

CORSIA, EU ETS and the EU2030 aviation emissions target

Report prepared for Transport and Environment (T&E)
Report nr: 18-13

André van Velzen
TAKS

September 2018

Utrecht, TAKS, September 2018

Title: CORSIA, EU ETS and the EU2030 aviation emissions target

Author: André van Velzen, TAKS

Report nr: 18-13

Prepared for: Transport and Environment (T&E).

Disclaimer

The European Aviation Safety Agency (EASA) has made available the AERO-MS model for this research on a complimentary basis. The content of this report does not reflect the official opinion of EASA or of the European Union. Responsibility for the information and views expressed lies entirely with the author.

Contents

List of tables.....	3
List of figures.....	3
List of acronyms and units.....	4
1. Introduction.....	5
2. EU aviation emissions target for 2030.....	5
3. CORSIA and EU ETS co-existence scenarios.....	6
4. Aviation emissions baseline for 2030.....	9
5. Emission reduction of CORSIA and EU ETS in relation to aviation emission target.....	10
6. Summary and conclusions.....	13
8. References.....	15

List of tables

Table 1. CORSIA and EU ETS co-existence scenarios for departing flights from EU airports....	8
Table 2. CO ₂ emissions in 2016 and 2030 on flights departing from the EU.	10
Table 3. Demand for EUAs and international credits in 2030 for co-existence scenarios.....	11

List of figures

Figure 1. Gap with EU2030 aviation emissions target for co-existence scenarios.....	12
---	----

List of acronyms and units

AERO-MS	Aviation Emissions and Evaluation of Reduction Options - Modelling System
AOC	Air Operator Certificate
CNG	Carbon Neutral Growth
CO ₂	Carbon dioxide
CORSIA	Carbon Offsetting and Reduction Scheme for International Aviation
EASA	European Aviation Safety Agency
EC	European Commission
EEA	European Economic Area (EU28, Norway, Iceland, Liechtenstein)
EFTA	European Free Trade Association (Norway, Iceland, Liechtenstein, Switzerland)
ETS	Emissions Trading System
EU	European Union
EU INDC	Intended Nationally Determined Contribution of the European Union and its Member States
EU28	28 Member States of the European Union
EUA	European Union Allowance for one tonne of CO ₂
GHG	Greenhouse Gas
ICAO	International Civil Aviation Organization
Intra EEA flights	Flights with both the airport of departure and airport of arrival in one of the EEA Member States
Intra EU flights	Flights with both the airport of departure and airport of arrival in one of the EU Member States
LRF	Linear Reduction Factor
MBM	Market Based Measure
Mt	Megatonne, million tonne
RTK	Revenue Tonne Km
T&E	Transport and Environment
UNFCCC	United Nations Framework Convention on Climate Change
UK	United Kingdom

1. Introduction

In 2012 aviation was brought into the EU's emission trading system (EU ETS). Originally the EU ETS covered all flights to and from airports in Member States of the European Economic Area (EEA). A number of countries from outside the EEA strongly disagreed that aircraft operators which are not based in the EEA were also subject to the EU ETS for the flights between non-EEA and EEA Member States. In 2013 the scope of flights subject to the EU ETS was temporarily reduced to only flights between EEA Member States (referred to as 'Intra EEA flights'). The reduction of scope was also taken in order to provide time to ICAO to agree on a global Market Based Measure.

During the ICAO Assembly in October 2016 it was agreed to implement a global Market Based Measure, called the Carbon Offset and Reduction Scheme for International Aviation (CORSIA), which aims to stabilise net emissions at 2020 levels referred to as carbon neutral growth 2020 (CNG2020). CORSIA requires airlines to offset their emissions of international aviation above the baseline level and will start in 2021, from which year ICAO Member States can voluntarily participate. From 2027 onwards CORSIA will be mandatory.

Regulation 2017/2392 envisages a review of the EU ETS for aviation once there is more certainty and clarity about CORSIA, and the steps taken by ICAO Member States for its implementation. This means it is presently unknown how and if the EU ETS will be adjusted should CORSIA be in force from 2021 onwards. Therefore this paper considers a number of alternative CORSIA and EU ETS co-existence scenarios.

