impact
ON SUSTAINABLE AVIATION

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Less is more: Three essential KPIs to guide aviation into a decarbonized future

Summary

The discussion about decarbonizing the aviation industry is often blurry and ranges between over-complexity on the one hand to leaving too much room for interpretation of metrics on the other.

Metrics on which performance is measured, if inadequately defined, may create loopholes and in some cases open the door to greenwashing. Similarly, having too many indicators can negatively affect transparency, credibility and ultimately the effectiveness of such measures. In short, the industry needs precise and all-encompassing metrics to promote decarbonization.

This study proposes three straightforward metrics that, individually and collectively, may help providing a clearer and robust picture of the status achieved and the development towards net zero in aviation. First, there is the absolute carbon footprint of an airline or a portfolio of aircraft; second, the efficiency (intensity) with which an aircraft can produce a given transport service; and third, the degree to which the evolution of CO_2 is decoupled from the evolution of capacity. These three key performance indicators (KPIs) are defined along with their application in specific contexts (scope).

With this study, we aim to start a discussion within aviation finance and beyond with regard to how our proposed strategic KPIs can be most effective and help accelerate the decarbonization of the aviation sector.

About impact

impact is a non-profit platform for investors in and financiers of airlines and aviation infrastructure that aims to be at the forefront of a new reality in aviation finance. impact is comprised of several collaborative working groups designed to deliver a credible and transparent roadmap to reduce CO_2 emissions from aviation to net zero by 2050. impact is funded by the pro bono contributions of members, which are composed of leading global financiers in the aviation sector.

impact members

Abbreviations

ACMI	Aircraft, crew, maintenance, and insurance (ACMI) lease
ASK	Available Seat Kilometers
ATK	Available Ton Kilometers
CO_2	Carbon dioxide
GHG	Greenhouse gas
impact	initiative to measure and promote aviation's carbon-free transition
KPI	Key Performance Indicator
Pax	Passenger
PP	Percentage points
RPK	Revenue Passenger Kilometers
RTK	Revenue Ton Kilometers
SAF	Sustainable Aviation Fuel

Current decarbonization strategies lack transparency

For aircraft financiers, banks, and lessors, investing in sustainable aviation while targeting net zero and tracking the environmental impact of those investments is currently a difficult task: what should investment strategies for more climate-friendly aviation aim for when there are few comparable figures of airlines' CO_2 emissions? How are targets to be defined? How is progress to be measured?

Only a small minority of airlines worldwide report data on their CO_2 emissions; the figures reported are defined largely at will and can be difficult to compare. It is rather like flying in fog without any navigation aids:

- The major airlines are required or compelled to file around 25 reports on their emissions every year, each to a different regulatory body, NGO, or rating agency, meeting different standards of scope and definitions, and at different times;

- The choice to allocate sub-contracted ACMI-operated flights (wet leases) as direct emissions (Scope 1) or as emissions from the supply chain (Scope 3) is largely left to the discretion of the airline;

- Fuel consumption is converted into CO_2 emissions using a variety of methodologies;

- Some airlines report their figures only in relation to their passenger business, others in relation to passenger operations including belly cargo, while others yet add up the emissions of passenger flights and cargo flights.

In parallel, aircraft financiers are supposed to report detailed and accurate figures on the sustainability of their investments to internal and external supervisory bodies such as risk committees or central banks, even though available figures on aircraft-related emissions can be challenging to compare. This problem does not only apply to aircraft financiers: without reliable emissions data, regulators and the public are similarly flying in the dark.

In view of these shortcomings, sustainability strategies in aviation are in danger of becoming void of relevance and perhaps increasing the risk of greenwashing. This would be an unfortunate result for the industry.

Three KPIs to steer and guide decarbonization in aviation: Footprint, Intensity, and Decoupling

Effective investment strategies in sustainable aviation largely depend on both the precise definition of their ambitions as well as the targeted policies underpinning them. That being said, transparent, well-defined, and pinpointed metrics are perhaps even more important in order to reinforce the convergence and the uptake of strategies to reach the required net zero by 2050 target.

