

## OVERVIEW - MARKET-BASED MEASURES

## MARKET-BASED MEASURES

BY ICAO SECRETARIAT

## INTRODUCTION

Market-based measures (MBMs) have been on the ICAO agenda for a number of years as a potential means to mitigate the climate change impacts of international aviation. MBMs are one of the important tools available to address greenhouse gas (GHG) emissions amongst a range of other measures including: operational improvements, new technologies, alternative fuels, action plans, and assistance to States.

Sometimes referred to as market instruments, MBMs provide financial incentives and disincentives to guide the behaviour of regulated entities towards lowering emissions. These measures can be implemented to reduce damage to the environment. The investigation of MBMs as a potential option for international aviation began in the late 1990s through ICAO's Committee on Aviation and Environmental Protection (CAEP).

In 2010, ICAO Assembly Resolution A37-19 adopted guiding principles for the design and implementation of MBMs (See **Box** on Assembly Resolution A37-19, Annex). The Resolution also requested that the Council explore the feasibility of a global MBM scheme, develop a framework for MBMs, review the *de minimis* threshold for MBMs, taking into account the specific circumstances of States and potential impacts on the aviation industry and markets, and undertake a study on the possible application of Clean Development Mechanisms of the Kyoto Protocol to international aviation.

## GLOBAL CONTEXT

Worldwide, there is increasing interest in using MBMs to address climate issues. The largest emission trading scheme in the world, the European Union Emission Trading Scheme (EU-ETS), decided to include aviation under its scheme from 1 January 2012. However, in November 2012, a decision was made to suspend the application of the EU-ETS to international aviation (referred to as "stop the clock"). For a period of one year, all international flights would be excluded from the EU-ETS, and only intra-European flights remained covered.

The first commitment period under the Kyoto Protocol was completed at the end of 2012, and at the 18<sup>th</sup> Meeting of the Conference of the Parties (COP18) to the United Nations Framework Convention on Climate Change (UNFCCC), held in Doha, Qatar, in December of that year, governments agreed to continue with an eight year second commitment

period from 2013 to 2020. It was also agreed that a legally binding accord on climate change should be adopted at COP21 in 2015 for implementation beginning in 2020. Many States did not commit to binding emissions targets for the second commitment period resulting in the weakening of market-based mechanisms under the Kyoto Protocol (see article *Market-Based Measures and the United Nations*, Chapter 4 in this report).

In June 2013, at its 69<sup>th</sup> Annual General Meeting, the International Air Transport Association (IATA) endorsed a resolution on the "Implementation of the Aviation Carbon-Neutral Growth (CNG2020) Strategy". This resolution is meant to provide governments with recommendations on how a global MBM for aviation could be implemented (see article *IATA Agreement on Carbon Neutral Growth*, Chapter 4 in this report).

## WHY MARKET-BASED MEASURES?

GHG emissions from international aviation are growing rapidly. ICAO data shows that international CO<sub>2</sub> emissions grew from approximately 185 megatonnes (Mt) in 1990 to 448 Mt in 2010. Recent analysis by CAEP on fuel trends estimated that the average annual growth of aviation traffic will likely range between 5.2% and 4.2%. This means that the continued growth of fuel consumption is projected to be from 2.8 to 3.9 times higher in 2040 than the 2010 value.

CAEP also concluded that, beyond the forecasted aircraft technology and operational improvements, additional measures will be needed to achieve carbon neutral growth by 2020. Sustainable alternative fuels have the potential to make a contribution to the remaining gap, but it is too early to confidentially predict their availability and potential contribution. More detailed results of the ICAO's CAEP analysis on trends are further discussed in this report (see article *Environmental Trends in Aviation to 2050*, Chapter 1 in this report).

Market-based measures are therefore believed to be an important gap filler, that can be characterized as an efficient way to reduce emissions. MBMs provide participants with flexibility to choose between the implementation of emission reduction measures within their own sector, or offsetting those CO<sub>2</sub> emissions in other sectors. This is particularly important for the aviation industry, where in-sector emissions reductions are expensive and limited.

## ASSEMBLY RESOLUTION A37-19 ANNEX

The guiding principles for the design and implementation of market-based measures (MBMs) for international aviation:

- a) MBMs should support sustainable development of the international aviation sector.
- b) MBMs should support the mitigation of GHG emissions from international aviation.
- c) MBMs should contribute towards achieving global aspirational goals.
- d) MBMs should be transparent and administratively simple.
- e) MBMs should be cost-effective.
- f) MBMs should not be duplicative and international aviation CO<sub>2</sub> emissions should be accounted for only once.
- g) MBMs should minimize carbon leakage and market distortions.
- h) MBMs should ensure the fair treatment of the international aviation sector in relation to other sectors.
- i) MBMs should recognize past and future achievements and investments in aviation fuel efficiency and in other measures to reduce aviation emissions.
- j) MBMs should not impose inappropriate economic burden on international aviation.
- k) MBMs should facilitate appropriate access to all carbon markets.
- l) MBMs should be assessed in relation to various measures on the basis of performance measured in terms of CO<sub>2</sub> emissions reductions or avoidance, where appropriate.
- m) MBMs should include *de minimis* provisions.
- n) Where revenues are generated from MBMs, it is strongly recommended that those funds should be applied in the first instance to mitigating environmental impacts of aircraft engine emissions, including mitigation and adaptation, as well as to support and assist developing States.
- o) Where emissions reductions are achieved through MBMs, they should be identified in the emissions reporting of States.

Finally, economic instruments such as MBMs provide “financial incentives to guide behaviour towards environmentally responsible activity”. For example, an MBM that places a price on carbon, encourages further efficiency improvements and the adoption of new technologies.

## PROGRESS AT ICAO

During the three years since the last Assembly, ICAO undertook work on each of the requests made by Resolution A37-19. One of the first deliverables completed was the “*de minimis* study” to assess the impact of applying a *de minimis* threshold which would exempt States which had less than 1% of the total international revenue tonne kilometres, from implementation of MBMs. That analysis demonstrated that if a *de minimis* exemption was introduced, there would be substantial market distortions between the operators that were subject to an MBM and operators not subject to an MBM. For example, it was estimated that impacts on traffic demand could be approximately 50% more significant for operators under an MBM than for operators with an exemption.

A process was established for work on MBMs at ICAO with the support of experts nominated by States and international organizations from around the world. The progress of the work was reviewed by an Ad Hoc Working Group on Climate Change, comprised of the ICAO Council Representatives from each of the six ICAO regions. The Ad Hoc Working Group provided recommendations to the Council up until June 2012.

The assessment of MBMs for a global scheme started with six possible MBM options, which were narrowed down to four in early 2012, and further reduced to three by the ICAO Council in June 2012. The three remaining options that were subject to more detailed analysis were: global mandatory offsetting; global mandatory offsetting with revenue; and global emissions trading. The qualitative and quantitative assessment of the three options was performed by the ICAO Secretariat and the experts, with the results presented to the ICAO Council in November 2012. The analysis determined that MBMs can contribute to achieving carbon neutral growth from 2020 at relatively low cost, compared to the cost of in-sector reductions, and with marginal differences between regions and groups of States.

To support MBM policy considerations, a High-level Group on International Aviation and Climate Change (HGCC), comprised of high-level government officials, was created by the ICAO Council at the end of 2012. Its role was to develop policy recommendations on issues such as design features that could be most appropriate for implementation of an MBM.

A quantitative assessment in 2012 estimated the costs and emissions reductions of the different MBM options for a global scheme. It was complemented by a supplementary study in 2013 which used the latest fuel burn and emissions data produced by CAEP. More detailed findings of both studies on MBMs are provided in the article *Potential Impacts of MBMs on the International Aviation*, Chapter 4 in this report.

The development of an MBM framework was undertaken in parallel with the work on the feasibility of a global MBM scheme. The MBM experts provided support on the framework for MBMs, including the role and purpose, the guiding principles, and the main elements of a framework. This work was also considered by the HGCC.

