, additional policy measures are needed to encourage usage. In an ETS, the reduced carbon intensity of alternative fuels (calculated on the basis of lifecycle emissions) should be considered when defining the obligation to surrender allowances. Authorities have begun to consider fuels with biogenic components ('biofuels'), but further alternative fuels, such as power-to-liquid-fuels, need to be considered as well in the future.

¹⁵ <https://www.airport-technology.com/features/france-bans-short-haul-flight-industry-reacts/>

¹⁶ <https://www.reuters.com/article/eu-austria-airlines-idU5L1N2K92I9>

3. CURRENT EU ETS

KEY FINDINGS

- Emissions of different stationary installations in EEA countries, of commercial and non-commercial intra-EEA flights, and of flights from the EEA to Switzerland, are currently included in the EU ETS.
- Extra-EEA flights are temporarily derogated until the end of 2023.
- Auctioning of allowances in the aviation sector is considered the default method for the allocation of emission allowances; the aim of the proposed revision is to reduce the allocation of free allowances as far as possible until 2030.
- Aviation still receives a relatively high share of free allowances (82 %).
- So far, aviation has been net buyer of allowances, also using allowances of stationary installations for compliance.
- The aviation emissions cap has not been lowered until 2020; from 2021, a linear reduction factor of 2.2 %, in line with the stationary installations, is applied.
- Maritime shipping is currently not included in the EU ETS.

In 2005, the EU implemented the EU ETS for stationary emission sources to ensure that the EU countries would meet the GHG emissions reduction targets as laid down in the Kyoto Protocol (first commitment period: 2008-2012). In 2012, air transport has been included. The EU ETS has been a key tool for meeting EU GHG emissions reduction targets, which have been set internationally and at the EU level.

Entities and emissions included

The following entities and emissions are currently included in the EU ETS (European Commission, 2021b):

- CO₂ from (a) electricity and heat generation, (b) energy-intensive industry sectors including oil refineries, steel works, and production of iron, aluminium, metals, cement, lime, glass, ceramics, pulp, paper, cardboard, acids and bulk organic chemicals, and (c) commercial and non-commercial aviation within the EEA as well as flights from the EEA to Switzerland;
- nitrous oxide from production of nitric, adipic and glyoxylic acids and glyoxal;
- perfluorocarbons from production of aluminium.

In some sectors, only stationary installations above a certain size are included, and in aviation very small operators are exempted when meeting very strict de-minima rules or qualifying as so-called 'small emitters'.

Emissions from maritime shipping are currently not included in the system at all.

Geographical scope

Stationary installations located in EEA countries are currently covered by the EU ETS.

Air transport activities within the EEA have been included in the EU ETS since 2012. Extra-EEA flights are temporarily derogated until end of 2023. Geographical exceptions are air services from continental EEA to the EU outermost regions¹⁷ and between, but not within, these EU outermost regions. Furthermore, non-European countries and territories of Member States like Greenland, Faroe Islands, French Polynesia or Svalbard are excluded.¹⁸ Since the beginning of 2020, the EU ETS has also been linked to the Swiss ETS. According to the linking agreement for aviation, flights from EU-27, Iceland and Norway to Switzerland are subject to the EU ETS, whereas flights from Switzerland to the EEA fall under the Swiss ETS.

Types and initial allocation of allowances

The current EU ETS knows two types of emission allowances: EUAs (European Union Allowances) and EUAAs (European Union Aviation Allowances). Aviation is allowed to submit both types of allowances to comply with the regulations, whilst operators of stationary installations have in the past been bound to EUAs. Until now, aviation has been a net buyer of allowances, i.e. also submitted EUAs for compliance ([European Commission, 2020c](#)).

The initial allocation of emission allowances to the sectors is as follows:

- Electricity generators receive no free allowances.
- For other stationary installations, emission benchmarks per unit of product are used to allocate free allowances. In 2013, 80 % of the allowances were freely allocated, in 2020, these amounted to 30 %. Sectors deemed at risk of carbon leakage¹⁹ however receive free allowances covering 100 % of the benchmark emission level.
- For aviation, 82 % of the total quantity of allowances are freely allocated to aircraft operators based on a benchmark of 0.6422 emission allowances per 1 000 tonne kilometres in 2004-2006; 3 % make a special reserve for new entrants and 15 % are auctioned.

Auctioning of allowances is considered efficient and the method to be applied by default, i.e. as far as possible, from Phase 3 (2013-2020) on.²⁰ Before the ongoing revision of the EU ETS, the aim was to phase out free allocation of allowances to stationary installations not at risk of carbon leakage between 2027 and 2030 and to analyse the potential for a higher share of auctioned allowances to aviation.

Auctioning is organized on behalf of the different countries within the scope, which also receive the according revenue. Auctions are held at the European Energy Exchange (EEX) and are sealed bid auctions with a uniform clearing price.

¹⁷ Like the Canary Islands, the Azores and Madeira, and the French Overseas territories like Guadeloupe, Martinique and La Réunion, as defined in Article 349 of the Treaty on the Functioning of the European Union.

¹⁸ The full list can be found here: https://www.dehst.de/SharedDocs/antworten/EN/Aviation/LV_005_scope.html

¹⁹ Carbon leakage refers to the situation that may occur if, for reasons of costs related to climate policies, businesses were to transfer production to other countries with laxer emission constraints. This could lead to an increase in their total emissions ([European Commission, 2021c](#)).

²⁰ According to an estimation of the [European Court of Auditors \(2020\)](#), however, for both Phase 3 and 4 (2021-2030) of the EU ETS, allowances allocated for free continue to represent more than 40 % of the total number of available allowances.

Use of the revenue from auctioning

At least 50 % of the revenue from auctioning has to be used for certain purposes as specified in Article 10 of the [‘EU ETS Directive’](#), like the reduction of GHG emissions, the development of renewable energies, carbon capture and storage, energy efficiency, etc.

Emissions cap

For stationary installations, the 2013 emissions cap was determined on the basis of the average total quantity of allowances issued annually in 2008-2012, and in Phase 3 of the EU ETS (2013-2020), the Union-wide cap decreased each year by a linear reduction factor of 1.74 %. The Union-wide cap for 2021 is fixed at around 1.57 billion allowances.

Since 2013, the emissions cap for aviation has been defined as 95 % of the sector’s average 2004-2006 emissions and the cap has not declined until 2020. From 2021 onwards, an annual linear reduction factor of 2.2 % is applied to the emissions cap for both stationary installations and aviation.

4. EU ETS REVISION PROPOSAL

KEY FINDINGS

Maritime shipping

- maritime shipping is proposed to be included in the existing EU ETS and the Union-wide quantity of allowances would be raised to this end;
- the system would be open, allowing sectors to use all allowances for compliance;
- the sector would receive no free allowances, but in the first 3 years would not have to cover all of its emissions with allowances;
- the system would rely on the EU MRV Regulation;
- in line with this Regulation:
 - companies would be the responsible entity and would be liable for the surrendering of emission allowances;
 - Tank-to-Propeller CO₂ emissions would be covered.
- the geographical scope would be narrower (50 % of extra-EEA voyages);
- companies would also have to report aggregated in-scope emissions per ship and the according aggregated emissions at company level;
- companies are proposed to be assigned to administering authorities.

Aviation

- the European Commission plans to tighten the EU ETS for aviation by means of a higher (4.2 %) linear reduction factor and a phase out of free allowances by 2027;
- CORSIA will be implemented through the EU ETS Directive for application on extra-EEA routes;
- formally, the Directive will reinstate the (former) full scope of the EU ETS, as the derogation for emissions from extra-EEA flights remains limited until 31 December, 2023;
- however, on most extra-EEA routes, airlines will effectively be allowed to make use of CORSIA offsetting instead, or they are fully exempt from both ETS and CORSIA obligations;
- in brief, the geographical scope of ETS vs. CORSIA application can be summarized as follows:
 - domestic intra-EEA routes: EU ETS (except for domestic flights from and to outermost regions and for PSO-routes within outermost regions);
 - international intra-EEA routes: EU ETS;
 - extra-EEA routes from/to countries participating in CORSIA, operated by carriers from the EEA and other CORSIA states: CORSIA;
 - extra-EEA routes from/to countries participating in CORSIA, operated by carriers from countries not participating in CORSIA: EU ETS;
 - extra-EEA routes from/to countries not participating in CORSIA (except Least Developed Countries (LDC) and Small Island Developing States (SIDS)): EU ETS (from 2027);
 - extra-EEA routes between CORSIA states, except for flights departing from or arriving in the EEA: CORSIA.

4.1. Maritime shipping

As part of the revision of the EU ETS ([COM\(2021\) 551 final](#)), the European Commission proposes to include the maritime shipping sector into the EU ETS. In the following, we will present the proposal by explaining the proposed main EU ETS design elements.

Should the maritime shipping sector be included into the EU ETS, additional MRV requirements would arise, which is why the European Commission also proposed to amend [Regulation \(EU\) 2015/757](#),

the 'EU MRV Regulation'. In the following, the proposed amendments to the EU MRV Regulation will be considered too.

4.1.1. Timing

It has been proposed that from 2023 on, the emissions of maritime shipping will be included into the EU ETS and that the sector's requirements will be phased in over a period of three years (see Article 3ga).

4.1.2. Responsible entity in the sector

The **shipping company** is proposed to be the responsible entity for the purpose of the EU ETS Directive. The shipping company is thereby defined as 'the shipowner or any other organisation or person, such as the manager or the bareboat charterer, that has assumed the responsibility for the operation of the ship from the shipowner and that, on assuming such responsibility, has agreed to take over all the duties and responsibilities imposed by the International Management Code for the Safe Operation of Ships and for Pollution Prevention, set out in Annex I to [Regulation \(EC\) No 336/2006](#) of the European Parliament and of the Council' (see Article 3, point (v)).

The company's EU ETS responsibilities

Under the proposed EU ETS Directive, the shipping company would be liable to surrender allowances in accordance with the verified aggregated emissions at company level (Article 3ga) and would have to pay an excess emissions penalty if not sufficient allowances were submitted on time (Article 16 (3)). The enforcement mechanisms will be described in more detail in Subsection 4.1.8 under 'Compliance control and enforcement'. Since the shipping company is proposed to be the responsible entity, the enforcement mechanisms are naturally applied to the shipping company. This also holds for potential expulsion orders.

- If the shipping company does not surrender sufficient allowances by 30 April of each year to cover its emissions during the preceding year, the company is held liable for the payment of an **excess emissions penalty**. The penalty amounts to EUR 100 for each tonne of CO₂ equivalent emitted for which the company has not surrendered allowances and increases in accordance with the European index of consumer prices from 1 January 2013 onwards (see Article 16 (3), (3a) and (4)).
- In case a shipping company has failed to comply with the surrender requirements for two or more consecutive reporting periods and where other enforcement measures have failed to ensure compliance, the competent authority of the Member State of the port of entry may issue an expulsion order and all Member States shall **refuse entry of the ships under the responsibility of the shipping company concerned into any of its ports** until the company fulfils its surrender obligations. (see Article 16 (11a)).

The company's additional EU MRV responsibilities

To facilitate the inclusion of maritime shipping into the EU ETS, the EU MRV Regulation is proposed to be amended too. The following additional EU MRV responsibilities for shipping companies have, in a nutshell, been proposed by the European Commission:

- Monitoring plans would have to be submitted using automated systems and data exchange formats and after the verifier has approved the monitoring plans, the companies would have to submit the plans to the responsible administering authority too;

- For each ship, companies would, as part of the annual EU MRV monitoring and reporting requirement, have to monitor and report the aggregated emissions data in accordance with the geographical scope of the EU ETS. The company would have to determine the 'aggregated emissions data at company level' by summing up these data for all the ships that fall under its responsibility. The company would have to submit/report the verified aggregated emissions data at company level to the responsible administering authority.

More in detail, it has been proposed that:

- '...monitoring plans shall be **submitted using automated systems and data exchange formats...**' (see Article 12); and
- 'Within three months of [date of entry into force of revised EU ETS Directive], **companies shall submit to the responsible administering authority a monitoring plan** for each of their ships falling under the scope of this Regulation, which shall first be assessed as being in conformity with this Regulation by the verifier' (see Article 6, Paragraph 6).
- 'Companies shall **report the aggregated emissions data at company level of the ships under their responsibility during a reporting period** pursuant to Article 11a' (see Article 4, Paragraph 8); the definition of 'aggregated emissions data at company level' is thereby as follows: 'aggregated emissions data at company level' means the sum of the CO₂ emissions to be reported by a company under Directive 2003/87/EC, in respect of all ships under its responsibility during the reporting period' (see Article 3 point (r)).
- According to proposed Article 11a of the EU MRV Regulation:
 - companies **shall determine the aggregated emissions data at company level during a reporting period, based on the data of the emissions report and the report referred to in Article 11(2) for each ship that was under their responsibility during the reporting period**, in accordance with the rules laid down in the delegated acts adopted pursuant to Paragraph 4;
 - from 2024, the company **shall submit to the responsible administering authority by 31 March of each year the aggregated emissions data at company level that covers the emissions in the reporting period to be reported under Directive 2003/87/EC** in relation to maritime transport activities, in accordance with the rules laid down in the delegated acts adopted pursuant to Paragraph 4 and that is verified in accordance with Chapter III of this Regulation (the 'verified aggregated emissions data at company level').

Change of company

Article 11(2) to which is referred to in Article 11a clarifies the allocation of responsibility for the case that there is a change of company.

In the **current EU MRV Regulation**, Article 11(2) reads as follows: 'Where there is a change of company, the new company shall ensure that each ship under its responsibility complies with the requirements of this Regulation in relation to the **entire reporting period** during which it takes responsibility for the ship concerned.' In the **2019 amendment proposal** of the European Commission it reads: 'Where there is a change of company, the previous company shall submit to the Commission and to the authorities of the flag State concerned, as close as practical to the day of the completion of the change and no later than three months thereafter, a report covering the same elements as the emissions report but **limited to the period corresponding to the activities carried out under its responsibility.**'

In the first case, the new company is responsible for the entire compliance period, whereas in the second case, each company is responsible for its specific part of the compliance period.

Note that Article 11(2) has not been proposed to be amended as part of the Fit for 55 proposal.

4.1.3. Scope

Emissions scope

Annex I of the EU ETS Directive specifies the categories of activities as well as the GHGs of these activities to which the Directive applies. To include the emissions of maritime shipping into the EU ETS, the table in Annex I is proposed to be extended (see p. 89 of proposal), specifying 'Greenhouse gases covered by Regulation (EU) 2015/757'.

Since the EU MRV Regulation currently covers CO₂ emissions released by ships, this is also the proposed emissions scope for the EU ETS. Note that the EU MRV Regulation follows the Tank-to-Propeller Approach.²¹ This means that the emissions released in the upstream chain of the bunker fuels/energy sources used on board of a ship are not accounted for.

If the emissions scope of the EU MRV Regulation was amended to also cover GHG emissions other than CO₂ and/or Well-to-Tank emissions, then these emissions would also be covered by the EU ETS Directive.

Ships and their activities covered

In order to include maritime shipping into the EU ETS, the definition of the term 'emissions' (Article 3 point (b)) is proposed to be broadened as follows:

' "emissions" means the release of greenhouse gases ... from ships performing a maritime transport activity listed in Annex I of the gases specified in respect of that activity, ...'

The table in Annex I is proposed to be extended (see p. 89 of proposal), specifying the following activities to which the Directive applies:

'Maritime transport activities of ships covered by Regulation (EU) 2015/757 of the European Parliament and of the Council performing voyages with the purpose of transporting passengers or cargo for commercial purposes'.

Maritime transport activities are not defined as part of the proposal and also not defined in the EU MRV Regulation.

The ships covered by the EU MRV Regulation are ships above 5 000 GT, with the exception of warships, naval auxiliaries, fish-catching or fish-processing ships, wooden ships of a primitive build, ships not propelled by mechanical means, or government ships used for non-commercial purposes.

The purpose of the voyages covered ('transporting passengers or cargo for commercial purposes') is in line with the definition of voyage as provided under the EU MRV Regulation. In the EU ETS proposal, the voyage scope is explicitly defined in Annex I, whereas in the EU MRV Regulation the voyage scope is specified under Definitions (Article 3).

²¹ 'Tank-to-Wheel' (TTW) approach is the equivalent term used for road transport.

Geographical scope

In terms of the geographical scope, according to Article 3g (see p. 43 of proposal), the following emissions from maritime shipping are proposed to be covered by the EU ETS:

- 100 % of emissions from ships performing voyages between intra-EEA ports;
- 100 % of emissions from ships at berth in an EEA port;
- 50 % of the emissions from ships performing voyages departing from an EEA port and arriving at a non-EEA port;
- 50 % of the emissions from ships performing voyages departing from a non-EEA port and arriving at an EEA port.

The geographical scope of the EU ETS Directive thus covers 50 % of the emissions released on extra-EEA voyages and is thus narrower than the geographical scope of the EU MRV Regulation, where 100 % of emissions released on extra-EEA voyages are covered.

The geographical scope of the EU ETS Directive is decisive for the allocation of and the surrender requirements for allowances.

4.1.4. Emission allowances and allocation thereof

According to the European Commission's proposal, no separate maritime allowances will be issued when maritime shipping is included into the EU ETS (see 'Detailed explanation of the specific provisions of the proposal', p. 23), but the Union-wide quantity of allowances will rather be increased (see Article 9) and all operators are allowed to use all allowances for their surrender obligations (see Article 12(3)²²).

Article 10 on the 'Auctioning of allowances' of the current EU ETS Directive will also hold for maritime shipping (see Article 3g(2)). It states that Member States shall auction all allowances that are not allocated free of charge and neither placed in the market stability reserve nor cancelled and also that the share of allowances to be auctioned has to be 57 %.

