

## ICAO'S GLOBAL OFFSET MECHANISM DRAWS WORLDWIDE ATTENTION TO INTERNATIONAL AVIATION EMISSIONS

Shahbano SOOMRO

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To discuss this issue, 191 countries convened last week at the International Civil Aviation Authority's 2016 Assembly. Historically international transport has been exempt from UNFCCC regulation, with responsibility for its emissions delegated to the UN's sectoral agencies, ICAO and IMO (the International Civil Aviation Authority and Maritime Organisation, respectively).

As emissions for these sectors increase rapidly, pressure has finally mounted on both industry bodies to take greater action to curb future emissions growth. On 6th October, the nature of this action was decided when members voted in a global, mandatory measure intended to keep emissions from international aviation at their 2020 level. This measure takes the form of a Carbon Offsetting and Reduction Scheme (CORSIA) which will start its Pilot Phase in 2021. This preliminary analysis outlines that:

- ◆ **Action by CORSIA is needed urgently in the context of the historical and projected rise in aviation's CO<sub>2</sub> emissions.** These emissions reflect only part of aviation's wider, more detrimental impact on the environment.
- ◆ **The CORSIA scheme proposed by ICAO and agreed by member states is defined by its requirement that operators must offset all emissions growth above the 2020 baseline.** These obligations are mandatory from 2027. From this date emissions from approximately 157 countries and specific routes are still eligible for exemption from offsetting.
- ◆ **The scheme's ability to ensure carbon neutral growth from 2020 can be called into question due to several design features:** the reduction baseline year, uneven coverage following exemptions, relationship with other non-global measures, and credibility of the future offsets and MRV system.
- ◆ **Some questions raised by the scheme remain unanswered:** its full implications, including the cost of the scheme for operators and the type and level of emissions reductions incentivised. To determine the full consequences of the scheme, time is needed for its implementation mechanism to develop, and for detailed examination of the costs of abatement both within and outside of aviation.

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# ICAO's global offset mechanism draws worldwide attention to international aviation emissions

Shahbano Soomro, Climate Economics Chair

## 1 / ICAO's 39th Assembly raises global attention on the challenges of the Aviation Sector

Emissions from the aviation sector are often overlooked due to the difficulty of assigning them between nations. However if the sector were treated as a state in itself, it would represent the 7<sup>th</sup> largest emitter, behind Germany and ahead of Canada and South Korea<sup>1</sup>. International aviation alone contributed 2%<sup>2</sup> to CO<sub>2</sub> emissions in 2013, not taking into account its production of other harmful gases.

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As emissions for these sectors increase rapidly, pressure has finally mounted on both industry bodies to take greater action to curb future emissions growth. On 6<sup>th</sup> October, the nature of this action was decided when members voted in a global, mandatory measure intended to ensure low carbon growth of international aviation from 2020. This measure takes the form of a Carbon Offsetting and Reduction Scheme (CORSIA) which will start its Pilot Phase in 2021.

This contribution will firstly put ICAO's proposal into the context of the aviation sector, its emissions and their regulation. Secondly, the proposal's key points will be highlighted and explained. Thirdly, questions and concerns raised by the Assembly's decision will be discussed. This preliminary analysis demonstrates that the consequence of CORSIA is inconclusive; more time is required for the scheme to develop and detailed economic examination.

## 2 / International Aviation and the Climate

The decisions made by ICAO's 39th Assembly will be crucial in determining the rise, or fall, in global emissions. This is because under Article 2.2 of the Kyoto Protocol, ICAO has been delegated sole responsibility for international aviation. This has left the sector exempt from the Paris agreement last year. Nevertheless, aviation remains important in helping to determine whether that agreement's 1.5 degrees warming limit is met.