The following three KPIs could effectively address these requirements, while being simple enough to comprehend and to calculate:

a) Footprint (effectiveness): how effectively is CO_2 being reduced in absolute terms in relation to climate targets such as "net zero"?

b) Intensity(efficiency): how efficiently are fuels used in a particular flight?

c) Decoupling: to what extent are CO_2 emissions coupled to underlying capacity trends?

Footprint describes the ultimate purpose of decarbonization; intensity summarizes its means. However, the effectiveness KPI can only detect progress when declines in CO_2 emissions can fully offset capacity growth. The efficiency KPI, on the other hand, can in some cases give the appearance of efficiency progress even though more CO_2 is being emitted.

Therefore, to complement the static perspective of the first two KPIs, a third decoupling KPI that measures the interdependency of CO_2 and RPK would be needed.

		Footprint (Effectiveness)	Intensity (Efficiency)	Decoupling (Decoupling CO_2 from RPK)
Definition	Question	How much CO_2 does an airline emit in total?	How much CO_2 is needed to produce a certain unit of capacity?	How closely are trends in CO_2 emissions coupled with capacity development?
	Answer	Total amount of CO_2 emissions generated by passenger transport	Ratio of direct CO_2 emissions to seat kilometers sold	Comparison of the respective annual change in CO_2 and RPK
	Formal definition	$CO_2\ footprint = CO_2$	$Intensity = \frac{CO_2}{RPK}$	Decoupling = $\Delta\%RPK$ - $\Delta\%CO2$
Scope	CO_2	• CO_2 (disregarding GHGs other than CO_2) • Direct emissions from flight operations ("everything that burns fuel")		
	Flights	An airline is allocated the emissions of all flights that take place under its commercial responsibility		
	Payload	Passenger (CO_2 and RPK must refer to the same category of payload without blending pax and cargo)		
	Capacity	RPK. To be expanded to RTK in due time		
	Periodicity	Calendar year		
	Airline	Complete data for each operating carrier and each airline group		

Figure 1: Definition and scope of the three essential KPIs in sustainable aviation

Footprint: Effectiveness

Are absolute CO_2 emission reductions sufficient for aviation to comply with the climate targets of the Paris Agreement? This question is only about the "whether" of CO_2 reductions, not about the "how."

The corresponding KPIs should, therefore, be based on absolute amounts of CO_2 emissions for each asset, airline, or the airline industry as a whole. These effective CO_2 reduction KPIs should not be related to production volumes of any kind, because the issue at hand is not about the efficiency of resource use, but rather about absolute CO_2 reduction independent of production volume. A CO_2 molecule in the atmosphere does not care how many passengers it served.

In the long term, the more SAF (sustainable aviation fuel) airlines use instead of fossil kerosene, the lower the net CO_2 emissions airlines could choose to report (corrected for certified lifecycle carbon savings). At present, additionally adjusting CO_2-related KPIs to account for SAF blending is not contemplated by impact due to the infancy of specific lifecycle GHG reduction data for the various SAF types. Compensation measures are also neither considered nor counterbalanced because hardly any valid and specific data are publicly available yet. Our focus remains on assessing direct CO_2 emissions.

Intensity: Efficiency

How much CO_2 is emitted per ASK, RPK, RTK, passenger, or other indicators of production volume? CO_2 per passenger kilometers sold (CO_2/RPK) has been one of the most recurring efficiency metrics in sustainable finance transactions in the aviation sector to date. This ratio finds its origin in the fuel/RPK ratio, which is used by airlines to manage the costs of fuel. Such standardization to industry-specific production units is also common in other industries to measure the efficiency of resource usage to achieve a particular economic output.

Efficiency refers to the amount of CO_2 emitted to produce a certain volume of flight services. It focuses first and foremost on the efficiency of production, rather than effectiveness of decarbonization. Efficient use of CO_2 is a prerequisite for effective decarbonization if decarbonization is not to come from a large-scale reduction in flights. Efficiency-based KPIs are relevant and appropriate to measure the contribution of technological advances with regard to the potential for effective decarbonization.