## UNDERSTANDING THE IMPORTANCE OF CARBON MARKETS TO INTERNATIONAL AVIATION

To understand the trends in the development of carbon markets and to identify implications for international aviation, ICAO has been monitoring MBMs globally. Lessons from the development of MBMs, such as the Kyoto mechanism, have provided useful information on how the market has responded to new mechanisms, policies and regulations. Trading platforms, international trading rules, State regulations for carbon trading, accepted verification methodologies and the international trading registry can all provide inputs for consideration by international aviation. The financial, intellectual and regulatory infrastructure created in the existing carbon market could facilitate the implementation of a sectoral-based MBM for international aviation. International aviation could build on these tools and avoid the cost of developing its own or new infrastructure.

Under the Kyoto Protocol, Clean Development Mechanism (CDM) carbon credits, known as certified emission reductions (CERs), may be issued to approved projects in developing countries for emissions reductions achieved.

Approximately 1.2 billion CERs were issued under the Protocol's first commitment period (2008-2012). Demand for CERs created under the Kyoto Protocol have weakened significantly. At the end of the first commitment period of the Kyoto Protocol, the CER market was in a situation of oversupply. Hundreds of millions of CERs were estimated to be available. In this context, estimates in 2012 showed that any demand created by international aviation for offset credits was not expected to significantly impact the price of CERs. The surplus of CERs was considered a readily available supply of offset credits for the international aviation sector. More information on the state of the carbon markets as it relates to international aviation is available in the article *Achieving Carbon Neutral Growth form 2020*, Chapter 4 in this report.

In addition to the CDM which has a strict and transparent verification process, there are an increasing variety of offset credits certified under different carbon programmes. Should there be a decision to develop an international aviation MBM using offset credits, it may be necessary to establish standards and quality criteria for offset credits to ensure the environmental integrity of emission reductions. The international aviation sector has the opportunity to consider existing criteria, standards, and verification practices, when defining what would be acceptable for the sector. The importance of flexibility in choosing emissions units for a potential aviation scheme is also discussed in the article *Offset Credits As An Option For Destination Green*, Chapter 4 in this report. ■

## MARKET-BASED MEASURES

# POTENTIAL IMPACTS OF MARKET-BASED MEASURES ON INTERNATIONAL AVIATION

BY ICAO SECRETARIAT

## BACKGROUND

Under the policy framework adopted by the International Civil Aviation Organization (ICAO) in 2010 (Assembly Resolution A37-19), market-based measures (MBMs) are included in a “basket of measures” that Member States can use to address CO<sub>2</sub> emissions produced by international aviation. To better understand and assess these measures, ICAO undertook a number of different studies. In 2001, ICAO’s Committee on Aviation Environmental Protection (CAEP) performed an economic analysis of various MBMs<sup>1</sup> that might be used to reduce CO<sub>2</sub> emissions from aviation. Following that, further studies and research were performed by CAEP, and several ICAO Documents have been published on the subject since 2007 (see **Box** on ICAO Policies and Guidance Material on Climate Change).

In 2010, the ICAO Assembly requested that the Council, “...with the support of Member States and international organizations, continue to explore the feasibility of a global MBM scheme by undertaking further studies on the technical aspects, environmental benefits, economic impacts and the modalities of such a scheme, taking into account the outcome of the

negotiations under the UNFCCC (United Nations Framework Convention on Climate Change) and other international developments, as appropriate, and report the progress for consideration by the 38<sup>th</sup> Session of the ICAO Assembly”<sup>2</sup>.

The research into options for a global MBM scheme involving international aviation began in 2011, with an initial literature review of planned and existing MBMs, in particular those related to aviation. In early 2012, six potential options for a global MBM scheme for aviation were identified, and the criteria by which they would be evaluated were elaborated, building upon the guiding principles (Annex to Resolution A37-19). In June 2012, the ICAO Council narrowed the MBM options to three – global mandatory offsetting, global mandatory offsetting with revenue, and global emissions trading; and requested that further quantitative and qualitative assessment of these options be undertaken.

This article provides an overview of the results of the two studies undertaken by the ICAO Secretariat to assess the feasibility of a global MBM scheme. This work was undertaken during 2012 and 2013 with the support of the MBM Experts nominated by Member States and international organizations.



## ICAO POLICIES AND GUIDANCE MATERIAL ON CLIMATE CHANGE

- ICAO 37<sup>th</sup> Assembly Resolution (A37-19)
- ICAO's *Policies on Charges for Airports and Air Navigational Services* (Doc 9082)
- ICAO's *Policies on Taxation in the Field of International Air Transport* (Doc 8632)
- ICAO Council Resolution on Environmental Charges and Taxes (9 December 1996)
- *Guidance on the use of Emission Trading for Aviation* (Doc 9885)
- *Scoping Study of Issues Related to Linking "Open" Emissions Trading Systems Involving International Aviation* (Doc 9949)
- *Report on Voluntary Emissions Trading for Aviation* (Doc 9950)
- *Offsetting Emissions from the Aviation Sector* (Doc 9951)
- *Report on the Assessment of Market-Based Measures* (Doc 10018)

## ASSESSING THE IMPACTS OF MBMs

The first study, in which the three MBM options were analysed, is referred to as the core study and was conducted in 2012. The core study assessed the possible economic and environmental impacts of: global mandatory offsetting, global mandatory offsetting with revenue, and global emissions trading (see **Box** on Global MBM Options for International Aviation). The study was comprised of two parts: quantitative and qualitative. In the quantitative assessment, impacts at a global level and on developing countries were assessed. In the qualitative assessment, the main design features were identified for each of the three MBM options. This evaluation helped identify the main differences between MBM options and highlight the differences in the administrative complexity of these options.

The second study, known as the supplementary study was limited to a quantitative assessment of the impact of a single global MBM measure on international aviation. It used the updated traffic forecasts and emissions trends prepared in 2013 by CAEP to further assess the impacts of MBMs on international aviation. The economic and environmental impacts were assessed only at a global level in the supplementary study.

## MODELLING TOOLS USED IN THE QUANTITATIVE ASSESSMENTS

The quantitative assessment of the core study was undertaken using aviation-specific economic models. Two models were employed in the evaluation of MBM options. The first model, the Aviation Emissions and Evaluation of Reduction Options – Modelling System (AERO–MS), was developed in Europe, while the second model, Aviation Portfolio Management Tool for Economics (APMT – Economics), was developed in North America. Both tools were developed for the purpose of testing the environmental and economic consequences of implementing various measures to reduce global aircraft engine emissions and validated by CAEP.

The supplementary study used a simplified spread sheet model that was developed by the ICAO Secretariat in association with MBM Experts.

## APPROACH USED IN THE QUANTITATIVE ASSESSMENT

To assess the impact of MBMs, it is first necessary to know the emissions reduction goals they will achieve and the timeline for their implementation. Then, the future of the aviation sector both with and without MBMs is forecasted and the results are compared to reveal the impact of MBMs. Assumptions defined for the analysis were kept consistent for both studies. These assumptions are:

- the environmental objective is to maintain CO<sub>2</sub> emissions at the same level from the year 2020 (*i.e.* carbon neutral growth);
- the impacts of MBMs would be evaluated from 2020 to 2036 (timeline);
- the future price of carbon per tonne of CO<sub>2</sub> (2010 USD): \$30 in 2020, \$40 in 2030, and \$45 in 2035<sup>3</sup>;
- the future price of fuel based on crude oil per barrel (2010 USD): \$109 in 2020, \$117 in 2030, and \$120 in 2035<sup>4</sup>;
- the cost of purchasing emissions units would be passed through to ticket prices (100% cost pass through);
- use of alternative fuels would result in zero CO<sub>2</sub> emissions; and
- only CO<sub>2</sub> emissions from international aviation are considered (*i.e.* non-CO<sub>2</sub> impacts of aviation are not included in this assessment).

In the quantitative assessment portion of the core study, six scenarios were developed using the above listed assumptions for all MBM options, including different levels of revenue generation for those options that can generate revenue.

The core study also assessed the impacts of MBMs on developing countries. Three different approaches were used: 1) evaluating six regions; 2) comparing differences between Least Developed Countries (LDCs) and non-LDCs; and 3) a sample analysis of countries which took into account the level of development by per capita income, and international aviation activity in terms of available seat kilometres (ASK).

