

Policy Analysis | August 2017

Linking the ICAO Global Market-Based Mechanism to REDD+ in Colombia

The International Civil Aviation Organization and its 191 member States agreed in October 2016 to implement a Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) to limit future increases in greenhouse gas emissions from the sector. This market-based scheme creates a potential global **demand of over 2 billion tonnes of investment-grade emissions reductions from 2021 to 2035.**

Colombia could meet some of this demand through its current and projected supply of emissions reduced from deforestation and forest degradation, and through forest restoration. By choosing to participate in the early Phases of this scheme, starting in 2021, the Colombian Government could generate more than **\$300 million in additional investment** at an estimated cost of \$23 million to its aviation industry, which represents a small fraction – less than 0.4 percent – of global emissions from international aviation.

Key Findings

1. The International Civil Aviation Organization (ICAO) in October 2016 created a potential global demand of more than 2 billion tonnes of investment-grade emissions reductions from 2021 to 2035 that could be partially met through continuing development of programs and projects in Colombia.
2. Colombia has the potential to benefit by linking this market demand to domestic supply through eligible supply-side activities, including Reducing Emissions from Deforestation and Forest Degradation (REDD+), structured via existing World Bank and business investment tools and structures and its many on-going long-term international investment supply contracts for emissions reductions.
3. The value to Colombia of supplying the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) is, conservatively, \$322 million in additional private institutional investment.
4. To facilitate this investment, the Colombian national government policy must deliver the necessary institutional and legal conditions for REDD to succeed, at national and

subnational jurisdictional levels, building on those currently applied to existing programs and projects.

5. Colombia can increase the impact of CORSIA and augment the associated demand for offset credits by opting-in to the scheme starting in 2021, and by encouraging others in the region to do the same. Colombia's airlines would incur an estimated additional cost of \$23 to \$54 million over the period 2021-2026, less the than marginal [fuel price variability during this period](#). The associated increase in demand and credit price could quadruple investment value.

Background and Purpose

The International Civil Aviation Organization (ICAO) and its 191 member states agreed in October 2016 to implement a global market-based scheme (GMBM) in the form of the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) to limit future increases in greenhouse gas emissions from international civil aviation to 2020 levels. The CORSIA is [implemented in three phases](#), reflecting a principle of common but differentiated responsibilities and respective capabilities, as follows:¹

- **Pilot Phase 2021 to 2023:** States participate on a voluntary basis.
- **First Phase 2024 to 2026:** States participate on a voluntary basis.
- **Second Phase 2027 to 2035:** Applies to all States that have an individual share of international aviation activities above the specified threshold, except Least Developed Countries (LDCs), Small Island Developing States (SIDS) and Landlocked Developing Countries (LLDCs) unless they volunteer to participate in this phase. The specified threshold refers to where the individual share in Route-Tonne-Kilometres (RTKs) in year 2018 is above 0.5 percent of the global total RTKs or whose cumulative share in the list of States from the highest to the lowest amount of RTKs reaches 90 percent of total RTKs.

As of May 31, 2017, 70 States, representing more than 87.7 percent of international aviation activity, intend to voluntarily participate in the CORSIA Pilot Phase. The Government of Colombia has not opted-in thus far, to the voluntary Pilot Phase or First Phase, and Colombia is expected to be exempt from mandatory inclusion in the Second Phase based on the 2018 threshold described above.² Although airlines registered in Colombia represent only a small fraction – estimated 0.35 percent – of international activity, their exclusion from the scheme has a substantial impact on the overall GHG effectiveness of the CORSIA due to the ICAO rule that restricts policies that discriminate among airlines traveling the same route.

Recognizing the current technological limits to reducing emissions within the sector itself, the CORSIA will allow airlines to meet their regulatory obligations through the acquisition of international verified emissions reductions achieved in other sectors. The ICAO members further agreed (in Assembly Resolution A39-3) to promote the use of emissions units that benefit developing nations, such as Colombia. Therefore, the CORSIA represents a significant opportunity to help solve one of the main challenges to achieving global and national REDD+ objectives – the mobilization of adequate and predictable financial support to catalyze REDD+.

¹ ICAO website <http://www.icao.int/environmental-protection/Pages/market-based-measures.aspx>.

² Colombia's Civil Aviation Authority is within the Ministry of Transportation and Communication: http://www.mtc.gob.pe/version_ingles/transportes/aeronautica_civil/index.html

including through results-based payments, while generating economic growth opportunities for States such as Colombia.

REDD+ is recognized in the 2015 UNFCCC Paris Agreement as an important emissions mitigation tool for developing countries. Recent analysis by [Environmental Defense Fund](#) and Climate Advisers concludes that:

- REDD+ could provide a significant source of emissions reductions to offset airlines' emissions above capped levels.
- A challenge to realizing supply of REDD+ credits is the need for a strong market demand signal.
- The ICAO CORSIA has could provide this necessary demand signal.

Based on the ICAO Assembly decision in October 2016, this brief takes a closer look at the potential demand from global airlines, the potential supply from REDD+ in Colombia and the current barriers to connecting the two. Analysis is presented demonstrating the benefits to Colombia's early entry into the CORSIA Pilot Phase and First Phase (2021 to 2026) and compares them to the cost of participation for the country's airlines.

This brief is primarily intended to inform policymakers of the potential opportunities and benefits for Colombia. Additional consultations with airlines are planned, focusing on how to access emission reduction opportunities from REDD+.

Analysis

GLOBAL DEMAND FOR EMISSIONS REDUCTION (OFFSET) CREDITS

Estimates show that cumulative international aviation emissions may exceed 2020 levels by more than 500 million tonnes carbon dioxide equivalent (tCO₂) during the Pilot Phase and First Phase of the CORSIA (2021 to 2026).³ Countries responsible for 65 percent of these emissions have voluntarily opted into the scheme, implying a global demand from their airline companies of at least 325 million tCO₂ over the first five years during the Pilot Phase and First Phase. Projected excess emissions during the Second Phase (2027 to 2035) are higher still: about 2,600 million tCO₂. Covered routes are expected to represent at least 79 percent of these emissions, resulting in a global demand of 2,050 million tCO₂ or larger. These figures are summarized below in Table 1.

