

CARBON MARKETS ARE WELL-POSITIONED TO MEET CORSIA DEMAND PROJECTIONS

ECOSYSTEM MARKETPLACE INSIGHTS BRIEF

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Key Findings

- **Supplies of carbon offsets that meet reported eligibility proposals (which limit eligibility to reductions achieved between 2016 and 2020) for CORSIA's first three-year compliance cycle (the program's "pilot phase") are more than adequate to meet demand under all scenarios.**
- **Current and potential supplies are 3.7 to 5.4 times higher than ICAO's February 2019 demand forecast.**
- **Current and potential supplies are between 2 and 4 times higher than demand estimated in the International Air Transport Association's (IATA) latest coronavirus (COVID-19) scenarios.**
- **The total pipeline of programs that have applied for recognition under CORSIA is exponentially larger than demand being generated in the pilot phase. Any effort to relax eligibility criteria beyond the current reported recommendation would swamp the market.**

Civilian air travel accounts for a relatively small percent of global greenhouse gas (GHG) emissions, but those emissions are projected to soar over the next 15 years.¹ Emissions from international air travel alone are projected to increase by an amount equal to 2.7 billion metric tons of carbon dioxide (2,700 MmtCO₂e) during that period.

Growth in emissions generated by flights between countries for the most part has not been included by countries in their nationally determined contributions (NDCs) under the Paris Climate Agreement, but are instead being addressed by the International Civil Aviation Organization (ICAO), the specialized agency of the United Nations that oversees international aviation. Every nation with an airport belongs to ICAO, and its members have committed to a goal of carbon-neutral growth from 2021 to 2035. The baseline for this target will be calculated as an average of the sector's emissions between the beginning of 2019 and to the end of 2020.

In 2016, ICAO launched the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).² A key step in CORSIA's implementation is the establishment of a process for identifying emissions units that meet rigorous additionality and permanence criteria but are still broad enough to meet market demand. While both

¹ Ivanovich, Catherine C., Ilissa B. Ocko, Pedro Piris-Cabezas, and Annie Petsonk. "Climate benefits of proposed carbon dioxide mitigation strategies for international shipping and aviation." *Atmospheric Chemistry and Physics* 19, no. 23 (2019): 14949-14965.

² More specifically, ICAO's member state Assembly, which meets every three years, passed Assembly Resolution 39-3 (A39-3), which laid out CORSIA's design and a timeframe for implementation. That resolution tasked the ICAO Council with ongoing governance of CORSIA. The Assembly includes all member states, while the Council is made up of 36 state representatives who are permanently in Montreal and meet three times per year.

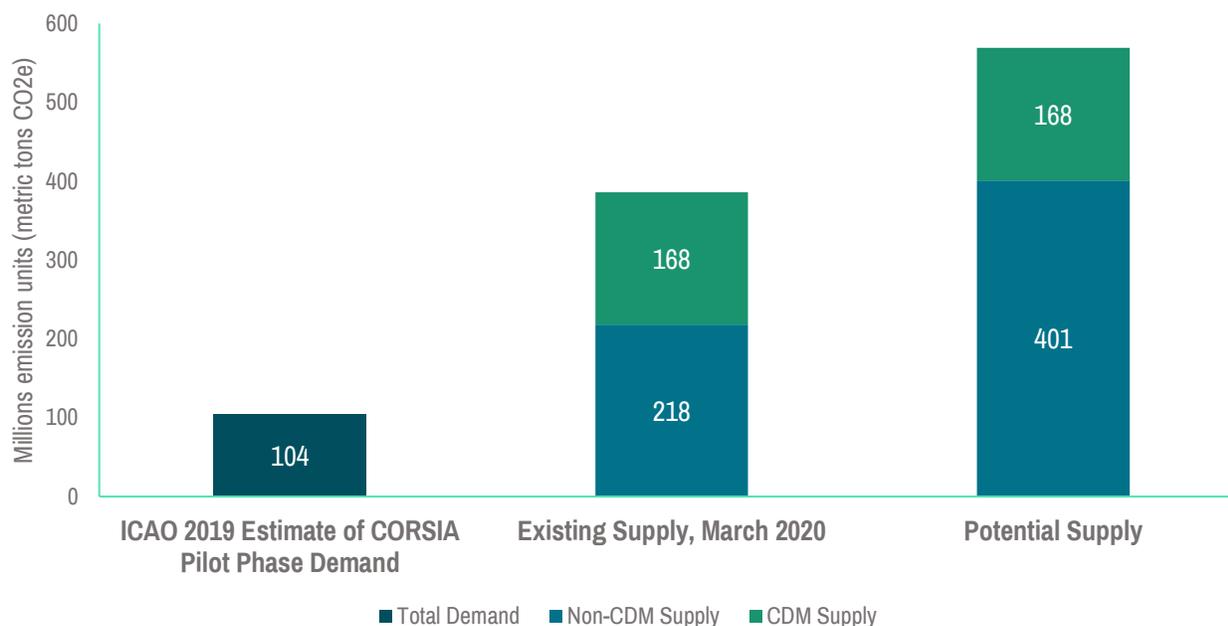
allowances and offset credits could, in principle, be used in CORSIA, to date the program has focused on the latter using the umbrella term “emissions units.” CORSIA’s offset requirements will apply for 15 years, from 2021 through 2035. However, the program enters full force in phases, by allowing countries to opt in to the first two cycles, beginning with a three-year pilot phase that runs from 2021 through 2023 and a second opt-in cycle between 2024 and 2026.³