In the proposal it is not explicitly mentioned that full auctioning is envisioned for maritime shipping, but you can deduce this from the fact that the proposal does not specify that Article 10a of the current Directive on the 'Transitional Union-wide rules for harmonized free allocation' would also hold for shipping.

Information provided by the platform which currently auctions EU ETS allowances corroborates this. EEX (2021) states that '[o]nce 100 % of emissions are within the proposed scheme, for which the current target date is 2026, it will be required that allowances are purchased and surrendered for every single ton of carbon reported via the MRV and within scope of the ETS.'

The obligation to surrender allowances in the maritime transport sector is gradually phased in (see Article 3ga): shipping companies have to surrender allowances covering 20 % of their verified emissions reported for 2023 and 100 % of their verified emissions reported for 2026.

4.1.5. Emissions target

No specific CO₂ emissions target for maritime shipping has been proposed, but it has been proposed to increase the Union-wide quantity of allowances by 79 million allowances for maritime transport

²² According to Article 12(3) (a) to (c), the operators of installations, aircraft operators and shipping companies are respectively allowed to surrender 'a number of allowances that is equal to their total emissions', without restricting the type of allowance used.

in the year following entry into force of the amendment of the EU ETS Directive (see Article 9). Just as for the other sectors, a linear reduction factor of 4.2 % would annually be applied to the cap of the previous year, starting in the year following entry into force of the amendment (see Article 9). And in the same year, the 'linear reduction factor is combined with a one-off downward adjustment of the cap so the new linear reduction factor has the same effect as if it would have applied from 2021.'

Table 8: Illustration of the proposed development of the emissions cap

Year	2021	Year of entry into force: 2021+x	2021+x+1	2021+x+2
(Change of) cap	CAP^{2021}	$CAP^{2021+x} = CAP^{2021} * (1 - 2.2\%)^x$	$CAP^{2021+x+1} = CAP^{2021} * (1 - 4.2\%)^{(x+1)} + 79 \text{ million}$	$CAP^{2021+x+2} = CAP^{2021+x+1} * (1 - 4.2\%)$

Source: Authors' own table

As Table 8 illustrates, 79 million allowances have been proposed to be added to the Union-wide quantity of allowances in the year after the amendments enter into force. This means that for each year after this year the according total amount of allowances declines by 4.2 %.

4.1.6. Monitoring reporting and verification

The additional MRV responsibilities of the companies have been described above (see subsection 4.1.2 on the responsible entity).

New responsibilities for verifiers

New responsibilities for verifiers are proposed as part of the EU MRV Regulation amendment:

- Regarding the scope of verification activities and proof of verification, the following has been proposed (Article 13(5)):
 - 'the verifier shall **assess the conformity of the aggregated emissions data at company level with the requirements** laid down in the delegated acts adopted pursuant to Paragraph 6;
 - where the verifier concludes, with reasonable assurance, that the aggregated emissions data at company level are free from material misstatements, the **verifier shall issue a verification report** stating that the aggregated emissions data at company level have been verified as satisfactory in accordance with the rules laid down in the delegated acts adopted pursuant to Paragraph 6'.
- Regarding the general obligations and principles for the verifiers (Article 14), it has been proposed (Article 14(4)): 'When considering the verification of the aggregated emissions data at company level, the verifier **shall assess the completeness and the consistency of the reported data with the information provided by the company**, including its verified emissions reports and the report referred to in Article 11(2)'.
- Regarding the verification procedures, it has been proposed (Article 15(6)): 'In respect of the verification of aggregated emissions data at company level, the verifier and the company shall comply with the verification rules laid down in the delegated acts adopted pursuant to the second subparagraph. **The verifier shall not verify the emissions report and the report referred to in Article 11(2) of each ship** under the responsibility of the company'.

To summarize: On top of the verification of the per ship emission reports, the verifier also has to verify the aggregated emissions data at company level. The aggregated emissions data at company level are derived based on the per ship emission reports, but the per ship emissions reports do not have to be verified again for the verification of the aggregated emissions data at company level. Once the verifier has verified the aggregated emissions data, the company receives a verification report from the verifier.

Administering authorities and their responsibilities

It has been proposed that '[e]ach shipping company falling within the scope of application of the EU ETS is attributed to a Member State – the administering authority – for its administration under the Directive.' The Member State that is responsible for a company is determined based on where the shipping company is registered (independent of the flag the company's ships are flying). If the company is not registered in a Member State, it is assigned to the Member State where the ships under the company's responsibility had the highest number of port calls in the two previous monitoring years (see Article 3gd). And where appropriate, the responsible administering authority in respect of a shipping company is proposed to be updated biennially. In this context, the European Commission will be responsible for the elaboration of a list of shipping companies covered by the Directive and their respective administering authority (Article 3gd).

New MRV responsibilities for Member States in their roles as administering authority have been proposed as part of the amendment of the EU ETS Directive as well as the EU MRV Regulation.

Under the EU ETS Directive, the administering authority would have the following MRV responsibilities:

- in respect of emissions from maritime transport activities listed in Annex I, the administering authority **shall ensure that a shipping company under its responsibility monitors and reports the relevant parameters during a reporting period, and submits aggregated emissions data at company level to the administering authority** in line with Chapter II of Regulation (EU) 2015/757 of the European Parliament and of the Council;
- the administering authority in respect of a shipping company **shall ensure that the reporting of aggregated emissions data at shipping company level** submitted by a shipping company pursuant to Article 3gb is **verified in accordance with the verification and accreditation rules** set out in Chapter III of Regulation (EU) 2015/757.

Under the EU MRV Regulation, the administering authority would have the following MRV related responsibility:

- 'within two years of entry into force of [revised ETS Directive], the responsible administering authorities **shall approve the monitoring plans** submitted by companies in accordance with the rules laid down in the delegated acts adopted by the Commission pursuant to the second subparagraph.' (Article 6(8)).

For the proposed tasks, the administering authorities would be able to rely on the assistance of EMSA.

Delegated and implementing acts

The amendment proposals for the EU ETS Directive and the EU MRV Regulation specify various delegated and implementing acts to further specify MRV related aspects at a later stage:

- MRV related delegated acts proposed as part of the EU MRV Regulation amendment:

The Commission is empowered to adopt delegated acts in accordance with Article 23 to:

- o **amend the methods** set out in **Annex I**²³ and the rules set out in **Annex II**²⁴ in order to take into account revisions of Directive 2003/87/EC, relevant international rules as well as international and European standards. (Article 5(2));
- o amend **Annexes I and II** in order to **refine the elements of the monitoring methods** set out therein, in the light of technological and scientific developments and in order to ensure the effective operation of the EU ETS established pursuant to Directive 2003/87/EC. (Article 5(2));
- o supplement the Regulation with rules for the:
 - **approval of monitoring plans by administering authorities** (Article 6(8)).
 - **monitoring and reporting of the aggregated data at company level** (Article 11a(4)).
 - **submission of the aggregated emissions data at company level** to the administering authority (Article 11a(4)).
 - **verification of the aggregated emissions data at company level and the issuance of a verification report** (Article 13(6)).
 - **verification of aggregated emissions data at company level, including the verification methods and verification procedure** (Article 15(6)).

And the Commission would have the power to adopt these delegated acts for an indeterminate period of time (Article 23(2)).

- MRV related implementing acts proposed as part of the EU MRV Regulation amendment:
 - o Article 6(5): Companies shall use standardised **monitoring plans** based on **templates** and monitoring plans shall be submitted using **automated systems** and data exchange formats. Those templates, including the technical rules for their uniform application and automatic transfer, shall be determined by the Commission by means of implementing acts. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 24(2).
- MRV related implementing acts proposed as part of the EU ETS Directive amendment:
 - o Article 3gd(3): The Commission shall adopt implementing acts to establish detailed **rules** relating to the **administration of shipping companies by administering authorities** under this Directive. Those implementing acts shall be adopted in accordance with the examination procedure referred to in Article 22a(2).

4.1.7. Compliance period/cycle

According to the proposed amendments to the EU MRV Regulation, 'The administering authority may require companies to **submit the verified aggregated emissions data at company level** by a date earlier than **31 March, but not earlier than by 28 February**' (see Article 11a(3)).

And according to the proposed amendments to the EU ETS Directive, 'The Member States, administering Member States and administering authorities in respect of a shipping company shall

²³ Annex I of the EU MRV Regulation is related to the 'methods for monitoring CO₂ emissions'.

²⁴ Annex II of the EU MRV Regulation is related to the 'monitoring of other relevant information'.

ensure that, **by 30 April each year**: ... (c) each shipping company **surrenders** a number of **allowances** equal to its total emissions during the preceding calendar year, as verified in accordance with Article 3gc...' (Article 12, Paragraph 3).

4.1.8. Compliance control and enforcement

The Member States, **administering Member States** and **administering authorities** in respect of a shipping company will have to ensure that, by 30 April each year, each shipping company surrenders a number of allowances equal to its total emissions during the preceding calendar year (see Article 12 (3(c)). **Member States** shall ensure the publication of the names of ... shipping companies who are in breach of the requirement to surrender sufficient allowances under the EU ETS Directive (see Article 16(2)) and the Member State should hold a company liable for the payment of an excess emissions penalty should the company not surrender sufficient allowances by 30 April. The penalty amounts to EUR 100 for each tonne of CO₂ equivalent emitted for which the company has not surrendered allowances and increases in accordance with the European index of consumer prices from 1 January 2013 onwards (see Article 16 (3)). For the excess emissions, allowances must still be submitted at a later stage.

In case a shipping company has failed to comply with the surrender requirements for two or more consecutive reporting periods, the **competent authority of the Member State of the port of entry** may issue an expulsion order which shall be notified to the Commission, EMSA, the other Member States and the flag State concerned (see Article 16(11a)).

If an **expulsion order** has been issued:

- every Member State, with the exception of the Member State whose flag the ship is flying, shall refuse entry of the ships under the responsibility of the shipping company concerned into any of its ports until the company fulfils its surrender obligations;
- where the ship flies the flag of a Member State, the Member State concerned shall, after giving the opportunity to the company concerned to submit its observations, order the ship to be detained until the shipping company fulfils its obligations.

4.1.9. Use of revenues

The allowances that are not allocated free of charge are auctioned, generating auctioning revenues. A share of allowances is made available to a Modernisation Fund (see Article 10(1)), an Innovation Fund (see Article 10a(8)) and the Union budget.²⁵ The remaining allowances are allocated to the Member States.

According to Article 10a(8) of the proposal, '[t]he Innovation Fund may also support break-through innovative technologies and infrastructure to decarbonise the maritime sector and for the production of low- and zero-carbon fuels in aviation, rail and road transport'.

The Commission can determine the details of the rules on the operation of the Innovation Fund by means of delegated acts (see Article 10a(8)).

²⁵ 'Adjustments to the EU budgetary framework will be presented by the Commission as part of the upcoming Own Resources package including a proposal to amend the multiannual financial framework.'

Member States can determine the specific use of the revenues generated, but revenues have to be used for climate-related purposes, including the support of low-income households' sustainable renovation (see Article 10(3)).

Projects in the territory of all Member States are eligible for funding from the Innovation Fund (Article 10a(8)).

4.2. Aviation

As part of the revision of the EU ETS, the European Commission proposes to tighten the EU ETS for aviation and to integrate CORSIA.

For this, the EC has published the following draft directives:

- proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC as regards aviation's contribution to the Union's economy-wide emission reduction target and appropriately implementing a global market-based measure ([COM\(2021\) 552 final](#));
- proposal for a DECISION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC as regards the notification of offsetting in respect of a global market-based measure for aircraft operators based in the Union ([COM\(2021\) 567 final](#)).

Formally, CORSIA will be implemented through the EU ETS Directive for application on extra-EEA routes.

In the following, we will present the proposal by explaining the proposed main amendments of the EU ETS design elements.

4.2.1. Timing

It is envisaged to bring the amendments to the EU ETS for aviation into force by 31 December 2023, so that the new regime can start from 2024.

As CORSIA offsetting obligations are likely to be zero in 2021 due to the COVID-19 effects, [COM\(2021\) 567 final](#) proposes – for the meantime – a revised Article 12(6) of Directive 2003/87/EC which will require Member States to notify their aircraft operators by the end of November 2022 that they have zero offsetting obligations for the year 2021. This way, the administrative burden can be minimized while the major amendments according to [COM\(2021\) 552 final](#) are still on their legislative way.

4.2.2. Responsible entity and administrative body

The responsible entity will remain the aircraft operator (Article 3c of the proposed revised Directive 2003/87/EC).

Also, provisions regarding the administering Member States remain virtually unchanged (Article 18a): Operators with an EEA licence continue to be administered by 'their' Member State, while foreign operators, with regard to EU ETS obligations, are handled by the Member State with the largest estimated share of their emissions on EEA routes. With regard to CORSIA obligations, foreign operators are administered by their home countries.

4.2.3. Scope

Emissions scope

[COM\(2021\) 552 final](#) does not provide any amendment for the column 'Greenhouse gases' for the entry 'aviation' of Annex 1 of 2003/87/EC. Hence, CO₂ emissions remain the only emissions type regulated by Directive 2003/87/EC with respect to aviation.

Aircraft types and activities

[COM\(2021\) 552 final](#) does not propose any amendments for the column 'activities' for the entry 'aviation' of Annex I of 2003/87/EC, except for a definition of requirements for operators and activities falling under CORSIA. Hence, there is no change to the aircraft types and activities (not) falling under the EU ETS. As listed in Annex I of the Directive and summarized in Figure 5 (see Paragraph 2.2.3), key activities and aircraft classes exempted from the scheme include most governmental, military, custom and police flights, most search and rescue, fire-fighting, humanitarian and emergency medical service flights, flights under visual flight rules, circuit, training, research, checking, testing and certifying flights and flights with aircrafts below 5.7 tonnes MTOM. In addition, certain PSO flights and flights by operators with only few otherwise applicable flights per year or with low emission volumes are excluded.

Geographical scope & CORSIA integration

From 2024, the directive will – formally – bring back the (former) full scope of the EU ETS as the derogation for emissions from flights to and from aerodromes located in countries outside the EEA remains limited until 31 December, 2023 only (Art. 28a(1a)). In addition, the proposed revision will introduce CORSIA requirements for EEA operators on 'flights other than flights departing from an aerodrome located in the EEA and arriving at an aerodrome located in the EEA, in Switzerland or in the United Kingdom' ([COM\(2021\) 552 final](#), page 13, number (17)), provided that the departure and arrival countries participate in CORSIA.

However, it has to be differentiated between this full scope approach 'on paper' and the actual obligation to surrender allowances as, on most extra-EEA routes, airlines will effectively be allowed to make use of CORSIA offsetting instead, or they are fully exempt from ETS or CORSIA obligations.

In the following, we present these provisions in more detail:

- Article 3a, Annex I and Article 12(2a) define the EU ETS in its full scope as a general market-based measure for flights within, from and to the EEA. In addition, a scope extension of Annex I with regard to flights between CORSIA states paves the way for offsetting requirements of EEA carriers for emissions from routes fully outside the EEA.
- Within the EEA, there is a derogation for flights between outermost regions of a Member State and the same Member State until 2030 (Article 3c, Paragraph 7). However, flights between outermost regions of a Member State and other EEA states will not be exempted any more as the provisions of the former Article 28a(1b) will be limited until the end of 2023. Routes within outermost regions 'performed in the framework of public service obligations imposed in accordance with Regulation (EEC) No 2408/92' seem to remain exempted in accordance with number (i) of Annex I.

Article 11a and new Paragraphs 6-8 of Article 12 contain the key provisions for the actual integration of the CORSIA requirements for EEA carriers into the EU ETS Directive 2003/87/EC:

- Article 11a enables aircraft operators registered in, or holding an AOC from, a Member State ('EEA-operators') to make use of CORSIA (instead of the actual EU ETS) on extra-EEA routes from and to 'CORSIA states', as listed in an implementing act 'pursuant to Article 25a(3)', which are 'considered to be applying CORSIA ... with a baseline of 2019 for 2021 to 2023 and a baseline 2019-2020 for each year thereafter'.
- Credits authorised according to Article 6(4) of the Paris Agreement and those considered eligible by the ICAO Council and listed in the implementing act pursuant to Paragraph 8 may be used if they originate from a party to the Paris Agreement and (from 2027) from a 'CORSIA-state'. Other eligible credits for flights by EEA carriers to and from CORSIA states include CER and ERU according to Paragraph 5 and credits from Union level projects according to Article 24a.
- As CORSIA offsetting obligations are likely to be zero in 2021, due to COVID-19 effects, [COM\(2021\) 567 final](#) proposes – for the meantime – a revised Article 12(6) of Directive 2003/87/EC which will require Member States to notify their aircraft operators by end of November 2022 that they have zero offsetting obligations for the year 2021.
- Paragraph 7 of Article 12 empowers the Commission 'to adopt delegated acts in accordance with Article 23 to supplement this Directive' with the CORSIA-methodology for calculating offsetting requirements. Paragraph 6 of Article 12 requires the Member States to apply this methodology to calculate, 'each year for the preceding year', the offsetting obligations according to 'ICAO's Recommended Practices on Environmental Protection for Carbon Offsetting and Reduction Scheme for International Aviation', except for flights from the EEA to the EEA, to Switzerland, or to the UK, which are subject to the surrender of allowances within the EU ETS.
- Paragraph 6 of Article 12 further requires each Member State to inform aircraft operators holding an AOC of that Member State and producing annual CO₂ emissions larger than 10 000 tonnes from the use of aircraft with an MTOM exceeding 5.7 tonnes on flights covered by Annex I (other than those within the same Member States) of the level of offsetting. The paragraph further lists emissions from those flights that are exempted from CORSIA. These are state, humanitarian, medical, military and firefighting flights. Unlike to official CORSIA provisions at ICAO level, we cannot find any provision for the exclusion of rotorcraft in the EC proposal.
- Paragraph 8 of Article 12 rules that aircraft operators will be notified by their Member States about the quantity of emission units they will have to cancel, and by when (e.g., by 31 January 2025 for the period 2021-2023, by 31 January 2028 for the period 2024-2026, and so on).

