REPORT ON THE AIR FRANCE-KLM GROUP'S GREENHOUSE GAS REDUCTION COMMITMENTS AND TRAJECTORY WITHIN THE FRAMEWORK OF THE NATIONAL LOW CARBON STRATEGY (SNBC)

AIRFRANCE KLM GROUP

I. INTRODUCTION

The Air France-KLM Group is publishing this report on the commitment and the strategy for reducing greenhouse gas emissions for the scope of mainland France and the overseas territories pursuant to the provisions of Article 66 of Act No. 2020-935 of July 30, 2020 and the decree-law of November 2, 2021.

This report contains a trajectory for reducing greenhouse gas emissions for the scope of the National Low Carbon Strategy (Stratégie Nationale Bas Carbone - SNBC) that has been updated, relative to the report published in the Air France-KLM Group's 2022 Universal Registration Document, to take into account the July 2023 revision of the projections for the activities, fleet and the incorporation of Sustainable Aviation Fuels (SAF).

Note that the SNBC scope under consideration represents 7.8% of the Air France-KLM Group's CO_2 emissions. Consequently, this update has no material impact on the Air France-KLM Group's trajectory.

The environmental transition of the air transportation industry is a priority in terms of tackling the reality of climate change.

- It is an immense challenge for our sector which plays a key societal role: air transportation brings together men and women, cultures and economies. It contributes to developing tolerance and understanding of others through travel. It connects the territories and contributes to the development of numerous economies. According to a report from the EM Strasbourg Management School, published in early 2020 and based on 2019 figures (prior to the Covid-19 period), Air France-KLM contributes €39 billion annually to the French economy (1.6% of GDP, and 475,000 direct, indirect and induced jobs). During the Covid crisis, the Group demonstrated to the full its strategic dimension, with repatriation operations and the transportation of masks, vaccines, and medical personnel.
- If it is to continue to play this role, the sector must succeed in decarbonizing: this is a necessity in the fact of the climate emergency; it is also a strong expectation of our customers and crews, and a requirement of society as a whole, which engages the whole of our industry. Throughout its history, the sector has managed to keep pace with technological and operational transitions towards safer, more affordable air transportation thanks, in particular, to aircraft and engines that are more energy-efficient, quieter and less-polluting. A new revolution is now under way, that of decarbonization. All of the sector's abilities are mobilized around a successful transition to more sustainable, more responsible aviation. This decarbonization constitutes a major challenge which is central to the strategy of Air France and the Air France-KLM Group, which intends to be a pioneer in this area.

II. THE NATIONAL LOW CARBON STRATEGY (*STRATÉGIE NATIONALE BAS-CARBONE* – SNBC): REMINDER OF THE OVERALL PRINCIPLES

National Low Carbon Strategy (SNBC)

The National Low Carbon Strategy (*Stratégie Nationale Bas-Carbone* – SNBC) serves as France's policy-making road map in terms of climate change mitigation. It provides guidelines to enable the transition to a low carbon economy in all sectors of activity. **It sets greenhouse gas emission reduction targets for France in the short/medium-term in the form of carbon budgets**, i.e., emission ceilings not to be exceeded per period of five years.

The carbon budgets account for the emissions recorded in mainland France, Guadeloupe, French Guiana, Martinique, Réunion, Saint Martin and Mayotte, as well as emissions from transportation between these geographical areas. Emissions from international air and maritime links are not included in these readings.

The AMS scenario for air transportation

The National Low Carbon Strategy is based on a **baseline scenario** developed through a modelling exercise also used in the Multi-Year Energy Programming. This scenario, called **"With Additional Measures" *(Avec Mesures Supplémentaires – AMS*),** details all the public policy measures, in addition to those already in place, which will allow France to adhere to its short, medium, and long-term climate and energy objectives. **It outlines a possible trajectory for reducing greenhouse gas emissions until carbon neutrality is achieved by 2050, which is used as the basis for defining the carbon budgets.**

The air transportation AMS scenario is based on a number of hypotheses relating to traffic growth, the improved energy efficiency of air transportation and the incorporation of sustainable aviation fuels. The latest version of the air transportation WAM, taking into account the most recent data available on the French Ecological Transition Ministry website, provides the following figures and revisions relative to 2015:

AMS scenario *($MtCO_2$)*	**2015**	**2025**	**2030**	**2050**
National air transportation	4.6	4.7	4.6	1.9
Change	0%	2%	0%	-59%

https://www.ecologie.gouv.fr/sites/default/files/Guide%20art.%2066%20LFR3.pdf

As indicated in this guide, **the rates of change in emissions projected between 2015 and the target year in the AMS** scenario are used as a reference for defining company trajectories, and are therefore used to check the compatibility of these companies' emission reduction targets with the National Low Carbon Strategy.

The AMS emissions projections for aviation are based, amongst other things, on the following assumptions for the incorporation of sustainable aviation fuels.

INCORPORATION RATE OF BIOFUELS

AMS scenario *($MtCO_2$)*	**2015**	**2020**	**2025**	**2030**	**2050**
Incorporation rate in aviation fuels	0.0%	0.5%	2.4%	4.3%	50.0%

III. CONSISTENCY OF THE AIR FRANCE-KLM GROUP'S CO_2 EMISSIONS ROAD MAP WITH THE SNBC TARGETS

Main hypotheses retained

In the definition of the Air France-KLM Group's CO_2 emissions trajectory for the SNBC scope, a number of hypotheses have been retained. Some of these assumptions are implicit in the Air France-KLM Group's overall decarbonization road map at global level while others are specific to the construction of this SNBC trajectory.

Note that, across the SNBC scope, **the Air France-KLM Group had already reduced its greenhouse gas emissions by 5% in absolute terms between 2015 and 2019)** (2.26 MInT of CO_2 in 2015 and 2.16 MInT in 2019).

