ICAO'S WORK ON THE DEVELOPMENT OF A GLOBAL MBM SCHEME FOR INTERNATIONAL AVIATION

BY ICAO SECRETARIAT

Market-based measures (MBMs) have been on ICAO's agenda for a number of years as one of the elements of the basket of measures to mitigate the climate change impacts of international aviation. In 2013, the 38th ICAO Assembly resolved that ICAO and its Member States with relevant organizations would work together to strive to achieve a collective medium term global aspirational goal of keeping the global net CO_2 emissions from international aviation from 2020 at the same level (so called Carbon Neutral Growth 2020). Aiming to ensure the fulfillment of this aspirational goal, the Assembly unanimously decided to develop a global MBM scheme for international aviation. Assembly also requested the ICAO Council to finalize all preparatory work, organize seminars and workshops, identify major issues and problems, and make a recommendation for a global MBM scheme that addresses them. Assembly requested the Council to report the results of the above work for decision at the 39th Assembly in 2016.

Why MBMs for International Aviation?

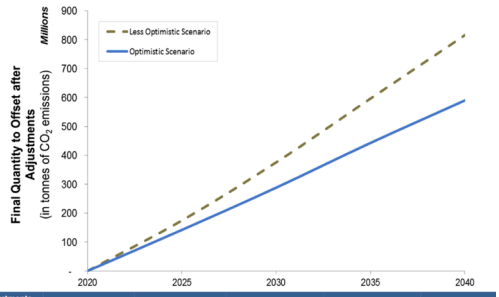
According to the Intergovernmental Panel on Climate Change (IPCC 4th Assessment Report, 2007), aviation (both international and domestic operations) is estimated to be responsible for approximately 2% of global CO_2 emissions. International operations account for approximately 65% of total aviation emissions, thus representing 1.3% of the global CO_2 emissions. The assessment undertaken by ICAO's Committee on Aviation Environmental Protection (CAEP) concluded that annual CO_2 emissions from international operations were 448 Mt in 2010. Significant improvement in efficiency of air transport operations and technological progress has been made in the aviation sector, with aircraft produced today being much more fuel efficient per passenger kilometre than in the 1960s. Total aviation emissions, however, are forecasted to grow in the coming decades, and the aggregate environmental benefit achieved by these measures will be insufficient for the sector to reach its aspirational goal of carbon-neutral growth from 2020.

In addition to improving operational efficiency and achieving technological progress, aviation community is putting significant efforts in promoting the use of sustainable alternative fuels that have a reduced carbon foot print compared to conventional jet fuel (see article page 153). However, hurdles (mainly economic) still exist to prevent a large scale production.

A complementary global MBM scheme would act as a policy tool that would allow for an immediate response to the need for stabilising the emissions in a cost-effective manner for international aviation to meet its aspirational goal.

Assessment of the Impacts of the Global MBM

As requested by the ICAO Council, CAEP and its Global MBM Technical Task Force (GMTF) provided the analyses on the impacts of a global MBM. Firstly, CAEP analysed the total quantities of CO_2 emissions from international aviation, and estimated the total expected quantities to offset. Based on the analysis (see summary of the results in **Figure 1**), the estimated quantity to be offset by the whole international aviation sector would be of the order of 142 to 174 million tons of CO_2 in 2025; and 443 to 596 million tons of CO_2 in 2035.



Final Quantity to Offset after adjustments (in Million tonnes of CO_2 emissions)	2020	2025	2030	2035	2040
Less Optimistic Scenario	-	174	376	596	816
Optimistic Scenario	-	142	288	443	590

Figure 1. Final Quantities to Offset. Source: CAEP analysis presented at EAG/15

CAEP also analysed possible costs of the proposed global MBM scheme by multiplying the estimated quantities of offsets with the assumed prices of an emissions unit (or carbon price). It should be noted that the carbon prices drive significant uncertainty in total cost impacts of offsetting CO_2 emissions from international aviation, and total cost estimates vary, depending on the assumptions.

In 2025, total offsetting costs vary from 1.5 to 6.2 billion US$, and in 2035, total costs vary from 5.3 to 23.9 billion US$ in 2035, depending on the assumed carbon prices (see summary of the results in **Figure 2**).