The supplementary study assessed MBM impacts using two scenarios. Emissions reduction potentials from both new technologies and operational improvements were analyzed. The study also looked at the impacts of the potential use of alternative fuels.

## RESULTS OF THE QUANTITATIVE ASSESSMENT

In the 2012 core study, the cost of introducing an MBM was found to be relatively small. Under a scenario of keeping net carbon emissions at the same level from the year 2020, MBMs would need to reduce or offset 464 Mt of CO<sub>2</sub> by 2036 to cover emissions increases from 2020 to 2036. In the cases where 100% of the costs of an MBM would be passed on to customers through increases in the price of tickets, the quantitative assessment showed that:

**Traffic Impact:** Under an MBM scenario, international aviation traffic would grow 107% from the years 2020 to 2036. Without an MBM, traffic would grow 110% between 2020 and 2036. Thus, the traffic level in 2036 would be 1.2% lower as a result of an MBM.



## GLOBAL MBM OPTIONS FOR INTERNATIONAL AVIATION

### GLOBAL MANDATORY OFFSETTING

Offsetting operates through the creation of emissions units which quantify the reductions achieved. These emissions units, which would generally be created outside the international aviation sector, can be bought, sold or traded.

A global mandatory offsetting scheme for international aviation would require participants to acquire emissions units to offset CO<sub>2</sub> above an agreed target. Emissions units would need to conform to agreed eligibility criteria to ensure adequacy of emissions reductions. No specific aviation allowances or revenues would be created under this scheme.

### GLOBAL MANDATORY OFFSETTING WITH REVENUE

Global mandatory offsetting complemented by a revenue generation mechanism would generally function the same way as the mandatory offsetting scheme. A key difference would be that in addition to offsetting, revenue would be generated by applying a fee to each tonne of carbon, for instance, through a transaction fee. The revenue would be used for agreed purposes, such as climate change mitigation or providing support to developing States to reduce GHG emissions.

### GLOBAL EMISSIONS TRADING

The global emissions trading scheme (ETS) would use a cap-and-trade approach, where total international aviation emissions are capped at an agreed level for a specified compliance period. Specific aviation allowances (one allowance is equivalent to one tonne of CO<sub>2</sub>) would be created under this scheme for all the emissions under the cap within the international aviation sector. These allowances would then be distributed for free, or auctioned, to participants using an agreed method.

At the end of each compliance period, participants would need to surrender allowances, or other emission units, equal to the emissions generated during that period, including those above their allocation.

Extract from *Report on the Assessment of Market-based Measures* (ICAO Doc 10018)

**Profit Impact:** Profits for the international aviation sector in 2036 would be \$33.3 billion under the scenario with an MBM. This would be \$0.4 billion lower than the profit level without the MBM.

**Cost Impact:** The cost of an MBM in 2036 would be approximately \$10 per seat for a flight of 10,000 to 12,000 kilometers, and \$1.50 per seat on a flight of 900 to 1,900 kilometers.

The supplementary study in 2013 confirmed the results of the core study that an MBM could achieve the environmental target of stabilizing CO<sub>2</sub> emissions at a relatively low economic cost. With an MBM, the traffic level in 2036 would be up to 1% lower than the traffic level without the MBM, and the cost of an MBM as a proportion of total revenue would be up to 1%, in the worst case scenario studied.

The quantitative assessment demonstrated that the differences of MBM impacts on developing countries were marginal. For example, the MBM impacts on traffic demand for the six regions were generally consistent with the global average of a 1.2% reduction. The change in operating result (profit) brought about by an MBM was relatively consistent among regions, varying from 1.0% to 1.3%. This was generally consistent with the global average of 1.1%.

The comparison of LDCs and non-LDCs showed a similar pattern to that of the regions in terms of consistency with the global results. However, LDCs were not as affected as non-LDCs by MBMs. Impacts on traffic levels and profits were smaller in LDCs, although reductions in CO<sub>2</sub> were also smaller. No differences were noted in the comparison of groups using development parameters (per capita income and ASK).

## QUALITATIVE ASSESSMENT

The qualitative assessment focused on the design features of the three options for a global MBM scheme by identifying and elaborating on the implications of different design choices. Any MBM is designed to achieve a clear environmental objective, which can be established with a baseline or cap on emissions levels. The distribution of the environmental objective among participants establishes individual obligations, which collectively respect the environmental objective. Both Member States and aircraft operators would have important roles to play in a global MBM scheme. It will be important to distinguish between the compliance obligations placed on participants in a scheme and on the implementation responsibilities, such as administration and enforcement obligations, for Member States.

**COUNCIL – 197<sup>TH</sup> SESSION – SIXTH MEETING  
(9 NOVEMBER 2012)****COUNCIL DECISION – C-DEC 197/6**

“...recognized that the results of the qualitative and quantitative analysis of the three options for a global MBM scheme evaluated by the Secretariat with the support of the Experts demonstrated that all three options were technically feasible and had the capacity to contribute to achieving ICAO’s environmental goals...”

Compliance obligations could generally be tracked through a registry, which at a minimum, would record the environmental objective of a scheme, emissions of each participant, obligation of each participant to surrender emissions units, and tracking of emissions units to ensure that participant obligations are met. A robust monitoring, reporting and verification (MRV) system is key to any MBM, as it ensures that one unit of emissions emitted and recorded in one jurisdiction is directly comparable to a unit in another jurisdiction. This also protects fair market competition and avoids market distortion.

Three main differences in the design features of the three options for a global MBM scheme (global mandatory offsetting, global mandatory offsetting with revenue and global emissions trading) were identified as follows:

1. use of different emissions units;
2. differences in the allocation of obligations to individual participants; and
3. different accounting requirements to ensure compliance under the two systems.

These design differences were assessed for the complexity of administrative steps that would likely be involved in implementing the three options, as follows:

**A global mandatory offsetting scheme:** could be less complex since existing emissions units can be used and tracked through a simple registry.

**A global mandatory offsetting scheme complemented by a revenue generation mechanism:** could be more complex due to the need to determine how revenues will be collected and used.

**A global emissions trading scheme:** could increase complexity and have higher upfront costs due to the need to administer specific aviation allowances (however, it should offer more flexibility for participants due to the creation of emissions units, which can be traded in the marketplace).

**CONCLUSION**

Overall, the results of the qualitative and quantitative assessments of the three options for a global MBM scheme demonstrated that they were technically feasible and have the capacity to contribute to achieving ICAO’s environmental goals. (See **Box** on Council - 197<sup>th</sup> Session - Sixth meeting, 9 November 2012). ■

**REFERENCES**

- 1 CAEP/5 Working paper: *Economic Analysis of Potential Market-based Options for Reduction of CO<sub>2</sub> Emissions from Aviation* (CAEP/5-WP/24).
- 2 ICAO Assembly Resolution A37-19: *Consolidated statement of continuing ICAO policies and practices related to environmental protection—Climate change*, ([http://legacy.icao.int/env/A37\\_Res19\\_en.pdf](http://legacy.icao.int/env/A37_Res19_en.pdf)).
- 3 International Energy Agency, *World Energy Outlook 2011*. To be consistent with modeling data, 2010 dollars were converted to 2006 dollars.
- 4 International Energy Agency, *World Energy Outlook 2011*. To be consistent with modeling data, 2010 USD were converted to 2006 USD. Fuel prices were converted to annual prices until the year 2036.

## MARKET-BASED MEASURES

# IATA AGREEMENT ON CARBON NEUTRAL GROWTH

BY INTERNATIONAL AIR TRANSPORT ASSOCIATION

The International Air Transport Association (IATA) represents 240 airlines that carry over 84% of global air traffic. In June 2013, IATA overwhelmingly endorsed a resolution on the “Implementation of the Aviation Carbon-Neutral Growth (CNG2020) Strategy”. Member airlines agreed that a single global mandatory carbon offsetting scheme would be the simplest and most effective option for an MBM designed to address climate change.

The resolution provides governments with a set of principles on how they could establish procedures for the development and implementation of a single market-based measure that is integrated into an overall package of measures to achieve CNG2020. The intention of such an MBM would be to deliver real emissions reductions, not revenue generation for governments. The agreed principles apply to emissions growth post-2020.