In the Nationally Determined Contribution (NDC) of the EU, the EU and its Member States are committed to a binding target of a 40% reduction in greenhouse gas emissions by 2030 compared to 1990 [1]. The EU 2030 target includes CO₂ emissions of aviation.

The main research question of this study is to what extent alternative CORSIA and EU ETS co-existence scenarios could contribute to meeting the EU 2030 aviation emission target which applies to all flights departing from the EU.

In chapter 2 of this report the EU aviation emission target for 2030 is described. The co-existence scenarios are defined in chapter 3. In chapter 4 the forecast of aviation emissions for 2030 is presented. In a final step the emission coverage of the CORSIA and EU ETS co-existence scenarios in 2030 is presented, also picturing the extent by which the EU 2030 aviation emission target is met in case of the alternative scenarios (chapter 5) followed by a summary of the main conclusions from the study (chapter 6).

2. EU aviation emissions target for 2030

The overall EU target under the NDC for 2030 is to achieve a 40% reduction for greenhouse gas emissions relative to the year 1990. The scope of the EU target under the NDC includes CO₂ emissions from all flights departing from an airport in one of the 28 EU Member States [2].

In order to reach the overall EU target, the number of ETS allowances for aviation in 2030 is calculated by the EC by first computing the average CO₂ emissions on all EU departing flights across the years 2004-2006. Then they have taken 95% of this average and applied the EU ETS Linear Reduction Factor (LRF) of 2.2% per year for the period 2021 – 2030. The resulting estimate, covering all departing flights from the EU, is 111 Mt of CO₂ emissions [2]. Hence in order to in 2030 achieve the overall reduction target of -40% relative to 1990, the aviation emissions on departing flights from the EU are proposed to be capped at 111 Mt of CO₂.

We have also looked at the UNFCCC data with respect to International Aviation Bunkers (1D.1.a) and Domestic Aviation (1.A.3.a) reported by the EU28 for the year 1990 [3]. These data reflect emissions from all departing flights. Total aviation emissions in 1990 reported to the UNFCCC by the 28 EU countries were 83.9 Mt. A reduction of 40% relative to 1990 would imply a level of about 50 Mt of aviation CO₂ emissions. However the aviation target, at 111 Mt, is over twice as high, meaning that aviation is allowed to increase emissions by 32% compared to 1990. This implies that in order to reach the overall EU target of a 40% reduction relative to the year 1990, the stationary sectors included in the EU ETS have to reduce more emissions to compensate for the aviation target being well above the -40% compared to 1990 level of emissions.

3. CORSIA and EU ETS co-existence scenarios

At present 72 ICAO Member States have indicated an intention to join the CORSIA voluntary stages from the start in 2021. This includes all Member States which are also a member of the EEA [4], who have stated that they will participate provided that certain conditions are met, notably on the environmental integrity of the scheme and global participation¹. From 2027 onwards CORSIA will be mandatory for States that have a share in international aviation above 0.5% of total Revenue Tonne Kilometres (RTKs). Based on international scheduled Revenue Tonne-Kilometres (RTK) by State of Air Operator Certificate (AOC) for 2014 [5] the forecast is that a further 7 countries will participate in CORSIA from 2027 onwards².

The offset obligations under CORSIA apply to all international flights between participating States. Hence flights between a participating State and a non-participating State are not subject to offset obligations. For the flights between participating States, aircraft operators need to offset emissions above the baseline emissions level. The baseline emissions level is calculated on the average of total emissions covered by CORSIA in the years 2019 and 2020.

Assuming the CORSIA is in place from 2021 onwards, the question is if and how the EU ETS for aviation might be adjusted. The international intra EEA flights, which are now covered by

¹ With the exception of Liechtenstein all EEA Member States are also an ICAO Member State. And also Switzerland has signed up to CORSIA.

² Brazil, Chile, China, India, Philippines, Russia and South Africa.

the EU ETS, will in principle also be subject to CORSIA. Domestic intra EEA flights can only be subject to the EU ETS, because CORSIA can only cover international aviation.

