

Policy Analysis | November 2017

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

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.**

Indonesia could meet some of this demand through its current and projected supply of emissions reduced from deforestation and forest degradation, and through forest restoration. This report provides a quantitative analysis of Indonesia's opportunities from making these emission reductions available to airlines in Indonesia and beyond.

Key Findings

1. Indonesia has already elected to join CORSIA from 2021 onwards. Indonesia can increase the impact of CORSIA and augment the associated demand for offset credits by encouraging others in the region to do the same.
2. The costs to Indonesia's airlines from CORSIA participation could be as high as \$115 million. These costs are vastly outweighed by the potential benefits of marketing emission reductions from the forestry sector to airlines. Our analysis finds that the value to Indonesia is, conservatively, \$902 million in total revenue between 2021 and 2026, and potentially over \$10 billion. This investment could be achieved by Indonesia allowing the transfer of as little as 11 percent of achievable emission reductions from REDD+.
3. To facilitate this investment, the Indonesian national government should publically announce its willingness to offer or approve the transfer of a portion of GHG emissions reductions resulting from REDD+ activities to meet airline demand under CORSIA. This will require a change in political direction from the current policy prioritizing REDD+ emission reductions for domestic use, by recognizing the potential benefits from foreign investment. The national government should also prioritize capacity building to develop a national greenhouse gas registry that includes REDD+ to track emission reductions that occur.

BACKGROUND AND CONTEXT

The purpose of this paper is to quantify the potential benefits for Indonesia to make available forest-based emission reductions to airlines through the Carbon Offsetting Reduction Scheme for International Aviation (CORSIA) under the International Civil Aviation Organization (ICAO), including the benefits of also opting-in to CORSIA's pilot phase.

The brief examines the potential demand from global airlines, the potential supply from REDD+ in Indonesia, the costs of early participation in CORSIA's pilot phase to Indonesian airlines, and the benefits to Indonesia from marketing forestry emission reductions to airlines in Indonesia and beyond. We also provide an analysis on how to structure transactions between airlines and Indonesia. An Annex provides more detailed information on our methodology that informs the analysis.

This section provides an overview of CORSIA and the current state of Indonesia's REDD+ policy, to provide context for our analysis.

ICAO'S MARKET-BASED MEASURE

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 September 28, 2017, 72 States, representing 87.7 percent of international aviation activity, intend to voluntarily participate in the CORSIA Pilot Phase. The Government of Indonesia has opted-in to the Pilot and First phases, and so will join from 2021 onwards, and it will also not be exempt during the secondary phase from 2027-2035. Airlines registered in

¹ ICAO, Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). Available at: <http://www.icao.int/environmental-protection/Pages/market-based-measures.aspx>.

Indonesia are a major source of international aviation emissions – an estimated 0.7 percent.

The ICAO members agreed (in Assembly Resolution A39-3) to promote the use of emissions units that benefit developing nations, such as Indonesia. 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+, including through results-based payments, while generating economic growth opportunities for Indonesia.

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.
- Realizing a supply of REDD+ credits requires a strong market demand signal.
- The ICAO CORSIA has could provide this necessary demand signal.

Indonesia's aviation sector is regulated by the Directorate General of Air Transport within the Ministry of Transportation, whereas REDD+ is managed at the national level by the Ministry of Environment and Forestry. Coordination and dialogue between these two ministries will be essential to realize the potential for Indonesia's REDD+ emission reductions as a compliance option for airlines under CORSIA, and this will be a significant challenge for the Indonesian Government.

INDONESIA'S REDD+ POLICY

In November 2016, the Indonesian Government submitted its first Nationally Determined Contribution (NDC) to the UNFCCC. In it, Indonesia plans to reduce emissions by 29 percent through its own efforts, and up to 41 percent with international support, against a business as usual scenario by 2030. Indonesia is the third most forested country in the world, but has been experiencing rapid deforestation and forest degradation. Data from the Food and Agricultural Organization (FAO) data estimates that 68% of greenhouse gas emissions in Indonesia came from land-use change and forestry in 2014.²

Therefore, forests and land use change represent a sizeable opportunity for Indonesia's mitigation strategy. As such, Indonesia's NDC stresses the importance of REDD+ in achieving its overall target. An existing regulation limits international transfers of REDD+ emission