The ICAO Council is meeting in Montreal during the week of March 9-13, 2020 to agree on a universe of emissions units eligible for the pilot phase. Media reports indicate a recommendation for approval of an initial tranche of units verified under six carbon standards meeting criteria that were agreed on last year and based on reductions from projects that begin crediting in the year CORSIA was approved (2016) through the end of 2020.

There has also been speculation as to whether there is enough supply in the reported 2016-2020 vintage period to meet expected demand during the 2021-2023 timeframe, especially if reductions in air traffic associated with the coronavirus (COVID-19) outbreak lower the baseline and thus increase offset obligations. An analysis by Ecosystem Marketplace shows that there is, indeed, more than adequate supply.

Specifically, we have identified 386 million existing emissions units, each representing one metric ton of verified emission reduction, that are expected to meet ICAO’s previously published Emissions Units Eligibility Criteria and fall within the 2016-2020 time period (Figure 1). We have also identified an additional 183 million units in the development pipeline, for a potential supply of 569 million units. On the demand side, ICAO in February 2019 estimated cumulative pilot-phase demand at 104 million units (See “CORSIA Pilot Phase Demand,” below).

Figure 1. CORSIA Supply and Demand in the 2021-2023 Pilot Phase, Under a 2016-2020 Vintage Scenario



³ Offsetting obligations are determined based on aggregated sector-wide growth against a sector-wide baseline. The "growth emissions" to be offset are distributed among participants based on a formula that starts with offsetting based on sector-wide average growth and then transitions gradually towards offsetting based on each airline’s individual emissions growth.

CORSIA Pilot Phase Demand

CORSIA is slated to run for 15 years, from 2021 through 2035. Demand for emissions units is estimated at 2.7 billion metric tons over the 15-year period.⁴

CORSIA begins with a three-year pilot phase that runs from 2021 through 2023, and participation in this phase is voluntary. As of February 2020, just 82 of the 193 ICAO member countries have elected to join. For this reason, demand estimates range from a low of 78 million metric tons to a high of 130 million tons for the entire three-year period.⁵ ICAO's February 2019 estimates, alluded to above, projected 104 million metric tons of demand (21 million in 2021, 35 million in 2022, and 48 million in 2023).⁶

IATA scenarios estimate a drop in air traffic, measured in RPK (Revenue Passenger Kilometers, e.g., the number of paying passengers flying a kilometer), of up to 19 percent in 2020 due to the coronavirus/COVID-19 outbreak.⁷ This could lower the 2019-2020 baseline and thereby increase demand for emissions offsets significantly if air traffic rebounds in the 2021-2023 period.