The sector has already agreed on global targets for greenhouse gas (GHG) emissions, as follow:

- Improving fuel efficiency by 1.5% annually to 2020;
- Capping net emissions from 2020 onward;
- Cutting emissions in half by 2050, compared to 2005.

Aviation was the first sector to agree on a global strategy to achieve climate change goals. An MBM is one of the four pillars of the aviation industry’s united strategy on climate change. The three remaining pillars, improvements in technology, operations, and infrastructure will deliver the long-term solutions for aviation’s sustainability.

A summary of the main principles of the resolution follows:

- Setting the industry and individual carrier baselines, using the average annual total emissions over the period 2018–2020.
- Agreeing to provisions and/or adjustments for:
  - Early movers-benchmarked between 2005–2020 with a sunset by 2025;
  - New market entrants for their initial years of operation;
  - Fast growing carriers.
- Adopting an equitable balance for determining individual carrier responsibilities that consider:
  - An “emissions share” element (reflecting the carrier’s share of total industry emissions);
  - A post-2020 “growth” element (reflecting the carrier’s growth above baseline emissions).
- Reporting and verification of carbon emissions that are:
  - Based on a global standard to be developed by ICAO;
  - Simple and scalable, based on the size and complexity of the operator.
- Instituting a periodic CNG2020 performance review cycle that revises individual elements and parameters as appropriate. ■



## MARKET-BASED MEASURES

## OFFSET CREDITS AS AN OPTION FOR “DESTINATION GREEN”

BY TAKASHI HONGO



## TAKASHI HONGO

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Environment and climate change are serious global issues. Worldwide greenhouse gas (GHG) emission reductions will be necessary and unavoidable for sustainable industry and societal growth and international aviation is no exception to this. The following article looks at the progress that has been made to date in developing and implementing emissions trading systems. It also discusses the possibility of developing an ICAO carbon emissions trading scheme, and what the criteria and attributes of such a system would be.

## FLEXIBILITY IS KEY

Generally speaking, it is better to develop a wide variety of measures to achieve reduction targets effectively and efficiently. This is because there are many ever-changing variables in the mix, including the business environment, available technology, evolving technological innovations and changing investment strategies. Accordingly, the “flexibility of reduction measures” is crucial.

Four primary options are considered for reducing emissions in the aviation sector:

1. Replacement of existing fleet with more efficient aircraft.
2. Route optimization and improvement of ground services.
3. Use of bio fuels as a zero emissions alternative energy source.
4. Offset credit mechanisms.

Each of the above options has pros and cons. Design and commissioning of more efficient aircraft, as well as implementation of route optimization and ground system improvements are essential measures that are already ongoing, and reductions achieved through them will continue for many years. However, it takes a long time to deliver new aircraft and to change over to the most optimal aviation routes. Furthermore, the costs of these measures are quite high. Drop-in type bio fuels have become almost a proven technology. However, further technology innovation is needed to improve their cost competitiveness and to avoid potential conflicts with food and water supplies.

Offset mechanisms reduce emissions indirectly by supporting GHG emission reduction activities through the purchase of offsetting “reductions”. For instance, biomass can be used for renewable energy (and reduce CO<sub>2</sub> emission by reducing fossil fuel) but it requires investment for installing equipment. Offset mechanisms support the investment by funding a part of investment cost through purchasing “reductions”. When costs are high to achieve abatement reductions by introducing new aircraft or using bio fuels, an offset mechanism can be a reasonable cost option and can work as a bridge towards eventual direct reductions in airline services. Offset mechanisms tend to increase the flexibility of investment timing and reduce investment costs.

## INTERNATIONAL EMISSION TRADING AND POSSIBLE OFFSET CREDITS FOR AVIATION

The carbon market is shifting from the two dominant market systems, Kyoto Credit and EU Allowance, to a fragmented markets regime. Following this structural change, various types of credits, both national and sub-national schemes, as well as project base emission reduction credits and allowances under ETS will soon be available for offsetting purposes. **Figure 1** summarizes the current carbon offset credit systems that have been implemented.

Type of Credits	Administration	Source of Reductions	Remarks
CER	UNFCCC	Six Green House Gasses reduction in developing countries.	<ul style="list-style-type: none"> <li>• Biggest project base reduction market and 2,371 million ton issued.</li> <li>• Uncertainty after 2023</li> </ul>
Voluntary Credits <ul style="list-style-type: none"> <li>• VCS</li> <li>• Gold Standard (GS)</li> <li>• Others like J-VER</li> </ul>	<ul style="list-style-type: none"> <li>• Association and NGO</li> <li>• VCS (alliance by IETA, WBCSD, etc.)</li> <li>• WWF</li> </ul>	<ul style="list-style-type: none"> <li>• Six GHG gasses but uncovered potential like forest.</li> <li>• Additional value such as social and biodiversity.</li> </ul>	<ul style="list-style-type: none"> <li>• 125 million ton VCS and 43 million ton GS are issued.</li> <li>• Used for voluntary offset or sub-national scheme but volume is limited.</li> </ul>
Allowance <ul style="list-style-type: none"> <li>• National Scheme: EU, Australia, Korea</li> <li>• California and Quebec, Chinese Provincial, Tokyo</li> </ul>	<ul style="list-style-type: none"> <li>• National government</li> <li>• Local authority</li> </ul>	<ul style="list-style-type: none"> <li>• Installations covered by ETS. Mostly power and industry. Tokyo ETS covers offices.</li> <li>• Offset credits such as CER, VCS are allowed. California use REDD.</li> </ul>	<ul style="list-style-type: none"> <li>• Domestic operation of aviation are under domestic regulations and easy to access.</li> </ul>
New Credits <ul style="list-style-type: none"> <li>• REDD+</li> <li>• CCS</li> <li>• HCFC</li> </ul>	-	<ul style="list-style-type: none"> <li>• Varieties of sources such as forest and CCS (Carbon Capture Storage).</li> <li>• HCFC and CFC are GHG but not covered by CDM.</li> </ul>	<ul style="list-style-type: none"> <li>• Forest is a target for voluntary credits. 1,600 million a year is emitted by land use change.</li> <li>• Stock of HCFC and CFC in 2020 is 8,700 million ton.</li> </ul>

**Figure 1: Types of Offset Credit Schemes.**

Project based credits are represented by Certified Emission Reductions (CER) that were implemented by United Nations Framework Convention on Climate Change (UNFCCC). By April 2013, 1,308 million tonne credits have been issued. Various “Clean Development Mechanisms (CDM) Reforms”, such as simplifying the process and improving the predictability, are being implemented. CER is the most common and widely used credit type and sufficient amounts of credits can be supplied depending on the price. This scheme will be continued until at least 2023.

Voluntary standard credits are developed and implemented by mostly non-government entities. VCS (Verified Carbon Standard) and Gold Standard are the leading voluntary standards. VCS is supported by business groups including the International Emission Trading Association (IETA) and the World Business Council for Sustainable Development (WBCSD). The Gold Standard was initiated by World Wildlife Fund. By June 2013, 125.4 million tonnes of VCS credits had been issued, with 43 million tonnes of Gold Standard credits issued by March 2013. These credits are used mostly for voluntary offsets of the carbon

footprint but not limited to voluntary purposes. For instance, California’s Emissions Trading System (ETS) is considering adopting VCS as a standard for evaluating its Reduction of Emission from Deforestation and forest Degradation (REDD+) program.

Australia and Korea have decided to start national ETS programs beginning in 2015, and Brazil and Chile are studying the adoption of national ETS programs. Sub-national governments, such as California, New York and Tokyo, have already started ETS, and Beijing, Shanghai and other cities will start soon. In addition, new project-based credit schemes, like Japan’s Joint Credit Mechanism (JCM), are under development. The carbon market is spreading globally and more than 30% of CO<sub>2</sub> emissions are currently covered by ETS or carbon taxes. The World Bank has stated that some 60 carbon regulations have been implemented worldwide. Airlines are affected by various regulations and it would be convenient for them to use the credits which are applicable under these regulations. Credits issued under national and sub-national schemes could also be an option to offset credits.