New paragraphs 4-9 of Article 25a then define various exemptions from EU ETS and/or CORSIA obligations, as well as provisions in case of competitive distortion:

- Article 25a(4) exempts operators from third-country 'CORSIA states' from requirements towards EU Member States to cancel units for emissions from extra-EEA flights from and to 'CORSIA states' as these carriers are administered by their home countries within the ICAO CORSIA framework.
- In reverse, this implies that operators from non-EEA countries not implementing CORSIA according to Art 25a(3) will have to surrender allowances for such routes (and possibly, administered by their home countries, also have to cancel offsets according to the route-based approach of ICAO A39-3).

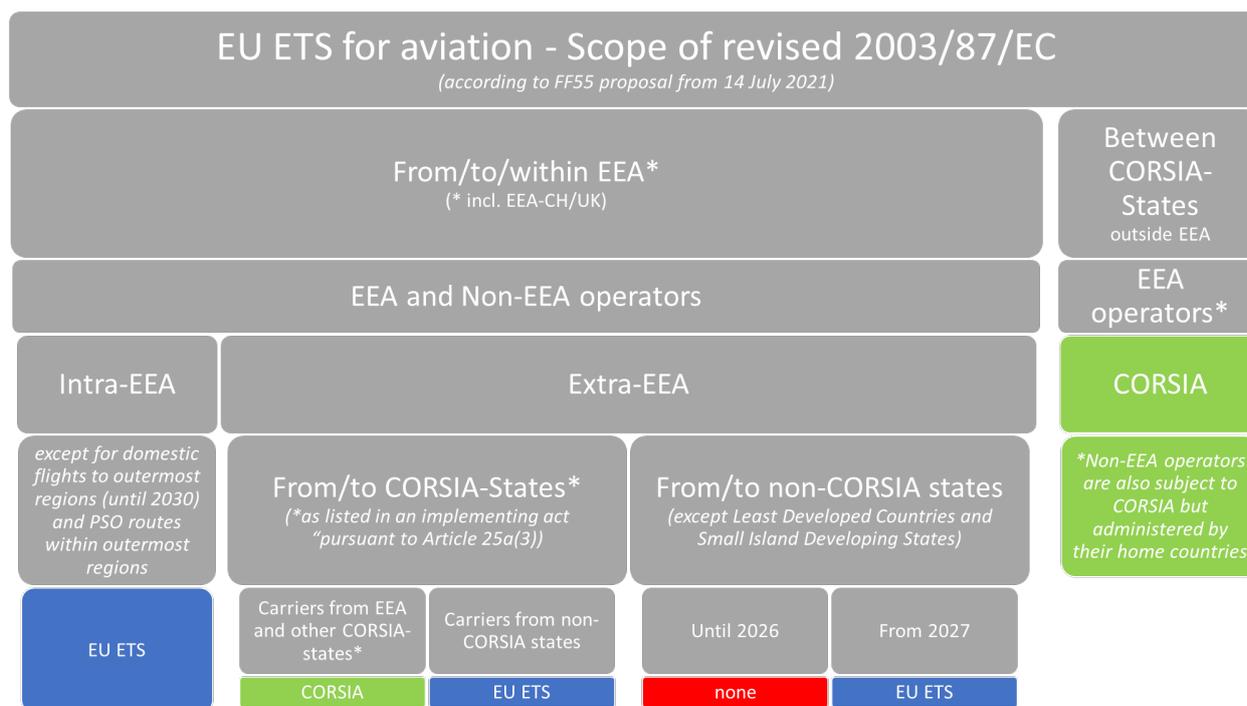
- Routes to countries not implementing CORSIA are exempt from requirements to cancel units until 2026 (Article 25a, Paragraph 5). Our understanding of this provision is that there will also be no obligation to surrender allowances until the end of 2026. In reverse, this would however mean that the obligation to surrender EU ETS allowances would be introduced for such routes (if any) from 2027. This may affect routes to countries exempt from CORSIA due to low (< 0.5 %) global RTK shares.
- Routes to Least Developed Countries (LDC) and Small Island Developing States (SIDS) not implementing CORSIA are generally exempt from the obligation to cancel units (Article 25a, Paragraph 6). Our understanding of this provision is that there will also be no obligation to surrender allowances.
- Article 25a, Paragraph 7 is a provision aiming at limiting unfair competition from carriers of countries which apply 'CORSIA in a less stringent manner' or which do not enforce CORSIA 'in a manner equal to all aircraft operators'.
- Article 25a, Paragraph 8, rules that EEA carriers may use other offset units than those defined in Article 11a(8) for emissions from routes between CORSIA states if these states allow their carriers to do so.

Hence, the geographical scope of both market-based measures can be summarized as follows:

- general 'full-scope' ETS requirements for all airlines on routes from, to and within the EEA, except for most flights subject to CORSIA offsetting or for flights fully exempt from ETS or CORSIA obligations;
- domestic intra-EEA routes: EU ETS (except for domestic flights from and to outermost regions and for PSO-routes within outermost regions);
- international intra-EEA routes: EU ETS;
- extra-EEA routes from/to countries participating in CORSIA, operated by carriers from the EEA and other CORSIA states: CORSIA;
- extra-EEA routes from/to countries participating in CORSIA, operated by carriers from countries not participating in CORSIA: EU ETS;
- extra-EEA routes from/to countries not participating in CORSIA (except LDC and SIDS): EU ETS (from 2027);
- extra-EEA routes between CORSIA states, except for flight departing or arriving in the EEA: CORSIA.

The following figure summarizes the interplay between EU ETS and CORSIA requirements within the scope of the proposal for the revised directive.

Figure 8: Revised EU ETS for aviation – Geographical scope & CORSIA interplay



Source: Authors' own figure based on our understanding of COM(2021) 552 final

4.2.4. Emission target and allocation and use of allowances

For emissions from routes subject to EU ETS obligations, the total quantity of European Aviation Allowances (EUAA) (the EU ETS emission 'cap' for aviation), currently defined as 95 % of average 2004-2006 emissions, will be subject to an increased linear reduction factor (LRF) of 4.2 % p.a. from 2024, replacing the previous LRF of 2.2 % which has been in operation from 2021 (Article 3c, new Paragraph 5, and Article 9 as to be amended by COM(2021) 551 final, Article 1(10)).

To clean out former allowances of former operators which have ceased operations or, for other reasons, do no longer use their allowances, from 2024, the quantity of allowances to be allocated to aircraft operators will no longer be directly calculated on the basis of the historical 2004-2006 emissions. Instead, the actual total allocation of allowances to active airlines for eligible services in 2023 will be taken as the new basis for the allocation, to which the new LRF of 4.2 % will then be applied. If applicable, allowances for 'new routes' like to the UK, or for international intra-EEA flights from and to outermost regions that were not part of the EU ETS in 2023, will be added to account for this scope extension (Article 3c, new Paragraph 6).

There will be no special reserve from 2024 (deletion of Article 3f), and former allocation rules are no longer valid (deletion of Article 3e).

Furthermore, free allowances will be phased out by an increasing share of auctioning:

- in 2024, 25 % of the quantity of allowances which would have been allocated for free if the directive remained unchanged will be auctioned (amended Article 3d, revised Paragraph 1);
- this share will go up to 100 % by 2027 (amended Article 3d, new Paragraphs 1a, 1b and 1c);

- for this purpose, the new Paragraph 5 of Article 3c requires the Commission to publish ‘the quantity of free allocation which would have taken place in 2024 if the rules for free allocation were not updated’;
- according to our understanding, the free allocation in the years 2024 to 2027 can then be calculated as follows:
 - 2024: $Em_{2023} * (1-LRF) * 0.85 * (1-0.25)$;
 - 2025: $Em_{2023} * (1-2*LRF) * 0.85 * (1-0.5)$;
 - 2026: $Em_{2023} * (1-3*LRF) * 0.85 * (1-0.75)$;
 - 2027: $Em_{2023} * (1-4*LRF) * 0.85 * (1-1) = 0$.

with

Em_{2023} = total allowances allocated to aircraft operators based on individual 2023 shares of verified emissions (Article 3d, Paragraph 1d);

LRF = Linear reduction factor of 4.2 %.

EUAAs can now also be sold to, and surrendered by, stationary sources (Article 6(2), revised point (e)).

4.2.5. MRV and compliance period

There are no amendments to the MRV system for the EU ETS for aviation as [COM\(2021\) 552 final](#) does not contain any changes to Articles 14 or 15. The compliance cycle also remains unchanged.

4.2.6. Use of revenues

ETS auctioning revenues ‘that are not attributed to the Union budget’ should be used for climate-related purposes (Proposal for a Directive, 2021, Article 10). A detailed proposal on this issue will be published by the Commission at a later point in time. However, Article 10 already indicates a stronger recommendation that Member States use ETS auctioning revenues to tackle climate change and that the share of those revenues not attributed to the Union budget should be used for climate-related purposes.

4.2.7. Other policy measures of the Fit for 55 package

ReFuelEU Aviation

The ReFuelEU Aviation Proposal for a Regulation of the European Parliament and the Council on ensuring a level playing field for sustainable air transport proposal ([COM\(2021\) 561 final](#)) includes an increasing rate of mandatory sustainable alternative fuel (SAF) usage, starting at 2 % in 2025 and reaching 5 % from 2030, 20 % from 2035, 32 % from 2040, 38 % from 2045 and 63 % from 2050.

A sub-quota of e-fuels (‘synthetic fuels’) starts at 0.7 % in 2030 and goes up to 5 % from 2035, 8 % from 2040, 11 % from 2045 and 28 % from 2050. The blending mandate will not be limited to intra-EEA flights but for all fuel uplifted in EEA countries, also including non-EEA airlines.

To limit evasion through tankering strategies, the proposal further requires all aircraft operators to refuel mandatorily at all Union airports for the next flight as the recital 21 reads: ‘This Regulation should therefore require aircraft operators to refuel prior to departure from a given Union airport.’ This requirement shall be enforced on an annual basis, with 90 % of the fuel required at each Union airport having to be uplifted at that particular airport.

Energy Tax Directive

The Proposal for a Council Directive restructuring the Union framework for the taxation of energy products and electricity ([COM\(2021\) 563 final](#)) includes provisions for an introduction of taxation on fuel and electricity consumed on flights within the EEA.

A step-wise introduction over ten years is envisaged, starting on 1st January, 2023 with a rate of zero, increasing each year by one tenth of the full rate of EUR 10.75 per GJ which will be reached on 1st January, 2033.

The proposed tax level of EUR 10.75 per GJ translates into EUR-cents 46 per kg or EUR-cents 37 per litre, under the assumptions of an energy density of 42.8 MJ/kg (lower limit for the net heat of combustion according to fuel standard ASTM D1655) and a fuel density of 0.8075 kg per litre (as average of the lower and upper density limits according to fuel standard ASTM D1655).

There will be a minimum rate of taxation of zero for SAF and electricity from renewable sources over the 10-year period. Another key exemption are cargo-only flights (mainly conducted by the integrators DHL, FedEx and UPS) within the EEA, unless one or more Member States agree on the application of taxes.

Member States are free to apply minimum tax rates also on extra-EU flights, when international agreements permit.

5. POTENTIAL IMPLEMENTATION PROBLEMS

KEY FINDINGS

Maritime shipping

- EU ETS, as a regional measure, has advantages and disadvantages. A major implementation issue could be that some stakeholder challenge the inclusion of extra-EEA voyages.
- An open EU ETS might make it difficult to integrate the sector in a global GHG reduction measure at a later stage.
- If the emissions scope is limited to Tank-to-Propeller CO₂ emissions, then a relatively high incentive to use fossil LNG will be given; the scope then also deviates from the FuelEU Maritime scope.
- Enforcement could be a challenge given that ships change companies on a regular basis.
- Certain elements suggest that the proposed enforcement is not entirely flag neutral.
- Political acceptability might be lower if it is unclear whether the sector can profit from revenues and if only projects in MSs are eligible for funding.
- The compliance cycle is not in line with that of the EU MRV system.
- To avoid implementation issues and to ensure alignment with EU MRV, some aspects need to be further clarified/be defined unambiguously.

Aviation

- The EU ETS for aviation is well-established and will not be substantially modified. As the responsible entities (aircraft operators – meeting the polluter pays principle), the responsible administrative bodies (Member States) and the MRV system will remain unchanged, there are hardly any formal or administrative challenges associated with the proposed amendments.
- The EU ETS for aviation will remain limited to carbon emissions. The decision not to include any non-CO₂ effects means that a significant share of the climate relevant emissions of aviation will remain unregulated.
- The EU has not fully aligned the aircraft types and activities subject to the EU ETS with those subject to CORSIA. CORSIA does not exempt training, checking or test flights, for example, while the EU ETS does not exempt rotorcraft. It is also unclear whether the proposal actually exempts rotorcraft from offsetting obligations.
- Regarding the interplay between the EU ETS and CORSIA, it is unclear if, from 2027, EU ETS obligations will also be introduced on routes to countries which are exempt from CORSIA. Also, the wording in paragraphs 4-6 of Article 25a seems misleading as it could imply that carriers are exempt from offsetting obligations while they would actually be obliged to surrender ETS allowances. Finally, the proposal does not explain how third countries will be formally informed about the fact that intra-EEA flights will be subject to the EU ETS so that third countries can exempt 'their' carriers from CORSIA obligations on such routes.
- The use of revenues (for 'climate-related purposes') is relatively vague and non-binding. It is also unclear whether SAF will be considered as zero-emission in the EU ETS.

5.1. Methodology

Our assessment of potential implementation problems (this Chapter 5) and socio-economic impacts (Chapter 6) is based on literature research, a stakeholder survey in the course of this project, and own analyses.

The following table provides an – anonymized – overview of the stakeholders from whom we have received oral or written feedback.

Table 9: Stakeholder input

Sector	Maritime shipping	Aviation
Input received from...	<ul style="list-style-type: none"> • four shipping companies • three shipowner associations • two national emission trading authorities • one classification society • four authorities reflecting MS/flag State/Port State Control perspective 	<ul style="list-style-type: none"> • one low cost airline • one leisure airline • two airports • one airline and airport lobby group • one airport lobby group

5.2. Maritime shipping

5.2.1. EU ETS as a regional measure

The EU ETS as a regional measure has advantages and disadvantages.

Certain stakeholders consider the following aspects as an advantage of the inclusion of maritime shipping into the EU ETS:

- Compared to a global MBM at IMO level, the EU ETS as a regional measure can be implemented more quickly.
- A good functioning regional measure can serve as a blueprint for other regional measures or a global measure.
- Ships sailing on routes within the scope of the EU ETS can be expected to improve their carbon-/energy-intensity relatively quickly compared to ships that operate solely outside the EU ETS scope. This can give ships comparative advantages and can also have a positive economic effect on sectors in the value chain of the different options to reduce shipping emissions.

On the other hand, the following aspects are considered disadvantages of the EU ETS as a regional measure:

- A regional measure has inherent limitations to its effectiveness due to possibilities to evade the system. More efficient ships might for example be used within and less efficient ships outside the scope of the system, with global emissions being less reduced than anticipated. Or ships may try to evade the system by calling at ports just outside the system also leading to negative economic effects for EEA ports.
- Incoherence with other measures, for example other potential regional measures, can lead to high administrative costs.

- A regional measure may have a negative impact on the international efforts to establish a global MBM.
- Smaller EU Member States might be put at risk of diplomatic repercussions from enforcing the rules to shipping companies registered in much larger non-EEA states.
- Inclusion of maritime shipping into the EU ETS will increase transport costs for European commodities exported from the EU region, which could lead to a deterioration of cost-competitiveness (Government of Japan, 2021).

Some fundamental objections to the EU ETS as a regional system have been raised by the Government of Japan (2021):

- It would not be possible to allocate GHG emissions from ships to countries in a fair and transparent manner.
- In the Kyoto Protocol it would have been stipulated that the GHG emissions reduction from international shipping should be pursued through the IMO.
- Application of EU ETS to emissions from non-EU flagged ships in waters outside the territorial seas of EU member states might deviate from UNCLOS provisions.

5.2.2. Timing

Some stakeholders consider the proposed timing for the inclusion of maritime shipping into the EU ETS as very ambitious, considering the time required for the negotiations, for the elaboration of the various delegated and implementing regulations, for the amendments of the national legislations and for the establishment of the required national administrations.

5.2.3. Responsible entity in the sector

According to the impact assessment, the European Commission has considered two alternative options for the sector's responsible entity under the EU ETS Directive:

- the company; and
- the ship commercial operator, defined as the entity, which has assumed the responsibility for the commercial operation of a ship and which is responsible for paying the fuel consumed.

In the EU ETS amendment proposal, the first option, i.e. the company has been put forward as the responsible entity. The proposed specific definition of the company is thereby in line with the definition as presented in the European Commission's 2019 proposal for a Regulation amending the EU MRV Regulation ([COM\(2019\) 38 final](#)): 'company' means the shipowner or any other organisation or person such as the manager or the bareboat charterer, which has assumed the responsibility for the operation of the ship from the shipowner and has agreed to take over all the duties and responsibilities imposed by Regulation (EC) No 336/2006 of the European Parliament and of the Council' which are the SOLAS Regulation responsibilities of the International Management Code for the Safe Operation of Ships and for Pollution Prevention ('ISM Code').'