Hypotheses common to the overall road map and the SNBC scope

- **Emissions factor relating to the combustion of kerosene:** for 1 ton of kerosene burned, 3.16 tons of CO_2 are emitted. This emission factor is in line with the ICAO's CORSIA system and slightly higher than the factor of 3.15 used within the framework of the EU-ETS system.
- **Percentage incorporation of SAF** (Sustainable Aviation Fuel) as a proportion of the total volume of fuel.
  - 2025: target of 2% SAF incorporation on the SNBC scope.
  - By 2030: the Air France-KLM Group is targeting the incorporation of at least 10% SAF at global level, higher than the French and European regulatory requirement.
  - At the time of writing of this document, there is no difference in the SAF incorporation assumptions in the specific SNBC trajectory below and those in the Air France-KLM Group's overall decarbonization road map.
- **Gains obtained thanks to air operations optimization**: the assumption is a gain of 5% by 2050 relative to 2019. This hypothesis is deliberately relatively conservative since it depends on exogeneous factors (e.g., the implementation of the Single European Sky project).

Hypotheses specific to the SNBC scope

- **The schedule of activity** expressed in Available Seat-Kilometers (ASK[1]), defined with the following granularity, corresponding to the Air France-KLM Group's SNBC activity scope:
  - Air France (AF) – Long Haul: French Overseas Territories: flights between Paris and Cayenne/ Réunion/Pointe-à-Pitre/Fort-de-France; and flights between the French overseas territories;
  - Air France - Hub: flights in mainland France feeding the Paris-CDG Hub;
  - Air France – Point-to-Point : Domestic France flights from/to Paris-Orly and Transversal flights;
  - Transavia France - Domestic: Domestic activity of Transavia France.

  This schedule is supported by activity projections per air line through to the end of 2028 as of the writing of this document, then beyond, by a projection of activity at a normative level established by the Air France-KLM Group's Strategy Division.
- **Aircraft load factor data**, specified based on the above-mentioned business segments. The current hypothesis retained for this trajectory is a return, in 2024, to the aircraft load factors seen in 2019, on the SNBC scope.
- **The fleet plan** expressed as the number of aircraft by aircraft type and by year based on the above-mentioned business segments. Several elements key to the specific SNBC fleet plan:
  - Air France - Long-Haul: taking into account the fact that the Long-Haul destinations on the SNBC scope are currently mainly served by Boeing 777-300ER aircraft, in a densified configuration. On the current forecasts, this will be the case until at least 2028;
  - Air France - Hub and Point-to-Point activity: since 2021, the Airbus A320 family fleet has been progressively replaced by new-generation Airbus A220s. These aircraft enable around a 20% reduction in CO_2 emissions and fuel consumption relative to the previous generation of aircraft;
  - Transavia - Domestic: Transavia France has historically operated Boeing B737-800 aircraft. The fleet mix retained within the framework of the SNBC for Transavia includes the introduction of the new-generation Airbus A320Neo as of 2024. These aircraft enable around a 15% reduction in CO_2 emissions and fuel consumption relative to the previous-generation aircraft.

Reasoning used for the road map and the organizational scope covered

The construction of Air France-KLM's SNBC trajectory does not correspond to a share of the Air France-KLM Group's overall emissions road map, but rather to a dedicated construction for the scope of activity in mainland France and the French overseas territories.

The model for the trajectory is based on:

- activity: expressed in ASKs (Available Seat-Kilometers), consistent with the Fleet Plan;
- the level of consumption in gFuel/ASK of the aircraft constituting the fleet, supported by the "realized" data on the aircraft currently in the Fleet and the assumptions of the manufacturers and of the Air France Fleet division for the aircraft not currently operated.

[1] *The ASK indicator measures the capacity on an air line or group of air lines. This measure is equal to the number of available seats multipled by the number of kilometers flown.*

Type of emissions

Scopes 1, 2, 3

The bulk of Air France-KLM's greenhouse gas (GHG) emissions is generated by its direct activities (Scope 1) and mainly by the air operations which represent 99.8% of the Group's total direct emissions. The ground operations (engine test benches, runway vehicles, etc.) represent 0.2% of the direct emissions. Tertiary activities also generate greenhouse gas emissions through energy consumption in buildings (electricity and air conditioning) (Scope 2).

The indirect greenhouse gas emissions (Scope 3) mostly come from the upstream phase (extraction, production, distribution, etc.) of aviation kerosene production. A first evaluation based on the 2019 expenditure and figures showed that around two-thirds of the Air France-KLM Group's Scope 3 emissions are linked to the emissions generated during the upstream phase of kerosene production. The other main components of indirect emissions are the purchasing of goods and services, aircraft manufacturing, business travel and employee commuting.

The Air France-KLM Group's CO_2 emissions trajectory below is **based on Scope 1 CO_2 emissions,** i.e. taking account only of emissions linked to fuel combustion, **so as to remain consistent with the specific targets assigned to air transportation in the SNBC, and the accounting of aviation sector emissions by CITEPA** (Interprofessional Technical Centre for Studies on Air Pollution) (see OMINEA_2023.pdf (citepa.org)). Additional emissions associated with the extraction, refining and transportation of fuels are not considered here. These additional emissions are however well accounted for in other sectors by the SNBC. For information purposes, the emissions linked to the manufacturing and transportation of fuel can be calculated by applying a factor of x0.2545 to the emissions linked to the combustion of kerosene. This multiplier factor comes from the recommendations of the Science Based Targets initiative in its document on the airline sector.

The Climate Action Plan section figuring in this document includes the Air France-KLM Group's commitments and actions on the remainder of the Scope 3 scope.

Greenhouse gas emissions and the focus on CO_2 emissions

The trajectory outlined below is based only on CO_2 emissions, consistent with the WAM scenario for aviation.

