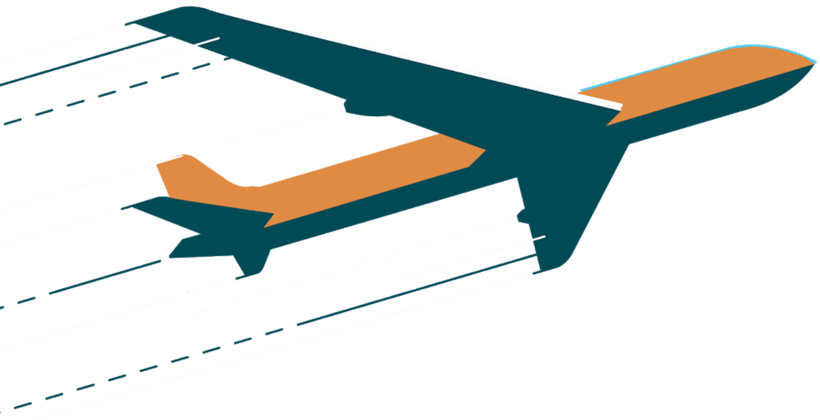
Science-based Target Setting for the Aviation Sector

DRAFT Guidance for Public Consultation

V1.0 | November 2020

These materials are for use during the public consultation period taking place from Nov 23rd - Dec 11th 2020 only. All content should be considered as draft and subject to change pending feedback from this process. The final materials will be formally launched in Q1 2021



ACKNOWLEDGEMENTS

This guidance was developed by WWF on behalf of the Science Based Targets initiative (SBTi), with support from the International Council for Clean Transportation (ICCT).

The Science Based Targets initiative mobilizes companies to set science-based targets and boost their competitive advantage in the transition to the low-carbon economy. It is a collaboration between CDP, the United Nations Global Compact, World Resources Institute (WRI) and the World Wide Fund for Nature (WWF) and is one of the We Mean Business Coalition commitments.

About WWF

WWF is one of the world's largest and most experienced independent conservation organizations, with over 5 million supporters and a global network active in more than 100 countries.

WWF's mission is to stop the degradation of the planet's natural environment and to build a future in which humans live in harmony with nature, by conserving the world's biological diversity, ensuring that the use of renewable natural resources is sustainable, and promoting the reduction of pollution and wasteful consumption.

About the ICCT

The International Council on Clean Transportation is an independent nonprofit organization founded to provide first-rate, unbiased research and technical and scientific analysis to environmental regulators. Its mission is to improve the environmental performance and energy efficiency of road, marine, and air transportation, in order to benefit public health and mitigate climate change.

Primary Authors

- Dan Rutherford (ICCT)
- Sola Xinyi Zheng (ICCT)
- Fernando Rangel Villasana (WWF)
- Brad Schallert (WWF)
- Rebekah Hughes-Khan (WWF)
- John Holler (WWF)
- Tim Letts (WWF)

A technical working group of dedicated experts from industry and NGOs provided detailed input during the planning phase and on various drafts of the guidance and tool.

TWG Organizations:
All Nippon Airways
American Airlines
Cathay Pacific Airways
Deutsche Post DHL Group (DPDHL)
JetBlue Airways
United Parcel Service (UPS)
Finnair
International Airlines Group (IAG)
EasyJet
Federal Express (FedEx)
GOL
Air New Zealand
Qantas Airways
Ethiopian Airlines
University College London (UCL)
The Smart Freight Centre
International Energy Agency (IEA)

We are very grateful for the input and engagement from all our Technical Working Group members and project support teams.

Contents

Executive summary: DRAFT for consultation use only - subject to change based on feedback

Introduction to Science-based targets initiative (SBTi)

- The Science Based Targets initiative (SBTi) helps companies understand how much and how fast they have to reduce GHG emissions by to align with the goals of the Paris agreement - to limit warming to well-below 2°C above pre-industrial levels
- This document provides guidance on how airlines and users of aviation services should set targets aligned with a well-below 2°C ambition (the goal of the Paris agreement)

Target setting approach for airlines

- The target setting method for airlines is based on the SBTi's Sectoral Decarbonization Approach (SDA) which states that a companies carbon intensity should converge to the sector's Paris-aligned GHG intensity by 2050

Decarbonization pathway for the aviation sector

- The rate and scale of aviation decarbonization is defined by the International Energy Agencies *Energy Technology Perspectives* (ETP) 2020 report which models GHG reduction requirements for each sector based on a number of assumptions including forecasted sector growth, availability of mitigation levers and socio-economic factors
- To align with the Paris agreement, the aviation sector is required to reduce average carbon intensity by ~35-40% between 2019-2035, or ~65% by 2050

Scope of emissions covered

- The impact of aviation non-CO_2 factors on warming is acknowledged but not included in quantitative target setting due to scientific uncertainty and lack of mitigation solutions
- To raise awareness of non-CO_2 impacts of aviation, airlines are encouraged to participate in data sharing, collaboration and include non-CO_2 factors in other climate commitments

Process to set a target

- Companies may use the accompanying SBT aviation Excel tool to help set SBTs
- Once a target has been developed, it can be submitted to the SBTi for validation

Mechanisms to realize targets

- The SBTi does not prescribe a technology roadmap for meeting targets, however, airlines may consider improving carbon intensity through fleet renewal, improved operational efficiency, adoption of Sustainable Aviation Fuels or other solutions
- Science-based reduction targets address in value chain reductions, hence out-of-value-chain neutralization or compensation credits cannot be used to meet SBTs
- However, science-based reduction targets can be complimented by science-based Net Zero targets (under development) which further consider the role of CO_2 removals/credits

SBTs for users of aviation services

- This pathway can be used to set targets for scope 3 category 4 (e.g., contracted freight), or for scope 3 category 6, business travel emissions
- Business air travel targets are generated using the absolute contraction method with a linear annual reduction rate of 0.4% (the sector decarbonization rate for 2019-2050)
- SAF can be used to address scope 3 targets if procured in line with SBTi principles

1. Context

1.1 What are science-based targets (SBTs)

SBTs specify how much and how quickly a company needs to decarbonize to align with the Paris Agreement goals

Science-based targets specify how much and how quickly a company would need to reduce its greenhouse gas (GHG) emissions by in order to align with the goals of the Paris Agreement - *to limit warming to well-below 2°C above pre-industrial levels (WB-2°C) and pursue efforts to further limit warming to 1.5°C.*

This report builds on existing Science Based Targets initiative (SBTi) guidance, in particular the SBTi Transport Target Setting Guidance (2018), and the GHG Protocol Corporate Accounting and Reporting Standard to outline how much and how quickly the aviation industry needs to decarbonize to meet the goals of the Paris Agreement. It shows the conclusions of a group of experts and industry stakeholders[1] that have been focused on developing best practices for science-based target-setting in aviation since March 2020.

This science-based target setting pathway for aviation has been built on the SBTi's Sectoral Decarbonization Approach (SDA) which allows aviation industry stakeholders including passenger and cargo airlines, contracted freight forwarders and business travelers to set GHG intensity targets that are aligned with a WB-2°C scenario (the goal of the Paris agreement).

1.2. The sector context

Aviation is considered a hard to abate sector, but needs to act now to respond to increasing regulatory, investor and consumer pressures

Because of its relatively higher abatement costs than the rest of the economy, aviation is considered to be a *hard to abate* sector, representing ~2.4% of global CO_2 emissions in 2018. Efforts to decarbonize air travel face significant headwinds due to large technical barriers associated with removing or replacing jet fuel, challenging industry fundamentals, such as low profit margins (2-4% global average, 5-15% US average) and limited historic regulatory pressure to decarbonize.