Carbon Capture and Storage (CCS) and Reduction of Emission from Deforestation and forest Degradation (REDD+) have significant reduction potential. Destruction of HCFC (Hydro Chlorofluorocarbons) and CFC (Chlorofluorocarbons) also have plenty of reduction potential. These gases are regulated to phase out under the Montreal Protocol (adopted in 1987) but are not eligible for CDM. It is estimated that 8.7 billion tonnes of emissions will be released from refrigerated or insulated buildings by the year 2020. The reduction potential from this source alone is more than 10 times what the estimated emissions will be from international aviation by 2020, and its cost is estimated around US\$ 5 per ton CO<sub>2</sub> equivalent. Clearly the reduction potential is significant.

The price of credits is determined by demand and supply, and also influenced by emission regulations and economic activities. Currently, the price is very low due to the low demand for credits caused by the sluggish economy, coupled with the uncertainty of future carbon regulation. The current CER price is €0.3-0.5 and the EU allowance is €4-5. Based on a market survey conducted by IETA, 67% of market players think that the CER price in 2020 will be less than € 5, while 56% believe that the EU allowance in 2020 will be between € 5 and 10. So, the belief is that the price is going to increase but not as high as the peak price reached in 2008. Also, it is important to note that the price of credits varies from system to system.

## POSSIBLE ICAO SCHEME

Should ICAO decide to develop its own aviation scheme, there are three important issues in particular that need to be considered: credit eligibility criteria, scheme governance and management, and how costs are transferred.

### Eligible Credits

Credit schemes and measures need to be flexible in defining what types of credits could be accepted, in order to avoid uncertainty in the availability and cost of credits in the future market. Therefore, it is better to allow the use of several different types of credits and to construct offset credits which utilize undeveloped reduction space such as: CCS, REDD+ and HCFC/CFC. However, quality control is crucial for contributing positively to global emission reductions and safeguarding ICAO's reputation. Eligibility criteria for offset credits need to be agreed upon and fully disclosed. Following are some guidelines that should be applied:

- Emissions reductions should be confirmed objectively and practically.
- Heavy administration burden should not impede reliable implementation.
- Double counting should be avoided.
- Credits should come from socially acceptable projects.

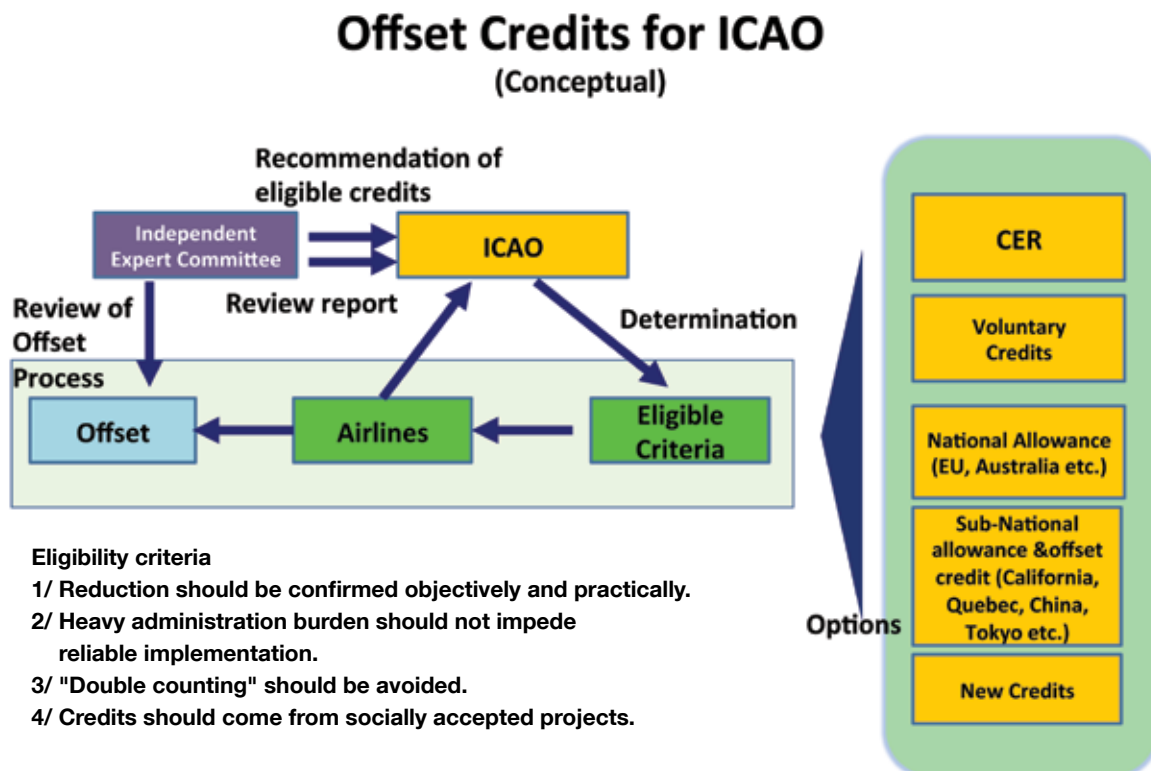


Figure 2: Proposed ICAO Offset Credit Scheme.

### **Governance**

Governance of the offset credit mechanism is also crucial. Conflicts among members based on differing points of view may arise during the design and implementation of the mechanism. Experience and know-how are necessary to construct and implement an effective mechanism. A practical solution would be to set up a committee of experts. When doing so, neutrality and expertise will be essential criteria for participation. This Experts Committee should be independent of ICAO and its members should be specialists in their fields, including: carbon markets, finance and investment, technology, and energy and legal issues. They should not represent any interested parties and need to participate only in their personal and professional capacities as experts in their field. A major task of the Independent Experts Committee would be to submit its expert views and recommendations to ICAO for consideration on such issues as, the eligibility criteria of credits and the review of the offset by airlines. ICAO should use the committee's submission to guide its decision making.

### **Cost Transfer**

The cost of offset credits is also a crucial issue. Carbon costs are caused by the creation of external carbon emissions when fuel is burned, and are therefore theoretically part of the fuel cost. Accordingly, these additional costs should be passed on to passengers. Using ICAO's carbon calculator, per passenger emissions from a return flight from Tokyo to New York (business and first class) is 3.1 tonnes, which is US\$ 0.8 per pax, when half of the emissions are offset by using the current CER. The economic burden is actually not that large, but awareness of carbon costs is important. One of the practical options for collecting carbon costs is by way of a "carbon surcharge". It shows the carbon cost explicitly and is therefore transparent.

Because international aviation is indispensable for world economic growth, it needs to be fully sustainable. The flexibility of all options developed to manage and offset carbon emissions from international aviation operations will be key to ICAO's ongoing pursuit of "Destination Green". ■

## MARKET-BASED MEASURES

## ACHIEVING CARBON NEUTRAL GROWTH FROM 2020

BY ANNIE PETSONK AND GUY TURNER



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## INTRODUCTION

In 1997, the Parties to the United Nations Framework Convention on Climate Change (UNFCCC) acknowledged the responsibility of the International Civil Aviation Organization (ICAO) for addressing greenhouse gas (GHG) emissions from international aviation<sup>1</sup>. After years of consideration, in 2010 the 37<sup>th</sup> ICAO Assembly adopted a resolution including, *inter alia*, a goal of improving fuel efficiency 2% per year through 2020; aspirational goals for improving fuel efficiency 2% per year through 2050 and stabilizing international aviation's net carbon emissions by 2020; and requested that the ICAO Council explore the feasibility of a global market-based measure (MBMs) to achieve the stabilization goal.

In June 2013, the International Air Transport Association (IATA) passed a resolution supporting a mandatory global carbon offsetting programme to achieve carbon neutral growth from 2020. Against this backdrop, we address four questions below:

- How big is the emissions gap?
- Where might carbon units come from to offset that gap?
- How much might that cost?
- What are the environmental integrity and administrative issues of various types of offsets?

## HOW BIG IS THE GAP?

Any estimate of the emissions gap first requires a projection of international aviation emissions absent an MBM. This in turn depends on many factors including: growth in demand for international air travel, the number and type of planes used to meet this demand, technical improvements in aircraft efficiency, fleet replacement phasing, improvements to air traffic management systems, and fuel mix, including biofuels.

