WWF

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AVIATION REPORT:

Market Based Mechanisms to Curb Greenhouse Gas Emissions from International Aviation

EXECUTIVE SUMMARY

INTRODUCTION

In July 2012 WWF's Global Climate and Energy Initiative commissioned a study to generate knowledge about, and contribute analyses and options for the design of an international agreement to reduce greenhouse gas emissions from the international aviation sector, based on market based measures (MBMs). This document serves as an executive summary of the study.

WWF

WWF is one of the world's largest and most experienced independent conservation organisations, with over 5 million supporters and a global network active in more than 100 countries. WWF's mission is stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

The Global Climate & Energy Initiative (GCEI) is WWF's global programme addressing climate change and a move to 100% renewable energy through engagement with business, promoting renewable and sustainable energy, scaling green finance and working nationally and internationally on low carbon frameworks. The team is based over three hubs – Mexico, South Africa and Belgium.

: vivideconomics

Company Profile
Vivid Economics is a leading strategic economics consultancy with global reach. We strive to create lasting value for our clients, both in government and the private sector, and for society at large.

We are a premier consultant in the policy-commerce interface and resource- and environment-intensive sectors, where we advise on the most critical and complex policy and commercial questions facing clients around the world. The success we bring to our clients reflects a strong partnership culture, solid foundation of skills and analytical assets, and close cooperation with a large network of contacts across key organisations.

AVIATION ENVIRONMENT TRUST

Aviation Environment Trust was founded in 1978 to advance knowledge and understanding of aviation's environmental and amenity impacts, through research and education. The Trust, which is the only UK charity operating exclusively in this field, conducts and sponsors research with the aim of raising awareness and producing innovative solutions to reduce civil aviation's local and global environmental effects.

Registered charity: 276987

BACKGROUND

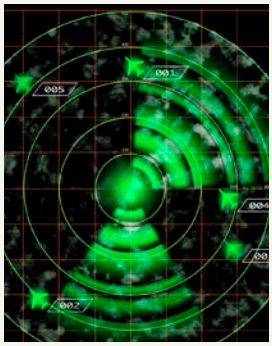
Global warming is a serious threat to people and ecosystems, and there is a strong case for substantially reducing emissions of greenhouse gases, including carbon dioxide from the fast-growing aviation sector. Civil aviation accounts for 2 per cent of global CO_2 emissions and, when its non-CO_2 impacts are factored-in, contributes 4.9 per cent of anthropogenic contributions to global warming. Dramatic growth is forecasted in the demand for air travel over the next couple of decades in all geographic regions, with annual growth rates in Revenue Passenger Kilometres between 2010 and 2030 ranging from 3 to 6.2 per cent. Even allowing for new technology, fuel projections out to 2050 show over a 250 per cent increase against 2006 levels, with levels in 2050 equivalent to 2,200 Mt of CO_2 per annum.

In-sector emission reductions from technology, operations and alternative fuels are unlikely to be sufficient to keep pace with the growth in traffic, and market-based measures (MBMs) may be able to meet the shortfall. For this reason, both the International Civil Aviation Organisation (ICAO) and industry (ATAG) have set their respective 2020 and 2050 goals based on CO_2 net reductions, allowing for the purchase of emission units from other sectors.

CONSIDERATION OF MBMs FOR THE AVIATION SECTOR

Article 2.2 of the Kyoto Protocol in 1997 required developed countries to pursue the limitation or reduction of emissions from international aviation working through ICAO. Since then, ICAO has been unable to reach a consensus on a global MBM, although ICAO negotiators have worked to bridge differences on the potential role of emissions levies, an aircraft efficiency charge, and open and closed emissions trading schemes. A perceived conflict between ICAO's principle of non-discrimination (the similar treatment of all carriers on a given route irrespective of nationality) and the UNFCCC's principle of Common but Differentiated Responsibilities and Respective Capabilities (CBDRRC) have added complexity and challenge to the ICAO negotiations. Many developing countries interpret CBDRRC to mean their airlines should not be subject to emissions reduction obligations.

The absence of a global measure for international aviation (including the absence of duty on fuel) has made aviation emissions a high priority for other advisory and policy-making bodies. The UN Secretary General's High Level Advisory Group on Climate Finance (AGF) identified international aviation, along with shipping, as potential sources of climate finance for developing countries, and subsequent work by the World Bank estimated that these sectors could generate up to $40 billion per annum by 2020 with a carbon charge of $25/t$CO_2$. The work introduced the idea of compensating developing countries for their costs of participating in a global scheme, in which case up to $24 billion in climate finance could be available annually from measures to reduce aviation and shipping emissions. By creating a mechanism for differentiating developed and developing country commitments, climate finance from the aviation sector offers the possibility of breaking a key deadlock in ICAO's negotiations. ICAO stakeholders have not all responded enthusiastically to the suggestion of aviation contributing to climate finance, but this option has led to renewed efforts within the organisation to reach agreement on a global MBM to deliver its goal of no net increase in emissions from 2020 onwards. This goal assumes that aviation sector activity and emissions will continue to increase, and therefore also assumes that the carbon markets can play a role in offsetting the growth of aviation beyond 2020 levels.