The role of ICAO has become increasingly important in the context of globalization and rising emerging economy incomes, both of which have driven a strong surge in the demand for air transport. Between 1990 and 2015, air passengers carried rose by 235%<sup>3</sup> and freight traffic grew by approximately 160%<sup>4</sup>. This growth is largely attributable to the transport demand from non-OECD countries: representing 86% of the global increase in passenger activity and 73% of growth in freight<sup>5</sup>.

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<sup>1</sup><http://www.climatechangenews.com/2016/09/12/pacific-nations-signal-support-for-un-aviation-emissions-deal/>

<sup>2</sup> IEA Statistics : CO<sub>2</sub> Emissions from fuel combustion, 2015, IEA

<sup>3</sup> Air Passengers Carried, World Bank Data,

([http://data.worldbank.org/indicator/IS.AIR.PSGR?end=2015&name\\_desc=false&start=1990&view=map&year=1970](http://data.worldbank.org/indicator/IS.AIR.PSGR?end=2015&name_desc=false&start=1990&view=map&year=1970))

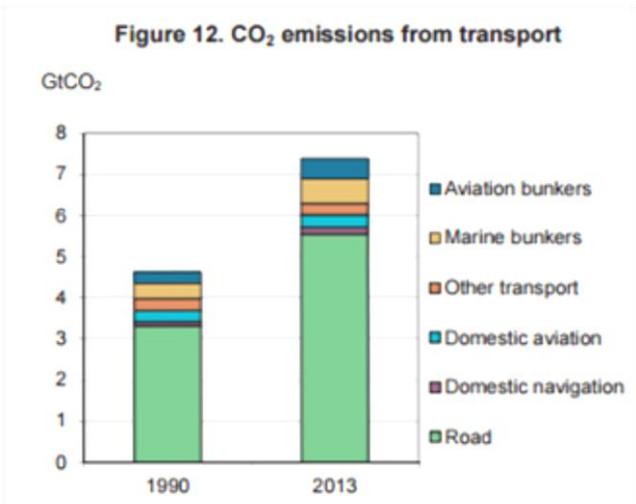
<sup>4</sup> 'World Air Cargo Forecast 2014-2015', Boeing

(<http://www.boeing.com/resources/boeingdotcom/commercial/about-our-market/cargo-market-detail-wacf/download-report/assets/pdfs/wacf.pdf>)

<sup>5</sup> Tracking Clean Energy Progress, 2015, IEA

Notably, this demand has so far outpaced efficiency improvements. As a result, emissions are both substantial and rising rapidly. International aviation accounted for 2%<sup>6</sup> of global CO<sub>2</sub> emissions in 2013, having grown by 90%<sup>7</sup> since 1990. The consequence for the climate is far greater than the production of CO<sub>2</sub>: airplanes produce other harmful gases, such as nitrogen oxide (NOx)<sup>8</sup>, which trigger the formation of condensation trails (contrails) and increase cirrus cloudiness. These effects heighten aviation's ramification on surface warming<sup>9</sup>. For instance, the IPCC estimated that aviation contributed about 3.5% of total radiative forcing in 1992<sup>10</sup>; they project future warming effects at a factor of 2 to 4 larger than the effect of CO<sub>2</sub> emissions alone.

Most importantly, in the industry's own business as usual projections, growth in activity and emissions aren't expected to reverse, or even stabilize. The ICAO<sup>11</sup> estimate that aircraft operations will triple by 2040, with an annual growth in passenger traffic of 5% up to 2030. Without strong action on the carbon intensity of fuels, 'nearly all growth in transport energy use translates directly into higher GHG emissions'<sup>12</sup> for the future. Under these baseline scenarios, emissions are expected to grow by at least 300%<sup>13</sup> up to 2050, and could account for 22%<sup>14</sup> of the carbon budget then.



Source : IEA Statistics 2015, 'CO<sub>2</sub> emissions from fuel combustion'

In response to the concerns caused by the fast growth of aviation emissions and the lack of mandatory targets set by ICAO, the EU has attempted to take steps to reduce aviation emissions in Europe. In 2008, the EU Member States adopted legislation to include emissions from all flights from, to and within the EEA within the EU Emissions Trading Scheme. This legislation would have taken effect from 2012, but was halted as a result of international opposition.

