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INCLUDING INTERNATIONAL AVIATION IN THE EUROPEAN UNION EMISSIONS TRADING SCHEME: A FIRST STEP TOWARDS A GLOBAL SCHEME?

Emilie Alberola[1] and Boris Solier[2]

CO_2 emissions from international aviation, which accounted for 2% of global emissions in 2009, are not currently capped by any international agreement. In October 2010, the International Civil Aviation Organisation (ICAO) nonetheless adopted a resolution that provides for the stabilisation of CO_2 emissions from international aviation from 2020 onwards, through an annual 2% improvement in aviation fuel yields up until 2050, and the implementation of a standard on CO_2 emissions from aircraft engines, which is expected to be defined in 2013.

The inclusion of the aviation sector in the European Union Emissions Trading Scheme (EU ETS) from January 1st 2012 onwards represents a first step towards the implementation of emission reduction regulations based on an emissions trading scheme. After the gradual extension of the scope of the EU ETS to new countries since 2005, the European Commission is now assimilating around 5,400 airlines that operate in Europe, two-thirds of which are non-European, into the EU ETS to join the energy generation and manufacturing industries.

This European Union's decision assigns quantified CO_2 emission reduction targets to airlines: a 3% reduction in 2012 compared with average CO_2 emissions for the sector between 2004 and 2006, then a 5% reduction between 2013 and 2020.

At short term, the inclusion of the aviation sector in the EU ETS should have an impact on the scheme. Indeed, the aviation sector is expected to represent a new source of demand for allowances. Based on the assumption of an average 2.5% increase in annual emissions between 2012 and 2014, and then of an increase of 2% over the period between 2015 and 2020, airlines would create a shortfall of 382 $MtCO_2$ between 2012 and 2020. The limited use of Kyoto credits to help them comply offers a maximum import potential of almost 65 $MtCO_2$ between 2012 and 2020;

This inclusion is a test of the EU's proactive policy, which involves encouraging other countries to define their own climate policy, without breaching international law, as confirmed by the Court of Justice of the European Union in December 2011. In view of criteria to be defined by the European Union, the potential exemption of airline operators from emitter countries that introduce equivalent regulations would be a success for the European policy. For the time being, the reaction of some countries, like the United States and China, is more focused on opposing the unilateral and extra-territorial nature of the scheme, and its breach of the UNFCCC's "Common but Differentiated Responsibility" principle;

Finally, this sector-based extension is a useful experiment that will feed into the ICAO's discussions regarding the introduction of a global system to regulate emissions via an allowance trading scheme. This option is currently the subject of an ICAO feasibility study, which has not succeeded in establishing a common position among the various countries to date.

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INTRODUCTION

Since January 1st 2012, the aviation sector has been included in the European Union Emissions Trading Scheme (EU ETS), which represents the central tool for the European Union's greenhouse gas emission reduction policy between now and 2020 (Directive EC/2007/83). This inclusion, which was unilaterally decided by the EU, implies assigning quantified CO_2 emission reduction targets to European and foreign airlines that operate within the European Union. In total, around 5,300 airlines are involved. Aviation is now the second largest sector in the EU ETS after the combustion sector, and will receive around 210 million allowances, i.e. 10% of the EU ETS' global cap, every year.

The inclusion of the aviation sector in the EU ETS is the first world-wide attempt to regulate the sector's greenhouse gas emissions (GHG) through introducing an emission cap. The first international initiative aimed at regulating global GHG emissions, as drawn up by the Kyoto Protocol, which was signed in 1997 and entered into effect in 2008, exempted emissions from the international transportation sectors.

At the time, the Kyoto Protocol had charged the International Civil Aviation Organisation[1], a specialist United Nations agency, with putting forward a framework to regulate the aviation sector's international emissions[2]. The Protocol, which forces the Annex I countries to reduce their GHG emissions between 2008 and 2012, only covers domestic air transportation emissions in developed countries. Where the period beyond 2012 is concerned, the Durban Agreement, which was the outcome of the 17th Conference of the Parties to the UNFCCC in December 2011, decided to extend the Kyoto Protocol until 2017, or even 2020, and to define a new climate architecture involving all countries by 2015, which would enter into effect from 2020 onwards. Both these decisions confirmed the ICAO's scope of intervention in terms of regulating the international aviation sector's emissions.

The aim of this Climate Study is to examine the procedures for including the aviation sector in the EU ETS, and its economic consequences for participants in the European carbon market, on the one hand, and the prospects of political progress towards a tariff structure for the international aviation sector's CO_2 emissions via the ICAO, on the other.

The first section of this report sets out the institutional procedures for including the airline sector within the EU ETS, before estimating the compliance position of the aviation sector by 2020. The second section sets out the proceedings launched by countries and airlines against the inclusion of the aviation sector in the EU ETS, and draws up potential solutions for the dispute. Lastly, the third section discusses the actions taken by the ICAO to promote the introduction of a coordinated and proactive international climate policy aimed at reducing the sector's emissions from 2020 onwards, based on an emission trading scheme.

[1] The Civil Aviation Convention, which is also known as the Chicago Convention, set up the International Civil Aviation Organisation (ICAO), a specialist United Nations agency responsible for coordinating and regulating international air transportation. The Convention determines airspace rules, the rules for aircraft registration, and security, and specifies the rights and duties of the signatory countries in terms of airspace law in relation to international transportation. The Convention was signed by 52 countries in Chicago on December 7th 1944.

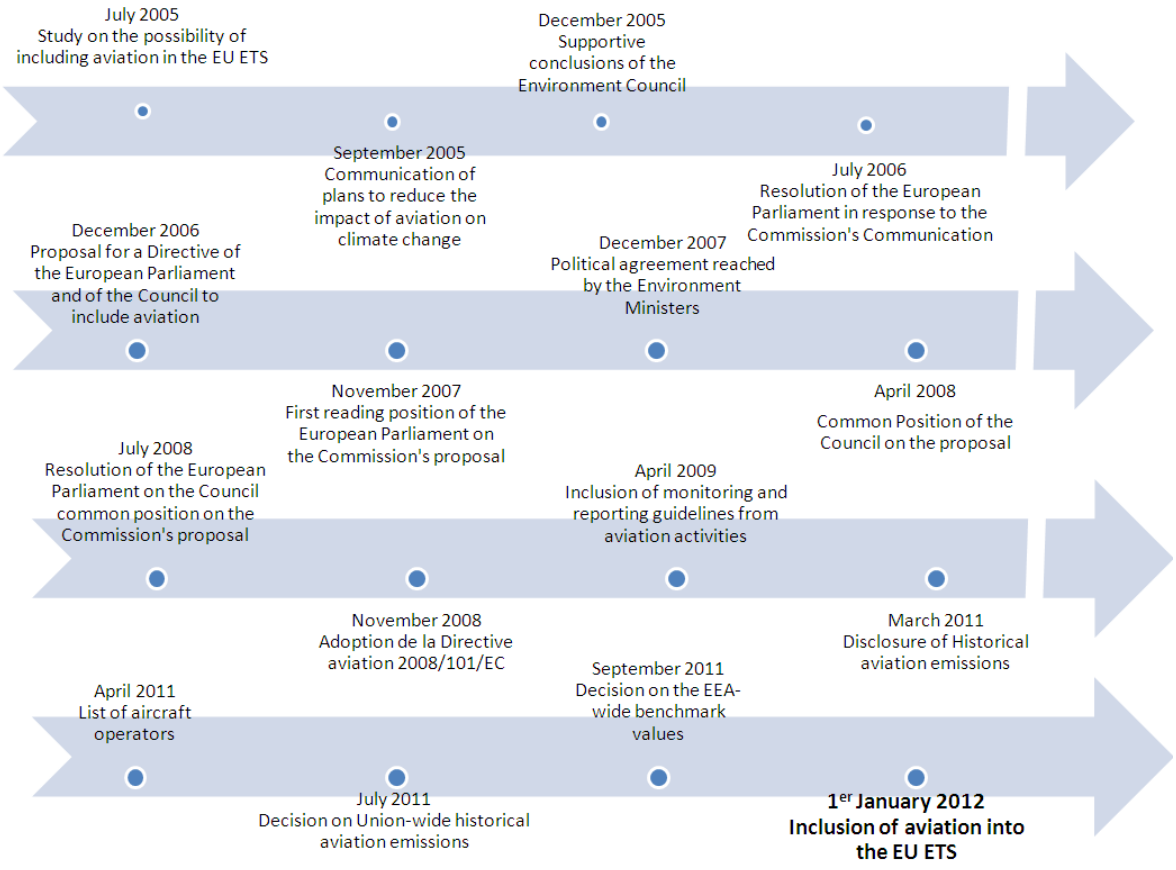
[2] The International Maritime Organisation (IMO) was granted the same remit for the maritime sector.

I. INTERNATIONAL AVIATION IN THE EUROPEAN UNION EMISSIONS TRADING SCHEME: A SEMI-OPEN EMISSIONS TRADING SCHEME

Starting with the observation that CO_2 emissions from the international airline sector account for around 2% of global CO_2 emissions, and around 13% of the transportation sector's emissions (IEA, 2010), the European Commission had been planning to involve the aviation sector in its communal CO_2 emission reduction policy since 2005. After a long period of proposals and discussions with the main players in the sector, the European Parliament and Council adopted Directive 2008/101/EC (amending Directive 2003/87/EC) on November 19th 2008. The aim of this Directive was to include the airline industry in the European Union Emissions Trading Scheme from January 1st 2012 onwards.

This unilateral decision taken by the European Union, which entered into effect in February 2009, resulted in the assigning of quantified CO_2 emission reduction targets to all European and foreign airlines operating in Europe. The aviation sector is therefore being asked to reduce its historical average emissions by 3% in 2012, and then by 5% over the period between 2013 and 2020. Given the increase in airline traffic, and the resulting increase in aviation-related CO_2 emissions, the implementation of a cap system for emissions from the airline sector will represent a substantial effort for the airlines involved.

Figure 1 – The legal process for including the aviation sector in the EU ETS



Source: CDC Climat Research, based on data from the European Commission

A. *The procedures for including the airline sector in the EU ETS*

The scope of the emissions trading scheme includes most international airline operators

The allowance system for the aviation sector covers all flights made by aircraft taking off from and/or landing at airports located in one of the 27 EU Member States. This scope of 27 Member States has been extended to two countries in the European Economic Area (EEA), namely Norway and Iceland – as Liechtenstein has no

airline operators. Croatia will join these 29 countries from January 1st 2014, due to its accession to membership of the EU, which is scheduled for July 1st 2013. Altogether, 30 countries will be covered by this aviation sector emission allowance cap-and-trade scheme.

The scope of the system has nonetheless been adapted, in order to reduce the scheme's operating costs. The following are therefore excluded:

- "Low emitters"[3], which operate less than 243 flights every four months on an annual basis or for those which total emissions are lower than 10,000 tonnes;
- Aircraft where the total weight is lower than 5,700 kg, or where total emissions amount to less than ten thousand tonnes of CO_2;
- Flights taken by third-party country government heads and by their ministers on official assignments, together with military flights, and rescue, humanitarian, medical emergency, and fire-fighting flights, etc.