Preliminary analysis by the Environmental Defense Fund shared with Ecosystem Marketplace⁸ shows that this additional demand would amount to between one-quarter and one-half of the potential supply we have identified. Further demand growth is limited because countries can reduce the baseline impact through adjustments permitted in the pilot phase.⁹

CORSIA-Eligible Supply: 386-569 Million Metric Tons

The ICAO Council has not yet determined which emissions units will be eligible for CORSIA, but several independent media report that the Technical Advisory Body (TAB), which advises the Council, has recommended limiting eligible emissions units to those generated under six recognized carbon standards through activities that started on or after January 1, 2016 and that reduced emissions before December 31, 2020.¹⁰ ICAO has not confirmed these dates, but they are a feasible outcome, for reasons illustrated below.

⁴ Schneider, L and & La Hoz Theuer, S. 2017. *Using the Clean Development Mechanism for nationally determined contributions and international aviation*. Stockholm: Stockholm Environment Institute. <https://www.sei.org/publications/clean-development-mechanism-nationally-determined-contributions-aviation/>

⁵ ICAO's market-based measure, available at <https://www.edf.org/climate/icaos-market-based-measure>

⁶ ICAO Committee on Aviation Environmental Protection. 2019. Analysis on the estimation of CO₂ emissions reductions and costs expected to result from CORSIA. ICAO. https://www.icao.int/environmental-protection/CORSIA/Documents/CAEP_Analysis%20on%20the%20estimation%20of%20CO2%20emissions%20reductions%20and%20costs%20from%20CORSIA.pdf

⁷ Pearce, B. 2020. "COVID-19: Updated impact* assessment of the novel Coronavirus." IATA, March 5. <https://www.iata.org/en/iata-repository/publications/economic-reports/coronavirus-updated-impact-assessment/>

⁸ Unpublished as of the time of this brief's publication. This analysis is expected to be released by mid-March 2020.

⁹ During the pilot phase, governments can adjust their airlines' offset obligation by applying ICAO's sectoral emissions factor to their airlines' 2020 emissions levels rather than to the airlines' actual emissions in each year from 2021 to 2023. See ICAO Assembly Resolution 39-3, paragraph 11(e). This would significantly blunt the effect of lower-than-expected baselines.

¹⁰ See Lampert, A and Rucinski, T. 2020. "UN aviation agency weighs restrictions on carbon credits under fire by climate activists." Reuters, March 4. <https://www.reuters.com/article/us-climate-change-aviation-exclusive/exclusive-u-n-aviation-agency-weighs-restrictions-on-carbon-credits-under-fire-by-climate-activists-idUSKBN20R0MU> as well as Garside, B. 2020. "UN panel backs offset vintage restrictions for CORSIA global aviation scheme." Carbon Pulse, March 3. <https://carbon-pulse.com/93413/>

The recommendation builds on a steady stream of developments last year, when the Council unanimously approved Emissions Unit Eligibility Criteria (EUC) establishing 19 metrics for additionality, permanence, and other criteria.¹¹ To be conservative, we have eliminated from our estimates, where possible, project types that may not currently meet EUC criteria, though it is possible for programs to make revisions that would make these projects eligible in the future. For example, our analysis does not include estimates of units generated from individual projects that reduce emissions from deforestation and degradation of forests (REDD+) because it is not yet clear which of these meet CORSIA criteria for avoidance of leakage.

By reviewing the existing and potential emissions units from six standards we believe are most likely to be included in the first tranche, and then filtering out offset types that may be excluded under the EUCs, we estimate a liquidity pool of at least 386 million units, and as many as 569 million.

The variance is based on emission-reduction estimates of projects that have submitted design documents to the Verified Carbon Standard (VCS) but have not yet completed the validation and verification process. These projects are currently engaged in activities that reduce emissions within the period 2016-2020, and any that achieve verification and validation during CORSIA's pilot phase could, under VCS rules, be credited.