Another development is that in 2017 the EU and Switzerland agreed to link the EU ETS and the Swiss ETS [6]. Currently the Swiss ETS does not cover aviation emissions. The integration of CO₂ emissions from the aviation sector into the Swiss ETS is a prerequisite for linking the two trading systems. According to the linking agreement, the EU ETS will cover flights from EEA Member States to Switzerland. The Swiss ETS will then cover domestic flights in Switzerland and flights from Switzerland to EEA Member States. The entry into force of linking the two emission trading systems is expected in 2020.

At present it is unknown whether the United Kingdom will remain in the EU ETS after Brexit. The UK white paper on the future relationship between the UK and the EU indicates that a consistent approach to carbon pricing is necessary for the market to function, which could be delivered by remaining in the EU ETS [7]. In this study it is assumed that the United Kingdom is still part of the EU ETS in 2030.

The two main CORSIA and EU ETS co-existence scenarios considered in this study are:

1. CORSIA + EU ETS for domestic. The EU ETS is abolished for flights from and between European states and will only remain in place for domestic aviation. CORSIA will be in place for flights departing from EEA Member States.
2. Retain EU ETS for aviation + CORSIA for outbound. The EU ETS will be retained for all intra EEA flights, in line with its current application. Also the Swiss ETS is linked to the EU ETS in line with the current linking agreement. CORSIA will apply to flights between EU/EFTA³ Member States and other participating ICAO Member States (outbound flights).

A number of variants to the main scenarios are considered:

- a. Assume that for emissions, which are to be offset under CORSIA and which are subject to the EU2030 aviation emissions target, EUAs need to be surrendered. The rationale behind this is that international credits to be surrendered under CORSIA are expected to stem from countries outside of the EU and thus will not contribute to reaching the EU target. Also in the NDC the EU has stated that international credits cannot be used to reach the EU reduction target [1]. EUAs however represent reductions in the EU ETS stationary sectors and contribute to reaching the EU target.
- b. For flights to be covered by the EU ETS, retain the EU ETS for emissions between the EU ETS cap and the CORSIA baseline and CORSIA for emissions above the CORSIA baseline.

Variant (a) can be applied to both main scenarios. Variant (b) is only relevant in relation to the Retain EU ETS scenario. This implies 5 co-existence scenarios are considered in this study. A Specification of the scenarios is provided in table 1.

³ EFTA encompasses all non-EU countries which are included in the EEA (Norway, Iceland, Liechtenstein) plus Switzerland

Table 1. CORSIA and EU ETS co-existence scenarios for departing flights from EU airports.

	Scenario 1. CORSIA + EU ETS for domestic	Scenario 1a. CORSIA with use of EUAs + EU ETS for domestic	Scenario 2. Retain EU ETS for aviation + CORSIA for outbound	Scenario 2a. Retain EU ETS for aviation + CORSIA for outbound with use of EUAs	Scenario 2b. EU ETS and CORSIA for Intra EU/EFTA flights + CORSIA for outbound
EU ETS					
Coverage of departing flights from EU airports	Intra EU: domestic flights only	Intra EU: domestic flights only	Intra EU: domestic and international flights From EU airports to EFTA Members States*	Intra EU: domestic and international flights + Flights from EU airports to EFTA Members States*	Intra EU: domestic and international flights + Flights from EU airports to EFTA Members States*
Aviation cap	95% of 2004-2006 with LRF of 2.2% in 2021-2030 Cap to be adjusted in response to coverage of domestic flights only	95% of 2004-2006 with LRF of 2.2% in 2021-2030 Cap to be adjusted in response to coverage of domestic flights only	95% of 2004-2006 with LRF of 2.2% in 2021-2030	95% of 2004-2006 with LRF of 2.2% in 2021-2030	95% of 2004-2006 with LRF of 2.2% in 2021-2030
Use of emission reduction units	EUAs for emissions above EU ETS cap	EUAs for emissions above EU ETS cap	EUAs for emissions above EU ETS cap	EUAs for emissions above cap for covered flights	EUAs for emissions above EU ETS cap which are not covered by international credits
CORSIA					
Coverage of departing flights from EU airports	International flights departing from EU airports to airports in ICAO Member States participating in CORSIA	International flights departing from EU airports to airports in ICAO Member States participating in CORSIA	International flights departing from EU airports to airports in ICAO Member States participating in CORSIA (except for flights covered by EU ETS)	International flights departing from EU airports to airports in ICAO Member States participating in CORSIA (except for flights covered by EU ETS)	International flights departing from EU airports to airports in ICAO Member States participating in CORSIA
Baseline	Average of 2019-2020 baseline emission level	Average of 2019-2020 baseline emission level	Average of 2019-2020 baseline emission level	Average of 2019-2020 baseline emission level	Average of 2019-2020 baseline emission level
Use of emission reduction units	International credits	EUAs for covered flights departing from EU airports	International credits	EUAs for covered flights departing from EU airports	International credits

