TORINO AIRPORT – SAGAT

TORINO GREEN AIRPORT

Change is possible.

ROADMAP TO NET ZERO

Table of Contents

1	**INTRODUCTION**	5
2	**METHODOLOGY**	7
	“Fit for 55” 2030 Goal	11
	“Net Zero Carbon” 2040 Goal	12
3	**THE ENERGY BALANCE**	13
4	**THE CARBON FOOTPRINT**	14
5	**“Fit for 55” 2030 ROADMAP**	15
6	**“Net Zero Carbon” 2040 ROADMAP**	21
7	**COMMUNITY INVOLVEMENT**	26

1 INTRODUCTION

The urgent need to reduce greenhouse gas (GHG) emissions and the environmental benefits of a renewable-based economy are triggering a global shift towards more sustainable ways of living, travelling, producing, and consuming. To transform the EU into a climate-neutral continent by 2050, the European Commission has adopted the "Fit for 55" climate package, which commits member states to reducing greenhouse gas emissions by 55% compared to 1990 levels, with the goal of achieving *"Carbon Neutrality"* by 2050.

Although air transport generates approximately 3% of the EU's CO_2 emissions, the Green Deal gives it a key role in contributing to reduce significantly these emissions.
Airports will play an essential role in achieving climate neutrality. The production and use of sustainable energy, as well as a shift to more eco-friendly means of transportation to connect the infrastructure to the territory, will help reduce the airport's carbon footprint and improve its air quality.
The goal of decarbonisation of airports has become increasingly crucial in addressing the challenge of climate change. In response to this task, in 2019 the members of the Airport Council International (ACI) made a commitment to achieve the Net Zero Carbon in 2050. In this context, the Airport Carbon Accreditation (ACA) programme promoted by ACI Europe, aims to provide a tool for calculating and therefore reducing carbon emissions in the aviation industry. These efforts reflect the growing awareness of the importance of mitigating the environmental impacts of aviation and underline the crucial role of airports in dealing with the climate crisis.

Achieving the "**Net Zero Carbon**" goal means reducing greenhouse gas emissions under its direct control (scope 1 and 2) as close to zero as possible, with the reabsorption of the remaining emissions by the atmosphere through carbon removal mechanisms. To do this, it is essential to map out a decarbonization trajectory by indicating concrete carbon reduction measures, milestones to be achieved, and credible intermediate targets.

The SAGAT Group considers essential to link the development of airport infrastructure to environmental sustainability and the fight against climate change.
In fact, since 2019, the Group has submitted to the Airport Carbon Accreditation programme and, in 2022, it achieved *Level 3* of this certification. This includes the creation of an Action Plan for reducing emissions and the involvement of stakeholders in the decarbonisation process.

SAGAT's commitment to decarbonising its activities is evidenced by a major structural and infrastructural investment plan designed to promote energy efficiency and the construction of renewable energy plants.
As of 2021, SAGAT voluntarily purchases electricity with *Guarantee of Origin* certificates for 100 percent of its consumption and plans to soon become *Carbon Neutral*, investing in *carbon offsetting* projects to balance any remaining emissions post internal reduction. The efficient management and rational use of its energy resources, the implementation of renewable energy generation systems, and the reduction of climate-changing emissions will drive the airport hub's profound transformation toward achieving the goals set by the **"Fit for 55" package in 2030 and "Net Zero Carbon" in 2040**.

This document fits into this framework and constitutes the second of two planning tools indicating the path to follow: **Vision TRN 2030 and the Roadmap to Net Zero**.

Year	Scope	Baseline	Goal
2030	Scope 1, 2 and staff business travel	2010	❖ **Primary energy demand: -39%** ❖ **Energy demand met by RES: 40%** ❖ **CO_2 emissions: -55%**
2040	Scope 1, 2 and staff business travel	2010	❖ ***Net Zero Carbon***

Table 1 - Summary of ROADMAP TO NET ZERO targets

Vision TRN 2030 defined Torino Airport decarbonisation goals for 2030 in line with the current European and national context and with the goal of full decarbonisation in 2040.

*This **Roadmap to Net Zero** constitutes a clear strategic guide for transforming airport operations into a zero-emissions system by 2040. Precise and measurable goals are specified through the adoption of innovative technologies, the implementation of renewable energy, the optimisation of operating processes, and the reduction of environmental impact. A SMART (acronym for specific, measurable, achievable, relevant, and time-based) approach was adopted in drafting the document. This is reflected in defining specific, measurable, and realistic goals, with a clear temporal alignment within which every step of the path is defined and monitored to ensure the final goal of "**Net Zero Carbon**" is achieved **by 2040**.*

The **Roadmap to Net Zero principles**:

1. Energy efficiency: the optimisation of processes and responsible consumption of energy will be a priority. Resources will be invested in advanced technologies to reduce the energy consumption of systems and improve overall efficiency.
2. Emissions reduction: emission management strategies are to be implemented, with a focus on switching to renewable energy sources, adopting zero-emission vehicles and upgrading infrastructure to reduce the carbon footprint.
3. Collaboration and Involvement: the importance of involving external and internal stakeholders, commercial partners, local communities, and government institutions is recognised. Active involvement and cooperation are crucial for the success of this initiative.
4. Innovation and Research: research and development projects will be supported to support sustainable technologies in the airport sector, in line with the goal of adopting eco-friendly practices.
5. Monitoring and Reporting: the implementation of monitoring and reporting systems and methodologies will enable the continuous assessment of energy and environmental performance, adapting and improving the ongoing strategies.

2 METHODOLOGY

This Roadmap outlines a clear and detailed strategy for reducing the airport's carbon emissions, in order to achieve the "Net Zero Carbon" goal by 2040, in accordance with the ACI's standards and recommendations.

