Greenhouse Gas Emissions Reduction Strategy

2024 - 2050

CO_2

GENÈVE AÉROPORT

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CONTENTS

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Editorial

Aware of its societal and environmental responsibilities, Genève Aéroport places sustainability at the heart of all its strategies, with a firm commitment to reduce its ecological footprint.

Genève Aéroport is therefore committed to achieving Net Zero[1] CO_2 emissions on its platform (Scopes 1 and 2) by 2037, with an intermediate target of a 60% reduction by 2026. This transition is primarily based on the development of sustainable infrastructure and greater reliance on renewable energy. A flagship project of this approach is the exploitation of cold water from Lake Geneva (GeniLac project), in collaboration with Services Industriels de Genève (SIG) to replace the heating and cooling system of the platform buildings.

Concerning aviation, which represents 79% of Scope 3 emissions, Genève Aéroport is relying on the roadmap of the Aviation Research Center Switzerland (ARCS). Key measures include promoting sustainable aviation fuels (SAF), providing financial incentives for airlines to adopt next-generation aircraft, as well as installing centralised energy systems for parked aircraft (400 Hz and PCA) to reduce reliance on auxiliary engines.

Genève Aéroport is also committed to reducing other indirect Scope 3 emissions. This includes electrifying 90% of vehicles and ground equipment by 2030, fostering more sustainable transport options for passengers and employees, and promoting responsible and sustainable purchasing.

André Schneider

Chief Executive

Nathalie Rossier-Iten

Head of Environment and Sustainable Development

[1] *Net zero is defined as the greatest possible reduction in CO_2 emissions, allowing for up to 10% residual emissions (compared to 1990), considered 'unavoidable', which will be offset through sequestration and storage technologies.*

02

Context and regulatory framework

2.1 Context

Airports are essential to global aviation and are therefore at the heart of economic and cultural exchanges. Still heavily dependent on fossil fuels, the aviation sector is often scrutinised when it comes to its responses to the challenges posed by climate change.

According to the Intergovernmental Panel on Climate Change (IPCC), in 2018 aviation was responsible for 2.4% of total emissions resulting from the use of fossil fuels worldwide[2]. This figure excludes the so-called 'non-CO_2' effects linked to nitrogen oxides (NOx), water vapour, and particles emitted during the combustion of kerosene by aircraft engines. According to the state of knowledge, these 'non-CO_2' effects are also responsible for significant radiative forcing and tend to warm the climate[3].

Aware of the issues associated with its governance, Genève Aéroport is developing its strategy for reducing its greenhouse gas emissions in this document.

2.2. Description of Genève Aéroport

Genève Aéroport has been an autonomous public institution since 1994, benefiting from a federal concession issued by the Federal Department of the Environment, Transport, Energy and Communications. Its supervisory authority is the Federal Office of Civil Aviation.

With a surface area of 340 hectares (owned by the State of Geneva), the airport platform borders France but is located exclusively on Swiss territory. It is home to some 200 different companies that employ about 11,000 people.

The dynamism of Genève Aéroport contributes to the influence and development of Geneva as an economic, financial, tourist, cultural, political and diplomatic hub. It also drives the development of a vast cross-border basin, supporting a catchment area that extends beyond the French-speaking cantons to neighbouring German-speaking cantons, the French departments of the Rhône-Alpes region and northern Italy.

Genève Aéroport connects the region to more than one hundred destinations (both in Europe and other continents), serving some seventeen million passengers each year.

2.3. Paris Agreement and IPCC

In 2015, at the 21st COP meeting organised by the UNFCCC in Paris, more than 195 countries signed the Paris Agreement, committing to actively combat climate change. This agreement mainly aims to limit the rise in global temperature to 2°C compared to pre-industrial levels, with an additional ambition to reduce it to 1.5°C (Figure 1). Under this agreement, signatory countries must establish indicators of nationally determined contributions (iNDCs). These include emissions from domestic flights only. International flights are not covered by this agreement.

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2 *Lee D.S. et al. The contribution of global aviation to anthropogenic climate forcing for 2000 to 2018. (2021) Atmospheric Environment, 244: 117834. DOI: 10.1016/j.atmosenv.2020.117834*

3 *Dannet, G. et al. Aviation et climat : CO_2, NOx, vapeur d'eau, aérosols… comment bien comptabiliser tous les effets sur le réchauffement ? (Aviation and climate: CO_2, NOx, water vapour, aerosols… how to properly account for all the effects on global warming?) La dépêche, 27 November 2022.*

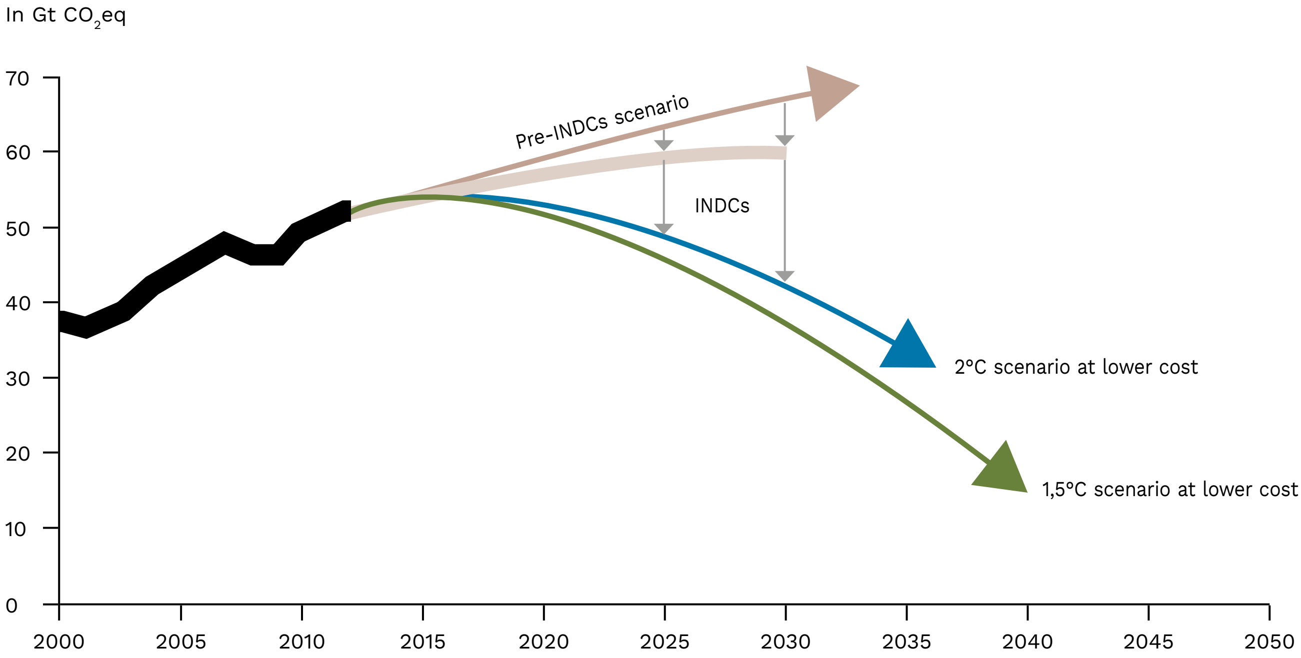


Figure 1: comparison of emission levels (in Gt CO_2eq) following the implementation of INDCs according to global temperature limitation objective[4].

In October 2017, the 191 ICAO members endorsed a CO_2 emissions offsetting mechanism, called CORSIA[5]. As part of this programme and the decision taken by the ICAO Council at the end of June 2020, airlines are required, as of 1 January 2021, to offset emissions on international routes exceeding the levels of the 2019 base year by purchasing emission reduction certificates.

As part of the Airport Council International Europe (ACI EUROPE) Sustainability Strategy, initiated in June 2019, European airports have committed to achieving net zero carbon emissions for operations under their control by 2050 at the latest.

In October 2022, the 41st ICAO Assembly adopted a Long-Term Strategy for International Aviation to achieve net zero carbon emissions by 2050 (LTAG), in support of the objectives of the Paris Agreement and the UNFCCC[6].

2.4. European Council: Fit for 55 package

In order to achieve the EU's net zero goal for 2050, the "Fit for 55" package, set up by the European Commission, aims to lay down legal measures to achieve the target of reducing emissions by 55% by 2030, compared to 1990 levels.

In this context, on 9 October 2023, the European Council adopted the RefuelEU initiative (Annex 6)[7]. This initiative includes new regulations for airports, which will have to ensure from 2025 that the fuel supplied to operators contains a minimum share of SAF (sustainable aviation fuel). The SAF rate imposed must gradually increase from 2% in 2025 to 70% in 2050. Added to this is the ban on aircraft carrying more than the fuel necessary for the duration of the flight, thus avoiding the practice of tankering. This practice consists of storing excess fuel on board the aircraft when it is cheaper at the departure airport, so as to avoid higher costs at the destination airport.

[4] *Key climate figures, France, Europe and the World, Ministry of Ecological Transition (Chiffres clés du climat, France, Europe et Monde, Ministère de la transition écologique) 2020, p. 61. Retrieved from: https://www.statistiques.developpement-durable.gouv.fr/edition-numerique/chiffres-cles-du-climat/pdf/document.pdf*

[5] *IATA, 2019, An Airline Handbook on Corsia. https://www.iata.org/contentassets/fb745460050c48089597a3ef1b9fe7a8/corsia-handbook.pdf*

[6] *ICAO, 2022. Resolution A41-21: Consolidated statement of continuing ICAO policies and practices related to environmental protection — Climate change". paragraph 7, p. 6*

[7] *Regulation (EU) 2023: RefuelEU Aviation, European Union, Brussels, 20 September 2023. https://data.consilium.europa.eu/doc/document/PE-29-2023-INIT/en/pdfdeveloppement-durable.gouv.fr/edition-numerique/chiffres-cles-du-climat/pdf/document.pdf*

ACI Targets – Net zero by 2050:

- ACI member airports worldwide commit to achieving net zero by 2050 and urge governments to provide the necessary support for this endeavour.

The net zero goal by 2050 is in line with the IPCC target of limiting global warming to 1.5°C. It was chosen because it is feasible and meets the societal expectations.

2.5. Climate Act of the Confederation (LCI-KIG)

For its part, on 18 June 2023, the Swiss people accepted the Federal Act on Climate Protection Targets, Innovation and Strengthening Energy Security (indirect counter-proposal to the Glacier Initiative). This Act aims to reduce the impact of man-made greenhouse gas emissions generated in Switzerland to zero by 2050 (net zero target) through reduction measures and offsetting using negative emission technologies in Switzerland or abroad.

The intermediate targets for reducing emissions are as follows (reference year: 1990)[8]:

- between 2031 and 2040: by at least 64% on average;
- until 2040: by at least 75%;
- between 2041 and 2050: by at least 89% on average.

2.6. Switzerland and the aviation sector

With regard to the aviation sector, Swiss legislation stipulates that emissions resulting from fuels refuelled in Switzerland are subject to the CIA targets. In 2019, flights departing from Switzerland accounted for 11% of the country's total emissions (calculation based on the total volume of kerosene sales)[9].

In 2020, the Aviation Research Center Switzerland (ARCS) launched a roadmap project for sustainable aviation in Switzerland[10]. With the support of Genève Aéroport, this working group identifies measures to be implemented in Switzerland in order to align the aviation industry with the Confederation's climate objectives. Therefore, the main contributions to reducing emissions in the aviation sector were the use of SAF, the optimisation of aviation technologies, operational and infrastructure measures, offsetting emissions (CO_2 and non-CO_2) and market-driven measures (Figure 2).

In parallel, the roadmap discusses the importance of self-financing the decarbonisation of the aviation sector. Therefore, the implementation of economic measures, particularly those encouraging the use of SAF, would fund promotional initiatives as well as investments, innovation and research into more efficient technologies.

Although Switzerland has significant room for manoeuvre to take autonomous measures to encourage the decarbonisation of the sector, the fact remains that the implementation of certain measures, particularly economic ones, depends on coordination at the European Union and international levels.

[8] *Federal Act on Climate Protection Targets, Innovation and Strengthening Energy Security (LCI), Article 3, Federal Assembly of the Swiss Confederation, 30 September 2022.*
[9] *FOCA Report on Promoting the Development and Use of Sustainable Aviation Fuels, Federal Office of Civil Aviation FOCA, 15 December 2022, p. 4.*
[10] *Swiss Roadmap for Sustainable Aviation: Towards Decarbonisation of Air Transport. Ecoplan, commissioned by Aviaton Research Center Switzerland (ARCS). 27 May 2021*

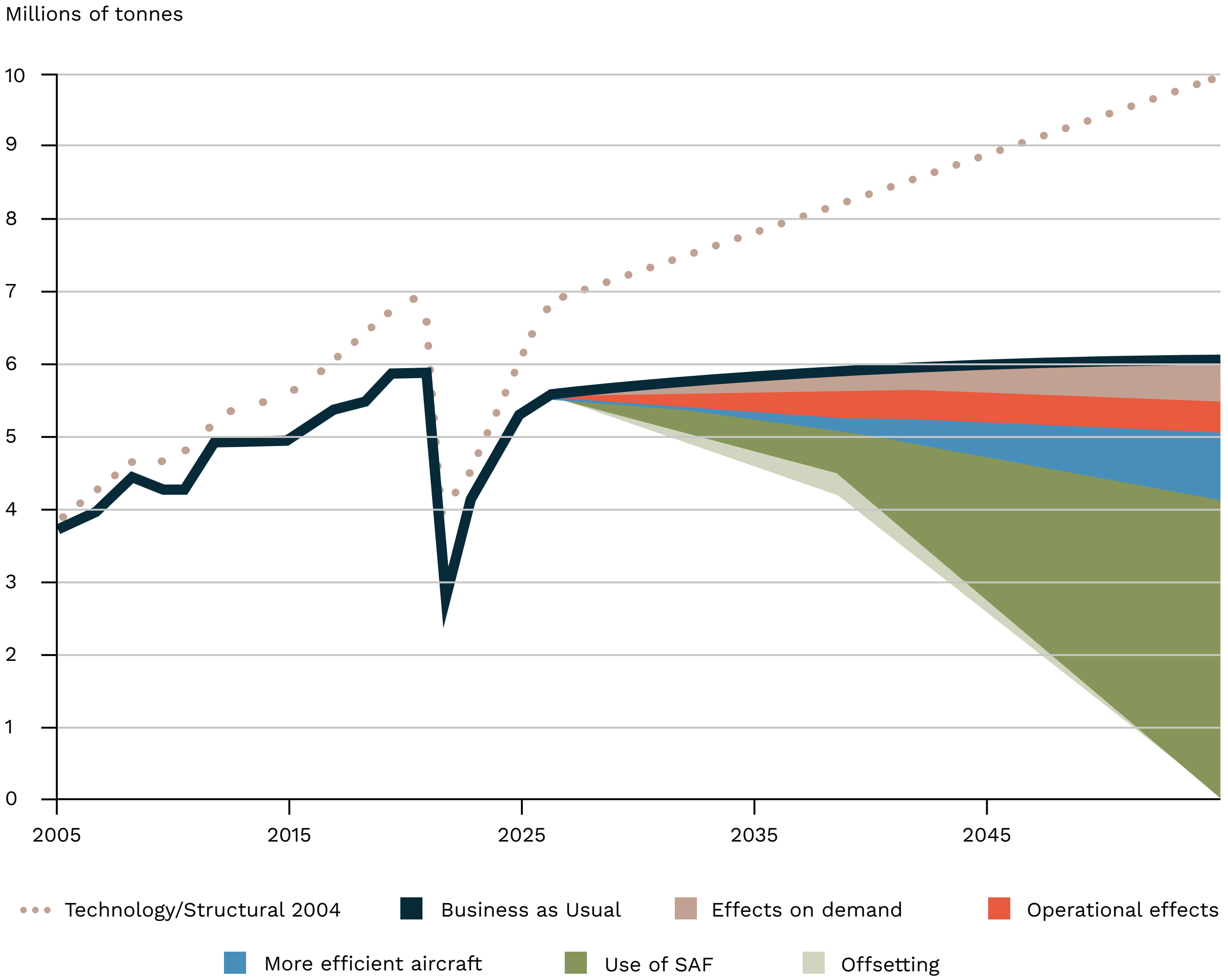


Figure 2: principle diagram for achieving the net zero goal for CO_2 emissions from air traffic. Source: Ecoplan, ARCS: Swiss roadmap for for sustainable aviation

2.7. Cantonal climate plan

At the level of the canton of Geneva, the Cantonal Climate Plan (PCC 2030 – 2nd generation) aims to reduce emissions related to the Geneva area by 60% by 2030 compared to 1990 and to achieve carbon neutrality by 2050.

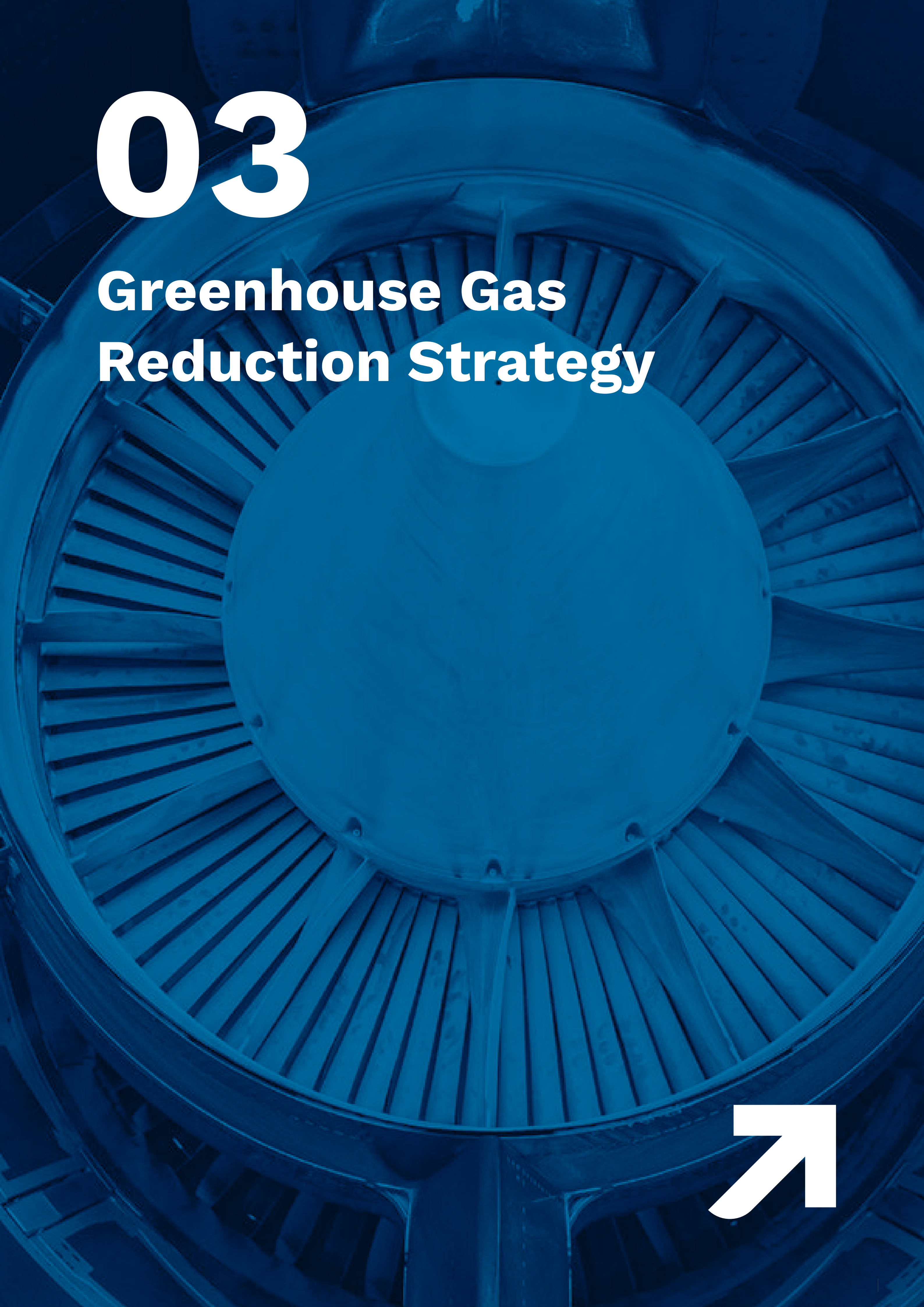
With regard to air traffic, the calculation of emissions and the scope of application of the objectives is based on the emissions of the entire distance of outbound flights for travellers residing in the Geneva area, i.e. 22% of Genève Aéroport passengers (2012 data).

In terms of the volume of aviation emissions to be reduced by 2030, the PCC sets 200,000 tCO_2e out of a total of 340,000 tCO_2e calculated in 2012. This reduction of 200,000 tCO_2e must be achieved through reduction measures and possibly offsetting measures.

However, the canton does not have the authority to regulate greenhouse gas emissions from the airport or air traffic; this authority falls to the FOCA. Collaboration between the canton and the various stakeholders, in particular Genève Aéroport, the FOCA, airlines and train line operators, has been identified as necessary to define the actions required to supplement the CORSIA system adopted by ICAO members, including Switzerland.

03

Greenhouse Gas Reduction Strategy



3.1 Airport approach

Since 2011, Genève Aéroport has been implementing a voluntary approach to reduce greenhouse gas (GHG) emissions under its direct control, aligning with the objectives of the Paris Agreement (section 1.1).

This approach is based on a GHG emissions reduction policy structured on the following principles, in order of priority: avoiding emissions, reducing them using the best available technologies and finally offsetting them once residual emissions have been minimised.

Avoiding future emissions
The measures taken by Genève Aéroport to prevent greenhouse gas emissions cover Scopes 1, 2 and 3 of its activities, namely emissions generated directly by fixed and mobile sources owned or controlled by Genève Aéroport (Scope 1), indirect emissions generated by energy consumption (Scope 2) and other indirect emissions linked to the airport's activity (Scope 3).
In this report, GHG emissions are sometimes quantified as quantities of CO_2, but sometimes also as quantities of CO_2 equivalent (noted CO_2 eq). The latter is necessary to take into account the effect of emissions that are not CO_2, but which nevertheless have a climate-warming effect, such as refrigerant gases.

These include extending the lifecycle of IT equipment, applying responsible purchasing criteria, monitoring DGNB standards to promote low-energy buildings, and improving the vehicle fleet (electric motorisation).

Genève Aéroport will implement a system of financial incentives in 2026 to encourage airlines to exceed legal SAF requirements. Through this measure, Genève Aéroport seeks to encourage greater adoption of SAF on its platform.

Reducing emissions compared to 1990
After implementing measures to avoid future emissions as much as possible, Genève Aéroport's CO_2 strategy aims to reduce its emissions compared to those of 1990. In 2014, Genève Aéroport set targets for GHG emissions under its direct control (Scopes 1 and 2), with the aim of reducing them by 500 tonnes in 2020 and 5,000 tonnes in 2030 compared to 2012 emissions. The first stage of this commitment has been largely exceeded, as Scope 1 and 2 emissions have already fallen by around 2,000 tonnes between 2012 and 2022 (Figure 3).