* EFTA Member States: Norway, Iceland, Liechtenstein and Switzerland.

In relation to the coverage of flights the focus in table 1 is on departing flights from EU airports because these flights are relevant in relation the EU2030 aviation emissions target. Furthermore it is assumed that the EU ETS aviation cap will be adjusted on the basis of the linear reduction factor (LRF) of 2.2% per year which will be applied to the EU ETS in the period 2021-2030 [8].

Finally the study has looked at the EU ETS coverage of flights in relation to outermost regions.

4. Aviation emissions baseline for 2030

In 2016 ICAO published an aviation demand growth forecast for the coming decades [10]. The ICAO demand forecast considers 59 global route groups for which a forecast is made in terms of the growth in passenger km and cargo tonne-km. The forecast for Intra EU flights (both domestic and international) shows an annual demand increase of 2.5% for passenger demand up to 2030. For EU departing flights with destinations outside the EU, the annual passenger demand growth varies between route group, with an average demand growth of 3.2% per year.

The demand growth forecast is included in the emission growth forecast for 2030, on the basis of which baseline CO₂ emissions on flights departing from the EU for 2030 are computed with the AERO-MS⁴. The ICAO baseline forecast as implemented in the AERO-MS assumes an improvement of the fuel burn characteristics of new aircraft entering the fleet up to 2030. Also, in line with ICAO specifications, it is assumed load factors will go up over time. As a result, the fuel-efficiency per RTK will improve by 1.0% to 1.5% per year, depending on the route. The expected technology improvements and higher load factors are insufficient to stop the growth in CO₂ emissions on flights departing from the EU.

The forecast of emissions for all EU departing flights for the year 2030 is presented in table 2. A distinction is made between flights with a destination in EU/EFTA Member States (these will be subject to the EU ETS in the retain EU ETS), and flights with a destination outside the EU/EFTA.

CO₂ emissions in 2030 are forecast to have grown to 73.8 Mt for EU departing flights with a destination in the EU/EFTA, and to 137.9 Mt for flights with destinations outside the EU/EFTA. Table 1 also includes CO₂ emissions for the latest year - 2016 - for which registered emission data are available, and the resulting annual growth rates of CO₂ emissions for the period 2016-2030.

⁴ The IPR for the AERO-MS is with EASA. Information regarding the model can be found on: <https://www.easa.europa.eu/easa-and-you/environment/impact-assessment-tools>

Table 2. CO₂ emissions in 2016 and 2030 on flights departing from the EU.

	CO ₂ emissions in 2016 (Mt)	CO ₂ emissions in 2030 (Mt)	Annual growth rate
EU departing flights - destination in EU/EFTA ⁵	60.1	73.8	1.5%
EU Departing flights - destination outside EU/EFTA	103.9	137.9	2.0%
All EU departing flights ⁶	164.0	211.8	1.8%

Source: EU ETS Union Registry and UNFCCC (data for 2016) and AERO-MS (2030 computational results)

5. Emission reduction of CORSIA and EU ETS in relation to aviation emission target

For the 5 CORSIA and EU ETS co-existence scenarios the number of EUAs and international credits to be surrendered in 2030 in relation to EU departing flights has been assessed.