We also assume a 100 percent issuance rate on all *verified* VCS units as well as more recent Clean Development Mechanism (CDM) units. This issuance rate is higher than the historical rate, but we chose it because the decision to issue is usually based on market conditions (see "Methodology"). Issuance rate is a function of market demand, and our goal is to identify supply that will become available in response to market demand.

Rationale for 2016-2020 Universe

Although not confirmed by ICAO, the 2016-2020 restriction makes sense for several reasons.

First, 2016 is the year that ICAO launched CORSIA, and many project developers initiated emission reduction activities in response to that market signal.

Second, previous analyses have shown that earlier start dates and looser criteria would flood the market and fail to generate a price point that supports new emission-reduction activities. Indeed, a 2019 analysis by NewClimate found that if CORSIA recognized all available post-2013 emissions units from just the four largest carbon standards, existing supplies would top 18 billion metric tons,¹² or more than six times the anticipated demand over CORSIA's entire 15-year lifecycle.

Finally, the December 31, 2020 end date also seems reasonable, at least for the time being, because negotiators within the United Nations Framework Convention on Climate Change (UNFCCC) have not yet finalized accounting rules for internationally transferred mitigation outcomes under Article 6 of the Paris Agreement.

¹¹ *CORSIA Program Application Form, Appendix A, Supplementary Information for Assessment of Emissions Unit Programs*. ICAO, n.d. https://www.icao.int/environmental-protection/CORSIA/Documents/TAB/Programme_Application_Form_Appendix_A_Supplementary_Information_for_Assessment.pdf

¹² NewClimate Institute. 2019. *Offset credit supply potential for CORSIA*. German Emissions Trading Authority (DEHSt). <https://newclimate.org/wp-content/uploads/2019/11/Offset-credit-supply-potential-for-CORSIA.pdf>

Non-CORSIA Market Demand

It is important to remember that CORSIA is not the only game in town. Several regional compliance programs are set to either begin or grow as the Paris Agreement takes effect, and voluntary carbon markets have also grown dramatically in the past year. Indeed, Ecosystem Marketplace tracked roughly 100 million metric tons of voluntary offset transaction in 2018,¹³ and early indicators show volumes rose again in 2019 and are continuing to ratchet upwards in 2020.

These additional volumes will likely exceed that of CORSIA's pilot phase, but there is plenty of supply both inside and outside the universe of units that ICAO appears to have staked out for CORSIA. Voluntary buyers purchase from a broader spectrum of project types than those eligible for CORSIA, and many voluntary and compliance buyers have expressed a preference for units generated through "natural climate solutions," which we have largely excluded from our analysis.

Methodology

Understanding the Project Development Process

All carbon standards prescribe a similar project development process, but no two are exactly alike. Here is a rough outline of a generic project development process:

1. **Project Design:** In this phase, a project proponent will submit a detailed plan for generating emissions units under the targeted standard. The project design document provides estimates of emission reductions to be achieved. Projects that have submitted design documents but not yet been validated are said to be "in the pipeline."
2. **Project Validation and Registration:** In this phase, a project's design is evaluated by third-party evaluators to ensure all criteria are met. On this basis, the project's registration request is either accepted or rejected by the standard-setting body.
3. **Project Implementation:** In this phase, the project proponent executes the proposed activity.
4. **Project Verification:** In this phase, a third-party verifier will audit the activity to ensure it is being undertaken, resulting in verified emissions units.
5. **Emissions Unit Issuance:** In this phase, a verified emission reduction is recorded as an emissions unit in a recognized registry, where it's assigned a unique serial number and can be tracked, transferred between accounts, and cancelled. It's important to note that in most programs high transaction costs discourage proponents from issuing units until they have a buyer. This has not historically been true of the CDM, which has lower transaction costs, but has become so recently. For this reason, when analyzing non-CDM programs, we treated issued units as having exited the market rather than having entered it.

¹³ Forest Trends' Ecosystem Marketplace. 2019. *Financing Emissions Reductions for the Future: State of the Voluntary Carbon Markets 2019*. Washington DC: Forest Trends. <http://www.ecosystemmarketplace.com/carbon-markets>

6. **Emissions Unit Cancellation or Retirement:** In this phase, a verified unit is officially taken out of circulation, usually to balance out or “neutralize” a ton of carbon emitted.