In addition, the European Commission, in agreement with all the Member States, may exclude flights to the European Union from foreign countries that have introduced measures to reduce CO_2 emissions from airline traffic. This last point is key, as it introduces the option of an escape clause for countries that oppose the European Union's decision, on condition that these countries fulfil the assessment criteria that will be retained by the European Union in order to establish an equivalent CO_2 emission reduction target.

The European Commission published a list of the airline operators whose business activities have been included in the European scheme since 2012 in February 2009, 2010, and 2012[4]. The Commission will publish an updated list of the airlines concerned in February every year. In total, over 5,438 European and international airlines are covered by the European Union Emission Trading Scheme.

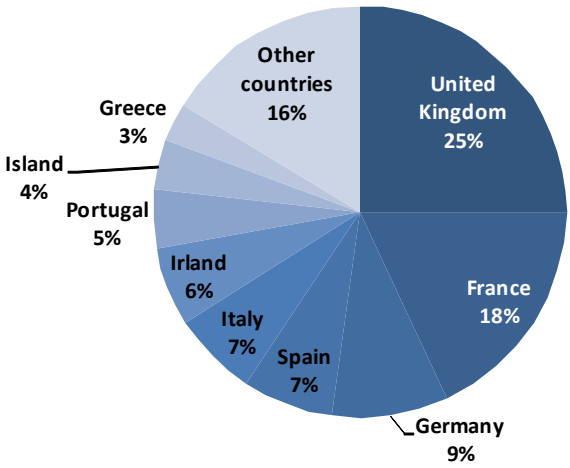
To manage their allocation, each airline operator is assigned a responsible Member State, which will take charge of allocating that airline's allowances and checking its emission reports. The responsible Member State is the European State that issued the operating license, for European airlines, and the Member State to which the largest portion of the airline's emissions can be assigned, for other airlines.

The main responsible Member States, in terms of the number of airlines managed, are the United Kingdom (1,065), France (788), Germany (400), and Spain (300), which account for over 60% of the airlines covered (see Figure 2).

[3] A low emitter is an air transportation operator (i) whose flights emit less than 10,000 tonnes of CO_2 per year overall, or (ii) who operates less than 243 flights per four-month period for four consecutive periods. A "low emitter" may benefit from simplified procedures to monitor the CO_2 emissions of their airline business. These procedures are set out in Section 4 of Appendix XIV of the Monitoring Decision, and involve the use of a calculation tool developed by EUROCONTROL, or of a similar tool developed by other organisations.

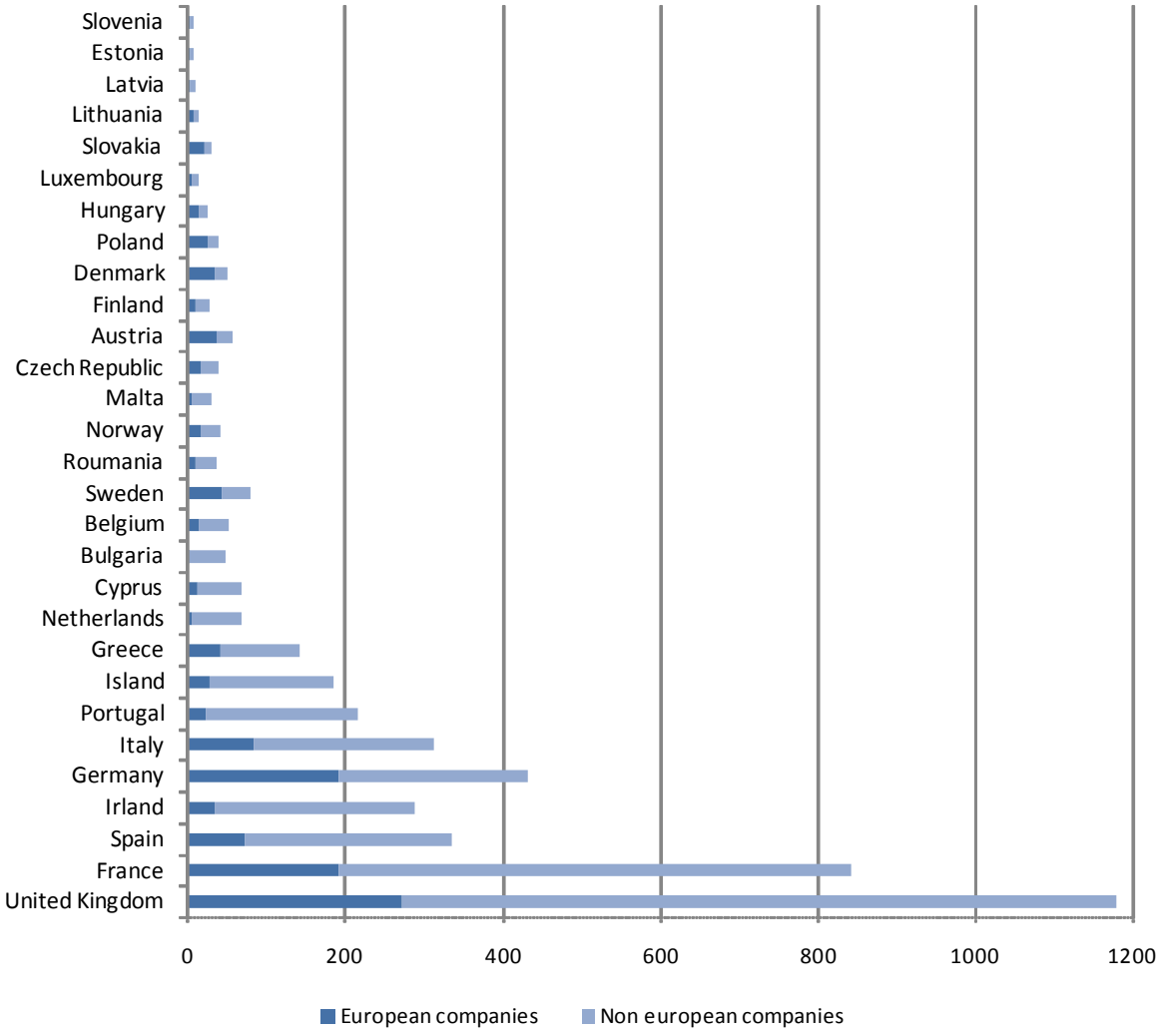
[4] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2012:039:0001:0132:FR:PDF

Figure 2 – Breakdown of European and international airlines by Member State responsible



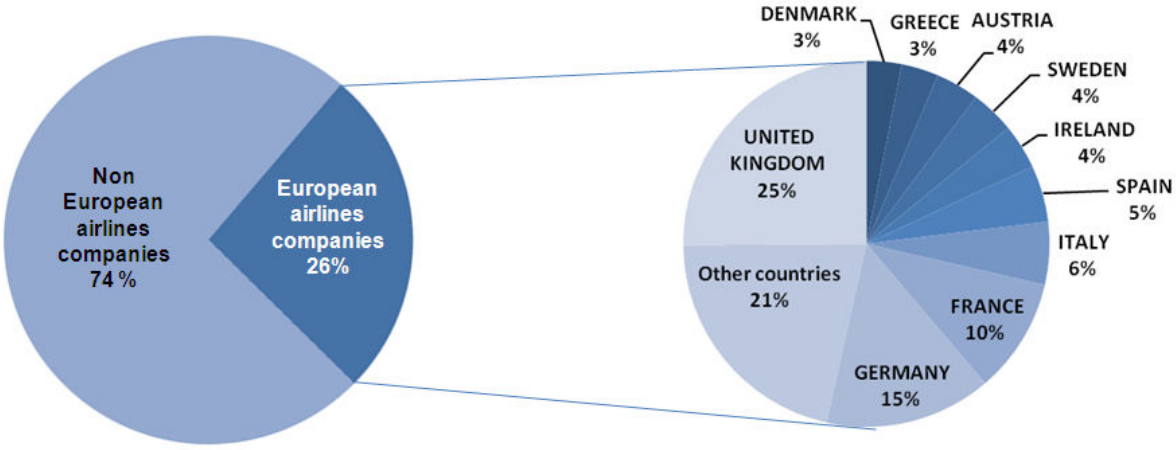
Source: CDC Climat Research, based on European Commission data, February 2012

Figure 3 – Breakdown of European and international airlines by responsible Member State



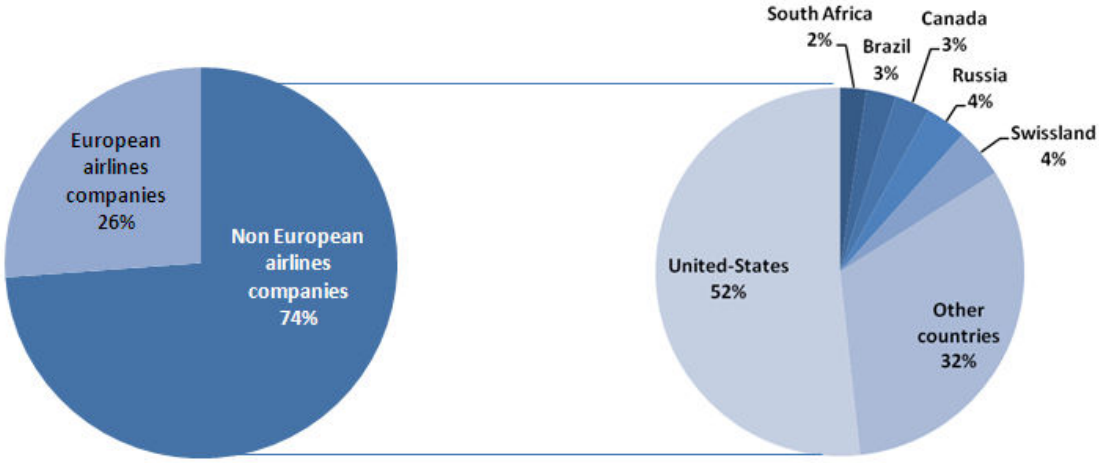
Source: CDC Climat Research, based on European Commission data, February 2012

Figure 4 – European airlines: breakdown according to country of origin



Source: CDC Climat Research, based on European Commission data, February 2012

Figure 5 – Non-European airlines: breakdown according to country of origin



Note: In terms of airlines companies, China, India and Brazil represent less than 1%. 34 Chinese companies, 49 Indian companies and 88 companies in Brazil are involved in the EU ETS.

Source: CDC Climat Research, based on European Commission data, February 2012

An allowance allocation that concentrates on European airlines

The amount of allowances to allocate is determined by the sector's historic CO_2 emissions, which correspond to the average annual emissions for 2004, 2005 and 2006. The European Commission has only used airlines' historical CO_2 emissions in order to determine the overall sector emission cap. It has then drawn up a benchmark to define the level of free allowance allocations for each airline.

The historical aviation sector emissions were calculated based on data regarding airline operators' actual fuel consumption provided by the Eurocontrol (European Organisation for the Safety of Air Navigation) organisation. Based on the information gathered, the European Commission has set the level of the aviation sector's historical emissions at 221.4 million tonnes of CO_2. This assessment, which was established by the two decisions of March 7th 2011 and of July 1st 2011[5], enables the number of emission allowances available to the aviation sector from 2012 onwards to be calculated.

