How can the environmental effect of the ETS for aviation be kept constant, despite changes in scope?

Research note
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Author(s):
Marisa Korteland
Jasper Faber

1 Introduction

1.1 Background

Since the beginning of 2012, emissions from international aviation are included in the EU Emissions Trading System (EU ETS), with the aim to reduce aviation CO_2 emissions at low economic costs. The directive covers all emissions of flights arriving at or departing from EEA airports. However, in order to promote momentum at a global level, the Commission now proposes to limit scope of the EU ETS in proportion to the distance flown within the EEA. This so-called 'hybrid' option means that the EU ETS would continue to fully cover all emissions from flights within the EEA. Coverage of emissions from flights to and from 3rd countries would be limited in proportion to the distance flown within the EEA. Depending on how the sea boundaries of the EEA are defined, this is expected to lead to reduced emissions coverage of 39 to 47% compared to the full-scope EU ETS (EC, 2013). Subsequently, implementation of the 'hybrid' option would lead to a lower reduction in CO_2 emissions. Environmental NGOs have proposed to share the responsibility for emissions coverage for departing and arriving flights by 50/50 between the State of arrival and the State of departure. This scenario is known as the '50/50'option.

T&E is interested in a scenario that ensures the same impact in CO_2 emissions as the original proposal. One way of achieving this is lowering the hybrid 12nm cap[1] so that carriers under it are required to purchase the same amount of credits from other sectors/market as they would have had to under the original, full-scope EU ETS system in 2012. T&E asked CE Delft to calculate what size the hybrid cap needs to be in order to achieve this. Two scenarios are relevant here:

1. The Hybrid 12mn scope is in place from 2013 up to 2020 (8 year period).
2. The Hybrid 12mn scope is implemented up to 2017 (4 year period), after which an 50/50 approach is chosen (4 year period).

Paragraph 1.2 covers key figures that are used in the analysis, after which cap estimates for the two scenarios are provided in Paragraph 1.3 and 1.4 respectively. Finally, results are summarized in Paragraph 1.5.

1.2 Key figures

Some key figures of the current, full-scope EU ETS system are needed for the analysis. The period of concern is phase three, i.e. 2013 until 2020.
The information we used is (EC, 2013):

- The total number of allowances in the system (cap) is 210 MT per annum per 2013. For matter of simplicity, we ignore the fact that the cap will be adjusted to include additional aviation activities arising from Croatia's full integration into the aviation part of the EU ETS on 1 January 2014.
- The aviation sector is expected to be short of 20 to 30 million allowances in 2013 under the full-scope EU ETS.
- Total emissions in the original scope of the EU ETS are projected to amount to 340 Mt CO_2 in 2020.
- Total emissions in the hybrid 12nm scope are projected to amount to 132 Mt CO_2 in 2020.
- Total emissions in the 50/50 scenario are estimated to be 213 Mt CO_2 in 2020.

[1] This is the territorial sea boundary of EEA area in terms of nautical miles (nm). The 12nm scenario is chosen in this note.

Table 1 **Coverage of emissions in 2020 under the Hybrid 12nm and 50/50 scenarios compared to full-scope EU ETS**

Departure/arrival region	Percentage of emissions covered (%) Hybrid 12mn	Percentage of emissions covered (%) 50/50
EEA	100.0	100
Africa	22.5	50.1
Europe (non-EEA)	54.4	49.4
Far East	14.8	51.1
Middle America	7.0	49.4
Middle East	31.0	50.0
North America	9.0	48.1
South America	7.8	49.0
Total	**38.5**	**62.4**

Source: EC (2013).

EC (2013) quantitatively assessed the impact that implementation of the hybrid option would have, also based on AEROMS. The main results are:

- 38.5% of emissions would be covered under this system, *ceteris paribus*, as shown in Table 1;
- accordingly, the total number of allowances in the system would be reduced to nearly 81 Mt per annum;
- there will be a relative decrease in demand for EU allowances and international credits (= emissions over cap) in line with the reduced coverage.