In response to the actions within the EU, ICAO agreed in 2013 to develop a global market based measure (MBM) and apply it by 2020. In response, the EU agreed to a 'Stop the Clock' policy, suspending EU ETS requirements for flights to and from non-European countries till 2016 and giving time for ICAO's negotiations to proceed.

<sup>6</sup> IEA Statistics : CO<sub>2</sub> Emissions from fuel combustion, 2015, IEA

<sup>7</sup> IEA Statistics : CO<sub>2</sub> Emissions from fuel combustion, 2015, IEA

<sup>8</sup> Environmental Report, 2016, ICAO

<sup>9</sup> Special Report on Aviation and the environment, IPCC

<sup>10</sup> Special Report on Aviation and the environment, IPCC

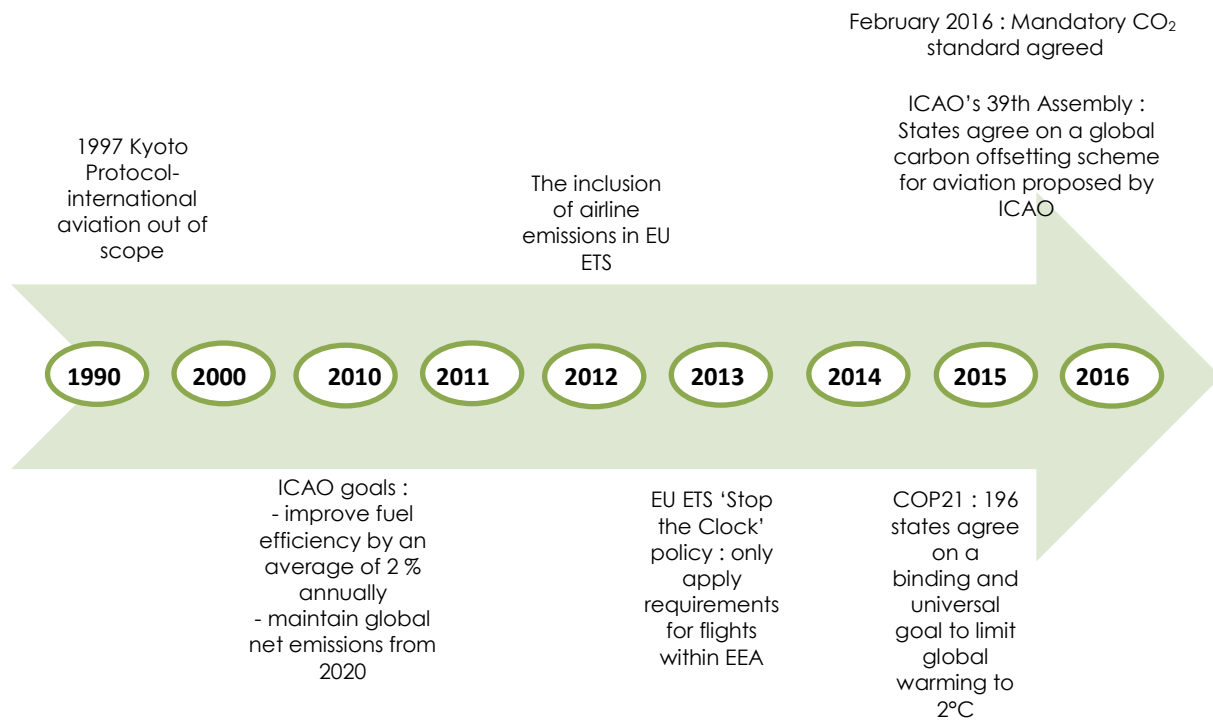
<sup>11</sup> Environmental Report, 2013, ICAO