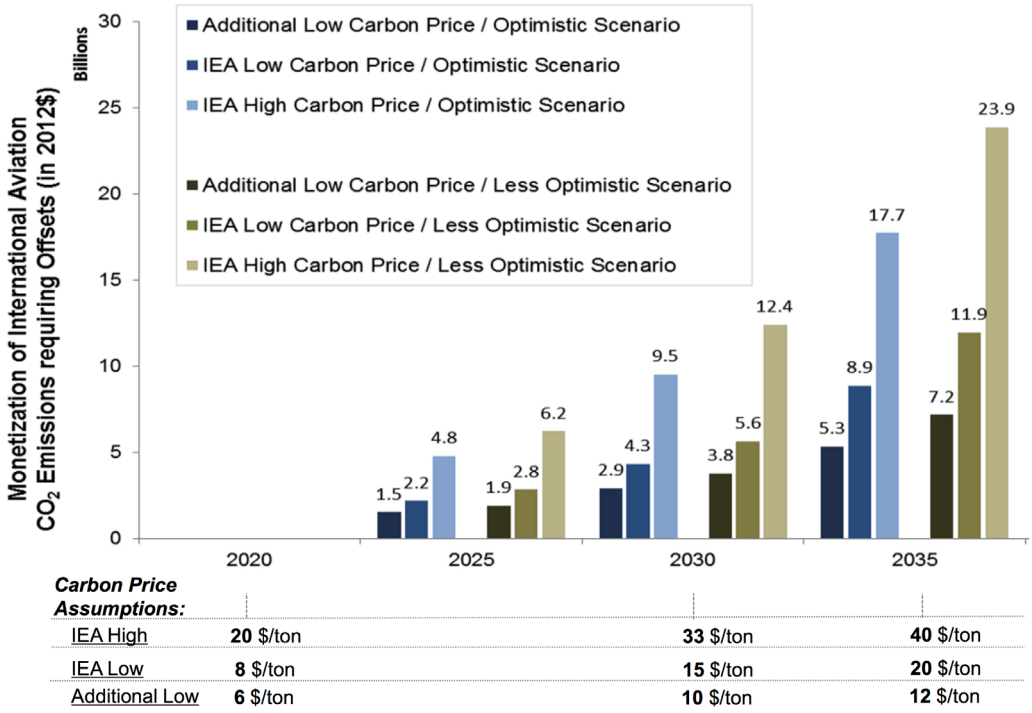


Figure 2. Cost of Offsetting with different Price Scenarios. Source: CAEP analysis presented at EAG/15

Putting in perspective with the reality of the business, the analysis also shows that the cost of carbon offsetting for operators would range from 0.2 to 0.6 % of total revenues from international aviation in 2025; and 0.5 to 1.4 % of total revenues from international aviation in 2035.

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According to a related cost analysis conducted by IATA, the offsetting costs related to the implementation of a global MBM scheme are expected to have a much lesser impact on international aviation than that caused by fuel price volatility. The estimated offsetting cost in 2030 is equivalent to that of a 2.6 US$ rise in jet fuel price (per barrel); an extra 10 US$ per barrel on the price of jet fuel would cost the industry about four times the estimated cost of offsets in 2030. To give a reference on magnitude, over the past decade the standard deviation of the jet fuel price annually has been almost 40 US$ per barrel, meaning that airlines have managed to cope with oil price volatility (mostly upwards) of more than 15 times the size of the estimated offsetting cost in 2030.

Technical analysis also included estimating the cost impacts of various options for distribution of offsetting requirements to individual aircraft operators under the global MBM, e.g., using different combinations for individual operator's growth rate and the international aviation sector's growth rate, as well as the route-based approach, accumulative approach, and comparison of these approaches[2].

Progress at ICAO

Since the 38th Assembly, ICAO Member States and relevant international organizations have actively been engaged to fulfill the request for the development of a global MBM scheme. In March 2014, the ICAO Council established the Environment Advisory Group (EAG), composed of 17 Council Representatives, to oversee all the work related to the development of a global MBM scheme and make recommendations to the Council. The EAG met a total of 15 times, and at its final meeting in January 2016, summarized deliberations and analyses conducted over the two years on options for a global MBM scheme.

Progress was pursued by the EAG, starting with a basic proposal for a global MBM scheme with a view to generating discussion and analyses on advantages and disadvantages of design elements, thus allowing for improvements. The EAG also discussed the work by CAEP to develop technical elements of a global MBM scheme, i.e., monitoring, reporting and verification (MRV), emissions unit criteria (EUC) and registries. The tenth meeting of the CAEP (1 to 12 February 2016) reviewed a vast amount of technical work related to the global MBM scheme and made recommendation to the ICAO Council. Pending to further decisions on a global MBM scheme by the Council and the 39th Assembly, GMTF's work programme for years 2016 – 2019 aims to produce additional technical recommendations that are needed to implement the global MBM.

In addition, as a means to ensure the full engagement of all States and other stakeholders and widest possible range of inputs, and to respond to the Assembly's request to organize seminars and

workshops on a global MBM, ICAO organized two rounds of Global Aviation Dialogues (GLADs). The first round of five GLADs was organized throughout April 2015 across the ICAO regions in Peru, Kenya, Egypt, Singapore and Spain, with 362 participants in total from 79 States and 22 international organizations[3]. The second round of GLADs was organized in March/April 2016 in Egypt, Senegal, Indonesia, the Netherlands and Mexico, with 390 participants in total from 60 States and 20 International Organizations[4]. The GLADs was a forum for information sharing and exchange of ideas, rather than a forum for decision-making. The main objective of the GLADs was to reach out to those States that are not directly engaged in the Council or CAEP. The GLADs allowed for well-informed deliberations on a global MBM scheme in the ICAO process toward the 39th session of the ICAO Assembly.

362 participants in total from 79 States and 22 international organizations attended the first round of GLADS in 2015 and 390 participants in total from 60 States and 20 International Organization attended the second round of GLADS in 2016

2016 GLAD in Cairo, Egypt

2016 GLAD in Dakar, Senegal

2015 GLAD in Madrid, Spain

2015 GLAD in Nairobi, Kenya

2016 GLAD in Bali, Indonesia

2016 GLAD in Mexico City, Mexico

In January 2016, the Council established a High-level Group on a Global Market-Based Measure Scheme to facilitate the convergence of views on a proposal for a global MBM scheme. The Group was comprised of high-level aviation and/or transport representatives of 18 States on the Council, taking into account equitable geographical representation. The group met in February and April 2016, and made progress on improving the proposal text.