ACI methodology identifies 5 main steps in which to develop a roadmap to reach the goal of "Net Zero Carbon" through intermediate targets:

1. **Calculating the Carbon Footprint**
   - ✓ Defining the baseline year: in order to facilitate the definition of goals in line with the IPCC decarbonisation scenarios, it is recommended to use 2010 as baseline year, i.e. the year against which the emissions reductions will be calculated.
   - ✓ Defining the Operating Limits: the scope of the inventories and goals for greenhouse gases should be as complete and accurate as possible. Emissions not covered by a quantified goal cannot be managed or reduced responsibly. All the Scope 1 and Scope 2 emissions must be included in the "Net Zero Carbon" Emissions target and, therefore, in the roadmap.
   - ✓ Defining the Energy Budget: quantification of the primary energy demand associated with activities falling within the operational limits and the local production of electricity from renewable sources for the reference year.
   - ✓ Defining the Carbon Footprint: quantification of the equivalent CO_2 emissions associated with activities falling within the operating limits in the reference year.
2. **Defining measures and actions**
   - ✓ Defining a list of possible measures and actions: collection and categorisation of best practices and actions implemented or planned by other airport organisations with the "Net Zero Carbon" goal.
   - ✓ Selection of measures and actions: identification of solutions suitable for the reference context based on: operations of the airport's and its emissions scope; the state, maturity, and associated risks (technology being developed, for example); timing and requirements for implementation; energy savings and emissions reduction.
3. **Definition of scenarios**
   - ✓ Assessment of possible scenarios: with the list of measures established in Step 2, different routes can be identified through the creation of multiple scenarios. These scenarios are based on factors including: combination of projects to achieve emissions reductions, impact and feasibility for the airport, level of investment required, maturity of the technology, and applicable regulations.
   - ✓ Definition of intermediate targets
4. **Development of the Roadmap**
   - ✓ Drafting writing
   - ✓ Defining the Governance of the plan: it is important to build a solid governance structure to progress the initiative towards the 2050 goal and monitor and report on its progress.
5. **Monitoring and implementing the Roadmap**

With regard to the **Roadmap to Net Zero**, the main choices and considerations that have led to defining this document and the path for achieving the "***Fit for 55***" **Goal** in 2030 and "***Net Zero Carbon***" in 2040 are included below.

Reference year

2010 was identified as the reference year by which calculating the achievement of goals for two reasons:

- ✓ the first relates the need to identify a reference year following to the completion of extension works carried out during the 2006 Olympics, which entailed a significant change to the airport's emissions;
- ✓ the second refers to the guidelines provided by ACA that are essential to obtain the level-3 certification, which identify 2010 as the reference year in line with the IPCC.

Operating limits

The definition of the Operating Limits includes identifying greenhouse gas emissions and removals associated with operations and activities under the direct control of SAGAT.
The operating limits within which to verify the achievement of the 2030 and 2040 targets are those listed and defined below:

Scope	Type of emission source	Description
1	Natural gas for heating	The main system for heating the terminal consists of a thermal power station with natural gas hot water boilers and a small district heating network connected to the sub-plants located throughout the various buildings.
1	Diesel for heating and for power-supply units	Used in the heating plants of some isolated buildings and in the de-icing building for heating water and glycol during the winter season as well as supplying power to the generator units, available and activated in case of emergency.
1	Consumption for SAGAT vehicles	The vehicle fleet consists of diesel, gasoline, and electricity means, including operating equipment (truck cranes, lifting platforms, tractors, mechanical shovels, snow vehicles, vans) and service cars.
1	LPG	Consumptions related to kitchens in the fire brigade building and fire tests.
1	Potassium formate for de-icing	Product used to prevent the freezing of aprons during the winter period.
2	Purchase of electricity	The airport is supplied by three MV lines (main, reserve, and fire-fighting cabinet). An additional MV delivery point makes it possible to power the cabinet serving the rainwater systems. An internal MV ring connects the main substations.

Scope	Type of emission source	Description
		A 400 Hz system extended to the aprons enables electrical powering of the equipment on board stationary aircraft. Electricity is the primary vector used for powering the main utilities such as the baggage handling system, the lighting and the winter and summer air conditioning systems.
3	Staff business travel	Emissions associated with SAGAT staff business travel.

Table 2 - Description of Scope 1, 2, and 3 operational boundaries

The operating limits of this Roadmap identify all those activities over which SAGAT has direct control. However, some significant activities that the airport has limited power to control and act on remain excluded from the Roadmap goals.

In relation to those emissions sources excluded from the Roadmap Operating Limits, SAGAT intends to actively involve airport stakeholders in identifying emission reduction goals and adopting a measurement and action plan that sets out how they can be achieved with the support of the airport authority.

It is also specified that electricity consumption related to AGL runway lights is considered a Scope 3 source from the baseline year until 2025. From 2026, a progressive takeover by SAGAT in the direct management of these sources has been assumed until complete control in the year 2030, in which these sources fall entirely under Scope 2 of this roadmap.

Scope	Type of emission source	Description
3	Mobile sources	Consumption associated with handling companies for passenger ground support services (transport) and aircraft (loading/unloading luggage, de-icing operations, GSE, etc.).
		Public and private vehicles for transporting airport operators and passengers.
3	Aircraft	Emissions related to LTO activities, taxiing, and parking of aircraft associated to airlines.
3	Electricity	Consumption of electricity relating to sub-contractors, powering the runway lights (AGL), and the ENAV control tower.
3	Glycol for de-icing	Product used by handlers to perform de-icing on aircraft during the winter.

Table 3 - Description of Scope 3 Excluded from Operational Boundaries

Definition of the Carbon Footprint

In defining the airport C*arbon footprint*, the electricity emission factor with a *location-based* approach was chosen.
This approach considers carbon emissions associated with the production of electricity in a given country, considering the national energy mix, i.e. the percentage of energy produced from renewable and fossil sources within the country.
This approach is in line with the SAGAT goal of reducing its *Carbon footprint* within its operating and geographic limits by directly acting on its facilities and infrastructure.

In this sense, the *location-based* approach is preferable because:

- ✓ it offers a more accurate representation of the real carbon emissions associated with the consumption of electricity in a given area;
- ✓ it encourages greater local responsibility concerning the reduction of carbon emissions; Communities may be motivated to develop cleaner energy sources and reduce their environmental impact, knowing that their actions have a direct impact on emissions in the surrounding environment;
- ✓ it does not consider the "virtual compensation" offered by the Guarantees of Origin or other *offsetting* measures and focuses attention on actually reducing emissions in the region of origin;
- ✓ it increases transparency and trust in the carbon footprint measurement and reduction. The information concerning carbon emissions is clearer and easily verifiable, contributing to greater trust in the overall assessment system.