<sup>12</sup> Tracking Clean Energy Progress, 2015, IEA

<sup>13</sup> 'Global Aviation CO<sub>2</sub> Emissions projections', Environment section, ICAO

([http://www.icao.int/environmental-protection/GIACC/GIacc-4/CENV\\_GIACC4\\_IP1\\_IP2%20IP3.pdf](http://www.icao.int/environmental-protection/GIACC/GIacc-4/CENV_GIACC4_IP1_IP2%20IP3.pdf))

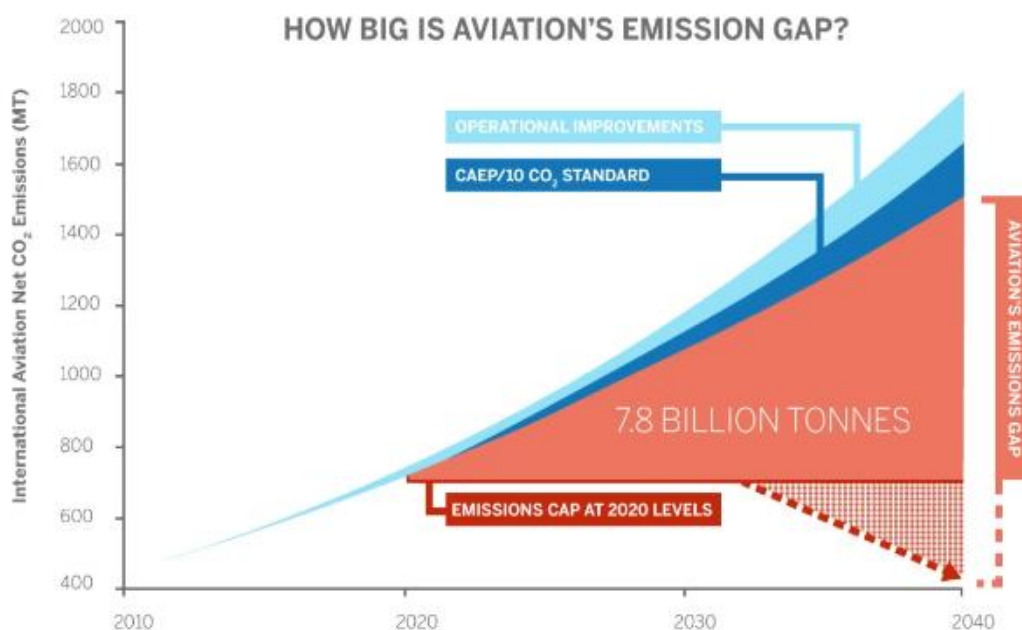
<sup>14</sup> International Aviation's link to Climate Change, ICASA



Source: author of the article

### 3/ ICAO's recent decisions on environmental protection

Since 2013, ICAO has worked to design an MBM which helps to achieve the industry's goal of carbon neutral growth from 2020. In order to achieve this target through reductions within the sector, there are three main levers available to operators: operational improvements, switching to low-carbon fuels, and investing in new aircraft technology. Thus far, ICAO has aimed to incentivize the above in sector abatement through standards and regulation. For instance targets to achieve a 2% average annual improvement in fuel efficiency up to 2050 or the application of a CO<sub>2</sub> standard on aircrafts, taking full effect from 2028. However, such measures have been determined as insufficient by ICAO's reports<sup>15</sup>; the limited reduction potential of standards and efficiency gains highlighted below.



Source : ICAO, 'Overview of Environmental work', Singapore GLADS 2015  
 Edited by FlightPath 1.5

<sup>15</sup> Environmental Report, 2016, ICAO

In light of this, to address the outstanding 7.8 billion tonnes of CO<sub>2</sub> without jeopardising demand for air travel, ICAO chose a global Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) as its preferred MBM. This measure enables airline operators to offset emissions growth above 2020 levels via the purchase of emissions credits. One credit represents an additional metric tonne of CO<sub>2</sub> reduced through projects outside of aviation. Unlike other market instruments, taxes and tradeable permits, CORSIA theoretically allows passenger traffic and emissions within the sector to continue rising. Carbon neutral growth of aviation is attainable so long as equivalent CO<sub>2</sub> reductions are achieved elsewhere.

