Key design elements of a market-based scheme to address international aviation emissions through carbon offsetting

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Fri 10 Oct 2014 – The global market-based mechanism (MBM) under development at ICAO aims at achieving carbon-neutral growth of international aviation through emission reductions combined with offsetting. This means that if international aviation CO2 emissions are above the 2020 level (the target), the difference between actual emissions and the target will need to be offset. While this would be a collective responsibility of the sector, different entities could be made responsible for parts of the collective obligation. Rules should be designed in a way that the covered entities are also incentivised to further reduce their emissions.

The environmental integrity depends on the correct monitoring and reporting of emissions as well as on a high quality of offsets to ensure that they are backed by real emission reductions. At the same time, administrative costs and complexity should be as low as possible without endangering the environmental integrity.

The scheme should not lead to distortion in competition, be difficult to evade and should minimise carbon leakage in order to ensure that all aviation emissions are covered and thus the environmental integrity is protected. If the scheme is easy to evade or it is possible to shift emissions so that they are not covered by the scheme, the principle of non-discrimination would also be undermined.

Global coverage is essential to maximise the environmental effect of the offset scheme. At the same time the offset scheme should be designed in such a way that it accounts for the specific situation of the States covered. Since earlier efforts to address the specific situation of States through the redistribution of revenues raised by a market-based instrument did not find sufficient support, our concept for the Scheme aims at avoiding the generation of any revenues.

Determining the accountable entity

First of all, it needs to be defined which entity would be accountable for purchasing offsets. There are many relevant actors in the aviation sector such as passengers, shippers, airlines, aircraft operators, airports, fuel suppliers, air navigation service providers (ANSPs), States or ICAO which may be assigned the responsibility of acquiring offsets. This decision will not have a major impact on most guiding principles – but it does influence administrative costs.

In order to keep the administrative efforts of the system low, it makes sense to keep the number of entities low and the number of information exchanges to a minimum. To enhance the incentive to reduce emissions and align it with the 'polluter pays' principle, it is expedient to involve entities that have control over emissions. The first criterion rules out passengers or shippers; the second one makes entities that do not monitor emissions or receive emission reports – such as airports, ANSPs and States – less suitable candidates. Hence, we see two options for the entity buying the offsets:

- Aircraft operators can directly monitor emissions, calculate the amount of offsets they need to buy and could pass on the costs of offsets to consumers; or
- A central organisation established under or mandated by ICAO buys offsets based on emission reports from aircraft operators and divides the costs among them.

In both cases the costs for offsets would finally either directly or indirectly incur at the aircraft operator level. Since these costs would increase the operational cost, aircraft operators would be additionally incentivised to further reduce emissions by enhancing operational efficiency. However, in terms of administration, the options are different.

When offsets are to be bought by a central organisation, the organisation which oversees the Scheme would be an obvious option. The organisation can aggregate the total emissions covered and can thus easily determine the amount of offsets which need to be purchased in a given year. If the central organisation purchases the offsets, the aircraft operators would not be required to surrender offsets but to transfer the amount of money equivalent to the number of emissions to be offset in the respective year times the average offset purchase price of the central organisation in the same year.

A central organisation could probably achieve economies of scale in buying offsets and acquire them at a lower price. However, as this organisation would handle large sums of money, strong oversight would be required, and the organisation would need to set up an administrative branch to handle payments from aircraft operators. This would reduce the benefit of lower costs to some extent.

The possible economic benefits of a central organisation have to be weighed against a number of disadvantages. There may be political objections to a central organisation charging aircraft operators directly as this could be interpreted as taxation by an international organisation. The organisation may need to be empowered with enforcement mechanisms to ensure payments. And since the organisation would not know the costs of the offsets in advance, aircraft operators may face an uncertainty in terms of the costs they incur.

If aircraft operators bought the offsets, the costs of the offsets could be higher. However, aircraft operators could develop strategies to manage these costs similar to the strategies used for aircraft fuel costs, which could give them a competitive advantage over other operators. In doing so, they could achieve a higher level of certainty over the costs. In this option, aircraft operators would not need to pay a central international organisation.

On balance, we consider the advantages of requiring aircraft operators to buy offsets to be larger than the benefits of a central organisation, mainly because of the economic freedom it provides to aircraft operators and the lack of a need for payments to be made to a central organisation.