The recent COVID-19 pandemic has impacted aviation at a fundamental level, causing industry wide disruption and, at its peak, a greater than 90% reduction in monthly Revenue Passenger Kilometers (RPKs) in April 2020. As the world begins to return to normal, flight activity in the aviation sector will see a return of demand – however, the rate of increase over the coming years is highly uncertain.

[1] The aviation pathway development process has been supported by analysis from the International Council on Clean Transportation, a Technical Working Group involving >15 representatives from airlines, freight carriers, research organizations and industry bodies

Prior to the COVID-19 crisis, the industry was already seeing a changing investor and consumer sentiment towards flying, both due to an increasing corporate focus on emissions targets, as well as consumer driven movements such as “flying shame”. However, it is possible that these changing attitudes will only have been exacerbated by the pandemic. Indeed corporates have become increasingly accustomed to a remote working model. Whether sustainably-minded travelers take to the skies again will depend partially on a cost benefit analysis; weighing up the benefits of travel against the costs in both financial and carbon terms.

Therefore, now more than ever, it is imperative for airlines to decarbonize: **sustainability and sector recovery should go hand in hand**. Setting science-based targets represents a credible signal to consumers, investors and regulators that the industry is ready, willing and able to take action and re-build with climate at the top of the agenda.

For aviation companies, the business case is clear: not only does setting a science-based target demonstrate to customers and investors a willingness to act, but decarbonizing now is key to creating future resilience and competitive advantage in a low carbon economy.

1.3 Overview of the public consultation process and next steps

Please submit feedback on this guidance document and target setting tool prior to Dec 11 via the feedback survey form accessible via the SBTi website

This guidance document and target setting tool for the aviation sector aims to to mobilize aviation companies globally to set ambitious, science-based GHG emissions targets for their operations and value chains.

To that end, this guidance document aims to:

- Summarize credible approaches to setting SBTs within the airline sector
- Describe the methodological assumptions included in the pathway development process
- Detail the approach to setting an aviation SBT
- Detail key decarbonization levers and their applicability to meeting SBTs
- Outline the target setting approach for users of aviation services

As part of the development process, this guidance has been opened for public consultation. Feedback on the materials presented herein is welcomed and encouraged via our dedicated website and submission form.

2. Development of an aviation SDA tool

2.1 Overview of the Sectoral Decarbonization Approach (SDA)

A target setting method based on intensity metrics which incorporates industry growth forecasts into decarbonization targets

The SDA is a target setting methodology developed by the SBTi allowing companies to set science-based greenhouse gas (GHG) intensity targets aligned with a well-below 2°C scenario.

At its core the SDA attempts to address a fundamental tension in corporate target setting: that rapid decarbonization is incongruent with industry growth. For commercial aviation, this uncertainty could be framed as:

"How much would the aviation sector's average carbon intensity need to decrease in order to achieve Paris aligned decarbonization goals whilst also allowing for projected industry growth?"

The SDA answers this question by helping companies model physical intensity GHG reduction targets that align with the sector specific pathway of an underlying climate scenario. The rate of decarbonization needed to meet the Paris goals is defined by scientific findings from Integrated Assessment Models (IAMs). These models detail how a global carbon budget should be spread over time and by sector based on a number of factors, including: sector mitigation potential, socio-economic drivers, regional factors and technological availability. One of the outputs of IAMs is an annual emissions pathway - an illustration of the necessary emissions each sector can emit in every future year in order to be consistent with a specific temperature outcome.

In the SDA, annual emissions pathways are divided by forecasted industry activity to define a carbon intensity curve. These curves can help compare the carbon intensity of an individual company and the sector overall. For example, if a company has a higher carbon intensity than the sector average it is considered to have less carbon efficient operations than its peers.

The SDA builds upon the comparison between sector wide and company intensities . Targets are set by assuming that all companies converge to the same intensity level as the sector by the year 2050. Science-based targets are set in the short to medium term (5 to 15 years) along this convergence path - the steepness of which is defined by the relative intensity of the company compared to the sector in the base year, and the rate of forecasted company activity growth. The larger the relative difference, and the faster the growth, the more stringent the intensity target for an individual company.

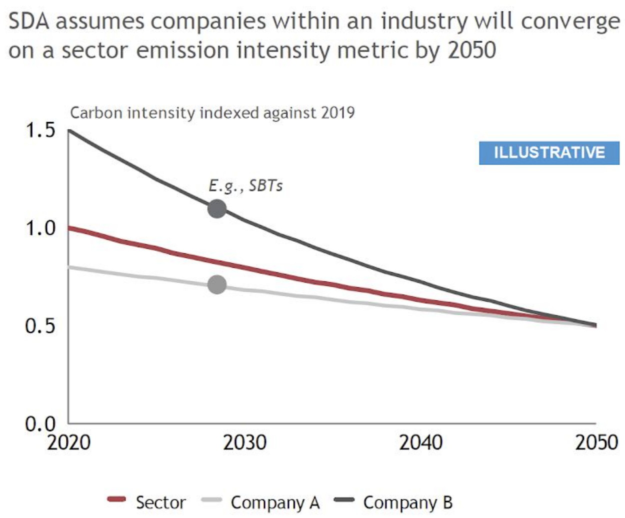


Figure 1: Illustration of an intensity convergence pathway - companies should converge to the sector average intensity (red line) by 2050, setting short-mid term targets along the way

2.2 Choice of emissions scenario and activity forecast

The first step in the Sectoral Decarbonization Approach requires development of an aviation sector GHG intensity pathway aligned to a WB-2°C scenario. Once a sector wide GHG intensity pathway has been defined, companies may set targets by comparing their base year GHG intensity with that of the sector, ultimately converging to sector intensity levels by 2050.

Equation 1

$$Sector\ GHG\ intensity\ (gCO2e/RPK) = \frac{Annual\ Emissions\ Pathway\ (gCO2e)}{Sector\ Activity\ Forecast\ (RPK)}$$

Annual emissions pathway: ***The International Energy Agency Energy Technology Perspectives (IEA ETP) Sustainable Development Scenario is used to define the required rate of decarbonization for aviation consistent with a WB-2°C scenario***

The numerator of the intensity equation is derived from Integrated Assessment Models (IAMs) that define the required rate of decarbonization from each sector to limit warming to a given temperature, in this case WB-2°C.

The International Energy Agencies (IEA) flagship Energy Technology Perspectives (ETP) model has been used as the source of annual emissions pathways for all previous SBTi SDA tools. The latest ETP publication describes two scenarios.

- The Stated Policies Scenario (STEPS) which outlines the current emissions trajectory (2020-2070) for each sector based on existing and planned policy commitments
- The Sustainable Development Scenario (SDS) which outlines an emissions trajectory (2020-2070) for each sector consistent with limiting warming to 1.8 °C above pre-industrial levels at a 66% probability - this is considered to align to the Paris ambition of limiting warming to well-below 2°C

For development of this SBTi aviation sector intensity pathway, the IEA ETP SDS was considered a credible, transparent datasource for the annual emissions pathway. The SBTi uses the SDS model as an input to the intensity equation; defining how much and how fast the sector needs to decarbonize.

The scenario developed by IEA is based on a number of underlying assumptions detailed in Figure 2. This scenario (and accompanying assumptions) represent just one illustrative way to achieve the required decarbonization aligned to a well-below 2°C scenario - the SBTi does not prescribe a specific technological roadmap and acknowledges that individual companies may achieve the required targets via a different combination of levers than what is outlined in the SDS.

