

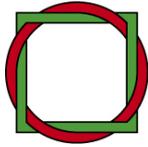
JIKO POLICY BRIEF

No. 01/2016

Offsetting for International Aviation The State of Play of Market-Based Measures under ICAO

Lukas Hermwille





Wuppertal Institute
for Climate, Environment
and Energy

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Internet

www.carbon-mechanisms.de

<http://wupperinst.org/en/projects/details/wi/p/s/pd/429/>

Contact

Lukas Hermwille

Email: lukas.hermwille@wupperinst.org

Wuppertal Institute for Climate, Environment and Energy GmbH
Döppersberg 19 • 42103 Wuppertal • Germany

www.wupperinst.org

February 2016

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Summary

While the states of world have adopted a new international climate change agreement in Paris last December, two important sectors remain largely exempt: international aviation and shipping. The designated UN bodies, the International Civil Aviation Organisation (ICAO) and International Maritime Organisation (IMO) are developing their own mitigation measures.

In this JIKO Policy Brief we focus on the negotiations under ICAO. The paper provides an overview of the history of climate change mitigation in the aviation sector and takes stock of the negotiation process that is to culminate in the establishment of a global market-based measure (MBM). Subsequently, we discuss the proposed MBM in the light of experiences with the UNFCCC's own offsetting mechanism, the CDM, and the ongoing negotiations of the Paris Agreement.

ICAO has set itself two aspirational goals to combat climate change: to increase fleet fuel efficiency by 2% per annum and to achieve carbon neutral growth after 2020, i.e. to cap net emissions of the aviation sector based on the emissions of that year. This latter is to be achieved by means of a mandatory global offsetting scheme, which is meant to compensate any excess emissions that cannot be abated directly.

ICAO has mandated the ICAO Council to develop this global MBM. Current negotiations are taking place under the Environmental Advisory Group that coordinates the negotiation process and deals with relevant policy issues and two technical working groups, one dealing with eligibility criteria for emission units (EUC) and the other dealing with provision for measuring, reporting and verification (MRV) of aircraft emissions.

Both working groups have made considerable progress, but especially the discussions of the EUC group so far remain rather on an abstract level and detailed provisions of a governance structure are so far lacking.

From the discussion of ICAO's proposed global MBM in the light of the CDM experience and the ongoing negotiations under the UNFCCC, we draw four key lessons for ICAO and the design of its global MBM:

Supply is abundant: The aviation industry has expressed concerns over high prices due to limited availability of emission units. The CDM experience shows that there is no basis for this concern. ICAO should therefore focus on high-quality offsets only.

Environmental integrity is key to maintain the credibility of the mechanism: ICAO should restrict eligible emission units to credits with highest standards with respect to environmental integrity and strong contributions to sustainable development.

An effective governance structure is required: The CDM benefitted greatly from its learning-by-doing approach. The CDM Executive Board resolutely worked out the details of the mechanism. Without this (political) engagement, the CDM would have risked to erode its credibility ultimately leading to a lack of political support.

ICAO should establish close ties to the UNFCCC in order to address issues arising from the accounting framework to the Paris Agreement. Unless the clear rules for accounting of emission reductions and transfer of emission units are incorporated in the 'fine print' to the new climate agreement, it is hardly possible to avoid double counting.

1 Introduction

In order to avoid dangerous climate change and limit global warming to below 2°C it is required to reduce global greenhouse gas (GHG) emissions by 40-70% below 2010 levels by 2050 and to (at least) zero in 2100 (IPCC, 2014). Under the United Nations Framework Convention on Climate Change (UNFCCC) countries have adopted a new global treaty in Paris that, if implemented, can pave the way for the fundamental transformation of global socio-economic systems required to achieve this goal.

While the national contributions communicated in the context of these negotiations thus far fall short of the task (Hood, Adkins, & Lavina, 2015; Climate Action Tracker, 2015), two important sectors are virtually exempt from mitigation efforts negotiated under UNFCCC: international aviation and shipping, representing roughly 1.5% (478 Mt CO₂) and 1.9% (602 Mt CO₂) of global energy-related CO₂ emissions in 2012 respectively (IEA, 2014). However, particularly the activity level of the aviation sector is deemed to increase dramatically. While governments are preparing an agreement to reduce domestic emissions from both developed and developing countries, emissions from international aviation are projected to increase threefold until 2050 (Lee, Lim, & Owen, 2013; Owen, Lee, & Lim, 2010).

Advancing climate change mitigation for the aviation sector has proven difficult in the recent past. While the issue of climate change is negotiated under the auspices of the UNFCCC, there is also a dedicated UN body that is tasked to regulate international aviation: the International Civil Aviation Association (ICAO).

The UNFCCC has repeatedly asked the ICAO to develop a plan to mitigate emissions from the sector. Still, progress has been slow. In 2010, the

37th ICAO Assembly has agreed to two aspirational goals: to improve fuel efficiency by 2% annually, and to cap net emission growth of the sector at 2020 levels (commitment to carbon neutral growth) (ICAO, 2010). This latter goal is to be achieved by means of a basket of measures including through aircraft technology, operational improvements, and sustainable alternative fuels. However, the combined effect of those measures is recognized by all stakeholders to be insufficient to make up for the strong expected growth for the sector. Hence, member states have agreed to develop “market-based measures” (MBM) at ICAO Assembly 38 in 2013 that can compensate the remaining emissions (ICAO, 2013a).

This JIKO Policy Brief gives an overview of the history of climate change mitigation in the aviation sector under both UNFCCC and ICAO and takes stock of the negotiation process that is to culminate in the establishment of a global market-based measure, most likely a single global offsetting scheme.

