Chapter 4

ECONOMIC INSTRUMENTS

ICAO
ENVIRONMENTAL
REPORT 2010

Economic Instruments
Overview

*By **ICAO Secretariat***

Introduction

Market-based measures refer to policy tools as well as market and economic instruments. They include: emissions trading, emission-related levies - charges and taxes, and emissions offsetting; all of which aim to contribute to the achievement of specific environmental goals, at a lower cost, and in a more flexible manner, than traditional command and control regulatory measures. Market-based measures are among the elements of a comprehensive mitigation strategy to address greenhouse gas (GHG) emissions from international aviation that are being considered by ICAO.

The articles in this chapter provide an overview of ICAO's work on developing policies, guidance material and technical and economic studies, as well as collecting information on various market-based measures. They also provide information on the recent developments on market-based measures in the context of the ICAO Programme of Action on International Aviation and Climate Change.

Background

ICAO has a long history dealing with economic instruments such as taxes and charges related to international aviation operations. Other market-based measures, however, have only recently become available options, and are now being considered by the international aviation sector. Over the last five to six years, governments and airline operators have started to explore emissions trading and various offsetting schemes as part of their efforts to limit the impact of aviation on the global climate.

GHG emissions trading and offsetting were introduced in 1997 as part of the Kyoto Protocol, which provided for three distinct mechanisms:[1]

1. **Emissions Trading**: a market mechanism through which a developed country may transfer Kyoto units to, or acquire units from, another developed country.
2. **Clean Development Mechanism (CDM)**: a project-based mechanism involving developed and developing countries. CDM credits are generated from the implementation of emission reduction projects or from afforestation and reforestation projects in developing countries.
3. **Joint Implementation (JI)**: a project-based mechanism by which one developed country can invest in a project that reduces emissions or enhances sequestration in another developed country, and receive credit for the emission reductions or removals achieved through that project.

The development of the three Kyoto mechanisms together with the emissions limitation and reduction commitments have triggered the establishment of what is commonly referred to as the global carbon market. Since 2000, the global carbon market (including: allowances markets such as EU-ETS, CCX; spot and secondary Kyoto offsets; and project-based transactions) has continued to grow, reaching a value of US$144 billion in 2009 according to estimates of the World Bank[2]. For more details on the three Kyoto mechanisms and on the carbon market, see articles *Status and Structure of the Carbon Market*, *Introduction to Carbon Markets and the Clean Development Mechanism* and *Designing an Emissions Cap and Trade Program*, Chapter 4 of the report.

Types of Market-based Measures

Emissions Trading

Under the emissions trading mechanism of the Kyoto Protocol, a developed country, in order to meet its emissions limitation/reduction targets, may transfer Kyoto units[3] to, or

acquire Kyoto units from, another developed country. Emissions trading does not affect the total emissions "allowances" assigned to all developed countries collectively; rather, it redistributes the allowances among them. A country may acquire an unlimited number of units. However, the number of units that a country may transfer to other countries is limited by the country's minimum level of units that it must hold in its national registry at all times.[4]

Domestic or regional schemes for entity-level emissions trading could be implemented by countries under their own authority and responsibility. Any transfer of units between entities in different countries under such domestic or regional trading systems is also subject to Kyoto Protocol rules. The European Union emissions trading scheme (EU ETS) is one example of a regional trading system operating under the Kyoto Protocol umbrella.

To respond to a request of the ICAO Assembly, the *Guidance on the Use of Emissions Trading for Aviation* (Doc 9885) was prepared under the Committee on Aviation Environmental Protection (CAEP). That document identifies options and recommendations on various elements of a trading scheme including accountable entities, emissions to be covered, trading units, types of trading systems, allowance distribution, monitoring and reporting, and geographical scope. On the subject of geographical scope, the Guidance document recommends that the implementation of an emission trading system for international aviation should be on the basis of mutual consent among States involved, as reflected in the Assembly Resolution A36-22 Appendix L[5].

CAEP also developed a *Report on Voluntary Emissions Trading for Aviation* in 2007, and it was updated in 2010 (see article *Market Based Measures Task Force - Overview of Reports From CAEP/8,* Chapter 4 of this report). That report described the general nature of various types of voluntary emissions trading schemes, summarized a number of practical experiences currently implemented throughout the world, and discussed the possible future development of such schemes involving aviation. Additionally, CAEP conducted a scoping study on issues related to *Linking Open Emissions Trading Systems involving International Aviation*, and the study report was approved in 2010 (see article *Market Based Measures Task Force - Overview of Reports From CAEP/8,* Chapter 4 of this report).

Emissions-related Levies

Levies generally refer to charges or taxes designed to address emissions from international aviation. They have potential advantages compared with other market-based measures, in terms of simplicity for administration, quickness of implementation, and low transaction costs (see article *A taxing question ...* Chapter 4 of this report).

ICAO policies make a conceptual distinction between a "charge" and a "tax". A charge is a levy that is designed and applied specifically to recover the costs of providing facilities and services for civil aviation. On the other hand, a tax is a levy that is designed to raise national or local government revenues which are generally not applied to civil aviation in their entirety or on a cost-specific basis.

The Council convened a Special Group in 2005 to address legal issues related to whether emission-related levies would be consistent with the Chicago Convention and ICAO policies. The conclusions of the Special Group were divided. Some States believed that if charges were linked to the quantity of emissions they would be consistent with Article 15 which deals only with charges for the use of airports and air navigational services. Other States believed that emisssions charges would not be consistent with Article 15 because they had no link to the recovery costs of providing facilities and services. The first group of States held the view that, in cases where charges were related to fuel consumption they would not be contrary to the Article 24 exemption of fees on fuel. The second group disagreed, finding that charges based on the quantity of fuels would constitute a fuel-based tax which would be incompatible with Article 24. In this context, there remains a legal issue to be resolved on the development and implementation of levies on GHG emissions from international aviation.

In 2007, Assembly Resolution A36-22 Appendix L affirmed the continuing validity of ICAO Council's Resolution of 9 December 1996, wherein the Council strongly recommended that any emission-related levies be in the form of charges rather than taxes, and that the funds collected should be applied in the first instance to mitigating the environmental impact of aircraft engine emissions.

Emissions Offsetting

An offset represents the reduction, removal, or avoidance of GHG emissions as a result of a mitigation project that is used to compensate for GHG emissions that occur elsewhere as opposed to Emissions trading which is the process through which emission reductions or removal units are traded in a market environment. Specifically for aviation; emissions offsetting involves compensating for the emissions resulting from aviation operations with an equivalent amount of emissions reductions or investment in specific mitigation projects.

The correct estimation of emissions specifically from air travel is essential to identify the amount of emissions to be offset. With a view to providing appropriate and harmonized information on CO_2 emissions from air travel and thus avoiding the proliferation of different methodologies, ICAO developed a globally accepted *Carbon Emissions Calculator* which is available on the ICAO website **(http://www.icao.int/)**.

CAEP also examined the potential for Emissions Offsetting for Aviation, and the report was approved in 2010 (see article *Market Based Measures Task Force - Overview of Reports From CAEP/8,* Chapter 4 of this report). The report concluded with a discussion of potential opportunities to use offsetting for the aviation sector in the future. At the passenger level, it is possible to draw on the current voluntary experience. However, there is also the possibility of using offsetting at a global sectoral level, either in a regulated emissions trading system or through an emissions charge. Offsetting can also be applied at an air carrier level rather than at the passenger level. These options offer some interesting possibilities for the future (see article *IATA's Carbon Offset Program*, Chapter 4 of this report).

Voluntary Measures

Voluntary agreements between governments and industries to limit or reduce aviation GHG emissions are often considered as market-based measures because they constitute an alternative to regulation. In 2004, CAEP developed a template for voluntary agreements to facilitate the implementation of such agreements. Since then, it has been collecting and compiling information on voluntary measures, including voluntary agreements between governments and the industry (see article *Market Based Measures Task Force - Overview of Reports From CAEP/8* and article *Voluntary Measures to Address Aviation Greenhouse Gas Emissions*, Chapter 4 of this report).

Toward a Global Framework for Market-Based Measures

While the 36th Session of the ICAO Assembly in 2007 generally agreed on the technical and operational aspects of mitigation measures to address GHG emissions from international aviation, the question of how to accommodate the views of different States on market-based measures for international aviation remained one of the most important and contentious issues. In an effort to continue to bridge the different views among States, the Assembly established the Group on International Aviation and Climate Change (GIACC) with the mandate to develop a Programme of Action on International Aviation and Climate Change.

During the GIACC process, a wide variety of market-based measures were identified and reviewed. GIACC acknowledged that there remained disagreement on the application of market-based measures across national borders. It also recognized that market-based measures implemented by States or by Regions with different policies and parameters, in the absence of a framework developed by ICAO, were far from optimal. GIACC consequently recommended the development of "a framework for market-based measures in international aviation".

At the High-level Meeting on International Aviation and Climate Change convened in October 2009, discussions on the application of market-based measures reflected the divergent views expressed during the GIACC deliberations. Many States expressed the need for ICAO to undertake the necessary steps to develop the framework for market-based measures.

Emerging national and regional measures involving aviation, as listed in Figure 1 (see article *Status and Structure of the Carbon Market*, Chapter 4 of this report), could be a knowledge basis for ICAO in identifying key elements of the framework for market-based measures, including the issues of compatibility and equivalency of measures. The main objective would be to avoid the patchwork or duplication of measures, thus facilitating the harmonization among States as part of a global approach to address emissions from international aviation.

As the forum for all matters involving international aviation, ICAO will continue to strive to make further progress towards global solutions to address GHG emissions from international aviation with the highest degree of harmonization and cooperation among its 190 member States and the aviation industry. The development of a global framework for market-based measures needs to be persued in a constructive and forward-looking manner to bridge the views of different States moving towards a globally accepted solution. ■

Emerging national and regional trading schemes

European Union *Emissions Trading Scheme (EU-ETS)*

- *Since 2005, 11,000 industrial installations in 27 EU member States, covering the most energy-intensive sectors, representing about half of European GHG emissions*
- *Domestic and international aviation to be included from 2012*

New Zealand *– stage implementation of national ETS*

- *A staged rollout of national ETS across different sectors, with forestry already covered since 2008, most stationary and transport-related energy and industrial processes being added in mid-2010, and agriculture to be added in 2015*
- *Purchasers of aviation jet fuel can opt into the scheme, and so far Air New Zealand is the only airline to opt in*

Japan *– voluntary national ETS*

- *Trial of a voluntary ETS for 2008-2012 to gather experience, allowing voluntary participants to set their emissions reduction targets and trading their allowances among participants (Japan Airlines and All Nippon Airways are voluntarily participating in the scheme)*
- *New legislation with references to a mandatory ETS is being considered by national parliament*

United States

- *Cap and Trade legislation is being considered at federal level*

Australia

- *Cap and Trade legislation consideration postponed*

Figure 1: *Emerging national and regional trading schemes.*

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1 *UNFCCC Kyoto Protocol Reference Manual on Accounting Emissions and Assigned Amount (http://unfccc.int/resource/docs/publications/08_unfccc_kp_ref_manual.pdf).*

2 *World Bank, State and Trends of the Carbon Market 2010 (http://web.worldbank.org).*

3 *Kyoto units refer to assigned amounts, certified emission reductions (from CDM projects), emission reductions units (from JI projects), removal units (from afforestation or reforestation projects).*

4 *UNFCCC Kyoto Protocol Reference Manual on Accounting Emissions and Assigned Amount (http://unfccc.int/resource/docs/publications/08_unfccc_kp_ref_manual.pdf).*

5 *42 Contracting States expressed their reservation on the text contained in the A36-22 Appendix L.*

Status and Structure of the Carbon Market

*By **Andrew Howard,** UNFCCC*

***Andrew Howard** has been instrumental at the UN Climate Change Secretariat in the development and implementation of the Kyoto Protocol, in particular emissions trading and the CDM. He supported the inter-governmental negotiations that set down the rules for these mechanisms and has led projects to establish key components of the trading infrastructure underlying the carbon market.*

He now manages the Strategy and Policy Development Unit in the market mechanisms arm of the secretariat and leads its support for the further negotiation and development of market-based instruments for the post-2012 period.