For the 50/50 option, the estimated results are:

- 62.4% of emissions would be covered under this system, *ceteris paribus*, as shown in Table 1;
- accordingly, the total number of allowances in the system would be reduced to 131 Mt per annum;
- there will be a relative decrease in demand for EU allowances and international credits (=emissions over cap) in line with the reduced coverage.

1.3 What would the hybrid cap need to be in order to achieve the same environmental results?

We have interpreted the requirement to achieve the same environmental benefits to imply that an equal amount of aviation emissions would need to be reduced through the purchase of allowances from the EU ETS in the period 2013–2020 (8 years).

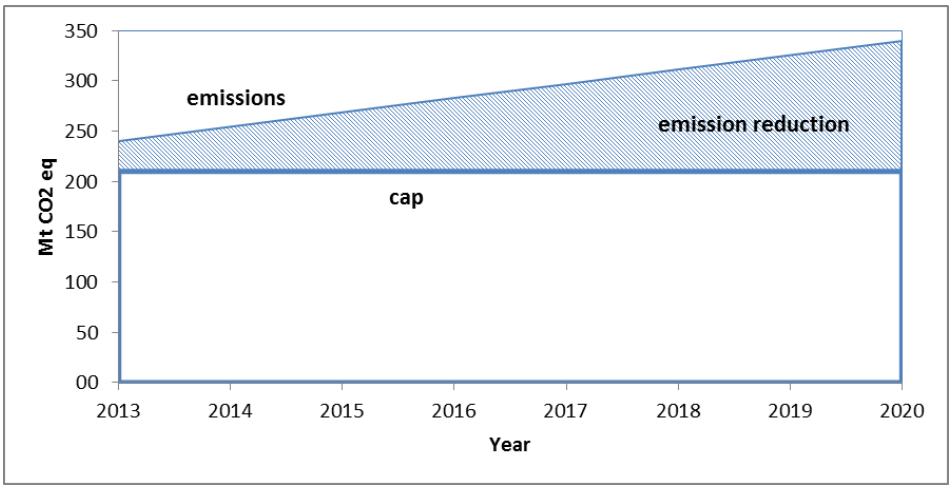
We have assumed that the shortfall in 2013 of 20–30 Mt in 2013 in the scope of the current directive will be proportionally lower in the hybrid 12nm scheme.

Based on the data summed in Paragraph 1.2, we will calculate the required reduction in the cap in order to maintain the original demand for EU allowances and international credits. Both the high and low emission scenario will be analysed.

The analysis contains two steps.

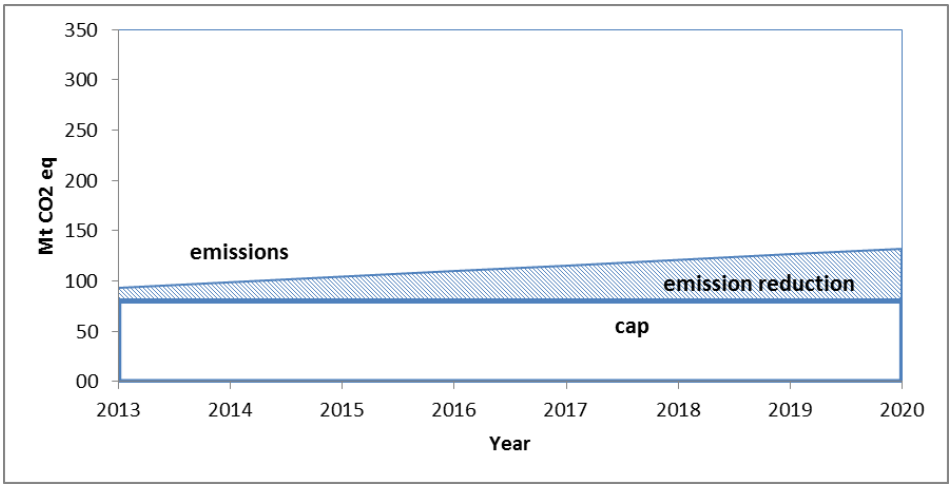
1. Determine the total emissions over cap for the period 2013 until 2020, under:
   - The original EU ETS scheme. This equals the demand for general EU allowances and international credits. As can be derived from Figure 1, total demand will be 600-640 Mt in the period 2013-2020. The goal is to maintain this demand under the hybrid scenario.
   - Implementation of the hybrid 12nm cap. We find that total demand for EU allowances and international credits will reduce to 180-190 Mt, also see Figure 1.
2. Determine how much the cap would need to change so that total demand equals 600-640 Mt in the same period.