Definition of scenarios

In defining the actions to be considered to achieve the 2030 goals, it was decided to focus exclusively on carbon emissions reduction actions within the geographical limits of the airport, without considering the purchase of electricity with Guarantee of Origin (GO).
This choice is motivated by the following factors:

1. **Direct control**: the emissions reduction actions directly implemented within the geographic limits of the airport offer the airport greater control and direct management.
2. **Local commitment**: giving priority to action within the geographical limits of the airport is a tangible demonstration of the commitment of the airport in relation to sustainability and the reduction of carbon emissions in its local community.
3. **Improvement in energy efficiency and security**: the internal emissions reduction actions, through energy efficiency measures and local production of renewable resource electricity, enable the airport to have greater control over its operational resilience and management of its energy resources, increasing its energy efficiency and security.

"Fit for 55" 2030 Goal

Reference

In order to define SAGAT's objectives to 2030, reference was made to the "***Fit for 55***" package of the European Union. By reviewing and updating its regulations, the EU is committed to achieving ambitious targets to reduce CO_2 emissions through an increase both in energy saved, as a result of energy efficiency actions implemented, and renewable energy produced.
Through "*Fit for 55*", the European Union plans to:

- ✓ increase the current goal regarding **energy efficiency** in order to reduce the primary energy demand by 39%;
- ✓ increase the current share of **Renewable Energy Sources (RES)** to at least 40% by 2030;
- ✓ reduce **CO_2 emissions** by at least 55% by 2030.

SAGAT goals

Similarly to the goals of the European Union, SAGAT also wishes to commit to achieving similar targets in 2030 within its airport context, reducing greenhouse gas emissions coming from operations under its direct control (*Scope 1, 2 and staff business travel*)**:**

- ❖ **Primary energy demand: -39%**
- ❖ **RES production: 40%**
- ❖ **CO_2 emissions: -55%**

"Net Zero Carbon" 2040 Goal

Reference

In May 2019, European airports pledged through ACI EUROPE to achieve the "*Net Zero Carbon*" goal for operations under their control by 2050 at the latest. Since then, the airports involved have reaffirmed their commitment on various occasions and set anticipated goals for the "*Net Zero Carbon*" target. In accordance with these commitments, the airports are drawing up roadmaps to identify and implement the necessary measures and actions to reach the target.

SAGAT goals

SAGAT is committed to achieving the "***Net Zero Carbon***" goal by **2040**, minimising greenhouse gas emissions coming from operations under its direct control (*Scope 1, 2 and staff business travel*) and compensating for residual emissions via actions that remove or sequester an equivalent quantity of carbon emissions from the atmosphere.
This goal can be achieved through a combination of actions aimed at the local reduction of emissions and the implementation of emissions removal and storage solutions:

- **Energy efficiency actions**
- **Local production of energy from renewable sources**
- **Decarbonisation of heat sources**
- **Purchase of biofuels and electricity with Guarantee of Origin**
- **Greenhouse gas removal and storage measures**

3 THE ENERGY BALANCE

This chapter represents the consumption related to the main energy vectors associated with SAGAT group's activities included within the operating limits previously described.
The airport is responsible for the management of Scope 1 and 2 emissions, which fall under its direct control or possession. These include the emissions generated by energy produced on-site to heat and cool the buildings, the liquid fuels used by the vehicles, as well as the electricity purchased from external sources to light and condition the terminal and offices.
The graphs below show the airport's primary energy demand related both to the reference year and the monitoring one.

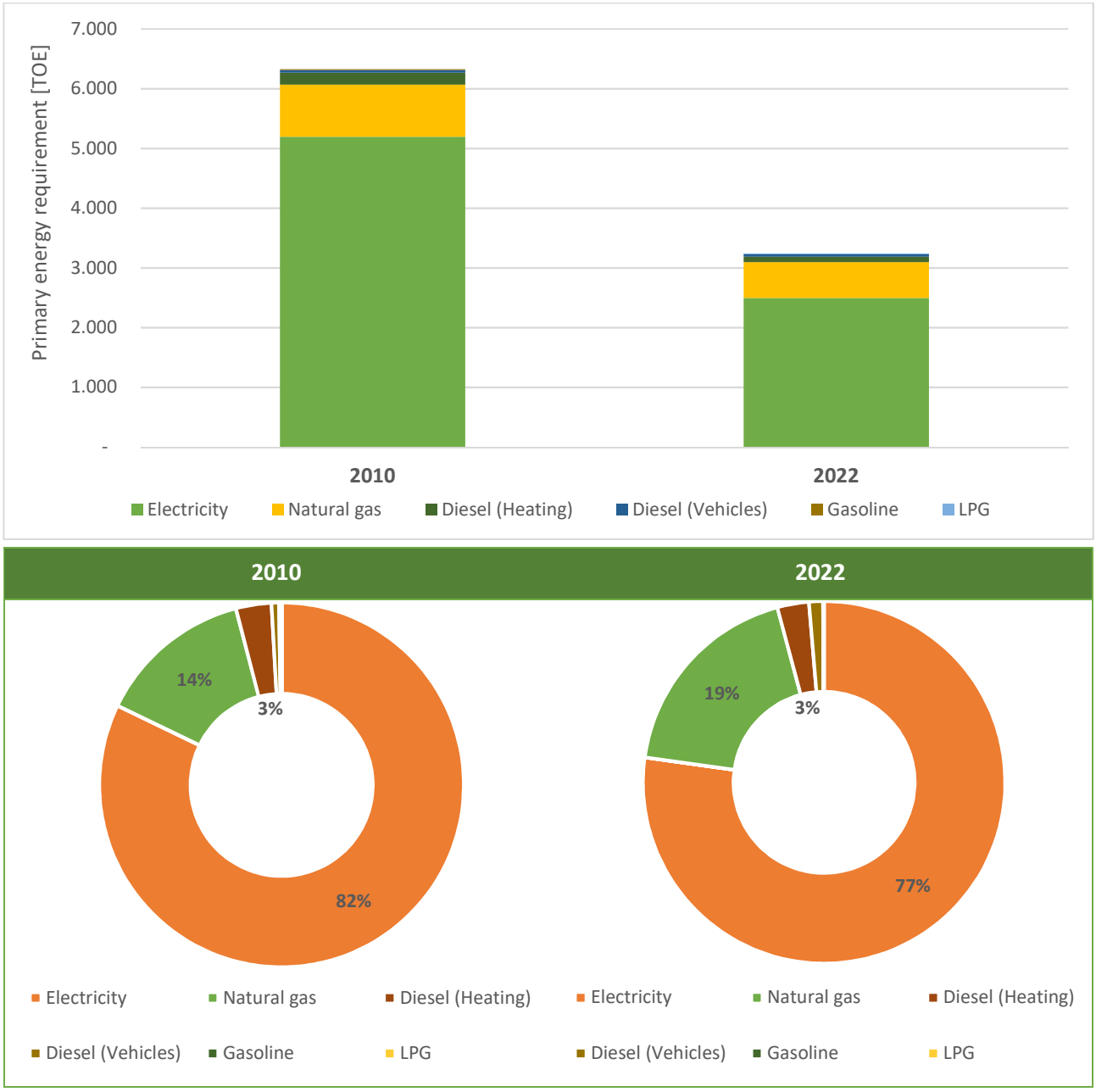


Figure 1 - Comparison of primary energy requirements by carrier years 2010 and 2022

4 THE CARBON FOOTPRINT

This chapter represents the CO_2 emissions relating to the main emissions sources associated with SAGAT group's activities included within the operating limits described above.