² Data presented in World Resources Institute (WRI) CAIT Climate Data Explorer. Available at: <http://cait.wri.org/> [Accessed: 3 Nov 2017.]

reductions to those which go beyond its NDC, and additionally restricts international transfer to a maximum of 50 percent of these emission reductions. The current policy is to prioritize REDD+ emission reductions for domestic use. However, if CORSIA can offer potential benefits from international investments which outweigh the costs, then revising this stance should be considered. A comprehensive review of Indonesian climate policy by the newly formed Ministry of Environment and Forestry may include scrutiny of this regulation to clarify if it remains appropriate. Indeed, Indonesia is currently preparing a Presidential Regulation on REDD+ and this is an opportunity to revise this regulation.

Indonesia's NDC emphasizes the role of international support from developed countries on financing, technology development and transfer, and capacity building to increase its ambition in reducing greenhouse gases. It also discusses how obtaining international support can assist Indonesia in the implementation of REDD+, the importance of which was reiterated in Article 5 of the Paris Agreement. The Indonesian government believes the country is ready for result-based payments for REDD+, given the progress of REDD+ readiness at the national and sub-national levels.³

Indonesia has broad experience with REDD+. A list of demonstration projects can be found on Indonesia's REDD+ knowledge sharing website.⁴ As of 2014, the Ministry of Environment and Forestry (MoEF) had registered over 35 REDD+ demonstration activities at the project and subnational levels. These projects have been developed and implemented by NGOs, governments, and the private sector, and have contributed to the development of Indonesia's national standards.⁵ For those demonstration activities that provided data, the average area is 704,534 hectares. However, of these demonstration projects only Rimba Raya and Rimba Makmur have reached the validation stage of the project cycle.

In West Kalimantan, GIZ FOLCLIME and Fauna & Flora International (FFI) collaborated with the IJ-REDD+ project to support the development of the sub-national Forest Reference Emission Level (FREL). The FREL for West Kalimantan, published in September 2016, applied the same methodology used for the National FREL, with some exceptions (e.g. emission factors are derived from data generated by sample plots developed by the provincial environmental agency, GIZ FOLCLIME and FFI). Additionally, an FCPF Carbon Fund emissions reduction program, in partnership with Global Green Growth Institute (GGGI), will likely serve as a model for sub-national REDD+ implementation with results-based payments.⁶

³ Ibid.

⁴ Data from REDD-I website. Available at: <http://www.redd-indonesia.org/index.php/tentang-kami/map2>. [Accessed: 27 Sep 2017.]

⁵ IGES, 2017. Indonesia REDD+ Readiness – State of Play – March 2017. Available at: <https://pub.iges.or.jp/pub/indonesia-redd-readiness-state-play-march-2017>.

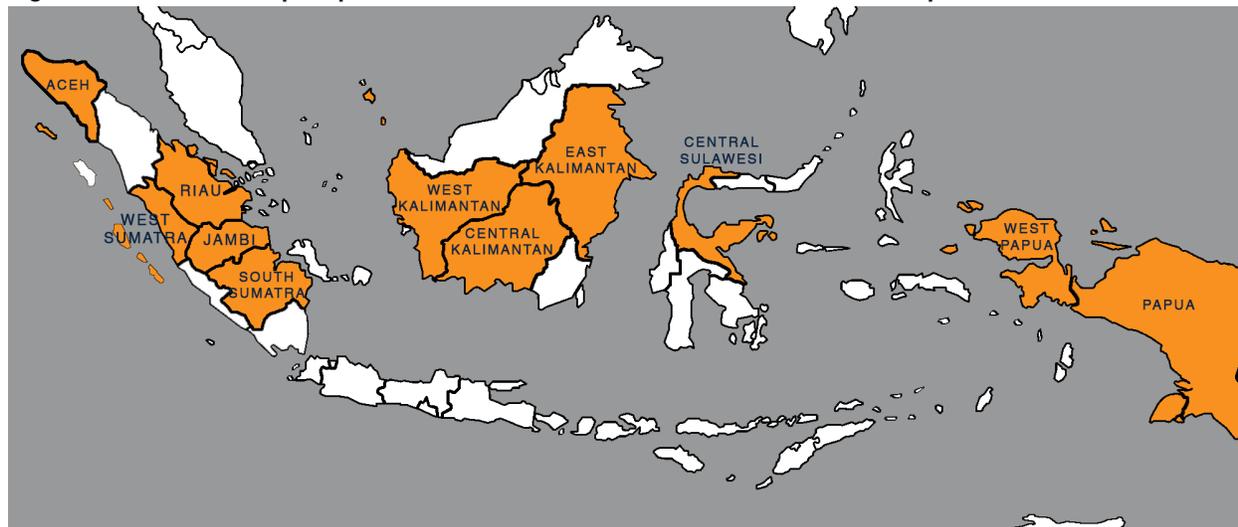
⁶ Ibid.