CORSIA has several other defining characteristics. Firstly, offsets are only required for emissions above the 2020 emissions baseline: there is an implied 0 cost for all emissions up to the 2020 level. Secondly, CORSIA will be implemented in several phases. It starts with a Pilot (2021-2023) and First Phase (2024-2026), both of which are voluntary for states to participate in; in the scheme's Second Phase (2027-35) offsetting becomes mandatory for all but exempt states. Thirdly, an estimated 157<sup>16</sup> countries are eligible for exemption in 2027 on the basis of two criteria which aim to respect 'special circumstances and respective capabilities'. One type of exemption applies to all developing countries: ninety states are exempt due to their classification as Less Developed, Small Island or Landlocked Developing countries by the UN. An additional type of exemption applies to countries which only contribute to a small amount of international activity: states accounting for less than 0.5% of total RTKs<sup>17</sup> in 2018 are exempt, so long as they are not within the cumulative 90% of RTKs from states with the highest to lowest RTKs. Despite being exempted countries may still participate, with 65 countries<sup>18</sup> having stated their intention to voluntarily participate from 2021.

#### **4/ The implications of CORSIA**

CORSIA raises many challenging questions: the effects of the scheme on global emissions and the international aviation sector; the uncertain relationship of the mechanism and national or regional initiatives; and lastly, the potential consequences on carbon credit markets and the sector's cost of emissions reduction.

##### **1. CORSIA limitations in reducing emissions**

Firstly, CORSIA's capacity to achieve ambitious emissions reductions is called into question due to several problematic design features:

###### **1.1 Reference to 2020**

Most apparently problematic is the decision to reduce emissions levels to the baseline in 2020. Given a rise in emissions over the next four years, this choice of baseline year signals fewer reductions targeted throughout the scheme. In addition, because operators face no cost for emissions up to the 2020 level, a perverse short-term incentive is created by the scheme. Operators are incentivized to increase emissions up to 2020: by increasing emissions in the next four years they effectively reduce their future offset requirements.

###### **1.2 Restricted Coverage**

Another problematic feature of CORSIA's design is its uneven coverage, and the high levels of carbon leakage that the state and route exemptions entail.

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<sup>16</sup> based on personal analysis of RTKs data for 2014

<sup>17</sup> RTKs are the scheduled revenue tonne kilometres of an aircraft (the metric tonnes of revenue in load, multiplied by the kilometres flown)

<sup>18</sup> ICAO website

Explicitly, the scheme's exemptions reduce emissions coverage on questionable grounds and without delivering significant benefits. For instance, whilst the protection of economic development is uncontroversial, exemptions to developing countries are neither the only nor necessarily the most effective means to reduce the cost burden of climate change mitigation. Exemptions exclude states from the practice of carbon pricing which is detrimental to both the scheme's coverage, and to the states own environmental protection. To safeguard development whilst ensuring effectiveness of carbon pricing, including and compensating states on the basis of low development indicators could be more successful.

The exemptions based on a country's share of international traffic also contain two serious flaws. Firstly, countries such as Poland and Argentina can be exempt, despite receiving a significant share of international air traffic. This is because the calculation of a state's RTKs (revenue-tonne kilometers) measures the RTKs of operators issued an Airline Operating Certificate by that state. This method entails that countries with few or no operators are predominately exempt. Analysis highlights that this method reduces the share of CO<sub>2</sub> emissions to be offset to 88% in the Second Phase, compared to 93% if RTKs were measured according to departing and arriving flights<sup>19</sup>. Secondly, countries such as Denmark and Monaco may be exempted, despite their capacity to bear the costs of the scheme. Without a further criteria based on GNI, small but rich countries remain able to avoid offset obligations.

