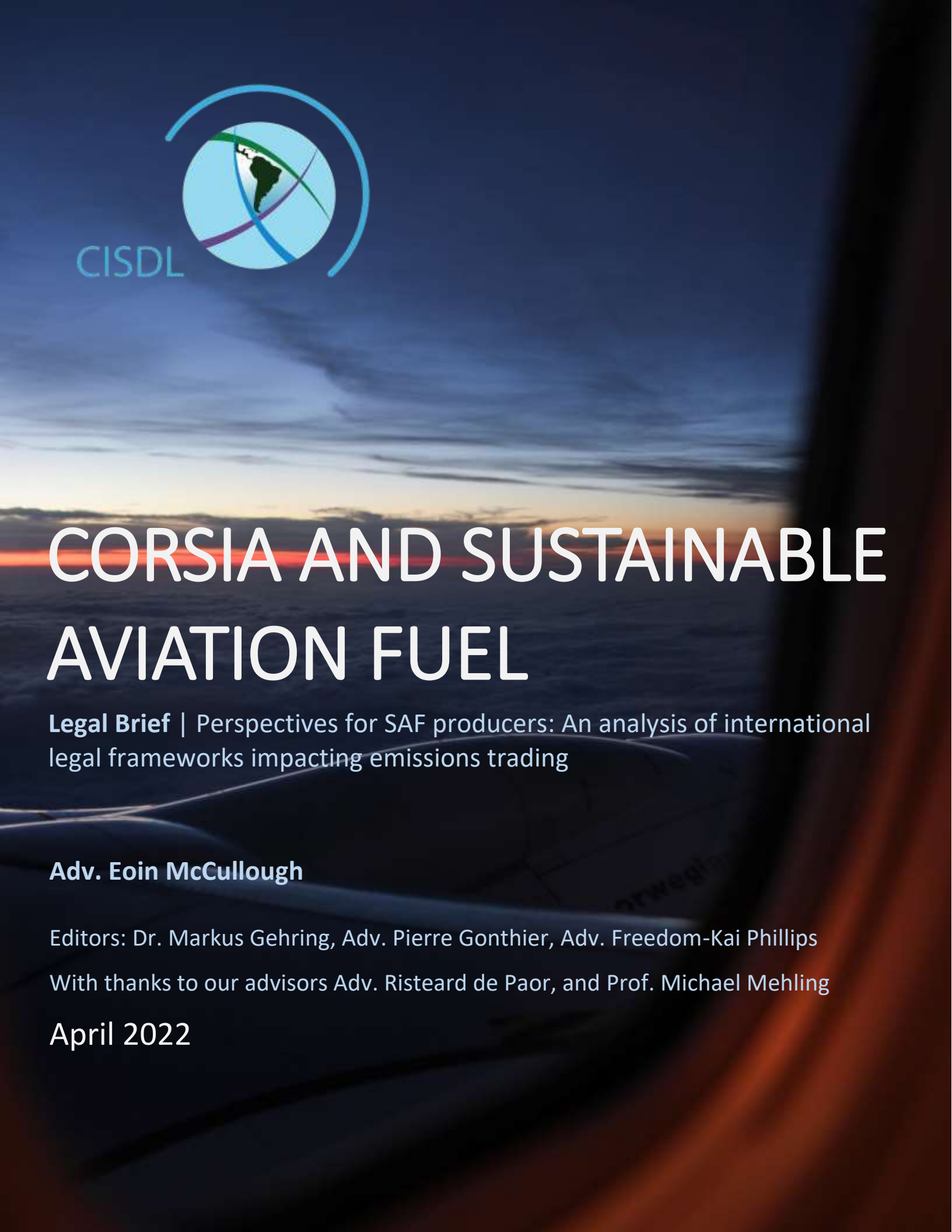

CORSIA AND SUSTAINABLE AVIATION FUEL

Legal Brief | Perspectives for SAF producers: An analysis of international legal frameworks impacting emissions trading

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Key Points

- Sustainable aviation fuels (SAF) are one of the most promising paths forward for the aviation sector to decarbonise. However, due to the nascent nature of the industry policies which would promote the development of SAF have been slow to develop, leaving SAF producers in uncertainty and obstructing the development at scale of SAF.

Introduction

According to data from the International Civil Aviation Organisation (ICAO), aviation accounts for 2% of global greenhouse gas (GHG) emissions.[1] Of this, two-thirds of global aviation emissions comes from international aviation.[2] Aviation emissions have been growing in recent decades, having doubled in Europe since 1990[3] and before the onset of the COVID-19 pandemic, which drastically reduced demand and emissions from aviation, ICAO had forecasted that emissions from aviation could triple by 2050 from 2015 levels.[4] Although emissions from aviation have fallen dramatically due to the COVID-19 pandemic, the trend of increasing demand for aviation and increasing emissions is expected to return.[5] The forecasted growth in aviation emissions has the potential to undermine the objectives of the Paris Agreement to keep global temperature rise below 1.5 degrees Celsius at a time when the global economy needs to increasingly decarbonise.