In scenario 1 (CORSIA + EU ETS for domestic) the demand for EUAs only relates to domestic flights in EU Member States. In order to estimate the adjusted EU ETS cap, we have taken UNFCCC data for the years 2004-2006 for domestic aviation emissions in EU Member States [3]. Taking 95% of the average across the 3 years, and taking into account the LRF of 2.2% for the period 2021-2030, the EU ETS cap for domestic aviation only in 2030 is estimated at 14.6 Mt. This will lead to a demand for EUAs for domestic aviation of 4.7 Mt in 2030 (see table 1).

For international flights departing from the EU the demand for international credits is computed in case of scenario 1. According to the CORSIA resolution in 2030 the offset requirement is based 80% on the sectoral growth rate and 20% on an aircraft operator's individual growth rate [12]. The individual rate for European aircraft operators is generally lower compared to the sectoral rate. For EU departing flights with destinations in EU/EFTA by 2030 about 27% of emissions will need to be offset under CORSIA. For EU departing flights with destinations outside EU/EFTA the offset percentage is about 24%. This percentage is lower because only EU departing flights to ICAO Member States which will participate in CORSIA by 2030 will be subject to offset requirements. It is estimated that 85% of the 2030 emissions on EU departing flights with destinations outside the EU/EFTA (total of 137.9 Mt - see table 3) will be related to flight with a destination in ICAO Member States which are expected to have joined CORSIA by 2030. Across all international flights departing from the EU, the offset percentage is estimated to be 25% by 2030. This implies a demand for international credits of 47.5 Mt to cover the CORSIA related offset requirements for all international flights departing from the EU (see scenario 1 in table 3).

⁵ Data for 2016 are reported in the EU ETS Union Registry [11]

⁶ Data for 2016 are reported by UNFCCC [4]

Table 3. Demand for EUAs and international credits in 2030 for co-existence scenarios.

Scenario	EUAs (Mt)	International credits (Mt)
1. CORSIA + EU ETS for domestic	4.7	47.5
1a. CORSIA with use of EUAs + EU ETS for domestic	52.2	0.0
2. Retain EU ETS for aviation + CORSIA for outbound	45.3	32.9
2a. Retain EU ETS for aviation + CORSIA for outbound with use of EUAs	78.2	0.0
2b. EU ETS and CORSIA for Intra EU/EFTA flights + CORSIA for outbound	30.7	47.5

Note: The numbers relate to EU departing flights only.

Source: AERO-MS

If for scenario 1, instead of international credits, EUAs would have to be surrendered for flights departing from EU Member States which are subject to the CORSIA, the demand for EUAs would be 52.2 Mt (see scenario 1a. in table 3).

For the Retain EU ETS for aviation scenario (scenario 2), the EU ETS cap for EU departing flights with a destination in the EU/EFTA will be 28.5 Mt⁷ in 2030, whereby the LRF of 2.2% per year over the period 2021-2030 has been taken into account. Aviation emissions for these flights in 2030 are estimated to 73.8 Mt in 2030 (see table 2). The difference between these emissions and the cap needs to be covered by EUAs (45.3 Mt - see table 3). For flights with destinations outside the EU/EFTA (in so far as these are to ICAO Member States participating in CORSIA) international credits need to be surrendered in the Retain EU ETS scenario (32.9 Mt). If the requirement would be that EUAs rather than international credits have to be surrendered, then the total demand for EUAs would rise to 78.2 Mt (see scenario 2a in table 3).

In the final scenario the demand for EUAs from the EU ETS relates to the emissions above the EU ETS cap in so far as these emissions are not covered by the CORSIA related international credits. In this scenario the demand for EUAs in 2030 is 30.7 Mt and the demand for international credits is 47.5 Mt.

The EU ETS coverage of flights in relation to outermost regions has also been looked at. The EU has nine outermost regions [9]⁸. Currently only flights between airports located in the same outermost region are covered by the EU ETS. Flights between the outermost regions and main-land of EU Member States are excluded. The coverage of emissions from the aviation sector in the EU ETS is estimated to rise by about 7% if flights between EU Member States and outermost regions would also be included.

⁷ The overall EU ETS cap for aviation in 2030 will be somewhat higher because flights departing from Norway, Iceland and Liechtenstein (with a destination in the EU/EFTA) will also be subject to the EU ETS.