Furthermore, the different options for market-based measures are briefly described. Also, the state of play of the negotiations for a global MBM under the various ICAO bodies is summarized with special emphasis on the proposed provisions on requirements for emission measurement, reporting, and verification (MRV) and eligibility criteria for emission units (EUC).

Finally we will discuss the proceedings of ICAO in the light of the vast experience with market-based mitigation instruments under the UNFCCC, namely the Clean Development Mechanism (CDM), and the ongoing negotiations for a comprehensive international climate agreement to be concluded in Paris by the end of 2015.

2 Who Is Responsible?

ICAO vs. UNFCCC

2.1 Unequal Siblings of the UN Family: UNFCCC and ICAO

The core responsibility for mitigating climate change rests with the UNFCCC. However, the UNFCCC has historically approached its task following the principle of territoriality. This makes it difficult to account for aviation emissions. In the Kyoto Protocol, emissions from domestic aviation were included under the emission caps set for developing countries listed in Annex B of the Kyoto Protocol. However, emissions from international aviation, i.e. emissions from aircrafts that depart from an airport in one country and arrive at an airport of another country, were not included, as it is extremely difficult to clearly and uniquely separate and attribute the emissions to the inventory of one of the countries.

Because of these difficulties, the UNFCCC resorted in the Kyoto Protocol to referring the issue of international aviation (and shipping) to the designated UN body: ICAO (and the International Maritime Organisation – IMO). Article 2.2 of the protocol states

The Parties included in Annex I shall pursue limitation or reduction of emissions of greenhouse gases not controlled by the Montreal Protocol from aviation and marine bunker fuels, working through the International Civil Aviation Organization and the International Maritime Organization, respectively. (UNFCCC, 1997)

One year earlier, the ICAO had requested the IPCC in collaboration with the Scientific As-

essment Panel to the Montreal Protocol to prepare a special report. In 1999, the report *Aviation and the Global Atmosphere* was published and highlighted that

- aviation traffic and emissions had grown significantly and was projected to experience strong continued growth;
- aviation accounted for roughly 2% of anthropogenic CO₂ emissions;
- aircraft emissions at high altitudes trigger the formation of condensation trails and cirrus clouds further contributing to climate change so that the greenhouse effect of those high altitude emissions (radiative forcing) is substantially larger than ground-level CO₂ emissions (IPCC, 1999).

Note that the mandate provided by the Kyoto-Protocol does not include the additional greenhouse effects of high-altitude emissions, but does include other greenhouse gases – relevant are NO_x emissions that produce ozone at high altitudes (IPCC, 1999). The latter are not addressed by ICAO to date.

Although earlier versions of the draft negotiating text of the Paris Agreement contained a formulation similar to the Kyoto Protocol's mentioning of international bunker fuels for aviation and shipping, this formulation was later dropped.

Despite these developments, ICAO made only limited progress on any mandatory policies to curb aviation emissions. On the occasion of the 32nd ICAO Assembly in 1998, responding to the Kyoto Protocol request, ICAO decided through its Committee on Aviation Environmental Pro-

tection (CAEP) to “study policy options to limit aviation GHG taking into account the findings of the 1999 IPCC Report and report back to the Assembly at its next session three years later” (T&E, 2010, p. 11).

Subsequent ICAO meetings were not much more productive with respect to mandatory policies. In 2001 the ICAO Assembly postulated that “environmental levies on air transport which States may introduce should be in the form of charges rather than taxes” effectively cancelling any attempts to introduce fuel taxes as a means of mitigating aviation emissions (T&E, 2010, p. 12). Instead it endorsed the development of an emissions trading scheme for global aviation and requested the ICAO Council to develop guidelines for such a scheme.

However, the idea of an aviation specific emission trading scheme was later discarded and the 2004 ICAO Assembly backtracked from its earlier resolution now only endorsing a voluntary trading system.

At the next ICAO Assembly in autumn 2007, a *Group on International Aviation Climate Change* (GIACC) was formed and tasked with the development of a programme of action on climate change for ICAO in the run-up of the Copenhagen UNFCCC conference. The GIACC proposed an aspirational goal of an increase of fleet fuel efficiency of two per cent per annum. However, the GIACC was not able to reach consensus on any market-based measures to mitigate aviation emissions.

Finally, in 2010 at the 37th ICAO Assembly two aspirational goals were agreed upon (ICAO, 2010):

1. To improve fleet fuel efficiency by two% per annum;
2. To keeping the global net carbon emissions from international aviation from 2020 at the same level (Carbon Neutral Growth goal).

Both goals, however, do not attribute any specific obligations to individual states.