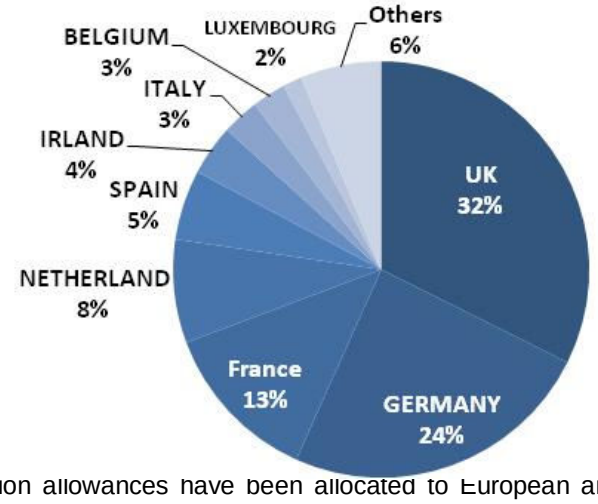
[5] The European Commission determined the historical emission level for all the airlines concerned by the EU ETS on July 1st 2011. Historical aviation emissions correspond to flights within and between the territories of the EFTA (European Free Trade Association, which includes Iceland, Liechtenstein and Norway) member countries, and flights between EFTA member countries

In 2012, the first year in which the aviation sector has been included in the EU ETS, the total allowance allocation amounts to 97% of average historical emissions. For the period between 2013 and 2020, which corresponds to Phase III of the EU ETS, airlines will receive an allowance amount that is 5% lower than their average historical emissions. In 2012, the number of allowances for the sector will be the equivalent of 214.7 $MtCO_2$. As of 2013, and in each subsequent year, the number of allowances to be created will be the equivalent of 210.3 $MtCO_2$.

Given the future inclusion of Croatia, the European Commission will assess the historical emissions for additional flights, the emissions cap, and the amount of allowances to allocate to the airlines concerned. These airlines will need to submit data regarding their flights' tonne-kilometre rates from 2012 onwards.

The allocation of CO_2 emission allowances for the aviation sector is highly concentrated, since 77% of the allowances are allocated to just four Member States, namely the United Kingdom, Germany, France and the Netherlands, as shown in Figure 6.

Figure 6 – Breakdown of CO_2 emission allowances allocated to each responsible Member State



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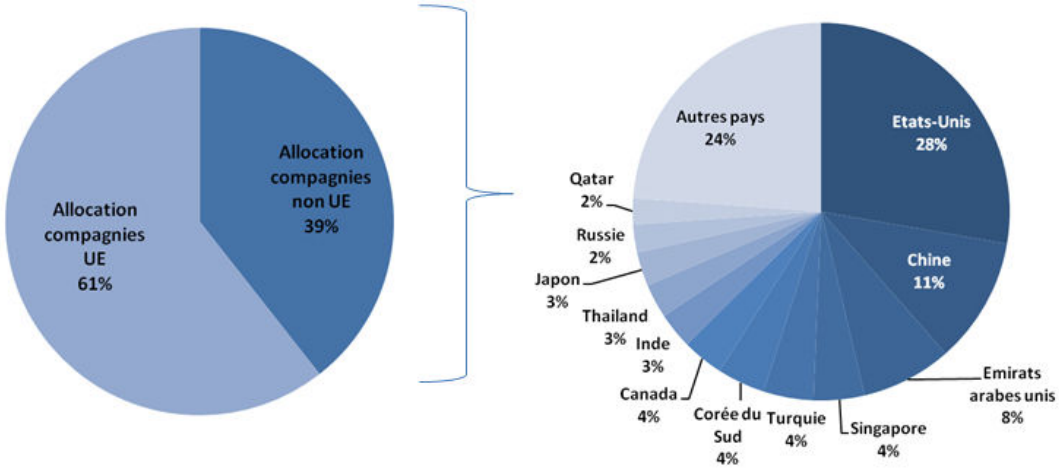
61% of the sector's CO_2 emission allowances have been allocated to European airlines. Among the non-European airlines, 50% of the allowances have been allocated to airline operators from the United States, China, and the United Arab Emirates.

The allocation of CO_2 emission allowances to the aviation sector is also characterised by a high concentration of allowances among airlines: 50% of the allowances are held by just 10 airlines.

In order to enable allowances to be allocated to airlines, the European Commission partially opened its central registry in January 2012. This registry enabled airlines to open accounts and to receive their free allowances at the end of February. This central registry should be fully operational in June 2012 for all other installations in the EU ETS.

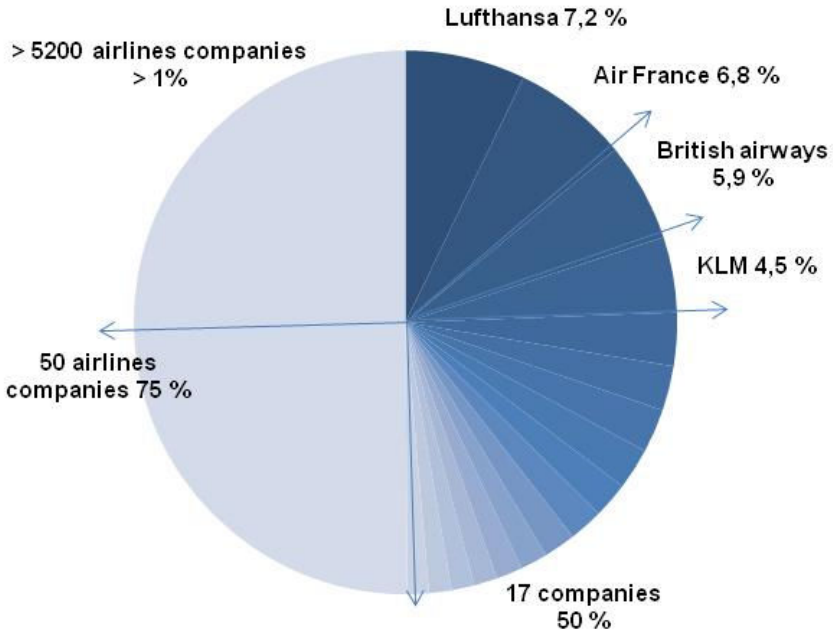
and third-party countries, and amount to 1,943,935 tonnes of CO_2. Historical aviation emissions for the European Economic Area have been set at 221,420,279 tonnes of CO_2.

Figure 7 – Breakdown of the CO_2 emission allowances allocated to airlines by country of origin



Source: CDC Climat Research, based on European Commission data, February 2012

Figure 8 – Concentration of the allowance allocation by airline



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The allocation of allowances will be mostly free of charge, with a small portion sold at auction

Based on this CO_2 emission cap, the European Commission will allocate 82% of airlines' emission allowances free of charge. In September 2011, the European Commission published the amount of the allowances for each airline, and the allocation method. The allowances allocated to the aviation sector are different from the allowances created for the industrial sectors covered by the EU ETS: they are "Aviation" allowances, or "European Union Aviation Allowances". This is therefore a semi-open system, as it turns out that aviation allowances are not fungible with the allowances issued by the EU ETS.

The free allowances are awarded via a benchmarking process, which is expressed in terms of tonne-kilometre allowances, and is obtained by dividing the previously calculated total number of allowances to be issued free of charge by the total tonne-kilometres reported by the airlines. To calculate this benchmark, airlines monitored their CO_2 emissions during 2010, and had to monitor their emission volumes and report them to their responsible Member States by March 31st 2011. Based on the information provided by each Member

State, the European Commission calculated the airlines' benchmarks, which determine the number of free allowances that they will receive. The benchmark for each airline was published in September 2011.

This benchmark mechanism guarantees equal treatment for each airline operator, since two operators that generated an equal amount of business during the year that was monitored will receive an identical amount of free allowances. As a result, airlines that emit a lower amount of CO_2 when operating their fleet will be favoured, while the others will be encouraged to make more efforts to reduce their emissions of pollutants.

In addition to their free allowance allocation, airlines will be able to buy 15% of the remaining allowances at auction, i.e. around 32 million tonnes in 2012. The four countries that account for 60% of the airlines, namely the United Kingdom, France, Germany and Spain, are expected to receive substantial revenues.

To guarantee that the free allowances for 2012 are delivered to airline operators' accounts, the European Commission opened the central single Phase III registry to airlines in advance.

In addition, as of 2013, and every year thereafter, 3% of the emission cap, i.e. 6.3 $MtCO_2$, will be placed in a special reserve. This reserve will enable free allowances to be allocated to new operators who began an airline business after 2010, or to operators who experience an average increase of over 18% in their business in terms of tonne-kilometres between 2010 and 2014. The operators concerned must file their request with the European Commission before June 30th 2015, in order to check its eligibility. In the event that these reserve allowances are not used between now and 2020, the Directive provides for them to be sold to the airlines via an auction process.

Kyoto allowances are admissible for the airline sector's compliance

Airlines may use allowances generated by the Kyoto Protocol[6] flexibility mechanisms for compliance purposes, up to a limit of 15% of the total emissions verified for 2012. The usage minimum limit has been set at 1.5% of the period's emissions for the period between 2013 and 2020. Given the fact that the Kyoto Protocol does not cover the GHG emissions from international airline traffic, the allowances allocated to airlines cannot be used to ensure the compliance of installations in other sectors. In addition, the Kyoto credits returned by the airlines in connection with the compliance requirements for the initial period shall only result in a transfer to the Member States' accounts if they correspond to domestic emissions, i.e. emissions covered by domestic inventories.

Control, monitoring and reporting procedures for the CO_2 emissions that are specific to the aviation sector

Accurate control and reporting of CO_2 emissions is essential for the effective operation of the emissions trading scheme. The monitoring, reporting and verification (MRV) guidelines for the aviation sector were adopted by the European Commission in April 2009.

The first stage in the implementation of the monitoring, reporting and verification (MRV) procedures amounted to the formalisation of the verification methods for the emissions generated by the aviation sector. In fact, the airlines submitted a plan setting out the methodology used to verify their emissions and the tonne-kilometre data to the competent authorities in their responsible Member State in September 2009. The monitoring procedure subsequently began in January 2010, in order to gather the data regarding operators' historical emissions. The airlines delivered their initial emission monitoring report in March 2011, and will be required to deliver the same report every year.

Two initiatives have been launched in order to help operators to control and monitor their CO_2 emissions. Drafted by the Netherlands and the United Kingdom, a guidance document[7] provides a practical interpretation of the legal MRV requirements. In addition, a working group including experts from the Member States and the

[6] Certified Emission Reductions (CERs) are obtained via initiatives conducted in non-Annex I countries, which are included in the Clean Development Mechanism (CDM); conversely, emission reduction units (ERUs) involve emission reduction initiatives conducted within Annex I countries, which are known as Joint Implementation (JI) initiatives.