The graphs below show the airport's carbon dioxide emissions, referred to both the reference and the monitoring year.

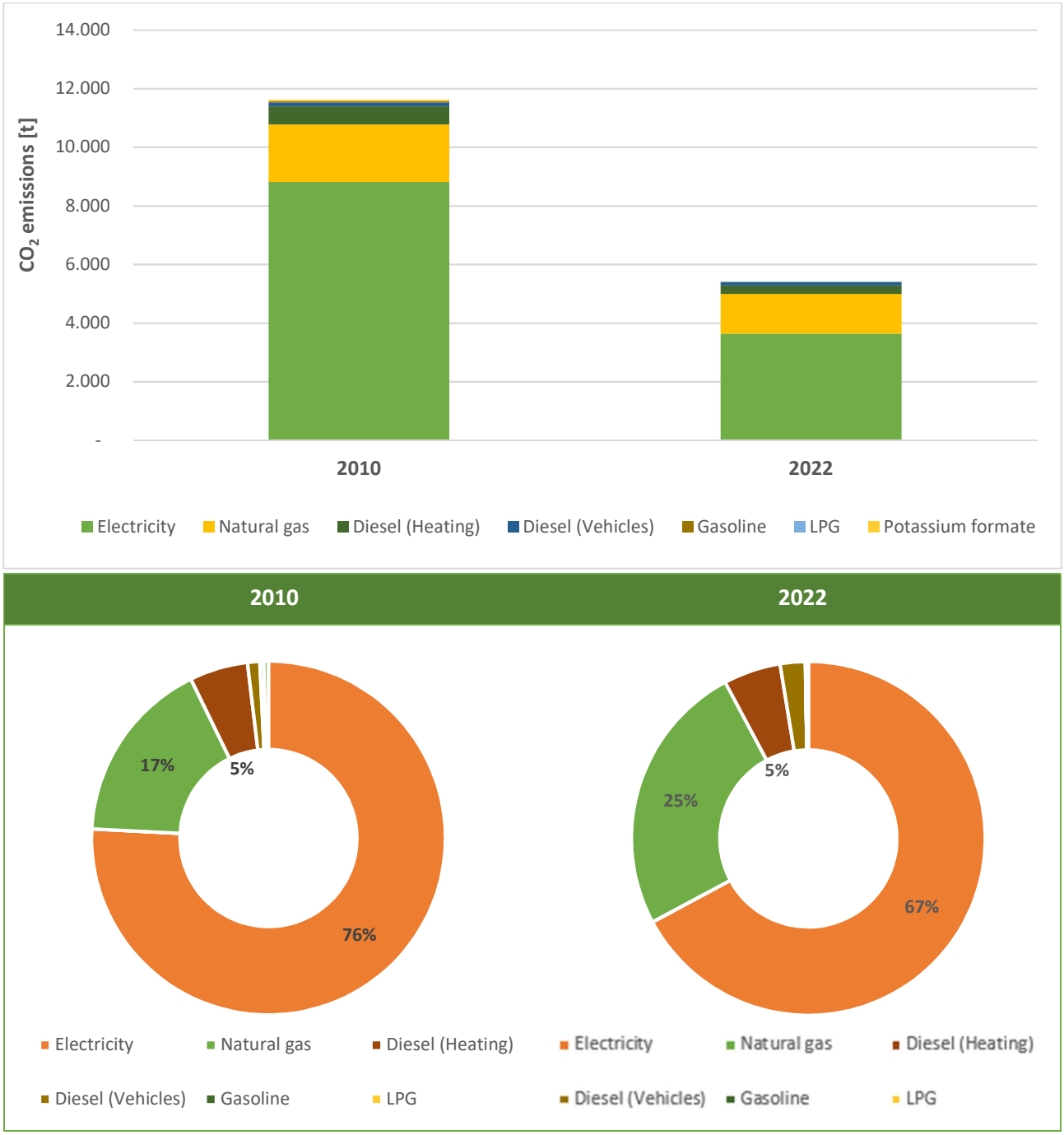


Figure 2 - Comparison of CO_2 emissions by carrier years 2010 and 2022

5 "Fit for 55" 2030 ROADMAP

*SAGAT intends to implement a series of emissions reduction measures that will mean **reducing** its Carbon Footprint **by at least 55%** compared to the 2010 level.*
*This is an intermediate goal within a decarbonisation path for transforming the **Torino Airport** into a **zero-emissions facility by 2040**.*

In line with the European Union goals envisaged by the "**Fit for 55**" package, SAGAT is committed to achieving similar targets in 2030:

- ✓ reducing the primary energy demand by 39% compared to 2010
- ✓ ensuring 40% coverage of the energy demand from local production of energy from RES
- ✓ reducing CO_2 emissions by at least 55% by 2030.

These goals are aimed at reducing Scope 1 and 2 emissions directly controlled by SAGAT.
The main measures adopted by the airport to achieve these goals are shown in the image below, based on the categories of decarbonisation detailed in the study: "*ACI World Long Term Carbon Goal Study*"[1].