The other greenhouse gas emissions (e.g. N2O, CH4) that are generally presented in the form of CO_2 équivalent (CO_2e) are marginal relative to the CO_2 emissions from aircraft, with a contribution of around 1%, as shown in the CITEPA data (https://www.citepa.org/fr/secten/) for air transportation in 2023 :

	Air transportation industry		
	2021	% of the total	% 2021/90
NOX (Gg)	6.0	0.79	(8.9)
COVNM (Gg)	0.62	0.05	(72)
CO (Gg)	7.3	0.27	(45)
HFC (Gg CO_2e)	0.11	0.0	–
CO_2 (Tg)	3.80	1.2	(8.8)
CO_2e (Tg CO_2e)	3.80	0.92	(8.8)
As (Mg)	–	–	–
Cd (Mg)	–	–	–
Cr (Mg)	–	–	–
Cu (Mg)	–	–	–
Hg (Mg)	–	–	–
Ni (Mg)	–	–	–
Pb (Mg)	2.8	3.3	(48)
Se (Mg)	–	–	0
Zn (Mg)	–	–	0
PM10 (Gg)	0.11	0.04	(34)
PM2,5 (Gg)	0.08	0.04	(41)
PM1,0 (Gg)	0.03	0.02	(61)
BC (Gg)	0.02	0.06	(54)
HAP (Mg) (*)	–	–	–
PCDD-F (g-ITEQ)	–	–	–

Thus, for 2022, for the Air France-KLM Group, here are the volumes of GHG emissions at global level to appreciate the proportions between the various GHGs:

	Air France-KLM Group's emissions in 2022	
	kTons	*%*
CO_2	22,487.10	99.960%
NO_X (< 3,000 ft)	8.30	0.037%
SO_2 (< 3,000 ft)	0.60	0.003%

Source : https://www.airfranceklm.com/sites/default/files/2023-04/AFK_DEU_2022_VF_24-04-23.pdf

Non-CO_2 effects

Furthermore, although CO_2 remains the most commonly cited and best-understood aviation pollutant, its contribution to global Effective Radiative Forcing (ERF), i.e. warming, is estimated in the current state of research at around one third of the industry's total impact (analysis by Lee et al, for the 2000-2018 period: The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018 - ScienceDirect). Two-thirds of aviation's climate impact is estimated to be caused by other pollutants emitted from jet engines that cause further warming beyond the impact of carbon alone. For example, particulate matter has been linked to the formation of condensation trails (the cloud-like stripes that form behind an aircraft) whose warming effect is potent but short-lived, lasting from a few minutes to a day. NOx emissions from aircraft engines at altitude contribute to the formation of ozone and the destruction of methane (both greenhouse gases) such that the overall effect is estimated to be warming although this is dependent on background surface air pollution levels. For the past thirty years, these non-CO_2 effects on the climate have been the subject of scientific research at international level. Quantifying the impact of these phenomena on the climate, which requires the use of complex multi-dimensional models, is still fraught with considerable uncertainty.

The trajectory below does not therefore take these non-CO_2 effects into account, in the same way as the Science Based Targets for aviation. Nevertheless, Air France-KLM is fully aware of these effects and factors them into its thinking, strategies and research work, as detailed in the Climate Action Plan section at the end of this document.

Baseline

In view of the impact of the Covid-19 crisis on the aviation industry, the baseline commonly used for the decarbonization trajectory is 2019.

In this document we also provide some figures based on 2015, in line with the reference year of the WAM scenario.

Air France-KLM's emission reduction targets over the short, medium and long term

The Air France-KLM Group is accelerating its environmental transition and has set itself a target of reducing its Greenhouse Gas emissions (GHG) intensity by 30% by 2030 relative to the 2019 baseline (g CO2eq/RTK [Revenue Ton-Kilometers]). This target was validated by the Science Based Targets initiative (SBTi) in November 2022 for the Air France-KLM Group, as well as for Air France and KLM.

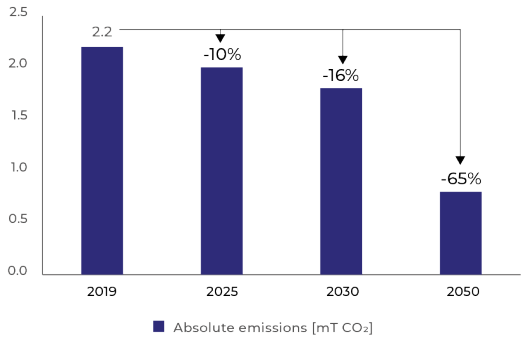
On the SNBC scope, i.e. national air transportation, the Air France-KLM Group has set itself the following short, medium and long-term targets for reducing CO_2 emissions in absolute terms (excluding offsetting):

- **in the short term (2025), a -10% reduction relative to 2019;**
- **in the medium term (2030), a -16% reduction relative to 2019;**
- **in the long term (2050), a -65% reduction relative to 2019.**

To define these targets, the Air France-KLM Group carried out a CO_2 emissions forecasting exercise, factoring in the expected effects of the various measures that will contribute to their reduction: fleet renewal, incorporation of sustainable aviation fuel, improved operational efficiency linked to the optimization of air traffic control and flight management.

Note that these short and medium-term targets are based on the current forecasts for Air France-KLM's traffic growth, the Group's ambitions in terms of sustainable aviation fuel and the current state of its market positions.

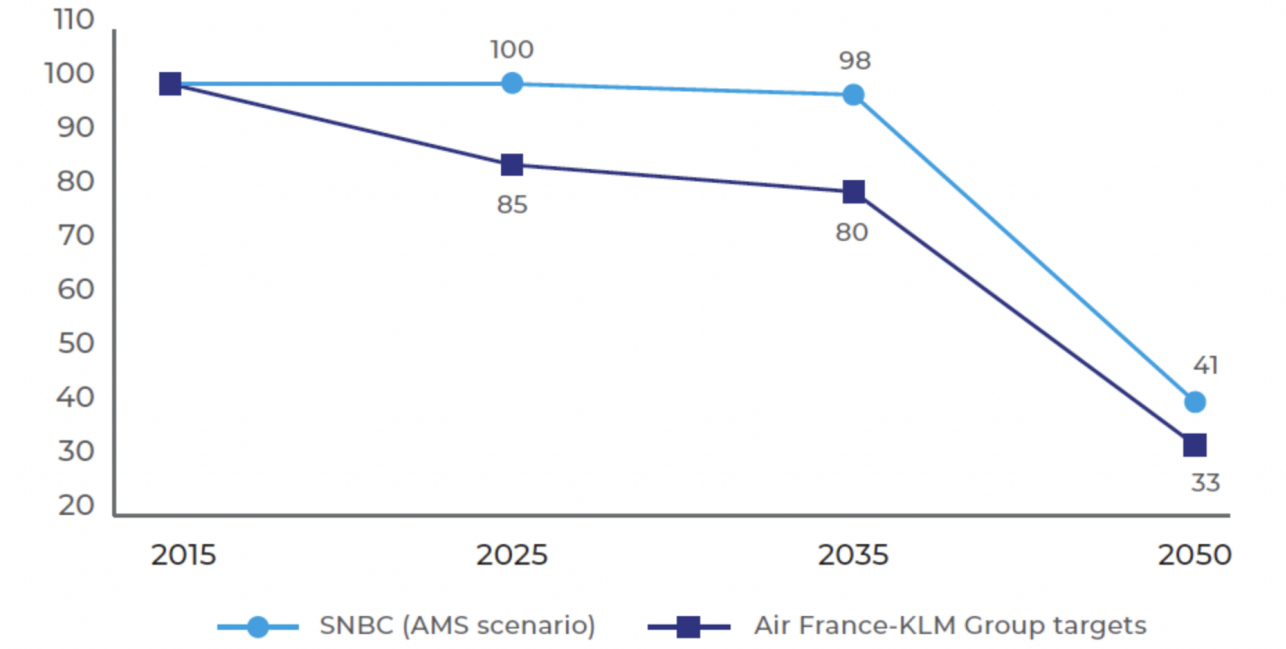
Furthermore, the long-term trend in the Air France-KLM Group's emissions (2050) is based on assumptions that are by their very nature uncertain concerning, in particular, the availability of sustainable aviation fuel (SAF) at competitive prices, technological advances in the development of aircraft emitting fewer greenhouse gases, or the implementation of measures to optimize air traffic control. France's strategy for building a national SAF production chain will thus be a key condition for the successful decarbonization of the Air France-KLM Group and of the French aviation industry as a whole – as detailed in the decarbonization road map for the French aviation industry: Proposition de feuille de route décarbonation transportation aérien.pdf (ecologie.gouv.fr).