Table 1. Projected global demand for offset credits (million tCO₂)⁴

Phase	Timeline	Emissions Above 2020 Levels	Projected Demand
Pilot Phase and First Phase	2021 to 2026	500	≥ 325 (65%)
Second Phase	2027 to 2035	2,600	≥ 2,050 (79%)

Source: [ICAO's Market-Based Measure](#), Environmental Defense Fund

It is important to note the uncertainty in estimating the demand for GHG emissions reduction units under the CORSIA, as it requires making assumptions about the growth of the international aviation sector over the next 10 years as well as fuel efficiency technological improvements and the impact of other sources of supply of emissions reductions (e.g. from other sectors and countries).

COLOMBIA'S SUPPLY OF REDD+ CREDITS

Airlines that will be participating in the CORSIA scheme as of 2021 are currently seeking opportunities to manage their liabilities with short- to long-term supply contracts. Airlines have expressed interest in forest-based climate programs because these represent large-scale supplies of emissions reduction units that also meet their corporate social responsibility and marketing needs.

³ Greenhouse gas emissions and removals are reported in metric tonnes of carbon dioxide equivalent, simplified as tCO₂ in this paper.

⁴ Based on Environmental Defense Fund (EDF), 2016. ICAO's Market-Based Measure. Available at: <https://www.edf.org/climate/icaos-market-based-measure>. [Accessed: 23 Dec 2016.]

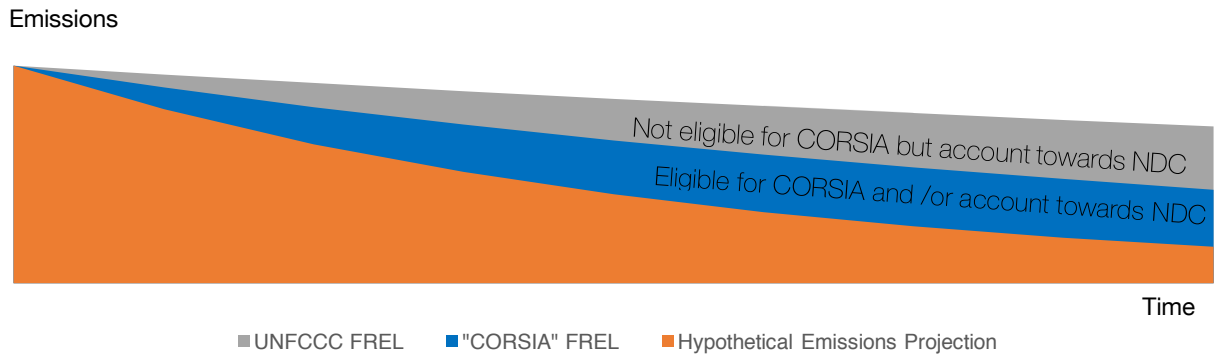
Beginning in 2021, Colombia's estimated average annual supply of REDD+ credits ranges from 21 to 128 million tCO₂. The low-supply scenario only includes Colombia's Amazon and Orinoquia (natural) regions, while the high-supply scenario results from national scale REDD+, including significant gains from forest land restoration. A third mid-range supply scenario includes national scale REDD+ *without* restoration. The three supply scenarios have been selected to represent a range of potentially available offset credits that could be purchased by airlines with short- to long-term supply contracts.⁵

Importantly, these three supply estimates do not consider the economic costs of implementing REDD+ activities (i.e., implementation, opportunity and transaction costs associated with generating the results). They also do not account for emissions units that would be kept domestically to meet Colombia's Nationally Determined Contribution (NDC), a requirement that would be necessary to avoid double counting. As Colombia's NDC represents an unconditional commitment under the Paris Agreement, there may be concern about allowing emission reductions (particularly 'low cost' reductions) to "leave" the country, thereby making it more difficult to achieve the NDC target. However, there are options for managing this risk, which warrant consideration:

- a. A Forest Reference Emission Level (FREL) used under a CORSIA-compliant methodology may differ from the national FREL submitted to the UNFCCC, similar to the FCPF Carbon Fund. This difference in accounting approach could mean not all REDD+ emission reductions would be available for transfer to CORSIA but could be accounted towards Colombia's NDC. Figure 1 illustrates this.
- b. The government could consider marketing REDD+ emission reductions to airlines as a "premium product" that helps airlines to meet CORSIA requirements while also contributing to multiple non-carbon benefits such as biodiversity, water management and local livelihoods. The premium would, in effect, involve the application of a discount factor, whereby each CORSIA-eligible credit sold represents more than one tonne of verified emission reductions, the remainder of which would be accounted towards Colombia's NDC.
- c. Colombia could establish an "NDC reserve" based on a percentage of all verified emissions reductions from REDD+ activities or programmes prior to international sales. The reserve could be retained by the government to contribute to the NDC target or released for sale at a later date if no longer needed to meet the target.
- d. Colombia could impose a price floor applicable only to international transfers, so that emission reductions below a certain price level are available only for domestic use towards fulfilment of Colombia's NDC.

⁵ The methodology to derive estimates of the supply of credits from REDD+ activities in Colombia is described in the annex to this paper.

Figure 1: Indicative “CORSlA FREL” and UNFCCC FREL against Hypothetical Emissions Reductions (illustrative)



The uncertainties inherent in these projections are significant, but the applied methodology is sufficiently rigorous to inform high-level policy decisions in the absence of projections published by the Colombian national government.

The low-supply scenario limits the scope of activities to projects and programs in the regions, which are formally engaged in international partnerships focused on REDD+ in Colombia:

- The REDD+ Early Movers (REM) program, of the German Federal Ministry for Economic Cooperation and Development (BMZ), focuses on the Amazon region, including the departments of Putumayo, Caquetá, Amazonas, Guainia, Guaviare, Vaupes and Meta
- The World Bank BioCarbon Fund’s Initiative for Sustainable Forest Landscapes (ISFL) has a program in the Orinoquia region, covering the departments of Arauca, Casanare and Vichada

The high-supply scenario covers all forest land in Colombia and includes the sequestration potential from continuing forest land restoration (FLR) activities – primarily via afforestation and reforestation – taking into account Colombia’s historical average rate from 2001 to 2012, and Colombia’s current forest restoration target of [2,017,984 hectares](#).⁶

Short term, jurisdictional supply potential based only on existing projects

The Ministry of Environment and Sustainable Development (MADS) has identified emissions

⁶ IUCN, Bonn Challenge Forest Land Restoration (FLR) Desk. Available at: <http://www.bonnchallenge.org/flr-desk/Colombia>

reductions initiatives (including the Clean Development Mechanism (CDM), voluntary market projects, and Nationally Appropriate Mitigation Actions (NAMAs)) that represent a potential accumulated reduction of 515 million tCO₂ in 2030.⁷ This includes forest and land-based initiatives.