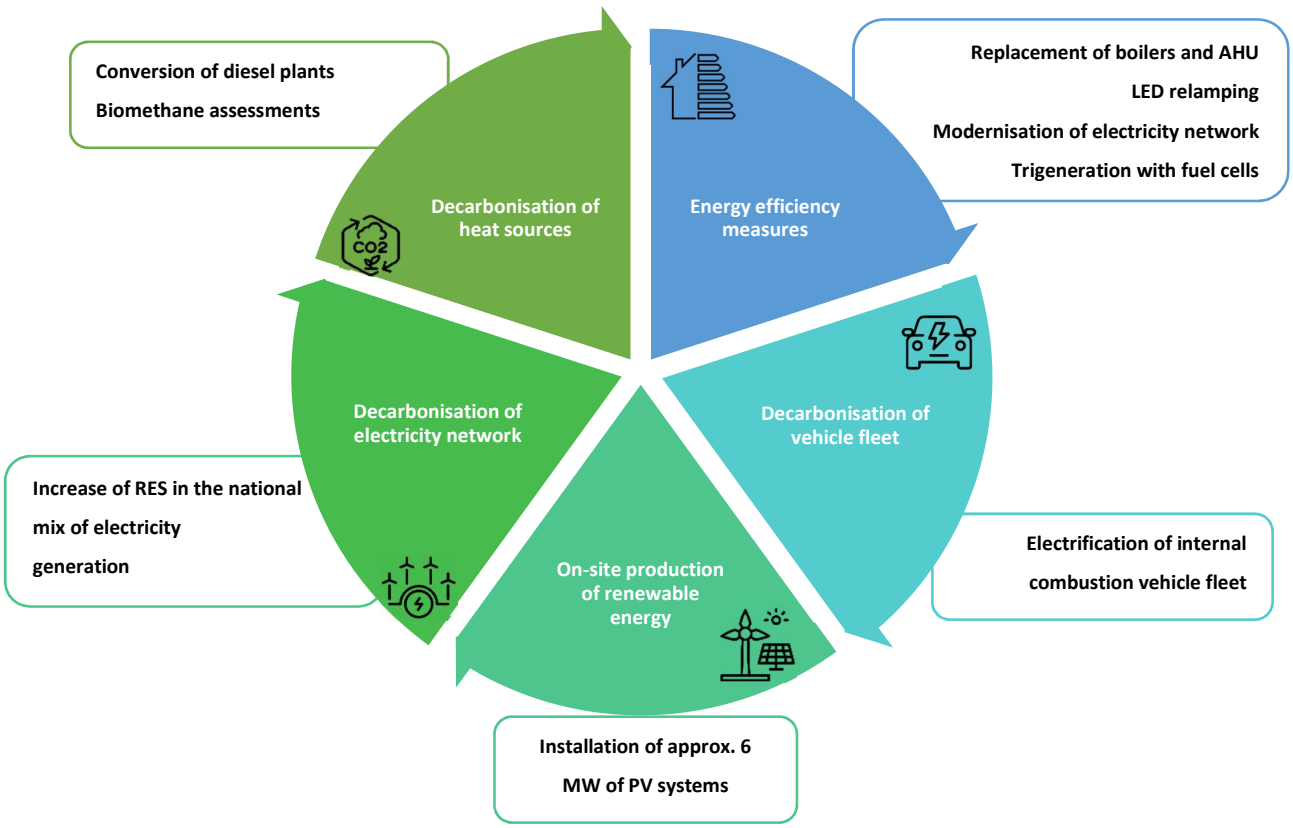


Figure 3 - Breakdown of interventions by decarbonisation categories "ACI World Term Carbon Goal Study"

[1] https://store.aci.aero/product/long-term-carbon-goal-study-for-airports-report-2021/

In the short term, it is planned to invest in energy efficiency projects in airport environments (installation of new condensation boilers, replacement of the most obsolete AHUs, LED relamping of interior lighting), the modernisation of electricity distribution networks and the promotion of renewable energies through the construction of a 1.44 MWp photovoltaic plant.
In the medium term (2026-2030), it is foreseen to complete the transition of the SAGAT vehicle fleet to 100% electric vehicles, to end the LED transformation of interior and exterior lighting under the direct control of SAGAT, to gradually convert the diesel central heating plants, to assess the installation of a 250 kW_e solid oxide fuel cell in trigeneration configuration and to install new solar panel systems for an additional total power of approximately 4.5 MW_p.