Working with the company as responsible entity has the following advantages compared to working with the ship commercial operator as responsible entity (see also Section 17.2 of the Commission's impact assessment for a discussion of the two options):

- The responsible entity would be **in line with the responsible entity of other relevant regulations** for maritime shipping such as the EU MRV Regulation, the FuelEU Maritime Initiative, the IMO Data Collection System and the ISM Code.
- **Consistency with the ISM Code** would allow to work with the [IMO Unique Company and Registered Owner Identification Number Scheme](#).
- In case of time charters, the ship owner/manager would be the responsible entity and not the charterer, therefore significantly reducing the **number of responsible entities** and the related administrative costs (see Table 10 for an overview).

Table 10: Responsible entity depending on charter party and EU ETS design option

	Time charter	Voyage charter	Bareboat charter
Company (as defined in proposal)	Owner/manager responsible	Owner/manager responsible	Charterer responsible
Ship commercial operator (as defined in IA)	Charterer responsible	Owner/manager responsible	Charterer responsible

Source: Authors' own table

- In case of time charters, the charterer pays the ship's fuel bill and has an incentive to improve the energy efficiency of a ship, while the ship owner is able to implement technical energy efficiency measures, but does not profit from an according lower fuel bill. This is known as the **split incentive problem**, preventing investments into energy efficiency measures. If the responsible entity was the company, then this split incentive problem could be **diminished**. This is however only the case if the company is not able to fully pass the allowance costs on to the charterer. As Table 11 shows, in all other cases (voyage charter, bareboat charter, ship owner operator), there is no difference between the two options when it comes to the split incentive problem.

Table 11: Validity of split incentive problem and polluter pays principle, depending on responsible entity and distribution of responsibilities/charter party

		Time charter	Voyage charter	Bareboat charter	Ship owner operator
Company (as defined in proposal)	Split incentive problem	Might be diminished	Undiminished	Might be diminished	Does not apply
	Polluter pays principle	Only applies if carbon costs are passed through	Only applies if carbon costs are passed through	Applies	Applies

		Time charter	Voyage charter	Bareboat charter	Ship owner operator
Ship commercial operator (as defined in IA)	Split incentive problem	Undiminished	Undiminished	Might be diminished	Does not apply
	Polluter pays principle	Applies	Only applies if carbon costs are passed through	Applies	Applies

Source: Authors' own table

- If the company was the responsible entity, Port State Control (PSC) would be able to take full action at ship level in case of time charters, whereas **enforcement** options might be restricted if the legal entity was the ship commercial operator (charterer): If there was a change of charterer, the current charterer can probably not be held accountable by PSC if a the previous charterer was not compliant.

Note in this context that attention should be given to the consistency between the EU ETS Directive and the EU MRV Regulation for the case that the company changes during the compliance period. The current EU MRV Regulation would not be consistent with the proposed EU ETS Directive in this regard, whereas the European Commission's proposal for a revision of the EU MRV Regulation ([COM\(2019\) 38 final](#)) would. In the latter it says:

'Where there is a change of company, the **previous company** shall submit to the Commission and to the authorities of the flag State concerned, as close as practical to the day of the completion of the change and no later than three months thereafter, a report covering the same elements as the emissions report but **limited to the period corresponding to the activities carried out under its responsibility**' (see Article 11(2)).

Whereas in the current EU MRV Regulation, Article 11(2) states: 'Where there is a change of company, the **new company** shall ensure that each ship under its responsibility complies with the requirements of this Regulation in relation to the **entire reporting period** during which it takes responsibility for the ship concerned.'

Working with the company as responsible entity is also associated with some disadvantages.

- If the company is the responsible entity, the company and not a single ship of the company is compliant or in breach. This would also mean that, should an expulsion order be issued, Port State Control could/would have to refuse all ships of the company entry into port. This might actually also be considered an advantage from an enforcement point of view.
- If the company is the responsible entity, the company has the obligation to surrender a number of allowances equal to its total emissions during the preceding calendar year. This means in practice that the company has to open an account at the Union Registry and has to ensure that sufficient allowances are deposited. If the number of allowances deposited is not sufficient, the company is the entity that will have to pay the excess emissions penalty. In case of time or voyage charters, the company will therefore probably purchase the allowances itself and will want to pass the costs onto the charterer. To ensure that the charterer and not the company is carrying the costs associated with the purchase of allowances, charter parties would have to be adjusted accordingly. For voyage charters, the fixed charter fee/the charter rate per tonne

could be increased or a new clause would have to be added to the charter parties. This would, however, also be required if the ship commercial operator would be the responsible entity since for voyage charters, the company is the ship commercial operator. For time charters, the charterer generally directly pays for the fuel costs as part of the voyage costs. If the costs for the allowances are defined as part of the voyage costs, not the ship owner but the charterer would bear the costs for the allowances.

- In case of time charters, the ‘polluter pays principle’ would only be implemented if the company can fully pass the costs for the allowances on to the charterer. If the principle is implemented, the charterer would have a higher incentive to select a relative carbon/energy efficient ship or to take operational measures (e.g. reduce speed). If it is not implemented, the split incentive problem would be diminished as described above.
- Some companies fear that they might not be able to fully pass on the costs for the allowances on to the charterer (see for example ICS (2021)). They therefore prefer that the (time) charterer is the responsible entity who has the obligation to surrender the allowances. As mentioned above, this could however lead to a high number of responsible entities and enforcement issues.

Note in this context that time/voyage charter contracts are used to varying degrees in the different fleet segments. In the cruise sector for example, ship owners are predominantly also the operator of the vessels and if time charter contracts are concluded then these are long term charter contracts, while for tramp shipping (short term) charter contracts play a crucial role.

5.2.4. Scope

Emissions scope

Regarding the emissions, the EU ETS proposal covers the TTP CO₂ emissions of maritime shipping.

Alternative bunker fuels like hydrogen and ammonia do not lead to any TTP CO₂ emissions, independent of the source of hydrogen used for their production (like coal or water electrolysis). And green, renewable hydrocarbons or alcohols are associated with the same TTP CO₂ emissions as their fossil equivalents, whereas the CO₂ used for the production of the green, renewable hydrocarbons is recycled after being captured at either a (biogenic) point source or directly from the air.

Keeping the WTT emissions of the bunker fuels outside the scope of the EU ETS would therefore mean that the use of green, renewable alternative bunker fuels like hydrogen, ammonia, hydrocarbons or alcohols would be associated with the same in-scope emissions as their fossil equivalents. And since the fossil equivalents can be expected to be much cheaper, the EU ETS would not incentivize the use of green, renewable alternative bunker fuels unless the emission factors used to derive the ships’ CO₂ emissions account for this fact. Otherwise only the use of fossil fuels that are associated with relatively low TTP CO₂ emissions, like LNG, would probably be incentivized.

In the current proposal, no specific emission factors have been proposed to this end, but it has been proposed to add a subparagraph to Article 14(1) which would then read:

‘The Commission shall adopt implementing acts concerning the detailed arrangements for the monitoring and reporting of emissions and, where relevant, activity data, from the activities listed in Annex I, ...’.

‘Those implementing acts shall apply the sustainability and greenhouse gas emission saving criteria for the use of biomass established by [Directive \(EU\) 2018/2001](#) of the European Parliament and of the

Council, with any necessary adjustments for application under this Directive, for this biomass to be zero-rated. They shall specify how to account for storage of emissions from a mix of zero-rated sources and sources that are not zero-rated. They shall also specify how to account for emissions from renewable fuels of non-biological origin and recycled carbon fuels, ensuring that these emissions are accounted for and that double counting is avoided.'

Restricting the emissions scope to CO₂ emissions leads to a relatively high incentive to use LNG. If the methane emissions/slip associated with the use of LNG is not accounted for, the TTP CO₂ emissions reduction associated with the use of LNG compared to conventional fossil bunker fuel amounts to around 25 %. If methane emissions/slip is accounted for however, the GHG emission reduction by using LNG can, depending on the engine used, be significantly lower. Some studies come to the conclusion that under certain circumstances, GHG emissions might even rise.

Restricting the emissions scope to CO₂ emissions also leads to an inconsistency with the emissions scope as proposed for the FuelEU Maritime Initiative and thus to deviating incentives.

Ships and their activities covered

Ambiguous definition

The ships that have been proposed to be included in the EU ETS are clearly defined, however, the activities of these ships to be covered by the EU ETS are not.

For the maritime shipping activities to be included, the proposal refers to the EU MRV Regulation, however the EU MRV Regulation does not define 'activities', it rather specifies the relevant CO₂ emission sources and defines the voyages that fall within the scope and delimits voyages by means of port calls. And to be consistent with the EU MRV Regulation, not all maritime shipping activities of ships performing voyages with the purpose of transporting passengers or cargo for commercial purposes, but only the maritime shipping activities of ships when performing these voyages, should be covered by the EU ETS Directive.

5 000 GT threshold

According to the proposal, ships of 5 000 GT and below fall outside the scope of the EU ETS. This is in line with the ship size scope of the EU MRV Regulation.

According to the European Commission's impact assessment (part 1/4), due to this threshold, around 55 % of all ships calling at EEA ports and 90 % of all CO₂ emissions of these ships would be covered and at the same time around 95 % of the SMEs would be excluded.

This means that the administrative costs for public entities can be reduced significantly, without significantly compromising the environmental effectiveness of the measure.

And the exempted SMEs do not have to comply with a system in which they have disadvantages compared to larger companies in terms of:

- fleet optimization options;
- access to capital for financing emission reduction options;
- administrative costs;
- man power that can be devoted to the compliance with the system;
- experience with trading.

Applying the 5 000 GT size threshold however also has some drawbacks:

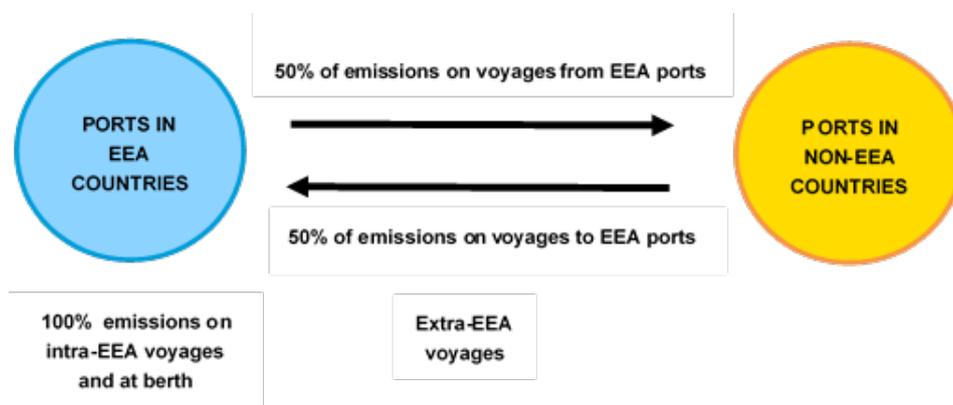
- not all SMEs and also not the ships above 5 000 GT calling only seldom at an EEA port would be exempted and the proposal does not provide an alternative compliance option for these companies/ships.
- It can lead to market distortions by:
 - incentivizing usage and build of ships (just) below the threshold;
 - potentially giving ships within the scope, in contrast to ships outside the scope, the opportunity to profit from funds stemming from EU ETS revenues should they want to reduce their GHG emissions.

Geographical scope

Ambiguous, potentially inconsistent definition

Our understanding of the geographical scope as proposed by the European Commission is illustrated in Figure 9.

Figure 9: Illustration of proposed geographical scope



Source: Authors' own illustration

However, the proposed definition of the geographical scope is ambiguous. The definition should refer to emissions released during specific voyages and not only to emissions of ships performing specific voyages.

To give an example 'fifty percent (50 %) of the emissions from ships performing voyages departing from a port under the jurisdiction of a Member State and arriving at a port outside the jurisdiction of a Member State' could be interpreted as 50 % of the total emissions of ships performing voyages departing from a port under the jurisdiction of a Member State and arriving at a port outside the jurisdiction of a Member State, independent of where these ships have released the emissions.

The EU MRV Regulation is clearer in this respect by defining its scope as follows (see Article 2): 'This Regulation applies to ships above 5 000 gross tonnage in respect of CO₂ emissions released during their voyages from their last port of call to a port of call under the jurisdiction of a Member State and from a port of call under the jurisdiction of a Member State to their next port of call, as well as within ports of call under the jurisdiction of a Member State.'

In order to avoid an inconsistency with the geographical scope of the EU MRV Regulation, a 'voyage' should, under the EU ETS Directive, also be delimited by a 'port call' and the definition of a port call should be in line with that of the EU MRV Regulation.

Extra-EEA voyages

With regards to the extra-EEA voyages of ships, the European Commission proposes to cover 50 % of the emissions from ingoing and outgoing voyages. Doing so, three potential implementation issues are avoided. First, by treating in- and outgoing extra-EEA voyages the same, the probability of the measure being considered a protectionist measure is reduced, because import and export are covered identically. Second, should other regional measures be developed that also cover emissions from maritime shipping, these could cover the other 50 % of the emissions on the extra-EEA voyages and also raise the revenues related to these emissions. And third, if 100 % of a voyage would be covered, this could be considered as EU ruling into other countries' jurisdictions, as it was argued with respect to the full scope of the aviation ETS. For this reason, some stakeholders also find the inclusion of 50 % of extra-EEA voyages not acceptable, while others decline it due to potential economic disadvantages. One stakeholder suggested to start with an intra-EEA scope and to only add extra-EEA voyages if the development of a global MBM progressed too slowly.

Remote areas

EEA Member States' overseas territories might heavily rely on ship transportation and geographic remoteness might lead to relatively high additional costs. Some stakeholders therefore stress that the impacts on remote areas should be carefully analysed.

5.2.5. Emissions allowances

Price volatility

In an emissions trading system, the allowance price is endogenous and fluctuates over time. This makes it difficult for companies to anticipate the actual compliance costs.

Stakeholders stated that they see the **risk of very high allowance prices and high price fluctuations**. SMEs might find it more difficult to manage the fluctuations in contrast to larger companies which, for example, are used to work with hedging mechanisms to insure themselves against price fluctuations on the bunker fuel market.

'Measures in the event of excessive price fluctuations' are however part of the current EU ETS Directive (see Article 29a). This allows the European Commission to adopt measures, if, for more than six consecutive months, the allowance price is more than three times the average price of allowances during the two preceding years on the European carbon market and if this price evolution does not correspond to changing market fundamentals.

There are also [admission requirements](#) to be able to trade at the auctioning platform for the allowances.

According to ICS, the price volatility would also make it difficult to pass on the costs for the allowances onto the company that pays for the fuel (ICS, 2021) which is, as discussed above (Paragraph 5.2.3), a relevant aspect in case of time charters and for the case that, as proposed, the company is the responsible entity.

Free allocation

Some stakeholders stated that, should the sector not receive any **allowances free of charge**, this would **restrict the sector's means to invest in GHG reduction measures**. Other stakeholders considered it **unfair** should shipping **not receive any free allowances while other sectors do** and pointed out that, in terms of free allocation, **other sectors** had a much **longer transition period** before they had to buy all/a substantial share of their allowances. Also the negative impact of the COVID-19 pandemic on some fleet segments, like the Cruise segment, would call for a longer transition period. Free allocation of emission allowances could reduce the potential socio-economic impacts stemming from port evasion (see Paragraph 6.1.2). Funds to potentially stimulate the development and uptake of emission reduction measures for the sector would then however not be generated.

Open system

The proposal is to integrate maritime shipping into an **open EU ETS**, i.e. that there are no sector specific allowances and that each sector can use any of the allowance to fulfil its EU ETS obligation. Advantage of such an open system is that the total emissions of the sectors included in the system can be reduced cost effectively, i.e. against the lowest reduction costs. On the other hand, full integration of the maritime shipping sector in the EU ETS might lead to limited in-sector emission reductions, at least in the short run, and might make it more difficult to integrate the sector into a potential global measure.

5.2.6. Emissions target

Starting point in the Commission proposal are 90 Mt of CO₂ emissions that are assumed to have been emitted by maritime shipping within the EU ETS scope in 2018. Applying the proposed annual linear reduction factor of 4.2 % then gives 79 Mt for 2021, reflecting the amount of allowances that has been proposed to be added to the system due to the inclusion of maritime shipping.

According to the latest THETIS EU MRV data (mid-August 2021), the historical CO₂ emissions within the proposed scope of the EU ETS have been as follows (see Table 12).

Table 12: Historical CO₂ emissions within the proposed scope of the EU ETS

	Historical CO₂ emissions within the proposed scope of the EU ETS
2018	100 Mt
2019	104 Mt
2020	83 Mt

Source: Authors' own table; based on the THETIS MRV emissions reports

The proposed amount of allowances to be added to the system is lower. We suppose that this reflects a correction for Brexit, but this is not stated explicitly in the revision proposal.

Regarding the application of the annual linear reduction factor to the additional allowances added to the system due to the inclusion of the sector to the EU ETS, there seems to be an inconsistency. In the explanatory memorandum as part of the proposal (see page 19) it is explained that '...from the year

following entry into force of this Directive, the cap is to be increased by an amount of allowances corresponding to the maritime transport emissions to be included in the EU ETS and derived from data from the EU Maritime transport MRV system for the years 2018 and 2019, adjusted, from year 2021, by the linear reduction factor.²⁶ According to the proposed Article 9 of the Directive, however, a fixed amount of 79 million allowances would be added to the system in the year following entry into force of the Directive and the linear reduction factor would be applied to these 79 million allowances in the second year following entry into force of the Directive.