The National Registry System on Climate Change Control (NRS)⁷ has a database of projects, which can be filtered into different categories, including REDD+.⁸ Seventy-three activities have been registered on the NRS, including 11 REDD+ activities executed by government authorities. The NRS was launched by MoEF in November 2016 and is fully functional. It is intended to act as a platform for standardized and high-quality data gathering and management to make informed decisions on climate change adaptation and mitigation. The objectives of the NRS are as follows:

1. Data collection on climate change mitigation and adaptation action and resources in Indonesia,
2. Government recognition of the contribution of various stakeholders to support climate change control,
3. Preparation of data and information for the public regarding adaptation and mitigation actions and resources, as well as achievements, and
4. Avoiding double counting of actions and resources for adaptation and mitigation, respecting the principles of clarity, transparency and understanding (CTU).⁹

As REDD+ moves to either jurisdictional programs or payments through a national funding mechanism, it will be important for the NRS to include up-to-date information within its Registry on REDD+. The primary responsibility should be with the national government to account for emission reductions. The national government could then allocate benefits accrued at the jurisdictional level based on their contribution to overall emission reductions.

Figure 1. Location of 11 pilot provinces for sub-national REDD+ readiness and implementation in Indonesia



⁷ DGCC - MoEF, National Registry System (NRS) on Climate Change. Available at: <http://ditjenppi.menlhk.go.id/srn/>.

⁸ Data from at DGCC – MoEF National Registry System (NRS) on Climate Change. Available at: http://ditjenppi.menlhk.go.id/srn/index.php?r=site%2Fsebaran&AksiSearch%5Bjns_aksi%5D=1&AksiSearch%5Bid_skema%5D=1&AksiSearch%5Bbidang%5D=3. [Accessed: 27 Sep 2017.]

⁹ DGCC – MoEF, 2016. About NRS on Climate Change. Available at: http://ditjenppi.menlhk.go.id/srn/index.php?r=site%2Ftentang_srn.

ANALYSIS

This section provides the findings of our quantitative analysis. Firstly, we estimate demand for emission reductions from CORSIA based on prior studies. Secondly, using a model developed by Climate Advisers, we calculate potential supply from REDD+ and forest restoration. Using this data, we calculate first the costs to Indonesian airlines from CORSIA from 2021-2026. Finally, we compare this to the benefits for Indonesia from marketing its emission reductions to airlines.

Our analysis focuses on three main variables. We model participation in the pilot and first phase of CORSIA under two scenarios: high participation and low participation. Secondly, 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.

INTERNATIONAL AVIATION: DEMAND FOR EMISSIONS REDUCTION 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).¹⁰ Countries responsible for 65 percent of these emissions have voluntarily opted into the scheme, including Indonesia, 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)¹¹

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

¹⁰ Greenhouse gas emissions and removals are reported in metric tonnes of carbon dioxide equivalent, simplified as tCO₂ in this paper.

¹¹ Based on Environmental Defense Fund (EDF), 2016. ICAO's Market-Based Measure. Available at: <https://www.edf.org/climate/icaos-market-based-measure>. [Accessed: 27 Sept 2017.]

units under the CORSIA, as it requires making assumptions about the growth of the international aviation sector over the next ten 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).