EMISSION TRAJECTORY FOR THE AIR FRANCE-KLM GROUP ON THE SNBC SCOPE
(IN ABSOLUTE VALUE AND RELATIVE TO THE 2019 BASELINE)

Air France-KLM Group targets	2019	2025	2030	2050
Absolute emissions *(mT CO_2)*	2.2	2.0	1.8	0.8
Relative emissions *(base 100 | 2019)*	100	90	84	35

Below is the translation of this trajectory based on the basis of a **2015 reference year,** consistent with the reference year for the airline industry in the WAM scenario – confirming the compatibility and performance of Air France-KLM objectives, which to beyond the sectoral targets:



AIR FRANCE-KLM GROUP EMISSIONS TRAJECTORY RELATIVE TO THE WAM SCENARIO
(BASE 100 RELATIVE TO THE 2015 REFERENCE YEAR)

Emissions in absolute value *(mT CO_2)*	**2015**	**2025**	**2030**	**2050**
SNBC (WAM scenario)	4.6	4.7	4.6	1.9
Air France-KLM Group targets	2.3	2.0	1.8	0.8

The forecast rates of activity that underlie the Air France-KLM Group's emission reduction trajectory are in line with the forecasts for the French air transportation sector road map for which the link appears above, on the aggregate national air transportation scope: namely a modest average annual growth rate of 0.8% for the 2019-50 period.

The assumptions for energy prices are detailed in the second part of this document, in the section dedicated to Sustainable Aviation Fuels (SAF).

The Air France-KLM Group's commitments concerning international traffic

While domestic air transportation is included in national accounting for CO_2 emissions, and is governed by the SNBC targets, international air transportation is subject to the ICAO (International Civil Aviation Organization) legal framework, with which Air France-KLM complies.

The ICAO has also put in place the CORSIA program, adopted by most countries, including France. This program consists of offsetting, through certified CO_2 reduction projects, any excess – compared with the benchmark of 85% of 2019 emissions – of greenhouse gas emissions produced by commercial flights. All of the Air France-KLM Group airlines participate in this international program.

Furthermore, the Air France-KLM Group's target of a 30% reduction in emissions per Revenue Ton-Kilometer by 2030 relative to 2019 has been validated by the Science Based Targets initiative.

The SBTi (Science Based Target initiative) specifies and validates the compatibility of a company's CO_2 emission targets with the climate objectives in the most rigorous way possible. In this case, with the validation of this target, the Air France-KLM Group is committing itself to a decarbonization trajectory in line with a "well-below 2degrees" climate target according to the Science Based Targets initiative.

https://www.airfranceklm.com/fr/newsroom/les-objectifs-de-reduction-des-emissions-de-co2-dair-france-klm-pour-2030-ont-ete

Comparison of Air France-KLM's CO_2 intensity with that of the sector

There is currently no benchmark against which airlines can compare themselves. However, the independent Science Based Targets initiative has provided airlines with a tool enabling them precisely to assess the CO_2 intensity of their operations and compare them with the sector as a whole, taking into account the types of market in which they operate (short-haul/long-haul and cargo).

According to this tool (available here: https://sciencebasedtargets.org/resources/files/SBTi_Aviation_Tool_v1.1_locked.xlsx), the **CO_2 intensity of the Air France-KLM Group in 2019, expressed in g CO_2e/RTK, was 948** compared with a theoretical intensity of **975** for the industry as a whole (based on the same proportions of short-haul/long-haul and cargo activity). According to the SBTi benchmark, the Air France-KLM Group's intensity is thus lower that of the sector as a whole (on a comparable scope of activity). Note that, within the framework of the SBTi benchmark, these CO_2 intensities are calculated on the basis of scope 1+3 fuel emissions, known as Well-to-Wake.

IV. AIR FRANCE-KLM'S CLIMATE ACTION PLAN TO ACHIEVE ITS DECARBONIZATION TARGETS

Greenhouse gas emission reduction strategy

To achieve its objectives and reduce its carbon footprint, the Air France-KLM Group is activating all the levers at its disposal and accelerating its decarbonization road map. This road map includes the following key priority areas for which targets have been identified and action plans deployed.

Fleet modernization

The renewal of the fleet with more fuel-efficient aircraft and thus emitting fewer greenhouse gas emissions is the first lever in the Group's decarbonization trajectory in the short term. The Group is continuously investing in renewing its fleet with the latest-technology aircraft. This renewal of the fleet is reflected in the gradual replacement of the existing aircraft with Airbus A350s (on long-haul flights, enabling a 25% reduction in CO_2 emissions and a 40% reduction in the noise footprint), the Airbus A320neo (for Transavia France, enabling a 15% reduction in CO_2 emissions and a 50% reduction in the noise footprint) and Airbus A220s (for Air France's short and medium-haul flights, enabling a 20% reduction in CO_2 emissions and a 34% reduction in the noise footprint), while gradually accelerating the retirement of the oldest aircraft.