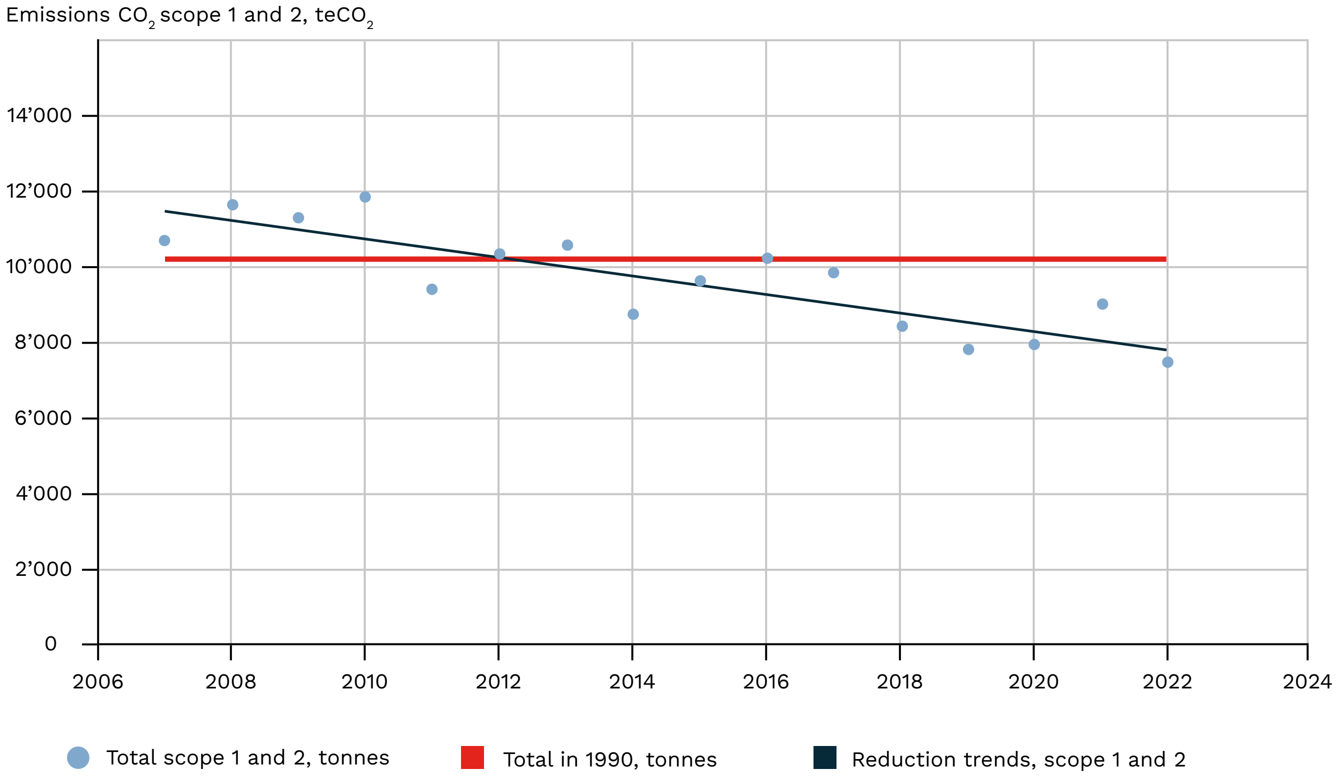


Figure 3: Genève Aéroport GHG emissions history for scopes 1 and 2

Genève Aéroport works with all stakeholders on the site to help them reduce their emissions. This may involve, for example, incentives for renewal of fleet and equipment on the tarmac (setting up charging stations, subsidies for the purchase of electric vehicles), but also improving energy efficiency in buildings (Watt Else programme) and implementing a mobility plan to encourage employees to adopt sustainable means of transport to get to the airport.

Offsetting residual emissions

Since 2017, Genève Aéroport has been offsetting all emissions related to its own activities (Scopes 1 and 2). This offsetting measure was incorporated into the 2024 target agreement between the canton of Geneva and Genève Aéroport. This obligation will continue until emissions are sufficiently reduced. Genève Aéroport will therefore continue to temporarily offset its emissions by purchasing carbon credits certified under the Gold Standard label[11].

The projects concerned and the quantities purchased for each of them are as follows:

	Year	2017	2018	2019	2020	2021	2022
Project 1	Project reference	Bachu, China	Dora II, Turkey	Dora II, Turkey	Dora II, Turkey	Dora II, Turkey	Dora II, Turkey
	Quantity purchased (t)	4,750	5,200	4,450	4,200	5,100	8,900
Project 2	Project reference	Hifadhi, Kenya	Hifadhi, Kenya	Hifadhi, Kenya	Hifadhi, Kenya	Karasu Solar, Turkey	
	Quantity purchased (t)	4,750	5,200	4,450	4,000	2,900	
	Total for the year	**9,500**	**10,400**	**8,900**	**8,200**	**8,000**	**8,900**

Table 1: quantity of carbon certificates purchased, and projects concerned

Official documents concerning these projects can be consulted at the following links:

- Bachu, Use of biomass to generate energy: https://registry.goldstandard.org/projects/details/138

- Hifadhi, Production of domestic cooking ovens: https://registry.goldstandard.org/projects/details/508

- Dora II, Electricity from geothermal energy: https://registry.goldstandard.org/projects/details/790

- Erzurum Solar, Photovoltaic solar electricity production: https://registry.goldstandard.org/projects/details/1888

Reporting
Genève Aéroport's emissions reduction strategy is validated by its Airport Carbon Accreditation (ACA) level 3+ certification, "Neutrality"[12], obtained since 2017[13], and its upcoming ACA4+ certification, "Transition". In addition, Genève Aéroport received the EcoVadis[14] Silver label in 2023 and actively participates in the Confederation's Exemplary Energy and Climate programme[15].

[11] *Genève Aéroport, Limiting the environmental impact: Energy and climate. https://www.gva.ch/fr/Site/Geneve- Aeroport/Developpement-durable/Impact-environnemental-(1)/impact-environnemental*
[12] *ACI EUROPE 2023, 6 levels of accreditation, Airport Carbon Accreditation*
[13] *ACA certification: 12-year certification review, Genève Aéroport, January 2024*
[14] *https://ecovadis.com/fr/*
[15] *Swiss Confederation 2023, Exemplary Energy and Climate*

3.2 Risks and opportunities in terms of GHG emissions at Genève Aéroport

The main risks and opportunities identified by Genève Aéroport with regard to non-compliance with public commitments regarding net zero GHG emissions may have the following consequences:

- Contribution to global warming
- Damage to its reputation
- Increased resistance during plan approval processes or other activities
- Operational restrictions imposed by the authorities

3.3 Specific objectives of Genève Aéroport's GHG strategy

In line with international governance bodies, particularly the International Civil Aviation Organisation (ICAO) and the policy of the Federal Office of Civil Aviation (FOCA), Genève Aéroport has established the following goals for its GHG reduction strategy:

In line with these global goals and in accordance with the Roadmap established by ARCS (Section 1.3), Genève Aéroport's strategy emphasises reducing reliance on fossil fuels (buildings and fuels), introducing and promoting SAF, embracing new technologies, and finally, implementing economic measures such as offsetting, sequestration and storage of residual emissions.

On the other hand, certain measures implemented to achieve the objectives integrating all scopes (net zero by 2050) go beyond Genève Aéroport's sphere of influence. As a concessionaire and under the control of FOCA, Genève Aéroport has a duty to operate within this framework and to meet commercial demand. In order to be consistent with its climate commitments, Genève Aéroport proposes an ambitious GHG emissions reduction strategy as a contribution to achieving the net zero 2050 goal, in accordance with the Paris Agreement.

Scope	Goal (reference year: 1990)	Basis/Source of the goal	Stakeholders
Scopes 1 and 2	Achieve net zero by 2037	Internal Genève Aéroport	Genève Aéroport mainly
Intermediate goal	2028: 60% reduction in GHG	Internal Genève Aéroport	
Extension to Scope 3	Actively contribute to net zero by 2050 in partnership with the entire air transport industry	ICAO, FOCA	All companies on the site including airlines
Intermediate goal	Accompany the reduction of GHG emissions by at least 55% by 2030	EU, Fit for 55 Cantonal climate plan	

Here we define net zero as the maximum feasible reduction of CO_2 emissions from Scopes 1, 2 and 3, reaching a minimum level of 10% of residual emissions (of 1990 emissions) considered as "unavoidable". The term "carbon neutrality" is not used. For more details, refer to Annex 6, "definitions".

3.4 1990 emissions

Genève Aéroport's strategy refers to emissions for the year 1990. The data available to calculate these emissions is fragmentary. To calculate them, we mainly relied on data available in the environmental impact report (RIE) produced when the federal operating concession was renewed in 2000.

Scope 1 and 2 emissions are relatively well documented; we were able to find the quantities of fuel and combustibles used in 1990, as well as electricity consumption. We made assumptions to estimate the consumption of refrigerant gas and that of emergency generators.

For refrigerant gas, the estimate we made is based on three times the average leaks from 2019 to 2023. We chose a factor of 3 because, in 1990, there were no rules on the recovery of refrigerant fluids. When a machine had a problem, technicians emptied the entire machine, without any recovery of refrigerant gases.

As for Scope 3, the only data we were able to find was the quantity of aircraft fuel that was distributed (400.7 million litres). In 2022 (see next chapter), Scope 3 emissions related to the fuel used by aircraft represent approximately 80% of Scope 3 emissions. The other sources of emissions are, in order of importance, induced traffic (12%) then purchases (7%), the following sources all being less than 1%.

Regarding induced traffic, the situation has changed a lot between 1990 and 2022: the share of passengers who travel to the airport using a sustainable mode of transport has increased significantly, and vehicle emissions have decreased. Therefore, assumptions based on this data were used to "reconstruct" the emissions linked to induced traffic in 1990. For other sources, due to the lack of solid data, we have applied a rule of 3 compared to 2022 emissions.

The following emission values were obtained (see the calculation details in Annex 1):

Year	1990
Scope 1+2	10,929 t
Scope 3	1,464,827 t

Table 2: estimated CO_2eq emissions for the year 1990, in tonnes of CO_2

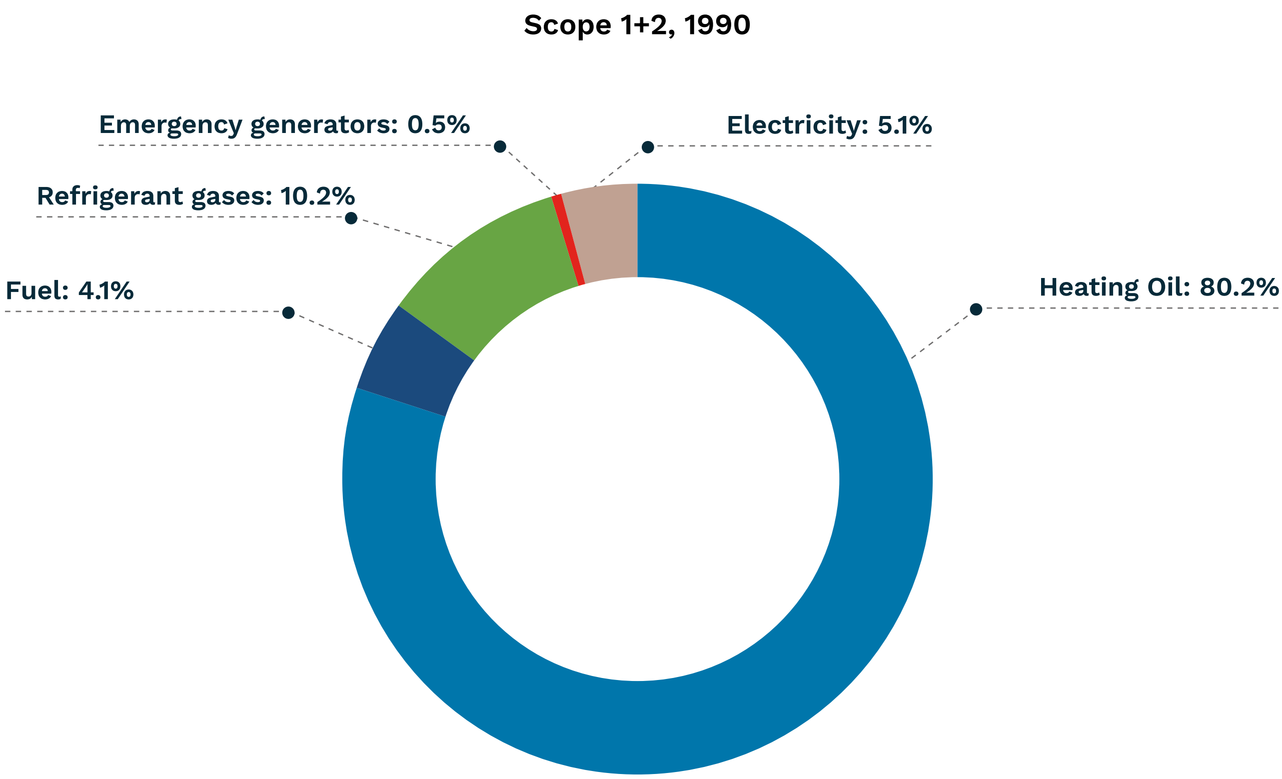


Figure 4: distribution of scope 1 and 2 emissions in 1990

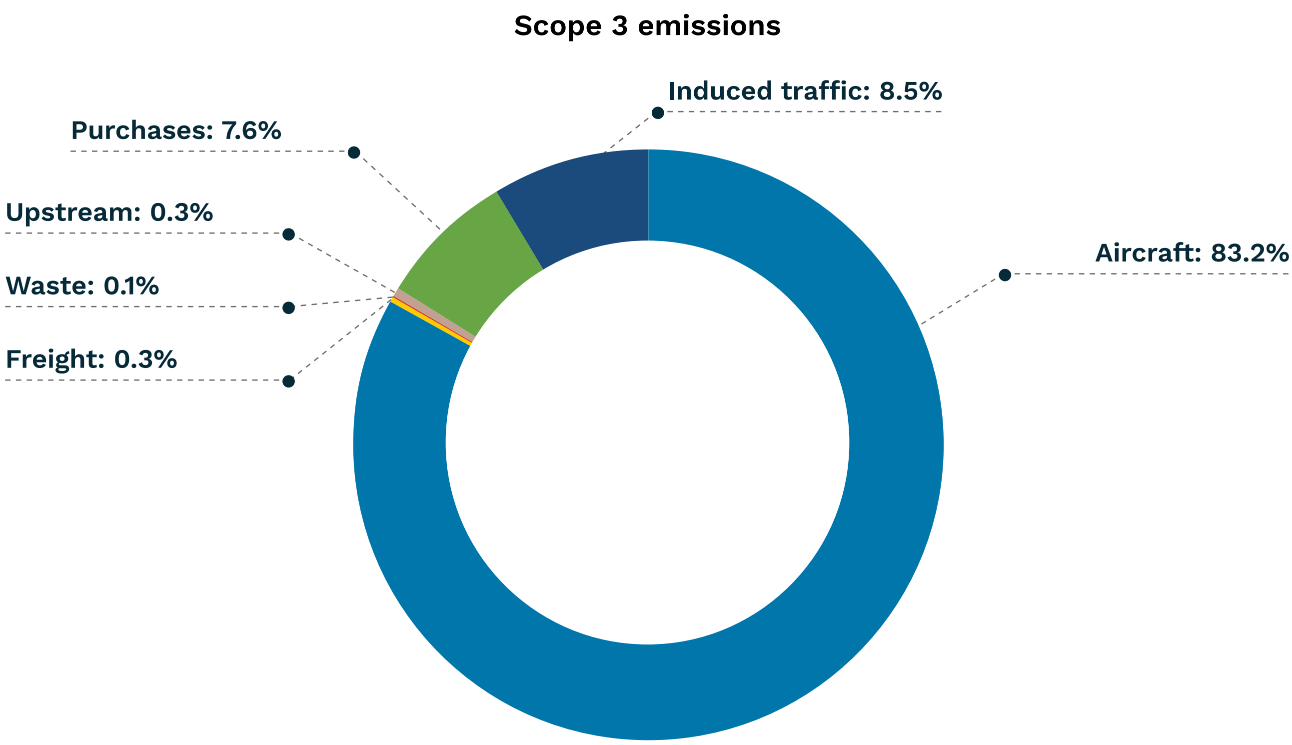


Figure 5: distribution of scope 3 emissions in 1990

04

Genève Aéroport 2022 emissions inventory

To plan its pathway towards achieving emission reduction targets, Genève Aéroport has carried out an inventory of greenhouse gas emissions associated with its activity. This includes scopes 1, 2 and 3.

4.1 Methodological aspects

The assessment of GHG emissions is based on version (8.8) of the ABC (Bilan Carbone Association). Carbon Footprint tool. This instrument is widely recognised as a benchmark in Europe and has notably been used to assess the carbon footprint of the Canton of Geneva. This accounting of GHG emissions is carried out using available data to evaluate both the direct and indirect emissions generated by Genève Aéroport.

GHG emissions are assessed and prioritised by emission items in accordance with the GHG Protocol. This method uses the global warming potential of each emission source, including upstream, to calculate CO_2 equivalent emissions (CO_2eq, or CO_2e).

The emission factors are sourced from internationally recognised databases such as Ecoinvent, KBOB, mobilitools, Agribalyse, Base empreinte (Ademe).

For a more detailed methodology, refer to Annex 2 of this document.

4.2 Main results

The results of the Genève Aéroport carbon footprint assessment highlight the importance of each emission item. This makes it possible to identify and prioritise specific sources of GHG emission in order to define and prioritise the actions to be taken.

The items identified as being most conducive to the implementation of GHG emission reduction measures were given particular attention when developing the action plan. Indeed, the measures target the emission items with the greatest potential GHG gain, while considering the complexity of their implementation.

In 2022, the total carbon footprint of the entire airport amounted to 1,576,923 tonnes of CO_2eq, the vast majority of which is attributable to Scope 3 (99.5%). Scope 1 and 2 emissions, i.e. direct and indirect emissions linked to Genève Aéroport's energy expenditure, represent 0.4% and 0.1% of the carbon footprint respectively (Figure 5), for a total of 7,439 tCO_2eq.

Year	2022
Scope 1+2	7,439 t
Scope 3	1,569,484 t

Table 3: CO_2eq emissions for the year 2022, in tonnes of CO_2

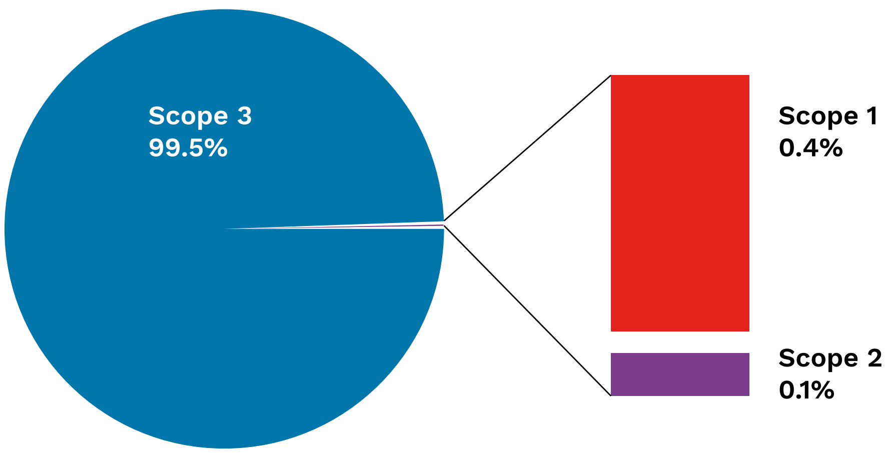


Figure 6: 2022 carbon footprint: details of GHG emissions by scope, in %. This colour coding (scope 1: red, scope 2: purple, scope 3: blue) is consistent throughout chapters 4 and 5, as well as annex 3.

Within Scopes 1 and 2, the largest emission source is the use of fuel for buildings (69% of emissions in Scopes 1 and 2). Emissions linked to refrigerant leaks and those linked to vehicle fuel follow.

The largest emission item across the total carbon footprint (Scopes 1, 2 and 3) is in Scope 3, and includes emissions from the fuel used by aircraft operating at the airport. The "Air transport" item alone accounts for 79% of the carbon footprint emissions, with 1,247,532 tCO_2eq. This item encompasses the airport's total kerosene sales (private business jets, scheduled flights, APUs and aircraft testing).

The other two major emission items are "Movement of people" and "Purchases". The "Movement of people" item represents 12% of emissions, with 189,865 tCO_2eq, of which 91% is due to the movement of airport visitors (mainly passengers), 9% to the commuting of Genève Aéroport employees and other airport authorities and companies and 0.02% to business travel by Genève Aéroport employees. The "Purchases" item, with 120,881 tCO_2eq, accounts for 8% of all airport emissions, including 22% attributable to Genève Aéroport purchases and 78% to purchases by airport concessionaires.

Annex 3 groups together the details of GHG emissions by emission item.

Below, Figure 7 provides an overview of the emission items.

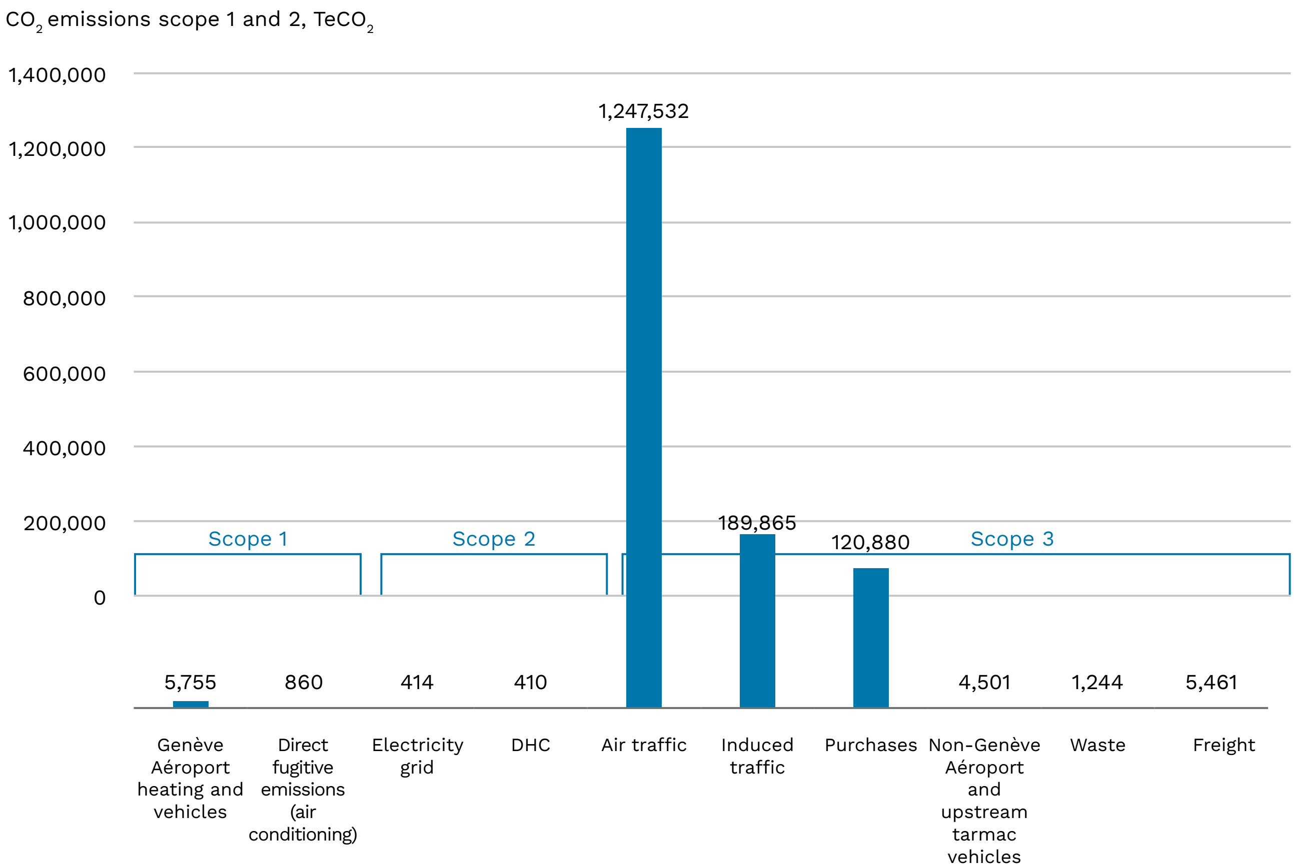


Figure 7: Genève Aéroport 2022 carbon footprint - details by emission items in tCO_2eq

05

Scopes 1 and 2: action plan towards net zero 2037

Now that we have an overview of Genève Aéroport's emissions, targeted reduction goals are set according to priority emission items. Since the reduction goals for Scopes 1 and 2 differ from those for Scope 3, two pathways are proposed and explained.

Genève Aéroport aims to achieve net zero by 2037 with regard to direct and indirect emissions under its control, i.e. Scopes 1 and 2. In 2022, these totalled 7,439 tCO_2eq. As shown in Figure 8, they include emissions from heating facilities, electricity consumed by Genève Aéroport on the network, fuels consumed by the fleet of vehicles belonging to Genève Aéroport as well as refrigerant gases losses from refrigeration and air conditioning systems. Annex 3 provides a more detailed breakdown of the various emission items in the carbon footprint.