In response to the pressure on international aviation to contribute to the effort to combat climate change, in 2009 the aviation industry set three objectives to address the industry's impact on climate change: Improve fuel efficiency by 1.5% annually from 2009-2020; Cap net GHG emissions at 2020 levels with carbon-neutral growth; Cut net emissions from aviation to 50% of 2005 levels by 2050.[6] In furtherance of these objectives, in 2016 the ICAO adopted its Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA). CORSIA is a market-based offsetting and reduction scheme for international aviation that aims to cap global aviation emissions at 2019 levels.[7] The mechanism allows for airline operators of participating countries to offset their

[1] IATA, An Airline Handbook on CORSIA, August 2019, available at https://www.iata.org/contentassets/fb745460050c48089597a3ef1b9fe7a8/corsia-handbook.pdf.
[2] Ibid.
[3] Transport & Environment, Roadmap to decarbonising European aviation (2018) p 3..
[4] "Trends in Emissions that affect Climate Change", online: <https://www.icao.int/environmental-protection/Pages/ClimateChange_Trends.aspx>.
[5] SOONE Jaan, "Sustainable Aviation Fuels", European Parliamentary Research Service (November 2020), p 2.
[6] Note 1, p 5.
[7] While the average of 2019 and 2020 emissions levels was originally to be the emissions accounting baseline, due to the severe effects of the COVID-19 pandemic on global aviations levels, 2019 emissions solely are adopted as the baseline to prevent the baseline from falling to an artificially low level, which would have been equivalent to setting the baseline at 2014 emissions. See: "CORSIA and COVID-19", online: <https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-and-Covid-19.aspx>; "IATA - CORSIA", online: <https://www.iata.org/en/programs/environment/corsia/>.

emissions either by purchasing offset credits or reducing them by using sustainable aviation fuels (SAF).

As demand for jet fuel is expected to increase in the coming decades, the utilisation of SAF in international aviation provides a tantalising prospect to help international aviation decarbonise. However, high start-up costs, political uncertainty and technological barriers make production of SAF currently challenging and expensive.[8] But given the urgency of the need to decarbonise the global economy and the long-expected development time on other alternative fuels such as hydrogen, some consider that "with today's technology, synthetic fuels are the only technically viable solution that would allow aviation to exist in a world that avoids catastrophic climate change."[9] As SAF demonstration plants are being developed in several countries around the world, including Canada and Norway,[10] and the industry looks to achieving economies of scale in the coming years, this policy brief hopes to shed light on the current emissions trading frameworks relevant to SAF and to analyse perspectives for SAF producers. This brief also hopes to facilitate negotiations on regulations and policy directions for a critical and developing component of aviation's effort to decarbonise.

Power to Liquid SAF Production: An Overview

Power to Liquid SAF (also known as e-SAF or PtL SAF) is a distinct method of producing SAF by combining electricity (for the purposes of this policy brief it is assumed that the source of the electricity is from a renewable source e.g. hydroelectricity) with water and CO2 to synthesise jet fuel. Electricity is used to extract the hydrogen from water which is then reacted with CO2 to form a carbon monoxide (CO) in a reverse water gas shift chemical reactor.[11] This CO combined with hydrogen constitutes a syngas which in turn is fed into a second reactor, known as a Fischer-Tropsch process (FT) reactor, to produce a mix of liquid hydrocarbons which can be purified and reprocessed to yield a significant amount of jet fuel.[12]

Contrary to more commonly known production methods for SAF, which typically use biogenic feedstock (i.e. non-fossil origin) such as fats, corn, wood residues or municipal waste to create hydrocarbons similar to kerosene (jet A-1 Fuel grade), the source of carbon for e-SAF can come from extracting CO2 from the atmosphere or capturing CO2 from a point source (such as a smokestack or another large-scale emitter), thus avoiding releasing CO2 into the atmosphere. This makes e-SAF a near-zero emission fuel, because it does not require any further fossil fuel extraction, and carbon circular, particularly when the carbon is sourced from air capture or from unavoidable industrial CO2 emissions.

[8] "ICAO's CORSIA scheme provides a weak nudge for in-sector carbon reductions | International Council on Clean Transportation", online: <https://theicct.org/blog/staff/corsia-carbon-offsets-and-alternative-fuel>.
[9] Transport & Environment, Roadmap to decarbonising European aviation (2018) p 3.
[10] Jaan, *supra* note 5 p 7.
[11] The chemical equation is $CO_2 + H_2 \rightleftharpoons CO + H_2O$.
[12] The chemical equation of the FT process is $(2n + 1) H_2 + n\ CO \rightarrow C_nH_{2n+2} + n\ H_2O$.

e-SAF in the context of SPEDE

In Canada, the government's policy on GHG emissions reduction operates on two levels: at the federal level and at the provincial level. The federal government has its own carbon tax,[13] which applies to all provinces in the absence of a similar carbon pricing system. Provinces have the option to pay the federal carbon tax, levy their own carbon tax that is sufficiently similar to the federal tax or participate in a carbon market under a traditional cap and trade approach. The Quebec government chose the latter of these approaches, establishing a carbon market in 2013 with California called the Western Climate Initiative (WCI). The WCI is established by contracts that allow each participating state to adopt rules that create GHG emissions units that can thereafter be traded on the WCI. The rules creating the emission units must be carefully crafted so that these units are fungible and can be traded on the WCI as a commodity. In Quebec, these rules are provided by the *Système de plafonnement et d'échange des droits d'émissions*, otherwise known as SPEDE.[14]

Scope of Application

Emissions Thresholds

Participation in SPEDE is mandatory for large emitters and voluntary for others. Participation in SPEDE is mandatory for:

- Industrial establishments that emit 25,000 metric tons of CO2 equivalent (tCO2eq);
- Electricity producers and importers, for which the GHG emissions associated to the production of electricity equal or exceed this 25,000 tCO2eq threshold;
- Distributors of fossil fuels used in Québec (which are required to cover the GHG emissions resulting from the products they distribute)

Participation is voluntary for industrial establishments that report annual emissions equal to or greater than 10,000 tCO2eq. but less than the threshold of 25,000 tCO2eq.