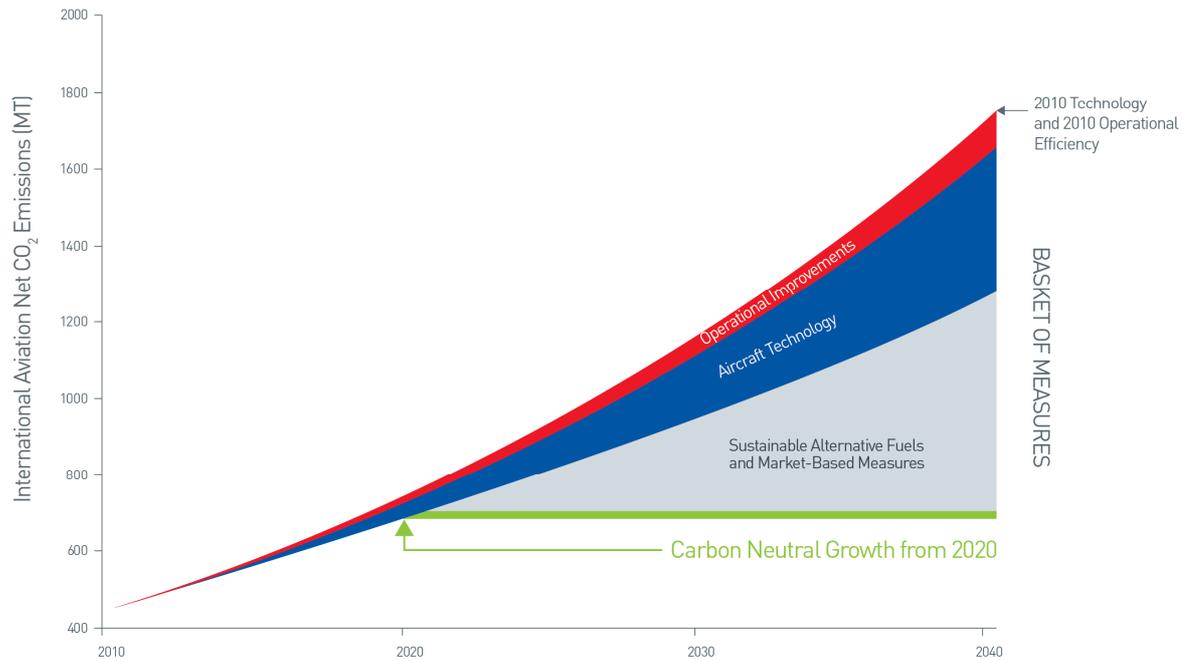


Figure 1: Contribution of Measures for Reducing International Aviation Net CO₂ Emissions. *Source: ICAO, 2015b.*

2.2 Carbon Neutral Growth

Strong influence from the aviation industry made sure that there would not be an absolute cap on the growth of the aviation sector. Instead, the concept of carbon neutral growth was put forward (T&E, 2010). At its 32nd Assembly, ICAO agreed to cap net global aviation emissions at 2020 levels from that year on.

This goal is to be achieved through a basket of measures:

Improved fuel efficiency: The two goals are intertwined; progress on the fuel efficiency goal has direct impacts on and supports compliance with the second goal. The contributions required from other measures to achieve the carbon neutral growth goal hinges on the implementation of the fuel efficiency.

Operational improvements are promoted by ICAO such as allowing for continuous climb operations, optimizing flight levels, better-coordinated air traffic management, alternative routes that cut down travel time and distance, and improved ground operations (Gençsü &

Hino, 2015; ICAO, 2013b). According to ICAO, these improvements are necessary anyway to accommodate the expected growth, but can also contribute to limit aviation emissions.

Sustainable alternative fuels shall be further developed and made available commercially at the large scale. An *Alternative Fuels Task Force* has been established under the ICAO Council's CAEP. To date sustainable alternative fuels are not available commercially at the large scale, but first successful operations have been carried out blending conventional fuel with up to 50% alternative fuels (ICAO, 2013b). ICAO estimates that sustainable alternative fuels may supply a maximum of three per cent of total international aviation fuel by 2020. However, the environmental performance of alternative fuels was found to vary greatly for different production processes and evidence suggests that currently large-scale biofuel production produces environmental harm and contributes to poor social conditions (Upham, Tomei, & Boucher, 2009).

Market-based measures (MBM) will be used to compensate any emissions that cannot be

mitigated through these measures and exceed the benchmark of 2020 emission levels.

2.3 Market-Based Measures

At the 37th ICAO Assembly, a list of 16 guiding principles for such MBM were also agreed upon and listed in an annex to resolution A37-19 (ICAO, 2010) including inter alia that:

- MBMs should support sustainable development of the international aviation sector;
- MBMs should be transparent and administratively simple;
- MBMs should be cost-effective;
- MBMs should not be duplicative and international aviation CO₂ emissions should be accounted for only once;
- MBMs should minimize carbon leakage and market distortions;
- MBMs should not impose inappropriate economic burden on international aviation;
- MBMs should be assessed in relation to various measures on the basis of performance measured in terms of CO₂ emissions reductions or avoidance, where appropriate;
- MBMs should take into account the principle of common but differentiated responsibilities and respective capabilities, the special circumstances and respective capabilities, and the principle of non-discrimination and equal and fair opportunities.

At its 38th Assembly, ICAO decided to mandate the Council develop a mandatory global MBM based on the guiding principles (ICAO, 2013a). At its first subsequent meeting the Council has set up two working groups to carry out the political and technical work programme:

The **Environmental Advisory Group (EAG)** is tasked to coordinate and oversee the work on a global MBM. It is set up directly under the auspices of the Council and is supposed to focus on the policy aspects of the development process. The EAG is to comprise 17 ICAO member states with both a wide geographical and developed / developing world representation: Argentina, Brazil, Canada, China, Egypt, India, Italy, Japan, Mexico, Russian Federation, Singapore, South Africa, Spain, Tanzania, United Arab Emirates, United Kingdom and United States.

The technical work is carried out by a dedicated **Global Market-based Measure Technical Task Force (GMTF)**. This task force is set up as a subgroup under the Council's Committee on Aviation Environment Protection (CAEP), a body that has been established already in 1983 as a technical committee that assists the Council in formulating new policies and standards related to aircraft noise and emissions, and more generally to aviation environmental impact.

The GMTF has organised its work in two separate subgroups focusing on eligibility criteria for emission units under a global MBM (Emission Units Criteria: EUC subgroup) and a second group tasked to draft modalities and procedures for measuring, reporting and verifying emissions (MRV subgroup).