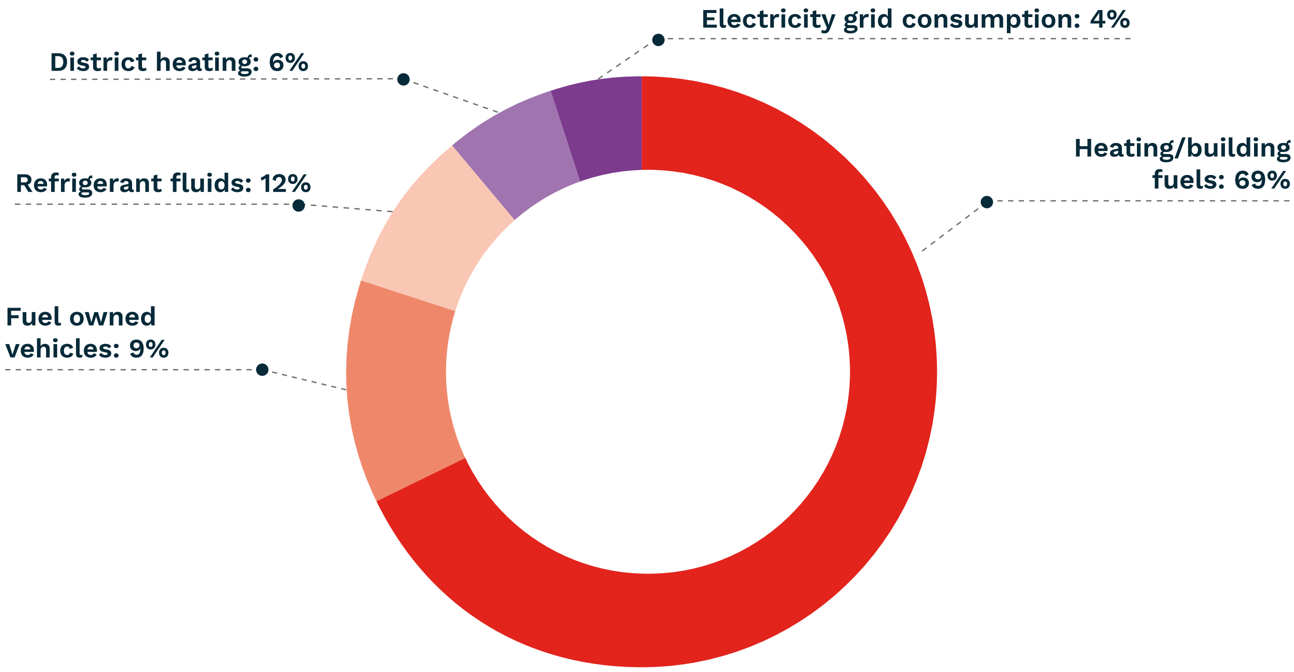


Figure 8: carbon footprint 2022 scopes 1 and 2 - emissions details, in %

In order to achieve its net zero objective, with a minimum residual emission level of 1,093 tCO_2e (10% of 1990 emissions), Genève Aéroport must reduce its Scope 1 and 2 emissions by 6,346 tCO_2e. In defining its net zero pathway, Genève Aéroport has set itself a mid-term objective, aiming for a 60% reduction in its 1990 emissions by 2028, i.e. a reduction of 4,372 tCO_2e. Measures are therefore planned to reduce these emissions accordingly.

5.1 Scope 1 and 2 action plan measures

The table below outlines the reduction measures currently underway or proposed by Genève Aéroport to reduce emissions under its direct control (Scopes 1 and 2).

Measure	Impact	Implementation date	Gain (tCO_2e)
Implementation of low GWP refrigerants (<10)	Massive reduction in climate impacts. Current refrigerants have an EF of 1,400 to 3,800 $kgCO_2e$ per kg of fluid, the new ones are less than 10 $kgCO_2e$ per kg	Progressive renewal to reach 90% by 2030	774
Replacement of the oil-fired thermal power plant with GéniLac	Removal of oil as an energy source for heating buildings, replaced by hydrothermal heat pumps in collaboration with SIG	2028	5'298
Evolution of the SIG Vital Vert electricity emission factor	Evolution of the operated electricity emission factor (SIG discovery: 20% Vital vert, 80% Vital bleu)	SIG estimates	22
Electrification of the fleet of vehicles and other equipment present on the tarmac belonging to Genève Aéroport	Reduction in fossil fuel consumption, replacing it with electricity consumption	Progressive renewal to reach 90% by 2030	555
Use of partly renewable road fuel for vehicles and tarmac equipment owned by Genève Aéroport and which cannot be electrified (SSLIA, snow equipment, etc.)	Reduction of the CO_2 impact of the fuel used	2035	45
Total CO_2 gains			6,694

Figure 9 below shows the emissions reduction pathway for each measure in Genève Aéroport's action plan. It also contains the net zero pathway according to Genève Aéroport's reduction goals for its Scopes 1 and 2 (final and mid-term). This pathway is based on the 1990 Scope 1 and 2 emission levels, and includes the maximum of 10% of residual emissions (1,093 tCO_2eq) to be sequestered and stored in order to reach net zero.

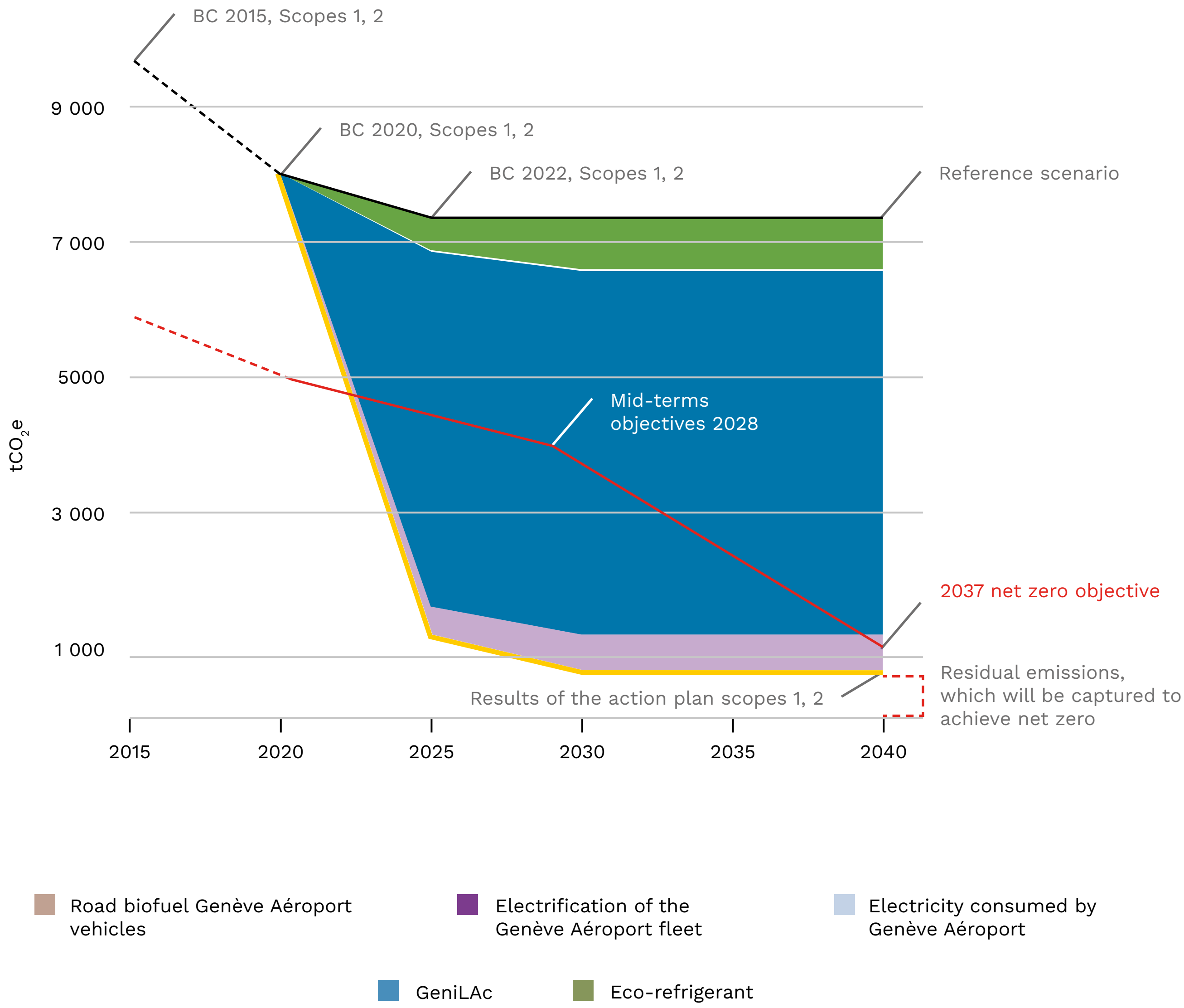


Figure 9: scopes 1 and 2 - contribution of Genève Aéroport's action plan to the net zero pathway 2025-2037, in tCO_2e

Given the measures already implemented and those planned, Genève Aéroport is expected to achieve 80% reduction by 2028, way ahead from its mid-term goal of 60%, with a gain of 5,962 tCO_2e. Concerning the net zero objective set for 2037, Figure 9 illustrates a residual emissions balance of 806 tCO_2e. This result represents a 93% reduction compared to Genève Aéroport's emissions in 1990.

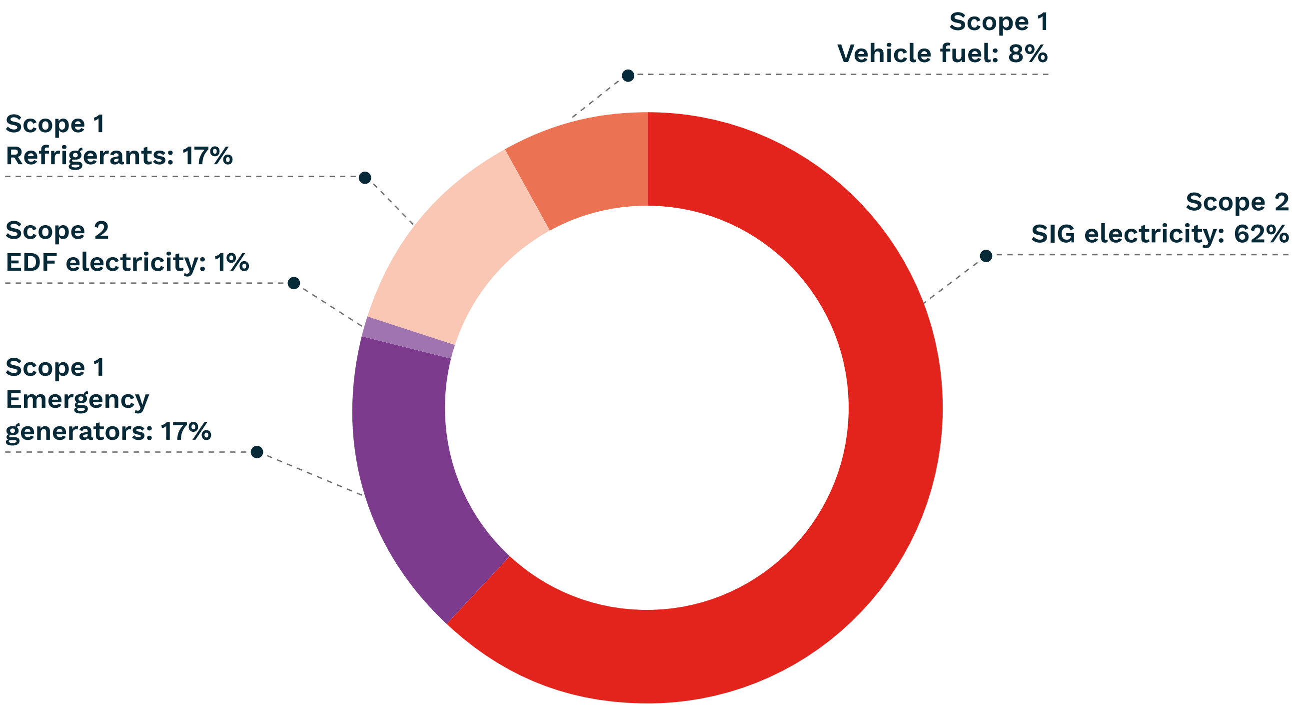
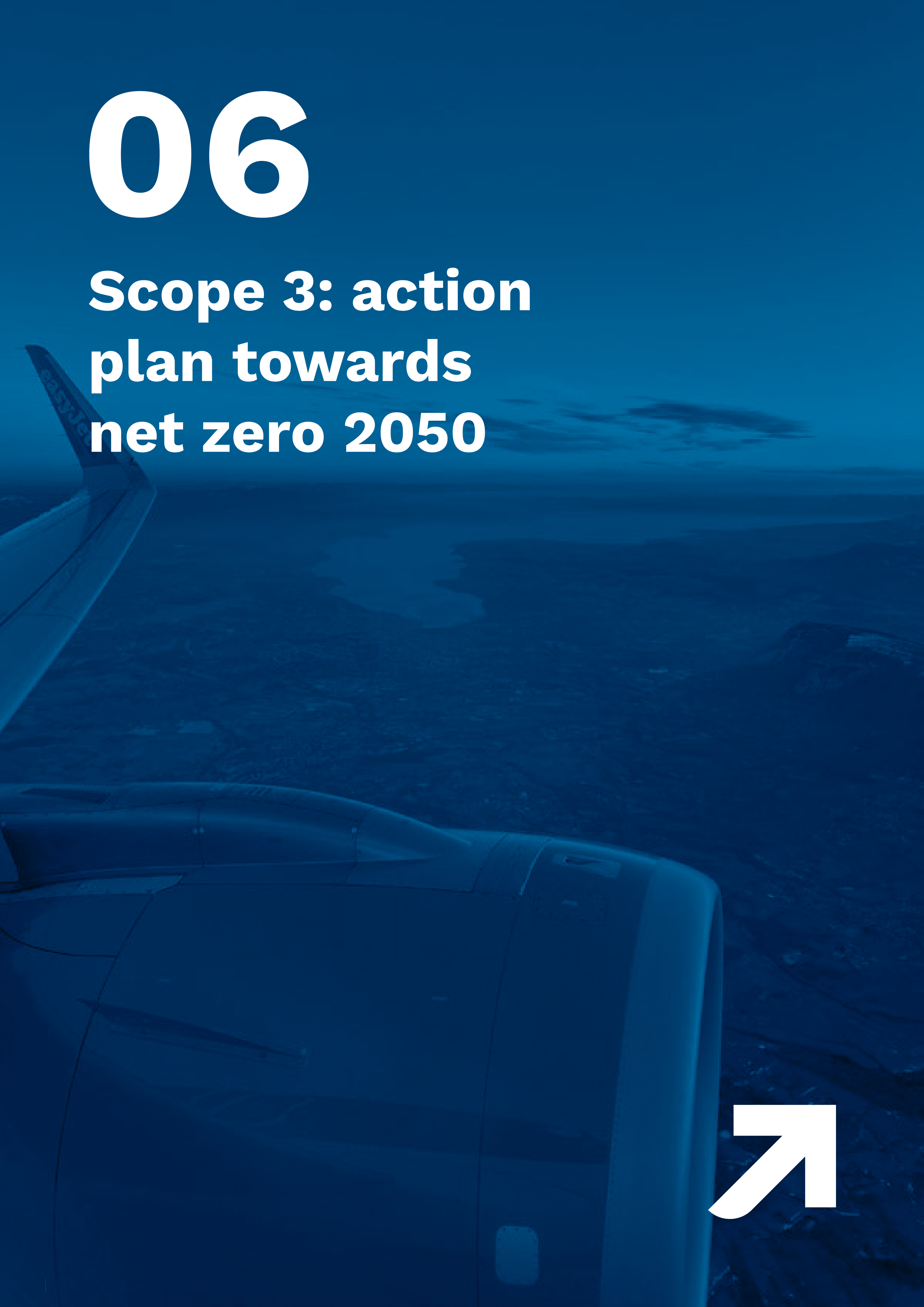


Figure 10: scopes 1 and 2 - distribution of residual emissions from scopes 1 and 2 following the implementation of the 2025-2037 action plan

It is worth noting that nearly two-thirds of residual emissions are associated with electricity purchased from the grid. However, Genève Aéroport exclusively purchases certified renewable electricity. Many airports report a zero emission factor under Scope 2 for renewable electricity, while reporting the emission coefficient under Scope 3.

06

Scope 3: action plan towards net zero 2050



To strengthen its commitments and actively contribute to the 2050 net zero goal of the air transport industry, Genève Aéroport has included Scope 3 in the framework of its greenhouse gas reduction strategy. Scope 3 covers emission sources outside Genève Aéroport's direct control, including those of airport concessionaires and airlines. It includes the vast majority of emissions recorded during the 2022 carbon inventory (section 3.2, figure 6). Figure 11 below details the emission sources of Scope 3.

Annex 3 provides an additional level of detail on the different emission sources.

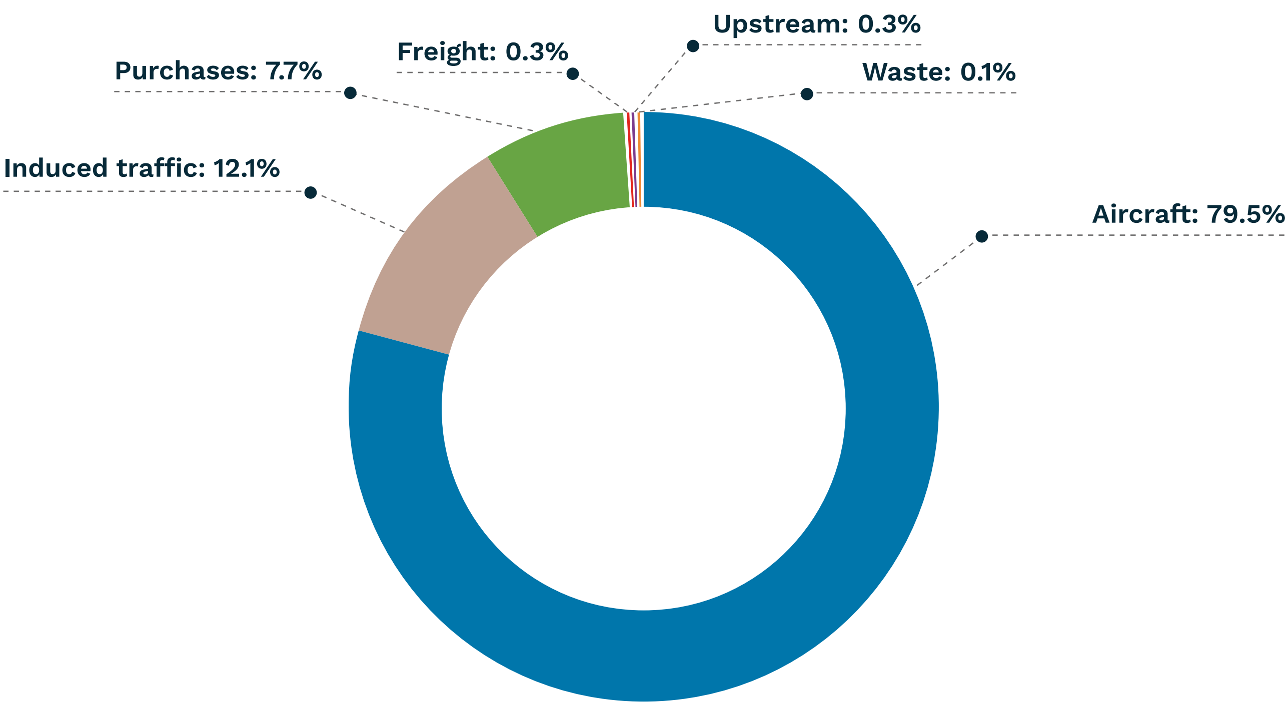


Figure 11 : 2022 carbon footprint scope 3 - emissions details, in %

Since the reduction targets for Scope 3 have a different timeline from those for Scopes 1 and 2, a reduction pathway specific to Scope 3 has been developed below.

Indeed, Genève Aéroport has set targets for all Scopes of its activities. Firstly, Genève Aéroport wishes to actively contribute to reducing 1990 emissions by 55% by 2030, a mid-term objective in line with the EU Fit for 55 (section 1.2). With a Scope 3 emissions footprint of 1,569,484 tCO_2e, this commitment requires a reduction of 910,312 tCO_2e by 2030.

Secondly, Genève Aéroport wants to actively contribute to achieving the net zero objective of the air transport industry for 2050, which is defined in this report as a 90% reduction in 1990 emissions, with a maximum level of 10% of residual emissions to be sequestered and stored, i.e. 146,483 tCO_2e. This objective requires a reduction of 1,423,001 tCO_2e.

As a reminder, the reduction measures outlined in the following chapter are not solely the responsibility of Genève Aéroport. They address indirect emissions on which the airport is dependent to continue its activity. However, Genève Aéroport's power of influence over certain emitting sources remains limited. Therefore, these measures aim to support and encourage other private or institutional stakeholders to reduce Scope 3 emissions in order to achieve net zero in 2050.

6.1 Scope 3 Action Plan, 2025-2050

6.1.1 Air Traffic Emissions

As shown in Figure 11, Scope 3 emissions are predominantly from air traffic, followed by, according to their their order of importance, induced traffic and purchases. Other sources account for less than 1% of the total. With regard to air traffic emissions, stakeholders (airlines, authorities, etc.) have collaborated within the framework of the Aviation Research Center Switzerland (ARCS)[16] roadmap to set up and quantify an action plan. This roadmap focuses on the following four sets of measures:

- Developing the SAF market: The most critical set of measures involves replacing fossil kerosene with biogenic and synthetic fuels (Sustainable Aviation Fuels, SAF). In this context, measures to develop the SAF market are applied at both the demand and supply levels. While international and transnational measures are a priority, these can be effectively supplemented by Swiss national measures.

- Promoting more efficient aircraft: promoting and encouraging the use of more fuel-efficient aircraft, particularly on long-haul routes, and in the medium and long term, the use of electric aircraft on short-haul routes and hydrogen-powered aircraft on short and medium-haul routes.

- Implementing operational measures: enhanced fuel-efficient air traffic organisation on the ground and in flight.

- Encouraging offsetting: short- and medium-term CO_2 offsetting through voluntary offsetting initiatives, participation in the European Emissions Trading System and the Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA), medium- and long-term development of global markets for negative emissions technologies (NETs) to reduce residual climate-impacting emissions.

These measures, their deployment up to 2050, their effects and the associated stakeholders are presented in the table, taken from the ARCS document.