[7] http://ec.europa.eu/clima/policies/transport/aviation/monitoring/docs/nl_guidance_en.pdf

European Commission, which was created in December 2008 at the Netherlands' request, has published guidelines[8] to promote a joint and harmonious understanding of these MRV requirements.

In order to make the recognition of "small airline operators" easier, the European Commission adopted regulations approving the use of an instrument that enables fuel consumption to be estimated based on simplified monitoring procedures in July 2010. This instrument, which was designed by Eurocontrol, and which meets the requirements of the guidelines for monitoring and reporting greenhouse gas emissions determined in Decision 2007/589/EC, may also be used to estimate the fuel consumption for specific flights by other aircraft operators, in the absence of data on actual consumption.

As of January 1st 2013, the measurement, reporting and verification rules for the annual CO_2 emission reports covered by the EU ETS will be governed by two new regulations, as specified in Articles 14 and 15 of the revised EU ETS Directive (2009/29/EC): a regulation on the monitoring and reporting of emissions (M&R), and a regulation on the accreditation of verifying bodies and on the verification of the annual emission reports, the EU Accreditation and Verification Regulation (AVR).

Table 1 – Summary of the European Aviation Allowance Scheme's main features

Scope	Carbon dioxide (CO_2) emissions for aircraft taking off from and/or landing at an airport located in one of the 29 European Economic Area (EEA) Member States, which includes the 27 EU Member States, Norway and Iceland.
Exclusion **The following flights are not included:**	- Flights operated by aircraft with a maximum weight that is lower than 5,700 kg - Flights where total emissions are lower than 10,000 tonnes - Flights operated by airlines that operate less than 243 flights per four-month period for three consecutive periods, - Military, rescue, medical emergency and humanitarian flights, etc. - Flights carrying heads of State on official assignments, when they represent a non-EU country
Emissions cap	97% of the average emissions over the period between 2004 and 2006 for 2012, 95% of historical emissions every year for the period between 2013 and 2020
Historical emissions calculation	Benchmark based on the best available data regarding tonne-kilometre emissions
Auction process	15% of the total amount of allowances to be allocated Breakdown of the allowances to be auctioned based on the Member State's share of total emissions in the benchmark year (corresponds to the year ending 24 months before the auction)
Special reserve	3% of the cap is intended for new entrants and for companies whose tonne-kilometre emissions have increased sharply between the year when they were monitored compared with the period between 2013 and 2020, and 2014 (annual increase of above 18% per year)
Relationship with other markets	The use of credits generated by the Kyoto mechanisms is limited to 15% of the allowance cap for 2012, and then to at least 1.5% of the emissions for the period between 2013 and 2020 "Semi-open" system: Fixed EU ETS installations cannot use the allowances allocated to airlines for their own compliance purposes

Source: CDC Climat Research, based on European Commission data

[8] http://ec.europa.eu/clima/policies/transport/aviation/monitoring/docs/ga_report_en.pdf

B. *Compliance in the aviation sector, which will be short of around 50 $MtCO_2$ per year by 2020*

The compliance timetable for CO_2 emissions from airline operators remains identical to the timetable applied to the industrial installations covered by the EU ETS since 2005. Therefore, the Member States will allocate the allowances before the end of February every year. Operators will then be required to return the number of allowances corresponding to the previous year's emissions by the end of April at the latest. Once the reported emissions have been verified by the responsible Member States, the allowances will be cancelled. If the report turns out to be inaccurate, the airline involved will no longer be able to perform transactions involving transfers of allowances. In addition, in the event that an insufficient amount of allowances is returned, in view of the emissions observed, a flat-rate and non-definitive fine equivalent to €100 per tonne of missing CO_2 shall be applied, in the same way as for the other sectors covered by the European carbon market.

Airline operators will be required to return carbon assets equivalent to their certified emissions in the previous calendar year every year. These assets may be:

- "aviation" allowances, known as EUAAs (European Union Aviation Allowances);
- credits generated by the Kyoto Protocol flexibility mechanism, with an import limit;
- allowances allocated to other sectors in the EU ETS, known as EUAs (European Union Allowances)*;*

The reverse will not be possible: as "aviation" allowances are not recognised for Kyoto compliance purposes, other sectors in the EU ETS will not be able to use them.

The price of European Union Aviation Allowances (EUAAs) is expected to be very close to the price of EUAs, as airlines will be able to buy EUAs or EUAAs indifferently until their prices reach parity. However, the market for trading EUAAs will be less liquid given that they can only be used in the aviation sector, so their price could be slightly lower than the EUA price. Another factor that is favourable to an EUAA allowance price discount is the fact that "aircraft" allowances cannot be reserved for Phase III in 2012, which will put downward pressure on their price compared with the price of EUA allowances. We would also note that EUAA transactions will only take place on the Over-the-Counter (OTC) market, since no exchange contract is currently proposed. The structure of EUAA trades through over-the-counter contracts will limit the transparency of prices and transaction volumes between operators in the aviation sector.

Estimating the airline sector's compliance position between now and 2020

To estimate the airline sector's compliance position within the context of the EU ETS, emission forecasts for the sector over the period between 2012 and 2020 must be drawn up. Based on the data for historical emissions between 2004 and 2006 provided by the European Commission, the annual cap for the sector's emissions will amount to 214.7 $MtCO_2$ in 2012, and to 210.3 $MtCO_2$ between 2013 and 2020.

Table 2 – Annual CO_2 emission cap for the aviation sector between 2012 and 2020 and allowance allocation method

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total 2012-2020
Emissions cap	214,8	210,3	210,3	210,3	210,3	210,3	210,3	210,3	210,3	1 897,4
Free allocation	*182,5*	*172,5*	*172,5*	*172,5*	*172,5*	*172,5*	*172,5*	*172,5*	*172,5*	1 562,3
Auctioning allowances	*32,2*	*31,5*	*31,5*	*31,5*	*31,5*	*31,5*	*31,5*	*31,5*	*31,5*	284,6
Special reserve		*6,3*	*6,3*	*6,3*	*6,3*	*6,3*	*6,3*	*6,3*	*6,3*	50,5

Note: the emission cap is awarded to airlines via three allocation methods: 82% of free allowances, 15% of auctioned allowances, and 3% of allowances via the special reserve for new entrants and airlines that are experiencing strong business growth, from 2013 onwards.

Source: CDC Climat Research, based on data from the European Commission

Given the lack of opportunity to reduce air transportation emissions in the short term, there should be a positive correlation between the growth in the sector's emissions and the increase in demand for air traffic. In

fact, demand for air traffic is expected to continue to increase according to a growth scenario of 4.0 and 3.5% per year respectively over the periods between 2012 and 2014, and between 2015 and 2020 (DGAC). Given the various assumptions included in the forecast trend of the capacity ratios and efficiency gains that may be achieved in the medium term, the emission forecasts were obtained based on the assumption of an average 2.5% annual increase in emissions 2012 and 2014, and then of an annual increase of 2% over the period between 2015 and 2020.

Table 3 - Assumptions and estimates for CO_2 emissions in the aviation sector between 2012 and 2020 ($MtCO_2$)

Year	Average 2004-2006	2007	2008	2009	2010*	2011*	2012*	2013*	2014*	2015*	2016*	2017*	2018*	2019*
Growth rate of air traffic (%)	5,5%	5,5%	5,5%	-6,0%	*-2,0%*	*2,0%*	*4,0%*	*4,0%*	*4,0%*	*3,5%*	*3,5%*	*3,5%*	*3,5%*	*3,5%*
Evolution of load factor (%)	0,5%	0,5%	0,0%	-1,0%	*-1,0%*	*0,0%*	*0,5%*	*0,5%*	*0,5%*	*0,5%*	*0,0%*	*0,0%*	*0,0%*	*0,0%*
Technology improvement SKO/Emissions (%)	1,5%	1,5%	1,5%	1,5%	*1,0%*	*1,0%*	*1,0%*	*1,0%*	*1,0%*	*1,0%*	*1,5%*	*1,5%*	*1,5%*	*1,5%*
Growth rate of CO2 emissions (%)	3,5%	3,5%	4,0%	-6,5%	*-2,0%*	*1,0%*	*2,5%*	*2,5%*	*2,5%*	*2,0%*	*2,0%*	*2,0%*	*2,0%*	*2,0%*
Emissions forecasts (MtCO2)	221,4	234,6	244,0	228,1	*223,6*	*225,8*	*231,4*	*237,2*	*243,2*	*248,0*	*253,0*	*258,0*	*263,2*	*268,5*

The data are forecasts.

Source: CDC Climat Research based on DGAC and ICAO data.

The net demand from the airline sector will be 40 $MtCO_2$ per year by 2020

Based on the growth scenario for CO_2 emissions from the aviation sector, and compared with the emissions cap, the sector will already be short 30 $MtCO_2$ from 2013, and this shortfall is likely to increase each year, reaching a total (2012-2020) estimated forecast allowance shortfall of 382 $MtCO_2$.

Table 4 – Estimate of the aviation sector's forecast compliance between 2012 and 2020 ($MtCO_2$)

Year	2012	2013	2014	2015	2016	2017	2018	2019	2020	Total 2012-2020
Emissions forecasts	231,4	237,2	243,2	248,0	253,0	258,0	263,2	268,5	273,8	**2 276,4**
Free allocation	*182,5*	*172,5*	*172,5*	*172,5*	*172,5*	*172,5*	*172,5*	*172,5*	*172,5*	**1 562,3**
Kyoto credits use	*34,7*	*3,6*	*3,6*	*3,7*	*3,8*	*3,9*	*3,9*	*4,0*	*4,1*	**65,4**
Auctioning	*14,2*	*31,5*	*31,5*	*31,5*	*31,5*	*31,5*	*31,5*	*31,5*	*31,5*	**266,6**
Forecast of the gap to cap	**0,0**	**29,6**	**35,5**	**40,3**	**45,2**	**50,2**	**55,2**	**60,4**	**65,7**	**382,1**

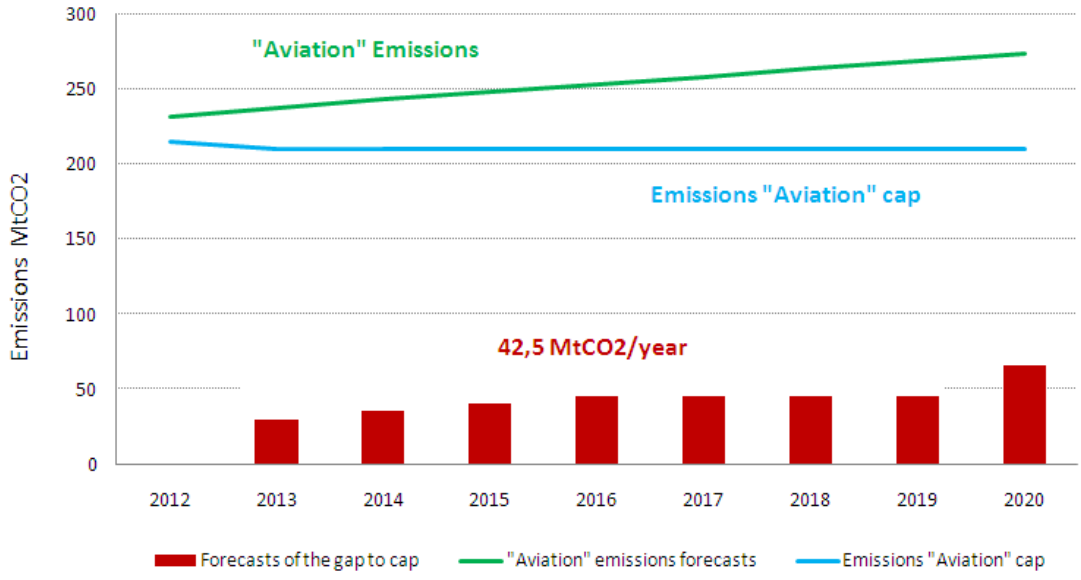
Note: To ensure their compliance, we assume that air operators use Kyoto credits up to 15% of their verified emissions in 2012 and a 1.5% share of verified emissions for 2013 to 2020. We assume also that air operators are using the auctioning to cover their need after the full use of their free allowances and Kyoto credits. The evaluation of the estimated need of EUA is highly sensitive to the estimation of the growth of CO_2 emissions and underlying assumptions used.