Excluded Activities

Some activities are excluded from SPEDE regardless of the emissions threshold, which for this research notably includes the production and distribution of fuel used in air navigation. The exclusion of aviation from SPEDE is understandable as aviation is a federally regulated activity that is not subject to provincial legislation. However, in the context of e-SAF, this gives rise to some interesting questions for e-SAF producers, the answers to which remain unclear. Given that aviation gasoline[15] is excluded from the federal Clean Fuel Regulations, that jet fuel is not required under this regime to show a reduction of its carbon-intensity (CI) over the 2030 period, and with the federal government having taken the decision to address GHG emissions from international aviation through CORSIA, there appears to be no sub-national emissions reduction program that applies to e-SAF producers. Thus, the ability of SAF producers to generate and sell carbon offsets

[13] Greenhouse Gas Pollution Pricing Act, (4 December 2020), online: <https://laws-lois.justice.gc.ca/eng/acts/G-11.55/> Last Modified: 2020-12-04.
[14] Règlement concernant le système de plafonnement et d'échange de droits d'émission de gaz à effet de serre, RLRQ c Q-2, r 461.
15 Art. 3(2)(b) CFR, Aviation gasoline is a refined type of gasoline used to power piston engines.

credits remains uncertain under the current understanding of the different emissions reduction programs allowed in Québec.

Compliance Period System

The WCI operates on an underlying three-year reporting period. At the beginning of each period, some emitters receive from their respective government free emission allowances, composed of emission units, to cover at least part of their emissions. The quantity of free allowances is based on a formula dependent on the level of production of the large emitter, rather than its level of emissions.[16] During a reporting period, the large emitter must declare on a yearly basis his emissions in accordance with the regulations.[17] At the end of the reporting period, the large emitters must cover his declared emissions by surrendering a combination of emission allowances and offset credits. These may be purchased on the carbon market, or during auctions held by the Government.

A maximum limit is set by the government for each reporting period and is reduced from one period to the other to gradually reduce the global emissions of the participating state.

Large Emitters' Perspectives

On a long-term basis, large emitters face the ratcheting effect of this gradual diminution of the emissions allowances issued by the Government. They need to plan to make sure the rising price of GHG emissions does not affect their cost structure and competitiveness.

Sale of Excess Emission Units

If at the end of the period, a given emitter cannot show they have enough emissions units, they must make sure they have bought some at auction or on the open WCI market. Alternatively, an emitter that has reduced their emissions below the number of units allocated at no charge e.g., through better efficiency, can then sell the excess on the market to other emitters that requires them to balance their account at the end of the reporting period. An emitter would also be able to sell credits created under the Clean Fuel Standard market for the same emissions reductions, which is described further below.

Effect of GHG Offtake on Free GHG Allowances

When producing e-SAF, the RDOCECA provides for a complex set of rules that determine the reporting of an emitter's GHG emissions.

When a large emitter offloads a large portion e.g., 50% of their emissions to a e-SAF producer, article 6.2(1) RDOCECA provides:

> *6.2. An emitter referred to in section 6.1 or 6.1.1 must, not later than 1 June each year, communicate to the Minister by electronic means, using the form available on-line on the website of the Ministère du Développement durable, de*

[16] Art. 39 and following SPEDE.

[17] Regulation respecting mandatory reporting of certain emissions of contaminants into the atmosphere, RLRQ chapter Q-2, r. 15 (RDOCECA).

> *l'Environnement, de la Faune et des Parcs, a greenhouse gas emissions report for the preceding calendar year, including*
>
> *(1) the total quantity of the emitter's greenhouse gas emissions in metric tons CO2 equivalent,* ***excluding greenhouse gas emissions captured, stored, re-used, eliminated or transferred out of the establishment*** *and emissions reported in accordance with protocols QC.17 and QC.30 of Schedule A.2, calculated using the following equation:*

[our emphasis]

There are two main consequences stemming from this GHG emissions declaration methodology in an e-SAF perspective. First, all emissions that are offloaded to the e-SAF producer can clearly be deducted year after year by the large emitters, with a potentially significant reduction on his present and future cost of covering his emissions. Indeed, the CO2 is being captured, re-used and transferred out of his establishment on the form of e-SAF.

Secondly, where the large emitter is entitled to a free allowance of emission units, because this allowance is based on his production level rather than his declared emissions, this reduction in his declared level of emissions will not diminish the size of the free allowance.

Offset Credits

The SPEDE allows for the use of offset credits to cover the emission allowance at the end of a reporting period. One limitation to SPEDE that has been identified is the limited number of offset programs under SPEDE, particularly when compared with the large number of offset programs under the Californian WCI system. The limited number of offset programs restricts the ability of businesses in Quebec to participate in the program and to purchase offset units. SPEDE currently only has five approved offset programs, but it should be noted that this may soon change. The Quebec government has announced a new deposit system to encourage Quebec businesses to improve their industrial processes rather than to purchase offsets. This new policy is being formulated and should enter into force in the next reporting period in 2024. Of interest to this project is one offset program that is currently being evaluated for admission to SPEDE that concerns the substitution of fuels in the maritime transport sector.[18] This offset program displays similarities to a program for the substitution of jet fuel, and the result of the ongoing evaluation could pave the way for such an offset program under SPEDE in the future.

e-SAF in the Context of the Canadian Clean Fuel Standard

The Canadian Clean Fuel Regulations exclude jet fuel for both international and domestic use.[19] The Government of Canada identifies CORSIA as the appropriate forum for addressing emissions from international aviation, while the treatment of jet fuel for domestic aviation is still under consideration by the Canadian authorities in conjunction with carbon pollution pricing policies.[20]

[18] "Offset Credits", online: <https://www.environnement.gouv.qc.ca/changements/carbone/credits-compensatoires/index-en.htm>.
[19] Public Works and Government Services Canada Government of Canada, "Canada Gazette, Part 1, Volume 154, Number 51: Clean Fuel Regulations", (19 December 2020), online: <https://gazette.gc.ca/rp-pr/p1/2020/2020-12-19/html/reg2-eng.html> Last Modified: <!--#config timefmt='%Y-%m-%d'--><!--#echo var='LAST_MODIFIED'-->.
[20] Ibid.