5.2.7. Monitoring reporting verification

The proposed scope of the EU ETS Directive is in line with the scope of the EU MRV Regulation and mainly builds on the Regulation. This helps to reduce the additional administrative costs related to the EU ETS. At the same time, the MRV tasks related to the different Fit for 55 measures that will apply to maritime shipping should be streamlined to avoid any unnecessary administrative costs (e.g. monitoring plans for EU MRV and FuelEU Maritime).

Since the EU ETS Directive mainly builds on the EU MRV Regulation, the effectiveness of the measure highly depends on the effectiveness of the EU MRV system which should be checked carefully. The European Commission is currently evaluating the implementation of the EU MRV Regulation and the outcome of this evaluation should be considered in this context. Stakeholders consulted in this project recommended for example to make additional funds available for the improvement (of e.g. the user friendliness) of the THETIS MRV system that the companies have to use to submit their EU MRV emissions reports. And also extra functionalities would be required since companies would now also have to submit their monitoring plans by means of automated systems. Some stakeholders questioned the independence of the classification societies as verifier, given the societies high dependency on the shipping companies as paying customers.

Regarding the additional approval of the monitoring plans by the administering authority, stakeholders assess this differently. While some find this additional third party check very useful, others doubt the added value. Independent thereof, the procedure in case an administering authority refuses to approve a verified monitoring plan should be clear to avoid unnecessary conflicts.

The administering authority is also proposed to control whether the aggregated emissions data at shipping company level submitted by a shipping company have been verified correctly. Here the question arises whether this task goes beyond the task of the National Accreditation Body that should also safeguard the quality of the verification and whether the administering authority would have access and should consider ship specific data to allow for a meaningful control of the verification.

As presented above (4.1.6), many MRV-aspects will be determined at a later stage by means of delegated acts. While this allows the Commission to take more time to work out specific details, this also means that the Member States will have less influence on the elaboration of these details. The European Sustainable Shipping Forum has been established by the Commission to allow Member States and other stakeholders to provide their views in this respect.

5.2.8. Compliance period/cycle

Under the current EU MRV Regulation, companies are required to submit the emissions report to the Commission and to the authorities of the flag State concerned by 30 April of each year. This means that, as illustrated by Table 13, the compliance period/cycle of the EU MRV Regulation and the

²⁶ If the 79 Mt represent the emissions in 2021, then applying the annual linear reduction factor of 4.2 % would result in 73 Mt in 2023.

EU ETS Directive do not connect well with each other: companies are obliged to submit the verified aggregated emissions data at company level before they have to submit their emissions reports on which the former builds on.

Table 13: Timing of the companies EU MRV and EU ETS obligations

	EU MRV obligation	EU ETS obligation
31 March, but not earlier than by 28 February		Submission of verified aggregated emissions data at company level
30 April	Submission of emissions report to Commission and authorities of flag State	Surrendering of number of allowances equal to verified total emissions of preceding calendar year

Source: Authors' own table

5.2.9. Enforcement

The effectiveness of the EU ETS highly depends on the effectiveness of the enforcement of the system. For the enforcement to be effective, the responsibilities must clearly be distributed, the responsible authorities must know the companies and according ships that are in breach, the consequences in case of non-compliance must be proportionate, but at the same time incentive enough to adhere to the rules and the consequences must also be actionable.

The proposal clearly defines the responsibilities and by the obligation of the Member States to publish a list of companies that have been non-compliant, responsible authorities in all Member States know the non-compliant companies.

However, to allow the competent authority of a Member State of the port of entry to issue an expulsion order, Member States will also have to know the **ships that fell under the responsibility of a non-compliant company in the period in which the company was non-compliant**, unless it is legally possible to issue an expulsion order for the company's ships at the time of enforcement. If the latter is not possible, then also the problem arises that **companies might have changed in the meantime** and that a new responsible company may be confronted with an expulsion order without being non-compliant.

In case an expulsion order has been issued, Article 11a also proposes: 'Where the ship flies the flag of a Member State, the Member State concerned shall, after giving the opportunity to the company concerned to submit its observations, order the ship to be detained until the shipping company fulfils its obligations.' This actually means that **ships flying a Member State flag could be detained while ships flying a non-Member State flag not**. Then the question arises whether the measure deviates from the **principle of flag neutrality**.

Some stakeholders propose to work with instalments that ships would have to pay each time they call at an EEA port in order to avoid later enforcement issues. These would however not be based on verified emissions, might not reflect the actual carbon costs and would require the ship or the ship's commercial operator to be the responsible entity (see Paragraph 5.2.3 for a discussion on the responsible entity).

5.2.10. Use of revenues

According to the European Commission's proposal, '[t]he Innovation Fund may also support breakthrough innovative technologies and infrastructure to decarbonise the maritime sector and for the production of low- and zero-carbon fuels in aviation, rail and road transport.' And Member States could use (parts) of their revenues from the auctioning of the allowances for the development and uptake of GHG reduction measure for the maritime shipping sector.

This means that the sector might profit from the revenues, but since no specific share of the revenues has been specified to be used in the sector, the **funds that could be used to facilitate the development and use of GHG reduction measures for the sector are rather uncertain** at this stage. To decarbonise, the sector will be required to use alternative fuels. The development of according value chains will, however, be capital intensive and the production and distribution, and thus also the deployment of the fuels, will be associated with significantly higher costs for the sector. This, together with the fact that third countries would contribute to the revenues, but would probably not be able to directly profit from the revenue, reduces the political acceptability of the measure in the sector. In the cited statement above, which specifies the potential use of the funds for the transport sectors, the support for the production of low- and zero-carbon fuels should not be restricted to aviation, rail and road transport, but should explicitly consider the maritime shipping sector too.

One aspect that needs clarification is the **allocation of the allowances to the Member States**. Companies are proposed to be attributed to administering authorities, based on the Member States where the companies are registered and, if not registered in a Member State, based on the number of port calls of the companies' ships in a certain period. The share of the allowances that a Member State receives could then be based on the share of the shipping emissions of the companies that have been attributed to the Member State's administering authority. The according allocation mode has however not been specified yet.

5.3. Aviation

5.3.1. Timing, responsible entity & administrative issues

The EU ETS for aviation is a well-established system which has already been in operation since 2012 and which will only be modified in detail. As the responsible entities (aircraft operators – hence meeting the polluter pays principle), the responsible administrative bodies (Member States) and the MRV system will remain unchanged, there are hardly any formal or administrative challenges associated with the proposed amendments.

5.3.2. Scope

Emissions scope

The EU ETS for aviation will remain limited to carbon emissions. From an environmental perspective, the decision not to include any non-CO₂ effects will mean that a significant share of the climate relevant emissions of aviation will remain unregulated.

The important role of such non-CO₂ effects, which are of special importance in long haul air traffic to extra-EEA states at higher altitudes, is acknowledged in the Explanatory Memorandum of the Commission proposal without proposing any specific policy measure to tackle such effects ([COM\(2021\) 552 final](#), page 2).

Without addressing non-CO₂ effect, climate neutrality of aviation cannot be achieved. It is thus a major flaw that the proposal does not contain any binding action with respect to addressing these effects.

From the viewpoint of some stakeholders, there is a lack of clarification if SAF will be considered as zero emission in the EU ETS.

Aircraft types and activities covered

We do not see any implementation issues as [COM\(2021\) 552 final](#) does not provide any amendments for the column 'activities' for the entry 'aviation' of Annex 1 of 2003/87/EC, meaning that the key activities and aircraft classes exempted from the scheme remain unchanged.

However, the EU has not fully aligned the aircraft types and activities subject to the EU ETS with those subject to CORSIA (which have been added to Annex 1). E.g., CORSIA does not exempt, e.g. training, checking or testing flights, while the EU ETS does not exempt rotorcraft. It is also unclear if the proposal actually exempts rotorcraft from offsetting obligations.

Geographical scope

As explained above, while the EU ETS will go back to its original full scope on paper, emissions from most extra-EEA (+CH/UK) flights will become subject to CORSIA offsetting, except for some extra-EEA routes where the EU ETS will become effective (flights to most non-CORSIA states, if any, from 2027 and flights to CORSIA states by carriers from non-CORSIA states). Effectively, this means that the Commission plans to maintain almost the same geographical scope as before, which means that the group of aircraft operators affected by the ETS will not change considerably.

The use of the term 'units' in paragraphs 4-6 of Article 25a seems misleading as it could imply that carriers are exempt from offsetting obligations while they would actually be obliged to surrender ETS allowances. Hence, we understand 'units' as 'credits and/or allowances'. Also, it is – from our perspective – unclear if Article 25a(5) implies that, from 2027, EU ETS obligations will also be introduced on routes to countries which are exempt from CORSIA as they are LDCs, SIDS or countries whose RTK share is below 0.5 %.

Regarding the interplay between the EU ETS and CORSIA, it is also unclear how the EC will (formally) inform third countries about the fact that intra-EEA flights will be subject to the EU ETS so that third countries can exempt their carriers from CORSIA obligations on such routes. And from a legal perspective, which is beyond the scope of this report, it may be questionable if the EU (which is not an ICAO member, but an ICAO observer) has the legal right to replace CORSIA with the EU ETS on international intra-EEA flights, especially with regard to emissions from non-EEA carriers which may operate, e.g., 5th freedom services within the EEA.

The stakeholders we spoke to generally supported the co-existence of ETS and CORSIA, but criticized intra-EEA 'double-taxation' e.g. caused by the combination of kerosene taxes, blending quotas and the ETS.

5.3.3. Emissions target, allocation and use of allowances

Formally, neither the application of a larger linear reduction factor nor the phase-out of free allowances can be regarded as critical.

However, the described tightening of the isolated (regional) EU ETS in a global aviation market otherwise regulated by CORSIA will increase the cost gap between intra-EEA operations, on the one hand, and extra-EEA or non-EEA operations, on the other hand, which can result in competitive distortions and carbon leakage as will be explained in the next chapter.

5.3.4. CORSIA integration issues

The proposed notification of aircraft operators that they have zero offsetting obligations for the year 2021 ([COM\(2021\) 567 final](#)) helps minimizing the administrative burden while the major amendments according to COM(2021) 552 final are still on their legislative way.

We cannot identify any provision in the proposal which would exempt rotorcraft from CORSIA requirements, although ICAO Annex 16, Volume IV: Part II, Chapter 2, 2.1 clearly limits the CORSIA scope to aeroplanes.

Paragraph 6 of Article 12 requires each Member State to inform their aircraft operators holding an AOC of that Member State and producing annual CO₂ emissions larger than 10 000 tonnes from the use of aircraft with an MTOM exceeding 5.7 tonnes on flights covered by Annex 1 (other than those within the same Member States) of the level of offsetting requirements. This provision seems misleading as it reads as if domestic flights within non-EU/EEA states would be subject to offsetting which cannot be the case.

5.3.5. Use of auctioning revenues

The use of revenues (EU budget + 'revenues not attributed to the Union budget should be used for climate-related purposes') is relatively vague and non-binding. Stakeholders we spoke to wish a dedicated channelling back of such revenues to the development of emission reduction measures in the sector, e.g. for SAF feedstock development, production and distribution as SAF is apparently the best source for aviation to address the issue of emissions in the short term.

6. POTENTIAL SOCIO-ECONOMIC IMPACTS

KEY FINDINGS

Maritime shipping

- Including maritime shipping in the EU ETS leads to an increase in transportation costs on routes within the scope, especially for Ro-pax, passenger and Ro-ro ships. The additional costs may be borne by various actors in the value chain, depending on their ability to pass them on.
- Competitiveness of extra-EU seaborne exports may deteriorate for specific trades, not necessarily affecting the sector negatively.
- A shift of employment among shipping companies operating in the system scope is conceivable.
- Port evasion and shift of transshipment hubs cannot be ruled out entirely; especially the latter may have a large impact on specific ports and regional communities.

Aviation

- Assuming full auctioning and a future CO₂ price of EUR 120, the ETS cost of intra-EEA passenger air transport could rise from about EUR 1.25 to about EUR 11 per passenger, which would mean a fare increase of some 9 % on average.
- Within the EEA, adverse competitive impacts are likely to remain limited as virtually all intra-EEA routes, by both low cost and network carriers, will fall under the scheme.
- There would be no competitive distortion from the EU ETS on non-stop, extra-EEA flights, such as Barcelona-New York, where the EU ETS will not be applied. The same applies to indirect routings between non-EEA places via the EEA, such as from most locations in Asia via Amsterdam to North America.
- Extra-EEA routings including intra-EEA feeder segments are in turn likely to be the main transport segment in which the competitive position of EEA carriers and hub airports would be adversely affected by a tightened EU ETS. As a result, competitive distortion and carbon leakage stemming from shifts to non-EEA carriers and routings are likely.
- All these effects are likely to lead to lower market shares and employment for EEA-based carriers and EEA tourism destinations, compared to a scenario without any tightening of the EU ETS for aviation. For EU air transport services, the tightening of the EU ETS could result in a potential loss of 10 to 35 thousand jobs out of a total of 633 thousand jobs in 2018.

6.1. Maritime shipping

6.1.1. Economic contribution of the sector

Data on the economic contribution of the EU shipping sector is rather uncertain and varies in the literature, also due to the use of different delimitations of the sector. A broad delimitation of the maritime transport sector also includes upstream and downstream sectors, like the shipbuilding

and equipment industry, ports, etc. Some of this industry, like for example the shipbuilding industry, is only partially located in the EU.²⁷ The EU Blue Economy Report 2020 (European Commission, 2020a) provides an overview of economic key indicators not only for EU maritime transport, but also for EU shipbuilding and repair as well as EU port activities.

Table 14: Economic key indicators for parts of the EU blue economy in 2018

	Maritime Transport	Shipbuilding and repair	Port activities
Gross value added (<i>billion EUR</i>)	35.6	17.3	35.2
Gross profit (<i>billion EUR</i>)	18.8	4.7	14.6
Turnover (<i>billion EUR</i>)	173.2	59.2	91.4
Persons directly employed in sector	407 525	319 315	549 340

Source: European Commission (2020a)

Note: Maritime transport includes passenger transport, freight transport, and services for transport; shipbuilding and repair includes shipbuilding, ship equipment and machinery; port activities include cargo handling, warehousing and storage, construction of water projects and service activities incidental to water transportation (the latter probably also including services to inland navigation).

Since ships operate worldwide, the turnover, gross value added and gross profit of the sea transport/maritime transport sector can be expected to be also depended on ship activities not related to the EU.

EU seaborne exports and imports accounted for 17 and 20 % of the world seaborne exports and imports in 2018 (European Commissions, 2020b). In terms of value, seaborne extra-EU imports and exports accounted for around 55 and 47 % of the total value of extra-EU imports and exports in 2018 ([Eurostat, DS-1262527](#)).

6.1.2. Potential market distortions and level playing field

When maritime shipping is included into the EU ETS, different costs will accrue to the sector: administrative costs, costs for the reduction of emissions, and costs for the purchase of the allowances covering the residual emissions.

The non-administrative costs depend on several factors: the energy efficiency of the ships, the carbon intensity of the energy sources used on board the ships (e.g. carbon intensity of the fuel used), the costs for the emission reduction measures as well as the activity of the ships within the EU ETS scope (e.g. distances covered within the geographical scope). If maritime shipping is included into the EU ETS, relatively carbon/energy efficient ships would have an advantage compared to relatively inefficient ships. This however cannot be considered a market distortion, but rather a correction of an existing market distortion – a market in which, so far, the external costs of GHG emissions have not been accounted for.

²⁷ The majority of ships is currently built in China, Republic of Korea, Japan, and the Philippines.

The inclusion of maritime shipping into the EU ETS can however potentially lead to market distortions within the system:

- Maritime shipping is proposed to be included into the EU ETS in a flag neutral way. That means that, independent of the flag that a ship flies, the same legal requirements hold. This prevents a market distortion between ships.
- As discussed above (see Paragraph 5.2.4), market distortions may accrue due to the ship size threshold as well as between small and large companies.
- To ensure that there is a level playing field between ships in the EU ETS, an effective MRV system as well as effective enforcement, independent of which flag a ship flies, where a company is registered, which verifier a ship selects or where a ship operates, are very important elements. The EU MRV system, especially the verification, should therefore be improved, and attention should be given to potential issues with regards to enforcement as discussed above (see Paragraph 5.2.9).
- Should other modes of transport have a competitive advantage due to no/a less strict environmental regulation within the system, then a shift from shipping to other modes of transport can be considered a market distortion.

Since the EU ETS is a measure that corrects a market distortion on a regional level, the playing field may become uneven since:

- ships might evade EU ports located at the EU external border to avoid/reduce their EU ETS compliance costs;
- transport might shift to other modes that fall under no/less strict environmental regulation;
- an increase of transport costs for commodities exported from (imported to) the EU could lead to a deterioration of the cost-competitiveness of the commodities.

A global measure for shipping would have the advantage that, inherently, it cannot be evaded by a route adjustment and the implementation of other regional measures for shipping might also allow for an alleviation of this distorting effect.

A global measure or other regional measures for shipping could however not prevent a shift to other modes of transport. And if the EU succeeds in implementing measures that internalize the external costs of GHG emissions of all modes of transport that compete with shipping, then the new equilibrium that is established with regards to the commodities imported to the EU by ships cannot be considered a distorted equilibrium.

In the following, the potential market distortions/distortions of the level playing field that have not been discussed as part of the analysis of the potential implementation problems will be discussed in more detail. Before, we discuss the potential impact of the inclusion of maritime shipping on the maritime transport costs and a potential cost pass through and subsequently, other potential regional measures, aiming at reducing the GHG emissions of maritime shipping.