Breakdown of the target

Entities would need to buy enough offsets so that the total amount of offsets equals the amount of emissions exceeding the target. If aircraft operators are obliged to purchase offsets, each operator would need to know how many offsets it has to buy. Basically, there are at least the three following options:

1. Individual rate: Divide the target among aircraft operators so that each of them has its own target.
2. Sectoral rate: Determine a share of actual emissions which needs to be offset.
3. Hybrid option: One part of the requirement to offset emissions would be determined through option 1 while the other part would be determined through option 2.

Under option 1, each aircraft operator would be required to offset all emissions above its 2020 level. Aircraft operators with emissions below or equal to their 2020 emissions would have no need to acquire offsets. In this way the sector-wide target would be broken down among the aircraft operators. There are several ways to divide the target among aircraft operators. The division could be based on emissions in a base period, or on transport performance in a base period (benchmarking).

If the division is based on historic emissions, it would have the advantage that the emissions can be determined unequivocally. Each participant gets the direct incentive to keep emissions below his historical base period emissions, the costs per emission above the threshold are directly translated into the cost for offsets. The disadvantage is that operators which have reduced their emissions before or in the base period (early action) would not be rewarded. Moreover a special increase of 2020 emissions might be induced by operators resulting from the knowledge that these emissions will be counted as the individual baseline.

Operators with faster growing activities would, in addition, have a rapidly increasing shortfall. A division based on historic transport performance rather than emissions would not penalise early action (since aircraft operators which have lower emissions per revenue tonne kilometre (RTK) would need to require fewer offsets) but would still leave faster growing aircraft operators short.

Under option 2, the target would not be divided. All aircraft operators would instead be obliged to offset a certain share of their actual emissions. If the target in a given year is, for example, equivalent to 80% of the total emissions, on average each aircraft operator would have to offset 20% of its emissions in that year. This offset share can be determined either ex-ante (e.g. for year x+1 based on the emissions in year x-1) or ex-post. If it is determined ex-post, aircraft operators would need to estimate the expected share when deciding on the offset acquisition strategies.

However, since they already need to handle many uncertainties in their strategies such as demand and fuel price, the incorporation of the offset price may not be problematic, particularly as this uncertainty is somewhat linked to individual and global output. If the offset share is determined ex-ante, this uncertainty is apparently eliminated. However, since it is unlikely that the target is exactly met, any shortfall or excess in offsets needs to be corrected ex-post. The difference between both options in terms of environmental integrity is likely to be negligible but the ex-post approach seems to be administratively somewhat leaner.

Under option 3, parts of the emissions would be determined by option 1 while the other part would be determined by option 2. The contribution of option 1 and 2 for determining the actual offset requirement may also vary over time so that the contribution of one of the options may decreases over time while the contribution of the other option would increase.

If the target is not divided (option 2) all entities need to acquire the same amount of offsets per unit of emissions, whereas in the case of a division of the target (option 1) some operators might have to acquire offsets and others might not need to, or to a lower extent. So in the case of no division, all aircraft operators would have a similar incentive to reduce emissions as it would reduce their costs whereas in the case of a subdivision of the threshold only those operators with a shortfall would have the incentive.

Both options are aligned with the 'polluter pays' principle, though not entirely. If the target is not divided, each polluter pays for only a share of the additional emissions it causes. If the target is divided, growing aircraft operators pay the full costs of additional emissions, but stagnant or decreasing aircraft operators do not pay, even though they emit.

An advantage of option 1 is that the marginal costs of emitting CO2 equal the social costs. In theory, this would lead to a socially optimal level of emissions. In option 2, the marginal costs of emitting CO2 would be lower than the social costs, resulting in emissions that are higher than socially optimal, but lower than in a situation without the Scheme.

An advantage of option 2 is that it does not require the politically difficult process of dividing the target among aircraft operators. To avoid lock-in of the aviation market's current structure, such division would involve designing several additional provisions for fast-growing routes or aircraft operators, for reflecting early action, and for new entrants and aircraft operators ceasing operations. In several market-based instruments and in setting standards, these issues have proven to be very difficult to handle. It is expected that dealing with such issues in a global system with very different starting points of states, routes and aircraft operators, this would be even more difficult.

Moreover, such distributional processes are subject to lobbying and do not always lead to fair results. Unfair target-setting for individual aircraft operators could result in market distortions. Since option 2 bypasses the process of setting targets for aircraft operators, it does not distort markets.