ICAO has yet to decide the types of emission reductions which will be eligible for compliance with CORSIA, or the programs that can deliver such units. Decisions on Emissions Unit Criteria (EUC) and eligibility criteria for offsetting programs are expected no later than the end of 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. We expect CORSIA's rules 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.**

Therefore, by following the relevant UNFCCC decisions the EUC could preclude eligibility of REDD+ offsets generated at a scale smaller than state-level jurisdictions. Any connection between 'project activities' that contribute to REDD+ would be through their contribution to, and possible benefit-sharing arrangement within, a national or state jurisdictional program. While nesting of projects has been implemented, nesting has not yet been applied in a regulatory market.

INDONESIA'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.

Beginning in 2021, Indonesia's estimated average annual supply of REDD+ emission reductions ranges from 140 to 866 million tCO₂, depending on whether coverage is national or only within certain jurisdictions. The low-supply scenario only includes the five provinces affiliated with the Governors Climate and Forest Task Force (GCFTF), a subnational collaborative agreement to advance jurisdictional approaches: Papua, Aceh, and West, Central and East Kalimantan. Emission reductions from other jurisdictions are possible, and membership of the GCFTF is not a prerequisite for delivering jurisdictional REDD+. However, these jurisdictions were selected to illustrate the potential for emission reductions from select provinces rather than nationwide. East Kalimantan was also included in Indonesia's Emissions Reduction Program Idea Note submitted to the World Bank Carbon Fund. The high-supply

scenario covers national emission reduction potential, including significant gains from forest land restoration. A third mid-range supply scenario includes the higher supply level from 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.¹²

Another important consideration is that Indonesia 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 Indonesia cannot be used against its own target.¹³ Such transfers can be considered as Internationally Transferred Mitigation Outcomes (per Article 6.2 of the Paris Agreement) which serve to enhance Indonesia's mitigation ambition and contribute to sustainable development objectives. If Indonesia 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.

In addition to avoiding double counting, distributing REDD+ credits to airlines should not be a substitute for meeting a country's NDC. Potential purchasers of these emission reductions may be hesitant to purchase from countries who fail to meet, or who are not on track to meet, their national targets because of the potential risks to their company's reputation. The Indonesian government should factor these risks into their decision-making regarding both CORSIA and their overall strategy for meeting the unconditional pledge in their NDC. Box 1 addresses Indonesia meeting its NDC while transferring emission reductions to CORSIA.

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 Indonesia's Nationally Determined Contribution (NDC), a requirement that would be necessary to avoid double counting. The Indonesian government would need to affirm its interest in emission reductions from REDD+ being made available for international transfer for the purposes of programs such as CORSIA.

¹² The methodology to derive estimates of the supply of credits from REDD+ activities in Indonesia is described in the annex to this paper.

¹³ UNFCCC INDC Submissions Portal, 2016. First Nationally Determined Contribution: Republic of Indonesia.

Available at:

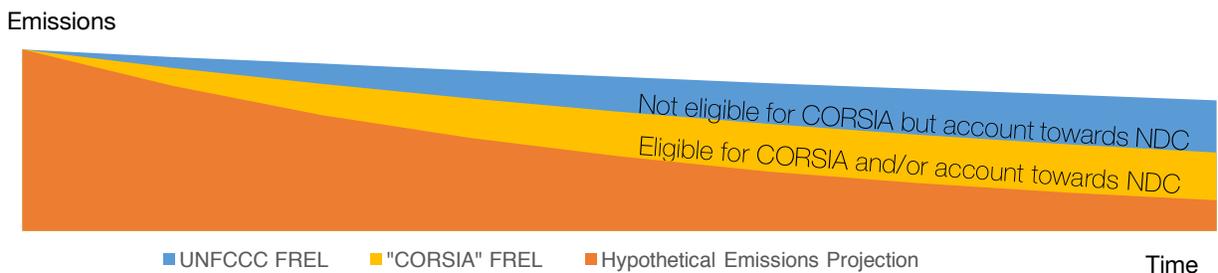
http://www4.unfccc.int/ndcregistry/PublishedDocuments/Indonesia%20First/First%20NDC%20Indonesia_submitted%20to%20UNFCCC%20Set_November%20%202016.pdf.