Impact on maritime transport costs and cost pass through

When maritime shipping is included into the EU ETS, the costs for maritime transport will increase and different actors in the value chain might bear the costs, depending on whether the responsible entity is able to pass the costs through:

- the shipowner/charterer might bear the costs and would therefore see a reduced profit;

- the shipper might bear the costs and would therefore see a reduced profit; or
- the consignee/consumer might bear the costs, leading to a lower profit/to a loss in welfare²⁸ or a change in the demand pattern and trade flows.

The possibility for a cost-pass through depends on:

- the contractual agreements between the ship owner and the charterer and the effectiveness thereof;
- the extent of the transportation cost increase;
- the share of the transportation costs in the overall costs of the product's value chain (comparably high for heavy, low-value products);
- whether the demand for the specific product decreases, as:
 - the purchase is waived;
 - the product is substituted with another product;
 - there are other, competing sources of supply of the product that are not/less affected by an EU ETS-related increase of shipping costs.

Potential costs

To give an indication of the potential cost increase due to the inclusion of shipping into the EU ETS, we have determined the total and the average CO₂ emissions that ships emitted in 2019 in the proposed geographical scope of the EU ETS according to the emission reports submitted as part of the EU MRV system.

As Table 15 shows, around 105 Mt CO₂ were emitted in 2019 in the proposed geographical scope of the EU ETS, with four ship types (container ships, Ro-pax ships, oil tanker and bulk carrier) accounting for almost 70 % of the total emissions. The average per ship emissions within the scope range from 2.7 to 43.6 kt CO₂ and are the highest for Ro-pax ships, passenger ships and Ro-ro ships. Ro-pax ships are ships that can carry vehicles and passengers and inherently operate entirely within the scope of the system.

Table 15: Total and average 2019 CO₂ emissions in proposed EU ETS scope per ship type

	Total 2019 CO₂ emissions in proposed EU ETS scope (Mt)	Number of ships	Average 2019 per ship CO₂ emissions in proposed EU ETS scope (kt)
Container ship	29.1	1 845	15.8
Ro-pax ship	17.2	394	43.6
Oil tanker	12.7	2 007	6.3
Bulk carrier	10.0	3 648	2.7

²⁸ The positive impact on climate change will be associated with a welfare gain, leading to a potential positive net effect.

	Total 2019 CO₂ emissions in proposed EU ETS scope (Mt)	Number of ships	Average 2019 per ship CO₂ emissions in proposed EU ETS scope (kt)
Chemical tanker	6.7	1 360	4.9
Passenger ship	6.3	179	35.3
Ro-ro ship	5.4	277	19.4
General cargo ship	4.5	1 239	3.6
LNG carrier	4.5	257	17.5
Vehicle carrier	3.2	434	7.4
Gas carrier	2.0	342	5.8
Container/ro-ro cargo ship	1.2	76	15.3
Other ship types	0.9	142	6.4
Refrigerated cargo carrier	0.9	145	6.2
Combination carrier	0.1	11	6.3
Total	104.6	12 356	

Source: EMSA (2021)

Assuming that the shipping baseline emissions grow as little as presented in the Commissions impact assessment (from 90 Mt in 2018 to 92 Mt in 2030), applying, in line with the impact assessment, a carbon price of 45 EUR/t CO₂, and assuming that the 2030 fleet's activity is just as in 2019, the potential 2030 total carbon costs and average carbon costs per ship type can be roughly estimated (see Table 16).

Table 16: Potential 2030 carbon costs per ship type (EUR 45/ t CO₂; rounded)

	Total carbon costs (million EUR)	Average carbon costs per ship, assuming 2019 per ship CO₂ emissions (thousand EUR)	Average carbon costs per ship, assuming increased per ship CO₂ emissions (thousand EUR)
Container ship	1 340	710	720
Ro-pax ship	790	1 960	2 000

	Total carbon costs (million EUR)	Average carbon costs per ship, assuming 2019 per ship CO₂ emissions (thousand EUR)	Average carbon costs per ship, assuming increased per ship CO₂ emissions (thousand EUR)
Oil tanker	580	280	290
Bulk carrier	460	120	130
Chemical tanker	310	220	230
Passenger ship	290	1 590	1 620
Ro-ro ship	250	870	890
General cargo ship	210	160	170
LNG carrier	210	790	810
Vehicle carrier	150	330	340
Gas carrier	90	260	270
Container/ro-ro cargo ship	50	690	700
Other ship types	40	290	290
Refrigerated cargo carrier	40	280	280
Combination carrier	3	280	290
Total	4 802		

Source: Authors' own table

Under these assumptions, the total potential 2030 carbon costs can roughly be estimated to amount to around EUR 4.80 billion. The average carbon costs per ship range from around EUR 120 thousand for bulk carriers to around EUR 1.96 million for a Ro-pax ship, assuming the 2019 per ship CO₂ emissions and from around EUR 130 thousand for bulk carriers to around EUR 2.0 million for a Ro-pax ship, assuming that the increase of the total emissions can be attributed to higher per ship CO₂ emissions.

This estimation can be considered a conservative estimation since ships might apply emission reduction options that are cheaper than the carbon price, and since the underlying EU MRV data has not been corrected for Brexit, but on the other hand, the carbon price might also be higher in 2030.

According to the European Commission's impact assessment (see Paragraph 6.2.2.1 on page 204 of the assessment), the sector costs would increase by 7 % in 2030, including EUR 3.7 billion ETS payments. And in the long-term all EU ETS policy options are expected to lead to an increase in total costs of approximatively 16-20 % by 2050.

To put these costs into perspective we have calculated (see Table 17) the daily carbon costs, depending on the daily fuel consumption (range of 25 to 125 tonne a day) and the bunker fuel price (USD 300, 400

or 500 per metric tonne) and assuming that the carbon intensity of the fuel used is in line with that of HFO (3.114 tonne CO₂/tonne fuel).

Table 17: Daily fuel and carbon costs, depending on consumption and prices

Fuel consumption per day (tonne)	CO ₂ per day (tonne)	Fuel costs per day (EUR)			Carbon costs per day (EUR)
		USD 300/t	USD 400/t	USD 500/t	100 % of CO ₂ emissions; EUR 45/t CO ₂
25	78	6 450	8 600	10 750	3 500
50	156	12 900	17 200	21 500	7 000
75	234	19 350	25 800	32 250	10 500
100	311	25 800	34 400	43 000	14 000
125	390	32 250	43 000	53 750	17 500

Source: Authors' own table

Assuming again that the carbon price amounts to 45 EUR/tonne CO₂ and also assuming that 100 % of the emissions have to be covered with allowances, the daily fuel costs would rise by 54 %, 41 % or 33 %, depending on the bunker fuel price.

The share of the fuel costs in the overall operational costs of ships differ between ship types, sizes, the age of ships and also depends on the bunker fuel price.

Data on the overall operational costs of ships is hardly publicly available. To nevertheless give an example: For a bulk carrier of 100 000 to 200 000 dwt, assuming to consume around 40 tonnes of fuel a day, the daily carbon costs would amount to almost EUR 5 600 a day which would be more than the ships average other operational costs per day including costs for manning, insurance, stores, spares, lubricating, repair & maintenance, dry docking, management and administration which in 2018 roughly amounted to EUR 4 700 (Drewry, 2018). Assuming a fuel price of 400 USD/metric tonne, the carbon costs would lead to an increase of around 30 % of the daily costs, considering the sum of the fuel costs and the other operational costs as specified above as the total daily baseline costs. Note however that this does not include costs for port calls and the capital costs for the ship and note also that bulk carriers have comparably low daily fuel costs since they, in general, sail at a relatively low speed.

Impact on EU seaborne trade

As already discussed above, if the additional transport costs were passed through to the consignee/consumer, trade flows might be impacted which could have an indirect impact on the shipping sector.

Would the price for EU seaborne imports increase, a shift towards trade flows that are not dependent on seaborne transport or which are transported shorter distances by ships is conceivable. This could mean that the sector receives less orders. And this effect may be amplified by the Carbon Border

Adjustment Mechanism (CBAM).²⁹ which has also been proposed as part of the EU ETS revision, at least, if the carbon intensity of seaborne imports is worse than that of EU products. Note however that the new equilibrium that would be established could not be considered a distorted equilibrium at least if the EU succeeds in implementing measures that internalize the external costs of GHG emissions of all modes of transport that compete with shipping and if the CBAM reflects the GHG emissions of the production of the imported goods correctly.

Would the price for EU seaborne exports increase, a shift towards trade flows that are not dependent on seaborne trade from the EU or which are transported shorter distances by ships within the EU ETS scope is conceivable. This can lead to an uneven playing field, but does not necessarily mean that the sector receives less orders since ships operate worldwide and might then operate on routes that gain at the expense of the routes from the EU.

To quantitatively assess the impact of the inclusion of maritime shipping on EU seaborne imports and exports calculations by means of a transport and trade model are required which is outside the scope of the project. To give an impression of trades that in potential could be affected by the inclusion of shipping into the EU ETS, Table 18 gives an overview of the five types of goods with the highest (monetary) share in the total value of extra-EU seaborne imports and exports in 2019, together accounting for 31 and 26 % of the total value of extra-EU seaborne imports (EUR 1 116 billion) and exports (EUR 921 billion) respectively.

Table 18: Types of goods with highest (monetary) share in the total value of extra-EU seaborne imports and exports in 2019

Extra-EU seaborne imports		Extra-EU seaborne exports	
Type of good	Share in total value	Type of good	Share in total value
Crude oil	17.1 %	Motor cars and other motor vehicles designed for the transport of < 10 persons	11.2 %
Petroleum oils and oils obtained from bituminous minerals (excl. crude)	5.8 %	Petroleum oils and oils obtained from bituminous minerals (excluding crude)	6.9 %
Motor cars and other motor vehicles designed for the transport of < 10 persons	4.2 %	Parts and accessories for specific vehicles	3.4 %
Petroleum gas and other gaseous hydrocarbons	1.9 %	Specific medicaments	3.1 %
Telephone sets	1.5 %	Specific alcohols	1.2 %

Source: Eurostat (DS-1262527), HS2-4-6, 4-digit code classification

²⁹ In [Annex I of the proposal](#), the different imported goods that have been proposed to fall under the Regulation are listed, which are, next to imported electricity, specific goods from the cement, fertiliser, iron & steel and aluminium industry.

And since the potential effect on the trade flows not only depends on the extent of the transportation cost increase, but also on the share of the transportation costs in the overall costs of the product's value chain, we have collected, for the above presented Top 5 of the extra-EU seaborne export trades, data on the transport costs (including insurance costs) share in Free on board (FOB) value on routes to the Top 3 importing countries of these products as provided by UNCTADSTAT for 2016. The transport costs have been estimated as the difference between the CIF (cost, insurance, freight) and FOB value of the goods. The FOB value of cargo reflects the value (costs and profit) of the cargo when loaded on board at the origin port and the CIF value of the cargo reflects the value when loaded off in the port of destination, i.e. including not only the FOB value, but also the maritime transportation costs including insurance costs.

Table 19: 2016 transport cost share in FOB value for the Top 5 extra-EU seaborne export trades on routes to the according Top 3 importing countries

Extra-EU seaborne exports	According Top 3 importing countries	
Type of good	Country	2016 transport cost* share in FOB value for a range of routes to different EU countries (median)
Motor cars and other motor vehicles designed for the transport of < 10 persons (8703)	United States	4.8-5.8 % (5.3 %)
	China	4.8-6.1 % (5.3 %)
	Japan	4.9-5.5 % (5.1 %)
Petroleum oils and oils obtained from bituminous minerals (excluding crude) (2710)	United States	n.a.
	Nigeria	6.0-7.7 % (6.3 %)
	Gibraltar	n.a.
Parts and accessories for specific vehicles (8708)	China	5.0-6.2 % (5.7 %)
	United States	5.0-5.6 % (5.3 %)
	Mexico	4.5-27.6 % (4.6 %)
Specific medicaments (3004)	United States	1.0-3.9 % (1.5 %)
	China	1.5-7.7 % (2.6 %)
	Canada	1.2-10 % (2.0 %)
Specific alcohols (2208)	United States	6.6-7.0 % (6.8 %)
	Singapore	6.9-7.8 % (7.4 %)
	China	6.8-8.8 % (*)

Source: UNCTADSTAT; *only 2 data points available

As Table 19 shows, the median share of the transport costs in the FOB of these trades ranges from 1.5 % to 7.4 % and differs mainly between products, but also between routes. A share of 5 % would mean that, when for example the transport costs would rise by 10 %, the CIF value would increase by 0.48 % or when the transport costs would double, the CIF value would increase by around 4.8 %.

In the impact assessment of the European Commission, impacts on trade are analysed from the perspective of third countries. Only for commodities with low weight to value ratio (i.e. commodities with high weight and low value) trade flows with third countries are expected to be impacted. Table 60 of the IA (European Commission, 2021d, on page 529 of the proposal document) gives an overview of large EU trade partners, the share of EU trades in the total value of the partner's imports and exports as well as an assessment of the value to weight ratio of the main imports and exports on the routes between the EU and these countries, considering all freight transport modes. And according to this overview, only trade flows on two routes are characterized by a medium-high value to weight ratio (exports from China and India to the EU) and only one by a low value to weight ratio (exports from the Russian Federation to the EU). Overall, it is concluded that due to the inclusion of intra-EEA voyages, extra-EEA voyages can be indirectly impacted due to transshipment, this however to a limited extent, and that the 'inclusion of extra-EEA journeys in the scope of the measure would increase the possible impacts on trade flows with third countries in case carbon pricing leads to a substantial increase in international transport costs' (European Commission, 2021d).

Regarding the impact on prices, an analysis of ten relevant commodities for European trade suggests, according to the impact assessment, that the proposed EU ETS would have relatively small impacts on prices, even by 2050. And effects on demand would be very limited, with some of the largest likely potential long-term effects for iron and steel and organic chemicals. Changes of consumer prices would be very limited and not drive significant changes in consumer behaviour. Effects on demand would therefore very limited too, with some of the largest likely potential long-term effects for iron and steel and organic chemicals.

Modal shift

Shipping companies compete with each other and compete with other transport modes for the transportation of goods and passengers. In general, maritime shipping costs are relatively low compared to other transport modes, but the competitive pressure from other transport modes can vary greatly depending on the segment. Maritime transport of oil competes with oil transport via pipelines, however, additional pipeline capacity can be expected to be limited. And maritime transport competes with road freight transport, if at all, on intra-EEA voyages only and also only competes for the transport of goods that can be transported by trucks. For coal, for example, road transport is not an option.

For some ferry or cruise passengers, flying can be an alternative. Regarding cargo, air transport is, due to the higher transportation costs, only an option for relatively high-value products. Grain, for example, is not transported by air. Rail transport can be an alternative for the transportation of cargo, with a gradual expanding long-distance network from Asia to Europe. This allows to reduce transportation time, but the capacity is, compared to shipping, relatively low and infrastructure costs can be expected to be relatively high too.

Due to the inclusion of maritime shipping there may thus be some modal shift from short sea shipping to road transport, however, road transport is also proposed to be included into the 'new ETS' which is why this effect is probably very limited.

The European Commission considers the risk of modal shift under the proposed EU ETS to be non-existent.

Choice of location

When a company is looking for a new production site, a wide range of factors play a role in the selection of the location such as investment security, fiscal regulations, the availability of adequately skilled personnel, etc. The suitability of a site in terms of transportation costs can also play a role, which is why some stakeholders fear that, due to the inclusion of maritime shipping into the EU ETS, companies might prefer a production site outside the scope of the EU ETS. A new refinery might for example be built in a non-EEA country, thereby avoiding a carbon price on the transportation of the crude oil to the refinery and on the transportation of the refinery products to non-EEA countries. This would not have an effect on the shipping sector as such, but rather on EEA ports which depend on incoming crude oil and outgoing refinery products and which then might receive only a relatively small flow of incoming refinery products instead. Whether the inclusion of shipping into the EU ETS will have an impact on choices of location highly depends on the availability of other suitable production sites and also on the anticipated date of the entry into force of a global measure to reduce GHG emissions from maritime shipping.

Port evasion

In order to reduce the EU ETS compliance costs, ships might decide to add an additional, strategic port call just outside the EU ETS scope or, in case of transshipment, might decide to switch to a hub outside the EU.

Adding an extra port call or switching of transshipment hub is associated with additional costs, otherwise the current logistic chain would not have been optimized. Port evasion thus only makes sense if the compliance cost savings outweigh these additional costs. An incentive for evasion increases with the carbon price and the length of the extra-EEA voyage. To include 50 % of the emissions released on extra-EEA voyages is thus associated with a lower risk of evasion than the inclusion of 100 % of these emissions. If only intra-EEA voyages are covered there is inherently no risk of evasion.

And the risk of port evasion is naturally higher if there are suitable ports with sufficient capacity just outside the EU. Especially Mediterranean transshipment ports are feared to lose market to ports in North Africa and North Sea transshipment ports to ports in the UK as a consequence of including maritime shipping into the EU ETS.

Since under the EU MRV Regulation a voyage is defined to begin with a port call, it helps to define a port call in such a way that, if a ship enters a port just for the sake of form, this does not qualify as a port call. The definition of a port in the EU MRV Regulation already takes this into account and this should consistently be applied in the EU ETS too. The risk of switching to another transshipment hub can however not be reduced by this.