The EUC subgroup shall:

- Review existing criteria for emission units used in offsetting CO₂ emissions, including but not limited to, quality assurance principles; methodology approval processes; approved project or program types; unit issuance, transfer and registration requirements; and validation and verification requirements.
- Evaluate how, and under what criteria, emission units from existing or proposed MBMs could be used in a global MBM scheme for international civil aviation.
- Undertake an assessment of the future availability of emission units from existing

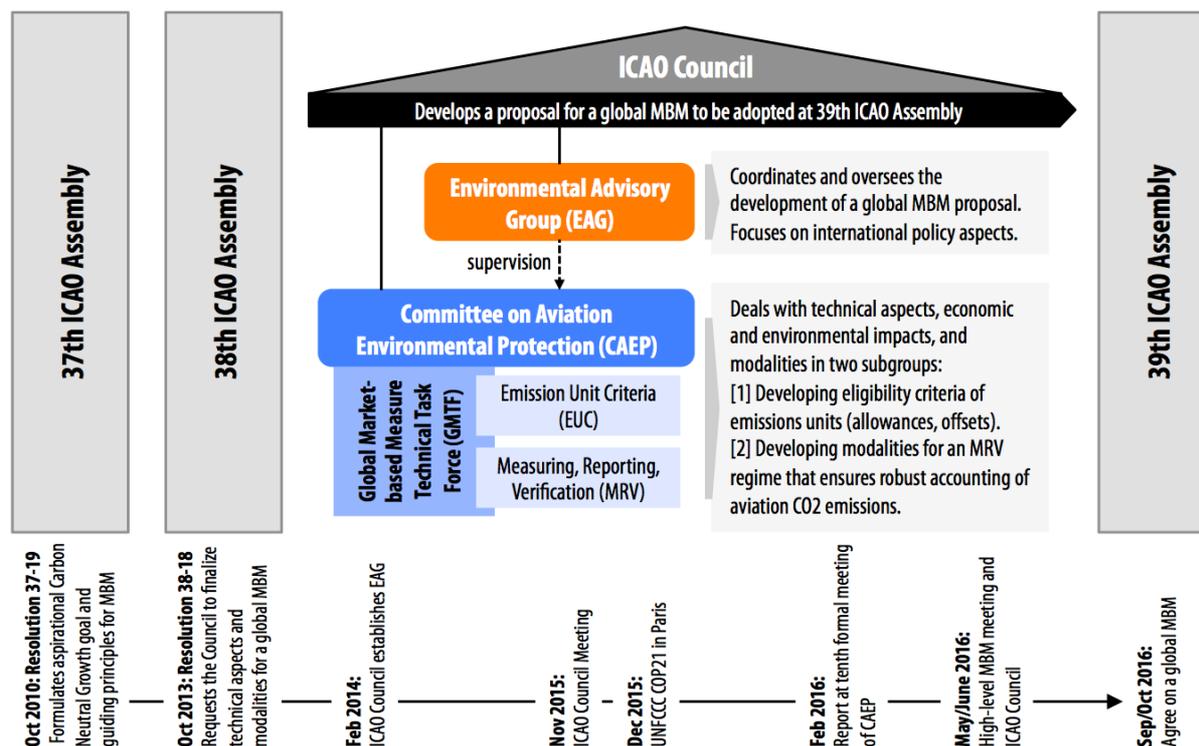


Figure 2: Governance Structure and Timeline of the MBM Proposal Development Process. *Source: own illustration.*

and proposed MBMs with respect to the potential needs of the international civil aviation sector and assess the impact of international civil aviation on the carbon market supply, demand and price.

The MRV group’s work includes the following key elements:

- Scope and coverage of the MRV scheme to support an international aviation global MBM;
- Monitoring of international aviation emissions;
- Reporting of international aviation emissions;
- Verification of international aviation emissions prior to reporting;
- Relationship of emissions monitoring, reporting and verification steps with the administration of the obligation for offsetting emissions.

Both subgroups are to prepare draft provisions for the 10th regular CAEP meeting in February 2016. The CAEP recommendations will then be discussed both on the occasion of the formal

ICAO Council meeting in May / June 2016 and at a separate high-level ICAO meeting in the run-up to the 39th ICAO Assembly from 27 September till 7 October 2016 where the global MBM is supposed to be finally agreed (ICAO, 2015b).

The governance structure and timeline of the process for the development of a global MBM is illustrated in figure 2 above.

2.4 Scale of Emissions to Be Covered by MBM

As outlined in the introduction, emissions of the aviation sector are projected to rise substantially over the coming decades. According to ICAO, international aviation is expected to grow (expressed in revenue tonne kilometres – RTK) at an average rate of 4.6% per annum until 2050 (ICAO, 2013b). If the aspirational goal for increased fuel efficiency is achieved, the increase of RTK translates into a projected emissions gap

of between 288-376 Mt CO₂ in 2030 and 590-816 Mt CO₂ in 2040 . Over the period from 2021 till 2035, the potential demand adds up to roughly 3300 Mt CO₂ (Lee et al., 2013; Cames, 2015). To put this into perspective, aggregate offset demand in the EU Emissions Trading Scheme has been estimated to 1650 Mt CO₂ over the 2008-2020 period (Bellassen, Stephan, & Leguet, 2012).

A portion of this demand may also be covered through the use of sustainable alternative fuels. ICAO has solicited targets for the use of alternative fuels from member states and observer organisations. These targets add up to about 25% of the projected emissions gap by 2050 (ICAO, 2013b). However, given negative experiences with environmental harm and deteriorating social conditions in the context of biofuel production (Upham et al., 2009), the projections for alternative fuels are subject to high uncertainties. Even 'speculative' levels of use of alternative fuels will not be sufficient to achieve the carbon neutral growth goal (Lee et al., 2013).

3 Options for Market-based Measures

3.1 Emissions Trading or Offsetting

Under the ICAO negotiations, the conceptual basis of the proposed Global Market-based Measure has not been elaborated in full detail. Preparatory work under ICAO (ICAO, 2013c) has identified three design options:

1. global mandatory offsetting,
2. global mandatory offsetting with revenue, and
3. global emissions trading.