Uncertainties in these factors generate a wide range of projections for the cumulative emissions gap. The latest estimate for the "central" scenario from ICAO's Committee on Aviation and Environmental Protection (CAEP) shows a gap ranging between 14 and 21bnt<sup>2</sup> (billion tonne) over the 30 years from 2020 to 2050. Assuming a conservative potential contribution from alternative fuels the range would be 13bnt to 20bnt<sup>3</sup>.

Analytical scenarios can generate estimates of the potential cost and carbon market implications of addressing this gap via a global MBM. Of course, these scenarios depend on, among other things, estimates of the marginal abatement cost (MAC) for in-sector emission reductions, assumptions about sources



of carbon units, changes to existing carbon markets, whether tonnes of allowable emissions can be banked or saved from one year to future years, the possibility of forward purchases of carbon units, the availability of option contracts (acquiring the right to purchase carbon units in the future at a price agreed in advance), and other factors.

### Factors Affecting Demand, Supply, and Cost

Carefully structured, market tools like banking and credit for early movers can reduce costs while safeguarding environmental integrity. Moreover, environmental integrity and administrative complexity may vary significantly across different types of carbon units:

- In general, units with the highest environmental integrity and least administrative burden come from programmes that place tough caps on emitters, ensure that emissions are accurately reported, and penalize non-compliance, as do the EU and California trading programmes.
- Units for which environmental integrity is subject to question and/or involve greater administrative burden, usually come from programmes that lack a cap on emissions. These programmes allow projects to earn credits if they reduce emissions below what would have otherwise occurred in the project's absence. Proving the environmental integrity of such units is difficult. Regulators, for example, must determine whether emissions would have declined without the project, and must account for "leakage" (*i.e.* reducing emissions in one place increases emissions elsewhere). These issues have led regulators to place quantitative and qualitative restrictions on such credits<sup>4</sup>.

## SOURCES OF CARBON UNITS TO OFFSET THE GAP

From a macro perspective, the global aviation sector currently accounts for about 2% of world CO<sub>2</sub> emissions. Growth in air travel is expected to double by around 2040<sup>5</sup>. International aviation comprises about two thirds of the total. Offsetting this growth is not expected to pose a problem for the industry.

In theory, to offset international aviation's emissions growth, emissions could be reduced anywhere else. Units from any of the world's existing emissions cap and trade programmes, or those under development<sup>6</sup>, could be used. In addition, the UN and other bodies recognize over a hundred categories of carbon credits-producing projects in sectors where there is no cap on emissions. These projects range from domestic and industrial energy efficiency, to renewable energy to forestry and land use. Many more categories are expected to be recognized. Supplying the aviation industry with carbon units to offset the industry's post-2020 growth thus seems eminently feasible.

### Potential Supply

Four main sources of supply could provide emissions units to meet the aviation industry's goals:

1. Emissions allowances from national or regional cap and trade programmes.
2. Emissions allowances created under the Kyoto Protocol.
3. Credits from UN registered emission reduction projects.
4. Credits from voluntary offset projects.

Whether, and to what extent, these could be counted as "supply" is unclear, given that some were developed in the absence of an emissions cap, or are subject to uncertainties about the future regulatory framework under which they might be accepted.

### 1. Emissions Allowances From National or Regional Cap and Trade Programs

These include the European Union's emissions trading system (EU ETS), New Zealand's programme, the U.S. State of California's programme, and the Canadian Province of Quebec's provincial programme.

The EU ETS is the largest system in operation. It has a large surplus of allowances that could potentially be used by the aviation industry. The EU ETS caps GHG emissions (mostly CO<sub>2</sub>, but also N<sub>2</sub>O and PFCs) from more than 11,000 power generating and industrial facilities in 31 countries. As of mid-2013, aircraft within-EU travel are also covered. In total, the system covers about 50% of EU CO<sub>2</sub> emissions. This system, combined with the economic downturn in Europe, has resulted in emissions substantially below the cap for the last five years<sup>7</sup>, and a substantial "bank" of unused allowances.

Analysis by Bloomberg New Energy Finance (BNEF) indicates that withdrawals from the "bank" may begin starting in 2018, but will still leave a potential pool of banked allowances of about 1.7bnt by the year 2020. These would be available to aviation sector buyers if EU ETS allowances were deemed eligible in a future global MBM. Allowances from the New Zealand, California, and Quebec programmes might also be deemed eligible in a future aviation MBM. Allowances from programmes under development could provide further supply. China, for example, recently launched the first of seven pilot emissions trading programmes, and Korea is consulting on design options for its proposed system. Others currently considering such programmes include Mexico, Kazakhstan, South Africa, Australia and Brazil. While it is difficult to estimate the potential of these programmes, one in the Brazilian state of Acre estimates that it will reduce emissions by as much as 164mt during the period 2006 to 2020<sup>8</sup>.

### 2. Kyoto Protocol Emissions Allowances

The Kyoto Protocol was established under the auspices of the UNFCCC in 1997. It imposes GHG emission limits on, and issues emissions allowances to, some 35+ countries for the period 2008 to 2012. Although the US did not participate, and Canada withdrew, the targets were accepted by the EU, Japan, New Zealand, Australia, Russia and the Ukraine, among others.

Among the Protocol's primary flexibility mechanisms are emissions trading and banking: a Party with an emissions limit may transfer surplus allowances to another such Party and/or save surplus allowances for use in future years. Included in this trading are allowances registered with the UNFCCC as representing emission reduction units (ERUs) from joint

implementation (JI) projects in Parties with emissions caps (see below). Parties with emissions caps may also use certified emission reductions (CERs) from the Protocol's Clean Development Mechanism, which approves projects in Parties without emissions caps, provided that the projects and CERs meet various criteria (see below).

Many Protocol Parties have met their targets through a range of domestic measures and trading. Some countries' emissions dropped well below their caps as a result of economic restructuring in the early 1990s, and have banked or saved large stocks of allowances. BNEF figures show that Russia has the largest bank of allowances, at 8.8bnt, followed by Ukraine at 2.8bnt, Poland at 0.89bnt, and Romania at 0.78bnt. Other EU countries collectively account for around 1.4bnt of banked allowances. In total, Kyoto Parties currently hold around 14bnt of banked allowances.

Whether these allowances, as a practical matter, will come into future emissions trading programmes is unclear. Consequently, with the possible exception of allowances rendered surplus through JI projects, it is prudent to exclude these when calculating potential supply available to the aviation sector<sup>9</sup>.

### 3. UN Registered Emission Reduction Projects

This source of supply includes the JI projects and CDM projects, noted above. Offsets from these projects are calculated as the difference between the actual emissions from a project and what would have happened in the project's absence. Projects are subject to a series of validation and verification steps before they can be approved by the UN. Questions have been raised about the environmental integrity of some CDM and JI credits, although ERUs generated by JI projects are transacted by subtracting allowances from the host country's pool of Kyoto allowances, thereby providing a greater measure of environmental certainty. The EU ETS and the future Australia programme allow private entities to meet part of their compliance obligations using ERUs and CERs; California does not.

By mid-2013 some 6,750 CDM and 600 JI projects had been registered with the UN. BNEF calculates that together, both sources are capable of issuing around 5,500 Mt of offset credits between 2008 and 2020, with actual volumes depending on price.

Of the 1.3bnt CERs and 730 Mt ERUs already issued, not all will be available to the aviation sector. BNEF estimates that between 2008 and 2020, companies and governments in the EU, Australia, and Japan will purchase around 3bnt, to offset domestic emissions. In addition, credits from certain industrial processes cannot be used in the EU and Australia. This leaves a net surplus of about 2.3bnt of CERs and ERUs up to the year 2020 that could be used by the aviation sector post-2020.