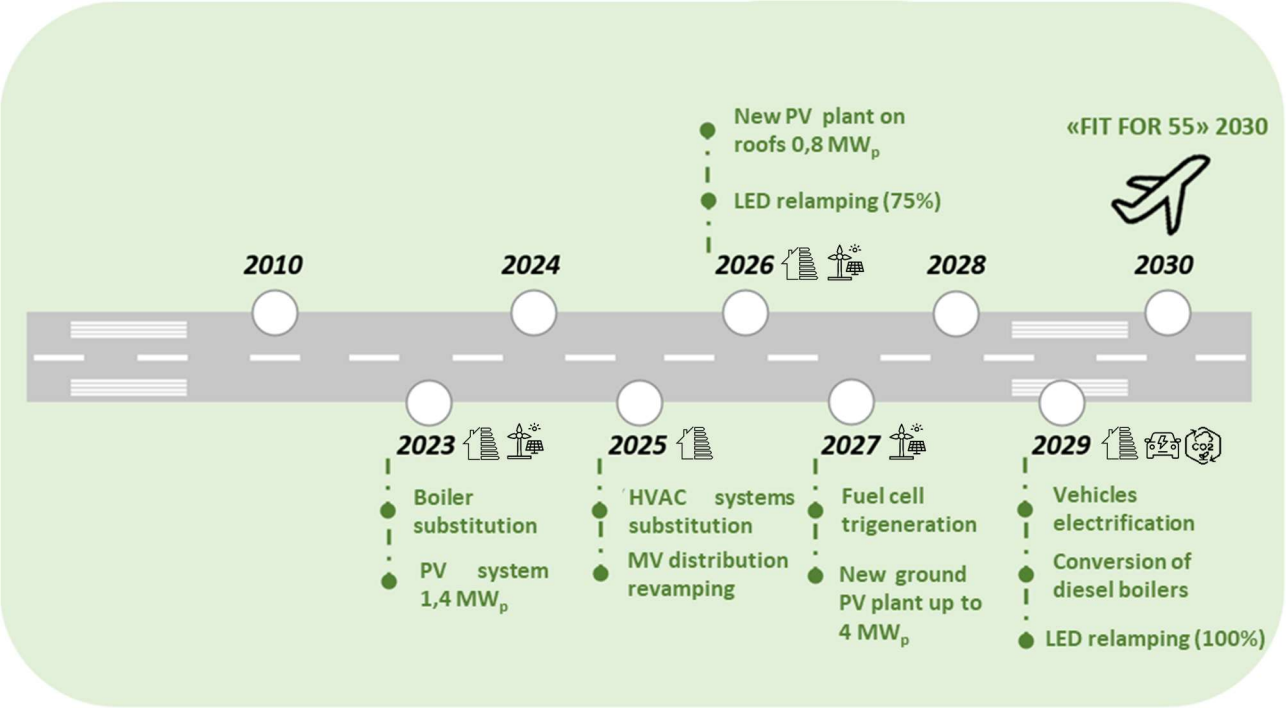


Figure 4 - Timeline of "Fit for 55" interventions 2030

It is planned to work in close synergy and collaboration with airport operators and airlines to support them in identifying and implementing actions aimed at limiting emissions.
To this end, SAGAT intends to broaden its current collaboration and participation in research projects and pilot initiatives intended to support and accelerate the development and scalability of new and emerging technologies in the field of smart-grids, carbon capture and storage systems, green hydrogen, new aviation fuels, and new-generation electric or hybrid airplanes.

It should be noted that, in defining actions to be considered to achieve the goals in 2030, it was decided to focus exclusively on carbon emissions reduction actions within the geographical limits of the airport, without considering the purchase of electricity with Guarantee of Origin (GO).
The GO will continue to be a tool that SAGAT uses to decarbonise the electricity supplies from the network. However, within this analysis, they were not considered in order to better highlight and quantify the actions carried out that impact both the reduction of primary energy and emissions associated with it.

Primary energy demand reduction

The graph below shows the airport's primary energy demand in relation to the baseline year (2010), the monitoring year (2022), and future trends with the implementation of planned measures. In addition to the absolute values, it is also possible to display the reduction achieved over time in relation to the reference year.
Thanks to the righteous journey begun a while ago, and to the actions included in the Roadmap, it is clearly possible to limit the airport energy demand to current levels, while enabling its logistical and commercial development, thus achieving the preset target.

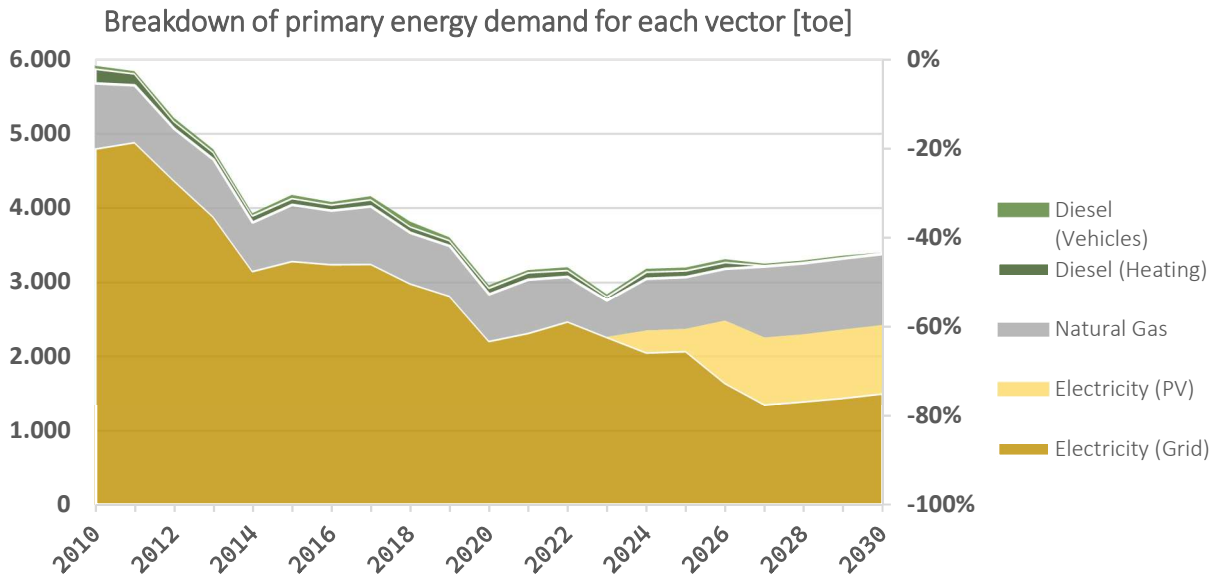


Figure 5 - Evolution of primary energy requirements (2010-2030)

PRIMARY ENERGY DEMAND	BASELINE – 2010	Scenario *Business as usual*	Scenario Roadmap 2030
[TOE]	6.324	3.690	3.378
GOAL (compared to 2010)		Scenario Roadmap 2030	Target "Fit for 55"
Primary energy demand reduction		-47%	-39%

Table 4 - Summary of targets and scenarios primary energy requirements 2030

Coverage of the primary energy demand with energy produced locally from RES

The graph below compares the primary energy demand of the airport with the local production of energy from RES systems.
It can be noted that this particularly challenging goal can be reached through the combined benefits of energy efficiency actions, designed to reduce airport's energy consumption, and investments in new renewable energy production plants.