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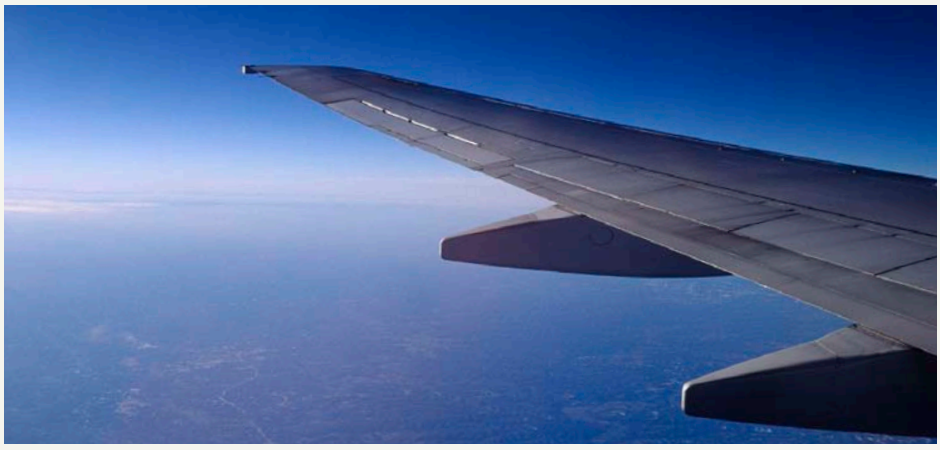
In addition, pressure is being exerted from the EU's 2008 decision to include aviation in its Emissions Trading System (ETS) from the start of 2012, a decision that has brought strong criticism and opposition from many non-EU States including the US, China, India, Brazil and Russia, with some threatening retaliatory action. An ICAO decision to implement an appropriate global scheme could provide an acceptable solution for parties on all sides of the debate.

MBM OPTIONS

ICAO plans to agree a proposal for a global MBM at its March 2013 Council meeting and has created a working group, supported by experts, to evaluate a range of options. The three options still under consideration include offsetting, offsetting with a revenue generation mechanism and a global cap and trade ETS. All the options rely on access to out-of-sector allowances and project credits through the carbon markets to allow the industry's gross emissions to grow above the 2020 target. The fundamental difference is that a cap and trade system requires the creation of aviation allowances for all emissions under the cap, thus covering all emissions from flights. Both the cap and trade option and the offsetting with a revenue distribution option have the potential to raise revenues. Those revenues could be used to fund further in-sector reductions, contribute to climate finance and/or compensate developing countries in other ways.

ICAO has ruled out further consideration at this time of an emission levy based solely on the objection that the 2020 environmental goal, without access to the carbon markets, would require a relatively high cost to influence demand (estimated in a report commissioned by ICAO to be in excess of $\$350/tCO_2$). However, set at a lower rate, a fuel/carbon levy could generate significant revenue that, in part, could fund the purchase of emissions unit credits or allowances. Unlike ICAO's option for offsetting plus a revenue generation mechanism, this option would apply a price to all fuel sold or CO_2 emitted, raising more revenue and ensuring that consumers bear the full cost of their flight. Like most levies, these are relatively straightforward to collect and administer, and could even be applied upstream on fuel suppliers to reduce the number of participants. This alternative approach has been considered in this study, alongside options currently under consideration by ICAO.

The effectiveness of each option will be dependent on the design criteria selected, including decisions on the participants, the stringency of the environmental target, the availability and quality control of offsets, and the coverage of emissions which depend, in part, on exclusions and de minimis provisions that could exempt small carriers, the size of aircraft and/or some developing countries with a minimal share of international aviation. The study considered these elements against a series of assessment criteria consistent with the approach being taken by ICAO (and, in relation to an MBM for shipping, by IMO) to determine how well each option performed against the study's objectives. The results are presented in full in the Annex. This assessment is summarised here.