### 4. Voluntary Offsets

In addition to the national/regional and Kyoto compliance-driven markets, there are also voluntary offsets via projects under the auspices of the Verified Carbon Standard, Climate Action Reserve, and the Gold Standard, which are not accredited by the UN<sup>10</sup> but have their own quality assurance processes. Companies or individuals voluntarily purchase these to offset their emissions, or as pre-compliance instruments with the intention that the credits may be used in some future legally mandated programme. Similar to some other emissions markets, supply in the voluntary sector is currently running ahead of demand. Based on recent data from BNEF and Forest Trends<sup>11</sup>, by the end of 2011 only about a quarter of the 280 Mt of voluntary credits accumulated had actually been used to offset emissions. This proportion is however increasing, and in 2011 just under 50% of verified credits had been used.

With the voluntary supply growing at about 90 Mt a year, and an increasing share being retired each year, BNEF estimates that by 2020 around 360 Mt of voluntary offsets could be available to aviation.

#### “Supply” Summary

BNEF estimates that if environmental integrity concerns can be addressed, the above units present a maximum available supply of up to 4.4bnt by the year 2020. This supply is only what is likely to be left unused, based on historic and expected credit generation activities in existing programmes and voluntary markets. It does not include the potentially substantial new supply that could be brought to market to meet additional demand.

## COSTS

Taking ICAO's CAEP 2013 figures, along with an assumption for alternative fuel reductions, the international aviation sector could face a shortfall of between 13bnt and 20bnt of CO<sub>2</sub> offsets over the 30 years from 2020 to 2050. On the basis of a central estimate of around 16.5bnt, the **currently identifiable** surpluses of 4.4bnt could meet around a quarter of this demand. Beyond this, additional investment would be needed to reduce emissions from sources outside the international aviation sector.

Ultimately what matters is the price paid for these offsets. Today, different types of carbon allowances and credits have different prices and these are likely to change over time. Currently, allowances in the EU ETS trade at around \$6/t, CERs and ERUs are less than \$1/t, and voluntary offsets are about \$6/t. Across all offset types, prices are likely to rise over time.

To model costs, Environmental Defense Fund (EDF) prepared conservative estimates of offset “supply” and “demand”; the price at which the intersection of those two curves

S/tCO <sub>2</sub>	2015	2020	2025	2030	2035	2040	2045	2050
Scenario #1	7	9	12	15	19	24	31	39
Scenario #2	6	7	8	11	14	18	23	29

**Table 1:** International Civil Aviation CNG2020 – Offset Costs (\$/tCO<sub>2</sub>) (Real USD 2010). Source: EDF.

would provide an estimate of the potential cost outlay of airlines. EDF's demand curve assumes that aviation will grow according to the central scenario based on the latest CAEP estimates, and will reduce emissions by a central amount via technology, operations, infrastructure, and alternative fuels. EDF's supply curves are also based on a number of assumptions. Two scenarios are created on the emissions reduction requirements for existing and newly formed cap and trade schemes outside the aviation sector: Scenario 1 assumes these schemes require a 50% cut in emissions by 2050 and Scenario 2 a 25% cut. It is also assumed that these schemes will limit the use of offsets to some extent and that offsets used in the aviation sector must meet strict environmental integrity criteria. The resulting modelled offset prices for international aviation are shown in **Table 1**.

The analysis shows the unit cost of offsets increasing from about \$6-7/t in 2015 to around \$29-39/t by 2050. These prices imply annualized estimated costs through 2050 of \$4.3-\$7.8 billion per year under Scenario 1, and \$3.3-\$6.1 billion per year under Scenario 2.

To put this in context, these costs will represent less than 0.5% of international airline revenues on average over this period. With all major airlines participating, there will be little risk of competitive distortions, so nearly all could be passed through to consumers. The net cost to industry would therefore be trivial.

## CONCLUSIONS

International aviation's goal of carbon neutral growth from 2020 is realistic. Starting with in-sector reductions, and moving up the marginal abatement cost curve to out-of-sector reductions, available carbon units, by 2020, could provide around a quarter of the industry's offset requirements through 2050.

Offset prices are currently low. Although prices will likely rise over time, they will remain significantly below the cost of reducing emissions within the international aviation sector. Even if offset prices rise, the net cost to the aviation sector of achieving carbon neutral growth by 2020 (CNG2020) will be trivial and nearly all the additional costs will be passed through to customers. The industry should therefore have few concerns about the implications of CNG2020, and should consider more aggressive targets aligned with long term climate goals. ■

## REFERENCES

- 1 See Kyoto Protocol on Climate Change (1997) at Article 2.2; and see "A New Flightplan: Getting Climate Measures for Aviation off the Ground," Transport & Environment, Environmental Defense Fund, The International Council on Clean Transportation and the Aviation Environment Federation (2012), text available at [www.transportenvironment.org/sites/te/files/media/Aviation%20Conference%20Background%20Report.pdf](http://www.transportenvironment.org/sites/te/files/media/Aviation%20Conference%20Background%20Report.pdf); see also H. Miller, "Civil Aircraft Emissions and International Treaty Law," 63 J. of Air and Commerce 698 (1998).
- 2 ICAO Doc 10012, *Report of the Ninth Meeting of the ICAO Committee on Aviation Environmental Protection (CAEP/9)*.
- 3 Source Lee D.S., L. L. Lim and B. Owen (2013), "Bridging the aviation CO<sub>2</sub> emissions gap: why emissions trading is needed", Dalton Research Institute, Dept. of Environmental And Geographical Sciences, Manchester Metropolitan University, Manchester, UK.
- 4 For example, the EU ETS has a maximum import quota of around 11% of allocated emissions over the period 2008 to 2012, and has restricted the use of carbon offsets from projects that destroy certain industrial gases with high global warming potentials (HFCs).
- 5 Extrapolated from IATA Economics, 2013, which shows global aviation emissions increasing from 677Mt in 2012 to 1011 Mt in 2030.
- 6 See, e.g., [www.ieta.org/worldscarbonmarkets](http://www.ieta.org/worldscarbonmarkets)
- 7 See "The European Union Emissions Trading System: Results and Lessons Learned," Environmental Defense Fund (2012), text available at [www.edf.org/sites/default/files/EU\\_ETS\\_Lessons\\_Learned\\_Report\\_EDF.pdf](http://www.edf.org/sites/default/files/EU_ETS_Lessons_Learned_Report_EDF.pdf)
- 8 See, e.g., [www.ipam.org.br/download/livro/Subsidio-para-a-Adocao-de-meta-de-reducao-de-desmatamento-no-ambito-do-PPCD-Acre/227](http://www.ipam.org.br/download/livro/Subsidio-para-a-Adocao-de-meta-de-reducao-de-desmatamento-no-ambito-do-PPCD-Acre/227)
- 9 That said, it is important for governments to keep in mind that if jurisdictions with emissions caps under the Kyoto Protocol choose to allow emissions units from their domestic emissions trading programs to be used in an MBM for international aviation, they will need to subtract from their Kyoto allowance accounts an amount of Kyoto allowances equal to the domestic emissions units transferred to the aviation scheme.
- 10 This could be for a range of reasons including different project types, such as types of land use activities, or because the start dates don't exactly coincide with the requirements of the UN validation processes.
- 11 Bloomberg New Energy Finance, *Forest Trends, 2012, "Developing Dimension – State of the Voluntary Carbon Markets 2012"*.

## MARKET-BASED MEASURES

# MARKET-BASED MEASURES AND THE UNITED NATIONS

BY ROBIN RIX

This article provides an overview of market-based measures that have been established under the United Nations Framework Convention on Climate Change (UNFCCC). It outlines the origins of these measures, assesses current trends, and offers views on the likely direction for these measures in the coming decade.



### ROBIN RIX

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## BACKGROUND AND ORIGINS

### Convention

The overarching international agreement on climate change, the United Nations Framework Convention on Climate Change (UNFCCC), was adopted in 1992 and entered into force in 1994. Its ultimate objective is the stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous human-induced interference with the climate system. The Convention has been ratified by almost all countries (195 Parties at the time of writing), which meet annually to review the implementation of the Convention.

At their first meeting (COP1, 1995), Parties agreed that the commitments under the Convention were inadequate for addressing climate change, and they launched a process to strengthen them. To guide this process, they agreed that developed countries should take the lead in reducing emissions, calling upon them to accept quantified targets for their domestic emissions and to elaborate policies and measures to meet those targets.