Source: CDC Climat Research, based on data from the European Commission

The possible use of Kyoto credits offers a maximum credit import potential of 34.7 $MtCO_2$ in 2012, and then of 3.8 $MtCO_2$ per year between 2013 and 2020. If we assume the full use of the Kyoto credit import limit, the forecast emission hedging requirement for airlines will then amount to 345 $MtCO_2$ between 2012 and 2020, which represents a source of demand for allowances on the trading market that amounts to 42.5 $MtCO_2$ per year. Although the aviation sector will have an overall allowance shortfall, it is likely that not all airlines will be involved, and that some will be more successful in reducing their emissions than others. However, the existence of excess allowances for some airlines will not be enough to offset the sector's net shortfall. As a result, airlines will have to buy either EUA or EUAA emission allowances, which means transferring the sector's emission reduction efforts to other sectors.

Moreover, the demand for European allowances in the airline sector is expected to increase over the period between 2013 and 2020, mainly due to the reduction in the Kyoto credit limit from 15% to 1.5%. The emergence of this additional demand for allowances will support the EUA price on trading exchanges.

Figure 9 - Estimated compliance position of the aviation sector within the EU ETS



Source: CDC Climat Research

C. *The economic impact of carbon pricing on the aviation sector*

The introduction of carbon pricing for the airline business will give rise to multiple economic consequences, which will primarily affect airlines' operating income and their flight pricing strategy, and therefore their competitiveness. These economic impacts will depend largely on the cost of compliance that will result in the level of carbon prices revealed by the EU ETS.

A limited impact on demand for air transportation and ticket prices

Faber *et al.* (2011) have reviewed all these consequences based on previous research, and have concluded that the emergence of carbon pricing in the aviation sector will have only very limited impact on the ticket price for consumers and on the demand for air transportation. Conversely, although the inclusion of the aviation sector in the EU ETS is being implemented in a way that limits competition distortions, there may nonetheless be some changes in terms of competitiveness. There is likely to be some carbon leakage, which means that part of the reduction in the aviation sector's emissions within Europe is expected to be offset by an increase in the sector's emissions outside the EU ETS. Assuming an allowance price of €15 to €45, and a full transfer of the EUA and opportunity cost, CE Delft (2007) estimates that the impact of the EU ETS on the cost of tickets in 2020 will be as follows, based on the AERO model calculations: a possible increase of between €2 and €4 in the ticket price for a short-haul flight of 480 km, and an increase of between €3 and €8 for a medium-haul flight, while the price for a long-haul flight of 6,400 km will increase by between €10 and €30. Faber *et al.* (2011) estimate that a carbon price of €10, €30 and €50 per tCO_2 could increase ticket prices by between 1.3 and 6.5%, and reduce demand for air travel by 0.5%, 2.4% and 2.6% respectively, and therefore CO_2 emissions. The European Commission has indicated that the impact of carbon prices on airline tickets will be minimal, with prices potentially increasing by between €1.80 and €9.00 depending on the aircraft, the distance, and pass-through rate chosen by the airlines.

Where France is concerned, the impact of the inclusion of the aviation sector on demand for air transportation will be a decrease of around 0.3% in 2015 and of 0.4% in 2020, according to the DGAC base case scenario forecasts, which corresponds to a trend that is similar to the trend at the European level forecast by Eurocontrol. According to Eurocontrol, the transfer of traffic to non-European hubs will be low, as the cost of carbon is not high enough to offset the additional costs resulting from displacing air journeys. However, some connections might be affected by this competition.

An uncertain economic impact on airlines' results

The airlines have underlined their concern regarding the consequence of carbon pricing on their economic results, primarily through their professional bodies, and have stressed the very high economic cost of their inclusion in the EU ETS. Many airlines have set out their own estimates: Emirates has estimated that its inclusion in the EU ETS will cost it between €500 million and €1 billion, while Lufthansa has assessed the cost at €350 million per year, etc. (PointCarbon, 2011).

In practice, an *ex-ante* assessment of the impact of carbon pricing on airlines' results is still complicated, as it depends on the carbon price pass-through rate applied by each airline and on its impact on transportation demand. Some research indicates that the impact is low, while others show that airlines' operating income could increase by between 3.1 and 5.4%, assuming that carbon pricing is passed through to ticket prices (CE Delft, 2007).

II. PROCEEDINGS HAVE BEEN LAUNCHED AGAINST THE INCLUSION OF THE AVIATION SECTOR IN THE EU ETS: A TEST FOR EUROPE'S CLIMATE POLICY

The inclusion of the aviation sector in the EU ETS is a test of the EU's proactive policy, which involves encouraging other countries to define their own climate policy, without breaching international law, as confirmed by the Court of Justice of the European Union (CJUE) in December 2011. In view of criteria to be defined by the European Union, the potential exemption of airline operators from emitter countries that introduce equivalent regulations would also be a success for European policy.

The United States, Canada, China, India, some Middle-Eastern countries, and Russia are opposing the implementation by the European Union of an emission allowance scheme covering international flights. They are primarily opposing Europe's climate policy on two grounds: the unilateral and extra-territorial nature of the scheme and non-compliance with the UNFCCC's founding principal of "common but differentiated responsibility". This opposition is in keeping with an unfavourable economic environment that makes diplomatic relations between countries more complicated. China and the United States are the two main countries that are the most strongly opposed to the entry into force of the inclusion of their airlines in the EU ETS.

This opposition has been translated into diplomatic and commercial pressure, as well as into legal action.

In November 2011, the 194th Council of the International Civil Aviation Organization (ICAO) has asked the European Union and its Member States to not include aircraft operators of third countries in the EU ETS and work on the subject of international issues with the rest of the international community in collaborative manner.

On February 22nd 2012, 26 countries, including Russia, China, Japan, Brazil, the United States, India and South Korea, signed a declaration in Moscow demanding the deferral or cancellation of the European decision, and describing this climate policy as illegal and discriminatory. Among these countries, China and the United States are the two that are most firmly opposed to the decision. This opposition is also entrenched at international level, at the ICAO. In September 2011, 26 member countries of the ICAO issued a statement opposing the EU ETS, which was adopted by the ICAO Council in November 2011.

On 11 June 2012, at the World Summit of air transport in Beijing, the International Air Transport Association (IATA), which represents some 240 airlines and nearly 85% of world air traffic, reiterated his call for an agreement on emissions from aviation negotiated by ICAO. IATA recognizes that all states, including Europe, agree on the fact that the solution lies in a global agreement under the leadership of ICAO.

A. *China: a series of measures in the name of non-compliance with the UNFCCC's principle of common but differentiated responsibility*

China is using political and commercial pressure to get the European Commission to exempt Chinese airlines. China's first initiative consisted in lobbying the European Commission directly. In fact, in March 2011, a group of the largest Chinese airlines sent the European Commission a note opposing the European Directive on the application of the EU ETS to non-European airlines. According to the Chinese aviation sector, this constraint

will impose an additional cost of CNY 800 million (US$122 million) per year, an amount that could reach CNY 3 billion (US$456 million) by 2020.

In April 2011, China launched another initiative against the European Union. The country set out its climate policy for its aviation sector, in order to ask the European Union to exempt Chinese airlines from being included in the EU ETS. Indeed, the Civil Aviation Administration of China (CAAC) has issued guidelines that require domestic airlines to improve their energy efficiency, by encouraging them to use alternative fuel and new-generation engines, and to reduce the intensity of their emissions by 22% compared with 2005. Under the 2006-2010 five-year plan, the CAAC had already set a reduction target of 9%.

The latest political measures to date: on February 6th, the Chinese authorities confirmed that they would forbid their national airlines from taking part in the EU ETS. India supported this initiative in turn, by asking its airlines not to take part in the European Union Emission Trading Scheme. In April 2012, China offered to introduce a US$11.10 tax for each passenger on international flights. The revenues generated by this tax, and managed by the national aviation authority will be used to finance emission reduction initiatives in the sector. The European Commission appointed a delegation to examine whether this measure was equivalent to the European policy, in order to open bilateral negotiations.

The inclusion of the aviation sector in the EU ETS is also subject to commercial pressure. In early March 2012, the Chinese Government froze the Airbus aircraft orders placed by its airlines for delivery in 2013. To counter this threat, Airbus and several European airlines (including British Airways, Iberia, Air Berlin, Air France, Lufthansa and Virgin Atlantic) and aircraft manufacturers sent a letter to the Commission, calling on it to "find a compromise solution and to put an end to these punitive measures".

B. *United States: legal action based on the incompatibility between the EU ETS Directive and the Chicago Convention*

The United States was the prime mover in opposing the Directive. On December 16th 2009, the Air Transport Association of America (ATA) and three US airlines (American Airlines, Continental Airlines and United States Airlines) initiated proceedings against the inclusion of the aviation sector in the European scheme. In its fact-finding report[9], the ATA estimates that US airlines will be required to pay over US$3.1 billion between 2012 and 2020 in order to ensure that they comply with the EU ETS framework.

US airlines believe that only the ICAO has the authority to introduce measures aimed at reducing CO_2 emissions in the aviation sector, and that the European scheme is the equivalent of a tax. They are also contesting the fact that, by including any aircraft that lands in and/or takes off from the European Union in the scope of the Directive, the Directive also covers sections of the flights that take place outside Member States' airspace.

The legal proceedings were initially launched in the British courts, since the United Kingdom is the Member State responsible for one third of the US airlines concerned; they were then brought before the Court of Justice of the European Union. An initial hearing took place on July 5th 2011. The Court of Justice of the European Union was asked about the compatibility of Directive 2008/101/EC with current international law, ICAO rules, the "Sky Blue" agreement, which binds the United States and the European Union, as well as with Articles 1, 12, 15 and 25 of the Chicago Convention and with the Kyoto Protocol. Moreover, in July 2011, the European Regional Airlines Association (ERAA), which represents 65 intra-European airlines, urged the European Commission to suspend the "Aviation" Directive, or to withdraw it completely, until an agreement was reached with foreign airlines, or until the ICAO adopted a global allowance scheme for the sector (Point Carbon, 2011).