Clean Fuel Standard Intersections with Provincial Legislation

The Clean Fuel Standard (implemented by the Clean Fuel Regulations) is a regulatory tool intended to reduce the carbon intensity of fuel consumed in Canada.[21] The Clean Fuel Standard is a regulation "that requires a reduction of the carbon content of domestically used liquid fuels".[22] Companies will be required to gradually reduce the life cycle carbon intensity in line with the standards set by the regulation. Companies that are unable to achieve the required reduction in carbon intensity will have the option to purchase credits on a market or to make a payment into a compliance fund at a cost of $350 per tonne.[23] The Clean Fuel Standard is a complementary policy tool to carbon taxes, which acts "to help make carbon pricing more effective and create incentives for innovation and clean growth."[24] The CFS, along with carbon pricing, aims to send "mutually reinforcing price signals" to encourage companies to reduce their emissions, allowing them to pay less in carbon taxes or to earn carbon credits which it can then sell, as well as creating credits that can be used for compliance under the Clean Fuel Standard.[25]

These dual systems – the price signal through carbon taxes and the regulatory requirement with per-tonne costs – seem to enable and encourage double counting of emissions reductions on the carbon emissions unit market and the Clean Fuel Standard market. The proposed regulatory approach provides an example of a fossil fuel supplier to demonstrate how an emitter can qualify to create credits under the CFS and other carbon pricing systems: For example, actions by a fossil fuel supplier (such as a refinery) to reduce its emissions by installing more energy efficient technology will reduce its exposure to carbon pollution pricing: it will either pay less or will be able to earn credits that it can sell to others covered by the pricing system. It will also create credits that can be used or sold for compliance under the Clean Fuel Standard.[26]

This results in companies who fall under both systems, such as large emitters who use a carbon offtake on their smokestack for e-SAF production, being able to benefit from one or more domestic systems without resulting in double-counting at the aggregated national level. Such an emitter would be able to sell credits for its emissions reduction to other companies under the Clean Fuel Standard and would also benefit from selling credits for the same emissions reduction due to the smokestack offtake under the applicable emissions trading mechanism, such as SPEDE.

[21] Public Works and Government Services Canada Government of Canada, "Canada Gazette, Part 1, Volume 154, Number 51: Clean Fuel Regulations", (19 December 2020), online: <https://gazette.gc.ca/rp-pr/p1/2020/2020-12-19/html/reg2-eng.html> Last Modified: <!--#config timefmt='%Y-%m-%d'--><!--#echo var='LAST_MODIFIED'-->.

[22] Pembina Institute, "Canada's Clean Fuel Standard", online: *Pembina Institute* <//www.pembina.org/pub/canadas-clean-fuel-standard-setting-the-record-straight>.

[23] Ibid.

[24] Environment and Climate Change Canada, "Clean Fuel Standard: proposed regulatory approach", (13 November 2019), online: *aem* <https://www.canada.ca/en/environment-climate-change/services/managing-pollution/energy-production/fuel-regulations/clean-fuel-standard/regulatory-approach.html> Last Modified: 2019-11-13.

[25] Ibid.

[26] Ibid p11.

e-SAF in the Context of the EU

Policy Measures

As part of the European Commission's recently published "Fit for 55" package of climate policy proposals, the Commission is pushing to increase the use of SAF in commercial aviation. The proposed changes to the Energy Taxation Directive would end the tax exemption for aviation fuel and introduce a minimum tax for transport fuels that is aligned with EU environmental and climate objectives.[27] In order to incentivise the use of SAF and other sustainable fuels, these fuels "will enjoy a zero minimum tax rate for a transitional period of 10 years," according to the Commission.[28] A further measure proposed by the Commission to promote the uptake of SAF is to mandate increasing blend-in levels of SAF into regular jet fuel and to incentivise the use of synthetic fuels, such as e-SAF.[29] The ReFuel Aviation initiative proposes mandating 2% SAF blend in jet fuel by 2025, rising to 5% by 2030 and continuing to rise to 63% of jet fuel by 2050.[30] The initiative also proposes a sub-mandate for e-SAF mandating a 0.7% e-SAF blend in 2030, rising to 8% by 2040 and reaching 28% by 2050.[31]

EU ETS

Under the EU ETS SAF are considered to have zero emissions and are exempted from the obligation to surrender CO2 certificates."[32] However, only fuels that meet the sustainability criteria under the Renewable Energy Directive (RED) are be classified as sustainable fuels. Therefore, for a SAF to be zero rated under EU ETS it must be produced in a manner that is in accordance with the sustainability criteria laid out in Article 29 of the updated Renewable Energy Directive (RED II).[33] The sustainability criteria in sections (2)-(7) of Article 29 contain sustainability criteria which apply only to biofuels from agricultural, aquaculture, fisheries and forestry residues. For biofuels (including e-SAF) from "waste and residues", the only sustainability criteria applicable are emissions criteria laid out in section (10). Section (10) provides that from 1 January 2021 fuels used in the transportation sector must provide at least 65% emissions saving.