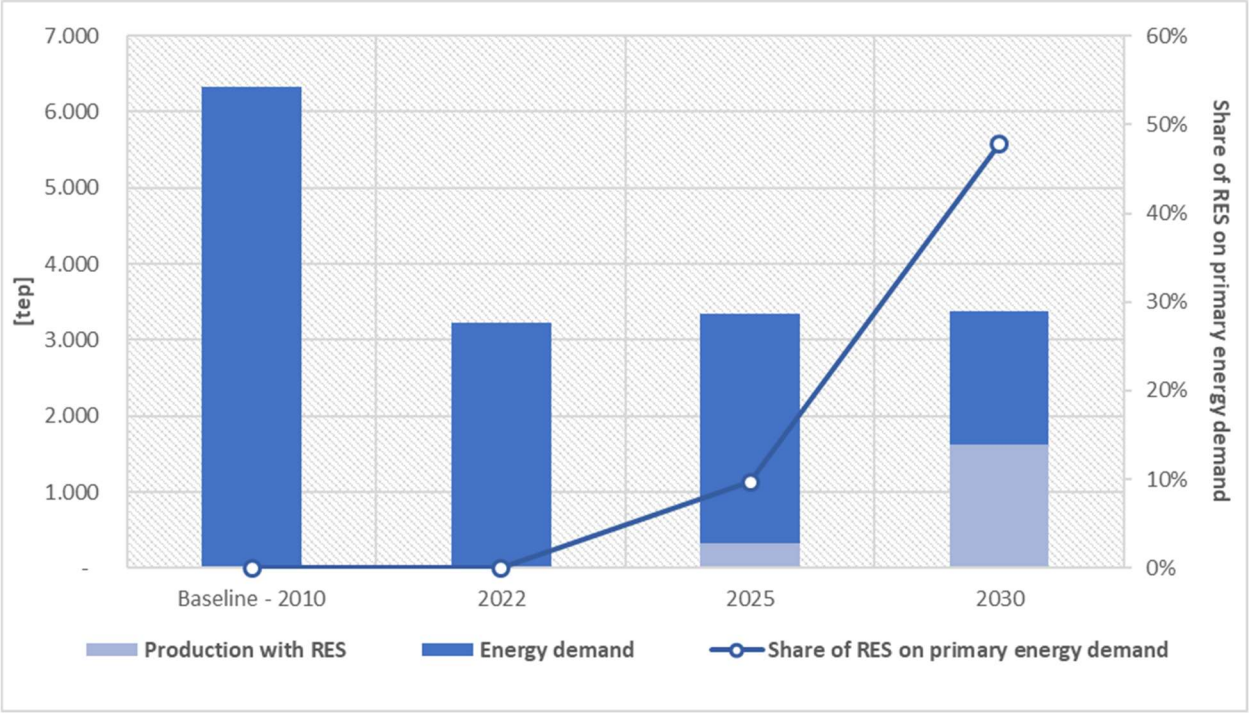


Figure 6 - Evolution of energy production from RES (2010-2030)

LOCAL RES PRODUCTION	BASELINE – 2010	2022	BAU scenario	2030 Roadmap Scenario
[TOE]	**0**	**0**	**323**	**1.617**
GOAL	BASELINE – 2010	2022	2030 ROADMAP	TARGET
Coverage of energy demand from RES	**0%**	**0%**	**48%**	**40%**

Table 5 - Summary of targets and scenarios primary energy requirement coverage from RES 2030

Reduction on carbon dioxide emissions

The graph below shows the airport's carbon footprint from the baseline year (2010) to the monitoring one (2022) and future trends determined by the implementation of the planned actions compared to the no action emissions.
This trend curve indicates the airport's carbon footprint in the event that the above-mentioned actions were not carried out and according to current growth scenarios and airport expansion.
Compared to the primary energy demand graph, it can be seen how the emissions trend decreases in this case. This is a result of the joint effect of the benefits relating to significant efficiency actions, carried out over time, and to the decisive contribution of self-production from renewable sources.

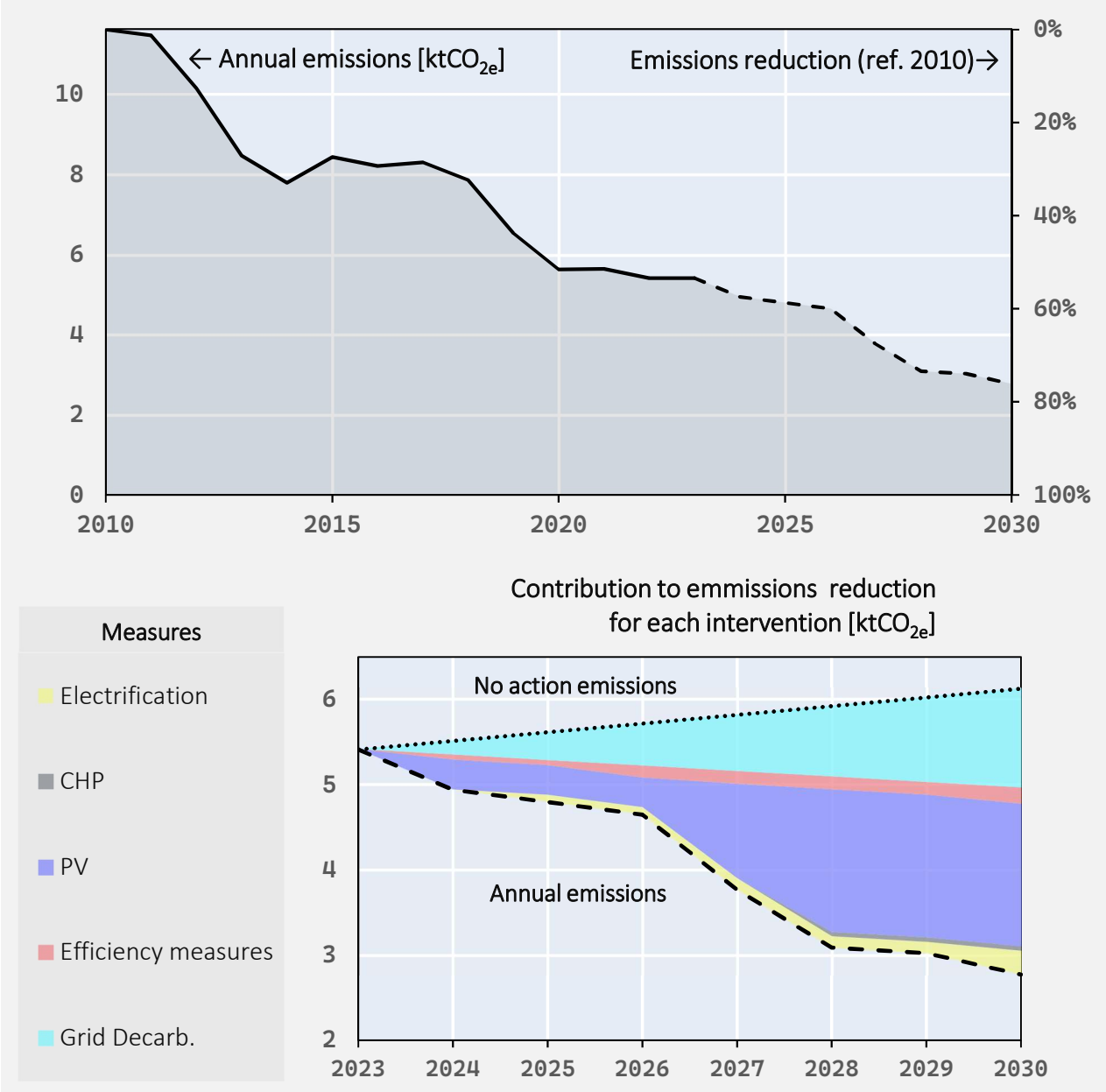


Figure 7 - Evolution of CO_2 emissions (2010-2030)