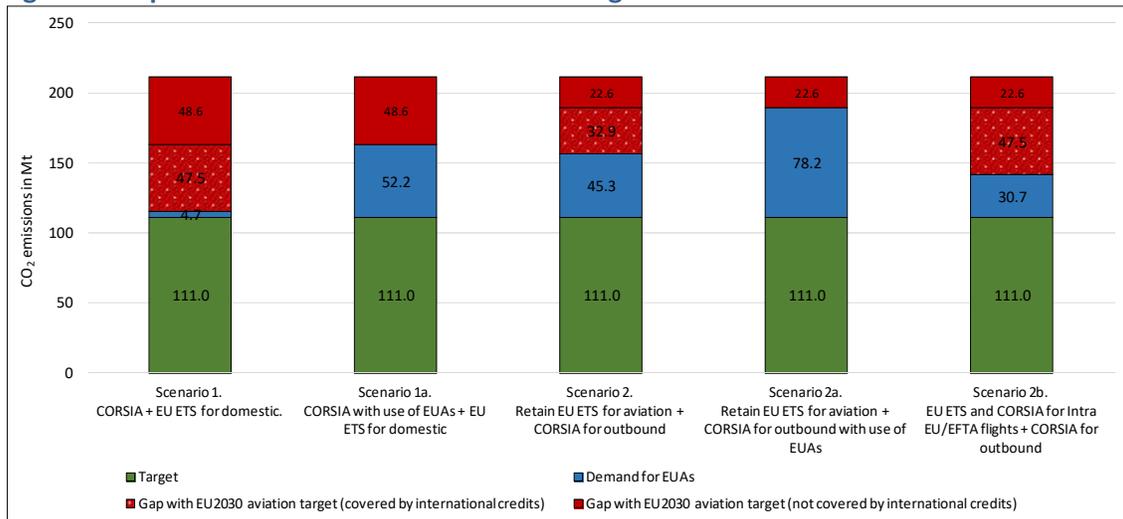
⁸ Canary Islands (ES), French Guiana, Guadeloupe, Martinique, Mayotte, Réunion and Saint-Martin (FR) and Azores and Madeira (PT).

For all 5 scenarios the gap with the EU2030 aviation emissions target is provided in figure 1. For the scenarios the figure divides the total of 211.8 Mt of CO₂ emissions in 2030 into the emissions under the target (111 Mt), the emissions reduction brought about by the demand for EUAs and the remaining gap. As stated in chapter 3 international credits will not contribute to reaching the EU target. In figure 1 the gap with the target is split between a part for which international credits are surrendered and a part for which no international credits are surrendered.

The figure shows that scenario 1 very limitedly contribute to reaching the EU2030 aviation target. The gap in case of the retain EU ETS scenario (scenario 2) is significantly lower compared to scenario 1, but still there is a gap of 55.5 Mt (of which 32.9 Mt is covered by international credits). The gap is smallest in the case of scenario 2a whereby the EU ETS is retained and the requirement under CORSIA is to surrender EUAs for EU departing flights. In relation to both scenario 1a and 2a a remark is that the requirement to surrender EUAs would also apply for the EU departing flights operated by airlines from outside the EU/EFTA. Hereby international agreement would need to be reached with countries from outside the EU/EFTA that the requirement to surrender EUAs is also applicable to airlines which are based outside the EU/EFTA.

Overall the conclusion is that retaining the EU ETS for domestic and intra-EEA flights will contribute most to reducing the gap between the baseline emissions and the emissions target for 2030. Also the use of EUAs in CORSIA will contribute to reduce the gap. However, if both retaining the EU ETS and using EUAs in CORSIA were to occur (scenario 2a), there is still a gap of 22.6 Mt and hence further policy measures would be required to reach the EU2030 aviation emissions target.

Figure 1. Gap with EU2030 aviation emissions target for co-existence scenarios.