Box 1: Meeting Indonesia's NDC and Transferring Emission Reductions to CORSIA

Indonesia's NDC represents both conditional and unconditional components under the Paris Agreement. Indonesia already has regulations in place that restrict the transfer of REDD+ emission reductions abroad to reductions that go beyond its NDC. Should the Indonesian government wish to revise this regulation, there may be concern about allowing emission reductions (particularly 'low cost' reductions) to "leave" the country, thereby making it more difficult to achieve the unconditional 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. At this stage, it is unclear which methodologies would be compliant with CORSIA. Therefore, it is premature to compare FRELs. Potential differences between accounting approaches could mean not all REDD+ emission reductions would be available for transfer to CORSIA but could be accounted towards Indonesia'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 Indonesia's NDC.
- c. Indonesia 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. Indonesia 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 Indonesia's NDC.

Figure 2: Indicative "CORSIA FREL" and UNFCCC FREL against Hypothetical Emissions Reductions (illustrative)



COSTS TO INDONESIAN AIRLINES OF CORSIA PARTICIPATION

In 2010, Indonesia was responsible for approximately 0.7 percent of international aviation emissions.^{14,15} This analysis assumes that Indonesia'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 Indonesian airlines' total cost over the three-year pilot phase would be \$113 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 Pilot and First Phases in 2026. In this scenario, the costs to Indonesian airlines from CORSIA between 2021 and 2026 would be approximately \$45.3 million.

Table 3: Costs to Indonesian Airlines during CORSIA Pilot and First Phases (millions US\$, estimated)

	Limited CORSIA (Low prices)	Expanded CORSIA (High prices)	Expanded CORSIA (Low prices)
2021	\$2	\$5.22	\$1.96
2022	\$4	\$11.07	\$4.26
2023	\$6	\$17.57	\$6.91
2024	\$9	\$24.70	\$9.90
2025	\$11	\$32.46	\$13.23
2026	\$15	\$41.84	\$17.31
Total Cost of Indonesia Participation*	\$39.02	\$112.52	\$45.28

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

¹⁴ ICAO Environment Advisory Group Meeting, 2016. Results of Technical Analyses by CAEP. Available at: http://www.icao.int/Meetings/HLM-MBM/Documents/EAG15_CAEP%20Technical%20Analyses.pdf.

¹⁵ Dave Southgate, 2013. Aviation Carbon Footprint. Available at: <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 (IEA) 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 credits), through several bilateral and multilateral arrangements, including the World Bank's Carbon Fund and Norway's Amazon Fund. While Norway is still negotiating a bilateral agreement with Indonesia for results-based payments, it is unlikely to reach the price levels estimated by the IEA. As CORSIA is a nascent regulated market, past experience of other voluntary and regulatory markets is informative but may not be accurate predictors of offset credit prices under the CORSIA.

BENEFITS OF MARKETING FORESTRY EMISSION REDUCTIONS TO AIRLINES

Indonesia's ability to market emission reductions under CORSIA does not depend on its participation in the pilot and first phase. Therefore, should it decide to do so, Indonesia may sell eligible emission reduction credits into CORSIA.

However, to increase offset credit prices significantly other currently excluded countries would also have to opt in to CORSIA early. On its own, Indonesia represents a major share of international aviation emissions – at 1.4 percent, but nevertheless the vast majority of international aviation emissions occur outside Indonesia.¹⁶

Indonesia has shown leadership in the region by opting in to the pilot and first phase of CORSIA, as of 2021. Among its neighbors in the Asia-Pacific region, Papua New Guinea and Thailand have already indicated that it will opt-in voluntarily in 2021. India, the Philippines and Vietnam will have to begin complying with CORSIA in 2024. Other countries in the region are excluded from the first phase of the scheme, including Cambodia, Fiji, Laos, Mongolia, Nepal, Bhutan, Pakistan, Sri Lanka, among others. In addition, other REDD+ countries – Mexico, Burkina Faso, Chile, Costa Rica, El Salvador, Gabon, Guatemala, Kenya, and Nigeria - will join CORSIA in either its first or second phase.