Uncertain Directions

Back in 1997, it took only a few paragraphs in the Kyoto Protocol to lay out a new concept and give birth to an innovative market in environmental protection. Today, the carbon market is like a budding teenager, sufficiently confident that it has a place in the world, but unsure which direction to take.

Few of the delegates negotiating in Kyoto would have been aware of what was to come. The World Bank estimates that carbon market transactions around the globe totalled US$144 billion (€103 billion) during 2009, with 8.7 billion units (each representing one tonne of CO_2 equivalent) being traded[1]. The European Union's emissions trading system remained the most significant global player, making up 82% of market value. The primary market for Kyoto's Clean Development Mechanism (CDM) represented around 2% of global value and made up 5% the year before.

Overall, this amounts to a 6% growth in the value of the carbon market in 2009, but this is considerably lower than the double-digit growth that became the norm in earlier years. It also masks a significant drop-off in prices since the peak in oil prices and the onset of the economic downturn. EU allowance prices fell from over €30 in mid-2008 to €8 in early 2009, before stabilizing in a €13-16 range. Prices for CDM credits have followed a similar path.

These signals may be seen positively. They are a sign that the carbon market, or at least elements within it, are acting as one would expect mature markets to act – falling in a global economic crisis when the pressure to emit carbon is weak, and then rising again as economic prospects improve.

As quickly as it began, however, people have begun announcing the market's demise. The emission targets set for developed countries under the Kyoto Protocol only cover until 2012, we are reminded. The eyes of the world were on governments when they were unable to agree on new emission commitments in Copenhagen in December 2009. How should we reconcile this with the generation of managers and entrepreneurs that have now begun to engage with the climate change issue and are starting to voluntarily extend their actions beyond what regulators oblige them to do?

This still maturing carbon market is still uncertain as to where best to focus its energy. Will it languish until policy-makers set a new direction? When it matures, will it be accepted by society as a responsible and effective way to address climate change?

Market Origins

The Kyoto Protocol set out an international architecture for combating climate change that incorporated market instruments as one of its defining features. The Protocol established quantitative emission targets for developed countries during the first commitment period (2008-2012) and also made

provisions to allow flexibility as to how they would meet these targets. Most developed countries committed to keep their emissions below their 1990 levels by 6-8% over this period.

Underlying this system of targets is the concept of "assigned amount" (see **Figure 1**). This expresses the quantity of emissions permitted under each target as an assigned number of units. Each developed country must hold and "retire" one assigned amount unit (AAU) for each tonne of CO_2 equivalent greenhouse gases that it emits. The finite number of AAUs held by the country acts to constrain its emissions. A number of flexibility provisions were embodied within the overall Kyoto architecture.

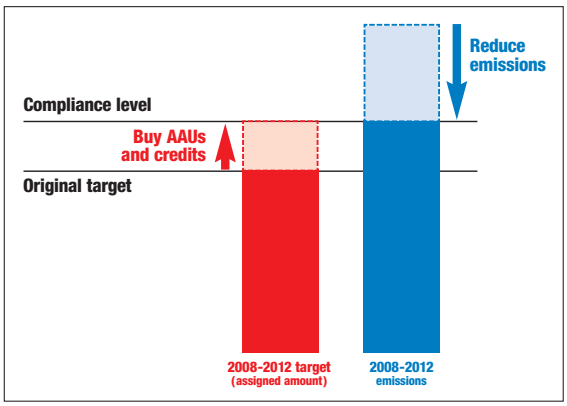

Figure 1: *Compliance with flexibility under the Kyoto Protocol.*

Firstly, the sequestration of greenhouse gases through land use and forests may be credited as removal units (RMUs). Secondly, through the Clean Development Mechanism (CDM), developed countries may undertake projects in developing countries that reduce emissions or increase sequestration there. The impacts on emissions are quantified and credited as certified emission reductions (CERs) that may also be retired against the countries' Kyoto targets.

Thirdly, developed countries may engage in projects under the "Joint Implementation (JI) mechanism" and in "emissions trading", under which they may obtain AAUs and credits from other developed countries where this is less expensive than making the reductions at home. Other countries, where they could reduce emissions more cheaply, would do so and make AAUs and other credits available for sale.

The carbon market is not an add-on to Kyoto — rather, it is an integral and defining feature of its architecture. Emission targets create market demand while the supply is provided through countries with more cost-effective mitigation opportunities.

While none of this flexibility removes the need for developed countries to radically alter their own emissions behaviour, they are seen as important means for directing efforts towards cost-effective mitigation opportunities and enabling developed countries to take on more stringent emission targets.

Regulating Business

Countries have sought to adopt the same market-based policies towards the private sector by introducing cap-and-trade systems. By setting emission targets for major emitters and allowing them to trade emission allowances issued against them, the incentives to reduce emissions are pushed downwards to the large and diverse range of economic actors whose decisions collectively determine national emission levels.

The EU emissions trading system, that covers 27 member States, 3 other European Economic Area countries, some 11,000 installations, and about half of Europe's greenhouse gas emissions, has been the main driver of what we know today as the carbon market. It is now well into its second phase (2008-2012), and the rules have been established for its third phase (2013-2020). The EU ETS has also been the main driver for the growth of the CDM and JI under Kyoto, by allowing credits from these mechanisms to be surrendered against EU company-level targets.

The decrease in emissions due to the economic downturn has left EU allowance prices low and caused some concerns as to the efficacy of trading approaches in reducing emissions. Though it can be argued, in retrospect at least, that the targets should have been tighter, the trading system is still delivering the emission results asked of it, and EU emission data indicates that allowance prices are prompting real reductions in emissions.

Other countries have also taken steps to introduce emissions trading systems at the national level. New Zealand has become the first country outside Europe to adopt an economy-wide, regulated system. It envisages a staged rollout of the system across different sectors, with forestry already being covered since 2008, most stationary and transport-related energy and industrial processes being added in mid-2010, and agriculture to be added in 2015.

Japan has experimented with emissions trading on a limited and voluntary basis now for several years, with much speculation brewing on whether a mandatory system will be introduced. Legislation introduced this year contains new references to such a system, although the fate of this legislation is still under much uncertainty, particularly in light of recent political changes within the Japanese government.

In the USA, successive attempts have been made to pass cap-and-trade legislation at the federal level. Although the House of Representatives passed a bill in 2009 that would have established a wide-ranging cap-and-trade system, the Senate remains divided on the best way to proceed. Several variants have emerged in the Senate with each embodying more or less of the cap-and-trade approach. At the time of writing, it is unlikely that progress will be made in 2010. Meanwhile, State-level trading systems continue to be developed and are in some cases already operational.

In Australia, the Carbon Pollution Reduction Scheme was defeated twice at the Senate level in 2009. It was more recently announced there that the legislation would not be considered again until 2012, although recent changes in government leadership suggest this may now be accelerated.

The experience in many countries shows the difficulty in uniting behind consensus legislation. Domestic cap-and-trade systems are typically affected by domestic concerns and political compromises that need to be made at the national level. The EU has called for the establishment and linking of cap-and-trade systems across OECD countries by 2015. However, as linking different systems depends on being able to achieve at least a minimum level of harmonization in the design of each individual system, this goal appears some way off from being achieved.

Kyoto's Project-Based Mechanisms

CDM projects in developing countries must lead to emission reductions or removals that are additional to any that would have occurred without the project. To demonstrate this, projects must fulfil robust requirements for validation and registration and the ensuing reductions or removals of emissions must meet monitoring and certification standards before CERs are issued.

The CDM has grown beyond expectations since taking its first steps in late 2001. At the time of writing, there were 2,250 registered CDM projects in 68 developing countries. United Nations Environment Programme (UNEP) Risoe estimates that registered projects represent an investment in developing countries of about US$67 billion[2]. Around 730 of these projects have already received credits for emission reductions, with some 420 million CERs having been issued. As well as reducing emissions, such projects have a key function in transferring technology and capacity to developing countries and contributing to their overall sustainable development.

Beyond the number of CDM projects that are already registered, the volume of projects still undergoing development is more difficult to estimate. Around 3,000 further projects have already reached the validation stage or are currently undergoing registration. If these were all to come to fruition, it is estimated that between 1 and 3 billion CERs would be issued for the period up to the end of 2012 and that investment flows through the CDM would exceed US$150 billion.

With so much activity being attracted, much market and government attention is focused on the efficiency of the regulatory process governing the CDM. The CDM Executive Board is moving on a comprehensive work plan of strategic reforms which aim to improve the efficiency of the CDM process while always ensuring that only quality reductions and removals get credited.

Key expectations for this work include streamlining the project procedures, allowing for appeals against the Board's rulings on projects, consolidating the Board's guidance, strengthening the performance of the certifying Designated Operational Entities active in the market, enhancing the objectivity of project baselines, and instituting loans for developing projects in countries under-represented in the CDM.

At the same time, the Parties to the Kyoto Protocol are considering possible wider-ranging changes in the scope of the activities that may be undertaken through the CDM. These include the possible inclusion of new activities such as additional forestry types, carbon capture and storage, and nuclear facilities.

The JI project-based mechanism allows for similar projects as the CDM, except that the projects take place in developed countries and may be approved either by the host countries ("track 1") or under the UN ("track 2"). JI began operation later than the CDM and addresses a smaller number of countries. Nevertheless, 17 projects have now been finalized under track 2 and about 170 further projects have entered the pipeline (with a potential reduction in emissions in the order of 300 million tonnes CO_2 equivalent from 2008 to 2012). In addition, it is estimated that a further 170 projects have been approved under the track 1 rules.