However, efficiency metrics such as CO_2/RPK or others can show a positive trend while underlying CO_2 is increasing. For that reason, there is a clear risk of misinterpreting efficiency ratios. Ideally, both ratios converge towards zero: at zero emissions, CO_2/RPK is also necessarily zero. However, it is important to bear in mind that as long as and whenever airline capacity increases faster than resulting CO_2 emissions are reduced, there is a considerable risk of misinterpretation.

Transition trend: Decoupling

In view of the enormous dependencies of effective decarbonization of aviation on sophisticated technologies and on renewable energies, there will be an extended transitional phase until the new technologies are fully introduced and effective in reducing CO_2. However, neither purely efficiency-based nor purely effectiveness-based KPIs seem to adequately indicate the status and progress of the transition as a whole. Additional KPIs are therefore needed to measure whether, and to what extent, it is possible to decouple the trends of capacity growth and CO_2 reductions. Until today, CO_2 emissions have grown linearly with capacity. Moving forward, we need CO_2 emissions to decline at a greater rate than capacity increase in order to stand a chance to achieve the net zero goal. Of course, this also needs to be delicately balanced against the ability of the aviation industry to prosper, in order to fulfill its social and economic function and afford investments in sustainable technologies.

Year	RPK (million)	RPK (change)	CO_2 (metric tons)	CO_2 (change)	Decoupling (pp)
2014	88,567	2.70%	8,435,508	2.65%	0.05
2015	91,578	3.40%	8,739,187	3.60%	-0.20
2016	95,424	4.20%	9,062,536	3.70%	0.50
2017	98,764	3.50%	9,298,162	2.60%	0.90
2018	101,925	3.20%	9,437,635	1.50%	1.70
2019	105,594	3.60%	9,333,821	-1.10%	4.70
2020	92,711	-12.20%	7,924,414	-15.10%	2.90
2021	90,208	-2.70%	7,678,757	-3.10%	0.40

Figure 2: Table with data of RPK and CO_2 development for a fictitious airline. The right column calculates how strongly the changes of CO_2 are coupled to those of RPK (decoupling index: difference of the percentage changes of RPK and CO_2, measured as percentage points): Positive values for the decoupling index indicate the favorable development that the dependence of the CO_2 development on the RPK development is decreasing (decoupling). Negative values indicate a troublesome trend of high or even increasing coupling of CO_2 to RPK. In the case shown, CO_2 develops more or less in parallel with RPK in 2014 and 2015. The decoupling indices are correspondingly close to zero. From 2016 on, the decoupling indices increase significantly (through the introduction of latest technology aircraft and engines, for instance) and the decoupling indices show positive values. From 2019, the CO_2 values decrease even faster than the RPKs increase (through an accelerated introduction of state-of-the-art technology or other measures). This situation is called "absolute decoupling" and is the state that aviation must reach as quickly as possible.

Getting a grip on KPI scopes

No matter how fundamentally important they are, it is not simply a matter of setting KPIs. Defining their scope within airline businesses is also important. The effectiveness of KPI reporting could be undermined if an airline reports the correct KPIs only covering its passenger business, while another covers both passenger and freight flights. It could also be unhelpful for one airline to calculate emissions in CO_2 equivalents (CO_2e), while another only reports CO_2 emissions. Therefore, it is important to precisely define the scope and boundaries of the corresponding KPIs.

CO_2

The airlines' reporting of Scope 1 (emissions flight and ground operations), Scope 2 (emissions from buildings), and Scope 3 (emissions of the value chain, upstream and downstream) is far from uniform. While the GHG Protocol Corporate Standard's scope classification has its merits, this differentiation does not help to compare GHG emissions by airline or aircraft type. We thus recommend focusing on direct CO_2 emissions for the context of sustainable aviation financing.

There are no scientifically accepted standards for converting fuel or CO_2 into CO_2 equivalents (i.e. the CO_2-equivalent climate impact of various gases). For this, several of the non-CO_2 climate gases depend strongly on factors such as flight altitude. The idea of measuring CO_2 equivalents is correct in principle, but it cannot be practically implemented in aviation. The focus should, therefore, be on CO_2 until simple and unambiguous measurement methods are available for the other relevant GHGs.