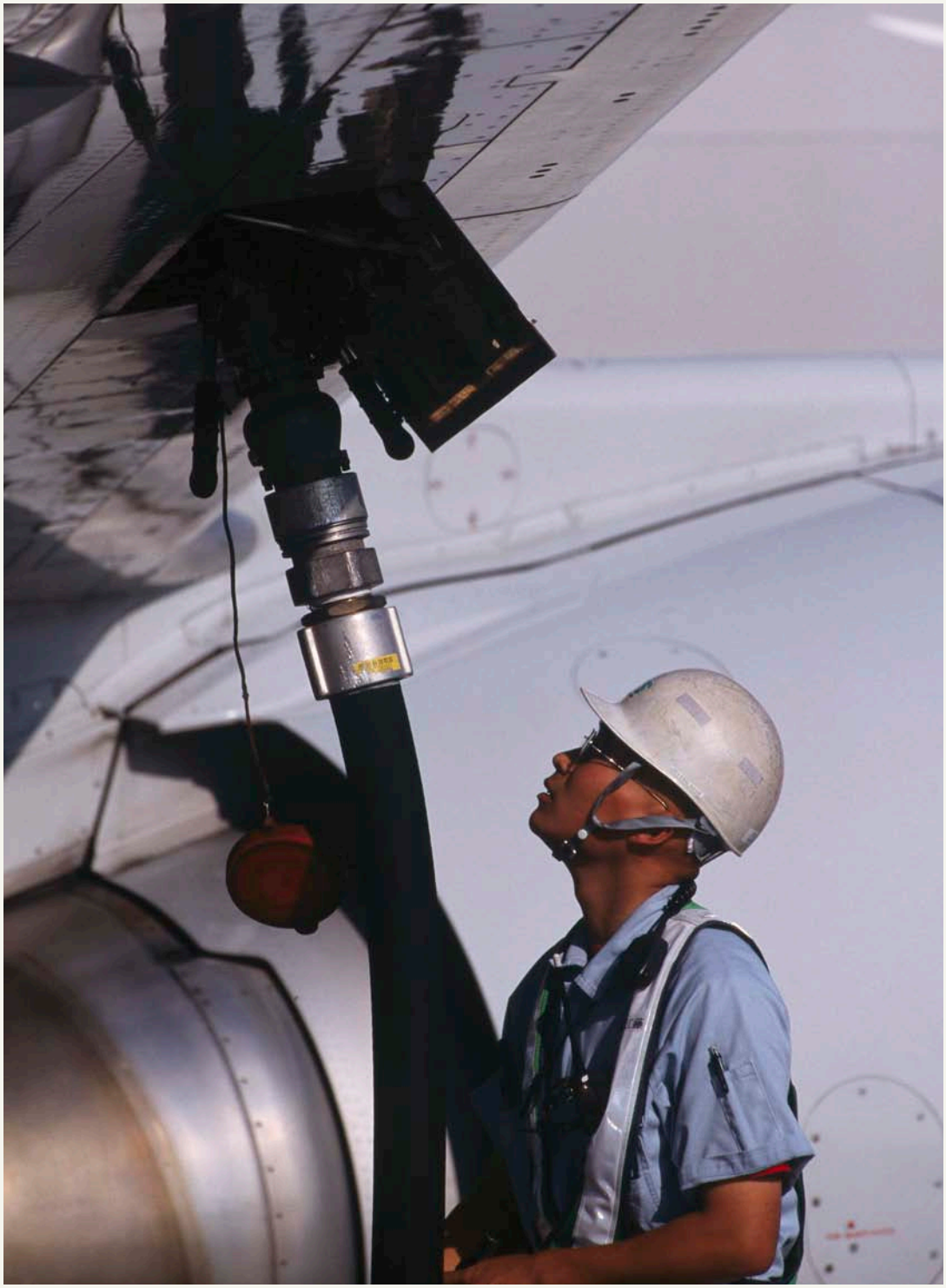
CO_2 reduction: To date ICAO has focused its attention on CO2 emissions as opposed to all GHG impacts. ICAO's aspirational 2020 climate change goal to cap further net emissions growth would limit emissions to approximately 660 million tonnes of CO_2 ($MtCO_2$) per annum. Without further intervention emissions are predicted to increase above 660 $MtCO_2$ per annum, reaching 800 $MtCO_2$ by 2025, 980 $MtCO_2$ by 2030, and more than 2,150 $MtCO_2$ by 2050. However, if international aviation is required to make an equitable contribution to emissions reductions consistent with keeping global warming below 2 degrees Celsius, the sector would need to achieve deep cuts. While ICAO's 2020 goal is used for assessment purposes, several States have called for more ambition and the environmental objective of a global MBM will be part of ICAO's future considerations.

Economic costs and benefits: The treatment of increased costs is the same for all four options, but there are differences in the way they are administered, the distribution of costs and benefits, and the revenue made available for spending. Under any of the four market-based instruments considered in this report, operating costs rise, although this is offset (to a degree) by action being taken in response to make both planes and airline operations more efficient. Higher operating costs in turn lead to higher freight rates and ticket prices. In travel markets, the distribution of costs between consumers and airlines is determined by the rate of cost pass-through. In general, the majority of costs will fall onto consumers. Vivid Economics (2007) has estimated cost pass-through rates of between 80 and 150 per cent, which means that at most 20 per cent of the direct costs of market based instruments fall onto airlines. However, even in scenarios with cost pass-through rates of more than 100 per cent, airlines may face reduced profits. If the profit reduction from selling fewer tickets (caused by higher prices) is greater than the increase in total profits from a higher profit per ticket (caused by cost pass-through greater than 100 per cent), then airlines will have lower profits. Between airlines, those with inefficient planes will lose volume, if they raise prices more than their competitors, and profitability, if they do not. Also, the economic benefits of reducing greenhouse gas emissions in this sector have not yet been quantified. For example, as the frequency and severity of extreme weather events increase, and a greater percentage of GDP must be devoted to responding to climate impacts, airlines will face losses that could be prevented by concerted action to reduce greenhouse gas emissions.