For SAF derived from non-biogenic sources, the Directive provides that "the electricity used for production should be of renewable origin."[34] The Directive indicates that the Commission develop a methodology for assessing the sustainability of such fuels that should "ensure that there is a temporal and geographical correlation between the electricity production unit with which the producer has a bilateral renewables power purchase agreement and the fuel production. For example, renewable fuels of non-biological origin cannot be counted as fully renewable if they are

[27] COMMUNICATION FROM THE COMMISSION TO THE EUROPEAN PARLIAMENT, THE COUNCIL, THE EUROPEAN ECONOMIC AND SOCIAL COMMITTEE AND THE COMMITTEE OF THE REGIONS "Fit for 55": delivering the EU's 2030 Climate Target on the way to climate neutrality p 9.
[28] Cathy Buyck, "European Commission Confirms Plans for Aviation Fuel Tax", online: *Aviation International News* <https://www.ainonline.com/aviation-news/air-transport/2021-07-14/european-commission-confirms-plans-aviation-fuel-tax>.
[29] note 16 p 8.
[30] Proposal for a REGULATION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL on ensuring a level playing field for sustainable air transport p 2.
[31] ibid p80.
[32] Directive 2008/101/EC, amending Directive 2003/87/EC so as to include aviation activities in the scheme for greenhouse gas emission allowance trading within the Community, Annex IV.
[33] Bill 32018L2001, *Directive (EU) 2018/2001 of the European Parliament and of the Council of 11 December 2018 on the promotion of the use of energy from renewable sources (Text with EEA relevance.)*, EP, CONSIL, 2018 volume: 328 (Formerly RED Art 18).
[34] ibid p L328/95.

produced when the contracted renewable generation unit is not generating electricity."[35] In July 2021 the European Commission produced a Proposal for a Directive amending Directive 2018/2001 which included the sustainability criteria for sustainable fuels of non-biogenic origin.[36] Under the proposal sustainable fuels of non-biogenic origin must have a GHG emission saving of at least 70% to qualify to be counted towards EU member states' targets for shares of GHG intensity reduction in the transport sector from the use of renewable energy.[37]

Of note also in the Proposal for a Directive is the equal treatment of sustainable fuels of non-biogenic origin regardless of whether the fuel is classified as a "recycled carbon fuel" or a "renewable liquid and gaseous transport fuel of non-biological origin" according to the definitions laid out in Article 2 of Directive 2018/2001.[38] This means that for SAF of non-biogenic origin the same GHG emission reduction criteria apply whether the fuel is produced from the capture of unavoidable industrial CO2 emissions or from renewable sources.[39] Furthermore, it is worth noting that under RED II aviation and maritime fuels are exempted from the obligation to contribute to the 14% emissions reduction target for the transport sector, although they may opt in.[40]

e-SAF in the Context of CORSIA

Even outside the context of Canada's implementation of CORSIA through its various federal/provincial legislation regimes, the very concepts present in CORSIA could result in double counting when coupled with the rules stemming from the Paris Agreement. This section contemplates how CORSIA means to operate and how it is directly implemented in Canada under the Canadian Aviation Regulations and in Europe under the EU ETS.

CORSIA's General Approach to SAF

CORSIA, which was adopted by ICAO's 39th Assembly in 2016, is an emissions reduction and carbon offsetting scheme that aims to cap aviation emissions at 2019 levels.[41] Under CORSIA international flights in between participating states are monitored, accounted for and subject to reduction according to a planned scenario over the next decade. Airline operators must therefore report to their respective governments who in turn report to the ICAO, with certification bodies overseeing the process. For each reporting period, airline operators may either reduce or offset their CO2 emissions using SAF or approved offsets.[42]

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[35] ibid.

[36] Proposal for a DIRECTIVE OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive (EU) 2018/2001 of the European Parliament and of the Council, Regulation (EU) 2018/1999 of the European Parliament and of the Council and Directive 98/70/EC of the European Parliament and of the Council as regards the promotion of energy from renewable sources, and repealing Council Directive (EU) 2015/652 (2021).

[37] Ibid Art 1(19) inserting Art 29(a).

[38] Art 2 of Directive 2018/2001 defines "recycled carbon fuels" as "liquid and gaseous fuels that are produced from liquid or solid waste streams of non-renewable origin which are not suitable for material recovery in accordance with Article 4 of Directive 2008/98/EC, or from waste processing gas and exhaust gas of non-renewable origin which are produced as an unavoidable and unintentional consequence of the production process in industrial installations", while "renewable liquid and gaseous transport fuels of non-biological origin" are defined as "liquid or gaseous fuels which are used in the transport sector other than biofuels or biogas, the energy content of which is derived from renewable sources other than biomass".

[39] See Art 1(14) replacing Art 25 of the Directive, Art 1(17) amending Art 27 of the Directive, and Art 1(19(inserting Art 29(a), note 37.

[40] Sotirios MOUSTAKIDIS, "Renewable Energy – Recast to 2030 (RED II)", (12 December 2018), online: *EU Science Hub - European Commission* <https://ec.europa.eu/jrc/en/jec/renewable-energy-recast-2030-red-ii>.

[41] Note 7.

[42] Other reduction mechanism are omitted here, such as the use of more efficient aircrafts bodies or powerplants, better ground operations and navigation etc.

The choice given to airline operators to purchase offset credits or to reduce emissions through using SAF is a large structural flaw in CORSIA from the perspective of SAF development. As identified in several reports,[43] the number of offset unit available under CORSIA is far greater than demand. Currently there are enough offsets available under the CDM to meet CORSIA's projected demand until 2035.[44] The abundance of offset credits available makes them much cheaper to purchase than for an airline to invest in e-SAF, which currently costs 3 to 6 times more than regular jet fuel.[45] This price disincentive represents an obstacle to the development of SAF production at scale for use in the commercial aviation sector. Nonetheless, the question for this brief turns to how SAF is accounted for under the CORSIA system, and how these concepts are implemented at the state level.