ICAO has yet to decide the types of emission reductions which will be eligible for compliance with CORSIA, or the programmes that can deliver such units. Decisions on Emissions Unit Criteria (EUC) and eligibility criteria for offsetting programmes are expected no later than 2018. There is a possibility that issues specific to the land-use sector could present challenges for eligibility, but it is the authors' understanding that EUC shall not prejudice particular sectors. In addition, the ICAO negotiations will also determine what "vintage" of emission reductions will be eligible for CORSIA. Reductions prior to 2013 are not under consideration. It is possible that emission reductions post-2013 will be eligible, in addition to post-2016 and post-2020. This will have implications for overall supply in the market, including for REDD+.

If ICAO decides that REDD+ *projects, where the accounting of offsets is done at a scale smaller than state or provincial jurisdictions, are ineligible sources for the CORSIA but there are no sub-national, jurisdictional scale programs actually delivering offset credits at this time, how can airlines be confident of short term supply?* Table 2 below demonstrates the potential supply of emissions reduction units (tCO₂) that could be available from REDD+ or forest-based projects within the Departments (sub-national jurisdictions) of Colombia. This bottom-up analysis is intended for illustrative purposes only, as the [nesting](#)^{8,9} of such projects into a jurisdictional REDD+ program may result in a change in project-level estimates as a result of aligning baselines or reference levels, distribution and allocation of accrued results, and/or other jurisdictional program considerations.

It is important to note that nesting of projects within jurisdictional programs has been effectively applied within the Andean region in Colombia and elsewhere. Nesting provides regulatory assurance and mitigates legal risk to investors, communities and participating companies, while allowing for rigorous attestation, validation and verification of emissions reductions and economically efficient cost-benefit sharing instruments.

A majority of the projects listed below in Table 2 have been registered by the [Verified Carbon Standard \(VCS\)](#) and some have already been in operation for a few years. In the Department of Chocó, for example, the projected emissions reductions from existing projects amounts to over

⁷ MINAMBIENTE, 2016. Post-2020 Accounting: Implications for Carbon Pricing and Registries, Colombian Context. (<https://www.thepmr.org/system/files/documents/PMR%20Hanoi%20Registries.pdf>)

⁸ <http://www.v-c-s.org/project/jurisdictional-and-nested-redd-framework/>

⁹ Pearson TRH, Casarim FM and McMurray A. 2016. Guidance Document: Options for Nesting REDD+ Projects. Commissioned by Fundación Natura Colombia. Pp 29.

1.3 MtCO₂e/year, in aggregate, to 2043.¹⁰

What do these projects mean for supply from sub-national, jurisdictional REDD+ programs? The Government of Colombia has developed strategies, policies and plans that provide the requisite high-level direction and administrative framework for implementing and reporting REDD+ activities at sub-national levels, including:

- The Amazon Vision Program to achieve zero net deforestation in the Colombian Amazon by 2020, launched by Government of Colombia in June 2016;
- The National Development Plan (PND) 2014-2018, which sets the goal of eliminating deforestation in natural forests by 2030;
- The commitment to adopt a national greenhouse gas registry, including a REDD+ registry.

The national REDD+ registry, currently under development, will be a key tool in preventing double-counting and providing the transparency of information necessary for the effective nesting of projects within jurisdictional and national systems. A requirement to register with the National REDD+ Registry would also help to mitigate legal ambiguity regarding the ownership of the emission reductions and inconsistencies between national GHG inventories and the general REDD+ accounting.¹¹

In Colombia, either Departments or Regional Autonomous Corporations (CARs) could be considered as appropriate sub-national jurisdictions for REDD+. According to the REDD desk:

Regional Autonomous Corporations (CARs) are decentralised environmental management authorities and are the principle environmental authority at the regional level, though territorial entities also have a role. CARs are responsible for all environmental management within their jurisdiction including managing forests and granting and enforcing environmental licenses. CAR territorial jurisdictions were initially based on watersheds but later began to reflect administrative boundaries (there are now 30 CARs and 33 administrative departments (departamentos). They are represented at the National level by the Association of CARs (ASOCARS).

Two CARs are active in a REDD+ Early Initiative, REDD+ in the Purace - Cueva de los Guacharos National Parks Corridor: The Corporación Autónoma Regional del Alto Magdalena (CAM) for the Corporación Autónoma del Río Grande de la Magdalena

¹⁰ <http://www.v-c-s.org>

¹¹ Charlotte Streck, Darragh Conway, Juan Pablo Castro, and Theo Varns, 2015. The impacts of international REDD+ finance: Colombia case study.

(CORMAGDALENA). The CAR of Risaralda (CARDER) has been particularly active in forest governance.¹²

To facilitate linking jurisdictional supply of REDD+ offset credits to the international market demand from CORSIA, Colombia's National Climate Change System, SISCLIMA, will need to clarify the institutional governance structure and policy for REDD+ within the larger climate change policy framework.¹⁰ Germany's REDD Early Movers Programme (REM),¹³ has begun rewarding emission reductions in the Amazon region in Colombia for the period 2013 – 2017. While the REM Programme does not involve a transfer of emissions reductions (or offsets), the institutional arrangements for achieving, measuring, reporting and verifying REDD+ results at the jurisdictional level can inform the development of the governance structure necessary to supply airlines' demand under CORSIA.