In addition, the analysis assumes that not all emission reductions from REDD+ in Indonesia would be made available for transfer to CORSIA. Understanding the vast potential mitigation from REDD+ in Indonesia, this analysis assumes only a portion being made available to airlines under CORSIA. In the low supply scenario, 11 percent of projected emission reductions from Papua, Aceh, East-, Central- and West Kalimantan are made available to airlines under

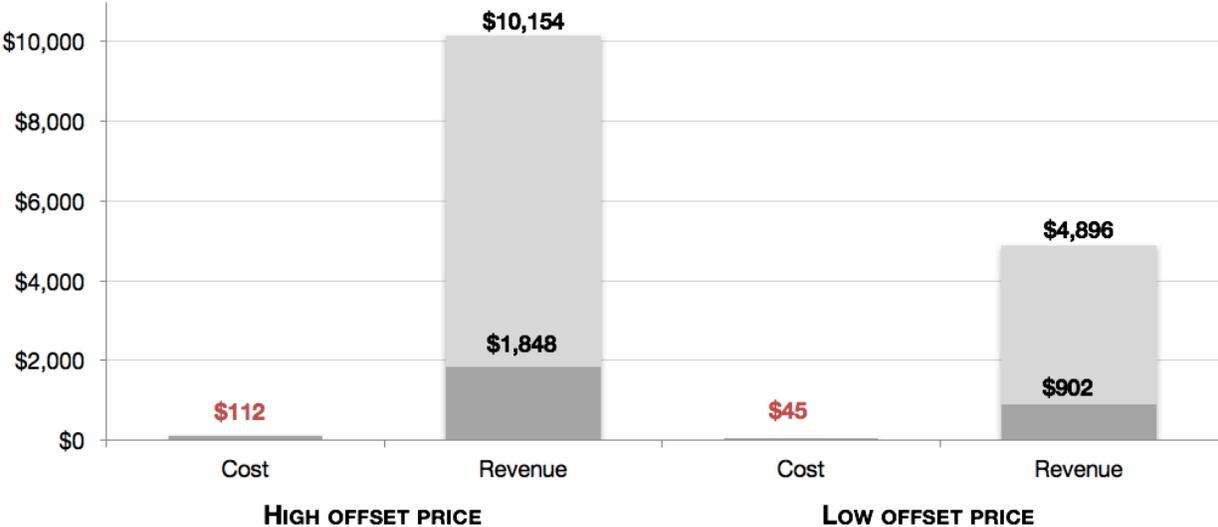
¹⁶ CAEP, 2016. Presentation of Technical Analysis Results to the ICAO Environment Advisory Group. 20-21 January. Available at: http://www.icao.int/Meetings/HLM-MBM/Documents/EAG15_CAEP%20Technical%20Analyses.pdf.

CORSIA. In the high supply scenario, a quantitative limit of 11 percent has been applied to the projected national REDD+ supply that would be made available for transfer to airlines under CORSIA. Under the high supply with forest restoration scenario, a quantitative limit of 11 percent is also applied, which equates approximately to emission reductions that go beyond Indonesia’s conditional and unconditional NDC targets and available for international transfer under current regulations. The methodology is explained in more detail in the Annex.

If Indonesia’s participation can convince its regional partners to join CORSIA in its early phases, 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 the total emission reductions made available – using the limits described above – **Indonesia could earn a total of between \$1.8 to \$10.1 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, **Indonesia could earn \$900 million to nearly \$5 billion during that same period.** In this case, Indonesia’s airlines would incur an estimated additional cost from early opt-in of \$45.3 million total over 2021 to 2026. Therefore, even in this low-demand scenario, the added revenue (to government) from early entry far outweighs the cost (to industry, see below).

Figure 2. Cost versus Revenue for Indonesia (millions US\$)



TRANSACTING BETWEEN INDONESIA AND AIRLINES

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.

Indonesia has opted-in to CORSIA during its voluntary phases. However, its interest in CORSIA should go beyond participation by its airlines to take advantage of the opportunity of marketing its REDD+ program. The Indonesian government can achieve this by examining the financial options available, and working to develop a framework for transacting with interested airlines. .

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 emerging markets. There are numerous U.S. Government investment, insurance and finance facilities actively supporting global investment in Indonesia. For example, in March 2016, the Overseas Private Investment Corporation (OPIC) [approved](#) a \$120 million loan to enable Florida-based renewable energy development company UPC Solar and Wind Investments LLC to finance the construction and operation of two 75-megawatt wind farm in Indonesia.¹⁷

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](#)."¹⁸ 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

¹⁷ OPIC, 2016. OPIC and PT UPC Sidrap Bayu Energi Partner to Expand Indonesia's Capacity to Generate Clean Energy. Available at: <https://www.opic.gov/press-releases/2016/opic-and-pt-upc-sidrap-bayu-energi-partner-expand-indonesias-capacity-generate-clean-energy>.