Mitigation potential: As each option acts on the same emissions target and is compared to the same "business as usual" (BAU) emissions scenario, the out-of-sector mitigation requirement is identical for each of the four options considered: 0 $MtCO_2$ in 2020 rising to 180 $MtCO_2$ in 2030. Relative to other sectors, aviation has a high abatement cost. For in-sector mitigation, the results from the analysis are similar for all options. Combining price driven and non-price driven abatement, the total combined in-sector abatement is approximately 110 $MtCO_2$ per annum in 2020, rising to approximately 221 $MtCO_2$ per annum in 2030. Assuming that total abatement is split proportionally across national and international aviation (ICAO is only

responsible for international aviation), and assuming ICAO's split between national and international aviation of approximately 63 per cent international to 37 per cent domestic, the results for international aviation are 69 $MtCO_2$ in 2020, and 139 $MtCO_2$ in 2030. Mitigation can also result from a reduction in demand. Using a range of values for price elasticity, from 0.2 to 1.5, the impact of a $\$40/tCO_2$ carbon price on passenger demand is expected to be a fall in demand of between 1-10%, and between 1-5% for air freight (where the elasticity range is 0.2 to 0.7).

Political acceptability: A global agreement will require the reconciliation of many divergent views. ICAO has been critical of aviation being singled out disproportionately as a source of climate finance that would see revenues flow out of the industry. Previous positions have been closely aligned to at least match the ambition being shown by industry. Industry is supportive of a global measure to avoid any double counting of emissions and multiple compliance requirements that could result from multiple national and regional measures. Furthermore, industry will want to see costs and administrative burdens minimised. Developing countries argue for CBDR to be taken into account, a position that the ICAO Assembly Resolution characterises as addressing the special circumstances and respective capabilities of developing countries. ICAO's President has stressed that a global agreement for the aviation sector does not have any adverse implications for developing country positions in the UNFCCC negotiations. ICAO has not explored the use of revenues in detail and the on going work by ICAO on an MBM, and the use of revenues, is an opportunity to consider both issues.



REVENUES

Of the four options considered, only three raise revenues in excess of those needed for funding the out of sector abatement required to keep net emissions constant post 2020. These are offsetting plus a revenue generating mechanism, cap and trade (based on 50% of allowances being auctioned and the remainder distributed free of charge, which does not generate revenue), and a carbon levy plus offsetting. Following the IMO's assumptions, the modelling uses a global carbon credit price of $25 per tonne of CO_2 in 2020, rising to $40 in 2030 (and the same level for levy and allowance price). Under these assumptions, the revenues associated with these options in 2030 will be $3.6 billion, $11.7 billion and $26.3 billion respectively. Research into a shipping MBM by Vivid Economics highlights that this revenue may be less than 15% of the total financial flows caused; changes in the competitiveness between producers, leading to higher market shares and profits for local producers, and lower market shares and profits for importers and exporters shipping their goods via air, can be much greater than the revenue-raising burden of the policy itself. This demonstrates the considerable competitive advantage to the industry that has arisen in the absence of carbon pricing.

Revenue could be collected from aircraft owners, operators, fuel suppliers or States, but in practice only two are feasible: the aircraft operator as it has full geographic and emissions data for the aircraft, and fuel suppliers who hold records of all fuel sales. Both have some disadvantages: operators will have to document and aggregate a large number of transactions, increasing administrative expense (even if only marginally), while fuel suppliers may not have full knowledge of where the fuel is used (an important consideration if an MBM is limited to international routes and/or as exemptions).

In relation to the collection of revenues, States have experience and frameworks in place for collecting revenues whereas a central entity, such as ICAO, has limited financial capability and may need to develop or outsource this function. It would therefore be sensible to charge States with the collection of revenue.