¹² <http://theredddesk.org/countries/actors/association-regional-autonomous-corporations-colombia>

¹³ <https://www.kfw-entwicklungsbank.de/PDF/Entwicklungsfinanzierung/Themen-NEU/20151128-REM-Colombia-agreement-summaryFINAL.pdf>

Table 2. Supply of REDD+ project emissions reduction units (tCO₂), by jurisdiction*

Department	Project Name	Project Crediting Period	Expected average emissions reductions (tCO ₂ per year)*
Chocó	Concosta REDD+ Project	2013 to 2043	333,978
	Rio Pepe y Acaba REDD+ Project	2014 to 2044	224,050
	Siviru-Usaraga-Pizarro-Piliza (SUPP) REDD+ Project	2013 to 2043	312,078
	Carmen del Darien (CDD) REDD+ Project	2014 to 2044	462,190
Valle de Cauca	Bajo Calima y Bahia Malaga (BCBM) REDD+ Project	2013 to 2043	498,719
	Cajambre REDD+ Project	2013 to 2043	297,488
Nariño	Acapa - Bajo Mira y Frontera REDD+ Project	2013 to 2043	404,786

* Potentially available (greater than 100,000 tCO₂ per year) based on public information. See VCS Project Database <http://www.vcsprojectdatabase.org/#/projects>

VALUE FOR COLOMBIA

What is the value for Colombia of joining the CORSIA from 2021?

Colombia will be able to sell eligible emission reduction credits (offset credits) into the CORSIA without formally “opting in” to the Pilot Phase and First Phase. In this case, the country can essentially benefit from the mechanism without incurring any cost. However, an early entry by Colombia and its international airlines could provide considerable financial benefits at a relatively low cost. Specifically, by opting in during either the Pilot Phase or First Phase, Colombia can help increase the demand for offset credits, which will increase the market price for offset credits according to assumptions in the model. The country’s airlines would bear the relatively small cost of early entry (see next section), but, as a large forest nation, Colombia could reap greater rewards of receiving a higher offset credit price from selling REDD+ credits to airlines under the CORSIA.

However, in order increase offset credit prices significantly other currently excluded countries would also have to opt in to CORSIA early. On its own, Colombia represents a small share of

international aviation emissions – at 0.35 percent, making up a very small share of global demand for offset credits.¹⁴ Among its neighbors in the Latin America and Caribbean (LAC) region, Brazil, Costa Rica, Ecuador, Panama and Peru are also excluded from the first phase of the scheme. Like Colombia, these are also forest countries which could benefit from higher offset credit prices. Mexico has already indicated that it will opt-in voluntarily in 2021. In addition, other REDD+ countries - Burkina Faso, Chile, Costa Rica, El Salvador, Gabon, Guatemala, Indonesia, Kenya, Nigeria, Papua New Guinea, Thailand and Vietnam - will join CORSIA in either its first or second phase.

The analysis focuses on three main variables. Participation in the pilot and first phase of CORSIA is modeled under two scenarios: high participation and low participation. The credit price reached in the market vary both between scenarios and over time depending on the level of participation. Finally, the available supply of REDD+ credits has three scenarios where the activities eligible to be sold into CORSIA vary. The methodology is explained in more detail in the Annex.

If Colombia's participation can convince its regional partners to join CORSIA, our analysis shows that greater participation could have a significant impact on credit prices. Our analysis includes a high participation scenario, with credit prices of \$21 to \$28 per tCO₂, so that if all available offset credits are sold Colombia could earn a total of between \$2.6 to \$16 billion during the six-year Pilot Phase and First Phase (2021 to 2026). Alternatively, a scenario with limited CORSIA participation would generate credit prices of between \$9 to \$12 per tCO₂, Colombia could earn \$1.1 to \$6.8 billion during that same time period. Therefore, *the additional revenue from Colombia and other's early opt-in to CORSIA could be as high as \$1.5 to \$9.2 billion (Figure 1)*. For a relevant comparison, Colombia's GDP in 2015 was \$292 billion. At the high-end of possible credit prices, Colombia stands to make substantial economic gains from voluntarily joining the CORSIA in 2021.

The analysis was also replicated using a much lower and narrower range of possible credit prices: \$6 to \$9 per tCO₂ with limited participation in CORSIA, increasing to \$8 to \$12 per tCO₂ in the higher participation scenario. In this case, Colombia's airlines would incur an estimated additional cost from early opt-in of \$23 million total over 2021 to 2026, while Colombia would receive between \$322 million to \$2.0 billion in additional revenue over 2021 to 2026. Even in this low-demand scenario, the added revenue (to government) from early entry far outweighs the cost (to industry, see below).

¹⁴ CAEP, 2016. Presentation of Technical Analysis Results to the ICAO Environment Advisory Group. 20-21 January. Available at: http://www.icao.int/Meetings/HLM-MBM/Documents/EAG15_CAEP%20Technical%20Analyses.pdf.

What is the cost to Colombia of joining the CORSIA in the Pilot Phase?

In 2010, Colombia was responsible for approximately 0.35 percent of international aviation emissions.^{15,16} This analysis assumes that Colombia's share of international aviation emissions remains constant. If broad participation in the CORSIA encourages a starting price of \$21 per tCO₂ in 2021 that gradually increases to \$28 per tCO₂ in 2026 when more countries join, the net present value of Colombian airlines' total cost over the entire six-year period would be \$54 million, less the than marginal [fuel price variability](#). A CORSIA with more exclusions, which means fewer airlines and routes included in the Pilot and First Phases, however, could result in prices as low as \$9 per tCO₂ in 2021 with a gradual increase to \$12 per tCO₂ by the conclusion of the First Phase in 2026. Because Colombia's airlines would not have to purchase offset credits at this lower price, *the additional cost of joining the CORSIA in its Pilot Phase would be approximately \$23 million.*

Table 3: Costs to Colombia of joining CORSIA (millions US\$, estimated)

Year	High Demand (High prices)	Low Demand (Low prices)
2021	\$ 2.6	\$ 1.1
2022	\$ 5.6	\$ 2.3
2023	\$ 8.8	\$ 3.7
2024	\$ 12.4	\$ 5.3
2025	\$ 16.2	\$ 7.0
2026	\$ 20.9	\$ 9.2
Total Cost of Early Opt-In*	\$ 53.6	\$23.0