However, a significant drawback of option 1 and 2 is that they put a relatively higher burden on either fast-growing aircraft operators (option 1) or incumbent aircraft operators (option 2). Neither of these options may thus be acceptable for all aircraft operators. Option 3 would include elements from both options and would neither give a relative advantage to fast growing or incumbent aircraft operators but strike a balance between the diverging interests. Specific provisions for fast growth or new entrants would not be required since these developments of the market structure would implicitly be reflected through the part of the requirements based on actual emissions so that at least some complexity could be avoided. The following table summarises the different pros (▲) and cons (▼) of each of the options:

	1) Individual rate	2) Sectoral rate	3) Hybrid (x/y%)
Environmental integrity	▲ Incentives to reduce emissions within the aviation sector	▼ Incentives to purchase offsets (rather than reducing emissions within the sector)	▲ ▼ Incentives to reduce emissions within the aviation sector higher than in option 1 but lower than in option 2
Environmental economics	▲ ▼ Aircraft operators have the same marginal costs (=social costs) provided that emissions are above the individual baseline	▲ ▼ Aircraft operators have the same average costs	▲ ▼ Aircraft operators have neither the same marginal nor the same average costs
Early action	▼ ▲ Early movers would be penalised (fewer base period emissions); could be addressed through a benchmark approach	▲ Early movers would implicitly profit (fewer actual emissions)	▲ Early action should be addressed through a benchmark approach and would implicitly profit in the part of the requirement determined by option 2
Fast growth	▼ Higher burden on growing aircraft operators than on incumbent aircraft operators	▲ No specific provisions for reflecting growth required	▲ Changes in the market structure can be reflected by Option 2, no specific provisions for reflecting growth required
New entrants	▼ May require establishing a reserve including rules how to fill and how to use it	▲ No specific provisions for reflecting new entrants required	▲ Changes in the market structure can be reflected by Option 2, no specific provisions for reflecting new entrants required
Individual emissions declining below the 2020 baseline	▼ May require establishing specific provision	▲ No specific provisions required; would be reflected implicitly	▼ May require establishing specific provision for option 1
Perverse incentives	▼ Incentive to increase emissions in the base period	▼ Tragedy of the commons (all have to pay if some increase their emissions)	▼ Incentive to increase emissions in the base period and tragedy of the commons
MRV	▼ Route specific data for base period and actual years required	▲ Route specific data only in actual years required	▼ Route specific data for base period and actual years required
Administrative issues	▼ High complexity, special provisions for early action, new entrants, etc. required	▲ Low complexity, fewer provisions to reflect market developments	▲ Low complexity, fewer provisions to reflect market developments
Political support	▲ ▼ Preferred by large incumbent aircraft operators	▲ ▼ Preferred by fast growing aircraft operators	▲ Could balance interests of incumbents and growing aircraft operators

Option 1 takes account of the specific situation of incumbent aircraft operators which already have a large volume of traffic. In their past decisions they could not take into account the new regulation which would be introduced by the Scheme. In this regard, fast-growing aircraft operators are in a better position because they do not yet have a large traffic volume and can consider the new requirements when they decide on extending their traffic supply. This difference in starting positions justifies the inclusion of option 1 into the hybrid option.

However, incumbent airlines have also gradually improved their carbon efficiency in the past. Due to these autonomous efficiency gains they can provide their base year traffic volume with significantly less CO2 emissions in the future. The contribution of option 1 to determining the offset requirements could therefore be gradually reduced over a period of about 10 years so that at the end of that period the requirement would be purely based on the sectoral rather than on the individual rate, which – at that time – would be derived from a somewhat distant period in the past and does not have to deal significantly with the actual market situation at the end of that period.

Environmental integrity

The quality of offsets is important for the environmental integrity of the Scheme because CO2 emissions will not be reduced in the aviation sector itself but elsewhere. If the certificates used to offset CO2 emissions in

the aviation sector are not issued for real emission reductions, global CO2 emissions would not be reduced. Therefore only offsets, which represent measurable and additional emission reductions with long-term benefits for the environment, should be eligible under the Scheme:

- Emission reductions need to be additional to ensure that the emission reduction would not have happened anyhow because it would have been economically attractive or required for other reasons (e.g. air quality).
- Long-term benefits are required in order to guarantee that the reductions are permanent and are not released again.

If the offsets stem from cap-and-trade schemes, it needs to be ensured that the targets of these schemes are significantly below the business as usual projections and do not result in so-called hot air, i.e. offsets which do not represent a real emission reduction. Moreover, it has to be ensured that units surrendered for offsetting emissions under the Scheme are not used for other purposes elsewhere to avoid any double counting.