Further in the process to develop a global MBM scheme for international aviation, a High-level Meeting on a global MBM scheme was held in May 2016 in Montreal with the purpose of facilitating a high-level discussion of a proposal on a global MBM[5]. The Meeting successfully clarified and improved a number of provisions in the proposal. The Meeting also recognized issues where further improvements were necessary, as well as possible alternative approaches and ideas to address the issues. The outcome of the Meeting was considered by the ICAO Council in June, after which the Council invited States to hold bilateral and multilateral consultations related to the draft Assembly Resolution text on a global MBM scheme. A "Friends of the President" informal group meeting was held in Montréal, Canada, from 22 to 23 August 2016, to evaluate the results of these consultations and develop compromise text for consideration by the Council, and its subsequent submission to the 39th Session of the ICAO Assembly. Timeline towards the 39th ICAO Assembly and beyond is presented in **Figure 3**.

GLADs –
Unique Format to Reach out ICAO Member States

To facilitate the engagement of participants, the GLADs used a unique small-group format to organize thematic dialogue sessions on design elements and implementation aspects of a global MBM scheme. The GLADs also featured an interactive panel discussion with representatives from States, industry, environmental NGOs and financial institutions.

In terms of the outcomes of the GLADs, 2015 GLADs identified major considerations for the design of a global MBM scheme, such as: administrative simplicity, environmental integrity, cost effectiveness, differentiation/ non-discrimination, and avoiding excessive cost or administrative burdens. 2016 GLADs highlighted the links between these major considerations identified by 2015 GLADs with the proposed global MBM scheme.

The structure and format of the GLADs successfully familiarized participants with the proposed global MBM scheme; provided opportunities to receive feedback from Member States and relevant organizations; and served as preparation towards the 39th Assembly.

ICAO's Proposal for a Global MBM Scheme for International Aviation

In early 2016, the ICAO Council started to discuss a proposal (in a form of draft Assembly Resolution text) for the global MBM scheme. The proposal would create an offsetting scheme for international aviation, aiming to its achieve carbon neutral growth from 2020 (or a 3-year average around 2020) onwards. A baseline

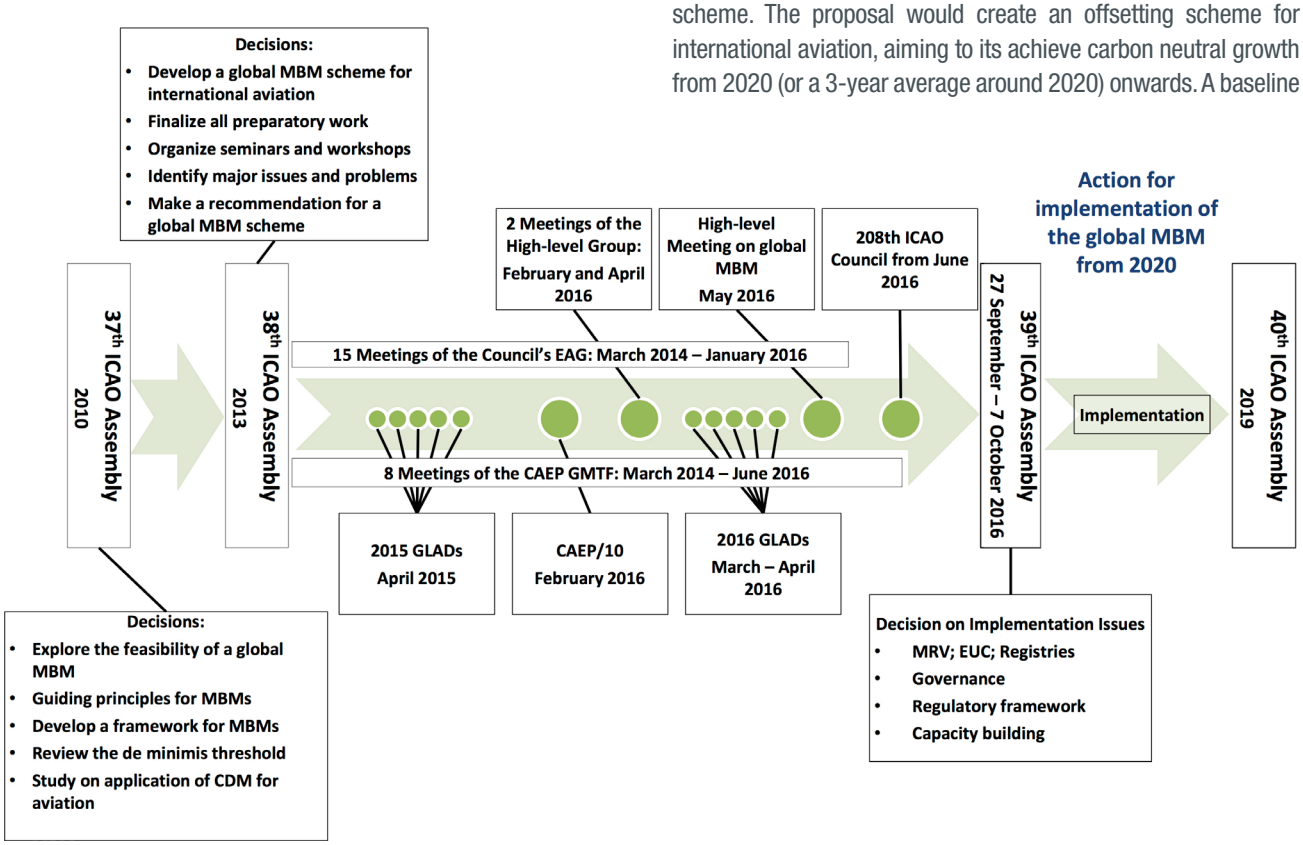

Figure 3. Timeline towards the 39th ICAO Assembly and beyond

Main Features of the Proposed Global MBM Scheme*

Phased implementation

- To accommodate special circumstances and respective capabilities of the States, the proposed global MBM scheme introduces a phased-in implementation, which classifies States in groups with different implementation timelines.
- To further acknowledge States' different capabilities, Least Developed Countries (LDCs), Small Island Developing States (SIDS) and Landlocked Developing States (SIDS) and Landlocked Developing Countries (LLDCs) would be exempted from the scheme
- Nevertheless, States not included in the scheme are encouraged to voluntarily participate in the scheme.