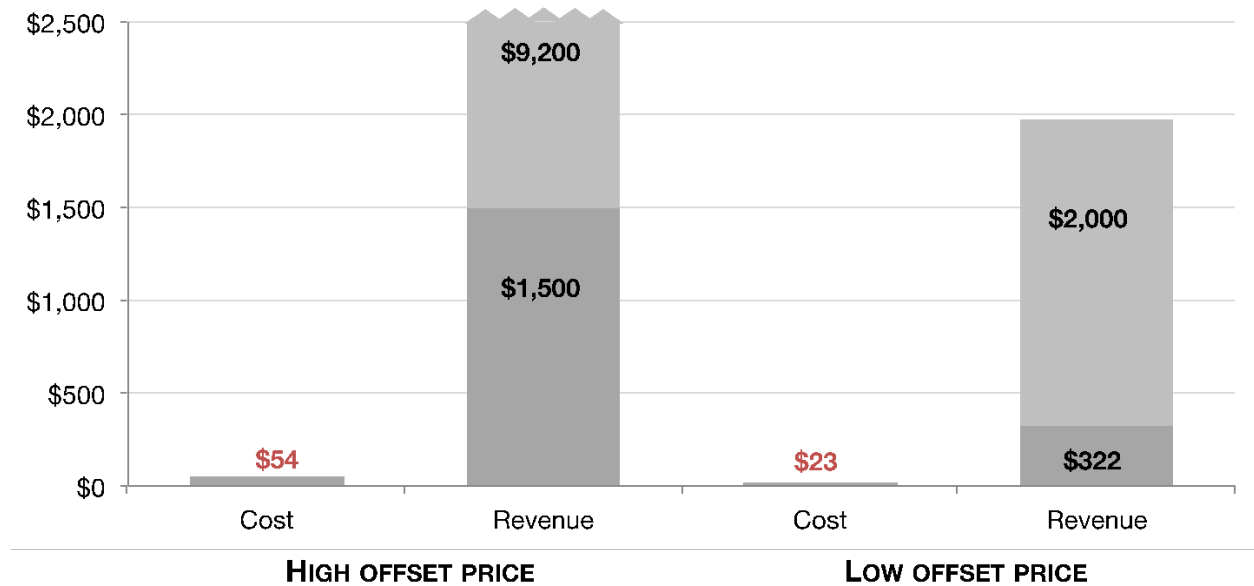
*Net Present Value discounted at 5 percent. See Annex for detailed methodology.

¹⁵ ICAO Environment Advisory Group Meeting, 2016. Results of Technical Analyses by CAEP. http://www.icao.int/Meetings/HLM-MBM/Documents/EAG15_CAEP%20Technical%20Analyses.pdf

¹⁶ Dave Southgate, 2013. Aviation Carbon Footprint. <https://southgateaviation.files.wordpress.com/2013/09/global-domestic-footprint-finalv6.pdf>

This figure can be considered as the ceiling of a possible cost range as a starting price of \$21 per tCO₂ is relatively high. This range of price estimates comes from the International Energy Agency's 2013 World Energy Outlook and reflects the prices used in the [January 2016 Presentation](#) of Technical Analysis Results by CAEP to the ICAO Environment Advisory Group.¹⁰ These are higher than current levels of what donor governments have been generally willing to pay – from \$5 per tCO₂ for REDD+ results (not necessarily as transferrable offset credits), through several bilateral and multilateral arrangements, including the World Bank's Carbon Fund and Norway's bilateral agreement with Brazil and its Amazon Fund. As CORSIA is a nascent regulated market, past experience of other voluntary and regulatory markets are informative but may not be accurate predictors of offset credit prices under the CORSIA.

Figure 2. Early opt-in cost versus revenue (millions US\$)



BARRIERS: Real & Perceived

Airline companies have expressed interest in sourcing offset credits from REDD+ activities, particularly due to the broader social and environmental benefits and marketing opportunities, yet there are barriers that will need to be addressed to incentivize airline participation in this market. If Colombian government officials and other relevant decision makers do not address these barriers, airline companies will source credits from other sectors and/or countries.

Uncertainty of supply from eligible REDD+ programs

Currently, given that ICAO has yet to decide on the Eligibility Criteria for Offset Programmes and Emissions Unit Criteria for CORSIA, the supply of units from eligible REDD+ programmes is uncertain. However, the rules for CORSIA are expected to be consistent with UNFCCC rules and guidelines, which includes the Warsaw Framework for REDD+ and any relevant provisions of the Paris Agreement, including those addressing international co-operative approaches (Article 6). It is our view that this means that, to be eligible under CORSIA, the scope of REDD+ activities must be national or, as an interim measure, sub-national. 'Sub-national' is commonly understood as regional, provincial or state jurisdictions, one level of government below the national level. This could also apply to a grouping of jurisdictions that encompass an entire ecological region within a country. This eligibility criteria would effectively exclude direct transfer of emissions reductions achieved from discrete 'projects' despite their inclusion or eligibility in current voluntary carbon markets. While there is a recent positive record of accomplishment from REDD+ projects, such project-level activities would need to be nested, for the purposes of GHG accounting, within a jurisdictional or national REDD+ programme to calculate the resulting emissions reductions and removals relative a jurisdictional or national reference level. Colombia has already reported emissions reductions from the Amazon region for results-based payments from the REM programme, which reduces the uncertainty of supply of jurisdictional or national REDD+ credits from Colombia in the future.

Assuming the CORSIA represents a long-term demand that will significantly exceed the current prices in the voluntary market, there is an incentive for REDD+ project 'owners' to nest their projects within a jurisdictional REDD+ program to meet demand from airlines.¹⁷ Such nesting arrangements will be specific to each jurisdiction and require alignment of GHG accounting baselines or reference levels and agreed-upon share of decreases (and increases) in GHG emissions resulting from activities within the program area.

¹⁷ Ecosystem Marketplace, 2016. State of the Voluntary Carbon Market 2016. (http://www.forest-trends.org/documents/files/doc_5242.pdf)

Government policy and institutional arrangements

Policy questions arising from the Paris Agreement create a degree of uncertainty for potential buyers of emissions reduction units, particularly within a regulated, compliance system such as the CORSIA. Firstly, national 'host' government approval is required under the Paris Agreement, as it is currently for projects under the Clean Development Mechanism (CDM) of the Kyoto Protocol. Is the government of Colombia still open to participating in such a mechanism, specifically supplying nationally or sub-nationally verified emissions reductions units to airlines under the CORSIA? An important consideration is that Colombia has committed to a target, or Nationally Determined Contribution (NDC), under the Paris Agreement and any emission reduction that is transferred or assigned to a country or entity outside of Colombia cannot be used against its own target.¹⁸ Such transfers can be considered as Internationally Transferred Mitigation Outcomes (per Article 6.2 of the Paris Agreement) which serve to enhance Colombia's mitigation ambition and contribute to sustainable development objectives. If Colombia does confirm its interest in taking advantage of such cooperative, market-based approaches, it may wish to withhold a portion of the emissions reductions to use against its own target and to buffer against other liabilities.