In summary,

Existing Emissions Units are those that have come from validated projects and are available now. In the CDM, this includes units that have been issued and entered in a registry, whereas issued units are filtered out of most other standards.

Potential Emissions Units in Figure 1 are what most practitioners would call “pipeline” units. They are associated with project design documents that have been submitted to VCS but not yet validated. Under VCS rules, such projects can retroactively issue emissions units for emission-reduction activities carried out prior to 2020 even if they are validated and verified later.

Assumptions Regarding Recognized Standards

After the CORSIA Council published its eligibility criteria last year, 14 different bodies applied for recognition.¹⁴ ICAO has not formally publicly commented on how many standards were recommended by the TAB, let alone which ones. But if media reports regarding six programs are correct, then for purposes of this analysis, it could reasonably be assumed that these include the Clean Development Mechanism of the Kyoto Protocol to the United Nations Framework Convention on Climate Change (UNFCCC) and the “Big Four” standards created outside the UNFCCC. As for the sixth, China’s GHG Voluntary Emission Reduction Program is a reasonable hypothesis, given the country’s size and the program’s state of development.

Table 1 presents the standards we included in our analysis, and a brief reference to how we achieved our estimates.

¹⁴ The 14 bodies that applied for recognition are American Carbon Registry, British Columbia Offset Program, China GHG Voluntary Emission Reduction Program, Clean Development Mechanism, Climate Action Reserve, Forest Carbon Partnership Facility, Global Carbon Trust, Gold Standard, myclimate, Nori, REDD.plus, Thailand Greenhouse Gas Management Organization, The State Forests of the Republic of Poland, VCS Program (managed by Verra).

Table 1. Standards Included in Ecosystem Marketplace Estimates of CORSIA-eligible Supply

Name	Data Source
CLEAN DEVELOPMENT MECHANISM	Publicly available data (available online)
VERIFIED CARBON STANDARD (ADMINISTERED BY VERRA)	Data supplied to us by Verra
CLIMATE ACTION RESERVE (CAR)	Data acquired in late 2019 for a previous Ecosystem Marketplace report
THE GOLD STANDARD	Supply data on actual issuances; extrapolated underlying data based on the program's historical pre-2016 issuance rate
AMERICAN CARBON REGISTRY (ACR)	Data acquired in late 2019 for a previous Ecosystem Marketplace report
CHINA GHG VOLUNTARY EMISSION REDUCTION PROGRAM (CEER)	Supply data on issuances; extrapolating based on the historical issuance rates of similarly sized programs

TAB is also expected to continue to evaluate the inclusion of other standards, which could open additional supplies, and is scheduled to open a new application period this month.¹⁵

A Note on Start Dates

Although news reports focus on emission reductions achieved from 2016 through 2020, there are several ways CORSIA could determine start date, as well as several ways in which various standards currently do this. Most programs, for example, track vintage, but CDM does not; CDM, meanwhile, can track the date an investment decision is made but most other programs do not.

Where possible, we used the dates that a project started, using the start date of its first crediting period as a common indicator of when emission reductions were initiated. This is the generally accepted definition of “vintage,” but some participants focus on dates of issuance. Here, we are focusing on the dates that the *emission-reduction activities took place*.

Excluded Programs and Project Types

The Forest Carbon Partnership Facility (FCPF) could also be a sizable source of supply but information about what they have issued or can issue is not public at this stage.

VCS's jurisdictional program (VCS JNR) could also be significant, but it is relatively new, and we know of only one project registered.

Stand-alone REDD+ Projects are excluded because CORSIA's Guidelines for Criteria Interpretation state that if a risk of leakage is present, the activity should be implemented at a larger scale (regional or national). While not

¹⁵ ICAO. 2019. TAB Work Programme and Timeline (as of May 2019). ICAO. https://www.icao.int/environmental-protection/CORSIA/Documents/TAB/TAB_work_programme_and_timeline_May2019.pdf

explicitly stated, this provision is assumed to apply to REDD+, given its similarity to elements of the Warsaw Framework.