Eligible Fuels Criteria

According to ICAO, only alternative fuels that have been certified for both quality and sustainability should be considered for widespread use. For a SAF to be approved for use in commercial aviation by the CAEP it must comply with the technical standards of the ASTM D4054[46] and the CORSIA sustainability criteria.[47]

Once a SAF is approved, then its value in terms of emissions reduction for the airline operator is calculated under a complex formula.[48] The airline operator can choose to compute the result of this formula using predefined lifecycle assessment (LCA) emissions values or the actual emissions value for that particular SAF, according to the sustainability certification scheme (SCS) that approved it.

Default LCA Values

Using a default LCA value constitutes an incentive both for the fuel producer, which benefit from the predictability of the commercial, carbon reducing value of its SAF, and for the airline operator, who will know that the LCA value behind the SAF they are purchasing has been vetted by the ICAO without going to an SCS to get specific LCA values for a given batch of SAF.

The ICAO acting through the CAEP,[49] has authority to designate pre-approved pathways with specific default LCA values. As of October 2021, 9 conversion processes have been approved for SAF production.[50] These pathways describe a combination of type of source material, commonly referred to as feedstock, a certified conversion process and a maximum blending percentage, as

[43] European Commission, *Assessment of ICAO's global market-based measure (CORSIA) pursuant to Article 28b and for studying cost pass-through pursuant to Article 3d of the EU ETS Directive* (2020); Lambert Schneider & Stephanie La Hoz Theuer, "Using the Clean Development Mechanism for nationally determined contributions and international aviation" 68.
[44] Schneider & Theuer, *supra* note 18 p 1.
[45] Bann SJ, Malina R, Staples MD, Suresh P, Pearlson M, Tyner WE, Hileman JI, Barrett S. The costs of production of alternative jet fuel: A harmonized stochastic assessment. Bioresour Technol. 2017 Mar;227:179-187. doi: 10.1016/j.biortech.2016.12.032. Epub 2016 Dec 11. PMID: 28024195.
[46] ASTM D4054-21, Standard Practice for Evaluation of New Aviation Turbine Fuels and Fuel Additives.
[47] *ICAO document Sustainability Criteria for CORSIA Eligible Fuels*.
[48] CORSIA s 3.3.1.
[49] ICAO Committee on Aviation Environmental Protection.
[50] "Conversion processes", online: <https://www.icao.int/environmental-protection/GFAAF/Pages/Conversion-processes.aspx>.

all SAF must qualify as blend-in fuels into CAF.[51] Presently, no pathway allows for the direct conversion from CO2 to jet fuel using the FT process.

e-SAF as a Carbon Offset

As of March 2021, the ICAO has approved eight CO2 offset programmes, referred to as CORSIA Eligible Emissions Unit Programmes.[52] It remain to be seen if e-SAF production, which in fact avoids extracting any additional fossil carbon for its synthesis, could qualify as a form of carbon sink. As an illustration of how difficult it is to interpret the ICAO'S Carbon Offset Credit Integrity Assessment Criteria[53] in the context of e-SAF, the CORSIA integrity criteria will be analysed:

> Carbon Offset Credit Integrity Assessment Criteria: There are a number of generally agreed principles that have been broadly applied across both regulatory and voluntary offset credit programs to address environmental and social integrity. These principles hold that offset credit programs should deliver credits that represent emissions reductions, avoidance, or sequestration that:
>
> 1. Are additional.
> 2. Are based on a realistic and credible baseline.
> 3. Are quantified, monitored, reported, and verified.
> 4. Have a clear and transparent chain of custody.
> 5. Represent permanent emissions reductions.
> 6. Assess and mitigate against potential increase in emissions elsewhere.
> 7. Are only counted once towards a mitigation obligation.
> 8. Do no net harm.[54]

One issue for making the argument in favour of inclusion of SAF as an eligible offset is criterion 5: permanence of the emissions reduction. The assessment criteria state that the offset must permanently reduce or avoid carbon emissions, or permanently sequester carbon. The argument can be made that e-SAF production does permanently avoid carbon emission because even in the case where the carbon captures is of fossil origin, for each kg of carbon capture and used in e-SAF, it alleviates the need to extract the same quantity of carbon from the ground. In this way e-SAF is a near zero-emission fuel that has the potential to become a carbon circular fuel, particularly when carbon is sourced from air capture. Where the carbon is of from a biogenic source, the argument becomes even stronger. However, the eligibility criterion offers an even more challenging analysis. The explanatory notes provide that:

> 7. Eligibility Criterion: Are only counted once towards a mitigation obligation. Measures must be in place to avoid:
>
> a) Double issuance (which occurs if more than one unit is issued for the same emissions or emissions reduction).