In accordance with the Paris Agreement, and with the provisions of the CORSIA, the host country must ensure that any emissions reduction units transferred outside of the country will not be double counted. The Government of Colombia is in the process of establishing its own national GHG registry and tracking system, located in the system of environmental information management under the responsibility of MADS.⁶

Jurisdictional REDD+ programs have a higher degree of complexity and risk than smaller REDD+ projects, which, by their nature, tend to be located and designed to minimize risks and maximize potential gains. Therefore, the official support and participation of regional and local governments is key to the establishing and maintaining the local institutions and relationships necessary for the REDD+ program activities to be implemented as planned. Colombia's National Climate Change System, SISCLIMA, approved in 2016, provides for a multi-stakeholder planning and resource framework to implement Colombia's national mitigation and adaptation goals. These include Colombia's Low Carbon Development Strategy, the National Adaptation Plan and National REDD+ strategy.¹⁹

The launch of the Colombian Voluntary Carbon Market Platform (CVCMP) in late 2016, which is

¹⁸ UNFCCC INDC Submissions Portal:

<http://www4.unfccc.int/Submissions/INDC/Published%20Documents/Colombia/1/INDC%20Colombia.pdf>

¹⁹ <http://www.minambiente.gov.co/index.php/component/content/article/126-noticias-cambio-climatico/2214-gobierno-nacional-aprueba-decreto-sobre-cambio-climatico>

being managed by the Colombian Stock Exchange ([la Bolsa Mercantil de Colombia](#)) in cooperation with the Ministry of Environment and Sustainable Development and technical support from Fundación Natura, was a major advancement for Colombia.²⁰ While this platform is currently considered to be in a pilot phase, it could serve as a window for airline companies to purchase eligible offset credits from jurisdictional REDD+ programmes in Colombia – as linked to Colombia’s domestic REDD+ registry.

Financial risk management

Standardized financial [risk mitigation tools](#) exist and have been widely used to meet the requirements for investors to invest in or expand their investments in Latin America.²¹ For example, there are numerous U.S. Government investment, insurance and finance facilities actively supporting global investment in Peru. In June 2012, the Overseas Private Investment Corporation (OPIC) [approved](#) a \$185 million loan to enable New York-based private equity investment firm Conduit Capital Partners to finance the construction and operation of two 20 megawatt solar facilities in southern Peru.²²

Investment grade jurisdictional REDD+ programs need to demonstrate commercial viability. In other words, program revenues need to cover program costs while providing returns commensurate to the risk for investment capital provided, alongside required co-benefits. A program’s ability to achieve registration and deliver verified emissions reductions on a predictable schedule while achieving desired risk and return requirements of a typical investor is referred to as being “[investment grade](#).”²³ This allows programs to sell future emissions reductions today to secure upfront financing to fund project implementation and management, regardless of whether the program is public, private, or public-private partnership managed and / or funded. The better the commercial preparedness demonstrated by a program, the more likely the program will succeed in obtaining favorable and longer-term investment terms.

Some of the types of possible investment include Emissions Reduction Purchase Agreements (ERPA), equity investment, loan financing and insurance. [Standardized approaches](#) exist for each of these four tools.¹³ In fact, the OPIC REDD+ emissions reduction [insurance launch](#) in 2011 received numerous awards. OPIC provided \$900,000 in political risk insurance to a US-based private investment fund to support the conservation of 64,318 ha of Cambodian forests while sequestering up to 8.7 million tCO₂ and securing significant community and biodiversity

²⁰ <http://www.bmcco2.com.co>

²¹ Gabriel Thoumi, Cameron Prell and Gus Kent, Revista EcoSostenible, October 2011. Gestionando los riesgos financieros del carbon forestal.

²² <https://www.opic.gov/press-releases/2012/opic-board-approves-185-million-two-solar-power-projects-peru>

²³ http://www.fcmcglobal.org/documents/FIELD_Report_No_16_REDD+_Guide.pdf

co-benefits.²⁴

ERPAs can function using two models – a pre-payment approach or a pay-on-delivery approach. In a pre-payment approach, funds are dispersed upfront based on expected emissions reductions (which produce offset credits), making funds available for program development. This upfront payment, usually at a discounted price per credit, may signal to other investors that the program is investment grade. The risk of program failure is with the buyer. In a pay-on-delivery ERPA, the sales contract may be agreed before the program begins, but the payment for the credits occurs only once the emissions reductions are verified and the offset credits are issued. The transaction's terms are pre-agreed and described in a term sheet, which, in the context of financial risk management, provides certainty of timing and value of future cash flows to participants.

Program financing approaches that do not require ERPAs include equity investment and loans. Institutional investors are often strategic investors who develop a relationship with a program during its initial stages, with the aim of accruing financial benefits as the program matures. The investor usually receives equity in the program in return for putting capital at risk upfront. Institutional investors seek long-term relationships which allow them to assume risk commiserate with returns. This makes them comfortable with fluctuations in performance as a program matures. Yet in an equity investment relationship, there is no predetermined buyer of future offset credits. However, an equity investor may seek to obtain a dividend that is a portion of the program's annual profits.

In a loan financing approach, a loan is made to the program so that it receives an early injection of funding. Loan agreement terms typically have operating and financial performance benchmarks and criteria that the program must achieve. Loan interest rates are typically fixed and must be paid, regardless of program performance, with seniority over the demands of other shareholders, including equity investors. Development finance banks are strong candidates to lend to REDD+ sector.

Who to purchase from and how?

Airline companies would prefer to interact with other businesses, rather than governments, when negotiating the terms of contracts to supply emissions reductions units. However, REDD+ programs necessarily involve sub-national and national government participation, if not leadership. Where 'host governments' have an ERPA with an international institution, such as the World Bank's Carbon Fund or BioCarbon Fund ISFL, it is possible that the World Bank

²⁴ <https://www.opic.gov/press-releases/2012/opicterra-global-redd-insurance-project-cambodia-wins-sustainable-forestry-award>

could serve as the agent to sell additional or unallocated units to airline companies.²⁵

From the Colombian perspective, the Government of Colombia could signal that they are interested in securing international financing through the Voluntary Carbon Market Platform, in conjunction with a multilateral development bank (e.g. World Bank's BioCarbon Fund or FCPF) or with support of the insurance tools available from the U.S. Government (e.g. OPIC) or other institution. The Government of Colombia can achieve this by developing a standardized ERPA to transfer their emissions reductions via this investment vehicle or window allowing simple and easy investment by global airlines in Colombian REDD+ programs.