Category	Topic	ETP 2017 B2DS (RTS)	ETP 2020 SDS (STEPS)
Model overall	Total model timeframe	Up to 2060	Up to 2070
	Temperature alignment	1.75°C, 50% probability	1.8°C, 66% probability
	Impact of COVID	Not included	Included
	Assumed 2050 carbon price	$420 / TCO2	$150 / TCO2
Aviation overall	2050 Aviation emissions target	~440 WTW MTCO2 (1,080)	~900 WTW MTCO2 (1,715, TTW only)
	Operations included	All commercial (freight + PAX)	PAX + belly (no dedicated freight)
	Boundary of aviation emissions	Well to Wake (WTT + TTW)	Tank to Wake only
	Activity growth, RPK (2019-2050)	2.3% (3.4%)	2.9% (3.2%)
Decarb. levers	Assumed annual efficiency	2.0% p.a.	2.2% p.a.
	Range of SAF modelled	Biofuel (GFT) only	Biofuel (GFT, HEFA, ATJ, SIP) & Synthetic fuel (PtL)
	SAF adoption	50% by 2050	30% bio by 2050, 10% syn by 2050
	Accounting of SAF impact	Part of Well to Tank emissions	Part of Tank to Wake emissions
	Modelling of alt. propulsion	Not included	Included

Figure 2: Comparison of key assumptions used in the IEA ETP 2017 B2DS compared to the IEA ETP 2020 SDS

Table 1: The SBTi Aviation Guidance currently supports targets aligned to well-below -2°C

Limiting warming to well-below 2°C above pre-industrial levels is the primary objective of the Paris Agreement, however, the agreement also defines a further ambition of limiting warming to 1.5°C. Achieving this ambition is currently the most ambitious temperature alignment. The IPCC Special Report on Global Warming of 1.5°C finds that 2018 emissions need to reduce 50% by 2030 to meet this target.

The SBTi recognizes the importance of a corporate ambition aligned to the higher 1.5°C ambition level. Hence the initiative aims to support 1.5°C aligned science-based target setting where possible. However, as with most SBTi sectoral development processes, the aviation pathway utilizes the IEA's ETP model as the basis for emissions pathways. The latest ETP model does not provide a scenario cited to align to a 1.5°C outcome. As a result, this development process and current guidance is limited to a well-below 2°C ambition.

The SBTi will continue to explore the latest scientific modelling to identify a credible 1.5°C intensity pathway; however, in the interim, it is recommended that aviation stakeholders seeking a higher ambition level target utilize the Absolute Contraction methodology to set a 1.5°C target or set complimentary long-term Net Zero target when specific guidance for Net Zero targets is published by SBTi in 2021.

2.3 Sector activity forecast:

The IEA ETP Sustainable Development Scenario (SDS) is used to derive long term industry activity forecasts

To derive a sector wide GHG intensity pathway, activity forecasts that reflect expected industry growth are required. As a general rule, the faster the sector is expected to grow, the faster its GHG intensity must fall to meet the annual emissions pathway consistent with the temperature scenario.

The Sustainable Development Scenario (SDS) provides the source of the annual emissions pathway data as well as a long term activity growth forecast of 2.9% (2019-2050) aligned to a well-below 2°C temperature goal. This growth rate accounts for both the short-term impact from the COVID-19 pandemic, as well as the necessary level of demand growth to achieve the decarbonization trajectory outlined by the scenario.

To ensure internal consistency with the annual emissions pathway from the SDS, a growth rate of 2.9% was applied in development of GHG intensity pathways in this guidance.

2.4 Approach to sectoral segmentation

The airline industry provides a variety of services using different aircrafts. To set fair and reasonable targets, the SDS total emissions budget for commercial aviation is divided into five segments based on payload type and stage length. This sectoral segmentation process followed two general principles: (1) materiality (that there should be a material difference in intensity profile between segments) and (2) compatibility (that segmentation should not incentivize avoidable business models that result in higher-intensity operations).

Based upon these criteria, emissions pathways for five market segments were developed (Figure 3). Research shows that the CO_2 intensity of short-haul flights (<1500 km) is significantly higher than that of longer flights, pointing to the need for different segments. Likewise, there are inherent differences in the business models of passengers and dedicated freight carriers that necessitate a separate emissions pathway. On average, belly freight demonstrates similar CO_2 intensity to long-haul dedicated freight using recommended industry practices for emissions allocation (see Figure 3). However, considering the different business models and operational arrangements for these two services, belly freight is designated a separate segment for target setting.

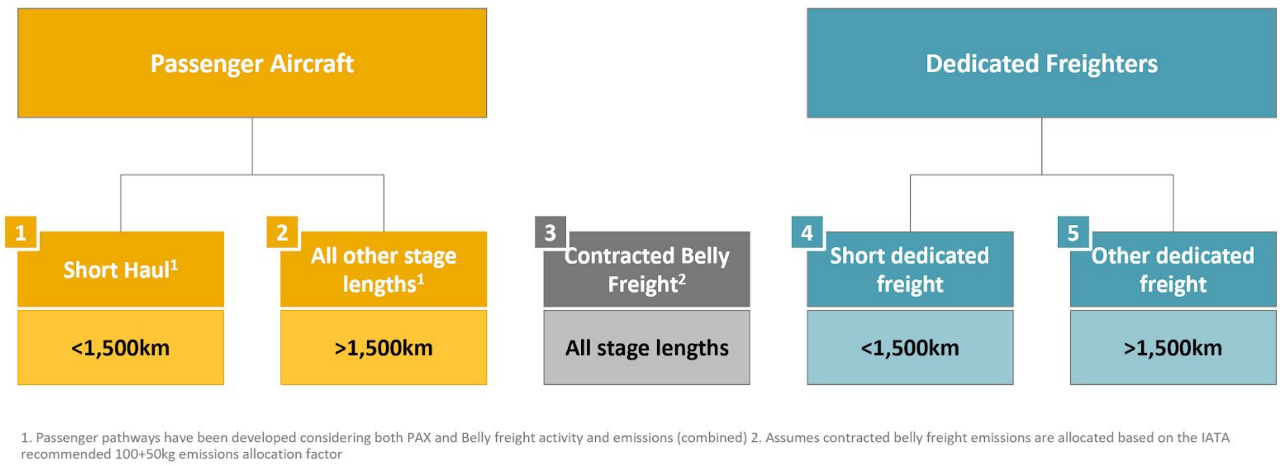


Figure 3: Aviation sector segmental split used in pathway development

Total emissions and activity in 2019 were segmented using ICCT's Global Carbon Assessment Model (GACA). GACA estimates flight fuel burn for each unique origin-destination-airline-aircraft combination using OAG historical flight operations data. Emissions and activity estimated by GACA are validated using airline and government data from major markets, including Europe, the US, China, and Japan, and matches well with high level statistics published by the International Air Transport Association (IATA).

IEA's SDS assumes a constant split between passenger and freight emissions over time; 91% of total commercial aviation CO_2 is attributed to passenger aircraft, while the remaining 9% is emitted from dedicated freighters.[2] Emissions associated with belly freight transport are included in the passenger emissions budget. Regarding traffic, the SDS assumes a 2.9% annual growth

[2] The share of aviation emissions related to private aviation and military is not included in this analysis.

rate for both passenger and freight traffic between 2020 and 2050. To develop each segment's emissions pathway, the share of emissions by payload type (e.g. passenger vs. freight), stage length (short vs. medium/long haul), and freight type (belly vs. dedicated) was held constant at 2019 levels as estimated by GACA. Similar to total emissions, the share of revenue passengers and freight revenue tonnes transported by stage length was held constant at 2019 levels.