More importantly, beyond the emissions of officially exempted states, CORSIA's route exemptions create even greater carbon leakage. These exemptions arise out of the decision to apply CORSIA equally across aircraft operators on the same route. On routes between a State that is included within CORSIA and one that is exempt, all emissions from all operators will remain outside of the scope of CORSIA's offset requirements. As outlined above, despite being exempt via the accounting of RTKs countries can accrue large amounts of international air traffic. For instance Poland is exempt despite having the 5th greatest international tourism<sup>20</sup> in 2014. Under CORSIA, all of the emissions from flights to and from Poland would be officially exempt. This design feature also creates the incentive to use more inefficient planes on exempted routes, shifting emissions outside of the scheme. The result is the appearance of total offsetting, when in reality there is a significant proportion of emissions growth that is not accounted for.

The final result is that carbon neutral growth of aviation could be compromised. This is because CORSIA does not intend on redistributing the emissions growth which falls under its exemptions to other obligated parties. The lack of burden sharing means the 7.8 Bt emissions gap faced by aviation may not be completely offset through the scheme.

### 1.3 The Monitoring, Reporting and Verifying of Offsets

Another problematic feature of the scheme is the uncertainty surrounding crucial aspects of its implementation. To date, ICAO has failed to establish clear guidelines for which offsets will be eligible, the process of monitoring, reporting and verifying emissions, and the legal penalties for non-compliance. These operational procedures are an essential pillar in the scheme's effectiveness. For instance, the environmental integrity of emissions reductions depends on the criteria for credits. If credits fail to guarantee reductions that are real, permanent and additional, then the use of offsets may contribute to a net increase in global emissions. In particular, additionality is difficult to ascertain because it requires comparison against a counterfactual, the emissions under a hypothetical baseline. A study commissioned by the CDM policy dialogue found that potentially two thirds of all credits expected between 2013 and 2020 would be from BAU projects; these credits could cause an increase in GHG

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<sup>19</sup> [http://www.icao.int/Meetings/HLM-MBM/Documents/HLM\\_GMBM\\_IATA\\_WP11\\_EN.pdf](http://www.icao.int/Meetings/HLM-MBM/Documents/HLM_GMBM_IATA_WP11_EN.pdf)

<sup>20</sup> International Tourism is defined as 'the number of departures that people make from their country of usual residence to any other country for any purpose other than a remunerated activity in the country visited.', World Bank Data

emissions of up to 3.6 bn tonnes if used for compliance<sup>21</sup>. Ultimately, the credibility of the scheme will depend on the reliability of its implementation which is still under determination.

(Further information on the CDM, a current offsetting scheme, is in Box 1.1.)

## **2. The uncertain relationship of CORSIA with regional and national aviation schemes**

Though CORSIA is the first global measure to cover international aviation, it is not the first regional or domestic instrument to tackle aviation emissions. Other market based instruments are already in operation, including the emissions trading schemes of the EU and Shanghai. The method by which these schemes will be incorporated in the global measure has yet to be decided, but will have an important effect on emissions reduced.

Currently it is not evident how these schemes will be change in light of CORSIA. Under a hypothetical scenario where regional measures remain as they were before, some routes to outside the scope of CORSIA would be under the obligation of alternative instruments. On one hand, more routes would face some form of carbon price for emitting, incentivizing greater emissions reductions. However, the coverage of routes under separate schemes, which encourage different types of reductions and have potentially very different costs, is likely to produce unequal and distortionary effects.

The fact that the EU accounts for 35%<sup>22</sup> of global aviation's emissions makes it vital to ascertain how CORSIA acknowledges and incorporates regional schemes such as the EU ETS. Equally significant is the future development of regional measures. The EU ETS's temporary 'Stop the Clock' policy is due to terminate, after which the European Commission will have to decide on the EU's stance on tackling aviation emissions outside of ICAO.