Going Voluntary

The role of the voluntary carbon market is often neglected in policy-making circles. Its emergence demonstrates the private sector's will to address climate change, even without a legal obligation to do so, although its lack of regulation remains the main stumbling block on the way to greater credibility and scale.

The motivation to voluntarily offset emissions is partly to show environmental responsibility and partly to gain carbon market experience, especially with further regulatory trading systems on the horizon. The size of the voluntary market remains small, accounting for around 1% of carbon market transactions in 2009, with a value of US$387 million (down from US$728 million in 2008)[3]. Much activity is based in the US where the prospect of state and federal trading systems has been present for several years.

Where the voluntary market stands out is as a testing ground for new ideas. New standards, registries and project types can be innovated and put through their paces, with a mix of criteria stemming from the need to prove environmental integrity (i.e. to obtain market value) and ensure business practicality. Although many initiatives have eventually sought rigour and environmental integrity by drawing on methods from the CDM and JI, some innovations from voluntary schemes may well find their way into future cap-and-trade systems, in the US and perhaps elsewhere.

Future Directions

Where does this all leave us today? The last decade has seen enormous growth and learning in the carbon market, among policy makers as well as the makers of business decisions. In Europe and some other regions, the institutions and service industries for emissions trading are maturing and carbon prices are being seriously factored into investment and other commercial choices.

Concerns and challenges nevertheless remain. Firstly, in practice there is not a global carbon market, but rather a fragmented set of activities and policy frameworks. The fragments will perhaps grow and consolidate over time but it is increasingly likely that this will only occur incrementally as the major drivers in the design of new market instruments remain oriented towards domestic interests.

Secondly, many governments in the developing world are questioning whether market approaches are able to deliver on the needs they have for sustainable development. There have been improvements in the numbers of CDM projects emerging in Africa and the least developed countries, but it has proven difficult for the mechanism to overcome long-standing hindrances and barriers to investment in some countries.

Thirdly, the carbon market's lifeline is the will of governments to reduce emissions and the extent to which they pass on these priorities to business in the form of targets. Current indications, especially in the midst of the current economic downturn, point to targets that can be relatively easily met and an offset market that is approaching saturation point. Moreover, the concept of offsetting emissions remains controversial and its acceptance depends on whether the targeted levels of emission cuts are sufficient to balance offsets with an assurance that sufficient mitigation action will be taken at home.

How deep the emission cuts should be is the subject of ongoing negotiations among governments on how the international framework of climate action should evolve after 2012. After an inconclusive summit in Copenhagen last year, attention has now shifted to what may be decided by governments when they meet in Cancun, Mexico, this coming December.

The discussions have not become easier since Copenhagen and it is unlikely that a full and specific package will emerge from Cancun. What is apparent however, is that holding the planet to a maximum temperature rise of 2ºC, or less, above pre-industrial levels will require enormous levels of support – finance, technology, capacity-building – to be provided to developing countries to assist with their mitigation actions.

While much of this will need to be provided by developed country governments from public sources, it is inevitable that significant additional amounts will be needed from the private sector. Effective tools are needed to channel private sector investments into developing countries in ways that support development along green paths rather than brown. New market instruments have been proposed that would operate at scales much larger – for example at a sector level – than the current focus of most CDM projects. Many of the ideas are still young and in need of more elaboration, and perhaps some on-the-ground piloting.

Emissions from international aviation must also factor into the international community's fight against climate change. Despite the sector's unique challenges in determining how to distribute the effort and responsibility, the need to address these emissions is recognized by both governments and industry worldwide.

Technical opportunities for improving the carbon efficiency of international aviation are known, but what remains unclear is what additional policy measures can be drawn upon to accelerate their implementation. The EU has taken some steps to incorporate international aviation into its emissions trading system, and other proposals have been made for various forms of cap-and-trade on aviation. Ultimately, one of the issues to explore is whether emissions trading and offset approaches may have potential, not only to promote cost-effective reductions in emissions, but also to offer solutions to the difficult issue of how the effort for reducing international transport emissions may be distributed.

The carbon market is maturing in an uncertain world. Only time will tell what policy environment will be put in place and what directions the market will take within it. ■

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Introduction to Carbon Markets and the Clean Development Mechanism

*By **Holly Krambeck,** World Bank*

***Holly Krambeck** is a Carbon Finance Specialist in the World Bank's dedicated Carbon Finance Unit, where she works on expanding transport sector access to climate-based finance. Her responsibilities include developing tools for estimating greenhouse gas emission reductions associated with different types of transport investment programs, as well as Clean Development Mechanism project review and management.*

Prior to joining the Bank, Holly worked as an infrastructure economics and finance specialist with Parsons Brinckerhoff, Inc., where she was task lead and project manager for infrastructure projects and climate-based initiatives in the US and abroad.
Holly has a Master of Science in Transportation and a Master in City Planning, both from the Massachusetts Institute of Technology.

At the ICAO Colloquium on Aviation and Climate Change, held in May 2010, participants expressed an urgent need to develop long term, collaborative strategies for achieving sector-wide energy efficiency improvements, as well as low carbon growth. Further, to sustain these strategies, participants expressed a need to identify means to finance low carbon and energy efficient investments, especially in developing countries, where the financial barriers to implementing green technologies and strategies may be particularly high.

One financing option discussed during the Colloquium was the leveraging of carbon finance, and to help facilitate this discussion, the World Bank provided an overview of carbon markets – what they are, how they work, and how they may help ICAO member States reach their greenhouse gas (GHG) mitigation goals. Following is a slightly elaborated version of the presentation given during the Colloquium.

Overview of Carbon Markets

Carbon markets come in many shapes and sizes. There are compliance allowance trading schemes, offset schemes, and voluntary programs. To sort through these different markets and understand how these markets function and relate to each other, the following sections describe two key distinctions between different carbon market mechanisms: allowance trading versus offset schemes, and compliance versus voluntary markets.

Allowance Trading Versus Offset Schemes

There are two types of tradable commodities supported by carbon markets – allowances and offsets.

Allowance Trading Schemes

In allowance trading schemes, such as the European Union Emissions Trading Scheme (EU ETS), a regulatory body, such as a national government, establishes an annual greenhouse gas emissions cap for specific activities, such as power generation or purchase of mobile-source fuels. GHG emitters from regulated sectors are allocated a set of emissions allowance certificates, which represent their maximum allowable CO_2e (carbon-equivalent, which includes all six Kyoto greenhouse gases) emissions over a pre-determined compliance period.

For example, a firm that is allowed to emit 10,000 tons of CO_2e per year would be required to own 10,000 tons-worth of emissions allowance certificates. Some entities will emit more than their regulated cap and run out of allowance certificates, while others will emit below their cap (because of decreased production, improved technology, etc.) and have excess certificates. An allowance trading scheme brings these entities together, so that demand for additional allowances is met by surplus allowances held by less energy-intensive entities.

Offset Trading Schemes

Offset schemes enable firms and entities that are not regulated by caps, such as those based in developing countries, to participate in emissions trading. Entities that voluntarily engage in activities that mitigate greenhouse gas emissions in a measurable way may register these emissions reductions under an offset crediting scheme, such as the Clean Development Mechanism (CDM). Upon registration, these offset credits may be sold to entities that are seeking to reduce emissions, such as entities participating in allowance trading schemes.

To illustrate how allowance trading and offset schemes may complement each other, consider a firm participating in the EU ETS, which will exceed its allocation of allowance before the end of the current compliance period (2008 - 2012). This entity would have three options: a) purchase leftover allowances from another firm; b) purchase offsets generated through the CDM; or c) pay a penalty.

Compliance versus Voluntary Markets

In addition to the distinction between allowance and offset markets, there is also a distinction between voluntary and compliance trading schemes.

Compliance Trading Schemes

Under compliance trading schemes, such as EU ETS and the Regional Greenhouse Gas Initiative (RGGI) in the US, entities motivated by strictly-enforced emissions regulations trade in tightly monitored allowance and offset schemes. Participating entities that exceed emissions caps and do not take corrective action through trade in allowances or offsets are legally required to pay penalties levied by the regulatory body.

Voluntary Trading Schemes

On the other hand, participants in voluntary schemes, such as the Chicago Climate Exchange (CCX), are not assigned externally defined emissions reduction targets – rather, participants may voluntarily establish their own legally-binding caps. Participants in voluntary markets tend to cap themselves out of a sense of moral obligation or corporate social responsibility. For example, firms that wish to participate in the Chicago Climate Exchange will first determine an emissions reduction target and sign a legally-binding agreement with the Exchange, holding the firm accountable to meeting that target either through emissions reductions or through trades on the exchange.

Unlike the heavily regulated and monitored compliance trading markets, the commodities of the voluntary markets are not standardized and therefore not typically tradable across different markets. Today, there are simultaneous initiatives throughout the world to develop a unified standard for verifiable voluntary emissions reduction allowance credits and offsets, though, the results of these initiatives may not be realized for a few more years.

The Clean Development Mechanism

CDM is an offset generation program, which enables entities in developing countries to generate offset credits from select activities that mitigate greenhouse gas emissions. These credits may be sold to entities seeking to reduce emissions under either voluntary or compliance carbon markets. Revenues from the sale of CDM credits, in turn, may be used to support the green project investments.

Eligible Aviation Activities and Investments

The United Nations Framework Convention on Climate Change (UNFCCC) places strict guidelines for the registration and issuance of CDM credits and only a select number of activities are eligible. It maintains a list of approved "methodologies" that provide all of the relevant applicability conditions as well as modeling, data collection, and monitoring procedures for different approved project types. The following table lists approved CDM methodologies that may be applied to the aviation sector:

CDM ID#	Methodology	*Aviation Applications*
Operations		
AMS III.T	BioDiesel	*Alternative fuels**
AMS III.C	Low emissions vehicles	*Aircraft technology*; airside vehicles*
AMS III.S	Low emissions vehicles (fixed route)	*Aircraft technology**
AMS III.AA	Vehicle retrofits	*Aircraft technology*, airside vehicles*
Infrastructure		
AMS II.C	Energy efficient equipment	*Airport facilities and terminals*
AMS II.E	Building efficiency and fuel switching	*Airport facilities and terminals*
AMS I.D	Renewable energy generation	*Power generation*
AMS II.B	Renewable energy generation (grid)	*Power generation*

***** *Domestic use only*

Table 1: *Clean Development Mechanisms (CDM) applicable to aviation.*

In general, most emissions trading schemes – either current or planned – will accept offsets developed using CDM-approved methodologies and procedures.

Applying for Clean Development Mechanism Registration

Following is a summary of the steps involved in the CDM registration process:

1) Project sponsor submits a completed template to the UNFCCC Executive Board and the UNFCCC-approved Designated National Authority (DNA), indicating its intention to pursue CDM registration.

2) Project sponsor completes a Project Design Document (PDD) template, which includes sections for presenting a project description, compliance with CDM and UNFCCC guidelines, emissions reduction calculations, and implementation and monitoring procedures.

