ICAO's Market Based Mechanism: Keep It Simple

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ICAO's market based mechanism to cap net emissions of carbon dioxide from international civil aviation at 2020 levels is a welcome first step towards achieving the industry's more ambitious targets for reducing its carbon footprint. The mechanism should be seen as a means for the aviation industry, in which it is relatively costly to achieve significant cuts in emissions with current technology, to widen the scope of mitigation actions available to it. The mechanism should be designed to be simple, and therefore procedurally straightforward to implement, oversee, and scale up. This article concludes that airlines' offset obligations should be made proportional to their total emissions. Exemptions from the mechanism will distort the market. Even if ICAO accomplishes the difficult task of targeting exemptions only towards the poorest countries, such exemptions will disproportionately benefit the wealthiest individuals in those countries. To fully address aviation's climate impacts, international regulation should be matched by domestic action, particularly in countries such as the United States whose circumstances and capabilities are uniquely suited to catalyzing the technological change needed to achieve deeper decarbonisation of the sector.

I. Introduction

Aviation is currently responsible for about 2% of annual anthropogenic emissions of carbon dioxide (CO_2).[1] Analysis by the International Civil Aviation Organization (ICAO)[2] suggests that within-sector approaches such as improved efficiency and foreseeable new technologies will not stem the projected growth in greenhouse gas emissions from international transport, let alone reduce them to well below current levels. If the impact of alternative fuels is not accounted for, CO_2 emissions from aviation are likely to grow by between 40% and over 300% between now and 2050, even as volume of traffic grows more rapidly.[3] This rate of growth will likely be faster than the growth in overall global emissions even in a "business as usual" scenario[4] and far in excess of the International Air Transport Association's (IATA) target of carbon-neutral growth after 2020 and a 50% reduction in emissions relative to a 2005 baseline.[5]

Because of the difficulties associated with allocating emissions from international transportation to individual countries,[6] Article 2.2 of the Kyoto Protocol requires that the limitation or reduction of green-

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1 David S. Lee et al., "Transport Impacts on Atmosphere and Climate: Aviation", 44 *Atmospheric Environment* (2010), 4678.

2 ICAO, "Global Aviation CO_2 Emissions Projections to 2050", 2009, available on the Internet at <http://www.icao.int/environmental-protection/GIACC/Giacc-4/Giacc4_ip01_en.pdf> (last accessed 15 July 2016).

3 Ibid., at A–13.

4 Detlef P. van Vuuren et al., "Stabilizing Greenhouse Gas Concentrations at Low Levels: An Assessment of Reduction Strategies and Costs", 81 *Climatic Change* (2007), 119.

5 IATA, "Resolution on the Implementation of the Aviation 'CNG2020' Strategy", available on the Internet at <http://www.iata.org/pressroom/pr/Documents/agm69-resolution-cng2020.pdf --gt> (last accessed on 15 July 2016).

6 Sebastian Oberthür, "Interactions of the Climate Change Regime with ICAO, IMO, and the EU Burden-Sharing Agreement", 2003, available on the Internet at <http://ecologic.eu/sites/files/download/projekte/850-899/890/in-depth/unfcc.pdf> (last accessed on 15 July 2016); Parth Vaishnav, "Greenhouse Gas Emissions from International Transport", 30 *Issues in Science & Technology* (2014), 25, available on the Internet at <http://issues.org/30-2/parth/> (last accessed on 15 July 2016).