Pre-2016 CDM Supply Alone Could Swamp Market

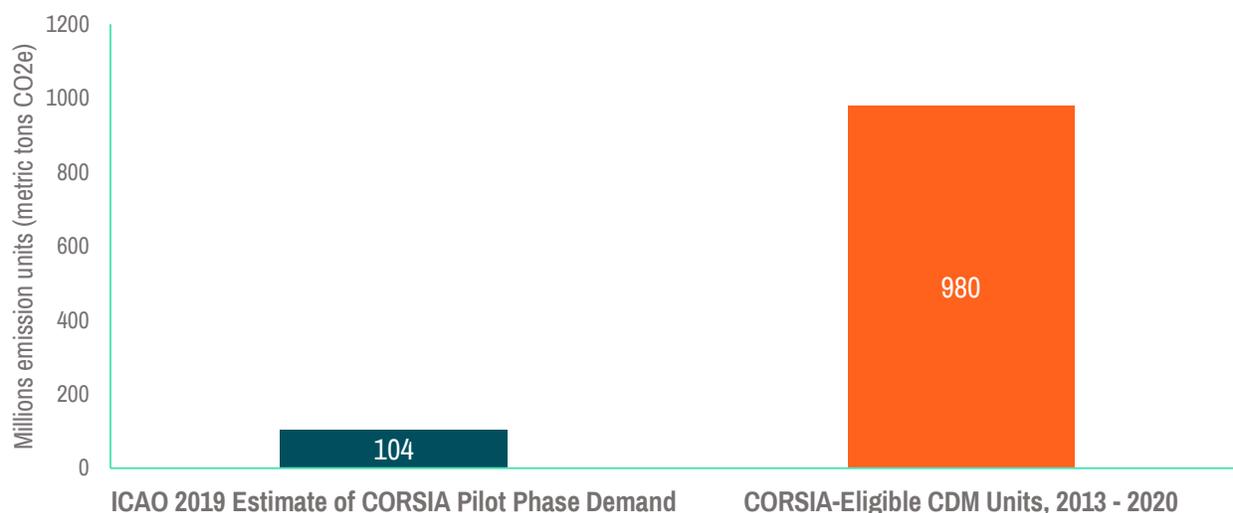
Previous analyses have identified massive oversupply if pre-2016 units are eligible under CORSIA, and we revisited that in our analysis as well, albeit briefly.¹⁶

Using data acquired at CDMpipeline.org, we identified all verified CDM units from activities that have a crediting start date of 2013 or later and then applied a 65 percent issuance rate or success rate, which is consistent with historical precedent.

We also identified 58 million units associated with projects that have not gone through validation, but we chose not to include them because CDM does not allow for the retroactive issuing of credits.

In sum, we have estimated a conservative potential supply of 980 million emissions units from CDM alone if units dating back that far are recognized (Figure 2).

Figure 2. Total CDM Units Swamp CORSIA Demand



Ecosystem Marketplace, an initiative of the non-profit organization Forest Trends, is a leading global source of information on environmental finance, markets, and payments for ecosystem services. As a web-based service, Ecosystem Marketplace publishes newsletters, breaking news, original feature articles, and annual reports about market-based approaches to valuing and financing ecosystem services. We believe that transparency is a hallmark of robust markets and that by providing accessible and trustworthy information on prices, regulation, science, and other market-relevant issues, we can contribute to market growth, catalyze new thinking, and spur the development of new markets and the policies and infrastructure needed to support them. Ecosystem Marketplace is financially supported by a diverse set of organizations including multilateral and bilateral government agencies, private foundations, and corporations involved in banking, investment, and various ecosystem services.

Each year, Ecosystem Marketplace collects voluntary carbon markets data from project developers and traders through its Carbon Survey. Please contact carbonsurvey@forest-trends.org to respond to the survey, inquire about sponsorship, and more. This work plan is supported by 3Degrees, American Carbon Registry, Arbor Day Foundation, Cool Effect, the Livelihoods Funds, and Verra.

¹⁶ See for instance NewClimate Institute 2019.