3) Project sponsor then hires an independent, accredited Designated Operational Entity (DOE) to validate the PDD and supporting documentation.

4) During the validation period, the DNA issues a Letter of Approval, which indicates whether the proposed project activity supports national sustainable development goals.

5) Upon completion of the validation, the DOE submits a final validation report, as well as all project documentation and completed CDM templates, to the UNFCCC Executive Board for completeness check and review.

6) Finally, upon Executive Board approval, the project sponsor is notified of registration and may commence with generation of creditable emissions reductions and preparation of issuance procedures.

Given current delays associated with the CDM registration and issuance process, CDM procedures are expected to undergo a major overhaul following the end of the current Kyoto Compliance period in 2012, although, not much is known at this time about what specific changes to the system will be made.

There has been a growing trend towards supporting programmatic activities (i.e., a series of similar, replicable investments, rather than single, isolated projects) and Nationally Appropriate Mitigation Actions (NAMAs), a somewhat generic term used in support of sectoral schemes, where governments in developing countries may be financially rewarded for compliance with self-established greenhouse gas mitigation goals, by sector.

Whatever shape the future CDM market takes, it is almost certain CDM projects registered today will be able to continue generating saleable credits after 2012.

Looking Forward

Following is a list of options ICAO and its Member States may consider for leveraging carbon markets to support energy efficiency and low carbon growth investments through carbon markets:

- Develop a green fund for the purpose of purchasing certified offsets from aviation-related industries, through schemes such as the CDM.
- Generate certified offsets, through schemes such as the CDM (would apply to domestic aviation in developing countries, only).
- Work with the UNFCCC (in collaboration with the International Maritime Organization, which faces similar challenges as ICAO) on developing a CDM-like offset scheme for the international aviation sector as a whole, which would enable participation from developed and developing countries.
- Develop an internal compliance or voluntary allowance trading scheme within the global international aviation sector (with linkages to external offset markets).

While each of these options presents a distinct advantage to ICAO Member States, they also pose challenges, which should be carefully considered in any follow-up work or initiatives.

For information on the World Bank's carbon finance activities, please visit the website: **www.carbonfinance.org** ■

Designing an Emissions Cap and Trade Program

*By **Katie Sullivan**, International Emissions Trading Association (IETA)*

***Katie Sullivan** recently joined the International Emissions Trading Association (IETA) as its new Canadian Director. In this role, Katie leads IETA's efforts in further enhancing its Canadian members' ability to engage in constructive climate policy dialogue at federal, provincial and territorial levels, while also contributing to IETA's growing international policy work on economic instruments to combat climate change. Prior to joining IETA, Katie worked as a consultant for ICF International, where she provided strategic climate change advisory services and specialized in greenhouse gas policy and carbon market developments in North America. Katie holds a Masters in Environment, Development and Policy from the University of Sussex, and an Honours Bachelor of Public Affairs & Policy Management from Carleton University.*

The broad and complex nature of the climate change challenge calls for decision-makers at all levels, and across all regions, to employ a suite of greenhouse gas and energy policies to achieve deep emission reductions over the long-term. Key instruments in these climate policy toolkits are known as market-based measures, whereby carbon pricing becomes integrated into the economic decision-making processes of market participants. These measures are designed to foster cleaner technology/investment choices and the overall de-carbonization of economies at the lowest cost to society. Although some developed regions of the world have recently slowed down climate policy action in the face of fierce political opposition, carbon pricing, in general, and emissions trading in particular, remain the weapons of choice in government policy arsenals to cost-effectively fight climate change.

General Types of Emissions Trading

In the field of emissions trading, two broad program design categories exist: cap and trade programs; and baseline and credit programs. Where a cap and trade mechanism uses an absolute emissions reduction framework (i.e., a permit/allowance or credit must be redeemed for every unit of emissions produced), a rate-based baseline and credit mechanism uses a relative framework, whereby entities must account only for deviations from their performance-standard baseline. To date, experience with emissions trading suggests that a cap and trade approach may prove more environmentally and economically beneficial than a strict baseline and credit trading system.

Cap and Trade

At the highest-level, and in the simplest of terms, the development of an emissions cap and trade system can be divided into several overarching steps. At the outset, a legally-binding economy-wide or sector-wide aggregate emissions limit (cap) is established. Second, this cap is divided into emissions permits (allowances), which are then allocated to eligible participants (covered or regulated entities) under the trading system. Third, participating entities are required to retain allowances to cover their emissions and allowed to trade (buy or sell) their permits in the market. Through trade, the permit purchaser essentially pays a charge for polluting, whereas the permit seller is financially rewarded for having successfully reduced emissions. Finally, on a pre-determined basis (e.g., annually), entities are required to submit allowances to the program authority to cover their facility, corporate, or entity-level emissions. Allowance price, set by fundamental market activity, will reflect the underlying cost of reducing emissions to comply with the regulatory cap; the more stringent the cap, the higher the allowance price. In principle, regulated entities that can reduce emissions through their least-cost option will do so and thereby achieve air pollution reduction goals at the lowest cost to society.

A number of regions around the world are developing or proposing emissions trading programs to meet climate policy goals. Many of these schemes allow for design adjustments, based on new information and lessons learned. As decision-makers must account for country or region-specific circumstances when designing policy initiatives, emissions trading programs and plans generally differ in target, scope, size, and allowance allocation method, among numerous other things. The largest emissions trading market in the world today is the EU Emissions Trading Scheme (EU ETS).

In January 2005, the EU ETS was implemented to cap carbon dioxide emissions from heavy industry. This program, that covers nearly half of the EU, became the cornerstone of the region's climate change policy towards meeting reduction commitments under the Kyoto Protocol. Assigning value to reductions in carbon dioxide emissions, established through trade in emission allowances, formed a market with an asset value worth tens of billions of dollars annually. Through linkages to emission credits generated under Kyoto Mechanisms (CDM/JI), establishing this price of carbon has been an international feat.

Despite some challenges that have faced the market, the EU continues to take a leadership role in using market-based mechanisms to address the climate challenge and remains fully committed to cap and trade and, in principle, the use of tradable offset credits and the linkage of existing/proposed programs. More popular criticisms of cap and trade will point to the existing EU ETS as an example of how a greenhouse gas trading program failed to reduce actual emissions while hindering the European economy. However, when one looks at the facts, this becomes a false argument.

Since its 2005 launch, the EU ETS has reduced emissions by 50-100 million metric tons of carbon dioxide a year, while adding more than 1.5 million new jobs in low-carbon technologies, all while adding some US$87 billion to the European economy. Today, the trading program represents the largest emissions market in the world, and Europe's carbon price undeniably represents the global benchmark. The lesson to draw from the European experience, to inform today's worldwide emissions trading debates, is that pricing carbon through cap and trade can enhance economies and improve productivity while achieving environmental objectives.

Key Cap & Trade Design Elements and Considerations

Determining the optimal scope of a cap and trade scheme requires a balancing of competing objectives. In general, a cap and trade system covering the highest percentage of an economy's emissions, as is practicable, has become a favored approach in policy design circles. This broad coverage of sectors, each with varying marginal (i.e. additional) abatement costs, enables the market to achieve high levels of cost savings. The differing marginal abatement costs of regulated entities under the program covered thereby allows them to sell emission rights (permits) to others whose internal control costs are higher, thereby creating a win-win situation for all involved. For those selling allowances, this new revenue stream provides an incentive to direct investment into emission reduction technologies and practices. For those purchasing allowances, the system creates incentives for better cost control. This beneficial market dynamic, between buyers and sellers, will continue to increase, as the system expands to cover the highest percentage of emissions.

Cap and Trade Design Elements

In developing a cap and trade program, four fundamental design elements can be identified:

1. **The cap** can be defined as the mandatory upper limit on the total emissions that can be released in a given period from covered sources. The stringency of a cap and trade program will depend on the level of the cap (e.g. a cap set below current emission levels will be more challenging to meet than one that allows for continued growth in emissions about current levels).

2. **Emission allowances** are permits that entitle the holder to emit a specified quantity of the pollutant, that is being regulated, during a given time period. For programs that target greenhouse gas emissions, allowances are typically equal to one metric ton of carbon dioxide equivalent emissions. The total number of allowances issued is determined at the cap level. For example, if the cap were set at 100 metric tons, a total of 100 allowances would be made available to the market in some fashion, either through free allocations or through an auction.
3. **Trading** allows for emitters to buy and sell allowances from other entities. Typically, a facility will buy additional allowances (entitling it to additional emissions), if the market price of allowances is less than what it would cost the facility – at the margin – to bring emissions down to the level implied by its initial allowance holdings. Similarly, a facility will sell allowances, if the allowance price is higher than it would cost to achieve the additional reductions made necessary by the sale of allowances. Every allowance purchased by one entity corresponds to an equal reduction in the allowances held by the selling entity. Therefore, allowance trades do not affect total allowable emissions, because they do not alter the number of allowances in circulation. Trading ensures that emissions are reduced at least cost and allowances go to the highest value applications.
4. **Monitoring and enforcement** rules help to assure accountability, heighten program integrity, and sustain confidence in the emissions trading market. At the end of each compliance period, entities regulated under a cap and trade system are required to submit allowances equivalent to the level of their greenhouse gas emissions. To assure compliance, the cap and trade program must include financial penalties for entities that do not hold a sufficient quantity of allowances to cover their emissions. The regulatory authority must track emissions to ensure that: **a)** emissions match allowances at particular sources, and **b)** overall emissions match overall allowances.

In addition to the core elements listed above, a cap and trade system can include other important design features or compliance mechanisms aimed at reducing/containing program costs and enhancing compliance flexibility, such as: the banking/borrowing of permits, use of international and domestic offsets, crediting for early action, and, of course, domestic and international offset use/access.

Other Considerations

Credits derived from greenhouse gas emissions reduction activities that take place outside of the capped sectors are called **offsets**, which can be purchased by regulated entities to cost-effectively meet their obligations under a carbon cap. It is particularly important that any offset design feature: ensure the environmental integrity of offset projects, obtain emission reductions from unregulated sectors of the economy, drive innovation in unregulated sectors, and provide a model for other programs.

There is no perfect design for an emissions trading scheme; if one existed, it would have universal application. There are a variety of design features that can be used, and each could either favor or penalize different participants. For example, some design issues that have proven challenging or contentious in policy debates, and will likely continue to, include: intensity-based versus absolute targets, choice of competitiveness provisions, inclusion or exclusion of hard/soft price collars, allowance auction versus free allocation (or a combination), treatment of new entrants, design/scope/access to offsets, and choice of denominator for intensity based schemes.

One of the more challenging and contentious issues related to cap and trade development is finalizing an approach to **allowance allocation**. Allocations (i.e., distribution rights, holding a monetary value, to pollute) can be designed to achieve or support "traditional" policy aims, such as program cost-effectiveness and compensation to emitters, or other sets of goals, such as preventing "leakage" of emissions, or production outside the program boundaries. Generally speaking, there are three main categories of allowance allocation approaches: grandfathering, benchmarking, and auctioning.