Route exemptions

- The global MBM would apply to all aircraft operators on the routes between States, both of which are included in the scheme. Provision ensures equal treatment of all operators on the same routes, thus avoiding market distortion between operators.

Distribution of offsetting requirements

- CO_2 emissions required to be offset by an aircraft operator would be defined by combining operator's emissions growth with a sector-wide growth factor.

Technical exemptions

- In order to simplify the global MBM scheme and avoid unnecessary administrative burdens, the proposal provides exemptions for small operators, new entrants and special operations, such as firefighting and search and rescue flights.

Implementation of the proposed global MBM scheme

- The proposal requests ICAO Member States to implement a MRV system, which includes procedures on how to monitor the fuel use, collect data and calculate CO_2 emissions; report emissions data; and verify emissions data to ensure accuracy and avoid mistakes.
- EUC ensures that operators purchase appropriate emissions units from eligible mechanisms, programmes or projects. Reduction of one tonne of CO_2 equals one emissions unit. One example of emissions reduction programmes is the UNFCCC Clean Development Mechanism (see article page 146)
- Registries are a means to check that the operators are in compliance with the global MBM.
- To ensure uniform application of the scheme, the proposal calls for ICAO and Member States to take all necessary actions in providing the capacity building and assistance and to build partnerships to ensure successful implementation of the global MBM scheme.

for international aviation emissions in 2020 would represent the basis against which emissions in future years are compared. The difference between the emissions in any year after 2020 and the baseline would represent the sector's offsetting requirements for that year.

The proposal builds on the progress and feedback from the process since the 2013 ICAO Assembly and considers the need for a global MBM scheme to be simple, cost-effective, ensure environmental integrity, avoid excessive administrative burden as well as accommodate differentiation of States without discrimination.

Once agreed, implementation of the global MBM can begin. The proposal outlines an ambitious timeline for preparing the implementation towards year 2020, and requests ICAO Council to ensure that necessary capacity building and assistance will be in place. ICAO is already identifying partnerships amongst Member states and stakeholders to facilitate provision of technical and financial assistance for ensuring universal implementation of the MRV system and Registries, building upon existing assistance projects in this area.

Conclusion

ICAO has made tremendous progress in developing a global MBM scheme for international aviation. Subject to the final decision on the design elements by the 2016 ICAO Assembly, the CORSIA (Carbon Offsetting and Reduction Scheme) would be the first global MBM scheme for a whole sector, and a major step to complement the efforts made by States in the context of the Paris Agreement. Action for the implementation of the global MBM scheme for international aviation from 2020 will start right after the Assembly.

Sustainable Development Goals

*Reflects the main features of the proposal as of May 2016. Further updates were expected prior to the 39th Assembly. For final result from the Assembly, please refer to the Green pages in this report's post-Assembly edition.

References

1. For reference see ICAO 2013 Assembly Working Paper A38-WP/26
2. For a summary of the technical analysis, please refer to ICAO High-level Meeting Webpage: http://www.icao.int/Meetings/HLM-MBM/Pages/background_information.aspx
3. For all material considered by the 2015 GLADs and full results, please visit the webpage: http://www.icao.int/meetings/GLADs-2015/Pages/default.aspx
4. For all material considered by the 2016 GLADs and full results, please visit the webpage http://www.icao.int/meetings/GLADs-2016/Pages/default.aspx
5. For all material considered by the High-level Meeting, please visit the webpage: http://www.icao.int/Meetings/HLM-MBM/Pages/default.aspx

AVIATION, OFFSETS AND THE PARIS AGREEMENT

BY NICLAS SVENNINGSEN (UNITED NATIONS FRAMEWORK CONVENTION ON CLIMATE CHANGE - UNFCCC)

After many years of intense negotiations, the 195 parties to the United Nations Framework Convention on Climate Change (UNFCCC) adopted on 12 December 2015 in Paris a new global agreement on how all countries collectively will tackle climate change. The Paris Agreement is widely recognized as the most significant environmental treaty ever adopted, with strong positive implications on development, international cooperation and, of course, for the climate. The ambition is to hold the increase in the global average temperature to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C.

One of the fundamental aspects of the Paris Agreement is that it is entirely inclusive. For the case of aviation, however, there is a long standing understanding that the effort to address greenhouse gas emissions from international air traffic, which does not fall under any national jurisdiction, is under the authority of the International Civil Aviation Organization (ICAO). ICAO also regularly updates the UNFCCC's Subsidiary Body for Scientific and Technological Advice on its climate change related work, thereby ensuring consistency between the two processes. It is therefore very timely that ICAO's 39th General Assembly will convene already in September 2016, and at that time will be in a position to decide on the aviation sector's contribution to the global response to climate change. The Paris Agreement clearly sets a baseline for the ambition for such considerations.

ICAO has actively addressed climate change in aviation since several years. In 2013, the 38th ICAO Assembly decided that ICAO would develop a global market-based measure (MBM) scheme for international aviation, with a final decision expected to be taken at the 39th ICAO Assembly, to allow the scheme to be fully operational from 2020 onwards. MBM is one of the measures in the "Basket of Measures" to reduce emissions from civil aviation that ICAO is working to develop, with MBM allowing the aviation sector to use offsets as one of several ways to address its climate footprint.