house gases from international aviation be pursued through ICAO.[7] In September 2013, ICAO's 191 member states resolved that they would propose a global market-based mechanism (GMBM) to reduce greenhouse gas emissions from international aviation by 2016, and implement it by 2020.[8] In March 2014, ICAO released a "Strawman" proposal.[9] After conducting extensive stakeholder outreach and considering recommendations from several expert committees, in March 2016, ICAO published a draft Assembly Resolution text for GMBM,[10] which was debated in high level meetings in May 2016. All proposed versions of the GMBM require, barring exceptions defined in the mechanism, that airlines purchase carbon credits each year to offset any growth in their emissions from international aviation after 2020, resulting in "net zero" growth in emissions due to the sector. Purchasing these offsets would also increase airlines' operating cost, and thus give them an incentive (albeit a small one)[11] to minimize the number of offset purchases needed. For conventional fuels, emissions are strictly proportional to the mass of fuel burned. As fuel is roughly a third of airlines' total cost,[12] a strong incentive already exists to reduce its consumption. The need to purchase offsets would be additional to that incentive, and could also serve to make alternative, low-carbon, fuels more attractive.

Each version of the MBM differs in two aspects. The first is the magnitude and distribution of exemptions to the scheme. The second is the way in which offset obligations are distributed among different airlines. These elements are not independent of each other, as the proportion of emissions an airline must offset depends on how much of its operations are on routes that are exempt from the mechanism.

In Section II, I discuss issues related to the way in which offset obligations are distributed among airlines. In Section III, I discuss exemptions.

II. The Distribution of Offset Obligations

ICAO's draft mechanisms have considered two different ways of apportioning offset obligations among different airlines.

The first method calculates the offset obligation as the difference between the airline's emissions in the current year and its emissions in 2020. ICAO calls this the "individual" approach. It has the benefit of directly reflecting the objective of the GMBM, which is to have net zero growth in emissions after 2020. To the extent that the GMBM provides an airline with an incentive to reduce its emissions, such an approach maximizes that incentive, because a reduction in emissions reduces offset obligations for the airline that achieves it and for no one else.

However, the individual approach produces several perverse consequences. Consider two airlines, one that currently pursues a strategy of operating an old, inefficient fleet and a second that currently operates a fleet of mostly new, efficient aircraft. In 2020, the first, inefficient, airline could start retiring its old fleet, and dramatically reduce its offset obligations, in essence being rewarded for past disregard of fuel efficiency. Indeed, if it were sufficiently large, and had a broad global footprint or a large domestic operation, the first airline could reduce its obligations by moving old aircraft to domestic and exempt international routes and could potentially reduce or eliminate its offset obligations without actually reducing emissions. The second, efficient, airline would have less opportunity to reduce its emissions – since it already operates more efficient planes, it would be placed at a relative disadvantage.

Similarly, an airline that was losing market share on account of poor service quality or a poor safety record would grow more slowly, and would therefore

7 Kyoto Protocol to the United Nations Framework Convention on Climate Change, Kyoto, 10 December 1997, in force 16 February 2005, 37 *International Legal Materials* (1998), 22.

8 ICAO, "Assembly Resolutions in Force (as of 4 October 2013)", 2013, at I–75, available on the Internet at <http://www.icao.int/publications/documents/10022_en.pdf> (last accessed on 15 July 2016).

9 Comisión Latinoamericana de Aviación Civil, "Trigésima Tercera Reunión Del Grupo de Especialistas En Asuntos Políticos, Económicos Y Jurídicos Del Transporte Aéreo (GEPEJTA/33)", available on the Internet at <http://clacsec.lima.icao.int/Reuniones/2014/GEPEJTA33/NE/NERstgd/33GENE18.pdf> (last accessed on 15 July 2016).

10 ICAO, "Draft Assembly Resolution Text on a Global Market-Based Measure (GMBM) Scheme", 2016, available on the Internet at <http://www.icao.int/Meetings/GLADs-2016/Documents/Draft%20Assembly%20Resolution%20text%20on%20GMBM%20for%202016%20GLADs.pdf> (last accessed on 15 July 2016).

11 Annela Anger et al., "Research to Assess Impacts on Developing Countries of Measures to Address Emissions in the International Aviation and Shipping Sectors", 2013, <http://climatestrategies.org/wp-content/uploads/2014/10/final-report-june21-cover.pdf> (last accessed 15 July 2016).