2020	2025	2030	2040	2050	Main players	Secondary players

Compensation (> Chapters 3.5, Figure 3-9)

Measure	Main players
Classical offsetting as a voluntary measure / indirect incentives to encourage classic offsetting	
Development of a global market-based mechanism CORSIA+, ETS/EU-ETS+) for offsetting emissions of	ARCS
Implementation of the market-based offsetting mechanism for CO_2 and other gas emissions (NET markets such as CORSIA+, ETS/EU-ETS=)	
Research funding Technology	ARCS
Encouraging the scaling up of DAC production	

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[16] *Swiss Roadmap for Sustainable Aviation: Towards Decarbonisation of Air Transport. Ecoplan, commissioned by Aviaton Research Center Switzerland (ARCS). 27 May 2021*

2020	2025	2030	2040	2050	Main players	Secondary players

Use of SAF (> Chapter 3.6, Figure 3-24)

Need for clarification and coordination with other sectors

Clarification of the allocation of feedstocks for biofuels between sectors, including aviation

Possibility to use domestically produced renewable electricity for the production of synthetic fuels (PtL)

Coordination and fair burden sharing between the road and aviation sectors

Supply-side measures

Research concept / support for research, development for efficient and cost-effective production of fuels — ARCS

Financing concept / support for the scale-up of synthetic fuel production facilities (PtL, StL)

Encourage the development of booking and transaction platforms (e.g a booking system and omplaints system

Demand-side measures

Create the legal basis for participation in a quota of harmonised European fuel blend

Take-off, landing and airport taxes with incentive for refueling in SAF

Supply-side and demand-size measures

Airline ticket tax with industry agreement: obligation for airlines to refuel in SAF

Airline ticket tax to finance and offset tje price difference between SAF and fossil kerosene

More efficient aircraft (> Chapter 3.4, Figure 3-8)

Nice research strategy and action plan for «efficient aircraft concepts» / Switzerland's role in the development of new propulsion technologies. — ARCS

Provision of refueling infrastructure (hydrogen, electricity)

Use of fue-efficient aircraft (incentive mechanism)

Operationnal and infrastructural measures (> Chapter 3.3, Figure 3-7)

Airline navigation optimised in terms of fuel (flight scheduling, load reduction)

Air traffic management (Single European Sky, efficiency of extra-European ATM

Ground-based measures (decarbonation of airport activity, taxi emissions and use of APUs)

Optimised navigation in terms of climate (taking into account the effects of gases other than CO_2) (atmospheric research, operational implementation) — ARCS

2020	2025	2030	2040	2050

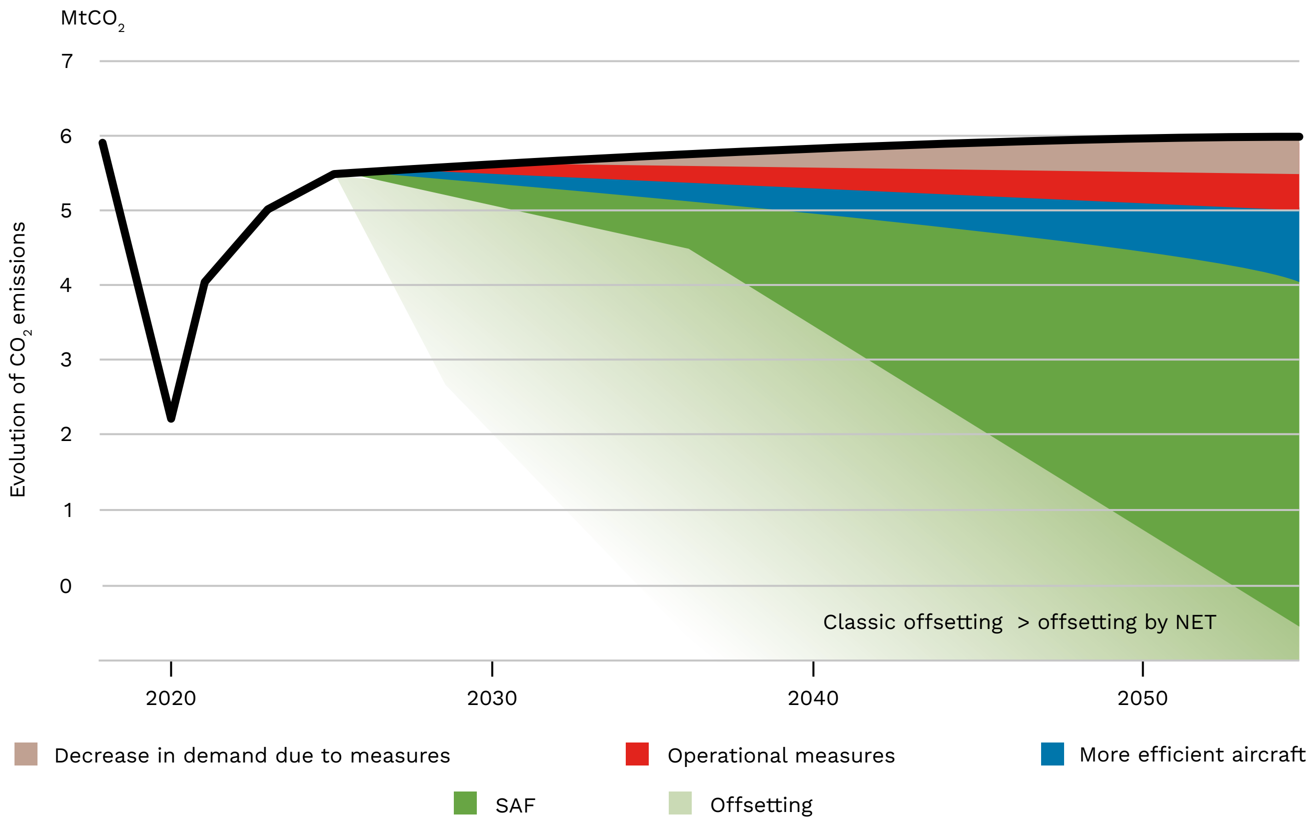
Periodic update of the «Roadmap Sustainable Aviation» for sustainable aviation/Monitoring and communication

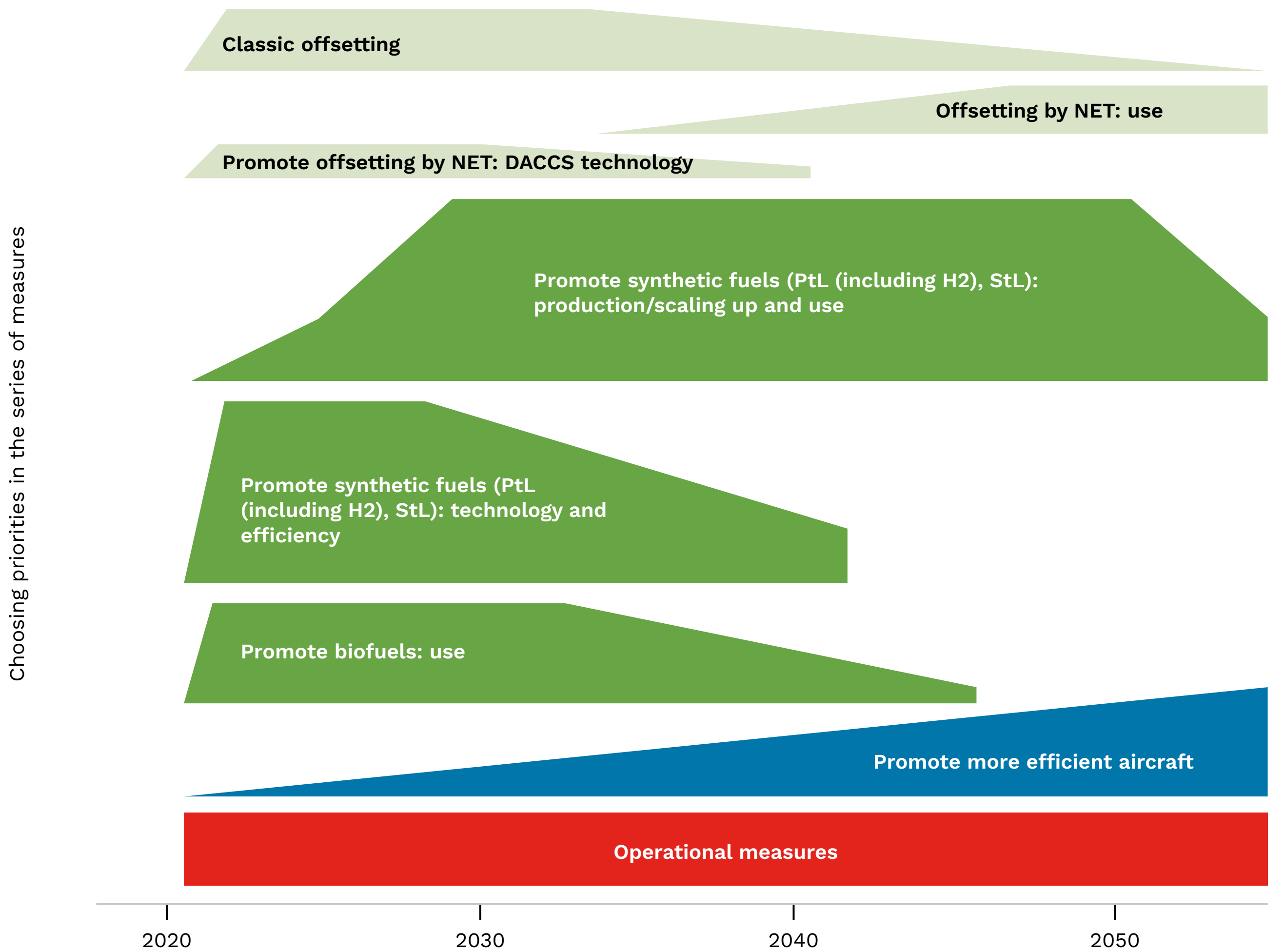
Swiss player | European, global player | Airlines | Swiss airports

ARCS Aviation Research Center Switzerland | ICAO | EU badies

Swiss institutions (federal government, federal offices, etc.) | Swiss, European or global company (with Swiss financial support)

The set of measures is broken down as follows, for all air traffic emissions in Switzerland:





The first figure shows that the main contribution to achieving the net zero CO_2 emissions target in aviation comes from the use of SAF. However, operational measures and the use of more efficient aircraft are also important factors. The role of offsetting in the long term is not yet decided and depends on the price of SAF and negative emissions technologies in the future. In the short and medium term, offsetting, beyond CORSIA as a voluntary and transitional measure, may be a logical contribution to reducing CO_2 emissions.

The second figure illustrates the choice of priorities in the series of measures. In the above context, “encourage” means, as well as direct financial support, also indirect incentive effects that encourage, among other things, the use of SAF. The coloured areas illustrate when and to what extent the measures are implemented: operational measures are permanent. Promoting more efficient aircraft is becoming increasingly important with the upcoming use of new propulsion technologies (electric and hydrogen-powered aircraft). Encouraging the use of biofuels allows the use of SAF to be launched quickly (“proof of concept”). In order to encourage the use of synthetic fuels, efficiency and technology must first be improved and, in the medium term, production facilities must be scaled up to reach large-scale industrial level and meet intensified use. Since synthetic fuels will remain more expensive than fossil kerosene in the long term, measures to promote the use of SAF also in the long term cannot be ignored.

As the ARCS document highlights, the roadmap requires collaboration between all bodies, both nationally and internationally (air traffic control, SAF production, development of more efficient aircraft, new technologies, etc.). It therefore makes no sense to roll it out locally, only for Genève Aéroport.

Nevertheless, Genève Aéroport is also actively participating in the implementation of these measures, notably in three main areas:
- Genève Aéroport encourages airlines to operate latest-generation aircraft, which are more fuel-efficient and quieter, by offering reductions on air charges to airlines showing increased use of such aircrafts
- Genève Aéroport will support airlines exceeding the legal SAF usage requirement from 2026 with financial incentives.
- Genève Aéroport continues to implement 400 Hz electrical power systems and pre-conditioned air (PCA) supply systems at aircraft parking positions. These devices reduce reliance on APUs in position, reducing aircraft emissions..

We therefore consider that, through the implementation of this roadmap, Scope 3 emissions related to air traffic can be neutralised by 2050. In its programme, ARCS estimates that approximately 5% of residual emissions will remain and will have to be removed from the atmosphere using negative emissions technologies (NETs). These residual emissions are shown in Table 5, also taking into account an increase in the number of aircraft movements of 1% per year between 2022 and 2050.

Therefore, the other measures listed below concern the other sources of emissions in Scope 3.

6.1.2 Other Scope 3 sources

For Scope 3 emission sources other than air traffic, the table below shows a series of actions to be implemented, along with their estimated CO_2 savings.

Measure	Impact	Implementation date	Gain (tCO_2e)	Stakeholders
Technological measures				
Electrification of the fleet of non-Genève Aéroport vehicles and other equipment on the tarmac	Reduction in fossil fuel consumption, replaced by electricity consumption	Progressive renewal to reach 90% by 2030	1,956	Airport companies, Genève Aéroport
Use of partially renewable road fuel for non-Genève Aéroport vehicles and equipment on the tarmac and which cannot be electrified	Reduction of the CO_2 impact of the fuel used	2035	159	Airport companies, Genève Aéroport, oil companies
Measures involving Genève Aéroport stakeholders				
Increase in sustainable passenger modal shares	Reduction in the use of motorised individual transport (MIT), therefore CO_2	2030 goal: 58% non MIT	8,066	TPG, CFF, OCT, Municipalities
Increase in sustainable employee modal shares	Reduction in the use of motorised individual transport, therefore CO_2	2030 goal: 44% non MIT	2,026	TPG, CFF, OCT, Municipalities
Strengthening of sustainability and CO_2 goals in the criteria of Genève Aéroport purchases	Reduction of embodied energy included in the purchases of Genève Aéroport and its concessionaires	Goal: 60% CO_2 reduction in 2050	72,528	Genève Aéroport
Passive measures				
Electrification of passenger and employee vehicle fleet	Electrification of private vehicles and buses according to national and European legislation	20% fewer emissions in 2030, then increase to 90% in 2050	170,879	-
Evolution of the EF of electricity SIG Vital Vert	Evolution of the EF of non-operated electricity (SIG discovery: 20% Vital vert, 80% Vital blue)	SIG estimates for 2030 and 2050	16	SIG
Change in network losses	Reduction in network losses following the reduction in emissions related to heating (GeniLac, district heating) and electricity (SIG discovery)	SIG estimates for 2030 and 2050	40	SIG
Transport of goods (freight)	Electrification of vehicles according to national and European legislation	75% fewer emissions in 2050	4,096	-
Total CO_2 savings in 2050			247,677	

In conclusion, if we take the sources of Scope 3 emissions in 2022, and compare them to the savings linked to the action plan, we obtain the following result:

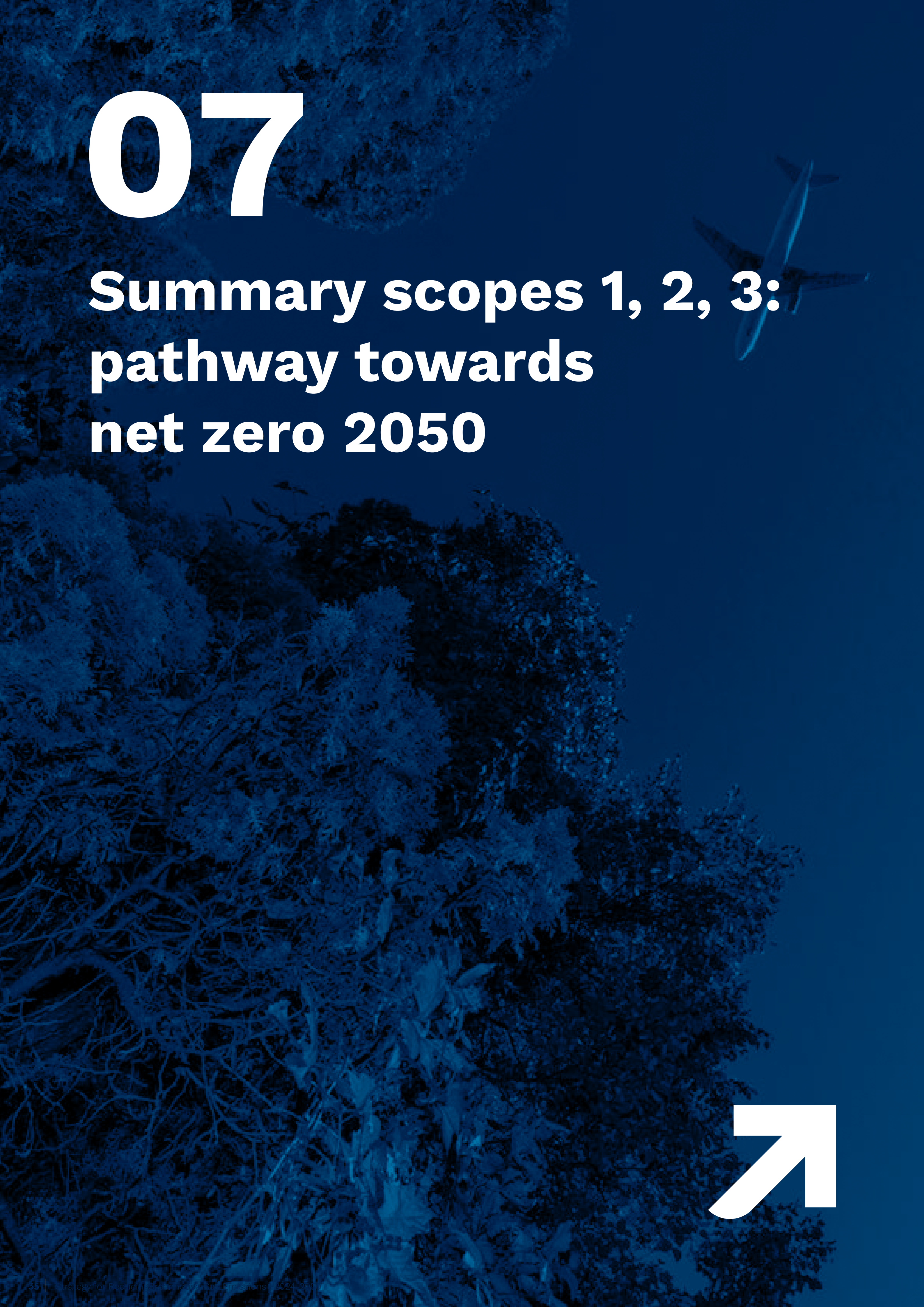
	Scope 3 2022	Scope 3 2050	
Air traffic	1,247,532	82,418	ARCS measures
Induced traffic	189,865	8,895	Change in modal shares and fleet electrification
Purchases	120,880	48,352	Introduction of sustainability criteria purchases
Waste	1,244	1,244	
Goods transport (freight)	5,461	1,365	Freight fleet electrification
Tarmac vehicles excluding Genève Aéroport and upstream	4,501	2,330	Fleet electrification and biodiesel
Total	**1,569,483**	**144,603**	These emissions will be sequestered by the stakeholders concerned

Residual emissions sequestered under the ARCS measure plan

Residual emissions sequestered as part of the confederation's net zero objective

Table 4: summary of residual emissions in 2030 following implementation of the action plan

Table 4 above illustrates the expected reduction of the various emission sources for Scope 3, in application of the measures discussed above. These measures are expected to reduce emissions to a value below the target of 10% of 1990 emissions.



07

Summary scopes 1, 2, 3: pathway towards net zero 2050

To conclude, with regard to Scopes 1 and 2, the initiatives currently implemented at Genève Aéroport are expected to deliver an 80% reduction in emissions from the 2022 carbon footprint by 2028, which largely exceeds the mid-term objective of a 60% reduction by 2028.

To achieve net zero in 2037 for Scopes 1 and 2, the measures currently planned are sufficient to achieve a 93% reduction in 1990 emissions, thereby exceeding the target set by 3%.

The net zero 2050 objective focuses on Scope 3, which constitutes the majority of emissions in the airport's carbon footprint, within the categories of "Air transport", "Movement of people" and "Purchases".

The "Scope 3" action plan brings together measures targeting these major emission items. Through the measures proposed in its action plan, Genève Aéroport is expected to reach a total carbon footprint of just over 144,000 tCO_2e in 2050, thus achieving the goal of reducing 1990 emissions by 90%.

The planned measures require collaboration and involvement of all stakeholders in the air transport industry and society. Genève Aéroport is committed to playing a leading role, and has already begun implementing numerous measures to support this roadmap.

Year	1990	2022	2037 goal*	2037 emissions expected following implementation of action plan	
Scope 1+2	10,181	7,439	1,018	806	These residual emissions will be sequestered by Genève Aéroport
Year	1990	2022	2050 goal*	2050 emissions expected following implementation of action plan	
Scope 3	1,464,827	1,569,484	146,483	144,603	These residual emissions will be sequestered by the stakeholders concerned

one tenth of 1990 emissions

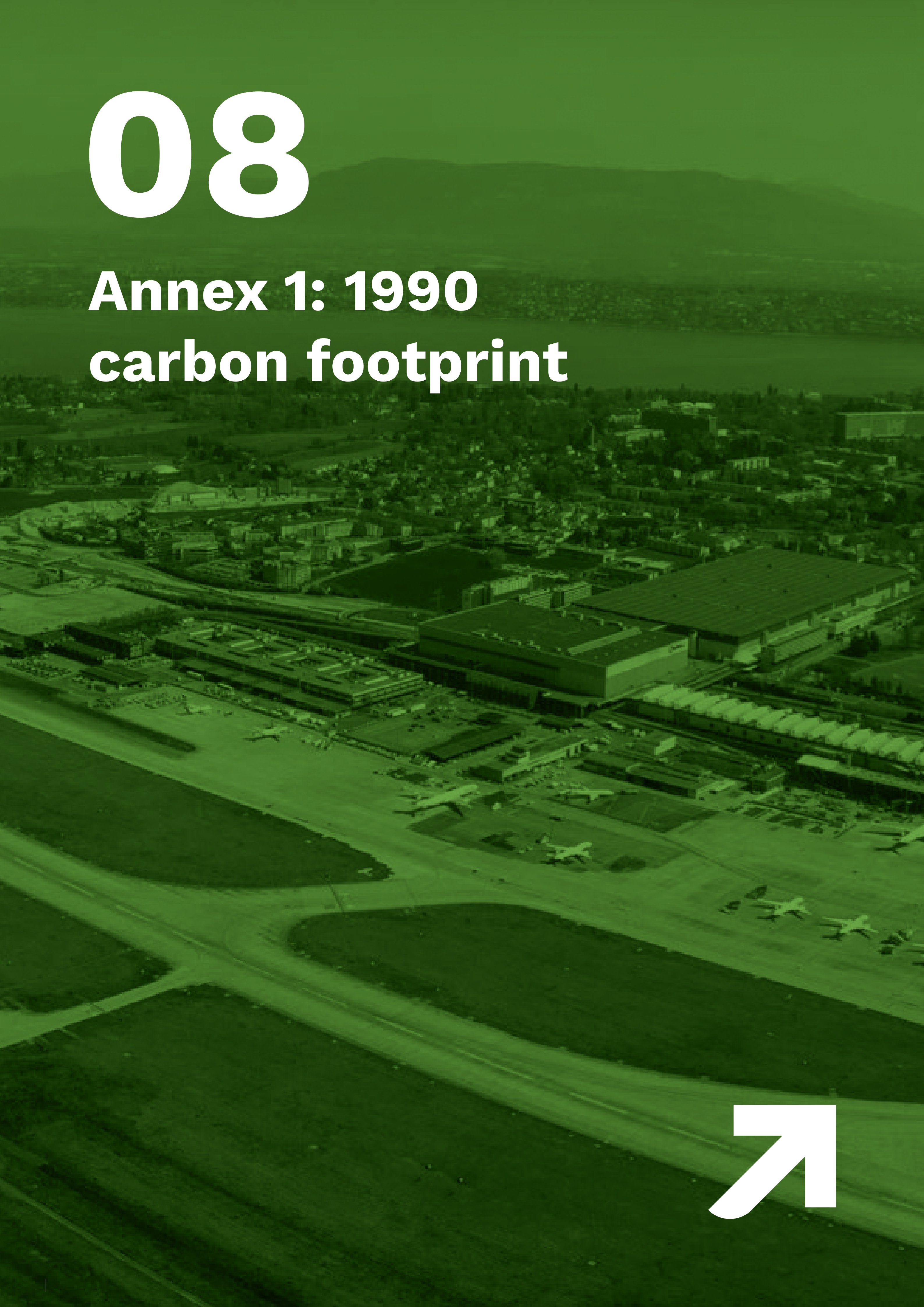
Table 5: summary of measured emissions and those forecast following implementation of the action plan

Residual emissions from Scopes 1 and 2 have been offset by Genève Aéroport since 2017, in accordance with the targets agreed with the canton. As carbon capture technologies advance, offsets will be replaced by carbon capture and sequestration (Neutral Emission Technology).

With regard to Scope 3 emissions, the offsetting and eventual capture of residual emissions will be managed through the relevant programmes concerned, as presented in Table 5 above.

08

Annex 1: 1990 carbon footprint



Spreadsheet for Scopes 1 and 2

SIMPLE CARBON FOOTPRINT CALCULATION

Airport name:	Aéroport International de Genève	FAA/IATA Code:	GVA
12 month period used for this calculation	From (mm/yy) 01/01/1990	To (mm/yy)	31/12/1990

Scope 1 - Direct Emissions

Stationary sources

Source	Fuel used	Quantity	units	Emissions factor	units	Annual emissions (te CO_2)	Data source	Emissions factor notes
Boilers, light oil	Mazout	33 048,0	MWh	73,7	gCO2/MJ	8 768,3	Enerplan annual report	Emission factor Suisse OFEV
Heating, gas	Natural gas	0,0	MWh	56,4	gCO2/MJ	0,0	Enerplan annual report	Emission factor Suisse OFEV
Fire fighting exercises								
Diesel use for emergency groups	Diesel	20,0	m3	2,62	kgCO2/l	52,4	Estimated for AEnEc 2000	ACA documentation and guidance

Mobile sources

Source	Fuel used	Quantity	units	Emissions factor	units	Annual emissions (te CO_2)	Data source	Emissions factor notes
Diesel use for vehicules	Diesel	76,557	m3	2,62	kgCO2/l	200,6	1992 data	Emission factor Suisse OFEV 2015
Gasoline used for vehicule	Gasoline	104,87	m3	2,32	kgCO2/l	243,3	1992 data	Emission factor Suisse OFEV 2015
CNG used for vehicule	Compressed Natural Gas	0	m3	2,58				Emission factor Suisse OFEV 2015

Other

Source		Quantity	units	Emissions factor	units	Annual emissions (te CO_2e)	Data source	Emissions factor notes
Refrigerant leakage	R22	0	kg	1810	kgCO2/kg	1110	Estimate based on 3x average leakage from 2019 to 2023. We take a factor of 3, because in 1990, there were no rules on refrigerant recovery. When a machine had a problem, the technicians emptied the whole machine, without any recovery.	