The fundamental idea with offsets is that while it is clearly the responsibility of all parts of society to reduce their emissions as much as possible, the technology and economics of today do not always allow them to achieve more significant emission reductions immediately. In that situation offsets represent a way for the emitters to invest in emissions reductions elsewhere, and to count the achieved emission reductions, represented as offset certificates, as part of their contribution to global emission reductions. From the perspective of the atmosphere, it does not matter where emission reductions are achieved as long as they happen in addition to in-house emission reductions, not instead of in-house emission reductions. By cancelling (tearing up) the offset certificates, they cannot be transferred onwards, and thereby the corresponding emission reductions are permanently counted to the stakeholder who invested in, and cancelled, the offsets.

Offsets are not a new approach, but were introduced at a global level already in 1997 with the adoption of the UNFCCC Kyoto Protocol. Among other tools conceived by the Kyoto Protocol was the Clean Development Mechanism (CDM), which became fully operational in 2004. CDM generates offsets by enabling investments in emission reduction projects in developing countries, partly being financed through the sale of CDM offsets (Certified Emission Reductions - CER). Each CER represents one ton of reduced greenhouse gas emissions, which are rigorously verified and validated by both UNFCCC and independent third-party verifiers before they are issued by UNFCCC. From an initially shaky start, CDM has evolved, improved and strengthened its functions and environmental integrity to become the mechanism it is today. With close to 8000 registered projects in 103 countries and almost 300 "programme of Activities" (large scale CDM project clusters), and with a current potential offset generation capability of close to 5 billion CERs up to 2020, it represents the largest mechanism of its kind in the world.

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Originally, the CDM offsets were intended to be used by developed countries to meet their Kyoto Protocol emission reduction targets that they may not be able to achieve only through domestic measures. Over time, however, the quality and environmental integrity of CERs have also made them popular for voluntary use in the corporate sector or by countries outside the Kyoto Protocol. This use is labeled "voluntary" since their use is not counted under any Kyoto protocol obligation.

The Paris Agreement, through Article 6, confirmed that the use of market mechanisms will continue to play an important role in the global effort to address climate change. Cooperative Approaches, generating as well as a new mechanism contributing to mitigation and sustainable development, were introduced by Article 6, as was the concept of non-market approaches. Both the Cooperative Approaches and the new mechanism represent ways in which offsets or other forms of emission reductions units may be recognized in the new climate architecture created by the Paris Agreement. The accompanying COP decision further clarifies a number of principles for how the new mechanism should be designed, including that it should be based on lessons learned from mechanisms previously created under UNFCCC, such as CDM. It is noteworthy that Article 6 is inclusive, not exclusive, in the sense that it indicates that Cooperative Approaches under the UNFCCC process need to be consistent with guidance to be adopted by the parties, but do not prescribe any unique mechanism for generating the ITMOs.

When CDM several years ago took the step to also allow the use of CERs outside the Kyoto Protocol it became evident that a system originally created for country-to-country level cooperation was not always easily accessible for users in corporate and voluntary sectors. UNFCCC therefore launched in September 2015 an on-line platform (www.offset.climateneutralnow.org) that allows anybody with an internet connection to simply select, pay, and cancel the CERs they wish to use.

The online platform provides direct access to CERs so that the user can identify the CDM project that the CERs come from, the host country, the type of emission reduction technology, or the associated sustainable development benefits. The cost for a CER is set by each CDM project and is today typically in the range of half a USD to five USD per CER. The user can thus select the type and number of CER they wish to purchase by putting them in the “shopping basket”. At the online check out, they pay with a credit card or PayPal. Immediately when this is done, the ownership of the CERs are transferred to the buyer and they are automatically cancelled in UNFCCC’s CDM Registry, which holds all CERs available at the on-line platform. The user receives confirmation on-screen and via e-mail that the transaction is complete, and normally within two working days the user also receives an official certificate from UNFCCC confirming the cancellation of the CERs. The certificate states the number of CERs cancelled, the name of the canceller as well as the purpose for which the CERs have been cancelled, as indicated by the user.

The experience from purchasing/cancelling CERs at the online platform is thus similar to many other online transactions, e.g. booking of hotels, reservation of flight tickets or purchasing of merchandise online.

Following the successful launch of the online platform in late 2015 it will be further developed and strengthened. Significant new features planned include:

- additional means of payment, such as through bank transfer;
- improved access to information about sustainable development benefits associated with the CERs on offer;
- business-to-business capabilities to allow companies to integrate the online platform into their business systems, thereby enabling automatic cancelling of CERs, e.g. every time a ticket is issued.
- increased supply of CERs to encompass the wider supply from all registered CDM projects.
- an express option that allows users to only indicate the number of CERs to be cancelled, without having to select from what projects they come from.

In September 2015, the UNFCC launched its first on-line offsetting platform.

The advantage for stakeholders in the aviation sector, or really any other sector wishing to offset their climate footprint, is that the cancellation is easy, quick and comes with virtually no costs apart from those paid for the CERs[1]. The system also allows for selecting the country, technology, or the sustainable development benefits that are associated with the CERs, so that the CERs selected may have some link with e.g. the country of the user. In addition the environmental integrity of the offsets is guaranteed by UNFCCC.