T&E (2020) has analysed the risk of port evasion due to the inclusion of maritime shipping into the EU ETS and find the risk to be very limited. It is however important to also analyse the risk given the cumulative effect of the different proposed measures (EU ETS, FuelEU Maritime, ETD) and to realize that the risk of ships switching transshipment hubs can be expected to be higher compared to the risk of adding an additional port call.

And finally, cruise ships might also decide to adjust their routes to minimize their EU ETS compliance costs. Very popular tourist locations in EEA countries will probably still be a cruise destination, but strategic adjustments of the order of the destinations or omission of port calls at slightly less attractive destinations are conceivable, at least if this shortens the distance sailed within the EU ETS scope.

Other potential regional GHG measures for maritime shipping

If, next to the EU ETS, other regional measures were implemented to reduce the GHG emissions of shipping, then the potential risk of disturbing the level playing field of ports and EU seaborne exports due to the inclusion of maritime shipping into the EU ETS might be reduced/minimized.

Currently, no such regional measures are in place. In the UK, however, the UK MRV system for shipping is in place (DNV, 2021) and maritime shipping is considered to be included into the UK ETS (Lloyd's List, 2021) and in the US, the Ocean-Based Climate Solutions Act includes a proposal to implement an MRV system comparable to the EU MRV system for maritime shipping which could be the basis for a regional measure (Splash 247.com, 2021a) and in their Nationally Determined Contribution (The USA, 2021), the US state that ways to support decarbonization of international maritime and aviation energy use through both international and domestic action are explored. In China, the national ETS started operating in 2021 (ICAP, 2021), but opinions are divided on whether and when shipping might be added to the system (Splash 247.com, 2021b).

6.1.3. Potential impacts on employment

Based on the analysis above, the following conclusions on the potential effect of the inclusion of maritime shipping into the EU ETS on the employment in the shipping sector can be drawn.

A potential loss of employment due to a modal shift or a shift of EU-extra seaborne imports mainly depends on whether and inasmuch the EU also internalises the external costs of other transport modes. The restoration of the level playing field between the transport modes in this sense, together with the implementation of the CBAM, could affect the sector but this new equilibrium cannot be considered a market distortion.

The sector might also be indirectly affected due to a shift of EU-extra seaborne imports, since the EU ETS can only regionally set a carbon price on shipping emissions. However, this does not necessarily mean that the sector receives less orders since ships operate worldwide and might then operate on routes that gain at the expense of the routes from the EU.

Ships sailing on routes within the scope of the EU ETS can be expected to improve their carbon-/energy intensity relatively quickly compared to ships that operate solely outside the EU ETS scope. This might give these ships a comparative advantage and might also have a positive economic effect on sectors in the value chain of the different options to reduce shipping emissions, like for example ship equipment manufacturers.

A shift of employment between shipping companies operating on routes to and from EEA ports is conceivable too. The flag neutral design of the proposed EU ETS helps to prevent this, but there is still the potential risk of a shift from small to large companies as well as the risk of a shift from companies with ships above the ship size threshold to companies with ships below the threshold.

Port evasion and shift of transshipment hubs cannot be ruled out and especially the latter is an issue which can have a large impact on specific ports and the according regional communities.

The **European Commission** expects that, due to the inclusion of shipping into the EU ETS, employment in the wider shipping sector associated with the development of abatement technologies, new sources of energy, digitalization and increased energy efficiency of shipping will increase.

If carbon evasion occurs, it would lead to a decreased level of shipping activities in certain ports and distribution hubs, and lead to a potential reduction in employment which could potentially have wider reaching impacts on the whole supply chain and the local community in which the port is located.

It is expected that there is little or no effect on the employment in the commodity sectors which rely on shipping for trade. The net impact (direct, indirect and induced) on employment, including the FuelEU Maritime initiative, is expected to be negative but very small (2 500 fewer jobs in 2030 and 10 000 fewer jobs in 2050 at the EU level). The sectors in which jobs are expected to be lost are not specified.

6.2. Aviation

6.2.1. Economic contribution of the sector

The most relevant actors further upstream or downstream in the air transport value chain are the aircraft manufacturers, the airport operators, ground handlers and air navigation service providers (ANSPs) (all upstream) as well as the global distribution systems, tour operators and travel agents (downstream).

Data on the economic contribution of the EU air transport industry and its upstream industries are available from Eurostat. Table 20 provides an overview of economic key indicators for air transport, airport and ANSPs services, repair and maintenance, and aircraft manufacturing in the EU. Aircraft manufacturing includes not only the production for the EU air transport industry but for the entire global market. In addition, it includes not only the production of civil passenger and cargo aircraft but also of military aircraft. Therefore, just a part of EU aircraft manufacturing is related to EU commercial air transport.

Table 20: Economic key indicators for parts of the EU aviation industry in 2018

	Air transport	Airport and ANSP services	Repair and maintenance	Aircraft manufacturing
Gross value added (<i>billion EUR</i>)	29.9	28.9	5.2	38.5
Gross profit (<i>billion EUR</i>)	8.5	14.5	1.4	10.5
Turnover (<i>billion EUR</i>)	123.2	48.0	18.5	161.0
Persons directly employed in sector	296 964	267 585	68 249	356 594

Source: Eurostat (sbs_na_1a_se_r2; sbs_na_ind_r2)

Note: Airport and ANSP services correspond to the industry sector 'service activities incidental to air transportation' as defined by the NACE Rev. 2 classification

In addition to the direct economic effects of the EU aviation industry as summarized in Table 20, there are indirect and induced effects that can be attributed to the sector. Indirect Effects are defined as impacts resulting from the purchase of goods and services by the aviation sector from other European firms further 'up-stream' in the value chain. Examples include aircraft manufacturers being supplied

with metal, plastic and components, or aircraft operators purchasing fuel or catering. And induced impacts of a sector's direct and indirect economic activities describe the contribution to the economy resulting from spending by the employees from the sector's value chain, which yields further economic activity and jobs.

However, the described direct economic contribution of the air transport sector, which solely mirrors the production side, does not provide the full picture of the sector's impacts on the society as the demand side is not fully considered. The concepts of catalytic effects or wider economic benefits, which are heavily discussed in the literature and difficult to quantify, are used to describe other effects which result from the availability of air transport services to the society. To some extent, these concepts can also be applied to other sectors and infrastructures like transport in general, telecommunication, or education.

Examples are:

- Trade and Tourism – Air transport may facilitate inbound and outbound trade, including tourism.
- Productivity and market efficiency – Good air transport linkages can reduce transport user costs and expand the market potential for companies, allowing them to benefit from economies of scale in production in a globalized world. In addition, global competition between companies can intensify due to improved accessibility of regions, which may reduce monopoly power and increase efficiency.
- Location decisions by firms – For the above reasons, firms may decide to locate in regions with good air transport connections. This may result in additional jobs, revenues and taxes there.
- Consumer welfare – Air transport may reduce travel time for consumers. The benefit to consumers is reflected in the difference between the willingness to pay for a flight and the fare actually paid, the so-called 'consumer surplus'. In addition, consumer welfare may stem from the option to use air transport when needed.

In a qualitative way, we will consider some of these effects when discussing the effects of potential market distortions in the next section.

6.2.2. Potential market distortions and level playing field

Cost types and cost impact

In principle, as already described in the preceding section on maritime shipping, the EU ETS for aviation also leads to administrative costs, emission reduction costs, and costs for the purchase of the allowances covering the residual emissions for the sector. As already argued above, the non-administrative costs will mean that airlines conducting environmentally more efficient operations (e.g. employing more efficient aircraft and engine technologies, flying less detours, carrying passengers directly, operating at higher load factors, using available space for more passengers...) will face a lower ETS burden per passenger or per passenger kilometre than the less efficient ones – unlike pure departure/passenger taxes. This can be regarded as a correction of existing market distortion in a market in which, so far, a lower share of external costs of GHG emissions has been accounted for.

While this study has been designed to assess the effects of the tightened EU ETS for aviation in a more qualitative way, we refer to some available statistics and sources to roughly quantify the cost and fare effects stemming from full auctioning.

For this, we assume:

- traffic, fare and general non-ETS cost levels at the time of full auctioning (i.e. 2027) to equal 2019 levels;
- uniform fuel consumption for all intra-EEA cargo and passenger flights;
- future carbon prices of EUR 45 (as in the impact assessment accompanying [COM\(2021\) 552 final](#)), EUR 83 (as in the impact assessment, high scenario) and EUR 120 per tonne of CO₂, which would mirror the reduced cap and any effects from interrelations with other ETS-sectors;
- a full ETS cost pass-through to passengers;
- a uniform cost pass-through to all intra-EEA segment passengers and one average fare for all intra-EEA passengers (neglecting the fact that, in reality, air transport demand is characterized by different customer groups with different willingness to pay and price elasticities).

We only regard intra-EEA services and do not consider extra-EEA services where the EU ETS may be applied under certain circumstances as detailed above (flights to most non-CORSIA states, if any, from 2027 and flights to CORSIA states by carriers from non-CORSIA states). For 2019, the EU Emissions Trading System (ETS) data viewer provided by the European Environment Agency (EEA) reveals verified carbon emissions of 68 175 732 t CO₂ within the scope of the EU-ETS (intra-EEA including UK), of which 30 189 624 t CO₂ refer to freely allocated emission rights. In the same year, according to Eurostat³⁰, roughly 96 % of all intra-EEA flight movements were passenger flights. Hence, we apply this share to the verified carbon emissions and assume verified carbon emissions of 65 296 525 t CO₂ from passenger services within the scope of the EU-ETS, of which 28 914 651 t CO₂ represent allowances allocated for free.

In 2019, the average EU ETS allowance price amounted to 24.58 EUR. At this price, airlines had to buy (65 296 525 – 28 914 651) allowances, for which they had to pay EUR 1.25 per passenger, based on 714 785 015 intra-EEA (incl. UK) passengers according to the Sabre MI database. Assuming full auctioning and a CO₂ price of EUR 120, the ETS cost per passengers would rise to 10.96 EUR. This estimated ETS cost of approximately EUR 11 comes close to the estimation conducted by one of the stakeholders we spoke to, which was based on ETS cost of EUR 0.4 per litre and a fuel consumption of 3.5 l/100 km and roughly translates to $0.4 * 3.5 * 8 = \text{EUR } 11.2$ for a 800 km segment.

The difference of EUR 9.71 (10.96 – 1.25) would mean a fare increase by 9 % based on an average intra-EEA segment fare of EUR 107.92 as reported by Sabre MI for 2019.

If future carbon price of just EUR 45 or EUR 83 were assumed (as in the impact assessment accompanying [COM\(2021\) 552 final](#)), the additional ETS burden per passenger would decrease to EUR 2.86 (or 2.6 %) and EUR 6.3 (or 5.9 %), respectively.

Effects on airline competition

Community (EEA) carriers compete with non-EEA carriers on many different routes, which can be regarded as relevant markets. Competitive distortion by market-based measures like the EU ETS at the operational level can occur if carriers have to bear different levels of environmental related cost burdens on the same relevant markets. In addition, in a globalized world, EEA carriers may be less attractive for investors if they have – on average – to bear a higher environmental-related cost burden than airlines from outside the EU.

³⁰ Eurostat-datasets Avia_PAOCC for passenger flights and Avia_COOCC for cargo flights.

Relevant markets

It is not straightforward to identify relevant markets in air transport. Are different carriers flying from the same or a nearby airport, or from the same country, always competitors? There is no simple 'yes' or 'no' as answer, as this depends on the passenger's requirements. A passenger flying from Nice to London may only regard airlines offering this route as competitors, while another airline operating from Nice to Morocco may be of less relevance (as long as competition between destinations is not considered).

However, things even get further complicated as air transport services can also be offered indirectly, via so-called hub or transfer airports. Imagine EasyJet operating from Nice to London directly, while Air France offers indirect connections from Nice via Paris to London. In this case, both airlines could still be regarded as competitors, at least for the market volume of passengers who would accept to change planes. This shows that the consideration of direct routes only as relevant markets may not be sufficient.

For these reasons, when assessing the competitive impact of the current or an amended EU ETS on the Community carriers, it has to be clearly sorted out which origin-destination (OD) markets (as requested and booked by the passengers) they serve and if there are competing carriers on these markets, which may be more or less affected by the scheme.

Hence, the risk of **carbon leakage** (which means apparent reductions in CO₂ emissions in the EEA or on EEA routes in exchange for increased emissions elsewhere) and the degree of **competitive distortion** will depend on the cost burden in the relevant markets.

Intra-EEA

Operating costs – and fares – within the EEA are likely to increase because of the increasing auctioning share, the reduced allocation of allowances and the expected higher CO₂ prices, and may result in a decline in demand and supply. Nevertheless, adverse competitive impacts are likely to remain limited as virtually all intra-EEA routes, both by low cost and network carriers, fall under the scheme.

However, there are three 'buts':

- For a very limited number of intra-EEA ODs, passengers could also select indirect services via non-EEA hubs, such as Istanbul or Kiev, which would not be subject to the EU ETS but to the softer CORSIA scheme only. For geographical reasons, such routings would only be of relevance for certain ODs between South East Europe (e.g. Greece, Cyprus...) and Northern or Eastern Europe. The same threat could – in theory – also come from London and Zurich; however, we assume the Swiss and UK ETS to be as strict as the EU ETS.
- Increased ETS costs (and subsequently air fares) on intra-EEA flights could induce demand shifts to non-EEA destinations within the CORSIA hemisphere. It is reasonable to assume that the specific cost burden of CORSIA (if implemented at all) will be considerably lower than the EU ETS cost effects, which would improve the competitive position of holiday destinations outside the EEA, like Egypt, Morocco, Turkey or the UAE, and help these regions attract additional tourists that would – otherwise – have spent their holidays within the EEA. However, such a development would probably affect the economic and employment situation at EEA holiday destinations much more than it would affect EEA carriers, as the latter could simply change their network and offer more flights to extra-EEA destinations. In this context, it should be noted that popular tourist destinations like Egypt, Morocco or Tunisia have not (yet) volunteered to participate in CORSIA (ICAO, 2021). As their RTK-shares (in 2018) were below the

0.5 % threshold (Egypt: 0.44 %, Morocco: 0.25 %, Tunisia: 0.11 %³¹), they may be eligible to be exempt from CORSIA even from 2027 onwards, whereby it is unclear if the EU ETS would then be introduced for emissions from such routes, as discussed in Paragraph 5.3.2.

- According to the proposal, only domestic flights to outermost regions will remain to be exempted from ETS obligations, while flights between outermost regions and other EEA territories will be subject to the scheme. This means that, for example, a direct flight from Poland to the Canary Islands (Spain) or an indirect service via Paris would be fully exposed to the EU ETS, while a service via Spain (e.g. Madrid) would only partly fall under the scheme and a direct flight from Spain would be fully exempted. The same applies to regions like Azores and Madeira (Portugal). This constitutes a competitive advantage for network carriers based in Spain and Portugal as international flights to other outermost regions (e.g. the French overseas departments Martinique, Mayotte, Guadeloupe, French Guiana and Réunion) are hardly of relevance.

Extra-EEA

There will also be no significant competitive distortion from the EU ETS on **non-stop flights between the EEA and non-EEA countries**, such as Barcelona-New York, as the EU ETS will not be applied there for EEA and most non-EEA carriers. The same applies to **indirect routings between non-EEA places via the EEA**, such as from India via Amsterdam to North America. All such international extra-EEA flights operated by EEA and most non-EEA airlines will only be covered by CORSIA, if at all.

The main transport segment in which the competitive position of EEA carriers and hub airports is likely to be adversely affected by a tightened EU ETS, however, are **extra-EEA routings including intra-EEA feeder segments**, such as Gothenburg via Frankfurt to Bangkok (Figure 10). Here, the intra-EEA portion (Gothenburg-Frankfurt) would be subject to the EU ETS, while a direct flight or a routing via a non-EEA hub like Istanbul would only fall under the less stringent CORSIA scheme, if at all. As a result, competitive distortion and carbon leakage stemming from further shifts to non-EEA hubs are likely.

Figure 10: Competitive distortion on indirect EEA-non-EEA routings



Source: Map generated by the Great Circle Mapper (www.gcmap.com) – copyright © Karl L. Swartz; own adjustments

³¹ See: https://www.icao.int/sustainability/Documents/RTK%20ranking/International%20RTK%20rankings_2018_SIDS_LDC_LLDC.pdf

Relevance of OD markets under competition from extra-EEA carriers not subject to the EU ETS

The following analysis is intended to show, at a very aggregated level, which traffic segments are exposed to possible shifts to extra-EEA carriers, and what share of revenue these segments account for.

In 2019, a total of 878.7 million OD passengers travelled by air with an origin or destination in the EU (Source: Sabre MI). 378.4 million (43.1 %) were passengers travelling within the EU without transferring. A further 28.5 million passengers (3.2 %) travelled within the EU on a transfer connection with a transfer within the EU. 1.9 million passengers (0.2 %) travelled within the EU with a transfer in a non-EU country.

As already discussed above, **intra-EU** traffic is hardly exposed to competition from extra-EEA carriers as routings between two EU states via a non-EU state is rather disadvantageous for geographical reasons; only a few relations (e.g. between South East Europe and Northern Europe via Istanbul, Kiev or Moscow) can offer competitive travel times. The competitive advantage for connections via Switzerland or the UK is rather small, if at all, as the CH ETS and UK ETS are likely to be as strict as the EU ETS. A possible shift could occur if passengers substitute EU destinations for non-EU destinations, e.g. a beach holiday in Turkey instead of Spain. However, this is likely to be an option for only a minority of passengers. Moreover, this would not per se a distortion of competition to the disadvantage of EU airlines – a German holiday airline that previously carried passengers to Spain could easily fly to destinations in Egypt or Turkey if there was sufficient demand. Even though this is a form of carbon leakage, it is not a distortion of competition that would burden EU airlines.