Figure 1 **Demand for EU allowances and international credits in phase three: original scope**



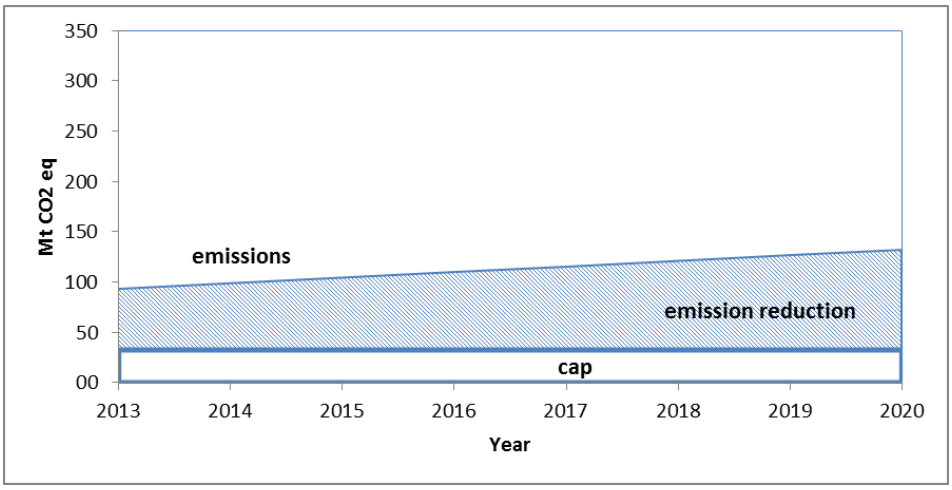
Note: The graph is based on the high growth scenarios with a 30 Mt shortfall of emissions in 2013. Other assumptions (low growth, lower shortfall) would change the figure but not the analysis.

Figure 2 **Demand for EU allowances and international credits in phase three: hybrid 12nm scope**



Note: The graph is based on the high growth scenarios with a 30 Mt shortfall of emissions in 2013. Other assumptions (low growth, lower shortfall) would change the figure but not the analysis.

Figure 3 A lower cap in the hybrid 12nm ETS yields the same environmental benefits as the full-scope ETS



In a low emissions scenario, the cap would need to change as well. Table 2 shows what cap would be needed under the different scenario to keep the environmental results the same.

Table 2 Caps required to achieve the same environmental result as the full-scope ETS: hybrid 12nm

Type of scheme	Low emission scenario		High emission scenario	
	Cap (Mt CO_2 eq)	Emission reductions (Mt CO_2 eq)	Cap (Mt CO_2 eq)	Emission reductions (Mt CO_2 eq)
Full-scope EU ETS	210	228-268	210	600-640
Proposed hybrid 12nm cap	80 (95% of 2004-2006 emissions)	89-105	80 (95% of 2004-2006 emissions)	244-259
Lower cap hybrid 12nm*	60-63 (71%-75% of 2004-2006 emissions)	228-268	32-36 (38%-43% of 2004-2006 emissions)	600-640

Source: Calculation by CE Delft, data EC (2013).

Note: * Estimation of cap that is required to maintain original demand for EU allowances and international credits.