So what challenges and opportunities lie ahead for CDM and the online platform? A fundamental uncertainty, which was resolved through the Paris Agreement, was whether offsets would be recognized at all in the new climate regime. Article 6 confirms that offsets will continue to be recognized well beyond 2020. The nuts and bolts of what criteria these offsets or ITMOs need to meet, and how they will be counted for so as to ensure that there is no double counting of emission reductions is now in the hands of parties to develop. CDM will continue at least until the end of the second commitment period of the Kyoto protocol (2023) but it seems that it will gradually be replaced by the Paris Agreement as it comes into force.

Since CDM effectively already today operates outside the compliance markets defined by the Kyoto Protocol, and since the mechanism is financially self-sufficient, CDM is well equipped to continue to operate also in the new climate architecture. This, of course, requires that CDM will evolve as needed to respond to the criteria to be established for ITMOs. This is the same requirement that will be put on any other mechanism generating ITMOs. That CDM will evolve as needed is not a farfetched assumption considering the tremendous investments and efforts that has gone into CDM over the past decade and the flexibility it has shown in responding to lessons learned and new requirements.

A clear difference between CDM in the Kyoto protocol and the CDM in the post-2015 world is that it will no longer be "the only game in town". The new mechanism defined by Article 6 in the Paris Agreement, and any other mechanism (or "cooperative approaches" in the Paris Agreement language) that may aspire to generate ITMO's will in reality offer alternatives to CDM. However, in this universe CDM has comparative advantages that put the mechanism in a good position to continue to evolve and support mitigation action globally. This includes its rigorous UNFCCC approved standards, its extensive infrastructure, and its readily available supply of CDM offsets.

From the perspective of international aviation, it is clear that the Paris Agreement has provided significant clarification about the context within which a MBM would operate. The expectations on ICAO from stakeholders and parties alike are clearly conveyed through the overarching well-below-2ºC target with the aim of 1.5ºC of the Agreement. The conditions for building a MBM that is aligned with the international climate architecture under UNFCCC have never been so favorable. With high quality, easily accessible offsets immediately available under UNFCCC, and with a clear direction for the future development of offsets under the Paris Agreement, there should be nothing stopping ICAO from taking an ambitious, yet realistic and practical, decision on how aviation will be part of the solution to climate change.

References:

1. The operation of the Online platform is funded by CDM itself (see reference[2]). This, however, does not include the nominal fees that PayPal or credit cards charge for any transaction.
2. CDM's operations are funded through a small fee (share of proceeds) that is charged for every CER that is issued.

CARBON MARKETS, THE SIMPLE REALITY

BY KATIE SULLIVAN (INTERNATIONAL EMISSIONS TRADING ASSOCIATION-IETA)

Carbon markets around the world received a boost from the new Paris Climate Change Agreement, adopted by Parties to the United Nations Framework on Climate Change (UNFCCC) in December 2015. Article 6 of the historic Agreement allows for the cross-border trade of greenhouse gas (GHG) reduction units, as well as establishing a new international crediting mechanism to encourage sustainable development. Accompanying decisions will see experiences and lessons from existing market mechanisms used in developing the rules for this new global system – including the Kyoto Protocol's Clean Development Mechanism (CDM), the regulatory body that has been gearing-up to potentially serve the aviation sector[1].

The Paris Agreement's inclusion of market provisions was made possible by a groundswell of carbon market support and action around the world. Whereas at the last major UNFCCC climate talks, in 2009 in Copenhagen, the EU Emissions Trading System (ETS) was the only major game in town, the intervening six years have seen other carbon markets sprout across the globe.

According to the World Bank's Carbon Pricing Watch 2016[2], approximately 40 countries now put a price on carbon, with over half using some form of ETS. At the sub-national level, over 20 states and provinces have implemented, or are planning to implement, trading and offset crediting programs. When China's seven existing pilot cap-and-trade programmes transition to a national ETS from 2017, the world's annual value of implemented carbon pricing initiatives will potentially double to USD 100 billion from today's USD 50 billion year. These figures and trends tell the story, and the message is clear: markets are here to stay.

From 2017, the world's annual value of implemented carbon pricing initiatives will potentially double to USD 100 billion from today's USD 50 billion year.

With the spread of emissions trading more broadly, time is running out for sectors to remain exempt from compulsory actions to cut their emissions.

The 1997 Kyoto Protocol tasked both the International Civil Aviation Organization (ICAO) and the International Maritime Organization (IMO) with tackling their respective sectoral emissions, given the global nature of aviation and shipping. However, after minimal progress by 2009, the EU took matters into its own hands and passed legislation extending its ETS to aviation, applicable to all planes taking off or landing in an EU nation from 2012, regardless of its destination or point of origin – or where it is flagged. Cue uproar, legal challenges and a diplomatic row.

But it was not until the airlines had received their allocations, priced in compliance costs to fares and were well into the first year of compliance that a détente was reached. At the end of 2012, the EU agreed to temporarily suspend the aviation provisions for one year (i.e., for 2012), to allow the ICAO Assembly to reach a deal on a plan at its 2013 triennial General Assembly. The provisions were later amended in 2013 to only apply to flights between airports in the European Economic Area region until 2016. The rationale behind idea was the understanding that, by the end of 2016, ICAO would have a decision to implement a global Market-Based Mechanism (MBM) to ensure carbon neutral growth from 2020.

Meanwhile, at ICAO's 2013 Assembly, governments endorsed a proposal to decide on a global MBM for aviation at the next triennial Assembly meeting in 2016, to take effect from 2020. Given the temporary derogation in the EU ETS, along with the momentum for climate action globally, this year's 39th Session of the ICAO Assembly is crucial.