1. **Grandfathering** is an approach that provides participating facilities with a free allocation of allowances based on historical emissions; typically calculated as an average over recent years.

2. **Benchmarking** is a method whereby allowances are allocated based on an industry standard. For instance, once the total allocation for the electricity sector has been set, allowances can be based on the average greenhouse gas intensity of electricity production. Benchmark emission intensities may be based on technical assessments of technology or top-down calculations of outputs and allocations.
3. **Auctions** allow a program authority to choose to sell allowances to market participants through an auction process. While this method does not require historical information or benchmarking calculations, the administrative requirements and auctioning system may be complex and the political appetite for auctioning can sometimes prove hard to muster.

In 2007, IETA published a study, *Complexities of Allocation Choices in a Greenhouse Gas Emissions Trading Program*, which attempted to clarify some challenges and correct some misconceptions associated with the initial allocation of allowances under cap and trade schemes. Among other things, the report found that "…under 'idealized' conditions, the decision to adopt one of the three major allocation approaches (listed above) would affect neither the cost savings from an emissions trading nor the ability of the program to cap emissions from program participants; under these conditions, the allocation of allowances is assumed to become 'just' a distributional issue".

A number of jurisdictions around the world are currently in the process of designing, implementing, or at the very least, debating, cap and trade legislation. Through program harmonization and eventual "linking" of carbon markets, these existing/planned programs could potentially lead to deeper economic cost savings and much wider environmental benefits.

Conclusions

Pricing carbon through the trading of emissions forms the cornerstone of a system that restricts the aggregate allowable amount of a pollutant and allows market forces to continually move the allowed emissions to the highest value uses. Although not all emissions trading schemes are similarly designed, the underlying theme of each program or plan remains the same — the need for economies to provide business with the flexibility to determine the most economic means to reduce their emissions.

In designing a workable emissions trading program, an economy can make tangible strides towards recognizing that climate change is a problem requiring a host of tools to achieve reductions, while accommodating a diverse range of participating sectors and countries. Further, if openings for program linkages are built into market design (e.g. complementary compliance mechanism design), it will become possible to deepen, as well as maintain, existing levels of global participation and contribution while also achieving environmental benefits at the lowest cost to society and business.

Note by Secretariat: *ICAO developed guidance for use by States to incorporate emissions from international aviation into their emissions trading systems (Doc 9885) published in 2008, as well as a study report on issues related to linking open emissions trading systems involving international aviation in 2010 (see Economic Instruments article, Chapter 4 of this report).* ■

A Taxing Question ...

*By **Tim Johnson,** International Coalition for Sustainable Aviation (ICSA)*

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He is the CAEP Observer on behalf of the International Coalition for Sustainable Aviation (ICSA) and is co-rapporteur of the Aviation Carbon Calculator Support group (ACCS). ICSA is a structured network of environmental non-governmental organisations working in the field of aviation and environmental protection.

Taxation of the aviation industry always generates debate and controversy, but it is rarely far from policy-makers' minds, especially these days in the context of environmental protection.

ICAO defines a tax as "a levy that is designed to raise national or local government revenues which are generally not applied to civil aviation in their entirety or on a cost-specific basis". As it is often perceived that taxation takes money out of the industry, ICAO's Council recommended, as far back as 1996[1], that any levies be in the form of charges[2] rather than taxes, and that the funds collected should be applied in the first instance to mitigating the environmental impact of aircraft engine emissions. This principle is still recognised in the current Assembly Resolution[3]. Furthermore, ICAO policies recommend the reciprocal exemption from all taxes levied on fuel uplifted in connection with international aviation, and calls on states "to the fullest practicable extent to reduce or eliminate taxes related to the sale or use of international air transport".

Despite this stance, ICAO's Committee on Aviation Environmental Protection (CAEP) did look briefly at the cost-effectiveness of taxes alongside other possible market-based instruments, as a means of addressing greenhouse gas emissions. CAEP/5 (1998-2001) focused on a fuel (or en route emissions) tax, concluding that it raised significant legal concerns in relation to compatibility with existing bilateral agreements, as well as the potential for tankering (the practice of avoiding refuelling at an airport by carrying additional fuel on board, uplifted from an airport where the tax is not applied). With the CAEP modelling results suggesting higher cost-benefit ratios compared to charges and emissions trading, the approach has not been revisited.

In contrast, many governments still talk about taxation of the sector, either as a global aspiration, or in a national context. Recently, Germany announced its intention to introduce a ticket tax in 2011, while a similar tax on tickets is also being discussed as a possible means of generating revenues to fund climate adaptation and mitigation. And, based on media reports, there is a raft of other potential taxes in the pipeline or being considered. So why do politicians still view aviation taxes as a solution?

There are several possible answers. Certainly increased understanding of aviation's impact on the upper atmosphere makes it very visible in the public eye. And the absence of duty on fuel for international aviation, when so many other carbon-intensive sectors are subject to energy taxes, draws obvious comparisons about equity of treatment.

From an economic standpoint, any tax introduced for environmental purposes is consistent with the idea of internalising costs by getting the polluter to pay. Putting a price on carbon for example, sends a price signal to further improve efficiencies and, properly labelled, helps educate and raise awareness amongst the public. Sir Nicholas Stern[4] sums it up very well: "*Putting an appropriate price on carbon – explicitly through tax or trading, or implicitly through regulation – means that people are faced with the full social cost of their actions. This will lead individuals and businesses to switch away from high-carbon goods and services, and to*

invest in low-carbon alternatives. Economic efficiency points to the advantages of a common global carbon price: emissions reductions will then take place wherever they are cheapest".

While Stern highlights both taxes and trading as possible approaches, taxes do offer some advantages over emissions trading schemes despite being generally regarded as less cost-effective. They are administratively simple and can be introduced quickly. In comparison to the monitoring, reporting and verification requirements associated with trading schemes, taxes will undoubtedly have lower transaction costs (often utilising existing sales systems). But perhaps their biggest political attraction is the ability to generate revenues.

Within the United Nations Framework Convention on Climate Change (UNFCCC) negotiations, international aviation has often been cited as a possible source of revenue to raise money for adaptation. Two years ago, the Maldives, on behalf of the block of nations representing the Least Developed Countries (LDCs) proposed a levy on tickets for international flights. At a rate of $6 for an economy class ticket and $62 for premium class tickets, the levy, it was estimated, could raise $8-10 billion annually. For LDCs that rely on tourism, it seemed a bold move, but the rates were in fact proposed at a level that was unlikely to have a significant affect on demand. Although this proposal has not been adopted, the sector is still seen by many as providing a valuable, reliable and equitable source of finance. And with the UNFCCC's High-level Group on Climate Finance currently looking at ways to raise $100 billion annually to help developing countries with the costs of climate adaptation, consideration of a levy for aviation will probably be high on the agenda.

There is a need for caution with this approach: while it may appear that there is growing momentum in some quarters for aviation taxes, if applied in isolation, they may not be the perfect solution especially if the focus is on raising finance rather than specifically reducing aviation emissions. For example, a flat-rate levy on tickets may raise substantial funds but would do little to influence airline behaviour or stimulate further efficiency improvements. Furthermore, it could give rise, potentially, to the argument that aviation is playing a role and does not need to take further action, making it difficult to get a political consensus on the need for additional measures.

Raising revenue for developing countries must be part of the solution, and is widely supported by non-governmental organisations, but it should not be at the expense of effective measures to tackle aviation's growing emissions. Viewed as part of an overall strategy to reduce aviation emissions it certainly deserves further attention, but additional measures, and most importantly an emissions reduction target, are equally vital ingredients.

This pitfall could be overcome, at least in part, if taxes (or charges) were made proportional to efficiency parameters, in effect a levy on fuel consumption. For many in the environmental sector, fuel taxes still appear the most straightforward and rational way to put a price on carbon and encourage further operational and technological improvements. Notwithstanding the current legal difficulties of reconciling this aim with bilateral air service agreements, many hope that this option will be open to policy-makers in the future.

Either way, there is strong support for a well-designed, effective global trading scheme, or other global market-based solutions for addressing aviation emissions. Any delays in agreeing and introducing such a scheme are likely to see increased pressure to consider the potential role of taxes, at least as an interim measure. ■

REFERENCES

1 *Council Resolution of 9 December 1996.*

2 *A charge being defined as a levy that is designed and applied specifically to recover the costs of providing facilities and services for civil aviation.*

3 *Resolution A36-22 Appendix L.*

4 *Stern Review: the economics of climate change (October 2006),* ***http://webarchive.nationalarchives.gov.uk/+/http:/www.hmtreasury.gov.uk/independent_reviews/stern_review_economics_climate_change/stern_review_report.cfm***

Market Based Measures Task Force
Overview of Reports from CAEP/8

*By **Trond Kråkenes** and **Kalle Keldusild***

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Trond Kråkenes finished his degree as a political scientist in 1995 at the University of Bergen, Norway. In 2007 he accomplished an Executive MBA on Public Economics and Management at the Norwegian School of Economics and Business Administration. Mr. Kråkenes has been in the Ministry of Transport and Communications since 2000.

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He has served as Alternate Permanent Representative of Norway on the Council of ICAO 1998-2001. Kalle has represented Sweden at six sessions of the ICAO Assembly and been advisor to the European DG:s in the DGCA Climate Group (DGCIG) 2010.

He has been co-rapporteur both of the ICAO Emissions Trading Task Force (ETTF) and the ICAO Market Based Measures Task Force (MBMTF).

Since 1998, the Committee on Aviation Environmental Protection (CAEP) has undertaken the development of policies, guidance material and technical and economic studies on various market-based measures to address GHG emissions from international aviation, including emissions trading, emission-related levies, and emissions offsetting. With a view to further developing information on market-based measures for aviation, CAEP/7 in February 2007 established a Market-based Measures Task Force (MBMTF) to develop the following three reports:

I. Report on Scoping Study of Issues related to Linking Open Emissions Trading Systems involving International Aviation;

II. Report on Offsetting Emissions from the Aviation Sector; and

III. Updated Report on Voluntary Emissions Trading for Aviation.

These reports were approved by CAEP/8 in February 2010 and by the Council in June 2010, and a summary of these reports is provided below.

I. Study of Issues related to Linking Open Emissions Trading Systems Involving International Aviation

1. Introduction and Scope

The use of market-based measures, and in particular open emissions trading, is considered by a large part of the aviation industry and many States as a cost-effective tool to support the achievement of "carbon neutral growth" for the aviation sector in the medium term. If aviation is going to stabilize its emissions, the view is that emissions trading can close the gap between the emissions from the anticipated growth of the sector and the emissions reductions that can be achieved through technical and operational means.

Discussions in ICAO and in other forums such as the United Nations Framework Convention on Climate Change (UNFCCC) have however demonstrated that an agreement to set up one global system including aviation might not be an easy topic. A more probable outcome in the short and medium term is a more widespread development of national and regional emissions trading systems, which could be linked together.