Currently, it is difficult to predict which offsets would be available after 2020. The variety of potential offsets may include:

- units generated under the Kyoto Protocol's flexibility mechanisms, Clean Development Mechanism (CDM), Joint Implementation (JI) and International Emissions Trading (IET) among Kyoto Protocol Parties, provided that these mechanisms remain available after 2020;
- units issued under sectoral mechanisms currently negotiated under the UNFCCC;
- units generated by countries or groups of countries under domestic emissions trading schemes or other market-based instruments; and
- units issued by private initiatives such as the Gold Standard or the Verified Carbon Standard (VCS), currently mainly aimed at offsetting emissions from companies under corporate social responsibility (CSR) initiatives.

The outcome of the UNFCCC negotiations is difficult to predict. Many developed countries consider market-based mechanisms as a central building block of the new global climate agreement, but diverge regarding the way in which new mechanisms should be designed and existing mechanisms should be improved. Many developing countries highlight that market-based mechanisms require a level of mitigation ambition high enough to generate a market price and consider the implementation of such mechanisms contingent on the outcome of the negotiations on mitigation targets. Some developing countries reject all market-based approaches under the UNFCCC since they consider the commodification of natural resources as the cause rather than the solution of climate change.

Since the outcome is uncertain, it is difficult to determine which units will be available after 2020 and to what extent they represent reliable offsets that ensure environmental integrity. It would be premature to limit the eligibility of specific units within the Scheme at this point because changes in the design of market-based mechanisms may, in the course of the negotiations, make their environmental quality better or worse. Currently, it is more important to agree that any unit used for offsetting aviation emissions must not undermine the environmental integrity of the Scheme and to agree on the general criteria for assessing whether this requirement has been fulfilled or not.

Units issued under the UNFCCC may in principle be eligible. However, past experience shows that the environmental integrity of many offsets issued under the UNFCCC has also been questioned. Concerns have been raised with regard to units issued under the CDM over a number of issues. To address loopholes, the European Union excluded certain unit types for compliance under the EU Emissions Trading Scheme (EU ETS). Units from CDM projects reducing industrial gases such as HFC-23 and nitrous oxide from adipic acid production were excluded from the third period of the EU ETS. Units from hydropower projects that did not comply with the requirements of the World Commission on Dams were excluded from the start of the EU ETS. Similar eligibility requirements may be needed to ensure the environmental integrity of the international aviation emissions Scheme.

Another option would be also to establish project-based aviation offsets. Such units may be attractive from the perspective of aircraft operators if they also develop their own mitigation projects which they can use in their environmental communication strategies. Since the Scheme will eventually cover all aviation emissions, such

offset projects need to be established outside the core aviation sector and may include measures such as efficiency improvements or fuel switch of airport buildings or improvements of ground logistics.

A fundamental question for this approach would be whether the administration – including scrutinisation and verification of the design and implementation of such mitigation projects – should be established under the ICAO or elsewhere. Since such measures are quite similar to projects types which are already established under the CDM, we do not see any merit in establishing parallel structures under ICAO but rather recommend developing such aviation specific offsets projects under the CDM, provided that it would be available after 2020.

The key design elements

The design of the Scheme aims at ensuring carbon-neutral growth of the aviation sector with a minimum of administrative complexity. In addition, global coverage and the minimisation of carbon leakage have been guiding ideas, always reflecting the need to take into account the specific situation of States. Contentious debates on the distribution of revenues with a high risk for continuing the prevailing deadlock are also avoided since the Scheme does not involve any financial flows except for the direct purchase of offset units by aircraft operators. Key design elements of such a scheme and their recommended characteristics can be summarised as follows:

- The accountable entity for buying the offsets should be the aircraft operator:
  - Offset acquisition is done by those who have the direct incentive to reduce emissions;
  - Reduction of administrative costs; and
  - Costs of offsets are not perceived as a charge, leading to higher political acceptance.
- The amount of offsets to be purchased by aircraft operators would be determined based on both the sectoral and individual rate (hybrid option):
  - All aircraft operators would have a similar incentive to reduce emissions;
  - The hybrid option strikes a balance between the conflicting interests of incumbent and fast growing aircraft operators; and
  - No elaboration of provisions for new entrants and fast-growing aircraft operators is needed.

The environmental integrity of the scheme strongly depends on the quality of offset units which shall be used to compensate CO2 emissions from aviation. Therefore only offsets which represent measurable and additional emission reductions with long-term benefits for the environment should be eligible under the Scheme.

Certainly, many more details need to be discussed and agreed. However, these basic design elements could constitute a good starting point for developing the global aviation carbon offset scheme under ICAO since it provides a design for an offset scheme which covers all countries, takes into account differences among countries and would enable the aviation sector to contribute appropriately to the global challenge of addressing climate change.

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