To ensure the programme is of high environmental integrity, this last criteria – emission reductions that are beyond business-as-usual (i.e., they would not have occurred without the programme) is crucial. This concept, known as *additionality*, is integral to existing offset programmes, such as the CDM, Gold Standard, and Verified Carbon Standard (VCS), and other similar voluntary and compliance systems. Independent verification of claimed reductions is also important, which would measure the reductions against an accepted baseline.

Bringing a market to the aviation sector makes sense. Since 1999, IETA has championed the use of well-designed market-based mechanisms – trading and offsets – to curb greenhouse gas emissions, ensure certainty in environmental outcomes, and achieve these goals at least cost to business, consumers and society at large.

Markets and the use of offsets are also a good way to bridge borders and encourage wider participation in a global response to the global environmental challenge – an especially important

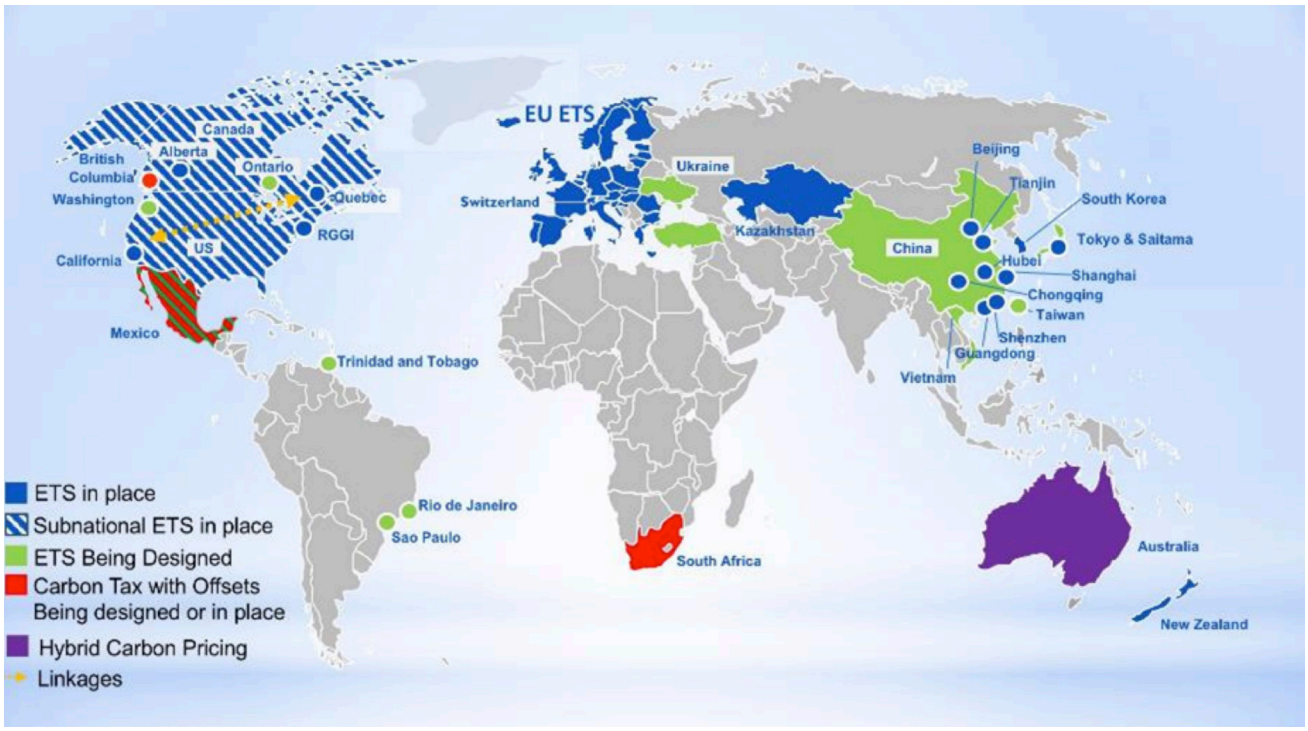

Figure 1. IETA carbon pricing map, June 2016

feature for an international sector like aviation. Offsets are also proven and powerful cost-containment tools. The opportunities for low-cost 'internal' reductions for aviation are limited, and are already being pursued as part of the carbon neutral growth strategy. Thus, access to a broad and robust pool of low-cost offsets can help the sector go further, faster, and cheaper en-route to reaching its climate goals.

With several offset programmes already in operation, there is a wealth of experiences and tools that an ICAO MBM can draw upon. Rather than start anew, there is nothing to stop ICAO's programme from deciding to use one or more of these existing systems. This would ensure that a 2020 start date could be met – particularly then as the amount of institutional and technical architecture needed, not to mention MBM design features, would be greatly reduced.

Tapping existing offset markets and programmes, with all the accompanying methodologies, rules and procedures, would also allow for more energy to be spent on the political question of obligations: who will do how much, and by when. These questions are pivotal to the successful design and implementation of market-based mechanisms in general, and gain more attention in the context of international aviation. Indeed, international aviation is the first-ever sector to consider the adoption of a global MBM, thus crystallizing expectations. Being a pioneer means that new pathways have to be created but international aviation has demonstrated on numerous occasions that it can respond to this type of challenge.

Since the 2013 Assembly, ICAO has actively engaged with its Member States and relevant international organizations in the development of a global MBM scheme. To this end, the ICAO Council established the Environment Advisory Group (EAG), composed of 17 Council Representatives, in March 2014. The EAG, under the direction of the Council, was to oversee all the work related to the development of a global MBM scheme and based on the results of its deliberations, to make recommendations to the Council. The Council was supported in its technical and analytical work by the Global MBM Technical Task Force (GMTF) of the ICAO Committee on Aviation Environmental Protection (CAEP). The current proposal would create a global offsetting system for the aviation sector, whereby operators can acquire or trade emissions units from approved programmes, projects or emissions trading scheme which reduce emissions beyond business-as-usual.