12 MIT Airline Data Project, "Fuel Expense as Percentage of Total Expense", 2011, available on the Internet at <http://web.mit.edu/airlinedata/www/2010%2012%20Month%20Documents/Expense%20Related/Fuel/Fuel%20Expense%20as%20Percentage%20of%20Total%20Expense%20%28Excluding%20Transport%20Related%20Expense%29.htm> (last accessed on 15 July 2016).

be required to offset a smaller proportion of its international emissions than one that was performing well.

Finally, consider a small airline that flies very few aircraft in 2020, but acquires a new aircraft every year after that. The majority of the emissions of such an airline would constitute growth since 2020, and it would – as a consequence – be required to offset a very large proportion of them. If a large airline with a fleet of a few hundred aircraft in 2020 competed with the small airline on all its routes, and followed the same pattern of growth (one new airplane each year), both airlines would have to buy the same volume of offsets each year. However, this would be a much smaller proportion of emissions for the larger airline compared to the smaller one. The "individual" approach would therefore place a proportionally larger burden on small, fast-growing airlines than on large incumbents. To the extent that fast growers are likely to be more common in the developing than developed world, the approach also runs counter to the principle of differentiation, which says that – while all countries have a responsibility to address climate change – their actions must be commensurate with special circumstances and respective capabilities.[13]

The second approach is to base an airline's offset obligations in each year on the product of its own emissions and the fractional growth[14] in the sector's emissions since 2020. ICAO calls this the "collective" approach. It multiplies an airline's emissions each year by a number that is the same for every airline (that is, by the fractional growth), ensuring that all airlines offset the same proportion of their emissions each year. This approach avoids the distortions introduced by the "individual" approach, by requiring airlines to offset an identical proportion of all their emissions.

A criticism of the "collective" approach is that it dilutes an airline's incentive to become more efficient. Although any measure that an airline takes to cut emissions would directly reduce its own fuel costs, it would also reduce the fractional growth of the entire sector. As a result, if an airline were to reduce its emissions by a certain amount relative to some baseline trajectory, under realistic assumptions about sectorial emissions growth, its offset obligations would fall by only by a fraction of that amount. The rest of the benefit would be distributed, so to speak, among other airlines.

Several arguments may be used to counter this criticism. First, the airline cutting its emissions would see its offset obligations fall by many times more than a similarly sized rival that did not make such cuts. As such the existence of the GMBM would give it a competitive advantage over its rivals that was additional to the advantage it would gain from simply being more fuel-efficient.[15]

Second, it may be unhelpful to view the GMBM primarily as an incentive for airlines to become more efficient; that is, to pursue "in-sector" measures to reduce emissions. Fuel accounts for a third of airlines' operating costs,[16] and so they already have a powerful incentive to reduce consumption, and therefore emissions. At any realistic offset price, the GMBM is likely to increase that incentive only slightly.[17] Recent

13 ICAO, "Assembly Resolutions in Force", supra, note 8, Resolution A38–18.

14 Fractional growth in a given year (after 2020) is defined somewhat counterintuitively as the total growth in emissions since 2020, divided by the emissions in that given year.

15 Consider two airlines, each of which constitutes about 5% of the sector's emissions in 2020, and both are set to grow their traffic volumes by 5% per year. Imagine that one airline invests heavily to grow its emissions by only 2.5% per year after 2021, while the other grows them at the sector-average rate of 5% per year. By reducing the fractional growth of the sector, the first airline's investment reduces the number of offsets all airlines would be required to buy. In 2021, roughly 10% of this reduction would accrue to the first airline, 5% to a similarly-sized rival that did not reduce its rate of emissions growth, and 85% to the rest of the sector. By 2035, assuming that the growth rates stayed the same, 54% of the benefit would accrue to the efficient airline, 2% to its rival, and 44% to the rest of the sector. Since airlines would buy many more offsets in the later years of the scheme, the more efficient airline would capture 42% of the total benefit over the duration of the scheme, its rival would capture 3% of the benefit, and the rest of the sector, 55%. As such, the efficient airline would capture 14 times as much benefit as its rival (note that we assume that airlines have access only to conventional fuels; if a low-carbon alternative fuel were available that cost as much or more than the conventional variety, airlines would be able to reduce emissions without necessarily improving operational efficiency, and financial performance).