The economic case for using revenues to support in-sector mitigation is not straightforward: abatement options that cost less than the prevailing in-sector carbon cost do not require a subsidy; airlines should implement these low cost options without a subsidy, since these will cut their carbon cost bill by more than the cost of implementing the abatement option. What about subsidising *additional* mitigation, over and above that which airlines would undertake by themselves? Abatement options that cost more than the prevailing carbon cost will carry a higher per-tonne mitigation cost than out-of-sector options, assuming that the prevailing carbon cost will be given by the price of other carbon credits. Spending revenue on procuring additional in-sector abatement is hence a needlessly expensive way of procuring emission reductions; more abatement could be had, at the same cost, outside the sector. However, if market failures are present, such as public goods that may include research and development costs, or imperfect knowledge about mitigation that could result in under-investment by airlines, there may be a role for in-sector expenditure. Revenues could be used to disseminate credible and reliable information about operational performance; if not yet available, this information could be created by funding tests of cost-effective mitigation technologies. This would provide reassurance and encourage uptake.

SPENDING THE REVENUE AND SUMMARY OF OPTIONS

The options described above could generate approximately $7 billion through the purchase of carbon credits in 2030. An additional contribution comes from the options that raise revenue. A levy with offsetting could generate $26 billion per annum in 2030.

Revenue can be used to address the circumstances and capabilities of developing countries, including equity issues. Possible means of doing so include the following.

Phased implementation: While phased implementation on a route by route basis is one option that would not require explicit spending of revenue, the increased burden on the participating sector to meet the sector-wide goal would result in an implicit redistribution of benefits and burdens.

Variable levy rates: In the levy with offsetting approach, all carriers could be included but at different rates depending on whether a route is developed to developed, developed to developing, or developing to developing (or by more complex means where the levy for each route takes account of GDP in the countries of arrival or departure). All carriers operating on a given route would be subject to the same levy. This approach is not as efficient as a single global price, as some relatively cheap mitigation options would not be implemented on routes with a reduced levy rate, forcing airlines on other routes to deliver additional mitigation at higher per-tonne costs.

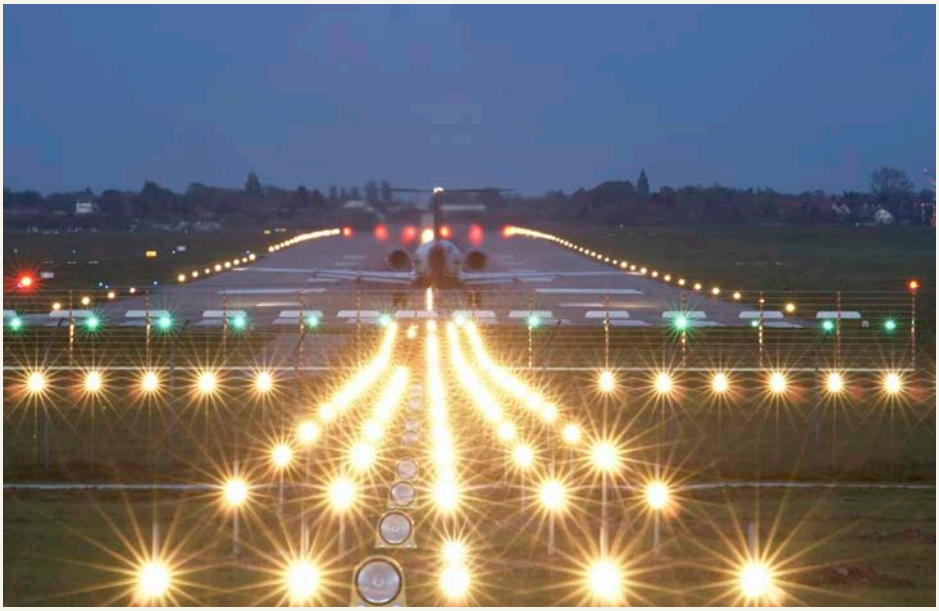
Compensation payments or rebates: This option assumes that all flights are included in the MBM, and makes lump sum payments to developing countries based on an assessment of the economic cost incurred. It might be a challenge to reach agreement on an appropriate methodology and eligibility, and compensation would be expected to go to national governments rather than those directly affected.

Reallocation of allowances in emissions trading systems: It is possible to give free allowances to countries (not airlines) based on an agreed indicator for country output. This approach could lead to some competitive distortion, windfall profits and reductions in the revenue pool, but could be introduced with a fixed phase-out to allow for transition.

Technology transfer mechanism: Revenue-raising options could be supplemented by a technology cooperation or transfer mechanism, for example along the lines of the UNFCCC Technology Mechanism, funded out of MBM revenues.

The following section summarizes the performance of four options in terms of emissions reductions and revenue generation:

Offsetting option: could deliver large volume of low-cost emissions reduction but there may be concerns about the reliability of its emissions impact, because of low trust in the quality of some offsets. This option also generates no revenue. Setting offset requirements based on the efficiency performance of airlines, or benchmarking, is a promising means of allocating an offsetting liability but it could diminish the incentive to reduce emissions, indeed as proposed here, there is no incentive to reduce emissions below the threshold of 2020. It seems unlikely, considering aviation's exemptions from VAT (and fuel duty), that the sector would be unfairly burdened



(compared to other sectors). The arrangement is legally and institutionally feasible but results in partial double counting with other instruments such as EU ETS, which would have to be reviewed if this or other MBM options are implemented.