With offsetting (Option 1), actual emissions are compensated through reduction, removal or avoidance of emissions elsewhere. For each ton of CO₂ (or CO₂ equivalent for other greenhouse gases), an emission unit is provided under a crediting mechanism or protocol. For each ton of aviation emissions to be offset, one emission unit has to be surrendered.

Offsetting with revenue (Option 2) differs from option 1 only in the fact that a levy, fee or share of proceeds is generated that may be used for other purposes, e.g. compensating airlines from developing countries, funding research and development on mitigation options in the aviation sector, or to provide a continuous stream of revenue to fund the administrative structure of the global MBM.

In contrast to the first two options, emissions trading would impose a hard cap on the actual emissions from the aviation sector. Specific aviation allowances would be created and provid-

ed to the aircraft operators by means of auctioning or free allocation. For each ton that the operators' aircrafts emit, one allowance would have to be surrendered. Trading of allowances would be possible among carriers.

Officially, no decision with respect to the design options of the MBM could be reached. Consequently, the GMTF has been tasked to develop both approaches. However, the aviation industry has repeatedly expressed its preference for the offsetting variant and opposes the idea of generating additional revenues through the mechanism. At its 38th Assembly, the ICAO has taken note of this position. It is therefore likely that the global MBM will take the form of mandatory offsetting.

In the remainder of this Policy Brief, we will therefore exclusively focus on the provisions with respect to offsetting mechanisms.

3.2 Options for Differentiation

3.2.1 The Principle of Common But Differentiated Responsibilities

It has been argued that progress on mitigating aviation emissions under ICAO has been hampered by a set of conflicting principles (Martínez Romera & van Asselt, 2015). In article 2-1 of the UNFCCC the principle of common but differentiated responsibilities and respective capabilities is specified (CBDR):

The Parties should protect the climate system for the benefit of present and future generations of humankind, on the basis of equity and in ac-

cordance with their common but differentiated responsibilities and respective capabilities. Accordingly, the developed country Parties should take the lead in combating climate change and the adverse effects thereof. (United Nations, 1992)

ICAO has explicitly acknowledged this principle in the context of its work (ICAO, 2013a).

In practice, this principle was operationalized in a static division of countries in the Convention's annexes: Developed countries are listed in Annex I. All countries not listed in this annex have been considered developing countries.

In the Kyoto Protocol, the principle of CBDR was operationalized in that only Annex I parties were formally obliged to limit or reduce their emissions. For the Paris agreement, more nuanced means to differentiate between countries will have to be found.

The question of responsibility (and capability) is particularly difficult to assess in the case of international aviation. Especially long-distance travel routes are usually operated to and from a relatively small number of large regional hubs. Air traffic at these hubs is very international. For example, the airport of Singapore serves as a hub for South-east Asia. Given the small size of the country, Singaporean citizens make up only a small fraction of the passengers boarding airplanes in Singapore. Should Singapore be responsible for all the emissions originating from flights to or from its airport?

Furthermore, usually only relatively affluent people can afford to travel by airplane. One could therefore argue that whoever can afford traveling by plane is also capable of contributing to climate change mitigation.

3.2.2 The Principles of Non-discrimination and Equal and Fair Opportunities to Develop International Aviation

ICAO was established on the mandate of the Chicago Convention on International Aviation. Article 1 of the Chicago Convention provides:

Subject to the provisions of this Convention, the laws and regulations of a contracting State relating to the admission to or departure from its territory of aircraft engaged in international air navigation, or to the operation and navigation of such aircraft while within its territory, shall be applied to the aircraft of all contracting States without distinction as to nationality, and shall be complied with by such aircraft upon entering or departing from or while within the territory of that State. (ICAO, 2006)

In other words, there shall be no discrimination of any air carrier based on their country of origin.

The conflict is evident: the principle of CBDR demands differentiation by country but the Chicago Convention prohibits discrimination by carrier based on their country of origin. A solution to this dilemma was proposed: route-based differentiation.

3.2.3 Route-based Differentiation

In the light of the Chicago Convention's principles, the default option would be to have no differentiation at all. This is, however, clearly not in line with the CBDR principle. To the contrary, this would pose a burden on airlines from developing countries. Routes to and from emerging economies are projected to contribute the lion's share of the aviation sector's growth over the coming decades, whereas routes in Europe and Northern America are projected to remain stable.

China, India, Russia, Egypt, Libya and Saudi Arabia have proposed to use the historical emis-

sions to determine each operator's offsetting amount after 2020 based on the proportion of its own accumulative emissions in the period 1992-2020 to the global accumulative emissions in the same period (Yue, 2015). This proposal would result in long established airlines from Europe and North America shouldering the biggest burden.

A compromise proposal was put forward by Brazil and Argentina (Deng, 2015): Differentiation would be implemented by route rather than by aircraft operator. The proposal foresees to establish two categories of countries:

1. developed or high income countries;
2. developing or mid/low income countries.

From these state categories three route categories are derived:

- i. routes from one high-income country to another;
- ii. routes between a high income country and a mid/low income country;
- iii. routes from one to another mid/low income country.

In a first step, the global offsetting obligation would be distributed among the three route categories. Subsequently, offset obligations will be distributed among routes (within each group). Finally, for each route the distribution will be defined for each operator serving that route.

Such an approach, while relatively complex to administer in the first place, would ensure that carriers operating on the same routes are treated exactly the same, no matter which countries they are registered in (Deng, 2015).

3.3 State of Play of ICAO Negotiations

ICAO has tasked two subgroups to work out the detailed provisions for a global MBM. The EUC subgroup mentioned above is tasked to develop criteria for emissions units used for compliance with the Carbon Neutral Growth Goal. It has developed a set of design elements and integrity assessment criteria building on and complementing the guiding principles outlined already in the annex to the 38th ICAO Assembly Resolution (ICAO, 2013a).