By 2028, 64% of the Air France-KLM Group's fleet should be composed of next-generation aircraft at global level, compared to 7% in 2019.

Operational measures enabling up to a 5% fuel saving

Reducing the weight on board

The lighter the aircraft, the less fuel it consumes. All the divisions of Air France-KLM are thus working to reduce the weight carried on board. This includes, for example, reducing the weight of seats, galley and service equipment, products such as paper documentation for cargo and flight decks, magazines and the loading of drinking water. The weight of the equipment required to transport the payload in the hold is also taken into account. The wooden beams used to support the cargo are replaced by a lightweight cardboard version and lightweight cargo containers are also prioritized.

Optimizing aircraft performance

As part of its fleet renewal program, Air France-KLM is also renewing its engine portfolio aimed at a significant improvement in energy efficiency. This includes the LEAP for the A320neo and the P&W 1500 for the A220.

A dedicated engine wash process enables engines to be washed at the gate instead of in the hangar. This makes it easier to plan a wash in the maintenance program. The number of annual engine washes has increased, resulting in better performance and a reduction in the amount of fuel burned.

Air France-KLM works with the different paint suppliers to reduce the amount and weight of paint and coatings. The paint is smoother and less dirt adheres to the hull which improves the streamline. All of these improvements ensure that the aircraft are faster, cleaner and more efficient compared to the former practices.

The use of winglets positioned at the tip of aircraft wings helps to improve efficiency and thus reduce fuel consumption.

Optimizing routes and flight paths

Improvements in energy efficiency can be achieved through the optimization of routes, flight paths and altitudes, and a reduction in aircraft waiting times:

- Air France-KLM is proactively involved in the SESAR (Single European Sky ATM Research) program, which contributes to the targets of the Single European Sky (SES) for the better management of air traffic. SESAR aims to contribute to the SES's 10% CO_2 reduction target by optimizing routes and thus reducing fuel burn;

- whenever possible, pilots apply the most-fuel-efficient procedures: Flight Plan precision, speed adjustments and optimized trajectories, and, on the ground, taxiing using just one engine. New efficient tools based on artificial intelligence are being implemented, in partnership with innovative start-ups. For example, Transavia and Air France have joined forces with OpenAirlines, a French start-up which has been awarded the Solar Impulse Efficient Solution label. Its SkyBreathe tool enables the highly-precise tracking of the application of fuel-efficiency practices for each flight. Transavia and Air France have also deployed a tool proposed by Safety Line: Optidirect. The application proposes direct alternative routes in flight to reduce fuel consumption. With Optiflight (composed of Opticlimb, Optispeed and Opdirect) Transavia France and Air France thus benefit from efficient tools to reduce their inflight CO_2 emissions;
- the Group's airlines work closely with French and Air Traffic Control to make their descents and take-offs more efficient.

All possible avenues of fuel-savings measures are identified and steered within the framework of a program known as the Fuel Plan. When feasible, they are implemented, subject to strict respect of the rules on Flight Safety. All the airlines within the Air France-KLM Group are included in the Fuel Plan, to improve the Group's energy efficiency and reduce its carbon footprint.

Intermodality

For journeys over short distances in France, there are low-carbon transportation alternatives. Prioritizing these low-carbon alternatives on short journeys, and more energy-efficient flights (new generation aircraft, sustainable aviation fuels) on longer journeys, enable the overall carbon footprint of a journey to be minimized. The Air France-KLM Group thus believes that combining train and air travel if possible is an obvious choice. Wherever possible, the Group's airlines offer their customers the possibility of combining different modes of transportation, a solution known as intermodality. Air France offers its customers a service that allows them to combine train and air travel in the same booking, with guaranteed connections. This offer known as "Train+Air" is in partnership with the SNCF and is used every year by more than 160,000 customers travelling to and from Paris-Charles de Gaulle and Paris-Orly airports. Since the end of 2020, the "Train+Air" offer has been significantly expanded with the addition of 16 new TGV lines from/to Roissy and Orly (via Massy) to a total of 41 lines currently. Furthermore, since November 16, 2022, "Train+Air" customers have been able to benefit from a rail e-ticket and thus complete a fully-digitalized journey. As of 30 hours before the departure of their Air France flight (or 24 hours for the USA), in addition to the boarding card for their flights, passengers can now print and/or download to their smartphone their rail e-tickets on the Air France App or from the Air France website and board their train directly. The "Train+Air" product offers customers numerous advantages: a single booking and one fare for their whole journey, a guaranteed seat at no extra charge on the next available flight or train service in the event of a delay to the train or aircraft.

Sustainable Aviation Fuels (SAF)

Sustainable aviation fuels are becoming a key lever in the decarbonization of the air transportation industry. They can reduce CO_2 emissions by an average of 80% compared to conventional jet fuel on a life cycle basis. SAF can be used as an up-to-50% blend with conventional kerosene in the current aircraft and infrastructures.

There are two families of SAF:

- biofuels manufactured from biomass. The European regulation (via the European Directive for the promotion of renewable energies – RED) imposes strict sustainability criteria, in particular that the production of such biofuels does not compete with food for humans or lead to deforestation. This biomass can be lignocellulosic (composed of wood and agricultural residues, herbs like miscanthus, straw); glucidic (composed of cereals, sugar beet or sugar cane); oleaginous (coming from rapeseed or sunflower crops). The only process currently deployed at commercial scale is the hydrotreatment of esters and fatty biomasses (ASTM acronym HEFA). It will thus be key to develop the maturity of the processes linked to the other types of biomass, notably lignocellulosic biomass which is still in the pre-industrial stage. Within the framework of CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) implementation, the ICAO estimated the emission reduction values for the different aviation biofuels as a function of the biomass used, its origin and the conversion processes. The ranges of emission reductions are shown in the following table:

Process used × biomass used	Reduction in emissions over the fuel life cycle relative to kerosene
Fishcher-Tropsch fuels originating from lignocellulosic residues and crops	93 to 125%
Fuels originating from organic municipal waste (emissions increasing rapidly with the fossil carbon content)	90%
ATJ originating from lignocellulosic biomasses	67 to 112%
HEFA produced from recycled oils and fats	75 to 84%
ATJ sugar beet	≈70%

- synthetic fuels – also know as "Power-to-liquid" or "e-fuels", produced from CO_2 captured either in the atmosphere or in effluents from high-emission activities (like cement factory chimney fumes), water and electricity. At present, the main synthetic avenue, which is also applicable for biofuels production, is the Fischer-Tropsch synthesis. The level of maturity of electro fuels is lower than that of biofuels. Their production is currently at the demonstration stage. However, it will be crucial for e-fuels to complement the use of biofuels, as foreseen in the EU Refuel SAF incorporation sub-mandates (up to 35% by 2050, i.e. half of the 70% mandate on that timescale).

Lastly, it is possible to combine production from biomass and electricity, to produce so-called electro-biofuels. They are based on the injection of decarbonated hydrogen into the biofuel production process enabling, the use of all the carbon content in the biomass, thereby doubling the efficiency of the production process. Electro-biofuels are thus a promising avenue to make greater use of the available biomass.

In terms of prices:

It is difficult to estimate how the price of SAF per process will evolve in the future. The cost of SAF will depend on the production technology and the associated inputs. Raw material and energy prices can fluctuate, industrial players do not disclose costs which can only be assessed on the basis of technical and economic studies and market prices can be very different from cost prices.

Within the framework of the decarbonization road map for the French air transportation industry, the Decarbonized Energy working group (FNAM) established the following estimates of SAF production cost by process:

SAF process	2022	2050
HEFA	€2,000	€1,500
Biofuels other than HEFA	€3,500	€2,500
PTL	€6,000	€4,000

Estimated production costs for one ton of SAF per process – Source decarbonization road map for the French air transportation industry (FNAM)

In 2022, the Air France-KLM Group:

- committed to incorporating a minimum 10% SAF to power all its flights by 2030;
- used a 0.6% sustainable aviation fuel blend in its total aviation fuel compared with 0.08% in 2021. The SAF is mainly used for flights on departure from France (in line with French legislation) and the Netherlands;
- signed medium-term supply contracts to cover its sustainable aviation fuel needs for the coming years. Agreements were signed with the company Neste, which will supply one million tons over the 2023-30 period, and with DG Fuels, which will supply 600,000 tonnes over the 2027-36 period. These contracts will cover around 3% of its 10% SAF requirement by 2030;
- lastly, on December 5, 2022, the Group signed a Memorandum of Understanding with Total Energies for the supply of more than 800,000 tonnes of SAF over a ten-year period, starting from 2023.

By entering into long-term supply agreements, Air France–KLM is supporting the development of a global SAF manufacturing chain which is still in its infancy (in 2021, SAF production represented less than 0.01% of global kerosene consumption) which is reflected in prices three or four times those of conventional kerosene. By increasing SAF usage and demand, Air France-KLM plans to pay its role in the ramping up of commercial SAF production.

Guaranteeing the quality of our SAF procurement

Air France-KLM has put in place a strict procurement policy to ensure that the sustainable aviation fuel projects selected have a minimal impact on the environment. The chosen sustainable aviation fuel projects must offer a minimum 75% reduction in CO_2, not compete with the human food or animal feed chains, not be derived from palm oil and be RSB or ISCC certified. As founding members of the Sustainable Aviation Fuel Users Group (SAFUG), Air France and KLM have been members of the RSB since 2008. This body takes into account 12 criteria ranging from food security to rural development, the quality of air, soil and water resources and, lastly, waste management.

Through the Council for Civil Aviation Research (CORAC), Air France is participating in the definition of a sustainable aviation fuel strategy via coherent technological research and innovation actions, aimed at achieving the objectives of the ecological transition in a global context. Air France-KLM is thus a founding member of the Aviation Climate Taskforce (ACT), a non-profit organization founded to accelerate breakthroughs in emerging technologies to decarbonize aviation, with a focus on the synthetic SAF, hydrogen and direct air capture technologies.

As part of the French government's Call for Projects, Air France has supported several new Sustainable Aviation Fuel production programs. By actively seeking industrial and logistics partners to join forces in consortia, the Group is backing innovative technologies, with alternative fuels originating from the circular economy and, in future, synthetic fuels (e-fuels) whose design is based on green electricity and carbon capture. In 2022, Air France-KLM thus joined the Renewable and Low Carbon Fuels Value Chain Industrial Allia (RLCF) Alliance, a new EU initiative bringing together the aviation and waterborne sectors to jointly boost the production and supply of Renewable and Low Carbon Fuels in Europe.

Action plan concerning non-CO_2 effects

The Air France-KLM Group is actively working with research facilities and solutions providers to deepen the knowledge of non-CO_2 effects and identify the most effective mitigation measures. Advances in scientific research should enable a greater understanding of, in particular, the mechanisms of condensation trails, reduce the uncertainties surrounding their climatic impact and increase the reliability of meteorological models. The availability of validated climate models is key, both to evaluating the climatic impact of these effects and to be able to envisage effective operational avoidance measures.

Thus :

- Air France is one of the first airlines in Europe to be involved in collaboration to derive specific data on the climate, via a partnership with IAGOS (In Service Aircraft for Global Observing System). Air France is reviewing financing to install instrumentation across a larger fleet to collect a representative set of data;
- To better understand and predict ISSRs (Ice Super Saturated Regions), the Air France-KLM Group is working with the Maastricht Upper Area Control Centre (MUAC 2). Through contrails observations, the aim is to determine contrail sensitive times as well as areas to avoid for ISSRs;
- Air France-KLM also participates in research through the *Conseil pour la Recherche Aéronautique Civile* (CORAC) and supports the Climaviation scientific research project (https://climaviation.fr/) by contributing its operational expertise and flight observations on the formation of condensation trails;
- Air France-KLM is also participating in the CICONIA European project, which proposes a scientific and operational approach taking into account the totality of the ecosystem.