Offsetting with revenue generation option: the additional revenue generation (of up to $3.6 billion by 2030, assuming a 50% surcharge) increases the cost to the aviation sector and raises the in-sector incentive to reduce emissions, but it requires new institutional arrangements to distribute the revenue.

Cap and trade option: this option offers greater potential for low cost global emissions reductions when it is linked to other sectors, and it is likely to encourage higher in-sector emissions reductions than offsetting schemes because it might operate with a higher emissions price. The financial impact on participants can be adjusted through grandfathering or benchmarking of free allowances, and in common with other options, cost is also passed on to customers. It allows a high degree of flexibility in design. This option could also deliver climate finance worth $8.2 billion in 2020 and $11.7 billion in 2030.

Levy with offsetting option: the levy offers the greatest certainty in future carbon prices facing airlines, and thus can be an efficient mechanism for stimulating in-sector investment. It raises greater questions about institutional arrangements since it requires a price to be set by an administrative authority and revenue to be collected and distributed. It is also the option that can generate the most climate finance, estimated at $14.7 billion in 2020 and $26.3 billion in 2030.

None of the options raises competition concerns if they are applied universally. If, however, they are applied unilaterally or together with benchmarks, these might favour some firms over others, although good design might allow adjustments based on differential environmental impacts.

SUMMARY OF OPTIONS

The strengths and weaknesses of each option against the assessment criteria are set out in the table below:

Offsetting	*Offsetting with a Revenue Generation Mechanism*	*Cap and Trade Emissions Trading System*	*Carbon Levy with Offsetting*
CO_2 reduction			
Amount of CO_2 reduction from offsetting depends on targets; can deliver large net reductions with the application of a discount factor; concerns exist over additionality and quality of offsets; some in-sector mitigation incentive, but weakened due to offset price fluctuation, benchmarking (see below) and currently low offset prices	Same as offsetting, with two exceptions: • additional revenues can be used for additional mitigation • in-sector mitigation incentive is slightly stronger if the revenue generation mechanism increases the effective carbon cost that airlines face	CO_2 reduction from cap and trade depends on level of cap; can deliver large net reductions if linked to other carbon markets, otherwise CO_2 reduction limited by in-sector mitigation potential; mitigation incentive weakened by carbon certificate price fluctuation	In-sector CO_2 reduction depends on rate of levy; total net reduction depends on chosen target; stable and predictable in-sector carbon cost may deliver more mitigation for the same average carbon cost than more volatile instruments
Competition impact (to airline industry)			
Competition impacts of offsetting depend on how obligations for offsetting are shared out: • 'grandfathering', i.e. requiring each airline to keep net emissions constant post-2020, advantages larger or more emitting airlines relative to smaller or cleaner airlines; • 'percentage of emissions', i.e. requiring each airline to reduce net emissions by the same percentage amount; this favours more emitting airlines that still have lower cost mitigation options available, may lead to some distortion between smaller and larger airlines if larger airlines can achieve economies of scale in mitigation, but not otherwise; • 'benchmarking' does not lead to competitive distortions; cleaner airlines will gain (relatively), more emitting airlines will lose, but this is due to internalising previously unpaid pollution costs	Same as offsetting	Similar to offsetting, the competition impacts of a cap and trade ETS depend on rules of certificate allocation: • under 100 per cent auctioning, assuming no liquidity constraints there is no competitive distortion; may change working capital requirements; • 'benchmarking' has similar impacts to 100 per cent auctioning, but leads to a smaller change in working capital requirements • 'grandfathering', based on allocating certificates covering a certain percentage of historic emissions, is likely to lead to windfall profits and favours larger and more emitting airlines relative to smaller and cleaner airlines and new entrants; the larger the percentage of historic emissions covered, the larger the competitive distortion	A uniform carbon levy does not distort competition; cleaner airlines will face lower costs than more emitting airlines, but this is due to the internalisation of previously unpaid pollution costs
Cost			
Minimises costs per RTK by making full use of least cost out-of-sector mitigation options; cost to industry is minimised by only pricing emissions above the 2020 baseline; costs for passengers and freight customers depend on cost pass-through, which is driven by market structure rather than MBM instrument choice; danger of windfall profits as marginal costs are increased, leading to higher prices across the board, while infra-marginal costs are not affected, leading to higher profits on each infra-marginal unit	Similar to offsetting, but with increased costs due to the revenue raising mechanism	Higher costs per RTK since all emissions are priced, not just those above a baseline; distribution of costs between government and industry is given by rules of allocation for certificates. 100 per cent auctioning places all costs on industry and customers, while 100 per cent grandfathering represents a government-to-industry transfer placing costs on governments and customers and creating windfall profits; distribution of costs between industry and passengers, and industry and freight customers, depends on cost pass-through, which is driven by market structure rather than MBM instrument choice or auctioning rules	Higher costs per RTK since all emissions are priced, not just those above a baseline; costs are placed first on industry, then falling, depending on cost pass-through, on passengers and freight customers