An emissions allocation factor was used to apportion emissions between passengers and belly freight on common flights. The mass of 100 kg of passenger plus 50 kg for seats and furnishings (e.g., lavatories, service trolley, etc.) was assumed, as recommended by IATA. Using this 100 + 50 kg approach aligns the intensity profile of belly freight to that of dedicated freight, avoiding potential market distortions and rewarding belly freight carriage on passenger flights. Note that this allocation was only used in development of the emissions pathway - alternative allocations may be used by airlines setting targets (most relevant to segmenting the business of a freight forwarder that contracts for both dedicated and belly cargo).

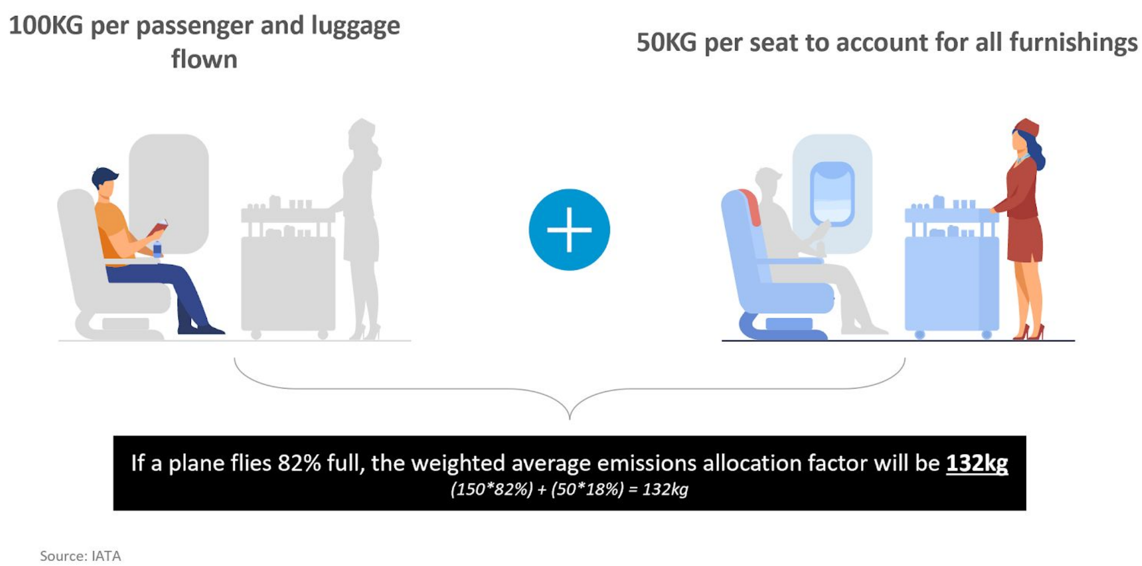


Figure 4: Emissions allocation during pathway development used a 100+50kg factor for belly cargo in alignment with IATA best practices. Airlines setting targets may choose to use different factors.

2.5 Pathway boundaries and assumptions

Due to the inherent complexity in climate target setting and the specific nuances of the aviation sector it is necessary to define explicit boundaries and scope for emissions covered by the aviation pathway and for target setting

2.5.1 Emissions boundaries for the aviation pathway

Jet Fuel is the primary pollutant from aviation, representing >90% of most airlines value chain emissions.[3] For that reason, this SBTi pathway focuses exclusively on Jet Fuel emissions - for target setting methodologies covering other aviation related emissions, please refer to other SBTi guidance.

Jet fuel use results in GHG emissions across the aviation value chain, from production, refining and distribution of the fuel to ultimately combustion in a jet engine. These value chain emissions can be split into two components: emissions from combustion of fuel, referred to as Tank-to-Wake (TTW), and emissions from production, refining and distribution, known as Well-to-Tank (WTT). Combined, the full value chain emissions from jet fuel are referred to as Well-to-Wake (WTW).

It is typical for many stakeholders to only consider direct combustion (TTW) when measuring emissions; however, the aviation pathway development process builds off the precedent set from other SBTi transport guidance to develop pathways on a WTW basis.

There are two key rationale for development of an aviation pathway on a WTW basis.

1. Inclusion of the upstream production and distribution (WTT) component is required to credibly account for use of Sustainable Aviation Fuels (see section 4.2).
2. Inclusion of upstream production and distribution (WTT) will best capture emission reductions from future alternative power plants, including those that consume electricity and hydrogen, please see SBT Transport Guidance for greater details on this precedent.

2.5.2 Boundaries for target setting:

The boundary for GHG inventories and targets should be as comprehensive and accurate as possible. Emissions not covered by a target cannot be responsibly managed or reduced.

The first step in setting a target involves measuring and accounting for GHG emissions. Best practice accounting follows guidance from the Greenhouse Gas Protocol (GHGP) which structures emissions from Kyoto gases according to three scopes: scope 1 representing direct emissions from operations (for jet fuel this is TTW emissions), scope 2 representing electricity consumed from operations (limited relevance for aviation) and scope 3 representing all emissions from the upstream and downstream supply chain (for jet fuel this is WTT emissions). Emissions within the scopes should be accounted for in terms of CO_2e, where the “e” represents the equivalent CO_2 warming impact of other Kyoto gases.[4]

[3] Based on the average of 19 airline CDP disclosures (2018)
[4] Note, this does not include the impact of non-CO_2 factors, see section 2.5.3

From a target setting perspective, to align with the pathway boundary, and to recognize that an airlines choice of fuel can influence both the upstream and combustion emissions, this guidance and tool requires users to account for the full value chain impact of jet fuel within their target setting boundary i.e., scope 1 + scope 3 category 3 (Well-to-Wake, WTW). Furthermore, in cases where Sustainable Aviation Fuel (SAF) is utilized, direct and indirect land use change impacts (LUC / iLUC) should additionally be considered in the target boundary - see section 4.2 for further guidance on SAF accounting.

2.5.3 Addressing non-CO_2 effects of aviation

Aviation SBTs only cover Kyoto GHGs - recommended best practice for non-CO_2 factors includes transparent accounting, data sharing and inclusion in other climate commitments.

Whilst CO_2 remains the most commonly cited and arguably best understood pollutant from aviation, its contribution to global effective radiative forcing (ERF) i.e., warming, is estimated to be only a fraction (~⅓) of the industry's total impact.

Emerging research validates long-held beliefs that other pollutants from jet engines can cause further warming beyond the impact of carbon alone. For example, particulate matter has been linked with increased contrail-induced cirrus cloudiness and NO_x emissions with net increased GHG formation.[5]

Despite the clear importance of these "non-CO_2 factors" on aviation induced warming, the science underpinning these findings remains nascent. Furthermore mitigation levers targeting these factors also remain un-tested, limiting the ability for individual companies to both measure the impacts and then take directed action.

As a result, the SBTi pathway developed in this process only covers CO_2 emissions and other Kyoto GHG's (CH_4, N_2O, Hydrofluorocarbons, Perfluorocarbons & SF_6 which are only minor pollutants for aviation) - it does not cover the impact from the aforementioned non-CO_2 factors.

Nonetheless, the SBTi recognizes that aviation non-CO_2 induced ERF will likely need to be addressed to deliver the ultimate goal of limiting warming to well-below 2°C. To that end, this guidance introduces an additional target setting criteria related to disclosure of emissions boundaries covered by targets, as well as recommendations for best practices for addressing the impact of non-CO_2 factors.

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Sector specific target setting criteria: aviation target formulation and communication should explicitly state that targets are exclusive of non-CO_2 factors (either in the main target language or in a footnote).