The total of 46.3 % of passengers travelling within the EU (non-stop or via EU hubs) is equivalent to 27.6 % of all revenue from passengers flying to or from EU airports.

A total of 469.9 million OD passengers (53.5 % of the total) travelled on **extra-EEA** routings between the EU and non-EU countries. Of these, 344.1 million passengers travelled on non-stop routes. Such flights are not, and will not be, subject to the EU ETS; however, a possible shift effect here could be the use of hubs directly outside the EU to avoid higher fuel costs as a result of the planned blending quota for sustainable fuel, but that is not the subject of this report.

In 2019, 50.9 million passengers travelled between EU and non-EU countries via a hub in the EU. This traffic segment, representing 5.6 % of passengers and 14.5 % of revenue, is most likely to be the most exposed to extra-EEA competition. The intra-EU feeder flight is subject both to the tightened EU ETS and to kerosene taxation as proposed in [COM\(2021\) 563 final](#). Moreover, in perspective, the route networks of non-EU carriers (e.g. Turkish Airlines connecting also smaller airports in the EU) and increasing liberalization (e.g. gradual full opening of EU air transport markets with Qatar after ratification of the CATA agreement within five years) offer realistic opportunities for passengers to exploit potential cost differences through their booking decisions. Here, it is largely a political question whether to further promote this traffic (and the related connectivity effects, as part of the long-haul connections from the EU depend on connecting passengers from other EU countries). However, in the future, the use of smaller long-haul aircraft such as the Airbus A321XLR (150-240 passengers with a range of up to 8 000 km) can be expected to further reduce the dependence on transfer passengers.

Finally, in 2019, already 74.9 million passengers travelled between EU and non-EU countries in 2019 (8.5 % of passengers, 21.3 % of revenue) via non-EU hubs. However, these passengers include not only those who flew with non-EU airlines, but also those who flew with EU airlines via the hubs of alliance and joint venture partners. I.e. this group of passengers is not to be considered completely 'lost' to EU airlines – EU airlines also benefit from transporting these passengers to non-European hubs.

6.2.3. Consequences on competitiveness

The above analysis has revealed that intra-EEA flights will be subject to significant cost increases caused by a tightened EU ETS. In this context, some stakeholders also criticized intra-EEA 'double-taxation' caused by the combination of kerosene taxes, blending quotas and the ETS.

Apart from the competitive effects described in the previous section (shifts to non-EEA carriers, hubs, routings and destinations), the increased cost base for EEA carriers can have the following adverse implications which are often brought forward by the sector:

- EEA carriers become less attractive for investors in a globalized financial market;
- cost increases which cannot be passed through reduce funds needed for fleet renewal;
- detours chosen by passengers via non-EEA hubs and shifts to holiday destinations outside the ETS lead to higher emissions at the global level.

6.2.4. Consequences on employment

The calculated expected fare increases between EUR 2.86 (CO₂ price of EUR 45) and EUR 9.71 (CO₂ price of EUR 120) per passenger flight leads to a decrease in passenger demand, which has negative consequences for employment in the EU/EAA aviation industry.

The extent of the demand decrease depends on the price elasticity of demand. The price elasticity indicates how much demand changes, measured in %, in response to a price increase of 1 %. InterVistas (2007) estimates a demand elasticity of -0.924 for a price change affecting all flights within Europe. This means that a price increase of 1 % is expected to lead to a drop in demand of 0.924 %. Using this price elasticity, a fare increase of 2.7 to 9 % for intra-EEA flights results in a demand decrease of intra-EEA traffic of 2.5 to 8.3 %. For EEA traffic, which also includes flights to destinations outside the EEA, this would result in a decrease of 1.7 to 5.6 %, and for global traffic a decrease of between 0.3 and 0.9 % would be expected.

Assuming now a linear relationship between EU traffic and EU air service employment, and between global traffic and EU aircraft production employment, the impacts in the EU air service sector (air transport, airport and ANSP services, and repair and maintenance) and in EU aircraft production can be estimated.

For EU air transport services, the tightening of the EU ETS could result in a potential loss of 10 to 35 thousand jobs out of the total 633 thousand jobs in 2018. For EU civil aircraft production, we see a potential loss of 700 to 2 400 jobs out of the total 357 thousand jobs in 2018 – taking into account that civil aircraft production represents only 74 % of the total industry in terms of turnover (ASD, 2019).

7. CONCLUSIONS AND RECOMMENDATIONS

KEY FINDINGS

For **maritime shipping** the following main recommendations have been developed:

- The ease of integration of the sector into a future global measure should be considered.
- All potential impacts should be assessed considering the aggregated effects of the different policy measures and the different measures should be consistent and properly geared. Also the impacts on remote areas like EEA Member States' overseas territories should be analysed.
- An exemption or alternative compliance option for SMEs and small emitters should be considered.
- The effectiveness of the MRV should be carefully checked and the enforcement should be effective and equally effective for all ships.
- Some portion of the revenues should be earmarked to facilitate the energy transition of the sector and should also become available for non-MSs.
- The external costs of the different transport modes should be internalized to the same extent.
- Compensating measures for transshipment ports for the period until other regional measures or a global measure are implemented should be considered if extra-EEA voyages are included. And due to the COVID-19 pandemic, consideration could be given to (including an option for) extending the phase-in period.
- Shipping-related administration should be designed in a careful and timely fashion and sufficient funds should be made available to this end.

Aviation

- There seems to be no reason to amend the EC proposal of 14 July, 2021 (COM(2021) 552 final), except for some clarification on exact ETS and offsetting exemptions (e.g. for flights to States exempt from CORSIA from 2027 onwards), on rotorcraft services and on exemptions for SAF fuels.
- As a possible solution for the competitive disadvantage of indirect routings via EEA hubs to non-EEA locations, a carbon leakage protection could be introduced, which would reduce the ETS-related cost of intra-EEA feeder flights proportionally to the share of non-EEA transfer passengers.
- A dedicated recycling of auctioning revenues to the development of emission reduction measures in the sector, such as SAF feedstock development, production and distribution, could help green the sector in the long run through new technologies.

7.1. Maritime shipping

If maritime shipping were included in the EU ETS as proposed by the European Commission, certain implementation issues could arise. While some of these issues can be readily solved, the solutions to others may be controversial, since divergent interests are at stake. There are also issues that are not

easy to solve because of the specifics of the sector. As one example, to issue expulsion orders for ships whose company did not comply with the EU ETS two years ago may turn out to be complex, since vessels change companies on a regular basis.

Including maritime shipping in the EU ETS will increase the cost of maritime transport. Average per-vessel emissions within the scope are currently highest for Ro-pax ships, passenger ships and Ro-ro ships. The initial cost increase due to the ETS can thus be expected to be highest for these segments. Irrespective of vessel type, the additional costs might be borne by different actors in the value chain, depending on whether the responsible entity is able to pass them on. The scope for cost pass-through depends on a variety of factors, including contractual agreements between ship owner and charterer and the effectiveness thereof, the magnitude of the transportation cost increase and the share of transportation costs in the overall costs of the product's value chain.

Since the EU ETS is a measure that corrects a market distortion on a regional level, the playing field may become uneven beyond the region. Ships might evade EU ports located at the EU external border to avoid/reduce their EU ETS compliance costs and also the competitiveness of extra-EU seaborne exports might deteriorate for specific trades. The latter may possibly have no impact on the sector, however, as ships might also operate on trades gaining a competitive advantage. Port evasion and shift of transshipment hubs cannot be ruled out entirely, though, and especially the latter is an issue that could have a major impact on specific ports and regional communities.

A shift of employment among shipping companies operating on routes to and from EEA ports is conceivable, too. While the flag-neutral design of the proposed EU ETS helps prevent this, there is still the potential risk of a shift from small to large companies, as well as the risk of a shift from companies with ships above the ship size threshold to companies with ships below.

Based on our analysis of the potential implementation issues and socio-economic effects resulting from including maritime shipping in the EU ETS as proposed by the European Commission and based on our stakeholder consultation, we have developed various recommendations.

With regards to the interaction of the EU ETS and other GHG reduction measures we recommend the following:

- Besides inclusion of maritime shipping in the EU ETS, there are other elements of the Fit for 55 package (FuelEU Maritime and Energy Taxation Directive) that will impact the sector. All potential impacts should therefore be integrally assessed in light of the aggregated effect of the measures.
- Consistency among and gearing of the different measures is important for two reasons: total administrative costs should be kept to a minimum and incentives for the uptake of the various emission reduction measures should be consistent. Streamlining consistency at a later stage might result in sunk costs.
- In this context: The compliance cycle of the EU ETS Directive and the EU MRV Regulation should be aligned in terms of timing/deadlines.
- As the IMO is yet to move on developing global market-based measures to address GHG emissions from ships, there is at present no need to align the EU ETS with a global measure. However, including maritime shipping in the EU ETS should not impede development of a global measure. Full inclusion of the sector in an open EU ETS could, for example, be an issue in this context.

With regards to the EU ETS proposal as such, we recommend the following, to prevent potential implementation issues:

- Given the fundamental difference between the shipping sector and the sectors currently included in the EU ETS, the shipping-related administration should be designed in a careful and timely fashion. Information exchange among different entities and Member States will be important (e.g. to provide information on ships falling under the responsibility of non-compliant companies) and should be facilitated. EMSA and centralized tools can play a crucial role in this context and sufficient funds should be available to this end.
- Certain definitions (e.g. 'voyage' and 'maritime activity') are ambiguous or lacking in the Commission's proposal and should be further clarified to avoid implementation issues and to ensure full consistency with the EU MRV Regulation.

To ensure a level playing field between the companies operating on routes to and from EEA ports, various different aspects need be considered:

- MRV has to be reliable for each ship. The effectiveness of the EU MRV system should therefore be checked carefully. The European Commission currently evaluates the implementation of the EU MRV Regulation and the outcome of this evaluation might be very useful in this context.
- Enforcement needs to be equally effective for all vessels. If only EU-flagged ships were potentially detained in case of non-compliance or if enforcement was less effective if there was a change of company, then the level playing field would be distorted.
- Applying a ship size threshold of 5 000 GT does not lead to an exemption of all SMEs and of ships calling only seldom at EEA ports. Given that SMEs and small emitters would be incurring relatively high administrative costs to comply with the EU ETS, an exemption or an alternative compliance option should be considered. Regarding small emitters, the corresponding approach for aviation could serve as a blueprint in this context.³²
- Should (parts of) the auctioning revenues become available to the sector, then all companies, including companies not registered in a Member State, should be equally able to profit from the revenues.

To prevent other potential socio-economic effects, we recommend:

- The energy transition of the sector requires large investments in both development and uptake of alternative fuels. Furthermore, depending on the stringency and timing of the policy measures, retrofitting of existing ships might also be required, which is known to be costly. The EU ETS proposal specifies that funds from the Innovation Fund could be used for the maritime shipping sector, but whether and to what extent funds would become available for the sector is unclear. Earmarking some portion of the funds for the sector could thus facilitate a timely sectoral energy transition without the sector having to face disproportionately high costs.
- To prevent the new equilibrium established through implementation of the different Fit for 55 measures being associated with a market distortion, the European Commission should take steps to ensure the external costs of the different modes of transport are internalized to the

³² For aviation a threshold value of 5.7 t MTOM holds, with the emissions of aircrafts below this threshold being exempted from EU ETS obligations. Aircraft operators that are small emitters are not exempted from the EU ETS, but rather subject to simplified monitoring requirements. In this context small emitters are defined as aircraft operators whose total annual CO₂ emissions or whose emissions from flights from, to and within the EEA (except for services to and from outermost regions) are relatively low.

same extent. This can also prevent a potential reduction of extra-EU seaborne import trades to be associated with a market distortion.

- Port evasion and shift of transshipment hubs cannot be entirely ruled out and especially the latter may have a major impact on specific ports and regional communities. A global measure or limitation of the geographical scope of the measure to intra-EEA voyages would not have such an effect. Implementation of other regional measures can help in this respect, too. The implementation and timing of other regional measures is still uncertain, however. The welfare gains due to the increased environmental effectiveness of an EU ETS including extra-EEA voyages will probably outweigh the socio-economic losses due to port evasion. Compensating measures for the transition period until other regional measures or global measures are implemented could, however, be considered if extra-EEA voyages are included. Free allocation of allowances could reduce the impact, for example. Revenues for the development and use of emission reduction measures could then not be raised, though, and a mode to allocate the allowances would have to be developed, too.
- The impacts on remote areas like EEA Member States' overseas territories should specifically be analysed, as these might be heavily reliant on ship transportation, leading to relatively high additional costs.
- Given that certain fleet segments have been impacted significantly by the COVID-19 pandemic, consideration could be given to extending the phase-in period beyond three years or including an option for extending this period as part of the Regulation.

7.2. Aviation

The EEA aviation sector can roughly be divided into the liberalized intra-EEA market and various extra-EEA markets with competition on direct or indirect routings between European carriers and extra-EEA carriers.

Since 2012, the EU ETS for aviation has proved to be a well-running system, with a well-established MRV system.

The EC proposal of 14 July, 2021 ([COM\(2021\) 552 final](#)) aims to strengthen the ETS and implementing CORSIA through the ETS Directive. The EU ETS will remain geographically limited to most intra-EEA flights, although it will be tightened as there will be no free allocation of allowances from 2027 onwards, and a reduction of European Aviation Allowances (EUAA) by 4.2 % annually. In addition, the ETS will apply to routes to Switzerland and the UK and – for carriers from states not participating in CORSIA – also on extra-EEA routes from the EEA to CORSIA states.

This means that the EC intends not to implement CORSIA on international intra-EEA routes, but only on routes between the EEA and CORSIA-participating extra-EEA countries and on routes between participating extra-EEA countries all over the world. It remains unclear whether the EU ETS will also be introduced (from 2027 onwards) on routes to states which are exempt from CORSIA as their share in global air transport is below 0.5 %.

Formally, there seems to be no need to amend the system itself, except for some clarification on the exact route exemptions and on the inclusion of rotorcraft services on routes where CORSIA may be applied (see Paragraph 5.3.2). Also, there is a lack of clarification as to whether SAF will be deemed zero-emission in the EU ETS. The EC may have to clarify the proposal in this respect.

Owing to the rising auctioning share, the lower cap and higher CO₂ prices expected, operational costs could rise by some EUR 10 per intra-EEA segment passenger – assuming a future carbon price

of EUR 120. This is of course as intended by the Commission as it actually eliminates existing distortion of competition, but it may lead to shifts of an unknown share of air transport demand and activities to non-EEA destinations or to routings via non-EEA hubs and hence cause carbon leakage.

Nevertheless, direct competitive effects of the revised EU ETS on **intra-EEA** routings are likely to remain limited, although there may be limited shifts of demand to extra-EEA routings and destinations. There will also be no competitive distortion from the EU ETS on **non-stop flights on extra-EEA routes**, such as Barcelona-New York, where the EU ETS will not be applied for EEA and most extra-EEA carriers.

The main segment in which the competitive position of EEA carriers and hub airports would be adversely affected by a tightened EU ETS, however, are **extra-EEA routings including intra-EEA feeder segments**, like Gothenburg via Frankfurt to Bangkok. As a result, competitive distortion and carbon leakage stemming from shifts to non-EEA carriers and routings are likely, which will also be reflected in decreasing employment at EEA carriers and airports. For EU air transport services, the tightening of the EU ETS could result in a potential loss of 10 to 35 thousand jobs out of a total of 633 thousand jobs in 2018.

As a possible antidote to the competitive disadvantage of indirect routings via EEA hubs to non-EEA locations, a carbon leakage protection mechanism could be introduced. This could be done in such a way that the ETS- (and fuel tax-) related costs of intra-EEA hub feeder services are reduced proportionally to the share of non-EEA transfer passengers, thus employing relatively straightforward means to reduce the ETS-specific cost burden for non-EEA transfer passengers. In this way the ETS-induced cost gap between EEA and non-EEA carriers could be levelled out.³³

Alternatively, air passenger duties ('departure taxes') could be redesigned such that longer flights to non-EEA destinations lead to higher air passenger duties and vice versa. This would to some extent reduce the ETS-induced cost gap between flights to EEA and non-EEA destinations.

The use of auctioning revenues as proposed by the EC is relatively vague and non-binding. A dedicated channelling back of auctioning revenues to the development of emission reduction measures in the sector, such as SAF feedstock development, production and distribution, could help green the sector in the long run through new technologies.

While the interplay of the elements of the Fit for 55 package would make an important contribution to global/EU GHG mitigation, the interviewed stakeholders generally supported the co-existence of ETS and CORSIA, but criticized possible intra-EEA 'double-taxation' caused, for example, by the combination of kerosene taxes, blending quotas and the ETS/CORSIA.

³³ Imagine ETS costs on a hub feeder within the EEA sum to EUR 1 000, and 60 out of 180 passengers (=1/3) on this flight are transfer passengers to non-EEA locations. In this case, $1/3 * \text{EUR } 1\,000$ could be refunded to the airline from the auctioning revenues or, alternatively, the number of allowances needing to be surrendered could be reduced by 1/3.

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Based on the EU Commission's Fit for 55 proposals published in July 2021, this report discusses the challenges and impacts resulting from the integration of the maritime sector in the EU ETS, and a more stringent EU ETS for aviation. It considers implementation challenges and consequences for the competitiveness of European stakeholders, e.g. caused by carbon leakage, and impacts on sectoral employment. Based on the initial analysis and the results of stakeholder consultations, recommendations on how to overcome implementation issues and adverse competitive and societal effects are provided.

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