Offsetting	*Offsetting with a Revenue Generation Mechanism*	*Cap and Trade Emissions Trading System*	*Carbon Levy with Offsetting*
Cost effectiveness			
Costs of out-of-sector mitigation is independent of the instrument, instead driven by global carbon markets; volatile carbon costs may prevent some mitigation options below the prevailing price from going ahead, thereby increasing overall mitigation costs per tonne of CO_2 and the incentive for in-sector emissions may be diluted by benchmarking	Average cost of mitigation per tonne of CO_2 for this instrument is driven by a) global offset prices, and b) the cost per tonne of CO_2 of any mitigation options funded from the additional revenues raised; if these additional mitigation options cost more than the average global offset price, then total unit cost will be slightly higher than for pure offsetting, and vice versa for lower unit costs of additional abatement	Costs of out-of-sector mitigation is independent of the instrument, instead driven by global carbon markets; if aviation cap and trade ETS is not fully linked with other schemes, costs may be considerably higher due to limited in-sector mitigation options; volatile carbon costs may prevent some mitigation options below the prevailing price from going ahead, thereby increasing overall mitigation costs per tonne of CO_2 Stable and predictable carbon	cost may lead to lower costs per tonne of CO_2 mitigated in-sector. Costs of out-of-sector mitigation is independent of the instrument, instead driven by global carbon markets
Fair burden on aviation compared to other sectors			
This could be viewed as both economic and administrative burden. Economic burden should be assessed by taking into account the respective regulatory burden of each sector in relation to climate change mitigation effort. Given absence of VAT on aviation and if relevant duty on fuel and the limited existing geographical application of carbon prices to the aviation sector, coupled with the fact that many other sectors are covered by emission obligations at a national level relative to 1990 levels, it is likely that aviation will not be unfairly burdened. Administrative burden is likely to be low, although monitoring, verification and a registry are cross cutting issues.	Similar to offsetting. Additional revenue raised is unlikely to impose an unfair burden.	Similar to offsetting only, but with a greater compliance cost due to auctioning. However, more and more sectors covered by the EU ETS will face 100% auctioning	Similar to offsetting, with potential for higher or lower compliance cost
Legislative feasibility			
States could legislate nationally to require the surrender of offsets. Registry required.	As with offsetting, but mandating an existing UN body or creating a new body to oversee the distribution of revenues could require a treaty. Registry required	ICAO could develop guidance on how to harmonise distribution methodologies and MRV requirements without a new treaty, but if auctions generate revenues, the same issues arise as with offsetting plus a revenue generation mechanism. ICAO or another UN body will require a mandate to create aviation specific allowances. Registry required	If ICAO agrees the appropriate rate for a levy, could be introduced nationally. Some States may require domestic legislation to introduce a levy. Registry required to account for volume of offsets obtained
Design features and timescale			
• All emissions above 2020 levels to be offset. Start date: 2020 • Requires definition of eligibility criteria for offsets/allowances. • Participants: operators • Annual compliance	• All emissions above 2020 levels to be offset. Start date 2020 • Agreed levy per transaction would give greater certainty over revenues but will need to be reviewed regularly (a percentage fee would vary with the offset price, leading to volatile revenues). • Requires definition of eligibility criteria for offsets/allowances. • All Participants: operators. • Annual compliance	• Cap set at 2020 levels. • Participants: operators • 50% auctioning, 50% free allocation based on benchmarked distribution. • Requires definition of eligibility criteria for non-aviation offsets and allowances. • Compliance required annually	• As with other offsetting options. • Participants: operators or fuel suppliers