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1. In November 2015, the CDM Executive Board approved the first methodology to credit GHG reductions from aviation, for the installation of electric motors to the landing gear of aircraft to reduce emissions from taxiing.
2. World Bank Group, Ecofys "Carbon Pricing Watch 2016" (May 2016)

CDM METHODOLOGIES

BY ICAO SECRETARIAT

The Clean Development Mechanism (CDM) of the United Nations Framework Convention on Climate Change (UNFCCC) was established as part of the 1997 Kyoto Protocol. It incentivizes the implementation of emission-reductions projects in developing countries, which earn saleable certified emission reduction (CER) credits for each tonne of CO_2 that the project reduces. During the first commitment period of the Kyoto Protocol (2008 to 2012), more than 1,650 projects were initiated under the CDM, producing CERs amounting to more than 2.9 billion tonnes of CO_2[1].

Baseline and monitoring methodologies are agreed by the UNFCCC Executive Board in order to provide a consistent means for determining the emissions reductions associated with the project. They are required to establish a project's emissions baseline, or expected emissions without the project, and to monitor the actual ongoing emissions once a project is implemented. The difference between the baseline and actual emissions determines what a project is eligible to earn in the form of CERs, as shown in **Figure 1**.

Methodologies exist for nearly every conceivable type of project, but prior to 2015 there were none in the aviation sector. Following the successful collaboration of the ICAO and UNFCCC Secretariats, today two aviation-related methodologies are recognized within the CDM programme: AM0116, "Electric taxiing systems for airplanes" and AMS-I.M., "Solar power for domestic aircraft at-gate operations." These methodologies are available for use on projects related to domestic aviation, as international aviation emissions are outside of the scope of the CDM programme.

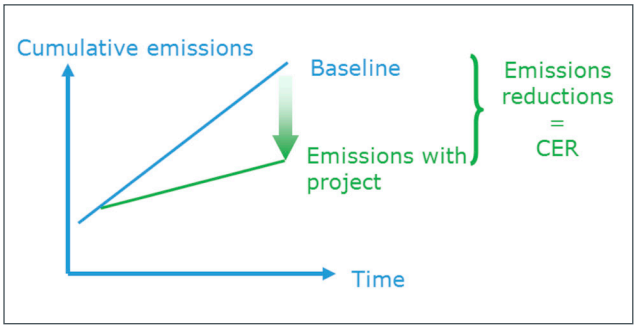

Figure 1. How a CDM project generates a CER.

Electric Taxiing Systems for Airplanes (E-Taxi)

Electric taxiing, or E-taxi, systems allow aircraft to move on the surface without requiring any power from the main engines. Instead, electric motors that are powered by the on-board Auxiliary Power Unit (APU), which consumes significantly less fuel, are used, as shown in **Figure 2**. One of the aims of the CDM programme is to accelerate the implementation of new measures. Since this technology is not yet widely deployed, it was identified as a candidate.

The methodology requires the definition of a baseline scenario, which will be the basis against which the benefits are measured. This baseline is defined based on the standard operating procedures for the project aircraft and may include any combination of multi multi-engine taxi, single-engine with APU taxi, and even the use of towing operations. The CO_2 emissions savings delivered from the project are the difference between the fuel consumed by the APU powering the E-taxi system and the baseline. An aircraft with an E-taxi system installed will burn slightly more fuel while airborne, due to the approximately 300 kg mass of the system. An adjustment factor is included in the methodology to account for this.

33 kg of CO_2 per minute saved

The use of electric taxi systems can save 33 kg of CO_2 per minute on a typical narrow body aircraft while the aircraft is taxiing. For flights of 9 hours or less, the benefits are positive, even when considering the fuel burn penalty from the weight of the system.

Figure 2. An aircraft with an e-taxi system installed taxiing using only the power from the APU.
Source: http://articles.sae.org/12662/

Figure 3. Solar panels at an airport and an aircraft receiving pre-conditioned air and power while parked at a gate.
Source: http://www.passengerterminaltoday.com/viewnews.php?NewsID=36516

Solar Power for Domestic Aircraft At-Gate Operations

Whenever aircraft are being serviced, loaded, and unloaded, they require power to operate their electrical systems as well as the internal heating, ventilation, and air conditioning systems. Most passenger aircraft are able to generate their own power using the APU, or receive power and pre-conditioned air, either from a ground power unit or directly from the gate. The solar power for domestic aircraft at-gate operations methodology aims to replace CO_2 intensive sources of energy for parked aircraft with renewable solar energy as illustrated in **Figure 3**.

The infrastructure in place at airports can vary widely, from a fully equipped gate that includes power and pre-conditioned air, to a stand with no service, thereby requiring the aircraft to run its APU. As a result this methodology provides guidance for defining baseline emissions based on the systems serving parked aircraft. Each minute that an aircraft does not need to run its APU while parked saves an average of 5.6 kg CO_2.

5.6 kg of CO_2 saved per minute

Looking to the Future

The successful development of these two CDM methodologies have paved the way for projects related to domestic aviation to generate CERs. The ICAO and UNFCCC Secretariats are continuing to investigate other potential projects within the sector for which methodologies could be developed.

Sustainable Development Goals

References

1. Source: http://unfccc.int/kyoto_protocol/mechanisms/clean_development_mechanism/items/2718.php