Two draft bills in the US Senate and the Chamber of Representatives were suggesting prohibiting US airlines from taking part in the EU ETS[10]. In October 2011, the Chamber of Representatives adopted Law H.R. 2594, which also asks the US authorities to negotiate with the European Union, and to take other measures in order to ensure that US operators are not penalised by unilateral regulations. A similar draft bill, S. 1956, which was

[9] ATA Testimony, "The EU ETS: A violation of International law", Statement of Nancy N. Young, Vice President of Environmental Affairs, ATA, July 27th 2011. http://republicans.transportation.house.gov/Media/file/TestimonyAviation/2011-07-27-%20Young.pdf

[10] Congressional Research Service "*Aviation and the European Union's Emissions Trading Scheme*" March 7th 2012 www.fas.org/sgp/crs/row/R42392.pdf

proposed in the Senate in January 2012, was included in the Federal Aviation Authority Finance Act, which was signed by President Obama in February 2012. The bill is a statement of opposition to the implementation of the EU ETS for US airlines. This statement is not a legally binding measure.

Further legislative action is currently underway. A second version of the bill, S.1956, proposed by the same senators received a new welcome in the Senate. Indeed, July 31, 2012, the U.S. Senate Commerce Committee supported this proposal bi-partisan that would allow the Secretary of Transportation to prevent U.S. airlines from complying with the EU ETS. Unlike the bill in October 2011 that had not been approved by the Senate, the bipartisan proposal should receive higher support during the plenary vote coming this year. Early August 2012, a group of 16 non-governmental organizations sent a letter to President Obama to alert that the adoption of such a law could slow efforts of ICAO to propose a global framework limiting CO_2 emissions of the sector.

The United States is also increasing diplomatic initiatives with the Union European. On December 16th 2011, Secretary of State Hillary Clinton and the US Transportation Secretary, Ray LaHood, sent a letter to the Chairman of the European Commission announcing that the United States is envisaging reprisal measures. In April 2012, during the Major Economies Energy and Climate Forum, Todd Stern, the United States Climate Representative, described this regulation as an inappropriate bilateral measure that was harmful to international trade.

C. *Is there a possible solution to the dispute between the European Union and other countries?*

The European Union Directive is compliant with international law

On December 21st 2011, the Court of Justice of the European Union (CJUE) confirmed the opinion delivered on October 6th 2011[11], according to which the inclusion of the international airline business in the European Union Emissions Trading Scheme is compatible with international law[12]. In July 2010, the American Transport Association (ATA) had instigated annulment proceedings relating to the validity of the 2008 Directive in respect of:

- international common-law, i.e. countries' sovereignty over their airspace, and freedom to fly over the high seas;
- the Chicago Convention on international civil aviation;
- the "Open Skies" agreement, which binds the United States and the EU;
- and the Kyoto Protocol.

Despite this decision, the inclusion of the aviation sector in the EU ETS has given rise to further hostile reactions from major international countries. The inclusion of the aviation sector in the EU ETS will amount to a test of the EU's proactive policy to encourage other countries to define their own climate policy.

Furthermore, France[13] and Germany have called on the European Commission to take swift action to protect the integrity of the EU ETS against strong opposition from countries like China or the United States, which are asking for their airlines to be exempt, and to preserve the competitive balance between European and non-European airlines. The two Member States are calling on the Commission to engage in negotiations with these third-party countries, based on Resolution A 37-19 of the last ICAO meeting, and Article 25a of the "Aviation" Directive.

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[11] The opinion of the Advocate General, Mrs Juliane Kokott, which was presented on October 6th 2011, is available on: http://curia.europa.eu/juris/document/document.jsf?text=&docid=110742&pageIndex=0&doclang=FR&mode=req&dir=&occ=first&part=1&cid=312400

[12] The opinion of the Court of Justice of the European Union is available on: http://curia.europa.eu/juris/liste.jsf?language=en&num=C-366/10#

[13] Letter from the French Ministry of the Environment, Sustainable Development, Transportation and Housing, Paris, May 26th 2011. http://www.euractiv.fr/sites/default/files/lettre_wauquiez-nkm.pdf

What are the consequences of the withdrawal of international airlines for the EU ETS?

Airlines from the United States and the BRIC countries account for 38% of the airlines covered by the EU ETS. Exempting US, Chinese, Brazilian, Indian and Russian airlines from the EU ETS regulations would reduce total demand from the aviation sector by 14% in 2012.

Table 5 – Importance of international airlines in the EU ETS

Airlines coming from	Number of airlines	EUA allocation in 2012	EUA allocation in 2013-2020
United-States	1 754,00	19,15	140,94
China	34,00	7,46	56,44
Brasil	88,00	1,18	8,88
Russia	122,00	1,65	12,50
India	49,00	2,14	16,14
TOTAL USA + BRIC	**2 047,00**	**31,59**	**234,91**
TOTAL EU ETS	**5 439,00**	**214,77**	**1 682,79**
% in the EU ETS	37,64%	14,70%	13,96%

Source: CDC Climat Research, based on data from the European Commission as at February 3rd 2012

Three possible ways to resolve the dispute

The uncertainty surrounding solving the dispute remains high, while diplomatic and commercial pressure is still strong. The aviation sector – or some airlines – could be exempted under three conditions, each of which amounts to a possible way to resolve the dispute.

- **The exemption of international airlines due to domestic climate policies that have been assessed as equivalent, according to EU criteria**: The short-term likelihood of such a measure is low, given the current undertakings of other countries, which are either small or non-existent.

In Article 25a, the Directive provides that airlines from countries that have introduced restrictions on CO_2 emissions that are equivalent to the European target will be exempt. Therefore, in view of criteria that still need to be defined by the European Union, the exemption of airline operators from emitter countries that introduce equivalent regulations would also be a successful outcome for the European policy. The European Commission is examining the issue of assessing the potentially equivalent status of the climate policy applied to the aviation sector. At the Climate Change Committee on June 17th 2011, Member States discussed possible EU ETS exemption measures, which could apply to foreign airlines, without reaching a significant consensus. According to which factors should the equivalent status of the European climate policy and the policy that the other country applies to the aviation sector be assessed? The issue was also on the agenda at the European Environment Ministers Council in June 2011, when the Commission gave a firm indication that the scheme must be implemented. In February 2012, the European Commission announced that it could consider the measures set out in the country action plans presented to the ICAO[14]. Aside from possible bilateral negotiations, the EU is now favourable to the ICAO taking multi-lateral action.

- **A revision of the European Directive**: such a measure is the most likely if the European Commission is to act quickly. It will be up to the Commission to justify revising the Directive on appropriate grounds.

In Article 30, the Directive provides for the Commission to review the application of the Directive by December 1st 2014, and if required submit proposed alterations to the European Parliament and to the Council. Among the grounds provided – energy efficiency, technological changes in the sector, etc. – the Commission could specifically choose the following two: the implications of the impact of the Directive on the general operation of the EU ETS, and the impact of the EU ETS on the aviation sector, including in view of competitiveness issues. The Commission will then present a report to the European Parliament and to the Council. But this revision could intervene at best in 2016.

[14] Speech given by Jos Delbeke on February 8th 2012: http://ec.europa.eu/clima/news/docs/speech_en.pdf

- **The suspension of the European Directive in view of the adoption by the ICAO of a resolution introducing a global emissions trading scheme with a higher emission reduction target, which applies to all airlines in a non-discriminatory manner**: the short-term likelihood of such a measure is low, as it depends on the progress made by the ICAO.

In fact, in Article 25a of the Directive, the Commission provides that *"it will assess the need to amend this Directive in light of such an international agreement".* It has been noted that the European Union is continuing its efforts to reach an agreement on global measures to reduce the sector's CO_2 emissions. This path towards changing European regulations depends on the further progress made by the ICAO in terms of introducing a policy to reduce CO_2 emissions, based on an emissions trading scheme. This issue is the subject of the third section of this report.

III. REGULATION OF CO_2 EMISSIONS IN THE AIRLINE SECTOR: WHAT ACTION WILL THE ICAO TAKE?

As part of the proceedings launched against the inclusion of the aviation sector in the EU ETS, the multi-lateral action taken by the ICAO in terms of defining a climate policy for reducing international CO_2 emissions remains a possible solution. Although it has adopted a passive attitude regarding the implementation of regulations based on an international emissions trading scheme since 1997, the ICAO has been showing signs of some political progress since 2010, under pressure from the European Union, which could lead to the proposal of a sector climate agreement at the next General Meeting, which will take place in November 2013.

A. *2008-2012: the Kyoto Protocol's passive stance towards the aviation sector*

The international aviation sector's emissions are generated by international flights from and to many countries, which make it hard to assign the source of those emissions to a particular country. The UNFCCC (1992) and the Kyoto Protocol (1997), which acknowledge the complexity of the way in which these emissions are accounted, have excluded emissions from the international aviation sector from recognition in the domestic inventories of the signatory countries. Article 2.2 of the Kyoto Protocol requires that industrialised countries pursue the goal of limiting GHG emissions from international civil aviation through the ICAO.

During the international climate negotiations that have been ongoing for over ten years, governments have debated the way in which to reconcile the principle of non-discrimination pursuant to the Chicago Convention with the principle of common but differentiated responsibility pursuant to the UNFCCC and to the Kyoto Protocol. Where setting a target for reducing emissions from the international aviation sector is concerned, some countries are in favour of a negotiation within the framework of the international climate negotiation process within the UNFCCC, while other countries would like to be able to draw up a sector-based climate policy that is defined and coordinated by the ICAO.

Buoyed by the mandate entrusted to it by the Kyoto Protocol, the ICAO has seized the climate issue by introducing an initial measure to assess the sector's responsibility for climate change. Since 1999, the ICAO has requested expert input from the Inter-Governmental Panel on Climate Change (IPCC), supported by the Montreal Protocol Scientific Assessment Panel, which has delivered its scientific assessment report, entitled *Aviation and the Global Atmosphere* to the organisation. The main conclusion established that the sector accounted for 2% of global CO_2 emissions. Discussions on the measures to take to combat climate change among the 190 ICAO Member States began during the 2000s, although they did not succeed in drawing up a consensus on the action the ICAO should take to reduce the sector's emissions during the Kyoto Protocol's first commitment period.

At the end of the day, the international aviation sector did not agree to any climate policy imposing a reduction target on its emissions between 2008 and 2012, neither within a legal framework nor through voluntary measures.

B. *Beyond 2012: towards a proactive climate policy coordinated by the ICAO*

Discussions aimed at implementing a climate policy for the international aviation sector became more forceful from 2004 onwards, as the issue assumed increasing importance on the international political stage. Several OACI decisions and initiatives demonstrate its desire to draw up and coordinate an international climate policy to reduce emissions in the aviation sector.

To support all the climate change policy decisions taken by the ICAO, the 36th session of the ICAO General Meeting in September 2007 asked the Council to create a new International Aviation and Climate Change Group (IACCG), which consists of 15 senior government officials who represent both developing countries and developed countries on an equal basis, and benefits from technical support provided by the Committee on Aviation Environmental Protection (CAEP). The IACCG is responsible for drawing up a dynamic action plan for international aviation and climate change, based on a consensus, which reflects the common and firm will of all the member countries, and for presenting it to the Council.