The linking of regional and local emissions trading systems might be one way forward on the road to an international wide-ranging carbon market, but so far there is limited experience of linking emissions trading systems.

The purpose of this report is to provide an overview of the issues related to linking emissions trading systems (ETS) that involve international aviation. In that context, the scheme that results from linking shall be global as it will geographically cover more than one country or region and open in the sense that aviation should be able to use for compliance, units that are created outside the aviation sector. According to previous CAEP analyses, a closed system, i.e. where compliance units could be created and used within the aviation sector only, is not regarded as cost effective.

2. Different Kinds of Linking of Emissions Trading Systems

An emission trading system establishes a **direct link** with another system when participants in one or both of the systems can use tradable units issued by the administrator of the other system to meet domestic compliance obligations. In other words, the direct linking makes the tradable units of the two systems equivalent for compliance use. The forms and variations of linking can be unilateral, bilateral and multilateral.

The administrators of two systems can establish a bilateral link if each accepts tradable units issued by the other system. Thus with a bilateral link, there can be two-way trade of units that are equally valid for compliance purposes in either system. A bilateral link requires that the systems be "compatible", and thus some form of agreement is needed.

The administrator of a trading system can establish a unilateral link with another system by agreeing to accept tradable units issued by the other system for compliance purposes, but not vice versa. A unilateral link could be easy to implement. It does not require that the two systems be "compatible" or that a bilateral agreement be completed, but it does require that the user system has access to compliance units in the supplier system. However, in practice it might be difficult to establish a unilateral link on a larger scale without the consent of the supplier system.

A system that establishes a unilateral or bilateral link with another system also establishes an **indirect link** with any other system to which the partner system is linked. The indirect link occurs without any formal or informal agreement between systems.

3. Benefits of Linking

The potential benefits of linking different trading systems include:

- Lower net cost of meeting the emissions cap across the two systems as a result of the flexibility to implement the lowest cost emission reduction measures across all participants;
- Increased financial incentives for entities to reduce emissions in systems where scarcity and price are increased due to linking;
- Reduced price volatility due to the creation of a larger, more liquid market for the tradable units of the linked systems; and
- Reduced competitiveness concerns due to the convergence of tradable unit prices in the linked systems, as well as a reduced likelihood of increase in emissions outside the scope of a trading system (carbon leakage).

Competitiveness issues are important in relation to the use of emissions trading involving international aviation. In the absence of a global system, the possibility of linking systems in different regions may considerably reduce competitive distortion if a significant proportion of international aviation emissions are captured by such linking arrangements. The risk of double counting of emissions will also be reduced by linking of systems.

4. Obstacles and Issues related To Linking Aviation Trading Systems

General Obstacles

The net benefits of linking trading systems will rarely be evenly distributed. Linking generates a convergence of prices and thus leads to a higher market price in the supplier system (as the supply of tradable units in that system decreases), and a lower price in the buyer system. In practise, the effect of linking on the convergence of prices of tradable units would depend on a combination of factors including: the relative price difference for achieving reductions in the two systems, the size of the market, and the additional reductions or commitments undertaken (if any), when the market is broadened through linking.

Linking could compromise the environmental integrity of the system with the stronger requirements. If tradable units from a system with weak monitoring, reporting and verification requirements did not achieve the intended reductions, but were nevertheless used for compliance purposes in the stronger system, the environmental integrity of the stronger system would be compromised. Furthermore, if the financial penalties are set at different levels, and there is no requirement to submit tradable units equal to the shortfall, effectively the lower penalty acts as a price cap for the entire system. Similarly, price caps or price interference, when present, could also be obstacles to linking.

In addition, there could be an incentive for one or both systems to make smaller reductions to its cap over time so that its participants could remain or become exporters of tradable units in the linked system.

These obstacles, including the possibility of higher total emissions, could be reduced or avoided by harmonizing the relevant provisions enough to make the linked systems "compatible". Much of the literature on linking trading systems focuses on the question of the "compatibility" of the systems that could be linked. Clearly, a level of compatibility will be a necessary prerequisite for any bilateral link to be established, and this compatibility would need to be sustained despite economic, technological and administrative developments over time. Sustaining the compatibility of the linked systems would, among other things, require a process for agreeing on revisions to the requirements of the linked systems.

Specific Issues Related To International Aviation

Aviation emissions have other climate change impacts than those caused by CO_2 emissions. However, it would be difficult to include the non-CO_2 effects such as NO_x, contrails and water vapour, in a trading system as there are many scientific uncertainties related to these effects, their duration, and their variability over time and location. On the other hand, aviation tradable units for CO_2 emissions might be regarded as permitting a larger climate change impact than from CO_2 only. Other emission trading systems might be reluctant to link with a system that includes international aviation because of the difference in the climate change impacts associated with their respective tradable units.

Many emissions trading systems for greenhouse gases are intended to help the country meet a national emissions limitation commitment under the Kyoto Protocol. Tradable units to be allocated to international aviation are not backed by Kyoto units for the time being, unless there was an agreement under the UNFCCC. The report discusses different risks and possible solutions when unique tradable units are used for compliance purposes for emissions from international aviation.

There are two ways for international aviation to be involved in an "open" emissions trading:

- some/all international aviation emissions are included in an existing national or regional emissions trading system that covers emissions from other sectors; or
- a specific emissions trading system is set up for some/all international aviation emissions and subsequently linked to one or more emissions trading systems that involve emissions from other sectors. It is noted that a system covering international aviation exclusively (closed system) would only be created with the precondition that it will be linked to one or more emissions trading systems involving other sectors.

The inclusion or the linking of international aviation with other systems raise some key issues, such as:

- Bilateral versus unilateral linking;
- Indirect linking;
- Willingness to link;
- Quality of tradable units and barriers to transfers of tradable units;
- Size of systems; and
- Double counting, registration and cancellation of allowances.

The report points out that, at present, only the EU Emissions Trading System (in combination with the Clean Development Mechanism) would likely be large enough to provide for the projected demand for external tradable units by a trading system for international aviation emissions. However, a national trading system established in the U.S. or links with a number of smaller systems may also be sufficient to meet the projected demand.

5. Harmonization Issues

From a technical perspective, harmonization of system designs to enable a bilateral link may be essential for only a relatively small number of provisions, such as a price cap. However, for political reasons, harmonization of several other provisions, such as the method for allocating tradable units and the use of offsets, is desirable and possibly essential. This is because a bilateral link effectively allows participants in one system access to many provisions of the other system.

A number of design elements are discussed in the report that should be considered in order to avoid the situation whereby linking leads to higher total emissions:

- cost containment measures such as price caps;
- non-compliance penalties and enforcement;
- borrowing and banking restrictions (as regards the use of tradable units);
- compliance period and life of tradable units;
- form of the emissions limit; and
- measures to address leakage (increased output and emissions by sources outside the trading system).

Other harmonization issues discussed are:

- coverage of the system (emissions sources and thresholds for participation);
- emissions constraints;
- distribution of tradable units;
- use of offsets;
- monitoring, reporting, and verification requirements;
- gateways; and
- government intervention.

A bilateral link requires that the designs of the two trading systems be harmonized enough to make them "compatible". Although a unilateral link does not require the same level of compatibility, in practice it will be important that certain elements of the systems are harmonized. Thus all the issues above should be assessed when considering any form of linking.

II. Offsetting Emissions From the Aviation Sector

1. Introduction

Offsetting can potentially be an important tool to mitigate the effects of aviation emissions on global climate, however, aviation-related offsetting has been rather limited so far. In addition, offsetting of emissions from aviation today is passenger-based only, and on a voluntary basis, although the biggest potential lies in using offsetting in a regulatory context.

2. Offsetting Defined

In general terms, an offset is a "compensating equivalent". As an activity, offsetting is the "cancelling out" or "neutralizing" of emissions from a sector like aviation with emissions reductions achieved in a different activity or location that have been rigorously quantified and verified. It is only when credits are acquired from outside the emissions trading scheme or linked schemes and used to meet commitments/obligations under the scheme that the activity is referred to as offsetting.

It is important to distinguish between the activity of "offsetting" and the creation of an "offset credit" used for offsetting emissions, because the term 'offset' has been used to refer to both. For the purposes of this article, "offsetting" is used to describe the action to compensate for greenhouse gas emissions. On the other hand, the term "offset credit" or "credit" is used to describe the product from reducing emissions in a different activity or location that is used in the activity of offsetting. For example, the Certified Emissions Reduction credits, generated by a Clean Development Mechanism (CDM) project under the Kyoto Protocol are offset credits.

Offsetting must also be distinguished from emission trading. If for example, a regulated emitter acquires emission credits or emission allowances from another regulated emitter within the same emission trading scheme, or from a linked scheme, this is referred to as emission trading. These credits or allowances could be used to achieve compliance with a regulatory obligation or could be banked for future use (compliance or trading). It is only when credits are acquired from outside the emission trading scheme, or linked schemes, and used from compliance that the activity is referred to as offsetting.

Both regulated emitters (or entities) and unregulated emitters may choose to offset their emissions. A regulated entity

could use offsetting as one means to comply with an emission commitment, for example under an emissions trading scheme. An unregulated entity's motive for offsetting is to meet its own voluntary goals. In both cases, the emitters need to acquire offset credits that can be used for offsetting their emissions. However, the regulated entity can only use credits that are approved by a regulatory authority, whereas the unregulated entity can choose freely among all the credits that are available for offsetting.

Thus, offsetting can take place in both regulated and unregulated contexts. Offset credits that are accepted for offsetting are created according to different rules or standards. The following sections explain in more detail how credits available for offsetting are created, the standards that could be used to ensure their quality, how offsetting could take place, and finally, the effects of offsetting.

3. Assessment of Current Aviation Offsetting Activities

A web-based review of sixteen airline offsetting schemes was conducted by the MBMTF during 2008. The airlines chosen for this study were mainly European, North American or Australian, ranging from big companies with large global market shares to low fare airlines or smaller operations focused on a few destinations. The companies in the study use a range of business models and offset providers to offer this service. Some companies buy credits directly from a project partner, while others work with offset providers such as Carbon Neutral Company or myclimate. For example, two major airlines in Australia have reported that in 2008, 10-12 percent of their passengers had taken up the voluntary offset option.

Several concerns related to offsetting are discussed in the report. Some of the most important are related to: difficulties that airline passengers have in navigating websites, limited passenger participation, and lack of transparency about the credits being offered, including the general absence of rigorous verification requirements.

On the positive side, buying offsets mitigates greenhouse gas emissions and airline consumers are being educated about the effects of air travel on climate change. Furthermore, the development of carbon markets is encouraged, and the need for improved standards and verification requirements for the generation of offset credits is becoming more accepted.

4. Offsetting In the Future

Despite the rapid ongoing growth of voluntary offsetting by air passengers, the potential for this type of voluntary approach for mitigating the effects of aviations emissions on the global climate is likely limited. Despite what appears to be widespread support, the willingness to actually purchase credits on a voluntary basis has been weak.