CORSIA must also define its relationship with the 35% of aviation emissions which are not covered by the scheme, those from domestic aviation<sup>23</sup>. Currently, these emissions are regulated by each country's national reduction targets. This separate treatment of national and international flights leaves open the same problems highlighted above of unharmonised carbon pricing and market distortions. For instance, operators with large domestic operations may face the incentive to use more inefficient fleets on domestic routes. Moreover some countries, with greater domestic air travel, are poised to benefit more from this dualism. Overall, this raises questions over how this duality in carbon price can be resolved, and whether a scheme covering the entire aviation sector will be necessary in the future.

## **3. Does the baseline for the aviation sector change in response to CORSIA?**

Lastly, to evaluate the full consequence of CORSIA on the cost and type of abatement a more extensive impact assessment is required. A key area of uncertainty is the cost of carbon abatement both within and outside of the sector. Depending on scenarios for carbon offset price and aviation abatement technology, the resulting cost of aviation's environmental targets and the incentives for further emissions reductions will be affected.

It is evident that to assess the impact of CORSIA it is vital to consider the price of carbon abatement outside of aviation, represented by the future price of carbon offsets. Without certainty over eligible offsets, the UNFCCC's Certified Emissions Reduction units (CERs) serve as a guideline offset market. These CERs are projected to be close to 0\$ at CORSIA's implementation date. This implies that as long as there are limited emissions reductions possible for a net negative cost, operators would choose to purchase offsets and continue emitting.

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<sup>21</sup> <http://carbonmarketwatch.org/wp-content/uploads/2013/05/Aviation-Emissions-Policy-Brief-June-20131.pdf>

<sup>22</sup> Fifth Assessment Report, 2014, IPCC

<sup>23</sup> Environmental Report, 2016, ICAO



However, the influx of demand for offsets simultaneously makes the equilibrium price of offsets more complex to forecast. On one hand a rise in demand and the high expected cost of aviation's abatement technology could push up the value of offset credits. On the other hand, it is uncertain whether offset prices will actually rise without more detailed understanding of the costs of abatement within and outside of aviation and the future supply in the offset market.

Given this large degree of uncertainty over the future carbon price faced by the aviation sector it is also unclear to what degree emissions of aviation will be reduced by CORSIA. ICAO baseline projections estimate limited reduction potential within the sector. However, alternative projections by the IEA (2009) see the potential for further fuel efficiency gains of 40–50% in the 2030–2050 timeframe (relative to 2005)<sup>24</sup>.

The extent to which operators choose to increase efficiency and decrease emissions beyond the ICAO baseline scenario can only be understood by a more thorough examination of the choice faced by operators. This choice hinges on relative costs, and so further research ought to be focused on both the internal costs of abatement technology and external credit price scenarios.

## **5 / Conclusion**

In summary, ICAO's CORSIA takes the first, and highly significant step towards the pricing of carbon in the international aviation sector. Nevertheless, there are many concerns raised about its environmental integrity: the reduction baseline, nature of exemptions, relationship with other non-global measures, and credibility of its offsets and MRV system. The questions raised are twofold : does CORSIA's coverage ensure all emissions increases of aviation are fully offset, such that carbon neutral growth from 2020 is achieved ; can such an offsetting scheme help to reduce the cost of reaching efficiency standards within the sector, and incentivise emissions reductions beyond existing standards.

To address these issues requires greater understanding of how the scheme will operate, and economic analysis into its spillover effects on carbon credit markets. With greater information on the number of participating countries, and the scheme's implementation tools, one can assess the capacity to achieve carbon neutral growth. However to understand the entire effects on global emissions, further economic analysis is still necessary. This includes research into probable offset price scenarios, and the likelihood that these offset prices can encourage operators to choose to abate within aviation. Without the capacity to incentivise efficiency gains and technology shifts beyond BAU, the offsetting scheme only authorises emissions of aviation increasing without clear limit.