Towards a definition of voluntary emission reduction measures and targets

The last three ICAO General Meetings, which take place every three years, have marked major steps forward.

- **Recognition by the market of the advantages of emission reduction measures, like an emissions trading scheme.**

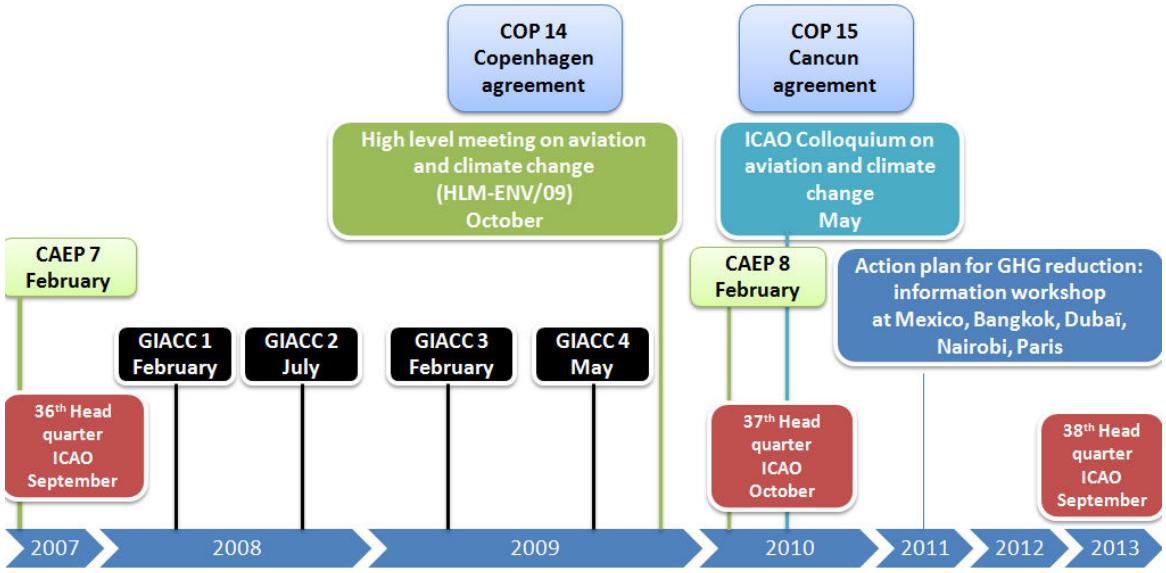
In September 2004, the General Meeting approved the principle of an ETS system via Resolution A35-5, and asked the Council to work on two areas: the implementation of a voluntary allowance system, and the development of guidelines for including the aviation sector in regional allowance systems, such as the one implemented in Europe.

- **Examining the implementation of an ETS system for the aviation sector**

In September 2007, the General Meeting asked the Parties not to introduce an ETS system without a mutual agreement, via Resolution A36-22. The EU Member States had expressed reservations regarding this resolution. In 2008, the General Meeting also took into consideration the report entitled *Guidance on the Use of Emissions Trading for Aviation*[15] prepared by the CAEP, in which all the regulatory and operating features of such an emission regulation mechanism were examined. The ICAO Meeting asked the Council to continue to examine policy options in order to limit or reduce the impact of aircraft engine emissions on the environment, to draw up practical proposals, and to provide opinions to the UNFCCC Conference of the Parties as soon as possible. It also asked that a particular emphasis be placed on the use of technical solutions, while continuing to review market-based measures, and factoring in the potential impact for developing and developed countries.

[15] ICAO, "*Guidance on the Use of Emissions Trading for Aviation*", 2008

Figure 10 – The ICAO initiative: an international policy for reducing CO_2 emissions in the aviation sector



Source: CDC Climat Research, based on information provided by the ICAO.

- **Voluntary undertakings to control CO_2 emissions**

In October 2010, the ICAO GM adopted Resolution A37-19, in which it provides for:

- a global target to improve fuel yields by 2% per year until 2050, and more in-depth investigation of the feasibility of more ambitious medium and long-term targets, particularly carbon-neutral growth and emission reductions;
- the drawing up of a global CO_2 emission standard for aircraft, and the promotion of changes in the aircraft manufacturing industry in order to reduce aviation emissions;
- the drawing up of a framework for measures based on an emissions trading scheme for the international aviation sector;
- the examination of other measures to help developing countries and to make access to financial resources easier, as well as technology transfers and the boosting of skills;
- the submission of action plans by countries, setting out their policies and their initiatives, and the annual disclosure of data on their consumption of aviation fuel to the ICAO.

International coordination of domestic plans for the voluntary reduction of CO_2 emissions

To achieve the targets established by Resolution A37-19 in October 2010, the 190 member countries of the ICAO willing to adopt an emission reduction policy in the airline sector must send the Secretariat a domestic action plan setting out their policy procedures between now and June 2012. The first action plan initiatives were presented by Australia and Mexico[16] at the UNFCCC Conference in Bonn in June 2011.

This resolution does not entail any binding obligation for the member countries. In contrast, below a 1% international aviation business minimum threshold, the ICAO has stated that member countries are not expected to present action plans to achieve global targets.

These action plans will also enable the ICAO to monitor countries' progress in achieving the global targets, and will help to fulfil specific requirements, thanks to better targeting of technical and financial assistance. In order to achieve this aim, the ICAO wants every action plan that is submitted to contain a set of information

[16] http://www.icao.int/icao/fr/env2010/ClimateChange/ActionPlan/Index_f.html

items, such as the assessment of the country's international air traffic, its forecast fuel consumption and CO_2 emissions up until 2050, its CO_2 emission reduction measures, and its estimated financial and technological assistance requirements.

In order to help each country with its voluntary approach to setting out its national action plan, the ICAO has prepared standard reporting documents for gathering, analysing, and disclosing CO_2 emissions from the aviation sector and for presenting their plans. The ICAO also organised training workshops at its regional offices between May and July 2011[17].

C. *Progress towards a carbon tariff structure for international aviation emissions*

The Emissions Trading Scheme: further progress is expected in 2012 and 2013

Discussions within the ICAO have shown that an agreement to implement a global emissions trading scheme for the aviation sector is a complex issue. Since 1998, the ICAO has performed several technical and economic reviews of various market-based measures for reducing the international aviation sector's CO_2 emissions, like the emissions trading scheme, the carbon tax, and the voluntary offsetting of the sector's emissions. Specifically where the introduction of an emissions trading scheme (ETS) is concerned, in February 2007 the CAEP created a special working group – the Market-Based Measures Task Force (MBMTF) – which is responsible for issuing the three following reports, where the information and conclusions they contained were approved by the Council in 2010.

- Report on the research into defining the issues relating to grouping open emission rights trading schemes that involve the international aviation sector;
- Report on the voluntary offsetting of CO_2 emissions from the airline sector;
- Updated report on the voluntary exchange of emission rights for the aviation sector.

In October 2010, the ICAO asked the Council to continue to explore the feasibility of a global ETS programme, with the support of Member States and international organisations, by carrying out further research on the technical aspects, the environmental benefits, the economic impact, and the execution procedures for such a programme, taking the results of the negotiations conducted within the UNFCCC into account.

In 2012, the ICAO launched a new study on the introduction of instruments aimed at controlling GHG emissions from the civil aviation sector, and specifically on the role of market instruments. The results of this study will be examined by the Council of November 2012, from the standpoint of the next ICAO General Meeting in 2013. The ICAO also recognises that voluntary offset programmes are a means of offsetting CO_2 emissions in the short term, and are inviting countries to encourage operators who want to take swift measures to offset carbon emissions, specifically to use credits from recognised international programmes such as the Clean Development Mechanism (CDM).

Based on the most favourable assumption, according to Lamotte (2011), the ICAO GM is expected to adopt a resolution opening the way to introducing market instruments at the international level at its 2013 session. An EGM could also take the same decision before that date, but this scenario seems very unlikely given the level of progress of such a proposal. Two solutions can initially be envisaged, with very different implications:

- the first option is likely to be a new ICAO resolution, supplementing Resolution A37-19 and returning the task of negotiating bilateral agreements relating to the introduction of market instruments back to countries above the minimum 1% threshold;
- the second option is a new ICAO resolution relating to the drawing up of an agreement establishing a multi-lateral agreement on the introduction of market instruments for all countries above the minimum 1% threshold.

This favourable outcome assumes that developing countries withdraw their opposition to the introduction of a universal market mechanism, while major emerging countries' hostility due to the impact on international

[17] These regional workshops took place in Mexico and Bangkok in May 2011, then in Dubai, in June, in Nairobi and Paris in July, and lastly in Montreal, in November 2011.

trade, and therefore growth and subsides. Currently, the most likely short and medium-term trend is a broader development of regional and domestic emission trading schemes, which could be inter-connected.

In November 2011, the Council, with the support of a majority of its Member Countries, adopted the Declaration inviting the European Union and its Member States to abstain from including international airlines operating out of and/or into countries that are not members of the European Union in the EU ETS. Furthermore, the Council reconfirmed the important role played by the ICAO in regulating the aviation sector's emissions and the acceleration of its work on a market-based emission regulation mechanism in order to achieve the best global solution. On March 2nd 2012, Raymond Benjamin, the Chairman of the ICAO, whose appointment has been renewed until July 31st 2015, announced that the UN agency would do everything possible to make proposals relating to reducing the sector's CO_2 emissions between now and the end of 2012.

The international emissions trading scheme: questions outstanding

Aside from the ICAO's political determination to introduce an international emissions trading scheme, a large number of questions remain, and amount to as many tension points that need to be resolved in order to establish a global agreement on air transportation.

Will this scheme be intended for all countries, or only for developed countries, in line with the interpretation of the principle of "common but differentiated responsibility" offered at Kyoto? The rapid growth in international aviation emissions attributable to developing countries requires that the scheme is extended to all countries where air traffic is above a certain threshold.

Another issue that arises is the link with the Kyoto Protocol flexibility mechanisms and with other existing cap-and-trade schemes. Where the option of using credits from the Kyoto Protocol initiative mechanisms, i.e. the CDM and JI, is concerned, this would enable the aviation sector to meet its commitments, given the low likelihood of reducing emissions in the short term.

In addition, a connection with domestic or regional emission trading schemes can only be made in markets that are large enough when compared with net credit demand from the airline sector (Haites, 2008). In all cases, the connection between an emissions trading scheme for the aviation sector and other mechanisms will need to be designed in such a way as to preserve a minimum reduction effort for the airline sector, by including credit import thresholds.

Assigning a tariff structure to the carbon from the international airline sector: a source of revenues for climate policies

There is currently no mechanism to finance the combat against climate change where the international aviation sector is concerned. Given that international aviation is not targeted by the Kyoto Protocol, it does not have access to any of the flexible financing instruments provided for in the Protocol. To date, no other instrument has been implemented on an international scale. An initial review is currently underway.