Nevertheless, steps might be taken to increase demand and quality of non-regulatory offsetting. For example, ensuring offset credits meet internationally accepted rigorous standards for quantification and verification, and improving systems for tracking credits to ensure they are used only once, should both be pursued.

Offsetting in a regulatory context may be an important tool in the future. If there is a decision to regulate emissions from aviation that allows for emission trading and emission sources not covered by a regulated system, that can reduce emissions at a cost less than reducing emissions from aviation itself, an offsetting mechanism is likely to be part of the scheme.

The report concludes with a discussion of opportunities to use offsetting in the future. At the passenger level, it is possible to draw on the voluntary experience to date. If the current shortcomings are adequately addressed, support of voluntary passenger offsetting is likely to increase. However, a more comprehensive coverage of emissions could be achieved if the initiative or responsibility to voluntarily offset emissions is transferred from the passenger to the airline.

There is also the possibility of using offsetting at a global sectoral level, either in a regulated emission trading system, or through an emission charge. Emission trading offers an option for managing emissions from the aviation sector by means of a regulated cap on emissions that allows for emission trading, including the use of offset credits.

As regulatory emission trading systems can be administratively complex, a hybrid approach can be considered which could achieve specific environmental outcomes. The approach would involve imposing a charge on fuel uplifted by international flights departing a state/region and using the revenue generated to fund the purchase of offset credits that meet agreed criteria.

III. Voluntary Emissions Trading for Aviation

1. Introduction

To provide information on the various voluntary emissions trading being undertaken, CAEP/7 in 2007 developed a Report on Voluntary Emissions Trading for aviation (see ICAO Environmental Report 2007 pp.152 - 153), and CAEP/8 in February 2010 has made an update of the report.

2. Ongoing Schemes

This report provides updated information related to voluntary emission trading schemes covered by the earlier report, as well as information on new schemes.

It describes the general nature of various types of voluntary emissions trading schemes, presents and summarizes a number of practical experiences currently implemented throughout the world, and discusses the possible future development of such schemes involving aviation.

Ongoing schemes presented in both reports are: United Kingdom Emission Trading Scheme; Japan's Voluntary Emissions Trading Scheme; and Chicago Climate Exchange. Recent schemes introduced in the CAEP/8 report are Trial Voluntary Emissions Trading Scheme in Japan (2008-2012); Switzerland's Voluntary Emissions Trading Scheme; Asia Carbon Exchange; and Australian Climate Exchange.

3. Aviation Participation

Voluntary emissions trading schemes are becoming established in a number of countries including two of the largest economies in the world, the United States and Japan. However, aviation participation has been confined so far to the UK Emissions Trading Scheme and the Trial Voluntary Emissions Trading Scheme in Japan (2008-2012), even where only domestic aviation services have been involved.

Conclusions

ICAO has been developing policies, guidance material and technical and economic studies on various market-based measures for international aviation, inluding the study reports developed by CAEP/8 (see Figure 1), to help States develop and implementt these measures and to facilitate the highest degree of harmonization and cooperation among States, as part of global solutions to address GHG emissions from international aviation. ■

- *ICAO 36th Assembly Resolution (A36-22 Appendix L)*
- *ICAO's Policies on Charges for Airports and Air Navigation Services (Doc 9082)*
- *ICAO's Policies on Taxation in the Field of International Air Transport (Doc 8632)*
- *Council Resolution on Environmental Charges and Taxes (9 December 1996)*
- *ICAO Guidance on the use of Emissions Trading for Aviation (Doc 9885)*
- *CAEP/8 – Collected Information on Voluntary Measures*
- *CAEP/8 – Report on on Scoping Study of Issues related to Linking Open Emissions Trading Systems involving International Aviation*
- *CAEP/8 – Report on Offsetting Emissions from the Aviation Sector*
- *CAEP/8 – Updated Report on Voluntary Emissions Trading for Aviation*

Figure 1: *ICAO Policies, Guidance Material and Studies on Climate Change.*

Voluntary Measures to Address Aviation Greenhouse Gas Emissions From Aviation

*By **Tetsu Shimizu***

***Tetsu Shimizu** is Policy Coordinator for Global Environment, Civil Aviation Bureau of Japan (JCAB) and is responsible for climate change issues in civil aviation sector in Japan. He joined JCAB in April 1996 and has gained experience in the field of airworthiness engineering, flight standards, environment protection, etc. in JCAB. He has taken charge of the Focal Point on Voluntary Measures since April 2005 (except for January 2007 ~ August 2008). He has participated in meetings of Group on International Aviation and Climate Change (GIACC) and DGCA Climate Group (DGCIG) as an advisor to Japanese member.*

Background

In 2004, the Committee on Aviation Environmental Protection (CAEP) acknowledged the importance of collecting information on voluntary activities that have been implemented to reduce climate impact caused by greenhouse gasses (GHG) emitted from aviation. It was recognized that providing such information to the aviation community would encourage the implementation of more such activities.

As a first step, CAEP members and observers were invited by the Focal Point on Voluntary Measures (FPVM) to provide information on voluntary activities. Information on five activities was collected and CAEP recognized that it was important to invite more information from various stakeholders. In October 2006, the Secretariat requested information[1] from all 190 States on voluntary emission reduction activities that have been undertaken by States and stakeholders such as airlines, airport authorities, etc., and responses were reported to CAEP/7 in February 2007. Noting the importance of collecting and sharing such information, CAEP/7 recommended that ICAO continue to request the information periodically and to share the collected information through the ICAO website. This information resulted in a very rich source of practical and concrete measures taken to reduce aviation emissions impacts.

ATTACHMENT to State letter AN 1/17-09/093

QUESTIONNAIRE CONCERNING VOLUNTARY ACTIVITY FOR GHG REDUCTION/MITIGATION IN THE AVIATION SECTOR

A copy of the questionnaire, in Microsoft Word format, has been posted on the Internet at http://www.icao.int/icao/en/env/measures.htm.

Name:
Organization:
Phone:
Facsimile:
E-mail:

Q1. Name of the voluntary activity.

Q2. Type[1] of the voluntary activity.

□ Unilateral commitment □ Public voluntary scheme □ Negotiated agreement
□ Other (Please describe the activity in the box below.)

Q3. Please mark all the participants[2] of the activity.

□ Airline □ Airline association □ Manufacturer □ Manufacturer association □ Airport authority
□ Air traffic control □ Government □ Other (Please specify in the box below.)

Q4. Is the voluntary activity accompanied by a side agreement[3]?

□ Yes (Proceed to Q4-1.) □ No (Proceed to Q5.)

[1] The features of each type of voluntary activity are as follows.
- Unilateral Commitment: The environmental improvement plan established by the participant itself, and declared to the stakeholders, such as employees, stockholders, consumers, etc. Target and measures to environmental improvement are established by the participant itself.
- Public Voluntary Scheme: The scheme which the participant agrees voluntarily with the standard on environmental improvement target, technology, management, etc. established by public organization such as Ministry for Environment.
- Negotiated Agreement: Contract based on negotiation between public organization (national government/local government) and industries. Both parties can independently decide whether to agree to the contract.

[2] If you marked "Public voluntary scheme" on Q2, the public organization which establishes the standard is included in the participants. If you marked "Negotiated agreement" on Q2, the public organization which agrees to the contract is included in the participants.

[3] "Side agreement" is the agreement between the participant of the activity and a third party. For example, the agreement between an airline and an engine manufacturer, which prescribes that the manufacturer assist the airline to attain its target by introducing new emission-reducing technologies, is considered as a side agreement. For more information, please refer to Part II Paragraph 6.5.2 on "Template and Guidance on Voluntary Measures", released on ICAO CAEP website (http://www.icao.int//icao/en/env/Caep_Template.pdf).

***Figure 1:** Questionnaire for reporting voluntary GHG mitigation activities.*

Recent Activities

In December 2009, the Secretariat requested further information[2], and 50 replies were received from 24 States and regions as of June 2010.

Table 1 shows the number of voluntary measures taken by various stakeholders. It is recognized that the recent increase in interest on climate change has contributed to this wide variety of stakeholders and the increase in the number of measures implemented and reported.

Organization	Number
Airline	37
Airline Association	7
Manufacturer	4
Airport Authority	15
Air Traffic Control	15
Government	13
Other	7

***Table 1:** Number of voluntary measures taken by various stakeholders – by June 2010.*

Example of Measures that can be Taken

Typical operational measures taken by air traffic control include the introduction of fuel efficient procedures, such as CDO and improvement of ATM. Some airport authorities cooperate with airlines to promote the use of GPU, in addition to their own measures such as the use of renewable energy and LEDs for aeronautical lights. Typical measures taken by airlines to improve aircraft fuel efficiency include the renewal of aircraft, improvement of aerodynamics, fuel efficient flight planning, reduction of aircraft weight, use of GPU instead of APU, washing engines and training using flight simulator. Carbon offsetting is also introduced by some airlines.

Voluntary Agreements

Voluntary measures can take various forms. Thirty of the measures reported were classified as Unilateral Commitment, nine were classified as Public Voluntary Scheme, meaning that participants agree voluntarily with the standard established by the public organization, and five were classified as Negotiated Agreement between public organization and industries. By their nature, these agreements are not legally enforceable, however, partners are assumed to undertake good faith efforts to comply with the terms and conditions. If one or more partners are unable to comply with the agreement, the agreement can be terminated and alternative methods for reducing emissions can be pursued.