[5] Increased NO_x emissions show to result in a net warming factor from a combination of increased O_3 formation despite an increased rate of CH_4 degradation

Sector specific recommendations: The SBTi also recommends best practices related to consideration of non-CO_2 factors

- Data sharing and collaboration to stimulate research and development, including sharing of flight and technical data will be key to better understanding and ultimately developing mitigation approaches for limiting the impact of non-CO_2 ERF
- Incorporation of non-CO_2 ERF into additional targets e.g., airlines are encouraged to include the full impact of non-CO_2 ERF in other target setting processes e.g., Net Zero commitments

2.6 Sector carbon intensity pathways

Based on the underlying emissions pathway and activity forecasts from the IEA ETP 2020 SDS, sectoral segmentation and the defined pathway boundaries, a sector average carbon intensity pathway consistent with a well-below 2°C scenario can be derived. The average pathway along with segmented variants represent the required rates of decarbonization for the sector as a whole, and are used to define the target intensity that each company must converge to by 2050.

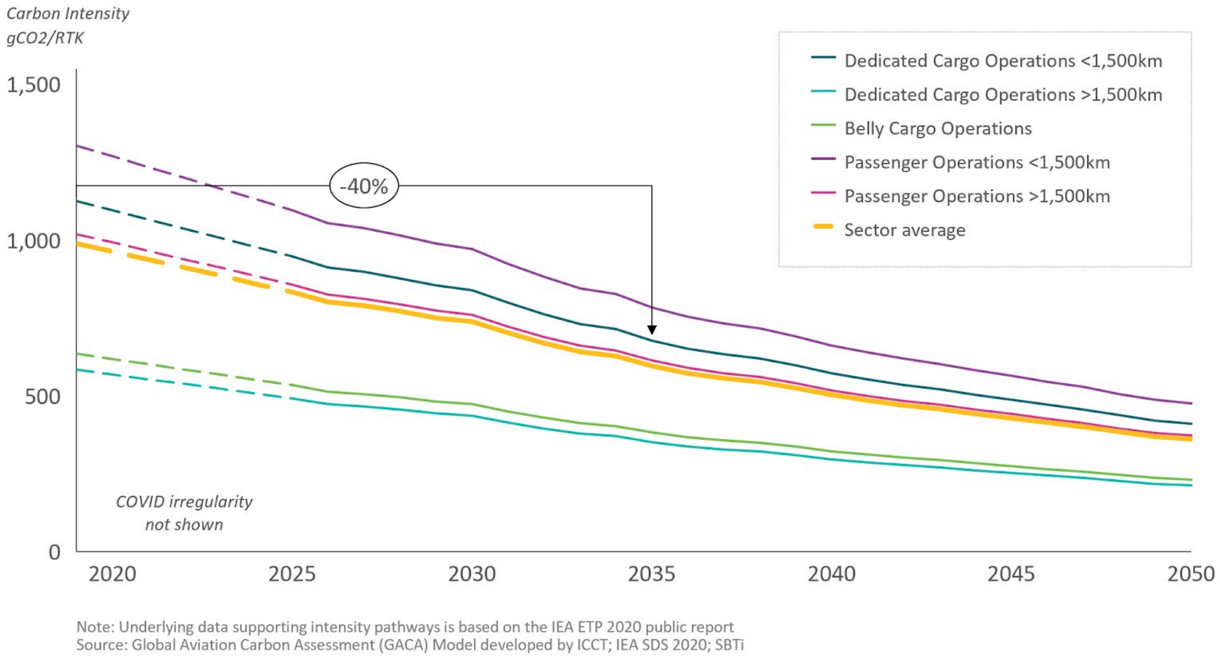

Figure 5: Sector average carbon intensity pathways (on a Well-to-Wake basis) derived from the methodological assumptions and data sources discussed in sections 2.1-2.5

3. Setting targets for aircraft operators

3.1 Using the target setting tool

The SBT Aviation tool is based on the same approach and structure as previous SBTi resources, most notably the 2018 Transport sector guidance and tool. Whilst the fundamentals of the Sectoral Decarbonization Approach remain consistent regardless of user, specific guidance and adjustments have been developed for different aviation stakeholders interested in setting targets. These variations predominantly address differences in accounting practices, operations and scope of emissions.

Operators of aircraft include airlines that carry either passengers, belly cargo, dedicated cargo or a combination. Science-based targets for operators of aircraft may be derived using the SBTi Aviation tool. The target-tool for airlines interface is split into 5 key sections:

1. **Settings:** users should input a base year and a target year. The SBTi recommends choosing the most recent year for which data are available as the target base year[6]. For the choice of target year, targets must cover a minimum of 5 years and a maximum of 15 years from the date the target is submitted to the SBTi for validation.

2. **Base year emissions data:** Base year emissions in tonnes of CO2e[7] for total passenger or dedicated cargo operations.
    a. Emissions data should be submitted on a Well-to-Wake basis - the sum of both scope 1 emissions from jet fuel combustion and scope 3 category 3 emissions from upstream production and distribution of jet fuel.
    b. If Well-to-Wake data is not available, users may enter Tank-to-Wake data (scope 1). In this instance, default Well-to-Tank emissions factors will be applied to convert TTW into WTW values.
    c. Optionally, airlines may indicate the percentage of emissions which originated from flights <1,500km in stage length. Inputting this data will help better tailor the targets to each users individual operating characteristics[8]

3. **Base year activity data:** Base year Revenue Passenger Kilometers (RPK) or Revenue Tonne Kilometers (RTK) from flown operations
    a. Passenger operations should report their activity in terms of RPK for passengers transported, and RTK for belly freight transported. If the split is not available, airlines should enter only RPK values (assuming 100kg activity conversion factor).[9]
    b. Dedicated cargo operations should report activity in terms of RTK only
    c. Optionally, airlines may also indicate the percentage of activity which originated from flights <1,500km in stage length. Inputting this data will help better tailor the targets to each airlines individual operating characteristics

[6] Since 2015 and excluding 2020/2021 (due to COVID impact)
[7] MTCO2e refers to Million Metric Tonnes of CO_2 equivalent, including all Kyoto gases but excluding the impact from non-CO_2 induced effective radiative forcing
[8] If no percentage split is provided, targets will be set based on the medium-long haul pathways as a default
[9] SBTi utilizes a conversion factor of 100kg to convert RPK into RTK

4. **Input activity forecast data:** Airlines are required to submit a forecast of expected activity in the target year. This forecast can be provided in two formats:
   a. As a Compound Annual Growth Rate (CAGR) from base year to target year - this growth rate will be applied evenly to all segments of activity entered in step 3
   b. Manually, by entering expected activity in the target year in terms of RPK or RTK for passenger and freight operations respectively. If an indication of the share of emissions and activity from flights <1,500km was provided in steps 2 and 3, this will split will also be required when manually entering activity forecasts

5. **Output:** Four key outputs will be generated from steps 1-4, including:
   a. A numerical science-based target in the format of gCO_2/RTK: represents a company wide aviation target representing all industry segments the company operates in
   b. Graph of the convergence pathway: companies are not expected to follow the pathway itself, but should instead should focus on achievement of the target year intensity
   c. Graph of absolute emissions reductions: as defined by the forecasted activity growth and the intensity target. Note sector absolute emissions are weighted to reflect the industry segments in which the user operates (based on activity inputs)
   d. Additional detailed graphics and data tables provided for convenience

3.2 Submitting a target

To participate in the SBTi, companies need to complete a submission form. The form requires disclosure of emissions per scope in the base year, activity figures, and other data to perform the assessment. All information is treated as confidential and is only used for the purpose of assessing compliance against current science-based target methods and SBTi criteria. Please see the SBTi website for resources and links to target-setting.

3.3 Communicating a target

Target formulations must indicate the emissions covered, the base year and target year selected, the percentage reduction and the units. As per the SBTi criteria, targets can be expressed on an absolute basis (tCO_2e) or intensity basis (e.g. gCO_2e/pkm, tCO_2e/tkm).