The second arm of the Group's strategy involves evaluating and minimizing its environmental impact. An impact diagnosis will be key to building an effective and viable strategy. If confirmed, the hypothesis that a small number of flights are responsible for most of the persistent contrail formation will enable the targeted implementation of two solutions on these flights. Firstly, the use of SAF, which emits less soot than kerosene, should reduce the formation of contrails. Secondly, operational mitigation which consists of modifying routes or the level of the flight to avoid climate risk zones. In most cases, this solution results in higher fuel consumption, and therefore additional CO_2 emissions. A number of prerequisites must therefore be met before it can be implemented, to avoid unnecessary avoidance: the ability precisely to predict the zones of condensation trail formation on the trajectory of the aircraft – which is not currently the case; the ability to quantify the climate benefits of avoidance on the basis of a trade-off, at international level, between the short-term effects of drag and the long-term effects of CO_2.

Risk analysis

The Group's activities are exposed to physical risks and the risks incurred in the climate change transition, all of which are a major concern for Air France-KLM. If the Group does not adequately anticipate these impacts and engage in a voluntary process to adapt to climate change and the other environmental risks, its financial performance and reputation will be affected.

Impacts

- **Physical:** climate change is expected to continue with ramifications like a rising sea level (already impacting some coastal and island destinations) and the increased occurrence and intensity of adverse weather events (like storms, heat waves, fires and droughts). These phenomena are leading to an increase in operational disruption, like cancelled or delayed flights and diversions. Such events can have significant operational and financial repercussions for the Group's activity.
- **Reputational:** air transportation is having to contend with ever-increasing public pressure, at both local and global level, focusing on the industry's impacts on the environment.
- **Current and emerging regulation:** the air transportation industry is subject to a significant level of environmental legislation governing areas such as the exposure of people to aircraft noise and local emissions, air quality, the treatment of waste products and regulations to ensure a reduction in its climate impact, including greenhouse gas emissions. Air France-KLM is subject to the European Union emission quota system (EU-ETS), as well as to CORSIA, the global Market-Based Measure (or 'MBM') applying to CO_2 emissions from international aviation. A 1% SAF mandate was introduced in France in 2022, increasing to 1.5% in 2024, while the European Union intends to introduce progressive SAF mandates from 2025 as part of its "Fit for 55" package. An increasing number of countries are introducing taxes on tickets, including France and the Netherlands. Any such legislation could have a significant negative impact on the Group's operations, through a substantial increase in its costs, especially when applied solely to a specific geographical area, potentially leading to competitive distortions between airlines.
- **Market:** changes in consumer habits and behavior are encouraging the use of videoconferencing, thereby reducing air travel in terms of frequency or distance, combining business and leisure travel, or preferences for services with a reduced carbon footprint, such as travel by train on shorter distances. Furthermore, climate degradation at the local level will have repercussions for travel demand patterns and, over time, tourists from temperate countries, who currently dominate international travel, may adapt their travel plans to take advantage of destinations closer to home.

Carbon credit risk

As an air transportation operator, the Air France-KLM Group complies in full with the regulatory provisions governing carbon emission reduction. These include the EU Emissions Trading Scheme (EU ETS), which has been in force at European level since 2012 for aviation. In December 2022, the European institutions defined the modalities for the reform of the EU-ETS through the revision of Directive 2003/87/EC. They have confirmed the intra-European scope of the EU-ETS, thus reinforcing CORSIA's future role in defining compensation solutions for international flights. They have also programmed the progressive ending of the quotas allocated free of charge to air operators. From 2026 onwards, this new measure will require the Air France-KLM Group to purchase emission rights (known as "credits") for all its flights to and from the European Union (intra-European flights). The clarification of the reduction trajectory for the allocation of free quotas nevertheless makes it possible to anticipate and control the risk associated with this regulatory change. The regulatory changes and the expectation of changes in terms of ambition are leading to significant volatility and an overall increase in ETS prices.

The cost of emission quotas and their potential price volatility could increase operating costs. For the financial year ending December 31, 2022, the Air France-KLM Group's CO_2 emissions reached 22.9 million tons (13.7 million tons for Air France and 9.2 million tons for KLM), of which 5 million tons were subject to the EU ETS requirement. In the light of the European arbitration in December 2023 (end of free quotas in 2026), the scenario retained by the Air France-KLM Group foresees the acquisition of 3.8 million additional carbon credits in the market between 2023 and 2027.

Link between the investment strategy and the decarbonization trajectory

Since the air transportation industry is one of the most complex sectors to decarbonize, Air France-KLM's environmental trajectory is supported by substantial investment over the short, medium and long term:

- concerning fleet renewal: despite the crisis, the Air France-KLM Group is investing more than €1 billion per year in acquiring new-generation aircraft – with a target of 64% latest-generation aircraft in the fleet by 2028. Air France-KLM's investment in aeronautical equipment reached €1,332 million in 2022 (versus €1,047 million in 2021) (URD 2.2.1);
- furthermore, the Group is investing in the acquisition of 100% electric runway equipment (electric vehicles, tractors and charging equipment) and the energy renovation of its buildings; This investment represented €52 million in 2022 (€40 million in 2021) (URD 2.2.2);
- Air France-KLM has also signed various contracts to guarantee its SAF supply, with Neste and DG Fuels for respectively 1 million tons and 600,000 tons of SAF, and with Total Energies for more than 800,000 tons over a ten-year period. These contracts will enable the Group to cover 3% of its 10% SAF requirement.

The Group has put in place an internal carbon tariff which attributes a monetary value to the greenhouse gas emissions and is taken into account when making investment decisions.

Modalities for the appropriation of the emission reduction commitments in the governance and by employees

Sustainable Development governance is ensured by the management bodies at the highest level of the Group. The Board of Directors and Executive Committees ensure that sustainability topics are given high priority and the sustainability teams report frequently to the most senior levels of management.