Flights

The allocation of emissions from flights operated by a subcontracted airline ("wet lease") is handled in various ways by different airlines. Frequently, they are accounted for as Scope 3 (emissions of the value chain). However, the "polluter pays" principle should strictly apply to the attribution of wet-lease flights: the emissions of all flights are to be attributed to the airline under whose economic responsibility they take place. Airline XY must account for the emissions of a flight marketed under the IATA code of XY. Codeshare flights are excluded.

Payload

Intensity is based on the ratio of CO_2 emissions to capacity produced (e.g. RPK). CO_2 and RPK must, therefore, relate to the same capacity. For example, CO_2 must not refer to the emissions of the entire fleet of passenger and cargo aircraft, while in the denominator only operations by passenger aircraft are considered. Intensity is the key figure most frequently reported by airlines. The key figures for CO_2 and RPK used to calculate intensity should thus also be those used for calculating direct emissions and RPK, so that Footprint, Intensity, and Decoupling remain comparable.

Capacity

Some airlines transport only passengers, some passengers and cargo, others only cargo.
To compare the emissions data of these different airline business models, capacity should be measured in tons, not in number of seats offered or sold. Very few airlines publish their capacity in tons (e.g. in terms of ATK or RTK). However, by far the most common – and still meaningful – key figure today is the number of revenue passenger kilometers, or RPK. Therefore, RPK should be the standard for the time being. At the same time, airlines should be encouraged to publish their capacity in RTK (freight tons sold) as soon as practicable.

Periodicity

To ensure comparability of the reporting periods, emissions data that do not relate to the calendar year should be converted proportionately to the calendar year. Ideally, the reporting cycles of the non-financial reports should also refer to the calendar year instead of the fiscal year from the outset.

Airline

Airline groups or holding companies often report part of their emissions data only at group level, other data only for the flying subsidiaries. This is inadequate since it impedes comparability. It is often argued that it is the holding company that allocates aircraft to the subsidiary airlines. However, it is these subsidiaries as operating carriers that cause the direct emissions. For aircraft financiers, it is essential to know the key figures on emissions and capacity of their contractual partners.
For this reason, the data must be published both at group level and for each individual operating carrier.

A smart way forward

Transparency matters. It is indispensable for developing sustainability strategies, measuring their success, and sharpening measures accordingly.

In the first few months of this year, the world's major airlines published their sustainability reports. Unfortunately, only a small minority of airlines – at most 15 percent of all airlines globally – made available their sustainability data; and where the data was published, there still seems to be some selectiveness in the information shared and a general lack of transparency.

It is impact's central goal to substantially improve the transparency of aviation sustainability. One of the strongest levers to this end is to drastically simplify the metrics used to measure aviation sustainability and introduce a uniform reporting requirement. We therefore propose to focus on three essential KPIs which will incorporate elements necessary to trace the progress of decarbonization: carbon Footprint as a measure of absolute CO_2 emissions, Intensity as a measure of the most careful use of fossil fuels, and Decoupling as an indicator of how well the trend of CO_2 emissions is being decoupled from capacity development. In a few weeks' time, impact will release another white paper with more details about the practical implementation.

As a way forward, we aim to do the following:

- Propose standards as to how to integrate these three key figures, individually or as a basket, as covenants in financing documentation. To this end, we will, for instance, encourage aircraft financiers to consider tying the financing of aircraft to the performance of the decoupling metrics of the airlines concerned (sustainability-linked).

- Encourage airlines to integrate these three metrics into their sustainability reports, if they are not already doing so. We would expect that, going forward, financing documentation would include disclosure of these metrics by the relevant airlines. These metrics would allow aviation companies to demonstrate a tangible commitment to decarbonization.

- Based on these three key figures and corresponding benchmarks and trend analyses, we aim to provide unprecedented transparency to internal and external supervisory bodies, investors, parliaments, and regulators in the world's major aviation markets. Increased transparency in aviation decarbonization will assist regulators and policymakers in supporting actions which will expedite the pathway to net zero – ensuring that our proposals will lead to a long-term positive sustainable impact.

Disclaimer

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