> (Company Name) commits to reduce Well-to-Wake GHG emissions (percent reduction)% gCO_2/RTK by (target year) from a (base year) base year.
>
> *Footnote: non-CO_2 factors which may also contribute to aviation induced warming are not included in this target*

3.4 Updating a target

To ensure consistent performance tracking over time, the target should be recalculated to reflect significant changes that would compromise its relevance and consistency. The SBTi recommends that companies check the validity of their target projections annually. At a minimum, targets should be reassessed every five years. The company should notify the SBTi (if participating in the initiative) of any significant changes and report these major changes publicly. A target recalculation should be triggered by significant changes in:

- Company structure (e.g. acquisition, divestiture, mergers, insourcing or outsourcing)
- Growth projections
- Data used in setting the target (e.g. discovery of significant errors or a number of cumulative errors that are collectively significant)
- Other assumptions used with science-based target-setting methods

The SBTi reserves the right to withdraw or adjust the tool at any time for updates and/or amendments to its calculations or third-party data. Adjustments can include changes to the decarbonization pathways embedded in the tool, which need to reflect model improvements and changes in the remaining carbon budget available as the world strives to mitigate GHG emissions across all sectors in the economy. For further details please refer to the terms of use and disclaimer in the SBTi transport tool.

Furthermore, SBTi endeavours to update it's guidance and target setting methodologies in accordance with the latest data science and research. To this end, potential future updates to this guidance could include:

- A 1.5°C aligned pathway for the aviation sector
- More detailed research and guidelines on non-CO_2 factors
- Improvements of Sustainable Aviation Fuel (SAF) accounting methodologies and frameworks to meet SBTs

4. Mechanisms to realize targets

The SBTi helps companies understand how much and how quickly they need to reduce emissions within their value chain in order to be consistent with the goals of the Paris Agreement. To that end, the SBTi's primary focus is on target setting, rather than prescribing the technological roadmap required to meet the targets.

Nonetheless, this guidance outlines some common aviation decarbonization levers and discusses any SBTi specific considerations where relevant.

4.1 Improving efficiency of technology and operations[10]

Jet fuel use has a major impact on airline profitability, typically representing about one-quarter of direct operating costs. Improving fuel efficiency remains an important way for airlines to reduce emissions, particularly until low carbon fuels can be scaled up and become cost competitive with fossil jet.

Airlines have three main levers to improve fuel efficiency: (1) replacing older aircraft with newer, more fuel-efficient designs; (2) improving operations to carry more payload (passengers and freight) per flight and to fly more directly to destinations; and (3) finding optimal flight paths and avoiding congestion near airports.

Each new generation of aircraft burns 15% to 20% less fuel per passenger kilometer than the aircraft it replaces. Key technologies include more fuel-efficient engines, improved aerodynamics, lightweight materials such as advanced composites, plus advanced systems (e.g., all-electric aircraft) and integrated design. Historically, new aircraft fuel burn has fallen by 1.3% per year since the 1960s due to new technologies.

In addition to buying new aircraft, airlines can improve fuel efficiency by increasing flight payloads and flying more directly to destinations. Payload can be increased by better filling a given capacity (e.g., flying with fewer empty seats) or by expanding capacity (e.g., swapping out premium seating in favor of economy seats). Reducing "circuity" by avoiding unnecessary layovers and routing flights more directly can also reduce fuel burn. Operational improvements typically reduce the fuel intensity of airlines by an additional 0.5% per year.

The final, smallest component is to improve air traffic management to reduce air delay and near-airport congestion through technologies like GPS-based navigation. In 2008, the International Civil Aviation Organization (ICAO) estimated that systemwide fuel efficiency could be improved by 12% through improved air traffic management. Subsequent analysis has found that half (6%) of that potential has been achieved, and that another 3% is possible over the next 10 years.

[10] Based on ICCT research

Collectively, airlines typically reduce their GHG intensity by 1.5 to 2.0% per annum over the mid to long-term via these strategies. Accelerated action, likely supported by government regulation and incentives, can support about 2.5% per annum reductions over the long-term. Faster reductions -- as high as 8% over one year -- have been seen for smaller airlines pursuing aggressive fleet renewal strategies.

4.2 Using Sustainable Aviation Fuels

Sustainable Aviation Fuels (SAF) are considered to be a critical lever for decarbonizing aviation. As liquid fuels chemically similar to Kerosene, they can be used interchangeably in aircraft engines when blended with up to 50% with fossil jet fuel – indeed, >200K flights have already flown on a biofuel blend between 2008-2019.

There are four "generations" of SAF; 1.) Biofuels made from harvested crops, 2.) Biofuels made from non-food crops, waste feedstocks such as used cooking oil or agricultural residue, 3.) Algae, and 4.) Synthetic fuels (PtL) made from renewable energy, water and captured CO_2. Depending on the feedstock and technology pathway used, SAF has the potential to significantly reduce lifecycle GHG emissions - combustion of the fuel still releases carbon, but the feedstock itself may capture or sequester carbon, artificially or through biomass.

Airlines may choose to procure SAF in order to lower their Well-to-Wake CO_2e emissions and hence improve overall carbon intensity. To this end, SBTi has developed guidance for use of SAF specific to aviation science-based target setting.

4.2.1 Accounting for SAF use

SAF accounting follows the precedent for bioenergy use outlined in the SBTi Criteria and Recommendations document as well as the GHG Protocol guidance.

"C4 — Bioenergy accounting: Direct CO_2 *emissions from the combustion of biofuels and/or biomass feedstocks, as well as sequestered carbon associated with such types of bioenergy feedstock[11] , must be included alongside the company's inventory and must be included in the target boundary when setting a science-based target and when reporting progress against that target. If biogenic carbon emissions from biofuels and/or biomass feedstocks are accounted for as neutral, the company must provide justification of the underlying assumptions. Companies must report emissions from N20 and CH4 from bioenergy use under scope 1, 2, or 3, as required by the GHG Protocol, and must apply the same requirements on inventory inclusion and target boundary as for biogenic carbon"*

[11] Non-bioenergy related biogenic emissions must be reported alongside the inventory and included in the target boundary. GHG removals that are not associated with bioenergy feedstock are currently not accepted to count as progress towards SBTs or to net emissions in the inventory.

4.2.2 Measuring GHG benefits of SAF use

Guidance on measuring SAF use has been developed based on the implementation element for CORSIA eligible fuels of Annex 16, Volume IV of ICAO's Standards and Recommended Practices, and its supporting documents. The ICAO rules for CORSIA have been adapted to ensure consistency with SBTi principles:

Category	Consideration	SBTi Criteria
Measuring the impact	Emissions factors used	● SAF use should be measured based on either the default CORSIA lifecycle values or the actual core lifecycle value certified by ICAO approved verifier or RSB / ISCC in addition to the default induced land-use change (ILUC) value
	Inclusion of LUC	● SAF emissions factors should include positive and negative Land Use Change values, but, with a cap on total lifecycle reductions at 100% emissions vs the fossil jet baseline
	Additional carveouts	● Additional credits (e.g. MSW landfill or recycling credits) or low LUC designations cannot be claimed for use of SAF towards a science-based target
	Fossil baseline	● SBTi aligns with the CORSIA baseline of 89 gCO_2e/MJ for impact measurement - may be updated in the future
Criteria and restrictions	Reduction criteria	● SAF used to meet science-based targets must meet a 10% minimum reduction threshold ● Additionally, SBTi recommends fuels meeting a minimum reduction threshold of 50% (60% for new installations) such as those certified by RSB
	Sustainability criteria	● SBTi requires certification of SAF against the 3 required ICAO criteria and the 14 additional sustainability criteria currently under consideration e.g., Water, Soil, Air, Conservation, Waste and Chemicals, Human & Labor Rights, Land Use Rights, Water Use Rights, Local & Social dev. and Food Security
Accounting	Impact claims	● Reduction impact from SAF use can only be used on volumes of SAF consumed (excl. offtakes with future deliverables) in order to meet science-based targets
	Impact on inventory	● Aligned with GHGP and existing SBTi precedent – impact of combustion and removals associated with SAF to be accounted outside the scopes

Table 2: SBTi measurement criteria for use of SAF to meet SBTs

4.3 Responsible growth

The Sectoral Decarbonization Approach (SDA) supports company level target setting on an intensity basis. The level of intensity reductions required by the sector as a whole is calculated by dividing the aviation emissions budget from the SDS pathway with forecasted sector growth to 2050 (2.9% 2019-2050). However, if the sector were to grow faster than this rate, the level of intensity reduction implied by this pathway would no longer be sufficient to meet the budget.