For the above reasons offsetting ought to be treated as an uncertain method to reduce, or even stabilise, global emissions in the long-term. There are alternative instruments to price carbon which respond to the problems highlighted throughout the paper. For instance, by application of a carbon tax there would both be greater control over the cost incentives operators face, and the possibility of raising revenue to help compensate developing countries. Two noteworthy benefits arise from the incorporation of a carbon tax into CORSIA, and the subsequent removal of exemptions: the incentive to increase emissions in the short term would disappear, and full coverage of the scheme would ensure all emissions growth post 2020 was offset.

Two lessons are clear, that discussions into how best to incentivise emissions reductions within aviation ought to be ongoing ; and that ICAO's Offsetting Scheme is valuable simply for the global awareness it raises on this issue.

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<sup>24</sup> Fifth Assessment Report, 2014, IPCC

### Box 1.1

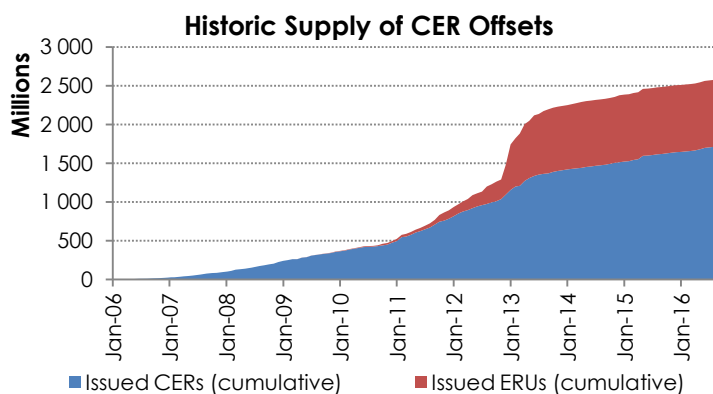
#### The Clean Development Mechanism & Certified Emissions Reduction (CER) units

##### What is the CDM ?

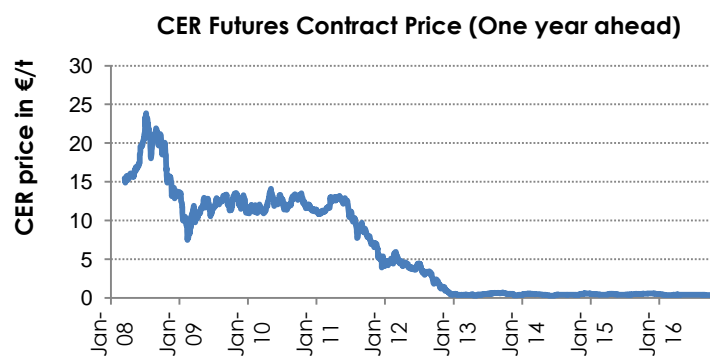
It is a Kyoto Protocol scheme which has since 2000 allowed emissions reduction projects in developing countries to earn tradeable CER (certified emissions reduction) credits. The purchase and retirement of credits is a means for industrialised countries to meet emission reduction targets in the Kyoto Protocol.

The premise for this offset mechanism is that by increasing flexibility over where emissions reductions occur, it is possible to achieve emissions reductions where it is least costly globally.

##### What is the historical price of CERs ?



Source : UNEP Risoe CDM and JI Pipeline



Source : ICE Market Exchange

##### What are the main advantages and disadvantages of CER units?

###### Advantages :

- It provides an important source of climate finance for economically less developed countries. For instance, over the past decade the CDM has mobilized more than US\$215 billion in investments in developing countries.
- It helps more highly economically developed countries to achieve emissions reductions targets.

###### Disadvantages

- Projects have sometimes been unable to provide emissions reductions which were **real, permanent and additional**
- The large cost of certifying and calculating the CO<sub>2</sub> reduced by emissions reductions projects

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