16 See MIT Airline Data Project, "Fuel Expense", supra, note 12.

17 An aircraft that spends its entire 25-year life flying back and forth between London and New York, one return trip a day, 360 days a year, would burn about 0.5 million tonnes of jet fuel, and produce 1.8 million tonnes of CO_2 (Helen Jiang, "Key Findings on Airplane Economic Life", 2013, available on the Internet at <http://www.boeing.com/assets/pdf/commercial/aircraft_economic_life_whitepaper.pdf> (last accessed on 15 July 2016); ICAO, "Carbon Emissions Calculator", 2016, available on the Internet at <http://www.icao.int/environmental-protection/CarbonOffset/Pages/default.aspx> (last accessed on 15 July 2016)). My calculations suggest that the GMBM would require it to offset about 40% of those tonnes in its final year, and a smaller proportion before that. Let us conservatively assume that the

scholarship[18] suggests that measures that can be implemented at a reasonable cost have limited potential (less than 20% of the total) to reduce emissions. Some of this potential may already have been realized. Measures such as the early replacement of aircraft would cost many times more per tonne of CO_2 emissions avoided than offsetting emissions in other sectors.[19]

Instead, the goal of the market-based mechanism should be to give the industry the means to meet its goal of carbon neutral growth after 2020 in the most cost-effective manner. ICAO recognized early that this could be best achieved by having an "open" system, in which "[i]mpacts on costs and the growth of aviation would be lower than all the other options, provided the required emissions permits could be purchased from other industry sectors".[20]

ICAO's March 2014 "Strawman" proposal[21] required airlines to calculate their offset obligations using both approaches, and then purchase offsets equivalent to the average of the two. Perhaps recognizing that even this compromise placed a disproportionate burden on fast growers, the "Strawman" created a complex mechanism to reduce the offset obligations of such airlines. I have demonstrated elsewhere[22] that this resulted in a pattern of offset obligations that likely ran counter to ICAO's aims in designing the mechanism.

The "100% collective" approach adopted in the March 2016 document is, therefore, a significant improvement. It values each tonne of CO_2 emissions in a particular year equally. The "individual approach" focuses too narrowly on those tonnes of CO_2 that are additional to airline emissions in 2020. However, each tonne of CO_2 emitted in a given year is equally harmful: the atmosphere is not warmed exclusively by that part of an airline's emissions that is additional to its emissions in 2020. There is no reason why carriers must be made to offset this particular tranche regardless of how much they emit in total. The collective approach is therefore a fair and simple way of ensuring that the sector meets its goal of carbon-neutral growth, and it is unlikely to be significantly less effective than any plausible alternative at incentivizing within-sector efficiency gains.

The value of this simplicity must not be underestimated. Before accounting for exemptions, this approach is completely defined by one number: the 2020 baseline. As such, the mechanism could potentially be modified to accommodate a more stringent target (e.g., the industry's own target of cutting net emissions to half their 2005 level by 2050)[23] by simply changing the baseline (e.g., from 2020 to half of 2005 emissions). While a fully "individual" approach could also be simple, a combination of the two approaches – especially one with the kind of embellishments seen in the March 2014 "Strawman" – risks becoming a policy dead end,[24] because making it more ambitious would require a tangle of different