To address this concern, when allocating intensity targets to individual companies, it is necessary to put in place safeguards that avoid over-allocation of the carbon budget if company growth exceeds that of the sector average. This is achieved through a market share parameter (M parameter), that is applied during target computation.

The M parameter reflects changes in market share. For example, if a company has 10% market share in the base year, and a 20% forecasted market share in the target year, the company is assumed to grow faster than the sector average. Resultantly, the M parameter is calculated using Equation 2:

$$M = \frac{Market\ share\ in\ base\ year}{Market\ share\ in\ target\ year}$$

Equation 2

In this example, the M parameter would be computed as 0.5. Company level intensity targets are corrected for this faster than average growth rate by multiplying the M parameter against the target itself, thus lowering the required intensity in the target year and compensating for the activity growth.

It is therefore recommended (but not required) that airlines consider their activity growth in RPK or RTK responsibly. For further details on the M parameter please see the SBTi SDA guidance

4.4. Applicability of Compensation and Neutralization

Corporate science-based reduction targets are just one component of a wide array of climate action that is required to meet the objectives of the Paris Agreement. The global energy and land system will likely require both rapid decarbonization (50% by 2030), as well as the use of carbon sequestration solutions in order to achieve a state where there is not net accumulation (or indeed net reduction) of CO_2 in the atmosphere.

Whilst both reductions in emissions and removals of GHG's are required immediately and in parallel, science-based reduction targets focus exclusively on the former - defining how much and how quickly a company needs to reduce emissions within its value chain. The role of corporate use of CO_2 removals is considered in SBTi Net Zero guidance, however, is not part of this pathway which focuses on emission reductions only.

We know how fast the global system needs to decarbonize, but the question of how much and how quickly a company must reduce in it's value chain is more complex. To answer this, SBTi uses data from Integrated Assessment Models (IAMs) such as the IEA ETP. The ETP, maps the global energy system, across all sectors and geographies, illustrating scenarios of decarbonization consistent with the goals of the Paris Agreement and based on a range of input assumptions e.g., a global carbon price and availability of mitigation levers. These assumptions are weighted together to determine the rate and volume of decarbonization required in each sector.

The output of the ETP represents an optimized decarbonization scenario, where each economic sector has been allocated a "fair share" of the decarbonization burden. Because this model already allocates reductions across sectors (to a degree based on economic efficiency), it is required that each sector's "fair share" of GHG reductions occur within the industry value chain.

The concept of in-value reductions is a core premise of science-based reduction targets and is a logical conclusion from the scientific under-pinnings of the methodologies. As a result, the use of carbon credits that either reduce carbon outside of the value chain or remove carbon from the atmosphere cannot be considered equivalent to in-value chain reductions, and hence are not suitable levers to meet science-based reduction targets.

Whilst science-based reduction targets must be achieved without the use of credits, recent guidance on science-based Net Zero targets outlines an important role for neutralization credits (tradeable GHG removals) and compensation credits (tradeable GHG reductions or avoided emissions from outside of a company's value chain e.g., avoided deforestation) in attainment of Corporate Net Zero.

5. Setting targets for users of aviation services

Scope 3 emissions from use of aviation services can fall into two primary categories: scope 3 category 4, upstream transportation and distribution of goods (e.g., contracted freight) and scope 3 category 6, business travel aviation emissions.

As per SBTi guidance, organizations with >40% of their total footprint in scope 3 are required to set SBTs against at least two-thirds of their scope 3 emissions. To that end, it is possible to set science-based targets against these two aviation related scope 3 categories by utilizing the aviation pathway. The target setting tool and guidance below provide specific instructions and interfaces for target setting in these categories.

5.1 Scope 3 category 6 target setting method

The science-based target setting method for business travel aviation emissions builds on the SBTi aviation pathway. Due to the differentiated growth rates of a given firm's business travel relative to the rest of the aviation sector[12], as well as logical inconsistencies in the target setting method[13], the Sectoral Decarbonization Approach (based on the principle of intensity convergence) was not considered appropriate for business travel target setting.

As an alternative to use of the Sectoral Decarbonization Approach, multiple options were considered, including other intensity convergence models, intensity contraction and sectoral absolute contraction. After analysis[14] of these options, *Sectoral Absolute Contraction* was considered the most credible and robust approach for business travel target setting. This approach builds upon the Absolute Contraction methodology as outlined in the SBTi paper, Foundations of Science-based Target Setting as well as the precedent set in the ICT sector for industry specific absolute contraction rates.

Sectoral Absolute Contraction targets may be generated through a dedicated interface in the SBT aviation tool. The interface requires scope 3 category 6 target setters to disclose absolute emissions from business related air travel in a defined base year (the most recent year with a complete GHG inventory[15]) and select a target year 5-15 years from the current date. A scope 3 category 6 aviation target will be calculated based on an annual linear reduction rate equivalent to the absolute emissions reductions required by the sector as a whole between 2019 and 2050.

Due to the cost and challenges for aviation decarbonization, the rate of reduction required by the aviation sector (and hence for business travelers) is less than the global averages required from the full energy system. The required rates of reduction (and their alignment to a given temperature scenario) can be summarized in the following table:

[12] Aviation sector growth rates used in the SDS include both leisure and corporate travel demand
[13] The SDA methodology assumes a closed market system whereby each actor represents a mutually exclusive and collectively exhaustive share of the total market. Addition of a customer of a service does not support this assumption and hence is deemed a logical inconsistency for use of the existing SDA pathway to support Business Travel target setting
[14] Methodology selection was based on the principles of Plausibility and Responsibility as outlined in the Foundations of Science-Based Target Setting
[15] Since 2015 and excluding 2020/2021 (due to COVID impact)

Applicability	**Scenario Alignment**	**Annual Linear Reduction Rate**
Aviation Sector Only	*Well-below 2°C (1.75°C, 50% probability)*	*0.4% Linear Reduction*
Global Energy System	*Below 2°C (2°C, 50% probability)*	*1.23% Linear Reduction*
Global Energy System	*Well-below 2°C (1.75°C, 50% probability)*	*2.5% Linear Reduction*
Global Energy System	*1.5°C (1.5°C, 50% probability)*	*4.2% Linear Reduction*

Table 3: Comparison of SBTi linear reduction rates used in the Absolute Contraction methodology

While Sectoral Absolute Contraction targets are calculated based on an absolute emissions footprint, the SBTi requires that scope 3 category 6 aviation business travel targets are communicated as an intensity metric: gCO_2e/full-time employee (FTE). The use of standardized intensity metric is a sector specific criteria of scope 3 category 6 aviation business travel targets which allows for efficient comparison and interpretation of targets across firms.

Target formulations must indicate the emissions covered, the base year and target year selected, the percentage reduction and the units. As per the sector specific criteria for scope 3 category 6 emissions, targets should be expressed on an intensity basis in terms of gCO_2e/FTE.