[51] ASTM D7566 is a specific certification norm developed for blend-in SAF.
[52] ICAO Document CORSIA Eligible Emissions Units (March 2021).
[53] ICAO emission units documents may be found at https://www.icao.int/environmental-protection/CORSIA/Pages/CORSIA-Emissions-Units.aspx.
[54] ICAO Document CORSIA Emissions Unit Eligibility Criteria p 2.

b) Double use (which occurs when the same issued unit is used twice, for example, if a unit is duplicated in registries).
c) Double claiming (which occurs if the same emissions reduction is counted twice by both the buyer and the seller (i.e., counted towards the climate change mitigation effort of both an airline and the host country of the emissions reduction activity)). In order to prevent double claiming, eligible programs should require and demonstrate that host countries of emissions reduction activities agree to account for any offset units issued as a result of those activities such that double claiming does not occur between the airline and the host country of the emissions reduction activity.[55]

If double issuance and double use do not seem likely where e-SAF emission units would be concerned, the wording in subparagraph c) is concerned with double claiming by the user and the seller, but only within the context of CORSIA. It could well be that an emission unit issued under the CORSIA offsetting regime could be used once within the framework of CORSIA, but that the same kg of e-SAF produced could be used to claim a credit under either a national cap and trade system, or under a national SAF blending mandate. Although CORSIA is not explicitly mentioned the Article 6, paragraph 4, emission reduction (A6.4ER) would encompass CORSIA.[56] However the absence of clear cross referencing in between the UNFCCC implementation agreements and CORSIA documents makes the matter only more concerning.

This is made even more likely by the fact that SAF is not distributed in a distinct logistical infrastructure. Because SAF is by nature destined to be blended, it is stored in a common fuel depot at airports. Thus, it is used to fuel both national and international flights. This reality is recognized in the footnotes at page II-2-4 of CORSIA.[57]

CORSIA Implementation in CANADA: Canadian Aviation Regulations

In Canada, CORSIA has been implemented by Part X of the Canadian Aviation Regulations (CAR). The Canadian regulations recognize that the implementation of CORSIA alongside the CAR could give rise to double counting, but provides a weak response to this risk: the regulations state that "the transfer of units must be authorized by the relevant Member State under the Paris Agreement and accounted for against its national target, to ensure that no emission reduction or removal is double-counted."[58] However, the CAR does not take responsibility for ensuring that no double counting occurs, preferring instead to leave it to ICAO to address any issues regarding double

[55] Ibid p 3.
[56] ***Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement***.
[57] Note. - The provisions of this Chapter consider that aviation fuel supply chains are not segregated at aerodromes, and that CORSIA eligible fuels will be typically co-mingled at various points in the fuel supply infrastructure (e.g., pipelines, storage terminals, aerodrome fuel storage systems). The CORSIA eligible fuels purchased by a particular aeroplane operator may not be physically used in its aeroplane, and it will not be feasible to determine the specific CORSIA eligible fuel content at the point of uplift in an aeroplane. Claims of emissions reductions from the use of CORSIA eligible fuels by an aeroplane operator are based on mass of CORSIA eligible fuels according to purchasing and blending records.
[58] Public Works and Government Services Canada Government of Canada, "Canada Gazette, Part 1, Volume 154, Number 35: Regulations Amending the Canadian Aviation Regulations (Parts I and X - Offsetting of CO2 Emissions - CORSIA)" p4, (29 August 2020), online: <https://gazette.gc.ca/rp-pr/p1/2020/2020-08-29/html/reg5-eng.html> Last Modified: <!--#config timefmt='%Y-%m-%d'--><!--#echo var='LAST_MODIFIED'-->.

counting of emissions units.[59] This lack of accountability at the national level represents a significant weakness of the Canadian implementation of CORSIA.

CORSIA implementation in the EU

In September 2020 the European Commission (EC) produced a report on its assessment of CORSIA and on how the EU could implement CORSIA through the EU ETS.[60] The report found major flaws in the ICAO scheme and called into question the compatibility of CORSIA with the EU ETS.[61] The report identified issues with the quality of the offset programs under CORSIA, particularly regarding double counting, noting that none of the CORSIA offset programs meet all EU ETS criteria.[62] The EC report also noted that due to the oversupply of offset credits available under CORSIA, it will be much cheaper for airlines to purchase offsets than using clean fuels and technologies, acting as a disincentive to decarbonize.[63]

The report questions CORSIA's environmental integrity, highlighting that "there are a number of features of CORSIA which imply its level of ambition for the international aviation sector is misaligned with, and weaker than the global level of ambition required to keep within the temperature goals of the Paris Agreement."[64] The report identifies the "type and stringency of the target, coverage of sources of climate impact, policy timeframe, and enforcement mechanism" as areas where "CORSIA is less ambitious than the regulation of aviation within the EU ETS."[65] The report also notes, "replacing part, or all, of the coverage of aviation from the scope of the EU ETS with CORSIA (...) risks weakening EU climate targets or may require the implementation of deeper emission cuts and removals in other sectors."[66]

In 2021, as part of its "Fit for 55" package of climate policy proposals, the European Commission laid out its proposal to become the first major aviation market to implement CORSIA.[67] The Commission notably has chosen not to go with the option identified by the 2020 assessment report to have the greatest effect on reducing emissions (Option 1: application of EU ETS to all flights to, from and within the EU/EFTA).[68] Rather, the Commission has decided to continue to apply EU ETS to flights within the EU/EFTA and apply CORSIA to flights to and from the EU/EFTA (Option 4 in the assessment report). The assessment report identified Option 4 to result in a similar

[59] Ibid.
[60] European Commission, Assessment of ICAO's global market-based measure (CORSIA) pursuant to Article 28b and for studying cost pass-through pursuant to Article 3d of the EU ETS Directive (2020).
[61] Ibid. The European Commission report judged that implementing CORSIA within the EU and removing aviation from the EU ETS would lead to "the biggest global net aviation CO2 emissions increase, and the smallest impact on demand and airline costs." (p 22) The report questioned the quality of CORSIA offset programmes, noting that many of the offsets were double counted and were not additional (p 18-21). Furthermore, a lack of participation from key markets such as China, India or Russia meant that CORSIA would only cover approximately 35% of CO2 emissions from aviation globally (p 15). The Commission also identified an oversupply of offset credits (p 18-21) and a lack of enforceability and transparency in CORSIA (p 17-18).
[62] Ibid p 18.
[63] Ibid.
[64] Ibid p 15.
[65] Ibid.
[66] Ibid p 44.
[67] "EUR-Lex - 52021PC0567 - EN - EUR-Lex", online: <https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX%3A52021PC0567> Doc ID: 52021PC0567Doc Sector: 5Doc Title: Proposal for a DECISION OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL amending Directive 2003/87/EC as regards the notification of offsetting in respect of a global market-based measure for aircraft operators based in the UnionDoc Type: PCUsr_lan: en.
[68] Ibid p 22.