Likewise, the MRV subgroup of the GMTF has developed a set of recommendations.

Unfortunately, the negotiation process under ICAO is not very transparent. All documents are strictly confidential. Public scrutiny is severely restricted and limited to officially registered representatives. The details of the state of play under the various relevant negotiation streams therefore cannot be laid out in this Policy Brief.

The author has traced the discussion inter alia by interviewing representatives from various delegations to the ICAO negotiations. The result of this research cannot be recited here, but it has been subject of consultations to the BMUB and is also taken into account in the recommendations section below.

4 ICAO's MBM and the CDM Experience

4.1 Will there be enough supply?

Industry representatives in the ICAO negotiations repeatedly voiced concerns that an ICAO MBM might face a shortage of supply. Therefore, in order to maximize supply, they pushed discussions under the GMTF towards a broad coverage of eligible mechanisms / schemes. The design elements and eligibility criteria specified in section 3.3 are rather generic and could cover credits from various protocols. Mostly, they focus on transparency and do not specify a process of continuous oversight.

However, experience with the CDM demonstrates that with sufficiently high (expected) prices, there is abundant supply.

While the future of the CDM is unclear after 2020 (see section 5 below), the mechanism has demonstrated the proficiency of crediting mechanisms: Recent research shows that CERs generated by current registered CDM projects could satisfy the aggregate demand of the aviation sector (Cames, 2015). Even under rigorous quality restrictions, i.e. excluding all project types that raised environmental concerns and taking into account only recent vintages, the existing CDM pipeline can generate enough CERs to offset the entirety of the projected

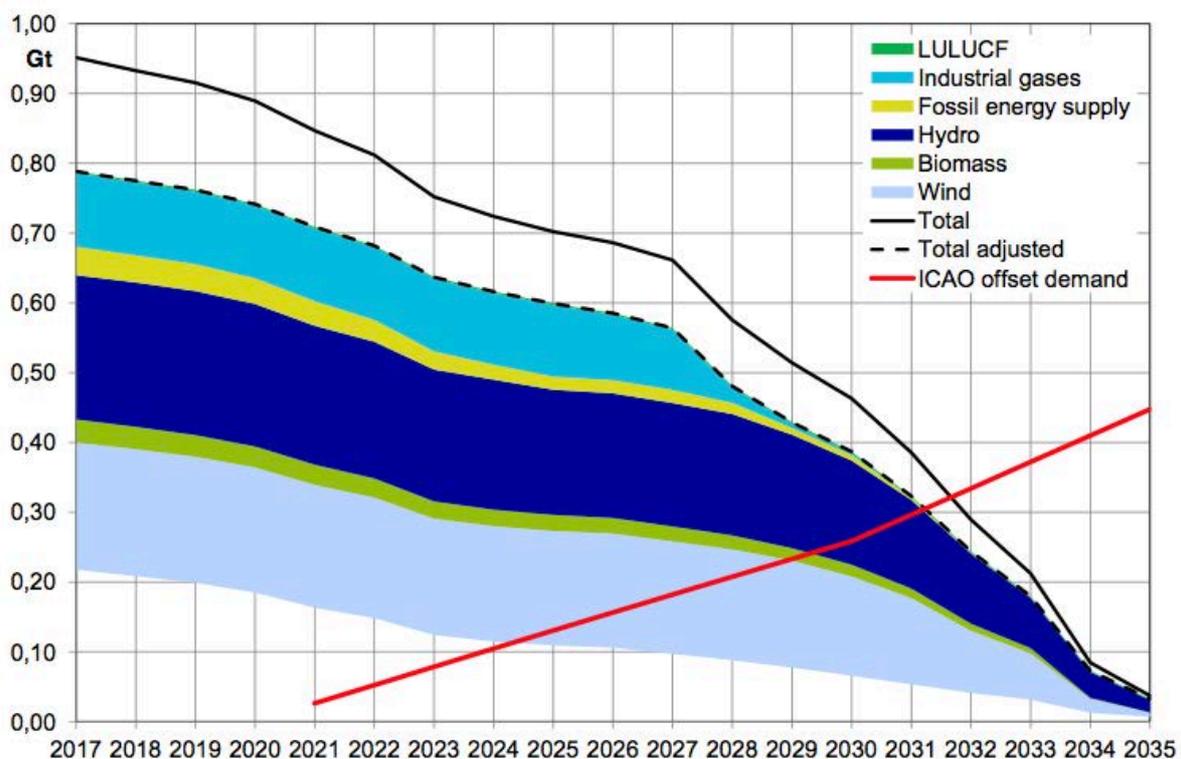


Figure 3: CDM Offset Supply and Demand 2017-2035. Source: Cames (2015).

emission growth of international aviation for the period 2021 until 2035 (see figure 3) (ibid).

Given the current low CER prices, many CDM projects have refrained from verifying emission reductions and / or requesting issuance of credits. However, Warnecke et al. (2015), by surveying a representative sample of over 1300 CDM projects, found that the vast majority of CDM projects are still operating regularly. Only 15% have permanently stopped their mitigation activities. Also, a strong majority could return to regular operation including verification and issuance at rather moderate price levels: 53% of all projects could resume verification and issuance activity at prices below EUR 5 per CER and 82% at EUR 10 (ibid).

This research also shows that considerable capacities exist on the supply side. There is ample experience in applying the CDM's tools and methodologies and this treasure trove will remain in the open space even if the CDM was completely shut down after 2020 without any form of transferring or transforming it in a different instrument.