### Kyoto Protocol

The outcome of the above process was the Kyoto Protocol, which was adopted at the third meeting of the Parties

to the Convention (COP3, 1997) and entered into force in 2005. The Kyoto Protocol establishes a legal framework by which developed countries accept emission targets for their domestic emissions for periods of time, known as commitment periods. The Kyoto Protocol does not prescribe emission targets for developing countries. Two commitment periods have been agreed to date: a first commitment period from 2008 to 2012, and a second commitment period from 2013 to 2020.

Of the 195 Parties to the Convention, 193 are also Parties to the Kyoto Protocol, the exceptions being Canada and the United States. These Parties meet annually, concurrently with the COP, to review the implementation of the Kyoto Protocol.

### Market-based Measures

Three market-based measures were established under the Kyoto Protocol.

The largest and best known of these measures is the clean development mechanism (CDM), which provides for, first, the registration of projects that reduce emissions in a developing country and, second, the issuance of units equivalent to the emission reductions achieved by these projects.

These reductions are measured as the difference between (i) baseline emissions (*i.e.* what emissions would have been in the absence of the project), and (ii) actual emissions (*i.e.* what emissions actually were). These units may then be transferred to other entities, most commonly to counterbalance, or offset, their emissions. Units may be issued for a crediting period of ten years, or for seven years that may be renewed twice.

In addition to reducing emissions, the CDM was also designed to assist developing countries in achieving sustainable development. To confirm this, each project must receive a letter of approval from its host country confirming that the project helps it to achieve sustainable development.

Governance of the CDM is the responsibility of an international regulatory body known as the Executive Board. Its key duties include: the consideration of requests for registration and issuance, the design and approval of methodologies for determining baselines and measuring emission reductions, and the accreditation of third-party auditors who perform delegated functions such as reviewing requests for registering projects and issuing units.



To date, the CDM has registered approximately 7,000 projects and issued almost 1.4 billion units, known as certified emission reductions (CERs).

The second market-based measure established under the Kyoto Protocol is joint implementation (JI), which operates similarly to the CDM but with two notable differences. First, JI focuses on projects in developed countries, rather than developing countries. Second, JI has two tracks; its first track allows an individual developed country to set its own standards for measuring emission reductions and issuing units, while its second track operates much like the CDM in being governed by an international regulatory body. The first track is by far the larger of the two, with approximately 98% of units under JI being issued under this track.

The third market-based measure is international emissions trading (IET), which involves the transfer of emissions units between developed countries, usually between governments.

## CURRENT QUESTIONS

### Negotiations Under the Kyoto Protocol

The three Kyoto market-based measures, particularly the CDM, have been the subject of intense scrutiny over the past few years with a view to reforming and strengthening them. Reforms fall broadly into seven categories:

**1.Environmental integrity:** As units correspond to the difference between baseline emissions (which are, by definition, hypothetical) and actual emissions, baselines must be properly set to prevent the issuance of non-additional units. While the CDM has historically used project-specific baselines, a growing trend has been the use of standardized baselines, set conservatively, that promote greater objectivity and certainty. The first two standardized baselines were approved in early June 2013, and more are expected to be approved in the coming years.

**2.Sustainable development:** As explained above, a condition of registration is that a host country provides a letter confirming that the CDM project helps it achieve sustainable development. Several stakeholder groups have suggested that the criteria used by governments to provide such letters should be more widely publicized, and also that the letters should be revocable if a CDM project is found not to help a host country in achieving sustainable development any longer. The UNFCCC produces an annual report on the sustainable development benefits of the CDM and has called for greater transparency in this area.

**3.Regional distribution:** The geographic imbalance of the CDM is a frequent source of concern, with over two-

thirds of registered projects (and over three-quarters of all issued CERs) originating from China and India. That said, current trends suggest a growing number of projects in other countries, most notably in Africa. The UNFCCC has recently opened four regional collaboration centres – in Colombia, Grenada, Togo, and Uganda – with a view to building capacity and promoting more diverse participation in the CDM.

**4.Operational efficiency:** In its initial years, the timelines for registering projects and issuing CERs were protracted, taking several months and at times up to and exceeding one year. Allegations of complex, non-user-friendly guidance were also made. That said, internal operational reforms and an increased quality of submissions have led to significant streamlining, and criticisms of this nature are now almost non-existent.

**5.Level of aggregation:** The CDM traditionally assessed emission reductions on a facility-by-facility basis. This has prompted claims that much broader coverage is needed, whereby emissions are measured and then reduced at broader levels of aggregation (e.g. an entire industrial sector). The response of the CDM has been the growth of “programmatic CDM”, in which a bundle of similar projects can be considered as a single project, thereby allowing for greater coverage and reducing transaction costs.

**6.Net decrease in emissions:** A commonly voiced concern about the CDM is that it is generally used as an offsetting mechanism, whereby emissions reduced in one location simply entitle emissions to be increased elsewhere. While true, several attributes enable the CDM to achieve a net decrease in emissions, among them the use of conservatively set baselines, time-bound crediting periods, and lower default factors.

**7.Governance:** The CDM is governed by a ten-person executive body. Various reforms have been undertaken to make its operations more transparent, although further initiatives are under consideration (e.g. clear criteria for appointment, objective code of conduct).

These reforms are being considered as part of the review of the CDM rules, which the Parties to the Kyoto Protocol are expected to resolve at their year-end meeting in Warsaw. These reforms have also been informed by the findings of the High-level Panel on the CDM Policy Dialogue, a blue-ribbon group which released a comprehensive report in 2012 on means to reform the CDM.

### Negotiations Under the Convention

In parallel with the negotiations under the Kyoto Protocol on existing market-based measures, the Parties to the Convention are engaged in negotiations under the Convention on new measures.



At their meeting in Bali (COP13, 2007), Parties agreed to consider “various approaches, including opportunities for using markets” as tools to enhance emission reductions. These were elaborated in a series of negotiations that produced, at the meeting in Cancun (COP16, 2010), a list of seven guiding elements for new market instruments, including: the stimulation of emission reductions across broad segments of national economies, environmental integrity, a net decrease of emissions, good governance, and robust market functioning and regulation.

A breakthrough was achieved at the meeting in Durban (COP 17, 2011), when a “new market-based mechanism” (NMM) was established and an agreement was reached to consider a “framework for various approaches” (FVA) – covering market-based measures administered at the domestic level, such as emissions trading systems or country specific offset programmes. At the meeting in Doha (COP18, 2012), Parties established two work programmes; one on the new NMM and another on the FVA. These work programmes are expected to lead to modalities for the operation of the NMM as well as further guidance, if not modalities, on the FVA.

## FUTURE PATHWAYS

While the precise outcomes of the negotiation processes are unlikely to be known for several years, the following considerations may apply.

First, **there is a growing sense that the CDM is a useful tool that is worth preserving and strengthening.** Despite a rocky few years in which the CDM was the object of intense criticism and slated for replacement by new market-based measures, its worth in assessing the quality and quantity of emission reductions is becoming increasingly appreciated. Further, when one considers what Parties hoped that new market-based measures would achieve – namely broader coverage within national economies, stronger environmental integrity, a net decrease in emissions, and better governance – are all compatible with the existing mechanism, and reflect the current direction of CDM reform.

Second, **accessibility to the CDM is being broadened.** Although the first use of the CDM was as a tool to help developed countries meet their emission reduction targets under the Kyoto Protocol, its use is not limited to that purpose. Units may also be “cancelled”, via established procedures that are administered by the United Nations Climate Change Secretariat, in order to meet the emission reduction targets of individuals, companies, or industry sectors that seek to carbon-neutralize their emissions. Such a method of offsetting is trusted, reliable, and easy to apply, particularly as the CDM is a centrally administered mechanism that enjoys a high level of international legitimacy, particularly among developing countries. It may therefore be of interest to the aviation sector.

Third, **there is an appetite for focusing on the appropriate role of domestic market-based measures.** Parties explicitly recognize that countries have the sovereign right to develop and implement their own measures to reach their emission reduction targets, and that these can include market-based measures. The current debate revolves around how the quality of these measures can be assured if they are used to meet compliance or voluntary targets, with various models under discussion. ■

## REFERENCES

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