Global investors could signal their interest first via a Term Sheet and then later via an ERPA. As introduced above, a Term Sheet is a preliminary document that is a written summary of negotiating points agreed between seller and purchaser, but not a contract and not necessarily legally binding - although some components may be legally binding such as exclusivity and confidentiality. The Term Sheet helps the program secure other funding, such as development bank loans, because it demonstrates investor interest as a possible "investment-grade" program.

An ERPA is a legally binding contract between an investor and program for pre-payment or pay-on-delivery of emissions reductions. It is subject to the laws of Colombia and will be written by Colombian attorneys according to Colombian laws. A typical ERPA will have sections describing conditions, precedent, prices, delivery, milestones for project development, representations and warranties, liabilities and indemnities, termination events and other sections. The World Bank and many other institutions have standardized ERPAs available.

The benefit to the Government of Colombia of developing the Carbon Market Platform into a standardized investment vehicle or window supported by a multilateral development bank or other institution is that it will clarify the roles of the seller and the buyer. This will develop into a standardized ERPA allowing for ease of transaction, assurance of contract completion, liquidity, clear cost-benefit sharing agreements and well-described community and biodiversity co-benefits.

²⁵ Donna Lee and Charlotte Streck, 2016. REDD+ ER Transactions and the Paris Agreement [DRAFT]

Recommendations

Part A

To remove the four main barriers linking Colombia's REDD+ Strategy to the airlines' demand for emissions reductions, as part of the broader financing strategy for achieving Colombia's climate change and development goals, we recommend the following:

1. In the context of ICAO CORSIA, or more broadly, the Government of Colombia announces its willingness to offer or approve the transfer of GHG emissions reduction credits (i.e. offset credits) resulting from REDD+ activities, consistent with its national REDD+ strategy and the Paris Agreement.
2. The Government of Colombia announces its plans regarding the REDD+ national registry and tracking system, a policy for nesting project activities within sub-national or jurisdictional REDD+ programs, and noting, as appropriate, linkages to the Colombian Voluntary Carbon Market Platform and World Bank BioCarbon Fund.
3. Sub-national governments overseeing jurisdictional REDD+ programs announce their support of the national government's REDD+ strategy and their interest in supplying REDD+ emissions reductions units originating in their jurisdictions to airline companies.
4. The Government of Colombia should facilitate up-front, private investment by establishing or clarifying the necessary institutional and legal conditions, including development of a standardized ERPA for jurisdictional REDD+ programs.

Part B

We recommend that Colombia voluntarily join the ICAO CORSIA beginning in 2021 and actively rally others in the LAC region to do the same. Given the country's leadership in climate diplomacy, within the LAC region and the UN community, its influence could be effectively extended to gain support of other developing nations to volunteer for early participation in the CORSIA, partly based on the opportunity to support REDD+ goals.

Given the Colombian government's interest in market instruments to aid in achieving its climate change targets, participation in ICAO's [technical discussions](#) is recommended to ensure appropriate eligibility for REDD+ in the ICAO CORSIA.

Annex: Detailed Methodology for Estimating Financial Cost and Benefit of Opting-in to the CORSIA

In this brief, we compare the cost to Colombia’s aviation industry of opting-in to the pilot and first phases of the ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) relative to the benefit from the sale of REDD+ into the CORSIA. This analysis focuses only on the **Pilot Phase** and **First Phase**, 2021 to 2026.

The Price of Emissions Offset Credits

The range of possible credit prices, expressed in US\$ per tCO₂, is taken from the International Energy Agency’s 2013 World Energy Outlook and reflects the prices used in the [January 2016 Presentation](#) of Technical Analysis Results by CAEP to the ICAO Environment Advisory Group.

Table 1. Credit price range (\$)

	Alt Low	Low	High
2020	\$6.00	\$8.00	\$20.00
2021	\$6.40	\$8.70	\$21.30
2022	\$6.80	\$9.40	\$22.60
2023	\$7.20	\$10.10	\$23.90
2024	\$7.60	\$10.80	\$25.20
2025	\$8.00	\$11.50	\$26.50
2026	\$8.40	\$12.20	\$27.80

To estimate both the cost and revenue in the limited CORSIA case, the analysis adopts the “low” emissions credit price during 2021 to 2026. This reflects the impact of low airline participation and thus a reduced demand for credits. In the expanded CORSIA case, the analysis uses the “high” price range. The higher value is intended to model the maximum possible impact of increased demand for credits that may result from an expanded participation in the CORSIA. We also test our results with a much narrower range of possible credit prices, using the “alternative low” in the limited CORSIA scenario, and the “low” in the expanded CORSIA case.

Limited vs. Expanded CORSIA: The Cost to Colombia’s Airlines

The portion of international aviation emissions attributable to Colombia was used to estimate the cost to Colombia’s airlines. Based on data from 2010 and 2012, this proportion is approximately 0.35 percent, on average. This percentage was not further segregated into the portion that will be subject to the CORSIA based on the assumption that a more inclusive

scheme would cover most of the destinations served by flights to and from Colombia.

For simplicity, Colombia’s emission reduction responsibility was calculated as a constant percentage of 0.35 percent of future estimated demand for offset credits based on low and high demand scenarios from CAEP’s Technical Analysis (table below).²⁶ The “low demand” figures are used in the limited CORSIA scenario to reflect the decreased need for offset credits in a scheme with lower airline participation; the “high demand figures” are used to model the expanded CORSIA case.

Table 2. Final quantity to offset (million tCO₂)

	Limited CORSIA		Expanded CORSIA	
	Low Demand	Colombia’s share	High demand	Colombia’s share
2021	28	0	35	0.1
2022	57	0	70	0.2
2023	85	0	105	0.4
2024	114	0	140	0.5
2025	142	0	175	0.6
2026	171	0	215	0.7

Note: When Colombia’s airlines do not participate in first phase of CORSIA, Colombia’s share of offsets is effectively zero.