After an initial backlog and relatively long lead times for project registration, the CDM's administrative infrastructure managed to register 3236 projects representing annual emission reductions of 364 Mt CO₂e and estimated cumulative emission reductions of 5.67 Gt CO₂e until 2030 (UNEP DTU, 2015). This accomplishment is even more impressive considering that the first CDM projects were registered by the end of 2004 only. Within seven to eight years, the CDM managed to build up capacities for designing and registering projects that are capable of satisfying twice the expected accumulative demand from international aviation. While a lot of the human capacities that contributed to this accomplishment are currently running idle due to the slump of CER prices, the history of the CDM has shown with confidence that sufficient supply will be available to satisfy ICAO's demand for offsets.

4.2 The CDM: A Learning Mechanism

The history of the CDM has also shown that offset crediting is a tricky business. Methodologies were developed that turned out to be inapplicable or, to the contrary, that were too generous or contained flaws in the assessment of the additionality of projects. The CDM has been confronted with criticism regarding its environmental integrity, lack of contribution to sustainable development, and high operational complexities.

However, the transparency of the framework has allowed to identify loopholes and design failures and a continuous reform process has strongly improved the integrity of the mechanism over time (Shishlov & Bellassen, 2012). For example, the geographical distribution of projects as well as the distribution among sectors was improved significantly with the introduction of Programmes of Activities and Standardized Baselines; the Secretariat has streamlined the administrative processes and achieved a much more efficient management of the registration process; and dubious methodologies, e.g. early versions of the methodology for the abatement of HFC emissions, were revised and improved to maintain environmental integrity.

The CDM followed a 'learning by doing' paradigm. This turned out to be key to maintain the mechanism's credibility. Without its governance structure, the CDM Executive Board and its Panels and without a robust political mandate for those bodies, the early success of the CDM would have been impossible. The lesson to learn for ICAO here would be, that in order to maintain an integer and credible global MBM, it is necessary to have continuous oversight and to be prepared to take great care of the details as problems will almost certainly emerge and require (political) attention.

5 ICAO's Global MBM and the Paris Agreement

Under the UNFCCC, a new climate agreement has been agreed in Paris in December 2015 (for a detailed analysis see Obergassel et al., 2016). The Paris Agreement does not explicitly mention carbon markets, but enables market-based approaches in several ways. One distinct feature is a new mechanism which is to “promote the mitigation of greenhouse gas emissions while fostering sustainable development” (UNFCCC, 2016, Paris Agreement, Art. 6.4; see also paras 37-40). While building on the experiences of the flexible mechanisms of the Kyoto Protocol, the scope of this mechanism is broader in that it is not restricted to project-type activities. Furthermore, it is to “deliver an overall mitigation in global emissions”, thus going beyond the zero-sum game of the Kyoto Mechanisms to date. The deviation from the Kyoto world is also mirrored in the fact that both developed and developing countries can use the mechanisms, leading to a kind of hybrid between the Clean Development Mechanism and Joint Implementation, respectively. Other features of this mechanism include oversight by the UNFCCC, participation of public as well as private entities, and the prohibition of double counting (i.e. accounting for emission reductions at the same time in the inventories of the host country as well as in the budget of the receiving country).

The decision text tasks the Subsidiary Body for Scientific and Technological Advice (SBSTA) with elaborating modalities and procedures for this mechanism (UNFCCC, 2016, paras 37–40). The decision text names important principles in this context, namely that reductions must be “real, measurable and long-term”. Further, re-

ductions must be additional, relate to yet-to-be defined ‘specific scopes’ of activities, and be verified and certified by designated operational entities (DOEs).

Moreover, the Paris Agreement allows Parties to conduct “cooperative approaches.” (UNFCCC, 2016, Paris Agreement, Art. 6.2). Under these, mitigation outcomes can be “internationally transferred” and “used” against nationally determined contributions. The respective article 6.2 names environmental integrity, transparency and robust accounting as the core principles guiding these approaches, while UNFCCC oversight is not foreseen. Instead, the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA) is to develop dedicated guidance.

To what extent these two approaches will actually be utilized remains to be seen. A couple of countries have indicated to use carbon markets in order to achieve some of their mitigation contribution. However, most of these countries are developing countries or emerging economies that have pledged to increase their mitigation ambition on the condition that they receive financial support through carbon markets. Only a small number of countries have indicated that they are willing to buy credits in addition to domestic mitigation. Even the EU, who has been a strong proponent of international carbon markets in the past, also has formulated its INDC in terms of a purely domestic mitigation goal, the use of international emission units is currently not foreseen (Obergassel, 2015).

The CDM, being an instrument of the Kyoto Protocol, was not transferred to the Paris Agreement. Future technical negotiations will determine whether existing CDM projects can be transferred to the newly established mechanism referred to above. Therefore, it would not be appropriate for ICAO to exclusively rely on existing UNFCCC mechanisms at this point of time.

However, the ongoing negotiations under UNFCCC remain of vital importance for any ICAO decision. One of ICAO's own eligibility and integrity criteria is the avoidance of double counting. The Paris Agreement has created a significantly different structure than the Kyoto Protocol including the need for a very different type of accounting framework.

Under the Kyoto Protocol accounting framework, the binding mitigation obligations of developed countries were translated into assigned amount units (AAUs). Each developed country only complies with its obligation if it can provide one AAU per ton of its actual emissions. Developing countries did not have any obligations and thus no AAUs. The world was thus divided into a capped environment (developed countries with assigned amounts) and an uncapped environment (developing countries). The CDM was introduced as a mechanism to generate and certify emission reductions in the uncapped environment.

The structure of the negotiations on Intended Nationally Determined Contributions (INDCs) at its core already determined that the world will look much different in the new Agreement. The majority of countries has formulated their INDC in terms of nation-wide mitigation contributions, but these contributions will not be converted into assigned amounts. Moreover, not all countries have communicated their contributions in terms of absolute emission goals. Alternative metrics are intensity goals (emissions per units of GDP), or reductions below a business-

as-usual scenario (see also Kreibich & Obergassel, 2016).