¹⁸ USAID, 2013. FIELD Report No. 16: Guidance and Best Practices for REDD+ Transactions. Available at: http://www.fcmglobal.org/documents/FIELD_Report_No_16_REDD+_Guide.pdf.

each of these four tools. 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 co-benefits.¹⁹

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.

STRUCTURING TRANSACTIONS

Airline companies would prefer to interact with other businesses, rather than governments,

¹⁹ OPIC, 2012. OPIC/Terra Global REDD Insurance Project in Cambodia Wins Sustainable Forestry Award. Available at: <https://www.opic.gov/press-releases/2012/opicterra-global-redd-insurance-project-cambodia-wins-sustainable-forestry-award>.

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 could serve as the agent to sell additional or unallocated units to airline companies.²⁰

The Government of Indonesia can secure international, private sector financing for REDD+ by developing a standardized ERPA to transfer their emissions reductions via this investment vehicle or window allowing access to Indonesian REDD+ programs by international airline companies. Multilateral institutions such as the World Bank FCPF or the PMR could provide technical assistance to Indonesia to develop these standardized trading documents.

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 Indonesia and will be written by Indonesian attorneys according to Indonesian 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 Indonesia of developing a 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.

²⁰ Donna Lee and Charlotte Streck, 2016. REDD+ ER Transactions and the Paris Agreement [DRAFT]. Available at: <https://www.forestcarbonpartnership.org/sites/fcp/files/2016/May/ER%20transactions%20and%20the%20Paris%20Agreement.pdf>.

RECOMMENDATIONS

Based on our analysis, we find that the Government of Indonesia could generate significant economic benefit from making forest-sector emission reductions available for airlines to purchase under CORSIA. Based on this finding, we offer the following recommendations:

1. In the context of ICAO CORSIA, or more broadly, the Government of Indonesia should announce its willingness to offer or approve the transfer of a portion of GHG emissions reductions resulting from REDD+ activities.
2. The Government of Indonesia integrates the forest and land sectors within its existing NRS registry to provide up to date information on REDD+ projects and programs.
3. Sub-national governments overseeing jurisdictional REDD+ programs announce interest in supplying REDD+ emissions reductions units originating in their jurisdictions to airline companies, including through sub-national partnerships such as the GCFTF. This should be conducted with authorization from the national government.
4. Indonesia should encourage its regional allies who have yet to join CORSIA during its voluntary phases to do so. Higher participation will mean greater climate ambition, and a larger market for Indonesia to access with emission reductions through REDD+.
5. Given the Indonesian 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. This includes coordination between the Ministry of Environment and Forestry and the Directorate General of Air Transport in ICAO negotiations.

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

In this brief, we compare the cost to Indonesia’s aviation industry during 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, rather than the second phase from 2027 to 2035.

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 Indonesia’s Airlines

The portion of international aviation emissions attributable to Indonesia was used to estimate the cost to Indonesia’s airlines. Based on data from 2010 and 2012, this proportion is approximately 0.7 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 Indonesia.

For simplicity, Indonesia’s emission reduction responsibility was calculated as a constant percentage of 0.7 percent of future estimated demand for offset credits based on low and high demand scenarios from CAEP’s Technical Analysis (table below).²¹ 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	Indonesia's share	High demand	Indonesia's share
2021	28	0.196	35	0.245
2022	57	0.399	70	0.49
2023	85	0.595	105	0.735
2024	114	0.798	140	0.98
2025	142	0.994	175	1.225
2026	171	1.197	215	1.505

The annual cost is then estimated by simply multiplying Indonesia’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.

²¹ This assumes that Indonesia’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 Indonesia will lower its airline emissions over time, and therefore may overestimate the true future cost. Conversely, there is a possibility that Indonesia’s international aviation emissions may grow at a higher rate than the global average.