The annual cost is then estimated by simply multiplying Colombia’s share of the demand for offset credits by its price. The total cost is then calculated by summing across the chosen time period, 2021 to 2026 and applying a 5 percent discount rate. Results are presented below in Table 3.

Table 3. Final Costs (millions \$)

	Limited CORSIA	Expanded CORSIA (High prices)	Expanded CORSIA (Low prices)
2021	\$0	\$ 2.6	\$ 1.1
2022	\$0	\$ 5.6	\$ 2.3
2023	\$0	\$ 8.8	\$ 3.7
2024	\$0	\$ 12.4	\$ 5.3
2025	\$0	\$ 16.2	\$ 7.0
2026	\$0	\$ 20.9	\$ 9.2

²⁶ This assumes that Colombia’s international aviation emissions would grow at the same rate as global aviation emissions. We recognize that this method does not account for the possibility that Colombia will lower its airline emissions over time, and therefore may overestimate the true future cost. Given this caveat, we can look at such a calculation as a maximum of what Colombia’s airlines may be expected to pay barring any large increases in future emissions.

Total Cost of Early Opt-In (NPV discounted at 5 percent)	\$53.6	\$ 23.0
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Colombia's REDD+ Supply

Estimates of the supply of offset credits from REDD+ activities in Colombia are based on the methodology used for the study by Grillo-Avila et al. (2016)²⁷ of global REDD+ supply for the ICAO CORSIA. However, for the purposes of this country-specific analysis, Colombian government data was used wherever possible and three scenarios have been selected to represent a range of potential availability. Importantly, these estimates do not consider the economic costs of the implementing the REDD+ activities. Our estimates of supply also do not account for emissions units that would be kept domestically to meet Colombia's emission reduction target, which would be necessary to avoid double counting in estimating the supply available to the ICAO CORSIA. The uncertainties inherent in these projections are significant but the applied methodology is sufficient to inform the high-level policy decision, in the absence of projections published by the national government.

A **low supply scenario** estimate limits the scope of activities to the jurisdictions which are formally engaged in international partnerships focused on REDD+ in Colombia: REDD+ Early Movers (REM) program commissioned by the German Federal Ministry for Economic Cooperation and Development (BMZ), and the World Bank BioCarbon Fund's Initiative for Sustainable Forest Landscapes (ISFL). The REM program focuses on the Amazon region, including the states of Putumayo, Caquetá, Amazonas, Guainia, Guaviare, Vaupes and Meta. The ISFL program covers states in the Orinoquia Region: Arauca, Casanare and Vichada. A **high supply scenario** covers all forest land in Colombia. A **third supply scenario** includes the sequestration potential from continuing forest land restoration (FLR) activities (primarily afforestation and reforestation) taking into account the historical average (2001-2012) and Colombia's current [2,017,984 hectare](#) forest restoration target.²⁸

Colombia's Forest Reference Emission Level, as submitted to the UNFCCC in December 2014, has been used as the basis for calculating estimates of reduced emissions from deforestation in the Amazonas region. For the remainder of the country, the Global Forest Watch data has been used to calculate a reference level based on average emissions from 2001-2014. Tree cover loss data from [Global Forest Watch](#) was used to estimate both BAU forest emissions.

²⁷ R. Grillo Avila, M. Wolosin, A. Roth, R. Lubowski, P. Piris-Cabezas, and G. Russo. "REDD+ in ICAO: Ready for Takeoff." *Draft submitted for publication*. July 2016.

²⁸ IUCN, Bonn Challenge FLR Desk. Available at: <http://www.bonnchallenge.org/flr-desk/colombia>

Table 4. Supply from REDD+ (million tCO₂) under three scenarios*

	Low: Jurisdictional	High: National	Forest Land Restoration	High +FLR: National
2021	20.8	39.5	89.0	128.5
2022	20.9	46.1	85.5	131.6
2023	21.0	52.7	79.1	131.8
2024	21.1	59.3	71.5	130.8
2025	21.3	65.9	64.2	130.1
2026	21.4	65.9	57.8	123.7
Average	21.1	54.9	74.5	129.4

*Note: These estimates do not take into account REDD+ units that may be retained to meet Colombia's NDC.

Limited vs. Expanded CORSIA: Colombia's Revenue from Selling REDD+ Credits

To calculate the additional revenue to Colombia from an early opt-in to the CORSIA, the price differential between the "high" and "low" offset credit prices was multiplied by the range of supply in each year. The total revenue is then calculated by summing across 2021 to 2026 and applying a 5 percent discount rate. Results are presented below in Table 5.

Table 5. Additional Revenue from Early Opt-In (millions US\$)

	High Offset Credit Prices			Low Offset Credit Prices		
	Low: Jurisdictional	High: National	High+FLR : National	Low: Jurisdictional	High: National	High +FLR: National
2021	\$ 262.1	\$ 497.7	\$ 1619.1	\$ 47.8	\$ 90.9	\$ 295.6
2022	\$ 275.9	\$ 608.5	\$ 1737.1	\$ 54.3	\$ 119.9	\$ 342.2
2023	\$ 289.8	\$ 727.3	\$ 1818.8	\$ 60.9	\$ 152.8	\$ 382.2
2024	\$ 303.8	\$ 853.9	\$ 1883.5	\$ 67.5	\$ 189.8	\$ 418.6
2025	\$ 319.5	\$ 988.5	\$ 1951.5	\$ 74.5	\$ 230.7	\$ 455.3
2026	\$ 333.8	\$ 1028.0	\$ 1929.7	\$ 81.3	\$ 250.4	\$ 470.1
Revenue from early Opt-in (NPV at 5 percent discount rate)	\$1,500	\$3,898	\$9,207	\$322	\$851	\$1,974

Results

The potential benefit from the sale of offset credits from Colombia's REDD+ activities through the ICAO CORSIA ranges from \$299 million to \$9 billion, depending on demand and price.

Table 6. Total Additional Cost and Benefit of Early Opt-In (millions US\$)

	Expanded CORSIA (High prices)	Expanded CORSIA (Low prices)
Cost	\$ 54	\$ 23
Revenue	\$ 1,500 - \$9,207	\$ 322 - \$ 1,974
Net	\$ 1,466 - \$ 9,154	\$ 299 - \$ 1,951