Scope 2 - Indirect Emissions

Source		Quantity	units	Emissions factor	units	Annual emissions (te CO_2)	Data source	Emissions factor notes
Purchased electricity, SIG blue		44 683,0	MWh	12,4	gCO2/kWh	554,1	Enerplan annual report	SIG vitale bleue: http://www.sig-ge.ch/particuliers/electricite/choisir-mon-electricite/sig-vitale-bleu/index.lbl

Calculations for Scope 3

For Scope 3, we only have the quantity of kerosene distributed in 1990, but also the following indicators:

	1990	2022	
Sustainable passenger modal share	30	49	%
Sustainable employee modal share	19	39	%
Average vehicle emissions	222	164	gr CO_2/km
Aircraft movements	150,000	163,168	
Passengers	6,020,000	14,285,280	

Sources : 1990: Environmental impact report of the application for renewal of the operating concession, 2022: extra-financial performance report. Vehicle emissions: database “The Handbook of Emission Factors for Road Transport”, https://www.hbefa.net/

We calculate the amount of CO_2 associated with the kerosene distributed. It is interesting to see that this amount is very close to that of 2022, despite the number of passengers being half as much. This is attributable to improvements in the fleet, but also the transfer of most of Swiss’ long-haul flights to Zurich.

For induced traffic, we consider the number of kilometres travelled by passengers in 2022. We deduce the number travelled in 1990 by taking into account the number of passengers in 1990, but also the higher modal share for cars. From these kilometres, we calculate CO_2 emissions based on the average emission factor for the 1990 vehicle fleet. This allows us to calculate the 1990 emissions related to induced traffic.

For other emission sources, a simple rule of 3 is applied based on 2022 emissions and on the number of aircraft movements.

The table below summarises the results obtained.

	Scope 3 in tonnes of CO_2			Scope 3 in % of total	
	1990	2022		1990	2022
Aircraft	1,218,273	1,247,532	tCO_2	83.2%	79.5%
Induced traffic	125,127	189,865	tCO_2	8.5%	12.1%
Purchases	111,126	120,881	tCO_2	7.6%	7.7%
Freight	5,020	5,461	tCO_2	0.3%	0.3%
Waste	1,144	1,244	tCO_2	0.1%	0.1%
Upstream	4,138	4,501	tCO_2	0.3%	0.3%
Total	**1,464,827**	**1,569,484**			

calculation of the figure based on kerosene sales for aircraft, and based on assumptions

Without further information, ratio of the 2022 figure to aircraft movement

09

Annex 2: 2022 carbon footprint: methodology

9.1 Calculation of GHG emissions

In order to plan its pathway towards its emission reduction targets, Genève Aéroport has carried out an inventory of carbon emissions associated with its activities. This includes the reassessment of GHG emissions from Scopes 1 and 2, following the renewal of an initial carbon footprint dating from 2017, as well as from Scope 3.

The assessment of GHG emissions is based on the latest version (8.8) of the ABC Carbon Footprint tool. This instrument is widely recognised as the benchmark in Europe and has been used notably to calculate the carbon footprint of Canton Geneva. This accounting of GHG emissions, based on available data, assesses both the direct and indirect emissions generated by Genève Aéroport.
GHG emissions are assessed and prioritised by emission items in accordance with the GHG Protocol. This methodology uses the global warming potential of each emission source, including upstream, to calculate CO_2 equivalent emissions (CO_2eq, or CO_2e).

Emission factors are sourced from internationally recognised databases such as Ecoinvent, KBOB, mobilitools, Agribalyse, Base empreinte (Ademe).

The carbon footprint of Genève Aéroport includes Scopes 1, 2 and 3, namely emissions directly generated by fixed and mobile sources owned or controlled by Genève Aéroport (Scope 1), indirect emissions generated by energy consumption (Scope 2) and other indirect emissions linked to the airport's activities (Scope 3). More specifically, the following items were taken into consideration:

Scope 1

- Fuel for heating buildings and emergency generators
- Fuel for vehicles/machines belonging to Genève Aéroport
- Refrigerant gas losses from cooling installations.

Scope 2

- Electricity consumption on the grid (guarantees of origin)[17]
- District heating

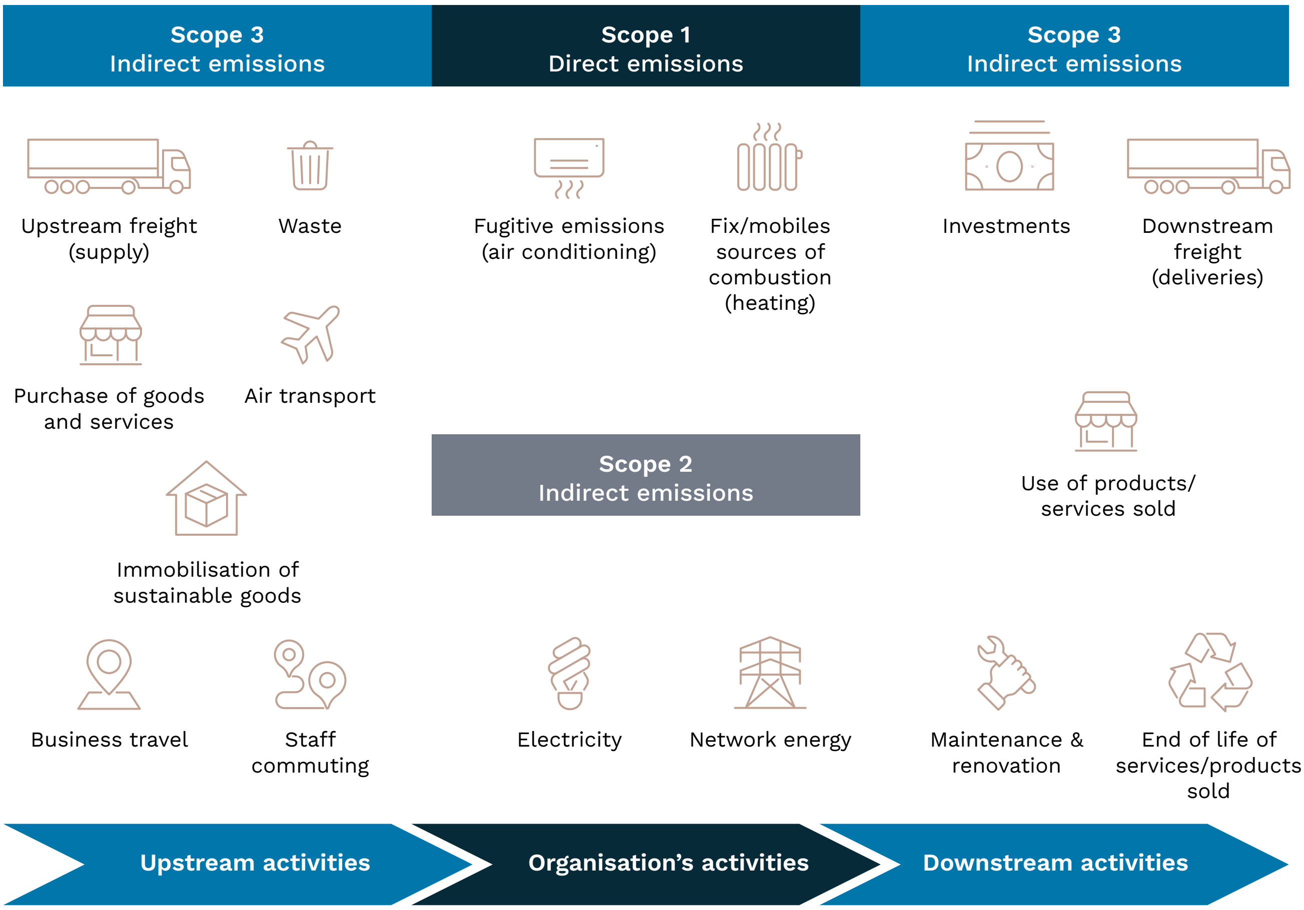


Figure 12: mission sources of a carbon footprint

Scope 3

- Direct purchases by Genève Aéroport
- Indirect purchases by Genève Aéroport shopping arcades
- Commuting by Genève Aéroport employees and shopping arcade employees
- Genève Aéroport employee business travel
- Visitor (passenger) travel
- Goods transport (upstream-downstream)
- Aircraft movements (total kerosene sold by the airport, FOCA method)
- Waste production
- Energy-related emissions not included in Scopes 1 and 2

9.2 Exploration of measures to reduce emissions and development of an action plan

9.2.1 Exhaustive list of best practices/ potential actions

To develop its action plan, Genève Aéroport consulted the community and stakeholders concerned. At the same time, a review of the measures implemented in other airports was carried out, leading to an inventory of best practices and potential actions. From this, the most appropriate solutions to achieve the airport's objectives were selected. The measures of the action plan were chosen based on the following criteria:

1. Risks associated with the implementation of the measure;
2. Implementation timelines and requirements;
3. Cost and return on investment;
4. Energy savings and impact on the reduction of GHG emissions.

9.2.2 Defining the net zero pathway

In order to define a pathway, several scenarios were developed (Figure 14) using the most relevant measures, available financial resources and target years. Intermediate targets were then defined to assess progress towards long-term objectives. These intermediate milestones ensure consistency with the pathway, while providing flexibility in order to adapt to changing circumstances in the short and medium term.

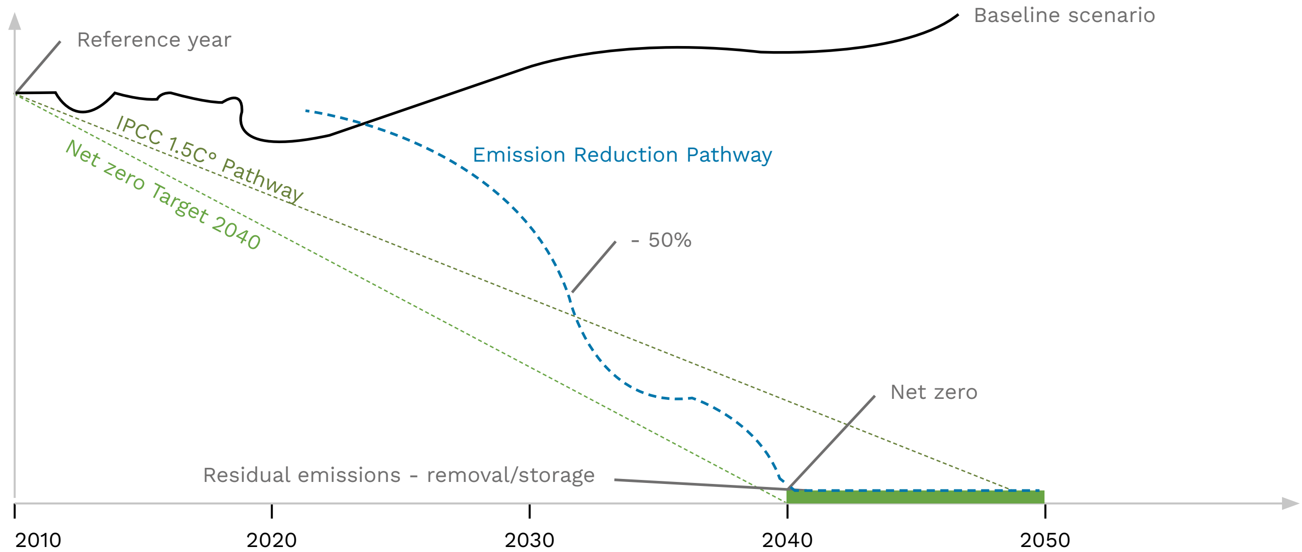


Figure 13: example of an emission reduction pathway to achieve net zero

[17] *In accordance with the GHG Protocol methodology, emissions from 100% renewable electricity should be zero, with only upstream emissions accounted for in Scope 3. However, Genève Aéroport wishes to include electricity in its Scope 2 scope of action, recognising its direct impact on its consumption and type of consumption.*

10

Annex 3: 2022 carbon footprint: Genève Aéroport emissions inventory

The results of the Genève Aéroport carbon footprint assessment (Figures 14 and 15) highlight the importance of each emission item. Thus, the different GHG emission items can be identified and prioritised, in order to define and prioritise the actions to be taken.

10.1 Summary of emissions by emission items: Scopes 1, 2 and 3

In 2022, the total carbon footprint of Genève Aéroport was 1,576,833 tonnes of CO_2eq. The largest emission item is "Air transport", accounting for 79% of emissions, with 1,247,532 tCO_2eq. This item covers the total fuel sold by Genève Aéroport to aircraft (private business jets, scheduled flights, APUs and aircraft testing).

The other two emission items that stand out are "Movement of people" and "Purchases". "Movement of people" represents 12% of emissions, with 189,865 tCO_2eq. This mainly includes passenger travel, employees' commuting and business travel. The "Purchases" item, with 120,881 tCO_2eq, represents 8% of all Genève Aéroport emissions and refers to airport purchases and purchases by airport concessionaires.

The other items that complete the carbon footprint are: "Energy" (0.4%), "Non-energy" (0.1%), "Upstream and network losses" (0.3%), "Transport of goods" (0.3%), and
"Waste"(0.1%).

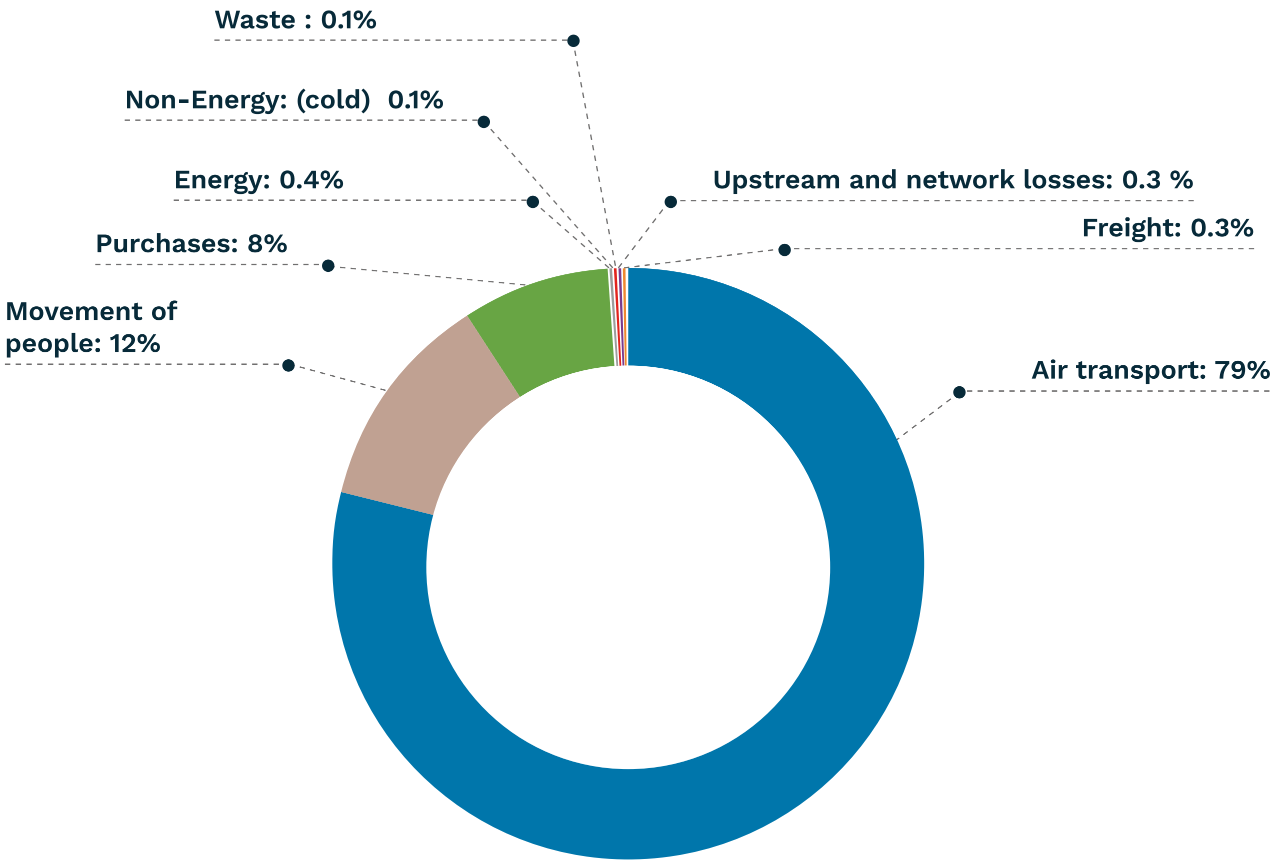


Figure 14: 2022 Genève Aéroport carbon footprint: details by emission items, in %

Below, Figure 15 provides a view of all emission items with the uncertainties associated with the data and emission factors.

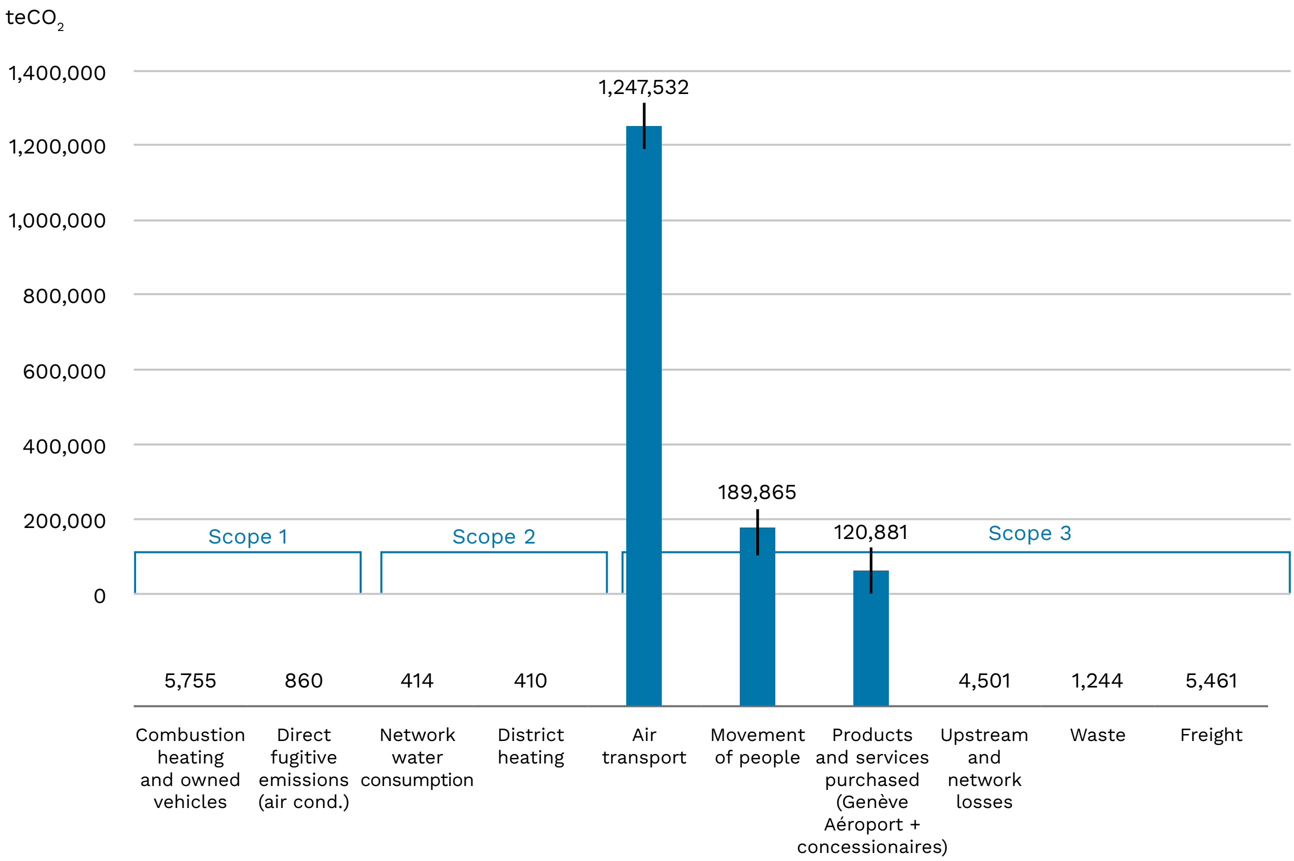
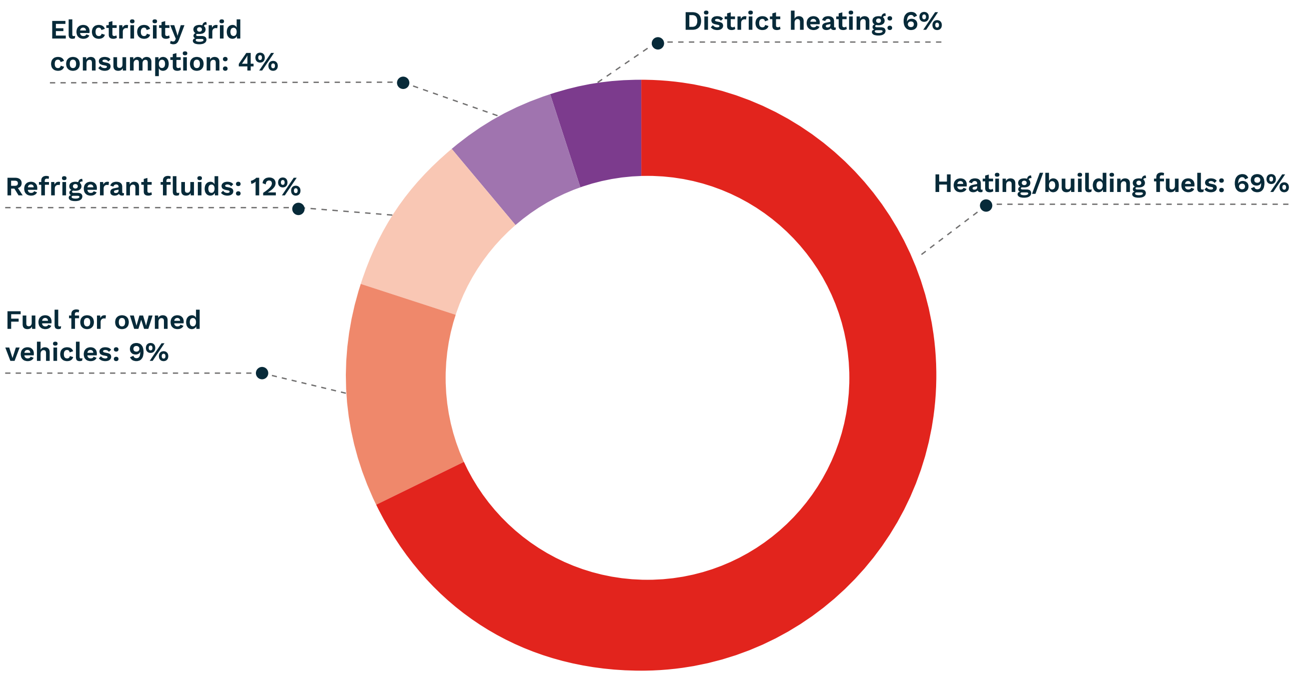


Figure 15: 2022 genève aéroport carbon footprint: details by emission items and associated uncertainties, in tCO_2eq

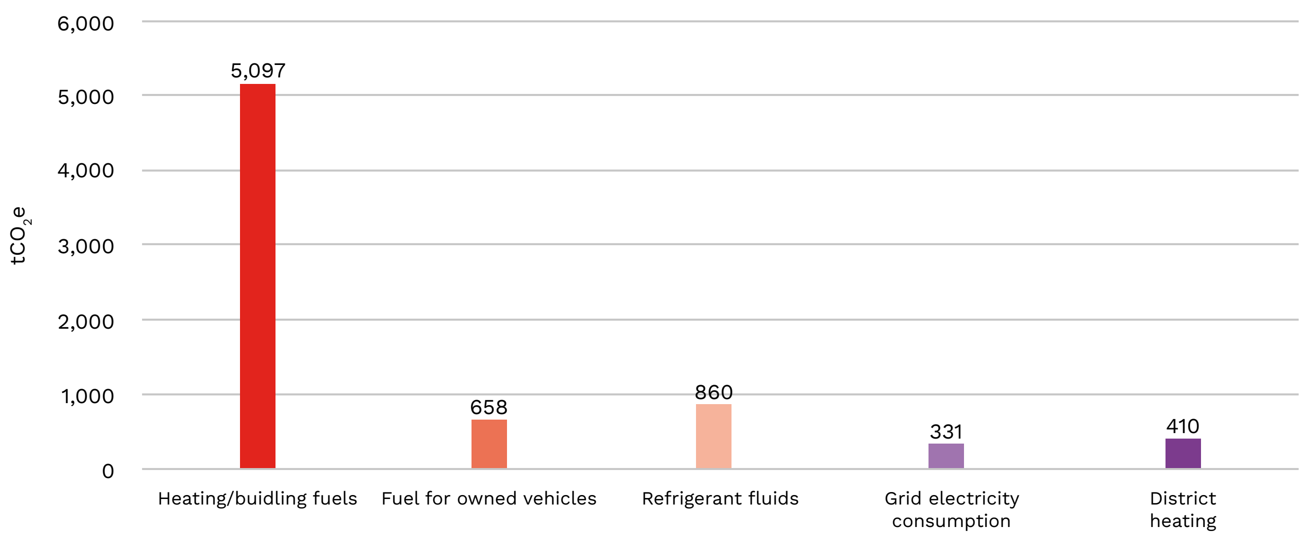
10.2 Summary of emissions by items: Scopes 1 and 2

The “Energy” and “Non-Energy” emissions related to Scopes 1 and 2 represent 7,357 tCO_2eq, or 0.5% of the airport’s carbon footprint. Direct emissions (Scope 1) include those from the heating of the building (oil and natural gas), air conditioning leaks and the fuel of vehicles owned by Genève Aéroport. Indirect emissions (Scope 2) include emissions from district heating (DHC) and electricity purchased on the grid.