Table 3. Final Costs (millions \$)

	Limited CORSIA (Low prices)	Expanded CORSIA (High prices)	Expanded CORSIA (Low prices)
2021	\$2	\$5.22	\$1.96
2022	\$4	\$11.07	\$4.26
2023	\$6	\$17.57	\$6.91
2024	\$9	\$24.70	\$9.90
2025	\$11	\$32.46	\$13.23
2026	\$15	\$41.84	\$17.31
Total Cost of Indonesia Participation (NPV discounted at 5 percent)	\$39.02	\$112.52	\$45.28

Indonesia's REDD+ Supply

Estimates of the supply of offset credits from REDD+ activities in Indonesia are based on the methodology used for the study by Grillo-Avila et al. (2016)²² of global REDD+ supply for the ICAO CORSIA. However, for the purposes of this country-specific analysis, Indonesian 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 Indonesia'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.

The **low-supply scenario** only includes 5 provinces based on their affiliation with the Governors Climate and Forest Task Force (GCFTF), a subnational collaborative agreement to advance jurisdictional approaches: Papua, Aceh, and West, Central and East Kalimantan. Emission reductions from other jurisdictions are possible, and membership of the GCFTF is not a prerequisite for delivering jurisdictional REDD+. However, these jurisdictions were selected to

²² R. Grillo Avila, M. Wolosin, A. Roth, R. Lubowski, P. Piris-Cabezas, and G. Russo. 2016. "REDD+ in ICAO: Ready for Takeoff." *Carbon & Climate Law Review*, Vol. 10, Issue 2.

illustrate the potential for emission reductions from select provinces rather than nationwide. East Kalimantan was also included in Indonesia’s Emissions Reduction Program Idea Note submitted to the World Bank Carbon Fund. The **high-supply scenario** covers national emission reduction potential, including significant gains from forest land restoration. A **third mid-range supply scenario** includes the higher supply level from REDD+ *without* restoration.

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

	Low: Jurisdictional	High: National	Forest Land Restoration	High +FLR: National
2021	139.9	199.6	666.2	865.8
2022	143.3	232.8	632.8	865.6
2023	146.7	266.1	576.6	842.7
2024	150.2	299.3	508.7	808.0
2025	153.6	332.6	437	769.6
2026	157	332.6	367	699.6
Average	148.5	277.2	531.4	808.6

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

**The High National estimates are calculated using the FREL&FRL submitted by Indonesia to the UNFCCC in 2016, which may not fully comply with CORSIA EUC.

Indonesia’s Revenue from Selling REDD+ Credits

To calculate the total revenue to Indonesia from an early opt-in to the CORSIA, the carbon price under the high and low scenarios was multiplied by the range of supply in each year. Considering the vast mitigation potential for Indonesia from REDD+ this analysis assumes a modest conversion of the mitigation potential into units available for CORSIA. In the low supply scenario, 11 percent of emission reductions from Papua, Aceh, and West, Central and East Kalimantan are made available for CORSIA. In the high supply scenario, a quantitative limit of 11 percent has been applied for the REDD+ supply that would be made available for transfer to CORSIA. In the high supply with forest restoration scenario, the quantitative limit of 11 percent has been applied. This percentage reflects the proportion of the national supply estimate approximate to the emission reductions available for international transfer after meeting the forestry sector target in Indonesia’s conditional NDC. This same limit is applied to jurisdictions under the assumption that the proportion available for international transfer is consistent across jurisdictions. The total revenue is calculated by summing across 2021 to 2026 and applying a 5 percent discount rate. Results are presented below in Table 5.

Table 5. Total Revenue for Indonesia from CORSIA (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	\$328	\$468	\$2,029	\$134	\$191	\$829
2022	\$336	\$545	\$2,028	\$148	\$241	\$895
2023	\$344	\$623	\$1,974	\$163	\$296	\$936
2024	\$352	\$701	\$1,893	\$178	\$356	\$960
2025	\$360	\$779	\$1,803	\$194	\$421	\$974
2026	\$368	\$779	\$1,639	\$211	\$446	\$939
Total Revenue (NPV at 5 percent discount rate)	\$1,848	\$3,410	\$10,154	\$902	\$1,691	\$4,896

Results

The potential benefit from the sale of offset credits from Indonesia’s REDD+ activities through the ICAO CORSIA ranges from \$900 million to \$10.1 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	\$113	\$45
Revenue	\$1,848 \$10,154	\$902 \$4,896
Net	\$3,432 \$13,734	\$2,661 \$6,631