> Example target language:
> *"Company A commits to reduce scope 3 GHG emissions from business travel 75% per FTE by 2035 from a 2019 base year.[16]"*

5.2 Methods to realize scope 3 category 6 targets

For some organizations, such as financial or professional services firms, business travel represents one the largest and most significant categories of emissions. Business travel aviation emissions can be addressed through a combination of levers, including, but not limited to:

- Reducing the need to travel e.g., substituting travel by using video conferencing
- Modality shift for necessary travel e.g., from aviation to high speed rail
- Supplier selection e.g., flying only with more efficient airlines
- Seating selection e.g., flying in coach class rather than premium seating
- Route selection e.g., flying only for less GHG intensive medium-long haul travel
- Use of alternative fuels e.g., direct procurement of biofuels (see guidance section 4.2)

For measuring and reporting GHG emissions related to air travel, companies can use default emission factors (e.g. from DEFRA emissions factors, EPA emissions factors, the ICAO Emissions Calculator, etc.) or engage with airlines to utilize specific emission factors to give a more accurate measurement of GHG emissions.

[16] Non-CO2 factors, which may also contribute to aviation-induced warming, are not included in this target

5.3 Deep dive: Sustainable Aviation Fuel (SAF) use to meet scope 3 targets

To build on the guidance in SBTi Criterion C4 (see section 4.2.2), use of SAF by consumers of aviation services to achieve science-based targets must follow procurement practices consistent with the Greenhouse Gas Protocol accounting framework. Specifically, SAF use to address scope 3 targets requires consumers of aviation services to:

- Obtain proof of fuel consumption / combustion
- Demonstrate environmental benefits associated with the SAF used (e.g., the SAF lifecycle values and sustainability certification)
- Prove clear chain of custody for the SAF consumption down, rather than across the value chain (i.e., a business traveler could only purchase SAF from an upstream supplier such as an airline or a fuel producer)
- Include full accounting of Well-to-Wake emissions from all fuel consumption (SAF + fossil fuel) in a firm's scope 3 inventory

There are two main mechanisms for SAF procurement considered in this guidance; direct purchase from a fuel producer, or indirectly via an airline. In both cases, proof of consumption and certificates of environmental benefits are required.

Accounting for the benefits of SAF consumption should be calculated by using the fuel-based method outlined in the GHGP scope 3 category 6 guidance, alongside ICAO guidance on lifecycle emissions factors for feedstock types as outlined in guidance in section 4.2.2. The delta between SAF WTW emissions and a fossil baseline may then be subtracted from emissions in scope 3 category 6 inventory calculated through use of the fuel, distance or spend based methods[17].

The use of tradeable SAF credits, carbon credits/offsets, or other SAF investment vehicles cannot at this time be counted towards a science-based target due to potential inconsistencies with GHG protocol guidance[18]

[17] The Distance based method combined with the fuel based approach risks double claiming the environmental benefits of SAF in a situation where distance based emissions factors incorporate reductions realised from SAF use. However, this is considered immaterial in the current market due to the available volume of SAF

[18] Subject to change based on updated GHGP guidance and/or future definitions of SAF procurement frameworks

Glossary

Carbon dioxide emission budget (or carbon budget)
For a given temperature rise limit, for example a 2°C long-term limit, the corresponding carbon budget reflects the total amount of carbon emissions that can be emitted for temperatures to stay below that limit. Stated differently, a carbon budget is the area under a carbon dioxide (CO_2) emission trajectory that satisfies assumptions about limits on cumulative emissions estimated to avoid a certain level of global mean surface temperature rise.

Carbon dioxide equivalent (CO_2e):
A way to place emissions of various radiative forcing agents on a common footing by accounting for their effect on climate. It describes, for a given mixture and amount of greenhouse gases, the amount of CO_2 that would have the same global warming ability, when measured over a specified time period.

Sectoral Decarbonization Approach (SDA):
The SDA is differentiated from other existing science-based target methods by virtue of its subsector-level approach and global least-cost mitigation perspective, in line with the carbon budget related to a given temperature goal. Currently, the SDA tool uses the sector decarbonization trajectories of the International Energy Agency (IEA).

Convergence approach used in the Sectoral Decarbonization Approach (SDA):
The convergence approach for homogeneous sectors in the SDA is based on the assumption that the GHG intensity of a company convergences towards the GHG intensity of the sector at a rate that ensures not exceeding the sectoral carbon budget. The rate of convergence of a company is a function of the initial GHG intensity of the company, the GHG intensity of the sector, and the growth of the company relative to the growth of the sector.

Tank-to-Wake emissions (TTW): Tank-to-Wake emissions cover all the energy used once transformed, this is emissions occurring during the combustion of the fuels by vehicles.

Well-to-Tank emissions (WTT):
Well-to-Tank emissions are based on attributional life-cycle assessment studies of fossil-derived fuels (e.g. gasoline, diesel, compressed and liquefied natural gas), biofuels and electricity (based on time and scenario-specific estimated average grid GHG intensity). Energy use and emissions resulting from pipeline transport are accounted for under “Energy industry own use” in the International Energy Agency own modeling.

Well-to-Wake emissions (WTW):
Together, TTW and WTT make up WTW GHG emissions. This does not include emissions from vehicle or battery manufacturing, or those offset by material recycling, among others.

Revenue Passenger Kilometer (RPK):
A RPK, is the unit of measurement representing the transport of one paid passenger by air over one kilometer.

Revenue Tonne Kilometer (RTK):
A RTK, is a unit of measure of freight transport which represents the transport of one tonne of goods (including packaging and tare weights of intermodal transport units) by air over a distance of one kilometer.

Scope 1 emissions:
Emissions derived from the combustion of fossil fuels in the vehicle; generally derived from invoices (e.g. liters of gasoline purchased).

Scope 2 emissions:
Emissions derived from the combustion of fossil fuels to produce electricity that is consumed in the companies' vehicles. The GHG Protocol Scope 2 Protocol allow companies to report these emissions in two ways.

Scope 3 Category 3 "Fuel and energy related activities":
This category includes emissions related to the production of fuels and energy purchased and consumed by the reporting company in the reporting year that are not included in scope 1 or scope 2. This category includes emissions from four distinct activities: 1) upstream emissions from purchased fuels (extraction, production, and transportation of fuels consumed by the reporting company); 2) Upstream emissions of purchased electricity (extraction, production, and transportation of fuels consumed in the generation of electricity, steam, heating, and cooling that is consumed by the reporting company); 3) T&D losses (generation of electricity, steam, heating, and cooling that is consumed (i.e., lost) in a T&D system – reported by end user); and, 4) Generation of purchased electricity that is sold to end users (generation of electricity, steam, heating, and cooling that is purchased by the reporting company and sold to end users – reported by utility company or energy retailer).

Scope 3 Category 6 "Business travel":
This category includes emissions from the transportation of employees for business-related activities in vehicles owned or operated by third parties, such as aircraft, trains, buses, and passenger cars.

Scope 3 Category 4 "Upstream transportation and distribution":
This category includes emissions from the transportation and distribution of products (excluding fuel and energy products) purchased or acquired by the reporting company in the reporting year in vehicles and facilities not owned or operated by the reporting company, as well as other transportation and distribution services purchased by the reporting company in the reporting year (including both inbound and outbound logistics).

Scope 3 Category 9 "Downstream transportation and distribution":
This category includes emissions from transportation and distribution of products sold by the reporting company in the reporting year between the reporting company's operations and the end consumer (if not paid for by the reporting company), in vehicles and facilities not owned or controlled by the reporting company. Bioenergy: Energy derived from any form of biomass such as recently living organisms or their metabolic by-products