airline had to offset 40% each year. Say offsets cost it $40 per tonne. (based on EPA, "Social Cost of Carbon", 23 September 2015, available on the Internet at <http://www3.epa.gov/climatechange/EPAactivities/economics/scc.html> (last accessed on 30 September 2015.) This is the social cost of carbon arrived at by the US Government; in fact, 85% of the emissions that are subject to some form of carbon pricing are priced at less than $10 per tonne (World Bank, *State and Trends of Carbon Pricing 2015* (Washington, DC: IBRD, 2015), available on the Internet at <http://documents.worldbank.org/curated/en/2015/09/25053834/state-trends-carbon-pricing-2015> (last accessed on 15 July 2016)). In this case, the airline would spend $30 million on CO_2 offsets. But, assuming the current, low price of $500 per tonne of jet fuel, the airline would have spent $270 million on fuel, ten times more than on offsets (IATA, "Fuel Price Analysis", 2016, available on the Internet at <http://www.iata.org/publications/economics/fuel-monitor/Pages/price-analysis.aspx> (last accessed on 21 June 2016). Even with unrealistically optimistic assumptions about the effectiveness of the GMBM, the incentive to reduce fuel costs is ten times larger than the incentive to reduce the costs of offsetting the emissions associated with that fuel.

18 Andreas W. Schäfer et al., "Costs of Mitigating CO_2 Emissions from Passenger Aircraft", 6 *Nature Climate Change* (2016), 412. This analysis finds that, for narrow body aircraft, cost-effective measures can reduce emissions by only about 25%. Several of these measures – for example, winglets – are already being deployed. Others require substantial operation changes and technical improvement in the air traffic control infrastructure, over which airlines have limited control. As such, the scope for further improvements is limited.

19 Ibid.; see also Joe Morris et al., "A Framework for Estimating the Marginal Costs of Environmental Abatement for the Aviation Sector", 2009, at 49, available on the Internet at <http://bit.ly/2bmhgft> (last accessed on 15 July 2016).

20 ICAO, "Work Already Done by ICAO on Market-Based Measures and Reference Documentation", Doc. Nr. GIACC/4-IP/7, 2009, available on the Internet at <http://www.icao.int/environmental-protection/GIACC/Giacc-4/Giacc4_ip07_en.pdf> (last accessed on 15 July 2016).

21 Comisión Latinoamericana de Aviación Civil, "Trigésima Tercera Reunión", supra, note 9.

22 Parth Vaishnav et al., "Analysis of a Proposed Mechanism for Carbon-Neutral Growth in International Aviation", 45 *Transportation Research Part D: Transport and Environment* (2016), 126.

23 IATA, "'CNG2020' Strategy", supra, note 5.

24 M. Granger Morgan, "Opinion: Climate Policy Needs More than Muddling", 113 *Proceedings of the National Academy of Sciences* (2016), 2322, available on the Internet at <http://www.pnas.org/content/113/9/2322> (last accessed on 22 June 2016).

rules, baselines, and adjustment factors to be renegotiated.

III. The Magnitude and Distribution of Exemptions

1. Magnitude of Exemptions

ICAO's March 2016 proposal carved out exemptions for the least developed countries, land locked developing countries, small island developing states except Singapore, and states that either individually or cumulatively make a small contribution to sectorial traffic (and, therefore, emissions). The approach required countries with high or upper-middle incomes to participate. However, ICAO does not define a state's contribution to air traffic on the basis of all the flows in and out of it. It is defined, instead, as the sum of all the traffic carried by airlines that have been issued air operating certificates (AOC) by the country. This, in addition to the proposal that the "same requirements and rules shall apply to all aircraft operators on the same routes between states",[25] expands the scope of the exemptions.[26] The approach would exempt a third of all emissions up to 2025. The rules would get more stringent after that, but would still exclude roughly 15% of sectoral emissions. My calculations suggest that, in 2021, this approach would release an additional 6 million tonnes of CO_2 – the equivalent of the annual emissions of 1.5 million US cars[27] – compared to a no-exemptions approach in which any growth in emissions relative to 2020 would be offset. This number would balloon tenfold to 66 million tonnes of CO_2 (or 15 million cars) by 2035.