Scope 1 and 2: GHG emissions by item, in %

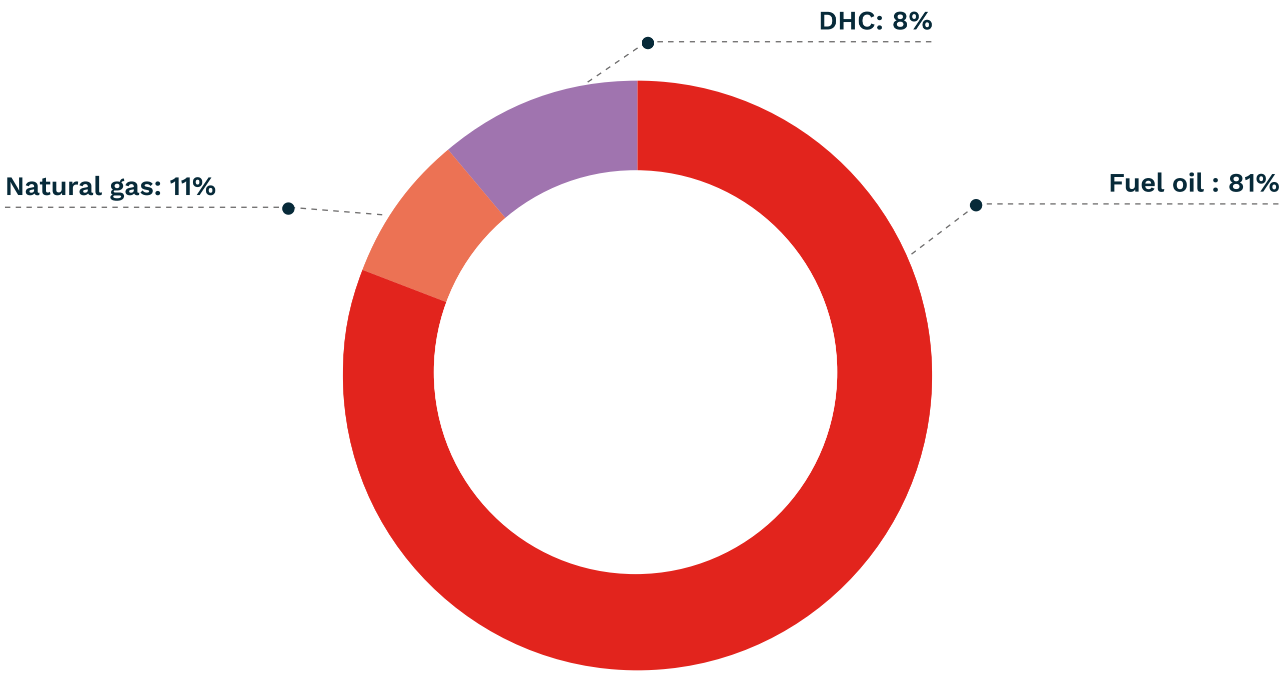


Scope 1 and 2 : GHG emissions by item, in tCO_2e

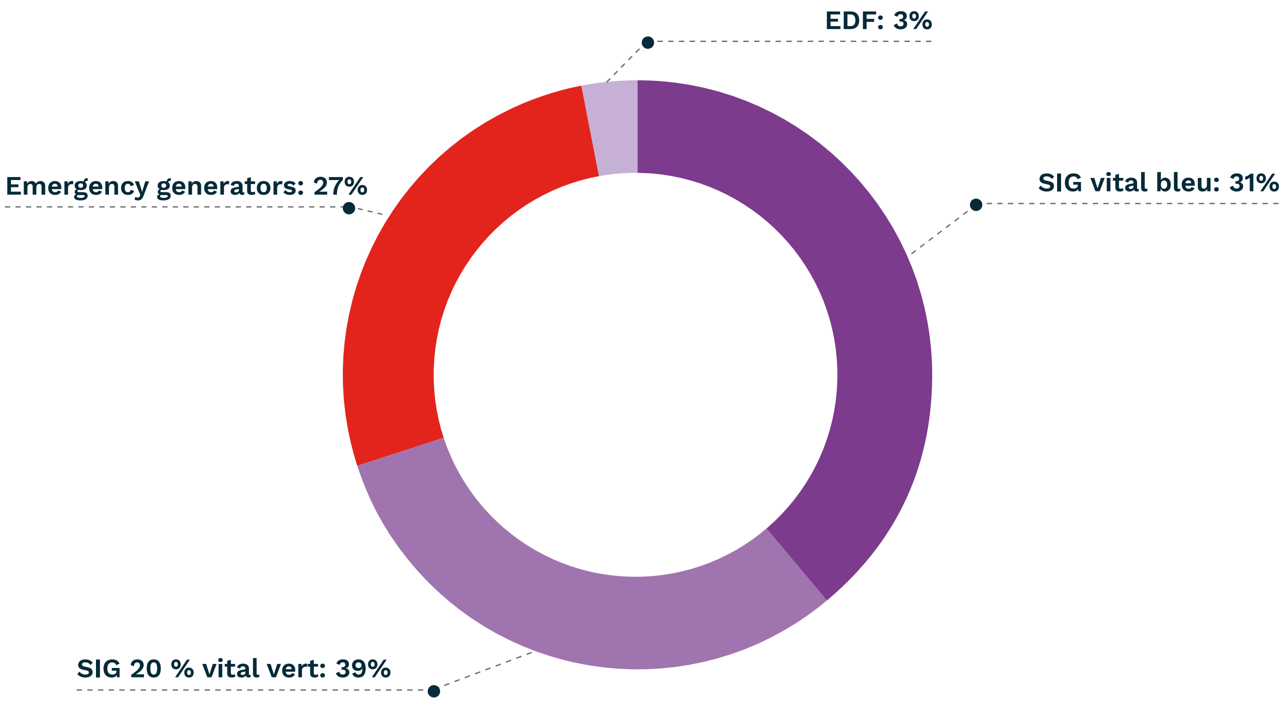


As for its heating consumption, Genève Aéroport produces (Scope 1) 16,527 MWh directly on site with its boilers, which emits 4,384 tCO_2eq, and 2,915 MWh with its natural gas heating, generating 587 tCO_2eq. The remaining 3,979 MWh are purchased for its district heating (DHC, Scope 2), which emits 410 tCO_2eq.

Heating: GHG emissions, in %



Electricity: GHG emissions, in %



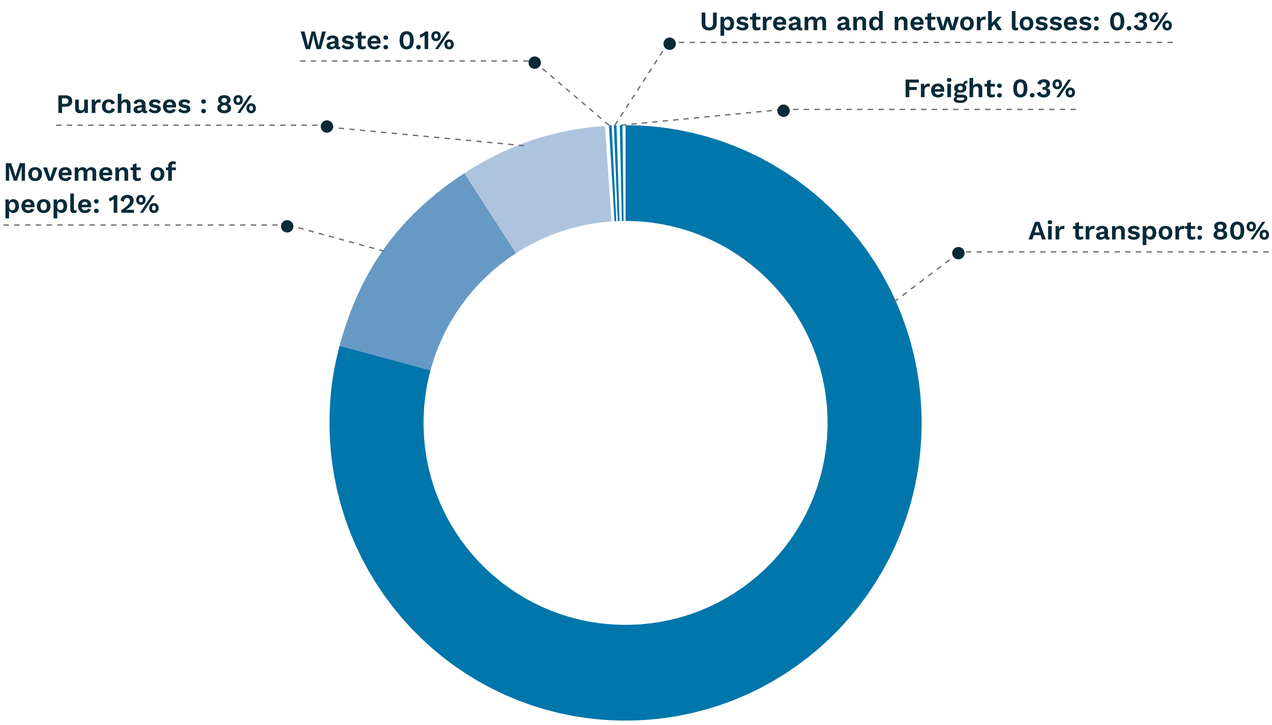
The airport's photovoltaic panels produce 1,306 MWh of electricity, which emits 53 tCO_2eq (including network losses). However, these emissions are only upstream (Scope 3, "Upstream and network losses" item), and the emissions generated by the direct use of this electricity are zero. The other 45,575 MWh of electricity consumed by the airport are purchased in Switzerland (SIG) and France (EDF). This electricity purchased and consumed on the network emits 331 tCO_2eq. Emergency generators (Scope 1) are powered by diesel and contribute to 27% of electricity-related emissions in 2022.

Emissions from fuel consumption by Genève Aéroport vehicles represent 10% of Genève Aéroport's Scope 1 emissions, and 12% are represented by emissions generated by refrigerant leaks.

10.3 Summary of emissions by items: Scope 3

Scope 3 alone represents 99% of Genève Aéroport's 2022 carbon footprint, totalling 1,569,484 tCO_2e of GHG emissions. 80% of these emissions are grouped under the "air transport" item, 12% are due to the movement of people, and 8% to purchases by the airport and its concessionaires. The "waste", "goods transport" and "upstream and network losses" items are minimally represented, covering less than 1% of Scope 3 emissions.

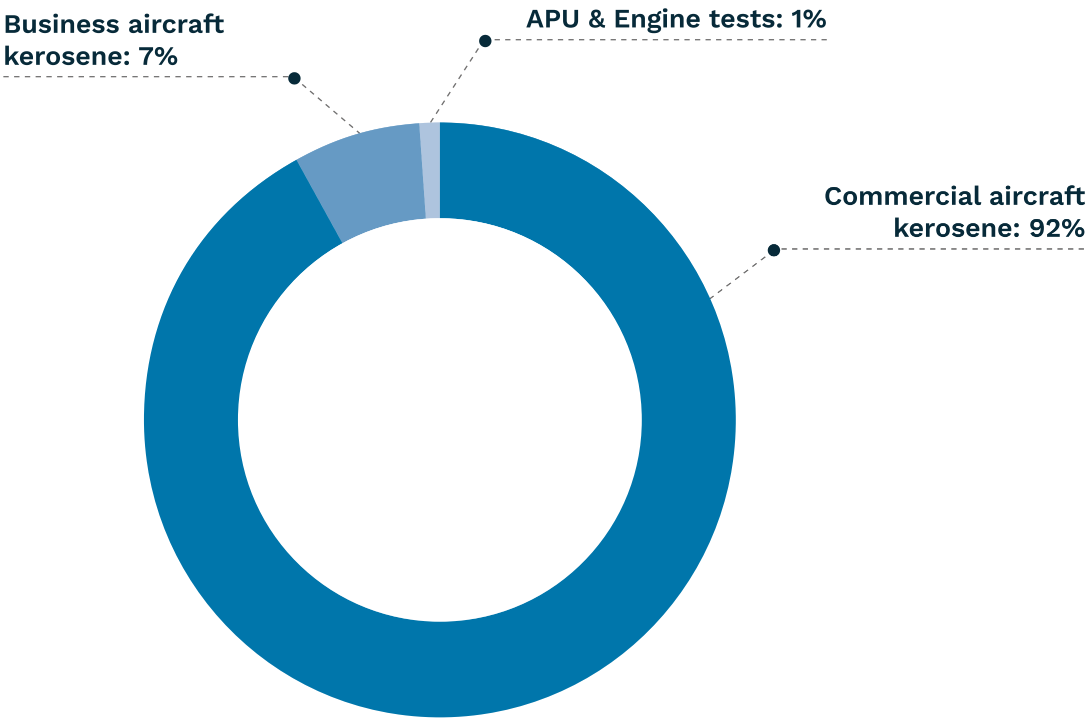
2022 Carbon footprint Scope 3: Emission details, in %



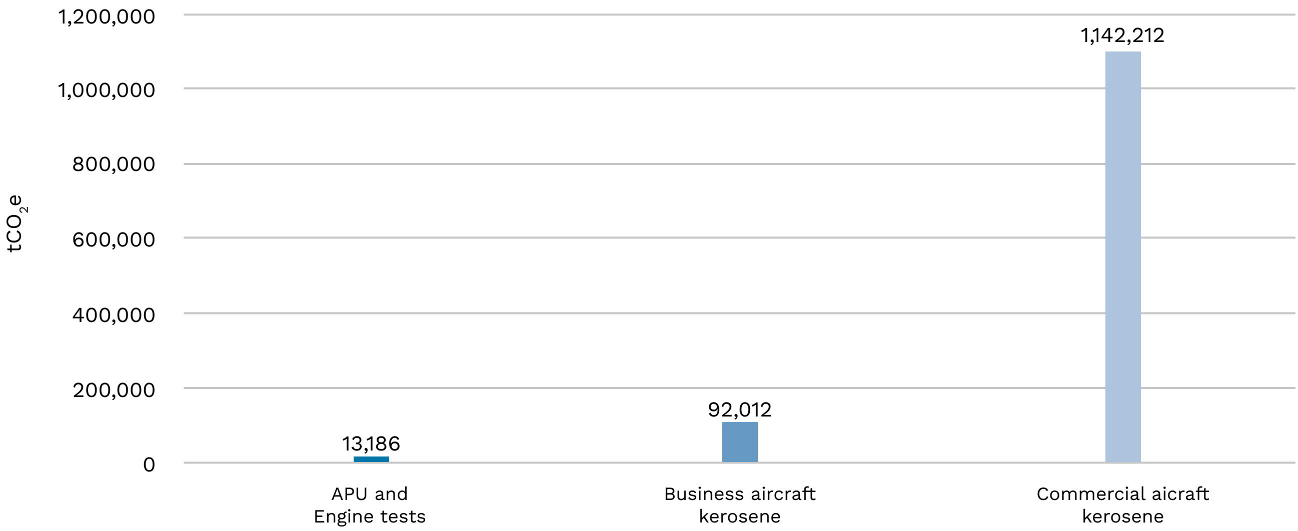
10.4 Indirect emissions from aircraft movements (Scope 3)

Emissions from aircraft movements take into account the airport's total kerosene sales, and represent 79% of the total carbon footprint with 1,247,409 tCO_2eq. This item is the largest in the carbon footprint, and includes emissions from commercial aircraft as well as those from business aircraft (private jets), and ground operations. In terms of ground operations, the airport emits 12,631 tCO_2e for the APU and 555 tCO_2e for engine tests.

Aircraft movement: Indirect GHG emissions (Scope 3) by item, in %



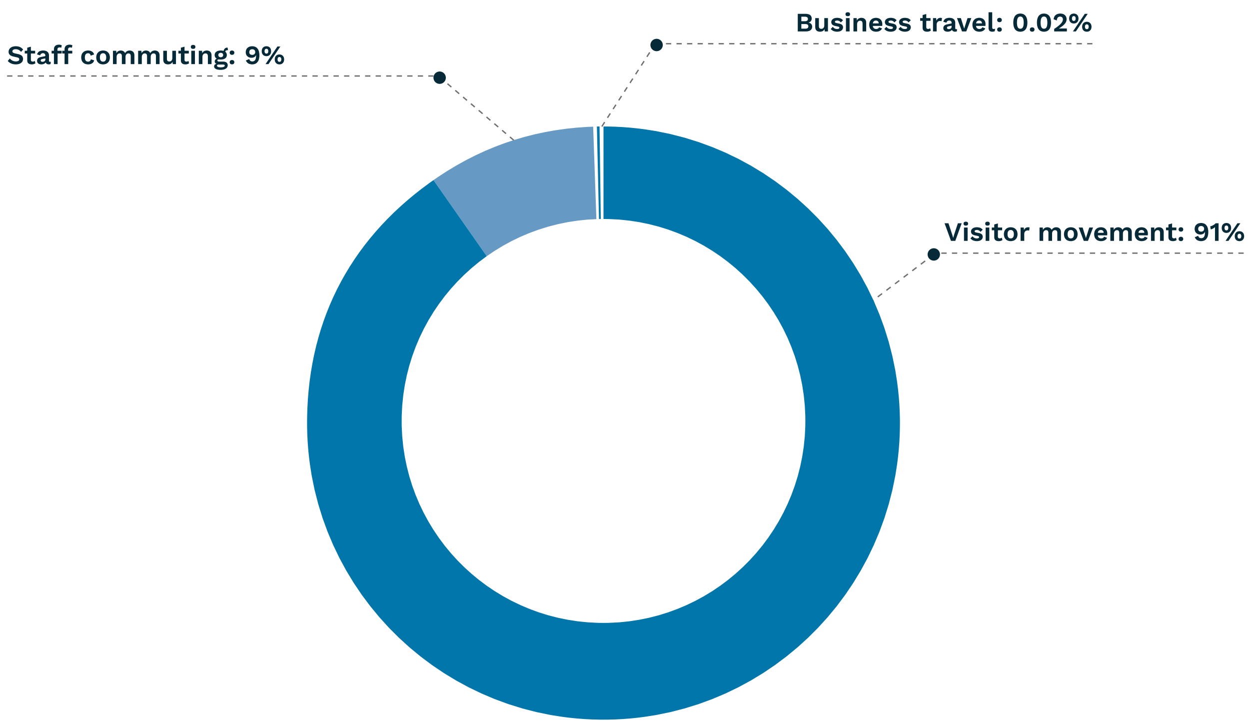
Aircraft movement: Indirect GHG emissions (Scope 3) by item, in tCO2



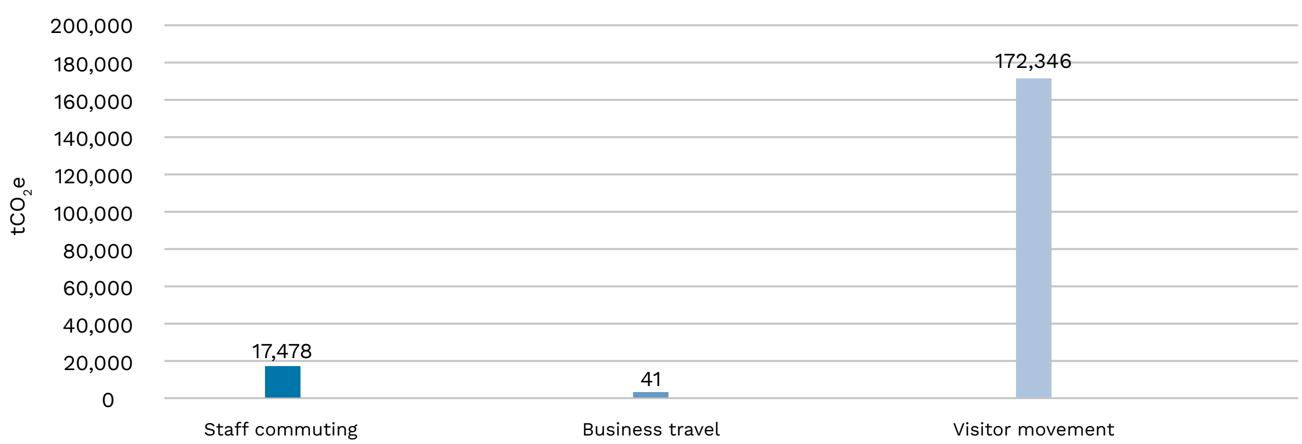
10.5 Indirect emissions related to the movement of people (Scope 3)

The second largest item in the carbon footprint is related to the movement of people, with 189,865 tCO_2eq, which represents 12% of all Genève Aéroport emissions. This item is divided into 3 categories: commuting of Genève Aéroport employees, Genève Aéroport business travel, and visitor movement. Of these categories, the largest is visitors (91% of the "Movement of People" item), with some 172,346 tCO_2eq. Staff commuting emissions amount to 17,478 tCO_2eq (9% of the "Movement of People" item), and those from employees' business travel amount to 41 tCO_2eq (1% of the "Movement of People" item).