Offsetting	*Offsetting with a Revenue Generation Mechanism*	*Cap and Trade Emissions Trading System*	*Carbon Levy with Offsetting*
Administration			
Will require a registry for cancellation of offset credits. Existing international registries could be utilized. Administration and enforcement by States. Allocation of obligations may require a central body such as ICAO: offsetting obligations may be issued based on all operators offsetting above their 2020 activity levels but this may not be seen as fair to rapidly growing operators. Alternative approach could use benchmarking but will require an authority to calculate obligations for each operator.	As with offsetting, but with States collecting revenues and a central entity charged with distributing revenues in accordance with an agreed policy	States will be responsible for the administration of the scheme. As with offsetting plus revenue generation mechanism, States can collect revenues from auctions but a central entity is required for distribution. A central entity will also need to set cap, create allowances, calculate and oversee the distribution of allowances to States or operators, provide a template for harmonised approaches to MRV and aggregate surrendered allowances by state to ensure consistency with the cap. Will require a registry for the surrender and cancellation of allowances and offsets	Could be undertaken by States using existing mechanisms to collect revenue and taxation. A central entity will need to distribute revenues in accordance with an agreed policy
Rechanneling revenue			
No revenue generated	Yes, approximately $3.6 billion available in 2030	Yes, approximately $11.7 billion available in 2030	Yes, approximately $26.3 billion available in 2030
Political acceptability			
Likely to have lowest administrative cost and burden, and could be introduced quickly. Absence of revenue removes the ability to compensate developing countries. Quality criteria for offsets will be a cross-cutting issue for all options	Similar to offsetting, but administrative complexity higher as need to collect and distribute revenues and need agreement on setting and reviewing an appropriate levy. However, generation of revenue can address developing country issues and could offer a higher degree of perceived integrity. In political terms this is the "middle ground" between offsetting only and the rigours and perceived complexity of a trading system	Perception that this is administratively complex. However, it could have a higher environmental integrity than offsetting that may influence political thinking. Ability to generate revenues could address developing country issues	Likely to be viewed as a proxy kerosene tax which will raise legal concerns amongst ICAO's Contracting Sta
Static versus dynamic mitigation incentive			
Static incentive to reduce emissions below the required threshold; weak dynamic incentive, as marginal emission costs drop to zero once the threshold is reached	Same as offsetting, though the static incentive is stronger due to the higher carbon cost caused by the revenue mechanism; equally weak dynamic incentive	Strong dynamic incentive due to constant marginal costs	Strong dynamic incentive due to constant marginal costs
Compatibility with unilateral action			
Will require emissions to be offset above a 2020 cap so would partially double count emissions covered by the EU ETS and some national schemes such as the German environment levy (although these could be amended to avoid double counting). However, most national measures in effect (e.g. Swiss carbon tax) or proposed (e.g. Australian cap and trade system) only apply to domestic routes so will be complimentary to a global measure for international aviation	Same as offsetting	Will depend on degree of auctioning. Measured against the 2020 goal with 50% auctioning, by 2030, a global ETS introduced on this basis will apply a carbon price to approximately 65% of the sector's CO2 emissions. The EU ETS, assuming existing design parameters for aviation of 15% auctioning and a cap of 95% of 2004-6, will apply a carbon price to a similar proportion of the international aviation emissions covered by the scheme	Will apply a price to all carbon emissions so will overlap with all national and regional schemes which include international aviation

Contributors
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This work would not have been possible without

Lead Authors:
Robin Smale (Vivid Economics)
Max Krahé (Vivid Economics)
Tim Johnson (Aviation Environment Trust)

Editors in Chief:
Tasneem Essop (WWF)
Mark Lutes (WWF)

Reviewers:
Keya Chatterjee (WWF)
Sam Van Den Plas (WWF)
Jean Leston (WWF),
Katherine Watts (WWF)
Barbara Lueg (WWF)
Will McGoldrick (WWF)
Jaco du Toit (WWF)

WWF International
Avenue du Mont-Blanc
1196 Gland, Switzerland
www.panda.org

WWF Global Climate and Energy Initiative
Tasneem Essop
tessop@wwf.org.za

Mark Lutes
mlutes@wwf.panda.org

Vivid Economics
306 Macmillan House
Paddington Station
London W2 1FT
+44 (0) 844 8000 254
enquiries@vivideconomics.com

Aviation Environment Trust
Broken Wharf House, 2 Broken Wharf
London EC4V 3DT
+44 (0) 20 7248 2223
info@aet.org.uk
www.aet.org.uk
Registered charity: 276987

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AVIATION REPORT

100% RECYCLED

6.2%

Annual increase in air travel estimated to 2030
Dramatic growth is forecasted in the demand for air travel in all geographic regions, with annual growth rates in Revenue Passenger Kilometres between 2010 and 2030 ranging from 3% to 6.2%

4.9%

of the Earth's warming effect caused by civil aviation
Civil aviation accounts for 2% of global CO_2 emissions and, when its non-CO_2 impacts are factored-in, contributes 4.9% of anthropogenic contributions to global warming

$40 BILLION

Aviation could contribute $40 billion per annum in climate finance by 2020
The UN Secretary General's High Level Advisory Group on Climate Finance identified international aviation and shipping as a potential source of climate finance for developing countries, and subsequent work by the World Bank estimated that these sectors could generate $40 billion per annum by 2020 with a carbon charge of $25/t CO_2

274%

Unchecked, there will be a 274% increase in fuel used by airlines in the next 38 years
Fuel projections out to 2050 show a 274% increase against 2006 levels, with levels in 2050 equivalent to 2,200 Mt of CO_2 per annum, approximately 7% of global CO_2 on a 2˚C degree trajectory, or 3% to 4% of global CO_2 on a business as usual trajectory

WWF

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To stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature.

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