They make sure that sustainability decisions are taken at the right level within all the relevant entities:

- the Board of Directors approves the strategic orientations and monitors their implementation;
- within the Board of Directors, the Sustainable Development and Compliance Committee, established in 2018, assists in reviewing the risks and policies, by issuing recommendations and ensuring that issues linked to sustainable development are taken into account when defining the Group's strategy. In particular, twice a year, the Sustainable Development and Compliance Committee reviews the risks linked to climate change and the remedial measures in place. The minutes of the discussions and, as necessary, the recommendations arising from meetings of the Sustainable Development and Compliance Committee are presented to the Board of Directors. Having taken into account the recommendations of the Sustainable Development and Compliance Committee, the Audit Committee approves the review of the main extra-financial risks on an annual basis;
- the Group Executive Committee determines the sustainable strategy and development policy. It reviews the sustainable development strategy and performance. The Group's Corporate Secretary is responsible for Compliance and the Group Executive Vice President, Human Resources and Sustainability is responsible for Sustainability;
- at Air France, the sustainable development policy is steered by the Vice-President in charge of sustainable development and new mobility. He is supported by the Air France Sustainable Development Committee, composed of members of the Air France Executive Committee, which guides and ensures the progress of Air France's sustainable development strategy and efforts.

Raising employee awareness of environmental, and particularly climate-related, issues is a major pillar of our sustainability strategy. It is even a prerequisite. This is why the Group has deployed internally, since 2020, the *Fresque du Climat*, a collective intelligence workshop that helps people understand climate issues based on scientific reference data. In mid-2023, more than 5,000 Air France-KLM staff had received *Fresque du Climat* training. In addition, specific training modules on airline environmental risks have been established and a network of environmental coordinators embedded in every business division. The more the awareness of employees is raised on such issues, the more they want and are empowered to take action in their different professions. This is thus a key tool in internal mobilization and the proliferation of environmental actions across the business.

The company's commitments to stakeholders, upstream and downstream in the value chain, to take into account the greenhouse gas emission reduction targets

Ongoing dialogue and a mutual understanding of the challenges facing Air France-KLM and its environment are key to building long-term relationships with stakeholders.

The Group pays a great deal of attention to the expectations of its stakeholders, in particular its customers, shareholders, employees, the authorities and national policy makers, its suppliers, associations and local communities, and players in civil society, like NGOs. A number of initiatives enable their perception to be evaluated on a regular basis through, notably:

- internal barometers and meetings to gather employee suggestions;
- regular exchanges with individual shareholders, and mainstream and Socially Responsible Investment (SRI) investors, together with recommendations from extra-financial ratings agencies;
- dialogue with the authorities and national policy makers;
- dialogue and evaluation of supplier CSR performance;
- exchange of best practices and working groups within the industry, and with other large companies;
- opinions and remarks gleaned from the dedicated email addresses, websites and the social media.

Every two years, the Group carries out materiality analyses, enabling the priorities key to the Group's activity to be re-evaluated and the results to be compared with those from previous materiality analyses. The Group's stakeholders like corporate and individual customers, employees, shareholders, investors, suppliers, NGOs, governmental organizations, local representatives from the Paris and Schiphol regions, sustainability managers from leading companies and representatives of the airline sector and the Group's peers, are requested to reassess the key priorities of the Group. For each topic, the respondents rank the level of priority to be accorded by Air France-KLM and their perception of the Group's current level of performance.

Contribution of Air France-KLM customers to its decarbonization trajectory

Air France and KLM were the first carriers to offer their customers a SAF program for both businesses and cargo, thereby raising awareness and knowledge around sustainable aviation fuels, and encouraging companies to reduce their scope 3 emissions linked to business travel and the transportation of cargo. The programs currently number 125 business participants.

Individual customers of the Group's airlines can also voluntarily contribute to increasing the use of sustainable aviation fuels in their flights when they make a booking or up until check-in. For Flying Blue members, Air France and KLM now offer the option to pay for sustainable aviation fuel with Miles. Since June 2022, as a mark of recognition for Air France and KLM high-value customers, these contributions also count towards earning or maintaining Flying Blue Elite status. Flying Blue is the first loyalty program in the travel industry to structurally introduce such a choice to earn status.

The SAF contributions from both Business and individual customers are wholly and exclusively invested in the purchase of SAF to be incorporated in the fuel used in Air France-KLM flights.

Sustainable procurement

As an airline company with activities spanning the globe, Air France-KLM purchases a wide variety of goods, products and services worldwide. The Group's procurement brings together many different industries. Procurement has a significant impact on the sustainability performance of its supplier base. Procurement must support the Group's sustainability strategy with a sourcing process aimed at selecting more sustainable products, and services and business partners that correspond to its Environmental, Social and Governance ambitions (ESG).

Procurement is responsible for an annual spend of around €14.5 billion. Fuel purchasing accounts for about €7 billion or roughly 50% of the total figure. In view of its industrial profile, Air France-KLM has a sharp focus on this procurement category in which investment in Sustainable Aviation Fuel (or SAF) plays a major role. However, this does not mean that other possibilities to drive sustainability through responsible purchasing are left untouched. These range from the purchase of aircraft maintenance and components to airport handling, cargo trucking, on-board products, etc.

The Procurement department has a risk-based approach, wherein it targets suppliers in sustainability high-risk categories first, in order to mitigate or avoid risk. It does so by understanding the broad umbrella of sustainability to include not only environmental but also societal and ethical factors. At a compliance level, high-sustainability-risk suppliers are required to carry out assessments on their ESG (Environment, Social, Governance) performance.

On top of addressing the high-risk categories, Procurement invites all its suppliers to undergo similar assessments in an effort to move beyond (legal) compliance and promote supply-chain transparency. Air France-KLM Procurement actively seeks to engage with suppliers as sustainable business partners, so as to foster sustainability in the aviation industry through joint innovation and development.

Air France-KLM integrates a responsible procurement policy in its sourcing process:

- suppliers are invited to sign the Air France-KLM Supplier Sustainability Code of Conduct;
- the tender documents include criteria enabling the evaluation of the environmental impact of the product or service, which is taken into account during the evaluation of the different supplier proposals. This is an integral part of the assessment of the total cost of ownership and the life cycle analysis;
- to manage and verify the sustainability quality of its supplier base, Air France-KLM uses the services of EcoVadis. EcoVadis operates an evidence-based online platform, providing supplier sustainability ratings that allows Procurement to assess the ESG performance of its global suppliers;
- the focus is on suppliers with high sustainability risks. Air France-KLM Procurement is exploring the possibility of joining forces with industry partners to boost the sustainability standards with its suppliers.

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