Aircraft movement: Indirect GHG emissions (Scope 3) by item, in %



Aircraft movements: Indirect GHG emissions (Scope 3) per position, in tCO_2e



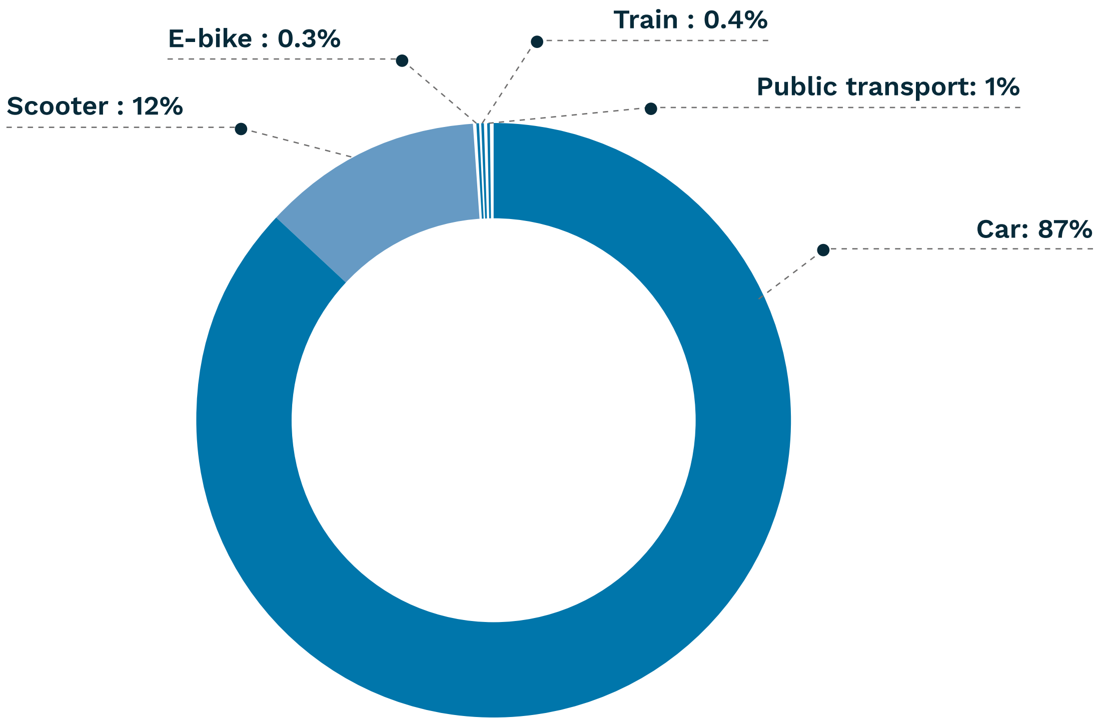
10.5.1 Staff commuting

Emissions from staff commuting include both Genève Aéroport and airport concessionaires' employees. The latter were included in this item, as they were part of the mobility survey carried out in 2022.

Following this survey, the travel habits of all Genève Aéroport employees were highlighted. Considering only emissive modes of transport, 55% of commuting kilometres travelled are by car, representing 87% of staff commuting emissions. 16% of the kilometres are travelled by public transport (1% of emissions), 14% by scooter/motorcycle (11% of emissions), 10% by train (0.4% of emissions) and 5% by electric bicycle.

In total, employee emissions amount to 17,478 tCO_2eq, representing 9% of the "Movement of People" item.

Indirect GHG emissions of staff commuting, in %

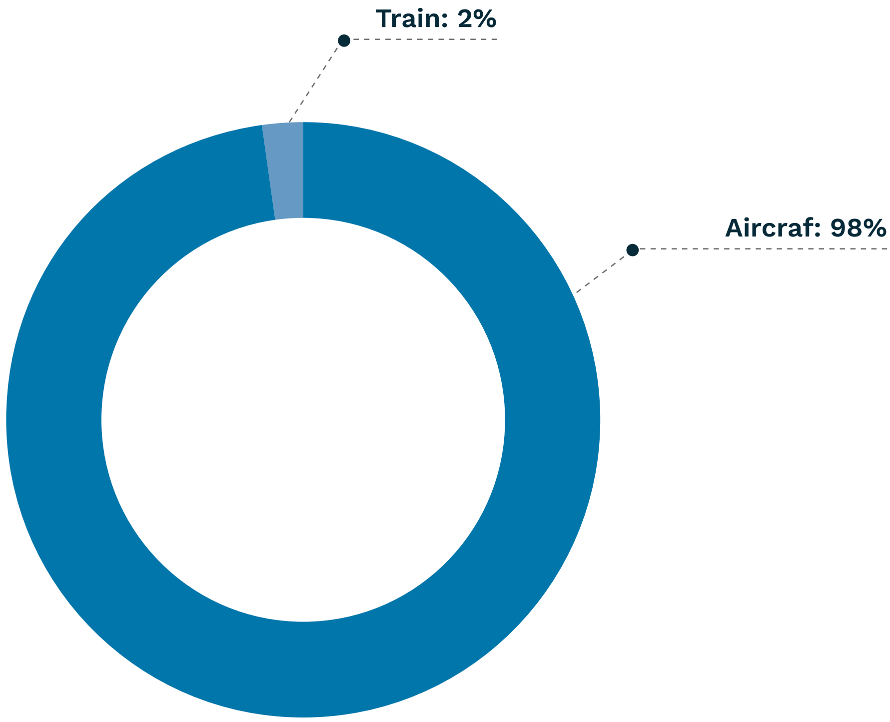


10.5.2 Business travel

Business travel included in this item only refers to Genève Aéroport employees. Employees of airport concessionaires are excluded here, as they are considered to be outside Genève Aéroport's scope of influence, unlike their commuting travel.

As for travel made by Genève Aéroport employees for professional purposes, train and plane are the two modes of transport that stand out. In 2022, approximately one tonne (0.918 tCO_2eq) was emitted by employees' business travel by train. Air travel represents 40.4 tCO_2eq of emissions, or 98% of the emissions in the "Business travel" item.

Indirect GHG emissions of staff business travel, in %

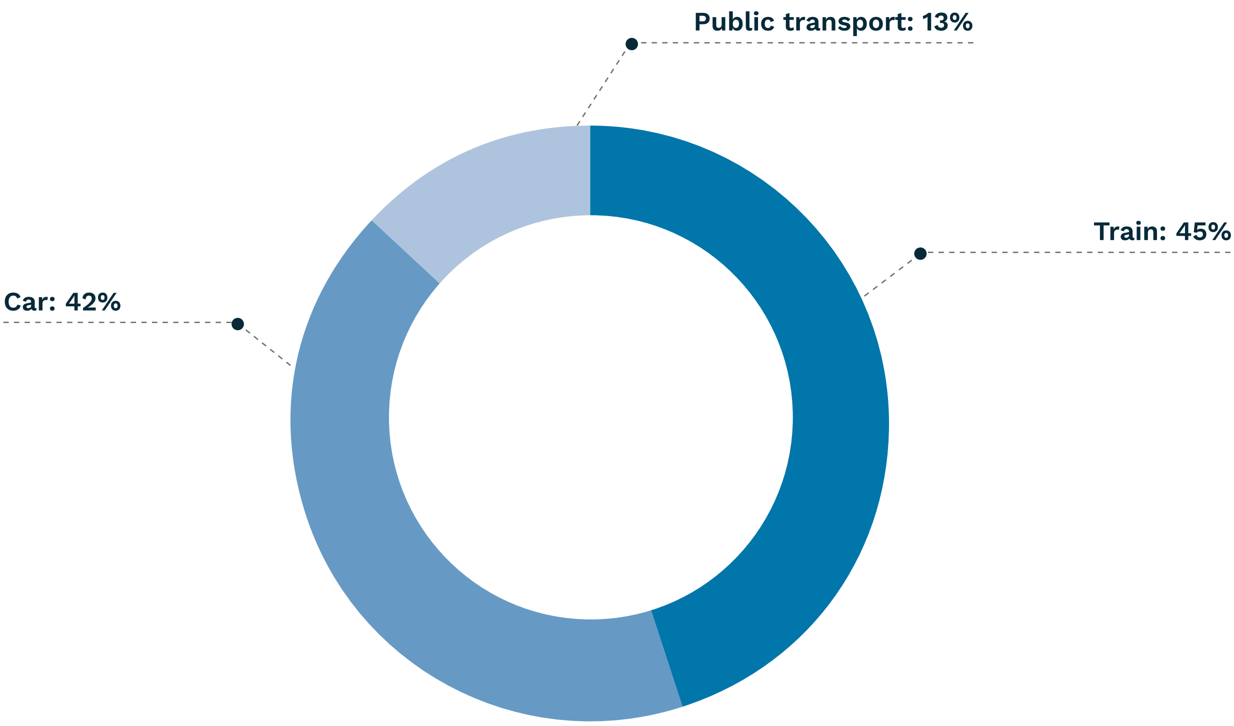


10.5.3 Visitor movement

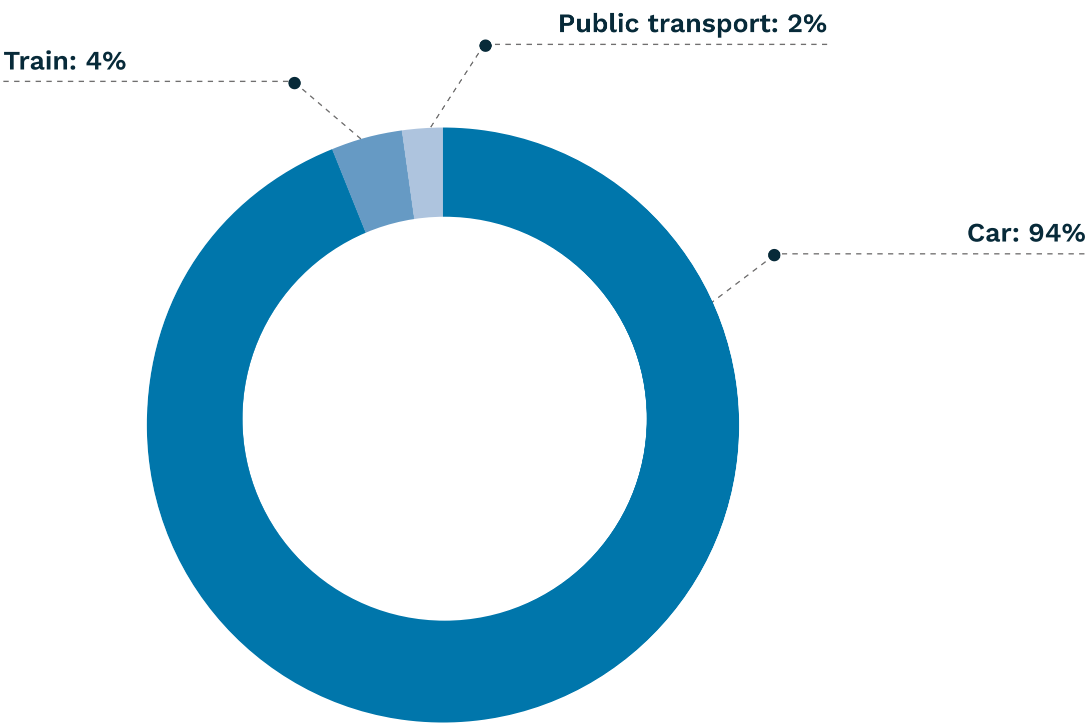
With 172,346 tCO_2eq of emissions, visitor movement generates 91% of the emissions in the “Movement of People” item, and alone constitutes 11% of the airport’s overall carbon footprint. However, it should be kept in mind that more than 17,000,000 visitors passed through the airport in 2022. When reported to the unit, these emissions represent approximately 10 $kgCO_2eq$ per visitor.

It can be noted that for both visitors and employees (commuting, section 3.4.1), cars are the preferred mode of transport, with 42% of kilometres travelled using an emissive mode of transport. Although a lower proportion than the 55% rate recorded by the staff commuting mobility survey, we observe much higher GHG emissions associated with cars for visitors (94% of visitor emissions, compared to 87% of staff commuting emissions). This is explained by the more extensive travel of visitors, unlike airport employees.

Breakdown of visitors' transport methods, in %



Indirect GHG emissions of visitors' movements, in %

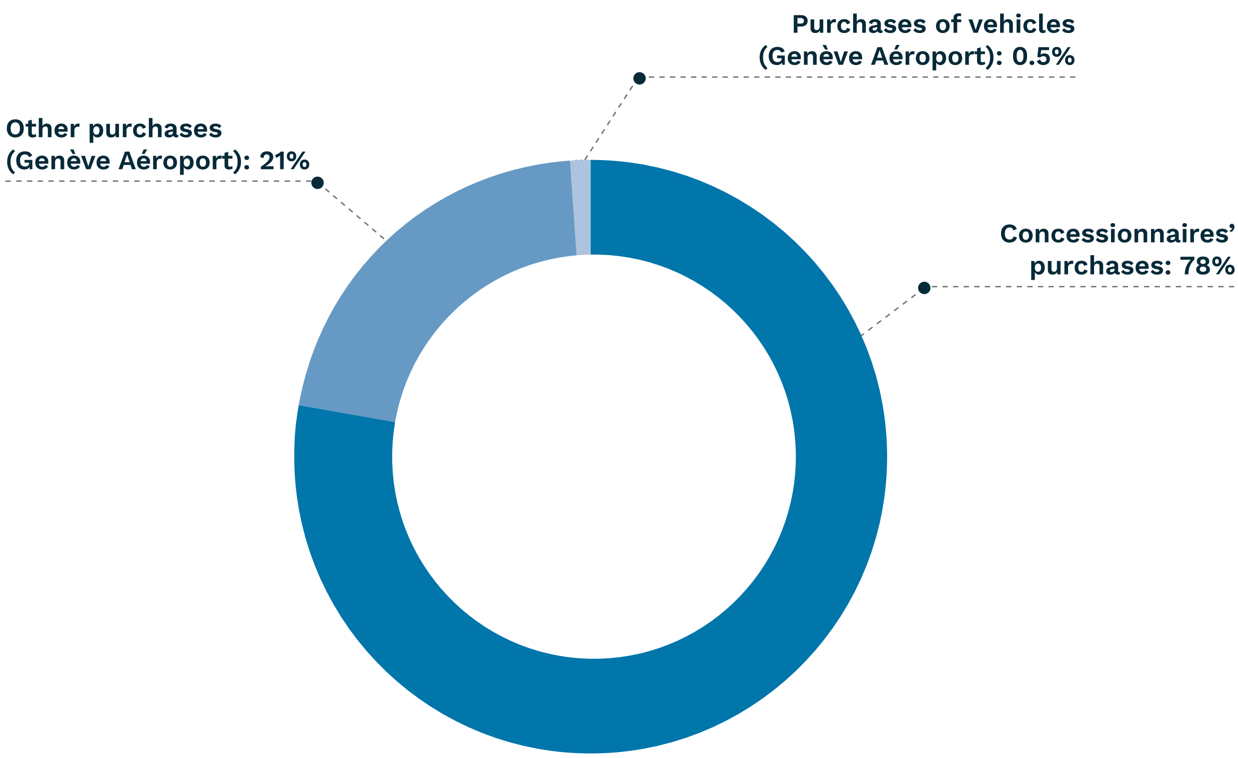


10.6 Indirect emissions associated with purchases (Scope 3)

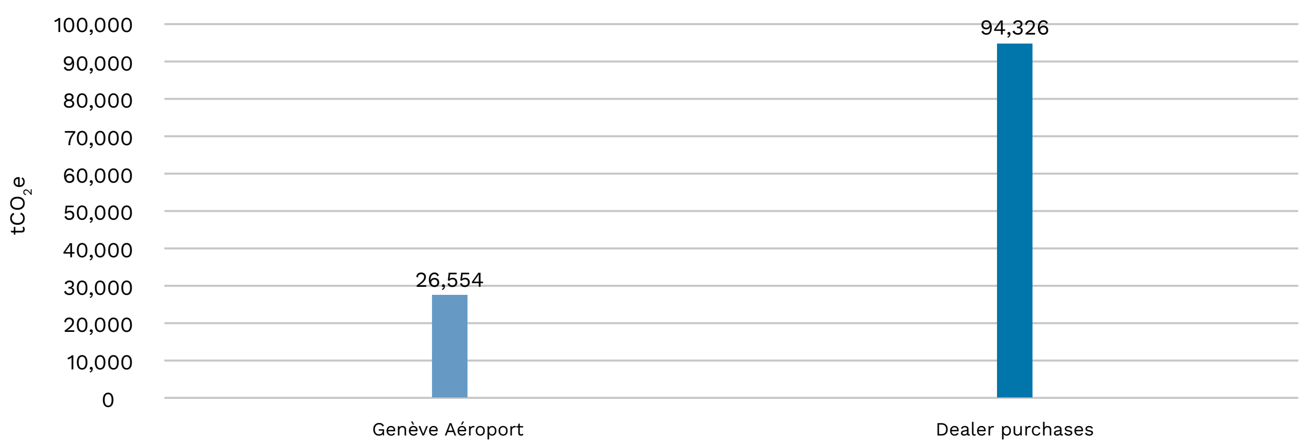
Emissions related to purchases constitute the third largest emissions item, with 120,880 tCO_2eq generated, representing 8% of Genève Aéroport's carbon footprint emissions. Emissions generated by the airport's shopping arcades are around 94,326 tCO_2eq (78% of the "Purchases" item). In addition, 26,554 tCO_2eq of emissions are produced by Genève Aéroport purchases (22% of the "Purchases" item).

With the exception of vehicle purchases (Genève Aéroport), other purchases could not be accounted for according to physical units. Instead, their "carbon weight" was considered, based on their purchase value and a monetary ratio from sector studies. Consequently, this purchase item is burdened with a significant uncertainty factor.

Purchases: Indirect emissions by item, in %



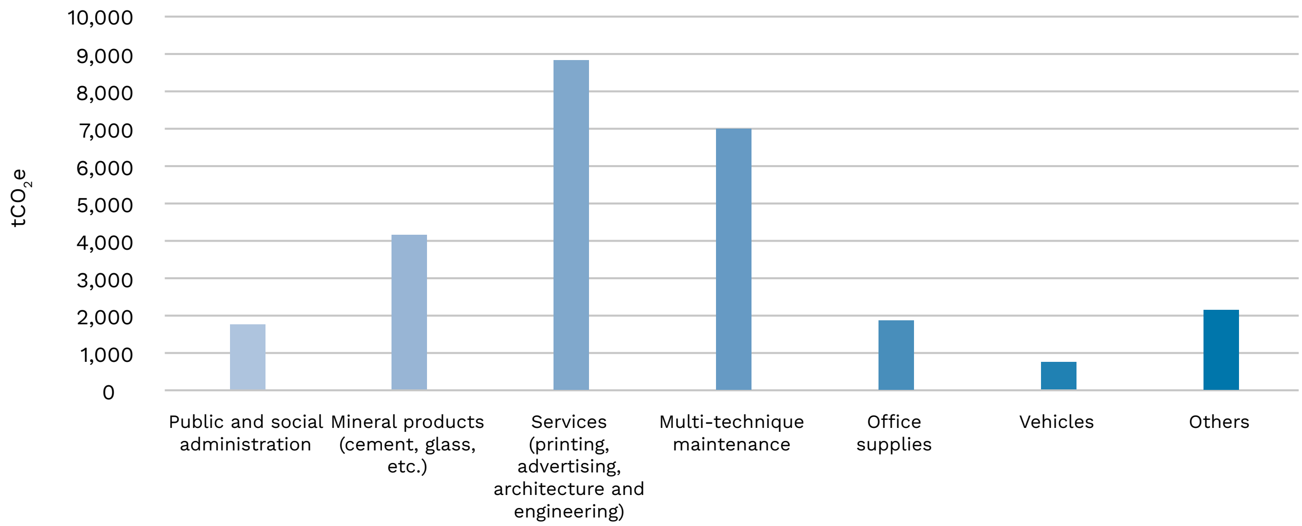
Indirect emissions of Genève Aéroport's and concessionnaires' purchases



10.6.1 Genève Aéroport Purchases

Among Genève Aéroport purchases item, emissions related to the consumption of various services, such as those dedicated to communication and advertising, as well as surveillance and security costs, are prevalent. Together, they account for 34% of Genève Aéroport purchase emissions. Multi-technical maintenance follows services in importance, with 26% of Genève Aéroport purchase emissions.

GHG emission: Genève Aéroport's purchases

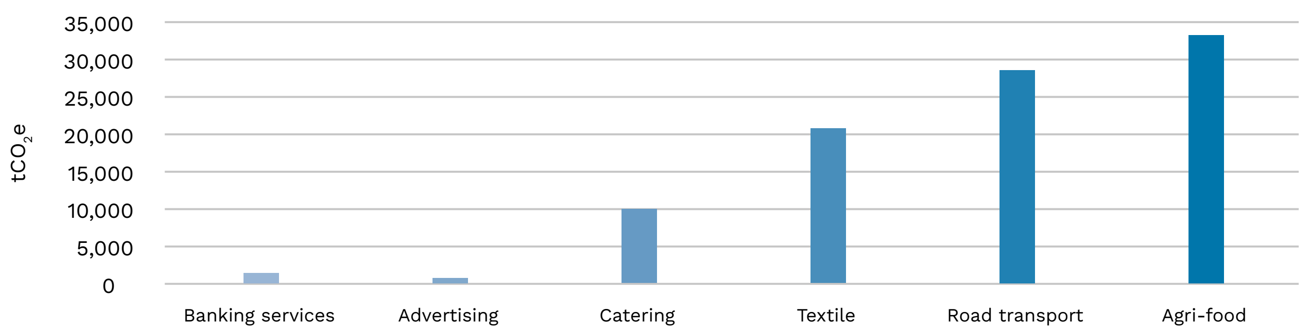


10.6.2 Airport concessionaire purchases

Representing 78% of the "Purchases" emissions item, the emissions generated by the airport's shopping arcades alone constitute 6% of the airport's carbon footprint. Of the different types of purchases made, agri-food products stand out (35% of tenant purchases). These include products sold by the airport's duty-free shop.

Responsible for 30% of tenant emissions, ground transportation includes car rental companies. The various retailers are under the textile category, representing 22% of airport tenant emissions.

GHG emissions: Airport concessionaires' purchases



10.7 Emissions associated with upstream and network leaks

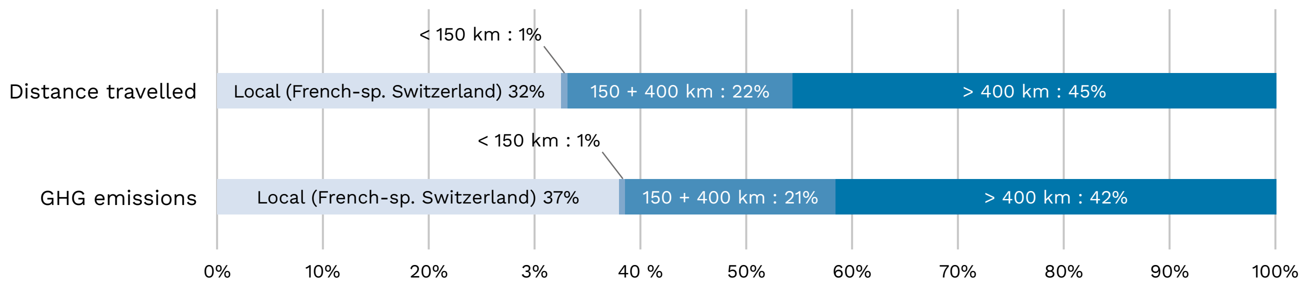
The GHG Protocol includes in Scope 3 the emissions generated upstream of the emissive activities integrated in Scopes 1 and 2. These represent 0.3% of Scope 3 of Genève Aéroport's 2022 carbon footprint. They include 53 tCO_2eq of emissions emitted by the production of photovoltaic panels as well as those upstream of fuels for owned and non-owned vehicles, respectively emitting 1,226 and 3,137 tCO_2eq. Losses in electricity and DHC networks are also included in this emission item. These losses represent 71 tCO_2eq.

10.8 Emissions associated with the transport of goods (Freight, Scope 3)

Only emissions from road transport of goods under the control of the airport are considered. Emissions induced by the transport of freight on board aircraft are included in aircraft emissions. This emission item represents a very small part of the airport's overall carbon footprint (0.3%), i.e. 5,461 tCO_2eq.

Genève Aéroport's freight is divided into local freight, covering French-speaking Switzerland, and international freight, serving the rest of Switzerland, Europe and some international destinations. Two companies provide deliveries outside French-speaking Switzerland. 753,844 km and 2,211,460 km were recorded for the two companies, respectively, in the airport's 2022 carbon footprint.

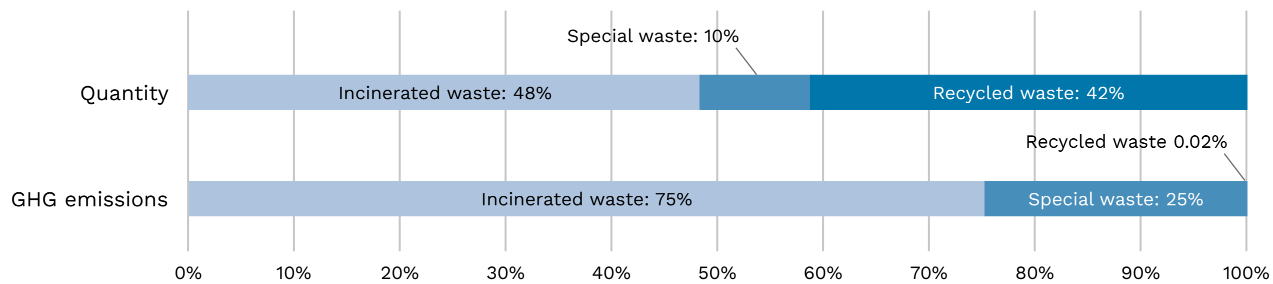
Road freight: breakdown of distances travelled and GHG emissions by type of distance, in %



10.9 Emissions associated with waste (Scope 3)

The waste produced by the airport emits 1,244 tCO_2eq, or 0.08% of the overall carbon footprint. The amount of waste produced in 2022 by Genève Aéroport is 3,711 tonnes. These include, in almost equal parts, incinerated waste (1,798 tonnes) and recycled waste (1,546 tonnes). Finally, the figure includes 367 tonnes of special waste.