In its May 2016 high-level meeting, ICAO abandoned all income-based criteria.[28] This change reduces the scheme's coverage to 50% of sectorial emissions up to 2025, and 70% thereafter. If retained, this structure would permanently exempt small European countries such as Denmark. If European countries volunteered to be part of the mechanism, then 60% of the sector's emissions would be covered up to 2025, and 80% thereafter.

Another potential approach is to exempt the smallest states until a cumulative threshold is reached. If this threshold were set at 3.5%, and the countries of Europe participated even if they fell beneath this threshold, the mechanism would cover 80% of global emissions.

2. Distribution of Exemptions

The distribution of exemptions is not uniform across airlines and countries. By applying the provisions of the various ICAO proposals so far to projections of airline emissions,[29] I estimate that if the rules described in the March 2016 draft text[30] were adopted, only about 75% of the international emissions of US airlines would be covered between 2021 and 2025, versus nearly 90% of the emissions of Chinese airlines. After 2026, this would rise to 90% for US airlines and 95% for Chinese airlines. This second set of numbers would apply throughout the duration of the mechanism if a 3.5% cumulative threshold exemption were applied.

While a good design can minimize exemptions, problems remain. First, all the approaches to exemptions being considered now allow for a considerable volume of emissions (at least 60 million tonnes CO_2 per year by 2035) that are not offset. This makes the claim of carbon neutral growth ring somewhat hollow.

Second, arguably the largest exemption available right now is to airlines' domestic operations. For example, the domestic operations of US airlines represent 14% of global CO_2 emissions from aviation.[31] These are not covered by ICAO rules, but account for 65% of the emissions share of US airlines.[32] A US airline that is offsetting 40% of its international emis-

25 ICAO, "Draft Assembly Resolution", supra, note 10, at para. 8.

26 Parth Vaishnav, "Plug the Loopholes in ICAO's Plan", 178 *Aviation Week & Space Technology* (2016), at 66, available on the Internet at <http://aviationweek.com/commercial-aviation/opinion-icao-s-emissions-plan-has-loopholes-big-enough-a380> (last accessed on 15 July 2016).

27 US EPA, "Average Annual Emissions and Fuel Consumption for Gasoline-Fueled Passenger Cars and LightTrucks", 2008, available on the Internet at <https://www3.epa.gov/otaq/consumer/420f08024.pdf> (last accessed on 21 June 2016).

28 ICAO, "Draft Assembly Resolution Text on a Global Market-Based Measure (GMBM) Scheme - Flimsy No. 2", 12 May 2016, para. 7, available on the Internet at <http://www.icao.int/Meetings/HLM-MBM/Documents/HLM_GMBM_Flimsy_2.pdf> (last accessed on 15 July 2016).

29 The methods by which the projections were made are described in Parth Vaishnav et al., "Proposed Mechanism", supra, note 22.

30 ICAO, "Draft Assembly Resolution", supra, note 10.

31 IATA, World Air Transport Statistics (58th ed., Montréal, QC: International Air Transport Association, 2014), 9011-58, 10; Bureau of Transportation Statistics, "Airline Fuel Cost and Consumption (US Carriers - Scheduled)", 2016, available on the Internet at <http://www.transtats.bts.gov/fuel.asp> (last accessed on 5 April 2015).

32 Ibid.

sions (as the GMBM would require it to do in 2035) would be offsetting less than 15% of its total emissions. While domestic emissions of Chinese airlines are about half the level of US domestic emissions, they are expected to grow much faster. Domestic operations account for about two-thirds of the emissions of Chinese airlines. For a European or Emirati airline, virtually all emissions are either international or covered by the EU's emissions trading system. Such airlines would, in fact, be required to offset 40% of their emissions in 2035. In general, the playing field is tilted in favor of airlines with large domestic operations in countries that do not regulate their domestic greenhouse gas emissions. It is important for climate diplomacy to ensure that countries begin to put in place domestic measures to reduce CO_2 emissions from aviation that either match or exceed ICAO proposals.