1.4 How could the cap be adjusted if the scope would change?

This section analyses how the cap could be adjusted if the scope would change within the next trading period. We provide here the example of a change to a 50/50 scope in which 50% of emissions on all incoming flights and 50% of emissions on all outgoing flights would be included in the EU ETS from 2017 onwards. A reason for such a change in scope could be that ICAO doesn't progress as much as currently anticipated in its development of a global system.

A change in scope would increase the amount of emissions in the system. In order to keep the environmental benefits constant, the cap would need to be increased as well.

Figure 4 A change in the geographical scope requires a change in the cap in order to keep the environmental benefits constant

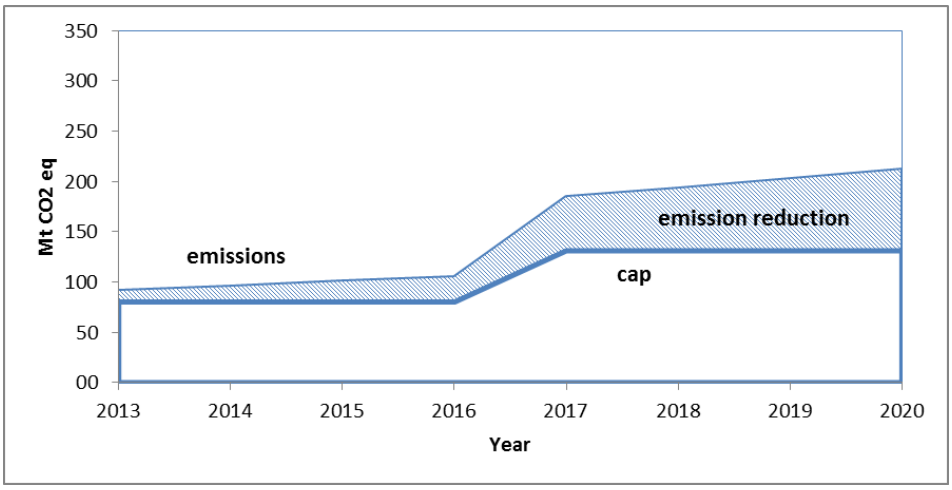


Table 3 provides the quantitative results for the different emission scenarios.

Table 3 Caps required to achieve the same environmental result as the full-scope ETS: 50/50 scope

Type of scheme	Low emission scenario		High emission scenario	
	Cap (Mt CO_2 eq)	Demand (Mt CO_2 eq)	Cap (Mt CO_2 eq)	Demand (Mt CO_2 eq)
Full-scope EU ETS	210	228-268	210	600-640
Combination: 2013-2016: hybrid 2017-2020: 50/50	2013-2016: 80 2017-2020:131	121-136	2013-2016: 80 2017-2020:131	334-350
Lower cap combi*: 2013-2016: hybrid 2017-2020: 50/50	2013-2016: 59,6-62,7 2017-2020: 118,6-120,5	228-268	2013-2016: 32,4- 35,5 2017-2020:100,1-103,4	600-640

Source: Calculation by CE Delft, data EC (2013).

Note: * Estimation of cap that is required to maintain original demand for EU allowances and international credits.

1.5 Summary

In order to reduce aviation emissions by the same amount in the hybrid 12nm scope as in the original scope of the EU ETS in the period up to 2020, the cap would have to be lowered. Depending on the emission projections, the cap would need to be reduced from 80 Mt to approximately 35 Mt (when emissions grow fast) or 70 Mt (when emissions grow slowly).

When the scope of the ETS would be changed to include half of the emissions on intercontinental arriving and departing flights, the cap could be increased to ensure a constant environmental effect.

1.6 References

European Commission, 2013
Impact Assessment
Accompanying the document Proposal for a Directive of the European Parliament and of the Council amending Directive 2003/87/EC establishing a scheme for greenhouse gas emission allowances trading within the Community, in view of the implementation by 2020 of an international agreement applying a single global market-based measure to international aviation emissions
Commission Staff Working Document, SWD (2013) 430 final
Brussels : European Commission, 2013