Examples of Voluntary Agreements

- ***Asia and Pacific Initiative to Reduce Emissions (ASPIRE)*** *which involves airlines, air traffic control, airport authorities and governments in a voluntary agreed measure to work together to reduce aircraft fuel burn and CO_2 emissions through efficiency improvements on key Asia and Pacific routes.*
- ***Memorandum of Understanding between Transport Canada and the Air Transport Association of Canada*** *to limit or reduce GHG emissions from aviation in Canada. The Agreement sets out a GHG emissions reduction goal for members of the Air Transport Association of Canada and covers both domestic and international air transport.*
- ***A negotiated agreement in Romania involving airlines, air traffic control, government and manufacturers****, which involves: Direct routes; Continuous Descent Approach at Henri Coanda International Airport, and Non-standard arrival trajectories (direct arrivals) at airports which provide approach services.*

#	Name of the Organization	Country	Dated Received	Language
1.	The Scheduled Airlines of Japan	Japan	08/12/2009	en
2.	Livingstone Spa	Italy	11/12/2009	en
3.	Airport Munich	Germany	16/12/2009	en
4.	TUNISAIR	Tunisia	16/12/2009	en fr
5.	Condor	Germany	17/12/2009	en
6.	Bologna Airport	Italy	17/12/2009	en
7.	Berlin Airport	Germany	18/12/2009	en
8.	Japan Airline Corporation	Japan	18/12/2009	en
9.	Narita International Airport	Japan	18/12/2009	en
10.	Kansai International Airport	Japan	21/12/2009	en
11.	Auckland International Airport Limited	New Zealand	21/12/2009	en
12.	ENAV S.p.A. Italian Company for Air Navigation Services	Italy	22/12/2009	en
13.	Department of Infrastructure, Transport, Regional Development and Local Government	Australia	23/12/2009	en
14.	Boeing	United States	23/12/2009	en
15.	Nippon Cargo Airlines	Japan	25/12/2009	en
16.	Malev Hungarian Airlines	Hungary	29/12/2009	en
17.	Budapest Airport Plc	Hungary	29/12/2009	en

Figure 2: *ICAO Voluntary Measures Web page.*

In February 2010, the ICAO Secretariat reconstructed its website to disseminate information on voluntary measures in a user-friendly manner (Figure 2). All information received is available at: **www.icao.int/icao/en/env/Measures/VM_Results_2010.htm.**

Moving Forward

Collecting and disseminating information on various voluntary activities to the aviation community will help and encourage the further implementation of such activities. ICAO welcomes additional submissions and updated voluntary activities, in order to ensure timely dissemination of a wide range of information. The questionnaire in MS-Word format is available at: **http://www.icao.int/icao/en/env/measures.htm.** ■

REFERENCES

1 *State Letter AN 1/17-06/77.*

2 *State Letter AN 1/17-09/093.*

IATA's Carbon Offset Program

*By **Paul Steele***

***Paul Steele** is Executive Director of the Air Transport Action Group (ATAG), the only global association that represents all sectors of the air transport industry. Its mission is to promote aviation's sustainable growth for the benefit of global society.*

Paul is also Director Aviation Environment of the International Air Transport Association (IATA), with the responsibility for guiding and implementing IATA's environment strategy worldwide. Before joining IATA in December 2007, Paul was CEO of WWF International. Paul also has over 20 years' senior management experience with major international companies, including The Virgin Trading Company, Hilton Hotel Group and Pepsi Cola International.

IATA is an international trade body, created over 60 years ago by a group of airlines. Today, IATA represents some 230 airlines comprising 93% of scheduled international air traffic. The organization also represents, leads and serves the airline industry in general.

IATA is committed to demanding targets related to climate change. By 2020 its members will cap its net emissions with carbon neutral growth. By 2050 they will cut net aviation emissions in half, compared with 2005.

To achieve this, IATA actively promotes a four pillar strategy that involves: investment in technology, more effective operations, more efficient infrastructure, and positive economic measures. All four pillars are critical. In line with this strategy, in 2009, IATA launched an industry standard carbon offset program.

Carbon Offsetting Explained

Carbon offsetting is simply a way for individuals or organizations, in this case airline passengers and corporate customers, to "neutralize" (i.e. offset) their proportion of an aircraft's carbon emissions on a particular journey by investing in carbon reduction projects. (see **Figure 1**)

Carbon offsetting has proven popular, with the voluntary offsetting market currently worth US$ 338 million (2009). Anecdotal evidence indicates that a significant proportion of this market volume is associated with offsetting emissions from aviation. However, with no information-sharing among airlines and third party offset providers the "real" balance of aviation emissions on a global basis cannot be determined. In addition, the wide variety of carbon calculators, carbon prices, project types, and credit types has caused confusion and scepticism.

More than 30 IATA member airlines have introduced offset programs, either integrated into their sales websites, or as a "click-away" to a third party offset provider; to varying degrees of success. IATA's offset program brings both standardization to the process and makes it possible for airlines of any size to easily introduce a credible and independently validated offset program. TAP Air Portugal went live in June 2009 as the first partner airline in the project, and 15 more airlines are due to launch in 2010.

How The Program Works

Phase I of IATAs carbon offset program provides management services to participating airlines that offer carbon offsets to passengers through their internet-based sales sites. During the implementation process, IATA provides advice on modifying an airline's internet site and on how to integrate applications such as: Carbon Calculator Tool, project information, and Web interface. The IATA programme ensures that passengers can complete their purchase of carbon credits within the same transaction as paying for their ticket. This avoids the link and transfer to a third party and the need for a double transaction that has proven to be a major barrier to passenger purchases of offsets.

The core element of the program is the Carbon Calculator, which is based on the ICAO Carbon Emissions Calculator methodology (see *The ICAO Carbon Emissions Calculator* article, Chapter 1 of this report), enhanced with independently verified airline data. The Calculator allows airlines to

enter data on fuel burn, load factor and passenger/freight weight on a city-pair basis, and to calculate emissions for each passenger by seat class (kg/CO_2). (see **Figure 3**)

During the flight booking process, passengers are given the option to offset these emissions with certified carbon credits by investing in UN-certified carbon reduction projects. These carbon credits are purchased from projects generating Certified Emission Reductions (CERs) issued through the Clean Development Mechanism (CDM) and approved under the United Nations Framework Convention for Climate Change (UNFCCC). Unique ticketing codes allows an airline to offer up to three different carbon offset projects; offset tracking is facilitated through code-share partners and interlining. Airlines are encouraged to select projects from locations which have a regional or cultural connection with the airline's passengers.

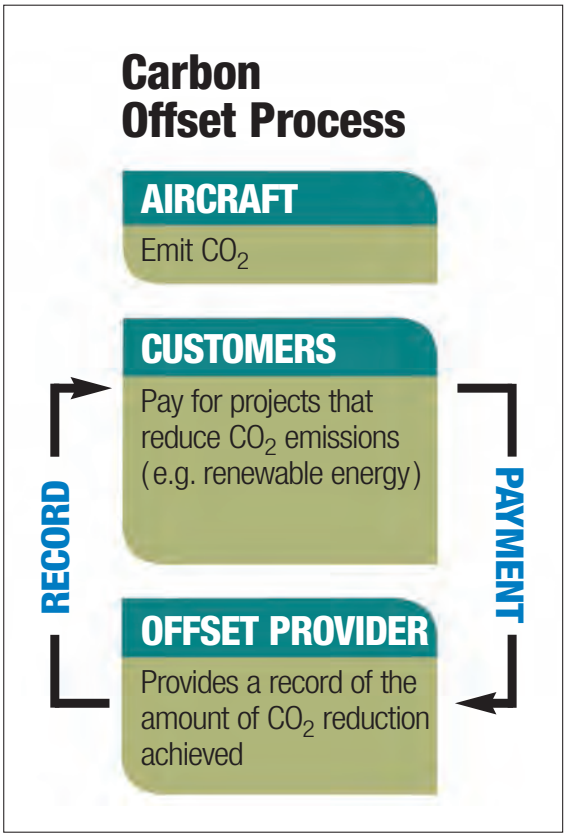

Figure 1: *IATA carbon offset process.*

"IATA's carbon offset programme offers best practice in the structure and implementation of carbon offsetting. Offsets are carefully selected and accounted for, and the issue of carbon calculation has been resolved by committing to the ICAO methodology supplemented with actual airline carbon data." Paul Steele, IATA Director Aviation Environment.

The IATA Offset Program has been independently verified by the UK Government's Quality Assurance (QA) Scheme for Carbon Offsetting, allowing participating airlines to carry the QA scheme's logo (**Figure 2**) as a seal of approval.

The QA scheme validates the carbon data, website information, carbon credit purchasing, and registration details.

Figure 2: *Official seal, UK Government's Quality Assurance (QA) Scheme for Carbon Offsetting.*

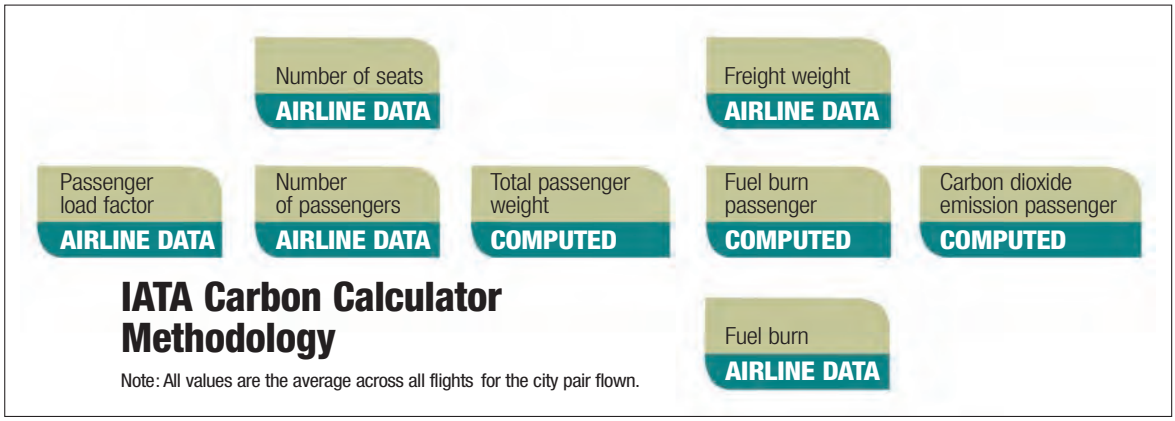

Figure 3: *IATA Carbon Calculator methodology.*

Next Steps

Phase II of IATA's Carbon Offset Program will expand the range of participating organizations to include other segments of the aviation business such as: global distribution systems, frequent flyer programs, and over-the counter sales. Aside from enabling the airline industry to present a coherent message to the global environmental community, this program also provides airlines with carbon market experience. It gives airlines assistance in driving towards internal sustainability and corporate responsibility goals. By unifying the industry approach, it strengthens the industry call for a global framework for addressing aviation emissions. The program provides the opportunity that the industry gets credited with the offsets purchased while it only pays once for its emissions. ■

REFERENCES

1 *IATA (2010)*
http://www.iata.org/WHATWEDO/ENVIRONMENT/Pages/index.aspx

2 *UK Government Quality Assurance Scheme for Carbon Offsetting Approval requirements and procedures for offset providers (2009)*
http://offsetting.decc.gov.uk.

CASE STUDY:

TAP Portugal Wins Award

TAP Portugal *was a launch customer of the IATA carbon offset program. Such have been its efforts that is was recently given the* ***Planet Earth Award 2010*** *in the* ***Most Innovative Sustainable Product category*** *by UNESCO and the International Union of Geological Sciences.*

"The Board of the International Year of Planet Earth (IYPE), that assessed and evaluated TAP's Offset Program, recognized it as being an innovative project representing a great advance to aviation sustainability," says Luisa Sousa Otto UNESCO's Project Manager for IYPE.

TAP purchases carbon credits from a hydropower plant in Brazil, which is registered under the UNFCCC Clean Development Mechanism. And its environmental work doesn't stop there. The Eco Act project extends company-wide, and promotes practical day-to-day solutions for environmental mitigation.

"The air transport industry has, in recent times, taken significant steps to protect environment," adds Fernando Pinto, CEO TAP. "That proves the industry's concern for environmental issues through the launch of sound projects, and by taking effective measures to help protect the environment in a sustainable way."