Following the 2009 Conference of the Parties (COP) in Copenhagen, the Secretary General of the United Nations entrusted a High-Level Advisory Group on climate change (AGF) with examining sources of revenue to finance climate policies. The AGF Report (2010) believes that raising an annual amount of US$100 billion by 2020 is a challenge that can be met through combining public and private financing sources. The AGF Report looks at various public financing options, including the introduction of market mechanisms (taxes and emission trading exchange) in the international sea and air transport sector. The ICAO has expressed a few concerns regarding the AGF Report, and particularly regarding the use of resources generated by the implementation of market mechanisms in the airline sector[18]. Indeed, the ICAO believes that the resources that may potentially be generated by market mechanisms should primarily be used to finance emission

[18] ICAO (2011), "Submission by the International Civil Aviation Organization (ICAO) to the Transitional Committee for the design of Green Climate Fund".

reduction policies in the airline sector[19]. The ICAO also notes that the civil aviation sector accounts for only 2% of global CO_2 emissions, and cannot represent a disproportionate source of financing for the Green Climate Fund without creating competition distortions among the various economic sectors[20].

Furthermore, the ICAO is claiming to be the competent institution to deal with financing in the aviation area, since it is able to adapt the financial instruments to the specific requirements of the sector and help developing countries at the same time, not only at the financial level, but also where technology transfers and boosting skills are concerned.

Lamotte (2011) reminds us that introducing a tariff structure for carbon in the airline sector through a tax on emissions or auctioning emission allowances, rather than allocating them free of charge, would enable the generation of financial resources that could be used to finance:

- research and development activities in the aircraft industry;
- offsetting the economic impact of the introduction of these instruments in developing countries;
- financing the domestic climate policies of developing countries, like the NAMAs defined in accordance with the Cancun Agreements in 2010.

The revenues from auctioning 100% of the emission allowances may be substantial: Faber *et al.* (2009) and the 2010 AGF Report suggest that the potential revenues from assigning a pricing structure to the airline sector's emissions would be in the region of €15 to €30 billion by 2020.

The latest discussions on carbon pricing in the airline sector, which took place as part of the November 2011 G20 Summit, chaired by France, were fuelled by a research report on international climate financing commissioned from international organisations (IMF, OECD, World Bank and Regional Development Banks)[21]. The report is a response to the G20's request to explore potential sources of climate financing, based on a carbon pricing structure relating to the CO_2 emissions generated by the international aviation sector and maritime transportation. The organisations concluded that introducing a carbon levy of US$25 per tonne of CO_2 on fuel could raise around US$12 billion for the international aviation sector by 2020, while slightly reducing CO_2 emissions. The G20 discussions led to the following conclusions, although they did not result in the adoption of measures to assign a pricing structure to CO_2 emissions, as recommended by the report:

- *"We discussed the international financial organisations' report on climate finance…"*
- "*We asked our Finance Ministers to continue their work in this area, in compliance with the goals, provisions, and principles of the United Nations Framework Agreement on Climate Change...*
- *"We also recognise that new sources of finance will need to be found over time in order to meet development needs and to deal with climate change."*

The review is continuing, although no real decisions have been taken. In Europe, on February 21st 2012, the Finance Ministers of the 27 European Union Member States reiterated their commitment to work towards financing developing countries' climate efforts, spending an amount equivalent to US$100 million per year between now and 2020. The Council is calling on the European Commission to draw up a discussion paper on taxing carbon emissions from the international civil aviation and maritime transport sectors by June 2012, and to do so taking into account developments in the work aimed at reducing these emissions performed by the International Maritime Organisation (IMO), and by the International Civil Aviation Organisation (ICAO). The Council is inviting the parties to increase their efforts to achieve the implementation of market-based solutions (ETS). The Council is also underlining the need to take into account domestic budgetary rules and the provisions of the UNFCCC, in terms of the potential uses for this carbon tax.

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[19] According to Resolution A37-19, "Where revenues are generated from MBMs, it is strongly recommended that they should be applied in the first instance to mitigating the environmental impact of aircraft engine emissions".

[20] "MBMs should ensure the fair treatment of the international aviation sector in relation to other sectors". Source: ICAO Resolution A37-19, Appendix.

[21] http://www.oecd.org/dataoecd/57/30/49032964.pdf

CONCLUSION

In its approach towards a proactive and exemplary climate policy, the European Union has taken the lead by unilaterally deciding to include all airlines' CO_2 emissions for the flights that they operate into or from the Continent, in its Emission Trading scheme. Applying a target cap of -3% in 2013, and then of -5% up until 2020 on the airline sector's emissions will result in an average net demand for allowances of around 40 million tonnes of CO_2 per year, in order to ensure that players in the air transportation sector comply with their emission reduction targets.

This EU climate regulation, which is based on an emissions trading scheme, have been strongly opposed by countries, by the ICAO, and by organisations and airlines, both in Europe and abroad. The proceedings launched by a large number of countries and airlines call on the European Union to define a negotiation framework, in order to:

- study the equivalent status of the scope of the emission reduction measures proposed by other countries, and therefore exempt international airlines committed to such reduction policies;
- suggest a review of the current directive, on the grounds of the impact of the inclusion of the aviation sector in the EU ETS on its competitiveness;
- promote the reaching of an international agreement within the ICAO framework, in order to determine a CO_2 emission reduction policy for the sector that is based on an allowance system.

To date, the ICAO demonstrated its intention to define a climate policy for reducing emissions in the sector in October 2010, when it adopted a resolution at its General Meeting. This resolution provides for the stabilisation of CO_2 emissions from the international aviation sector from 2020 onwards, via an annual improvement of 2% in the aviation fuel yield up until 2050, and the introduction of a standard on CO_2 emissions from aircraft engines in 2013. These commitments do not imply any binding obligation for ICAO member countries. The introduction of a global emissions trading or market regulation scheme is currently the subject of a technical study at the ICAO, which will be presented at the next Council in November 2012, ahead of the next General Meeting in November 2013.

The difficulty of achieving a consensus amongst ICAO member countries makes the likelihood of such a decision low in the short term. The introduction of carbon pricing via the introduction of an international emissions trading scheme has little chance of becoming operational before 2020, unless the European Union's proactive initiative to include the aviation sector in its emissions trading scheme leads the UN to take a decision in favour of such regulations in 2013. If there is no decision by that date, the ICAO will only rule on the issue in 2016, at its next General Meeting. The adoption of such an international sector-based agreement would be a political success for the European Union's initiative in favour of combating climate change.

APPENDIX 1 - THE CONTRIBUTION OF INTERNATIONAL AIR TRANSPORTATION TO CLIMATE CHANGE

Air transportation emits several pollutants that contribute to climate change, mainly carbon dioxide (CO_2), but also nitrous oxide (NO_x) and steam (H_2O), which leads to the formation of condensation trails.

The statistics on CO_2 emissions in the air transportation sector are obtained through multiplying fuel consumption by an emission factor (one tonne of kerosene emits the equivalent of 3.1 tonnes of CO_2). According to estimates from the International Energy Agency (IEA), global CO_2 emissions generated by the aviation business (including all flights) amounted to 455 million tonnes of CO_2 in 2008, i.e. a 76% increase since 1990. Around 62% of these emissions were from international flights.

Most CO_2 emissions from the international air transportation sector are generated by developed countries, even if the same emissions are increasing rapidly in developing countries, and particularly in major emerging markets like China and India. In 2008, for instance, one third of the international air transportation sector's emissions came from the European Union, while North America was responsible for 21% of CO_2 emissions, and Asia for 19% (see Figure 12). Asia recorded the sharpest increase in air transportation emissions, posting a rise of 188% compared with 1990, followed by South America, which saw an 103% increase in its emissions over the same period.

CO_2 emissions from the aviation sector will increase by at least 100% by 2050

The ICAO called upon the expertise of the Inter-Governmental Panel on Climate Change (IPCC) and the Montreal Protocol Expert Scientific Assessment Panel to assess the aviation sector's responsibility for climate change as far back as 1999. The conclusions of their first scientific assessment report, entitled *Aviation and the Global Atmosphere*, were reviewed in the IPPC's fourth assessment report (IPCC AR4) in 2007, and specifically concluded that the volume of CO_2 emissions from the aviation sector is likely to increase by between 3 and 4% per year. In fact, improvements in fuel yields could potentially lead to a medium-term reduction in the CO_2 emissions generated by the aviation sector. However, these improvements will only partly offset the increase in aviation CO_2 emissions relating to the increase in traffic.

The IPCC has started preparing its fifth assessment report (AR5), which is expected to be published in 2014. According to the various scenarios in the report, CO_2 emissions from the civil aviation sector are likely to increase by a factor of between 1.9 and 4.5 times compared with the 0.20 Gt estimated in 2005, reaching a level of between 0.37 Gt and 0.89 Gt by 2050, in the absence of a climate policy for reducing GHG emissions.

APPENDIX 2 – THE COSTS OF, AND THE POTENTIAL FOR REDUCING CO_2 EMISSIONS

The level of CO_2 emission reductions in the aviation sector will depend on each measure's potential to reduce emissions, on the economic incentive provided by the CO_2 price signal, on marginal reduction costs, and on the pass-through rate for air tickets.

Several studies have shown the potential for reducing the sector's CO_2 emissions and the marginal costs of each of the reduction measures (DFT, 2011; Koehler, 2010; CCC, 2009; ICF, 2006). All agree on the increasing marginal costs, from the low reduction cost of operational air traffic management measures, up to the very high cost of replacing aircraft by new generation aircraft. The CO_2 price represents an incentive for airline operators to make these emission reductions while the marginal cost of the measures taken is lower than the CO_2 price and the cost of fuel.

Reduction measures where the marginal cost is lower than the carbon price determined by the EU ETS will be economically viable and will therefore be possible to implement. With a carbon price of €20 per tonne in 2020, the reduction is likely to be only 10 $MtCO_2$. In contrast, all the other measures will require a higher carbon price beyond 2020, or the implementation of additional policies and financing, in order to provide operators and aircraft manufacturers with incentives to invest in these CO_2 emission reduction measures.

By 2050, the measures that enable the most substantial emission reductions correspond to operational air traffic flow management measures and the compulsory use of biofuels (DFT, 2011) In terms of cost-efficiency, the two most profitable measures are: improving the effectiveness of air traffic flow management, and

developing the use of biofuels. We would also note that an important measure for reducing emissions also consists in reducing travel by organising videoconferences.

LIST OF ACRONYMS

CAEP – (OACI) Committee on Aviation Environmental Protection

UNFCCC – United Nations Framework Convention on Climate Change

DGAC – *Direction Générale de l'Aviation Civile Française* (French Direction General for Civil Aviation)

CER – Certified Emission Reductions, or URCE

EU ETS – European Union Emissions Trading Scheme

EUA – European Union Allowance

EUAA – European Union Aviation Allowance

GHG – Greenhouse gas

GIACC – (ICAO) Group on International Aviation and Climate Change

CDM – Clean Development Mechanism

JI – Joint Implementation

MRV – Monitoring, Reporting and Verification

NAMA – Nationally Appropriate Mitigation Action

ICAO – International Civil Aviation Organisation

CERU – Certified Emission Reduction Unit

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