emissions reduction to Option 2 (EU non-participation in CORSIA and continue to apply EU ETS to intra EU/EFTA flights), with global aviation projected to be only 1.5% lower in 2035 under the Option 4 scenario compared to Option 2. It is worth noting that this assumes that CORSIA offsets are "of high quality" – an assumption that has been strongly questioned in the same report.[69] However, Options 1 & 2 were determined to be unsuitable as although each option was legal, they went against the EU's established position to participate in CORSIA.[70] Therefore, while the EU has chosen the path that does not have the biggest impact on emissions reduction (Option 1), it has opted to continue to promote multilateralism while achieving modest reductions in emissions by choosing to operate CORSIA for flights not covered by EU ETS.

Conclusion/Recommendations

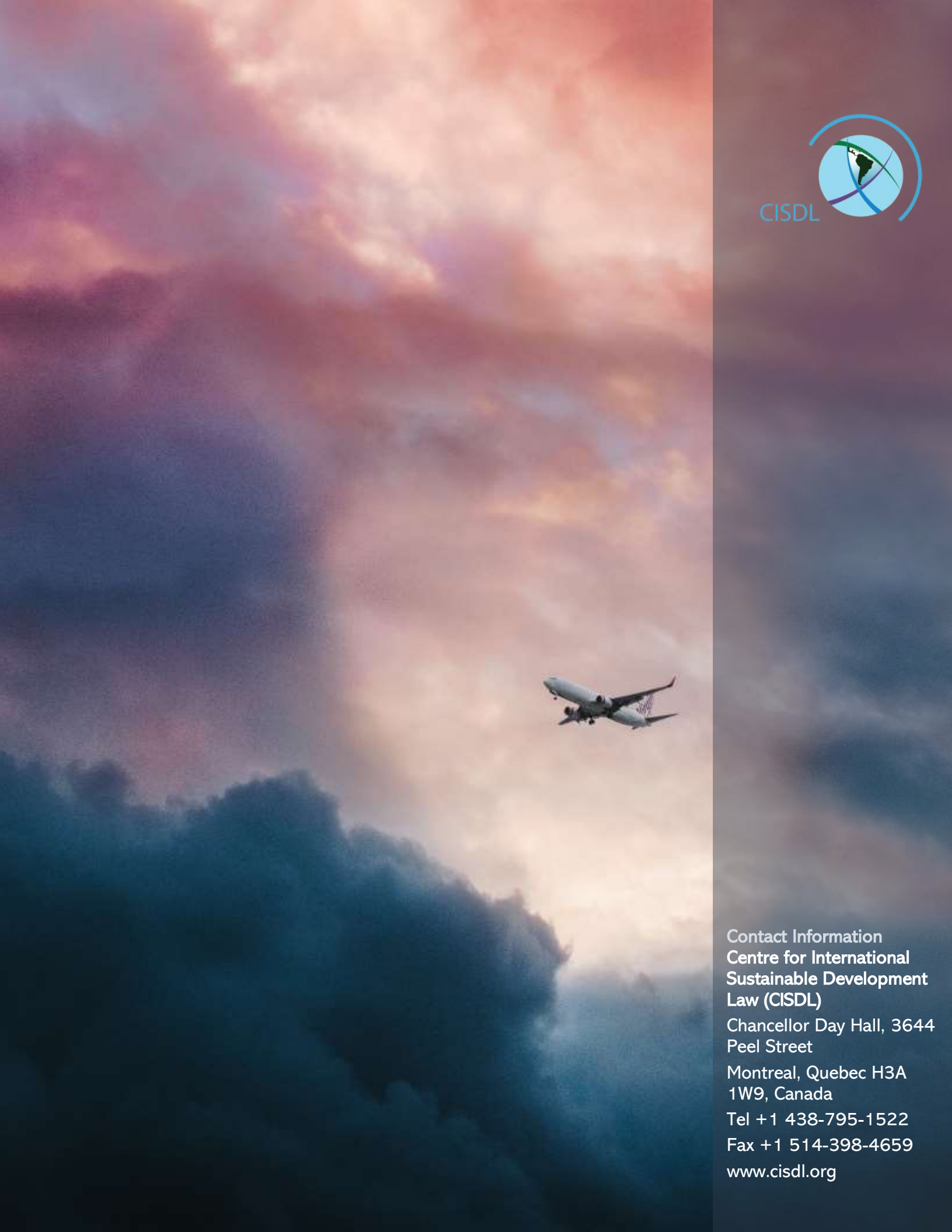
Common Emissions Unit Accounting Rules

Effort should be made to establish common accounting rules across all countries and emissions trading mechanisms to help prevent double counting of emissions across different emissions trading mechanisms.

Policy Safeguards

In order to support the continued development of e-SAF policy safeguards should be developed to provide certainty to e-SAF producers, allow production to scale up as needed. Strict safeguards will also be required to ensure e-SAF is produced in way that progresses decarbonization of aviation by ensuring that e-SAF is produced from zero emission electricity.

[69] Ibid p 18.
[70] Ibid.



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