Waste: Distribution of collected quantities and GHG emissions by waste type, in %.



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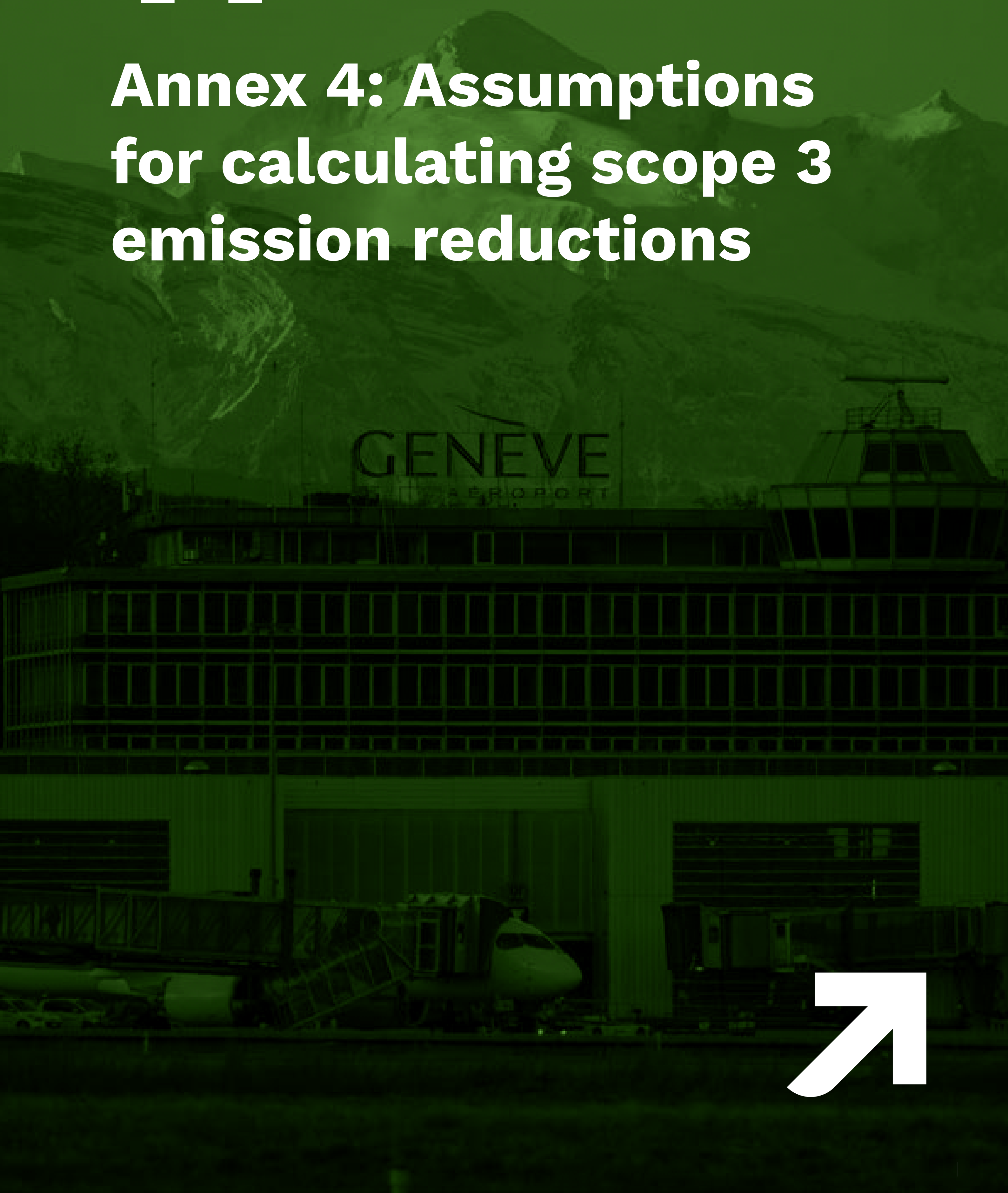
Annex 4: Assumptions for calculating scope 3 emission reductions



The calculation of CO_2 savings related to the various measures listed in the chapter 5.1.2 Table was carried out based on the following assumptions:

- **Air traffic emissions**

  o Assumption: increase in traffic of 1% per year between 2022 and 2050, and residual emissions to be offset by 5% of the 2022 total weighted by the increase in traffic

- **Electrification of vehicle and machinery fleets Excluding Genève Aéroport**

  o Assumption: 90% electrified fleet in 2030
  o Calculation: taking into account 10% of the current energy consumption of company vehicles, converted into CO_2 (calculation for petrol and diesel)

- **Use of road fuel for the remaining thermal vehicles**

  o Assumption: Use of HVO fuel which reduces the carbon footprint by 50% compared to fossil fuel, from 2040 (and no reduction before)
  o Calculation: 50% reduction in CO_2 on the residual emissions of vehicles in 2050, based on the 10% of remaining emissions

- **Increase in sustainable passenger modal shares**

  o Assumption: modal share car 40%, train 46%, bus 14%
  o Calculation: according to assumption modal shares each mode and travel distance

- **Increase in sustainable employee modal shares**

  o Assumption: modal share car to 48% in 2030
  o Calculation: emissions according to modal share of each mode

- **Electrification of vehicles used by passengers and employees to travel to the airport**

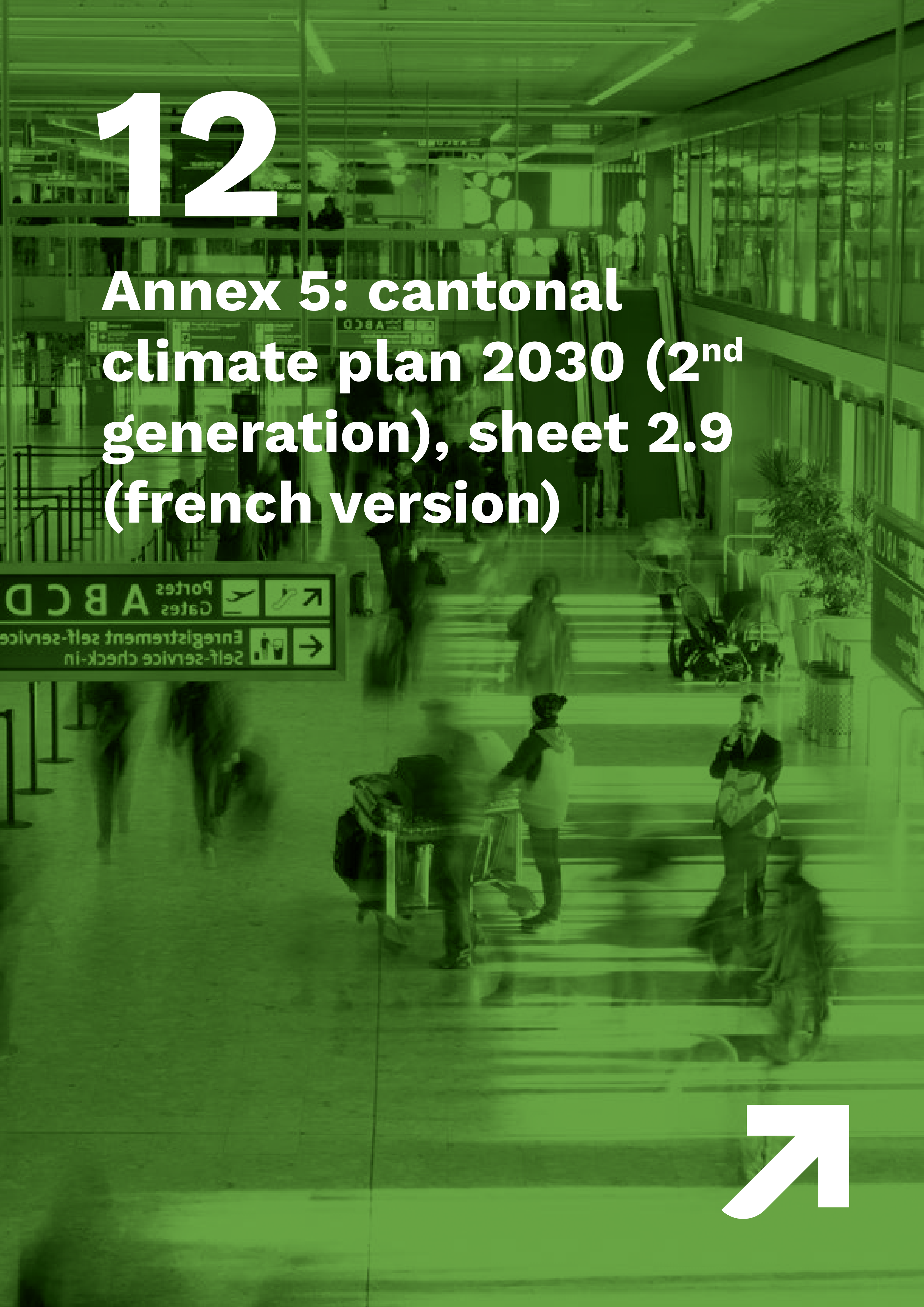
  o Assumption: decrease in CO_2 emissions by 20% in 2030 and 90% in 2050 compared to the current situation.

- **Electrification of vehicles used for freight**

  o Assumption: 75% reduction in emissions in 2050 compared to the current situation.

- **Strengthening of sustainability and CO_2 objectives in Genève Aéroport purchasing criteria**

  o Assumption: increase in the weight of sustainable development criteria in the weighting of Genève Aéroport purchases, but also implementation of net zero policies implemented in all branches of activity linked to purchases
  o Calculation: 60% gain on CO_2 emissions related to purchases



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Annex 5: cantonal climate plan 2030 (2nd generation), sheet 2.9 (french version)

Fiche 2.9

Réduire les émissions de GES dues au trafic aérien des résident-e-s genevois-es

Objectif CO_2 : ~200’000 tCO_2e (réduction des émissions et éventuelle compensation)

→ **2023 :** Établissement d’un plan d’action

2023 → 2030 : Mise en œuvre des mesures

Enjeux

Selon la méthode utilisée dans le Bilan carbone territorial du canton de Genève, qui calcule les émissions du trafic aérien au départ de Genève en considérant les émissions sur la totalité de la distance des vols, les émissions de GES liées au trafic aérien en 2012 s’élevaient à 1’545’000 tCO_2e* (déplacement de personne et fret inclus). Toutefois, vu la dimension régionale de l’AIG, les émissions imputables aux résident-e-s genevois-es représentent environ 22 % du total, soit 340’000 tCO_2e.

En 2018, sous l’impulsion du PCC, une sous-commission CO_2 de la CCLNTA a été créée. Chargée de suivre l’évolution des GES générés par le trafic aérien, cette sous-commission s’est réunie à plusieurs reprises entre 2018 et 2020 afin notamment d’examiner les actions possibles pour stabiliser au niveau de 2014 les émissions de gaz à effet de serre du trafic aérien à Genève d’ici 2030 sans compromettre l’activité économique de la région conformément à l’objectif fixé dans le volet 2 du PCC.

Les nombreuses mesures et pistes qui ont été envisagées par la sous-commission pour réduire les émissions de GES dues au trafic aérien se sont révélées être essentiellement hors du périmètre d’influence et de compétences de celle-ci ou de l’aéroport en tant que tel. Pour ne citer que quelques exemples : augmentation de l’utilisation de kérosène renouvelable, incitation règlementaire pour le renouvellement de flottes d’avions de nouvelle génération, développer des liaisons en train de nuit, diminuer le prix des billets de train sur les destinations en concurrence avec l’avion, etc.

Les conclusions de cette première étape indiquent que seule une entité comprenant des représentants des parties prenantes compétentes en la matière serait à même de poursuivre les réflexions de la sous-commission afin d’approfondir les pistes de mesures envisagées et élaborer des actions concrètes visant à diminuer les émissions de GES du trafic aérien.

Description

- Réorienter les travaux de la sous-commission vers le suivi de la mise en œuvre de la stratégie CO_2 de Genève Aéroport dans son périmètre d’influence pour les émissions du trafic aérien.
- Poursuivre le suivi annuel des émissions de CO_2 du trafic aérien sur la base de la méthode de calcul de l’OFAC.
- Étudier les possibilités de créer une entité ad hoc incluant des représentants de Genève Aéroport, du canton, des compagnies aériennes, de l’OFAC et les exploitants de lignes de train (CFF et SNCF).
- Évaluer précisément les mesures déjà envisagées en terme de diminution des émissions de GES et idéalement d’impact économique.
- Définir un mécanisme de compensation en prenant en considération les mesures déjà prises par les compagnies aériennes pour compenser leurs émissions.

Effets induits

- Meilleure qualité de l’air
- Effets favorables sur la santé
- Réduction des nuisances sonores

Périmètre d’application

Canton de Genève et Grand Genève

* La méthode utilisée dans le Bilan carbone territorial comprend les émissions indirectes liées au transport, l’extraction et la transformation du carburant. Selon les données OFAC, les émissions directes de GES du trafic aérien pour 2012 sont de 1’279’200 tCO_2e. Genève Aéroport utilise cette valeur de référence pour établir son bilan annuel de suivi des émissions du trafic aérien.

Co-pilotage : SCDD (DT) et DI / **Collaborations :** Genève aéroport, OFAC, Compagnies aériennes, exploitants de lignes de train

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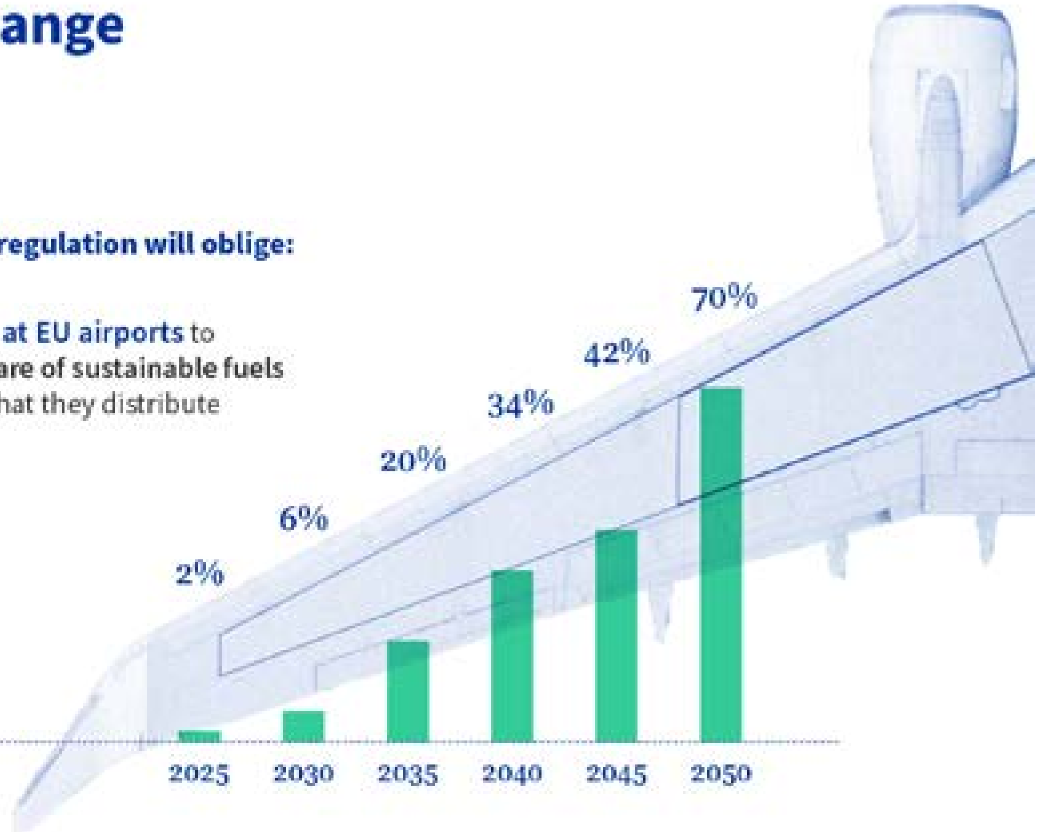
Annex 6: refuelEU aviation initiative: infographics

What will change

The ReFuelEU aviation regulation will oblige:

1. aircraft fuel suppliers at EU airports to gradually **increase the share of sustainable fuels** (notably synthetic fuels) that they distribute

Minimum share of supply of sustainable aviation fuels (in %)



2. airlines departing from EU airports to refuel aircraft only with the **fuel necessary for the flight** to avoid emissions related to extra weight caused by tankering practices (carrying extra fuel to avoid refuelling at a destination airport where fuel is more expensive)

3. EU airports to guarantee the necessary **infrastructure** to deliver, store and refuel with sustainable aviation fuels

In addition, a **Union labelling system** about environmental performance for aircraft operators using sustainable fuels will help consumers make informed choices and will **promote greener flights.**

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Annex 7: definitions

Sustainable Aviation Fuel (SAF): Carburants Aviation fuels produced from biomass (biofuels), and those whose energy content is derived from renewable sources other than biomass (synthetic fuels) as well as liquid or gaseous fuels produced from liquid or solid waste streams of non-renewable origin (recycled carbon fuels).[18]

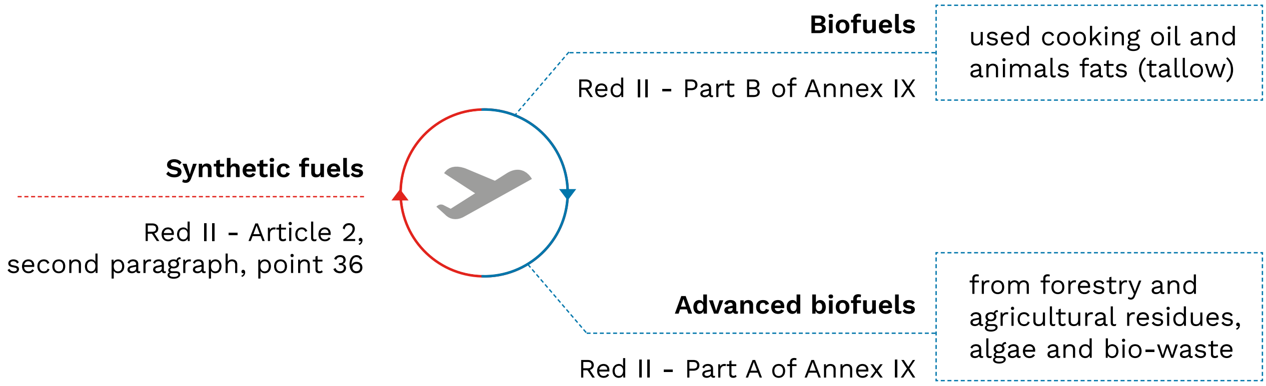

Figure 16: types of saf permitted for aviation proposed by the european commission

European Single Sky: defragmentation of European airspace to enable more efficient air traffic management and therefore, addressing capacity shortages from a global perspective and, consequently, reducing delays and the resulting additional emissions.[19]

Carbon Offsetting: Reduction or elimination of emissions resulting from actions outside the organisation's boundaries, used to offset the organisation's residual emissions[20,21].

Nationally Determined Contributions (NDCs): Commitments made by each signatory country to the Paris Agreement in order to achieve its objectives.

CO_2 Equivalent (CO_2eq): Unit of measurement for GHGs that accounts for the warming potential of each gas relative and reducing it to that of carbon dioxide (CO_2).[22]

GHG Protocol: The Green House Gas Protocol is an international protocol aimed at establishing a regulatory framework able to better define GHG emissions, enabling their accounting and subsequent reduction. On a global scale, it is the most widespread method for ensuring compatibility of GHG emissions[4].

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[18] *European Union (EU). 2018. Directive (EU) 2018/2001 of the European Parliament and of the Council on the promotion of the use of energy from renewable sources (recast), Official Journal of the European Union, L 328/82, https://eur-lex. europa.eu/legal-content/EN/TXT/PDF/?uri=CELEX:32018L2001&from=EN*

[19] *Règlement du parlement européen et du conseil relatif à la mise en œuvre du ciel unique européen (refonte). 2020. Commission Européenne, Bruxelles*

[20] *IPCC. 2021. Climate Change 2021: The Physical Science Basis. Contribution of Working Group 1 to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change, Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp. doi:10.1017/9781009157896*

[21] *The Greenhouse Gas Protocol : A Corporate Accounting and Reporting Standard, Revised Edition. 2015. World Business Council for Sustainable Development and World Ressource Institute, USA, 114 pp.*

[22] *GIEC*

Net zero & Carbon Neutrality: Since the emergence of these terms, their definitions have multiplied, leading to confusion[23,24]. In the context of this report, we wish to clarify the following elements. On a global scale, the IPCC stipulates that net zero is achieved when anthropogenic CO_2 emissions are balanced by the implementation of CO_2 absorption measures over a defined period. For the IPCC, “Net Zero” and “Carbon Neutrality” are equivalent. On the other hand, for the ACI, carbon neutrality implies reducing emissions as much as possible, followed by offsetting residual emissions (see the definition of “carbon offsetting”). Net zero, however, excludes offsetting and advocates a reduction of emissions to a maximum level, ideally zero. Unavoidable emissions are removed and sequestered (see the definition of “carbon sequestration”)25. With regard to the CO_2 strategy of Genève Aéroport, this report defines net zero as the maximum reduction of CO_2 emissions from Scopes 1, 2 and 3, reaching a minimum level of 10% of residual emissions (of 1990 emissions) considered “unavoidable”. The term “carbon neutrality” is not used.

Carbon sequestration: Direct capture and sequestration of carbon in biological pools.[26]

Scope 1: Direct emissions from owned or controlled sources.

Scope 2: Indirect emissions resulting from the production of purchased energy.

Scope 3: Indirect emissions include all other indirect emissions within the company’s value chain, including both upstream and downstream emissions.

European Union Emissions Trading Scheme (EU ETS): A system for the purchase and resale of carbon credits by companies, following the implementation of an emissions cap and a carbon market. Companies that reach their emissions cap must therefore purchase emission allowances from a company that has emitted less, which implies a financial reward for the latter.[27]

Taxiing: Ground movement of an aircraft using its propellers. Movement phase
before take-off or after landing.

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[23] *Rogelj, J. et al., 2021. Net zero emissions targets are vague: three ways to fix. Nature. Vol 591 : 365-368. https://doi.org/10.1038/d41586-021-00662-3*

[24] *Allen, R. M., et al. 2022. Net zero : Science, Origines, and Implications. Annu. Rev. Environ. Resour. Vol. 47:849-887 https://doi.org/10.1146/annurev-environ-112320-105050*

[25] *ACI World, 2021, Long-Term Carbon Goal Study for Airports.*

[26] *Commission européenne, Système d’échange de quotas d’émission de l’UE (SEQE-UE). URL: https://climate.ec.europa.eu/eu-action/eu-emissions-trading-system-eu-ets_fr*

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Annex 8: abbreviations

ABC: Association Bilan Carbone

ACI: Airport Council International

APU: Auxiliary Power Unit

ATA: Air Transport Analytics Ltd

CIA: Climate Act of the Confederation

CCNUCC: Convention-cadre des Nations Unies sur les changements climatiques

CO_2e: CO_2 Equivalent (or CO_2eq)

COP: Conference of Parties, en anglais

CORSIA: Carbon Offsetting and Reduction Scheme for International Aviation

EU+: Member States of the European Union and the signatory states of the European Common Aviation Area (ECAA) Agreement, i.e. Albania, Bosnia and Herzegovina, North Macedonia, Georgia, Montenegro, Serbia and Moldova, Norway and Switzerland.

FOCA: Federal Office of Civil Aviation (Switzerland)

GHG: Greenhouse gas

ICAO: International Civil Aviation Organization

IPCC: Intergovernmental Panel on Climate Change

NDCs: Nationally Determined Contributions

NET: Negative emission technology

SAF : Sustainable Aviation Fuel

UNFCCC: United Nations Framework Convention on Climate Change

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