Third, exemptions are ICAO's way of operationalizing the principle of common but differentiated responsibilities. Yet, *de minimis* exemptions from the mechanism are a blunt way of achieving this goal. Given the size and projected growth rates of their international aviation sectors, it is entirely appropriate that none of the constructs discussed above would exclude relatively poor (in terms of per capita GDP) countries such as India or China. And yet, if no income-based criteria are applied, and if they did not volunteer to join, each of these constructs would exclude Brunei and the Bahamas, which are considerably richer. Even if exemptions only applied to low-income countries, the benefits would accrue to the richest in those countries (that is, those who can afford foreign travel)[33] or to visitors from well-off countries (e.g., scuba diving enthusiasts from Europe travelling to the Maldives, which would be exempt), while the consequences of climate change would disproportionately hurt the poor (e.g., citizens of the Maldives). Studies have shown that energy subsidies in developing countries accrue disproportionately to the comparatively well-off in those countries, and the current aviation proposals appear to do the same.[34]

By 2035, I estimate that over 60 million tonnes of CO_2 will have leaked out of the GMBM as a result of the route exemptions associated with the March 2016 text.[35] At $40 per tonne, this will mean that those in the developing world who are rich enough to fly (to say nothing of bankers in London travelling to the Bahamas), will receive $2.4 billion per year in subsidies, largely to the detriment of poor, vulnerable populations.

Exemptions may be essential to grease the skids at ICAO, but they will not protect the economic or other interests of anyone but a small globe-trotting elite.

IV. Conclusions

States have explored various configurations of the MBM to find the right balance between a system that produces the right incentives and one that gives effect to the principle of differentiation. Our analysis of these alternatives suggests that any tweak to the "100% collective" approach (which would require all airlines to offset the same proportion of their total international emissions) produces significant distortions, and poses policy problems. Policymakers would do well to take Occam's razor to the design of the GMBM, and vote for a simple, "100% collective" mechanism. The alternatives that have been discussed so far are likely to produce unpalatable consequences, and result in a mechanism that is complicated enough that any extension or renegotiation of it will become unnecessarily fraught. Regulating greenhouse gas emissions from international aviation falls within the purview of ICAO because allocating emissions to individual countries is extremely difficult. The same is arguably true of exemptions – it is hard to conceive of a set of exemption criteria that would exclude only those whose circumstances make buying carbon offsets for a relatively small fraction of their emissions exorbitant. Any exemptions will be a form of relief given to those who can afford to fly internationally, to the detriment of the vast ma-

33 In India, which would not be exempt from the mechanism, a mere 18 million people – or 1.5% of its population – travelled abroad in 2014, a 40% rise since 2009. If that rate of growth continued through to 2035, 80 million Indians – or 5% of its projected population - will travel abroad in that year. Pacific Asia Travel Association, "Indian Outbound Travel", 2015, available on the Internet at <https://pata.org/store/wp-content/uploads/2015/09/Ve_September_A4_Sept30-1.pdf> (last accessed on 15 July 2016).

34 International Monetary Fund, "The Unequal Benefits of Fuel Subsidies: A Review of Evidence for Developing Countries", 2010, available on the Internet at <https://www.imf.org/external/pubs/ft/wp/2010/wp10202.pdf> (last accessed on 15 July 2016).

35 If national income was not considered in deciding which countries to include, but Singapore, the European Union, all members of the European Economic Area, Switzerland and Singapore all volunteered to participate, the leak would be 80 million tonnes of CO_2 per year.

jority of the world's people who cannot. To the extent that the GMBM might serve as a template or precedent for other sectoral mechanisms (e.g., one that covers ocean shipping), a leaky GMBM could have consequences that are felt well beyond international aviation. Finally, while action on international aviation is welcome, it must be matched by domestic policies, particularly in the United States.