Source: AERO-MS

A scenario which by definition will reach the target is to have all EU departing flights covered by the EU ETS. This does not require a return to the full original scope of the EU ETS because the original scope also included all EU arriving flights. In combination with CORSIA the scenario would be:

- EU ETS coverage of all EU departing flights whereby airlines have to surrender EUAs for the emissions above the EU ETS cap (95% of 2004-2006 with LRF). For the EU departing flights which are also covered by CORSIA, the requirement under the EU ETS would be to surrender EUAs for emissions above the EU ETS cap but below the CORSIA baseline.
- For emissions on EU departing flights which are subject to offset requirements under CORSIA, EUAs need to be surrendered. So these flights will formally be subject to two regimes (CORSIA and EU ETS) but under both regimes EUAs are required to be surrendered.

In order to realise the above scenario, the EU and its Member States would have to set additional requirements to EU departing flights compared to the CORSIA requirements. The additional requirements relate to:

1. Apply the EU ETS cap to EU departing flights which are also covered by CORSIA; and
2. Set additional requirements to the eligible units for EU departing flights to be surrendered under CORSIA (EUAs instead of international credits); and
3. Apply the EU ETS to the international flights departing from the EU which are not covered by CORSIA. In 2030 this will be to the flights from the EU to ICAO Member States which are exempted from CORSIA in the mandatory phase 2.

A key issue is that the additional requirements would also apply for the EU departing flights operated by airlines from outside the EU/EFTA, and it will be a challenge to get agreement with countries from outside the EU/EFTA on the additional requirements. Also the price of EUAs recently has increased to about €20, and a recent report forecast the price to reach €40 by the end of 2020 [13]. In case the price of EUAs will be significantly higher compared to the price of international credits, to get agreement on the additional requirements will even be harder because of the implied higher cost impact resulting from the requirement to surrender EUAs.

4. Summary and conclusions

The study and its main conclusions are summarized below.

1. In 2012 aviation was brought into the EU's emission trading system (EU ETS). Currently all flights between and within EEA Member States are subject to the EU ETS. During the ICAO Assembly in October 2016 it was agreed to implement a global Market Based Measure, which is referred to as CORSIA. CORSIA requires airlines to offset their emissions of international aviation above the baseline level and will start in 2021. It is presently unknown how and if the EU ETS will be adjusted if as planned the CORSIA is in force from 2021 onwards. Therefore this paper considers a number of alternative CORSIA and EU ETS co-existence scenarios.
2. The main research question of this study is to what extent alternative CORSIA and EU ETS co-existence scenarios could contribute to meeting the EU 2030 aviation emission target.

3. For 2030 the overall reduction target of the EU is to achieve a 40% GHG emissions reduction relative to 1990. As part of this, the EC has set the target for aviation, including all flights departing from EU airports, to 111 Mt of CO₂. Total aviation emissions in 1990 reported to the UNFCCC by the EU Member States countries were 83.9 Mt. A reduction of 40% relative to 1990 would imply a level of about 50 Mt of aviation CO₂ emissions. The aviation target of 111 Mt is, however, in fact over twice as high. This implies that in order to reach the overall EU target of a 40% reduction relative to the year 1990, other economic sectors have to reduce more emissions to compensate for the aviation target being above the -40% compared to 1990 level of emissions.
4. Without emission reduction policy measures, aviation emissions on all flights departing from the EU are forecast to grow to 211.8 Mt in 2030. Hence an emission reduction of about 100 Mt in 2030 has to be brought about by policy measures in order to meet the target of 111 Mt.
5. This study considers the following CORSIA and EU ETS co-existence scenarios:
 1. CORSIA + EU ETS for domestic.
 - 1a. CORSIA with use of EUAs + EU ETS for domestic.
 2. Retain EU ETS for aviation + CORSIA for outbound.
 - 2a. Retain EU ETS for aviation + CORSIA for outbound with use of EUAs.
 - 2b. EU ETS and CORSIA for Intra EU/EFTA flights + CORSIA for outbound.
6. Scenarios 1a and 2a, with the use of EUAs in CORSIA instead of international credits are considered because international credits are expected to stem from countries outside the EU and thus will not contribute to reaching the EU target. EUAs however represent reductions in other EU ETS sectors and contribute to reaching the EU target.
7. In the scenario CORSIA + EU ETS for domestic the demand for EUAs only relates to domestic flights in EU Member States, and therefore this scenario very limitedly contribute to reaching the EU2030 aviation target. Retaining the EU ETS will contribute to reduce the gap between the forecasted emission and the emissions target for 2030. Also the use of EUAs in CORSIA will contribute to reduce the gap. However, if would both be done (as in scenario 2a), there is still a gap of 22.6 Mt and hence further policy measures are to be put in place in order to reach the EU2030 aviation emissions target.
8. A scenario which by definition will reach the target is to have all EU departing flights covered by the EU ETS. This would mean that EU and its Member States would set additional requirements to EU departing flights compared to the CORSIA requirements. A key issues is that the additional requirements would also apply for the EU departing flights operated by airlines from outside the EU/EFTA, and it will be a challenge to get agreement with countries from outside the EU/EFTA on the additional requirements.