Under all of these nation-wide contributions the same problem arises: Any mitigation activity will count towards the achievement of the national mitigation contribution of the host country. Unless the units generated by that mitigation activity are explicitly accounted for in the country's inventory, double claiming will occur. This holds true not only for CDM-style international standards or protocols, but also for voluntary standards.

The Paris Agreement's accounting framework will be elaborated in the coming years. As long as this as this task is not accomplished, it is almost impossible to avoid double claiming of emission reductions. For the use of international carbon markets, a robust accounting framework is therefore a prerequisite. As long as there is no clarity on this issue, it is virtually impossible to adhere to ICAO's own draft recommendations on the eligibility of emission units.

6 Conclusions

Under the UNFCCC, parties are preparing a new comprehensive global climate agreement to be adopted in Paris. However, this agreement is not going to cover two important sectors: international aviation and shipping. Separate negotiations are ongoing under the dedicated UN bodies ICAO and IMO. This Policy Brief provided a short overview of the state of play of the negotiations in the aviation sector.

The negotiation process under ICAO

Progress on addressing aviation emissions under the ICAO has been slow. In 2010, ICAO agreed on an aspirational goal two cap net emission at 2020 levels, and to achieve carbon neutral growth after 2020. A basket of measures is to be considered to achieve this. A central role will be played by a yet-to-be-adopted global market-based measure (MBM), a mandatory offsetting scheme that will be used to compensate for any excess emissions above the 2020 baseline from 2021 onwards.

The global MBM is supposed to be adopted at ICAO's 39th Assembly in autumn 2016. Currently, preparatory work is ongoing: The Environmental Advisory Group (EAG) established under the ICAO Council oversees and coordinates the process and deals with the policy aspects. The question of how differentiation among developed and developing countries can be achieved without discriminating against aircraft carriers based on their country of origin is one of the core challenges to be addressed. Route-based differentiation was proposed to solve this dilemma – obligations to offset emission growth would be distributed equally among carriers serving the same route, irrespective of their country of origin.

Two technical committees are dealing with eligibility criteria for the emission units (EUC) under the scheme and provisions for measuring, reporting and verification (MRV) respectively. The two sub-groups have made substantial progress and the current draft recommendations provide a solid basis for a robust mandatory offsetting scheme.

Carefully design the governance structure

What is yet missing, however, is more detailed provisions with respect to the governance structure for the scheme. Who gets to decide on the eligible offset programmes? How compliance with the eligibility criteria ensured after a programme has been accredited?

The experience of the CDM has shown that addressing these questions is key for maintaining the credibility and environmental integrity of an offset crediting scheme. The transparency of the CDM's governance framework allowed for a continuous reform process that ultimately led to robust procedures and methodologies that have been taken up not only at the international level, but also by many national offsetting schemes and by the voluntary carbon market.

If ICAO wants its global MBM to be credible over the long term, it thus needs to carefully design the details of its offsetting schemes. Either it establishes a permanent body following the example of the CDM Executive Board that continuously oversees the offsetting scheme. As an alternative, it could allow 'internationally accepted' units only and leave oversight onto these to the UNFCCC.

Supply is abundant

Some have argued that ICAO should not restrict its supply too much by limiting itself to specific offsets protocols. However, the experience with the CDM shows that fears over lack of demand and consequently high compliance costs are unfounded. Analysis shows that even the remaining CDM pipeline can supply more than the entire projected demand of international aviation.

Even if the CDM as a source of supply may not be available for international aviation, it still demonstrates the efficacy and proficiency with which offsetting schemes can operate. The CDM reached its peak of proficiency in 2012, only eight years after the first projects had been registered. Substantial capacities exist and will prevail even in the event that the CDM will not be continued after 2020. This includes, for example, the CDM's tools and methodologies that will remain in the public domain in any case. With sufficient lead time, there will be plenty of supply to satisfy the demand from international aviation.

The Paris Agreement: A fresh start for carbon markets?

With the Paris Agreement on the horizon, global carbon markets suffered from a lot of uncertainty. While the Paris Agreement does include provisions that allow for market-based mitigation, not much of the uncertainty was resolved. The it remains to be seen if existing CDM projects, its tools and methodologies will be transferred to the newly established mechanism to "promote the mitigation of greenhouse gas emissions while fostering sustainable development". Also, the nature of the national contributions will require an accounting framework fundamentally different from what we know from the world of the Kyoto Protocol. The aspect of the accounting framework has not yet been addressed in the negotiations of the Paris Agreement in any depth. This is one of the chal-

lenges that have to be worked out in the 'fine print' to the agreement that will have to be developed in the years to come.

The integrity of international carbon markets critically hinges on a robust accounting framework. If certified emission reductions are not clearly accounted for in the inventories of the host countries, every mitigation activity will automatically contribute to complying with the host countries' mitigation contribution / commitment. Ultimately, this could lead to a situation in which emission reductions are claimed both by the host countries and the ICAO towards achieving their mitigation goals, thus leading to double counting.

Take your time

We therefore recommend that ICAO does not conclude the discussion on emission unit criteria or even accredit certification programs or protocols to be eligible. While robust criteria and a transparent accreditation process should form an integral part of the MBM decisions to be taken at ICAO's 39th Assembly, ICAO should not prematurely designate any offset programmes / protocols before the issue of the accounting framework under the Paris Agreement is resolved. While this may restrict the ability to contribute to 'early action' – much needed emission reductions in the time before 2020 – it would also make sure that ICAO's contribution to mitigating climate change is real and additional to the efforts under UNFCCC.

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Wuppertal Institute

for Climate, Environment and Energy

P.O. Box 100480

42004 Wuppertal

GERMANY

www.wupperinst.org