9. References

- [1] EU, 2015. Intended Nationally Determined Contribution of the EU and its Member States. Submission by Latvia and the European Commission on behalf of the European Union and its Member States. Riga, 6 March 2015.
https://ec.europa.eu/clima/sites/clima/files/docs/2015030601_eu_indc_en.pdf
- [2] Council of the European Union, 2017. Non-ETS (ESR): WPE 2 March – Commission presentation on 2030 GHG emission reduction target (WK 2310/2017 INIT. Brussels, 01 March 2017.
https://www.transportenvironment.org/sites/te/files/WK_2310_2017_INIT_2.pdf
- [3] UNFCCC, 2018. United Nations Framework Convention on Climate Change. Greenhouse Gas Inventory Data - Detailed data by Party.
http://di.unfccc.int/detailed_data_by_party
- [4] ICAO, 2018. Updated information on the States that intend to voluntarily participate in CORSIA from its outset.
<https://www.icao.int/environmental-protection/CORSIA/Pages/state-pairs.aspx>
- [5] ICAO, 2016. Civil Aviation: 2014 International Scheduled Revenue Tonne-Kilometres (RTK) by State of Air Operator Certificate (AOC).
<https://www.icao.int/Meetings/GLADs-2016/Documents/RTK.pdf>
- [6] EU, 2017. Agreement between the European Union and the Swiss Confederation on the linking of their greenhouse gas emissions trading systems (OJ L322/3, 7/12/2017).
[https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22017A1207\(01\)&from=EN](https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:22017A1207(01)&from=EN)
- [7] HM Government, 2018. The future relationship between the United Kingdom and the European Union. Presented to Parliament by the Prime Minister by Command of Her Majesty. CM9593. July 2018.
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/725288/The_future_relationship_between_the_United_Kingdom_and_the_European_Union.pdf
- [8] EC, 2017. Regulation (EU) 2017/2392 of the European Parliament and of the Council amending Directive 2003/87/EC to continue current limitations of scope for aviation activities and to prepare to implement a global market-based measure from 2021. 13 December 2017. (OJ L350/7, 29/12/2017)
<https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32017R2392&from=EN>
- [9] EC, 2014. Frequently Asked Questions. 2013-2016 Regulation amending the EU Emissions Trading System for aviation.
https://ec.europa.eu/clima/sites/clima/files/transport/aviation/docs/faq_aviation_2013-2016_en.pdf

- [10] ICAO, 2016. ICAO Long-Term Traffic Forecasts, Passenger and Cargo. July 2016. International Civil Aviation Organization.
<https://www.icao.int/Meetings/aviationdataseminar/Documents/ICAO-Long-Term-Traffic-Forecasts-July-2016.pdf>
- [11] EC, 2018. EU ETS Union Registry.
https://ec.europa.eu/clima/policies/ets/registry_en#tab-0-1
- [12] ICAO, 2016. Resolution A39-3: Consolidated statement of continuing ICAO policies and practices related to environmental protection – Global Market-based Measure (MBM) scheme
https://www.icao.int/environmental-protection/Documents/Resolution_A39_3.pdf
- [13] Carbon Tracker, 2018. Carbon Countdown. Prices and Politics in the EU-ETS. Mark C. Lewis August 2018.
<https://www.carbontracker.org/reports/carbon-countdown/>