CO_2 EMISSIONS	BASELINE – 2010	Scenario *Business as usual*	Scenario Roadmap 2030
[ton_{CO2}]	11.571	4.965	2.771
GOAL (compared to 2010)		Scenario Roadmap 2030	Target "Fit for 55"
CO_2 emissions reduction		-76%	-55%

Table 6 - Summary of 2030 CO_2 emission targets and scenarios

6 "Net Zero Carbon" 2040 ROADMAP

*SAGAT is committed to achieving the **"Net Zero Carbon" goal by 2040**, minimising greenhouse gas emissions coming from operations under its direct control and compensating residual emissions via actions that remove or sequester an equivalent quantity of carbon emissions from the atmosphere.*

Since 2019, the Group has adhered to the Airport Carbon Accreditation programme and, in 2022, achieved *Level 3 - Optimisation* of this certification. This consists in having an Action Plan for reducing emissions and involving stakeholders in the decarbonisation process.
Thanks to current emissions reduction actions and as a result of compensation projects adopted, during 2024 SAGAT will be able to apply for the *Level 3+ - Neutrality* accreditation, reaching the intermediate goal of carbon neutrality.

By maintaining climate neutrality and achieving the "*Fit for 55*" goals in 2030, it will be possible to continue on the path towards climate neutrality, anticipating the achievement of the "**Net Zero Carbon**" goal by **2040**. This may occur by minimising the greenhouse gas emissions coming from operations under its direct control (*Scope 1, 2, and staff business travel*) and compensating for residual emissions.

This goal could be met through a combination of actions aimed at the local reduction of emissions and the implementation of emissions removal and storage solutions:

- **Energy efficiency actions**
- **Local production of energy from renewable sources**
- **Decarbonisation of heat sources**
- **Purchase of biofuels and electricity with Guarantee of Origin**
- **Greenhouse gas removal and storage measures**

The main measures adopted by the airport to achieve these goals are shown in the image below, based on the decarbonisation categories detailed in the "ACI World Long Term Carbon Goal Study"[2].

[2] https://store.aci.aero/product/long-term-carbon-goal-study-for-airports-report-2021/

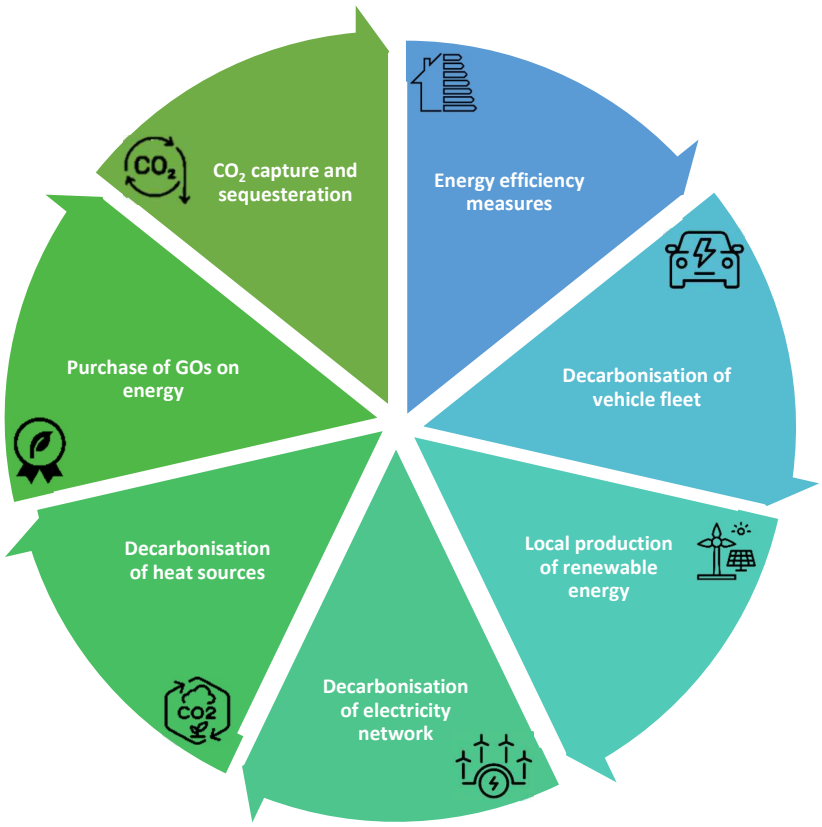


Figure 8 - Breakdown of interventions by decarbonisation categories "ACI World Term Carbon Goal Study"

The potential decarbonisation scenarios for airport activities analysed in 2040, with the definition of actions and measures that will help achieve this goal, are presented below:

- ✓ Scenario with ***hydrogen-based*** technologies
- ✓ Scenario with ***electrification*** of final energy uses

The scenario based on the installation of hydrogen technologies involves making significant and progressive investments in new fuel cells between 2027 and 2040, initially powered by natural gas or biomethane and, subsequently, by hydrogen. In any case, to achieve the "*Net Zero Carbon*" goal, new storage capacity and renewable energy production plants for a total of approximately 10 MW_p, must be installed. The purchase of hydrogen externally and Guarantees of Origin on biomethane, in order to neutralise residual emissions associated with thermal sources supplied by fossil fuels, is also needed.

The scenario based on the electrification of final uses involves also in this case significant investments in new renewable energy production plants (up to 10 Mwp) while providing for a storage system with greater capacity for excess energy produced. Another key element of this scenario consists in the electrification of thermal loads by replacing boilers with heat pump systems. Starting in 2035, the purchase of biomethane and biodiesel with Guarantee of Origin is planned, in order to neutralise the residual emissions associated with thermal sources powered by fossil fuels.

The analysis of the two scenarios reveals that the decarbonisation strategy through the use of fuel cells can be implemented if Guarantees of Origin are available for biomethane and hydrogen at competitive prices. In both scenarios electrification is a necessary driver, regardless of the introduction of hydrogen-based technologies.
The most robust and flexible strategic model is the one associated with pure electrification.

The actions to be carried out within the scenario based on pure electrification of final consumption between 2030 and 2040 which will make it possible to achieve the "**Net Zero Carbon**" before 2040 are shown below.

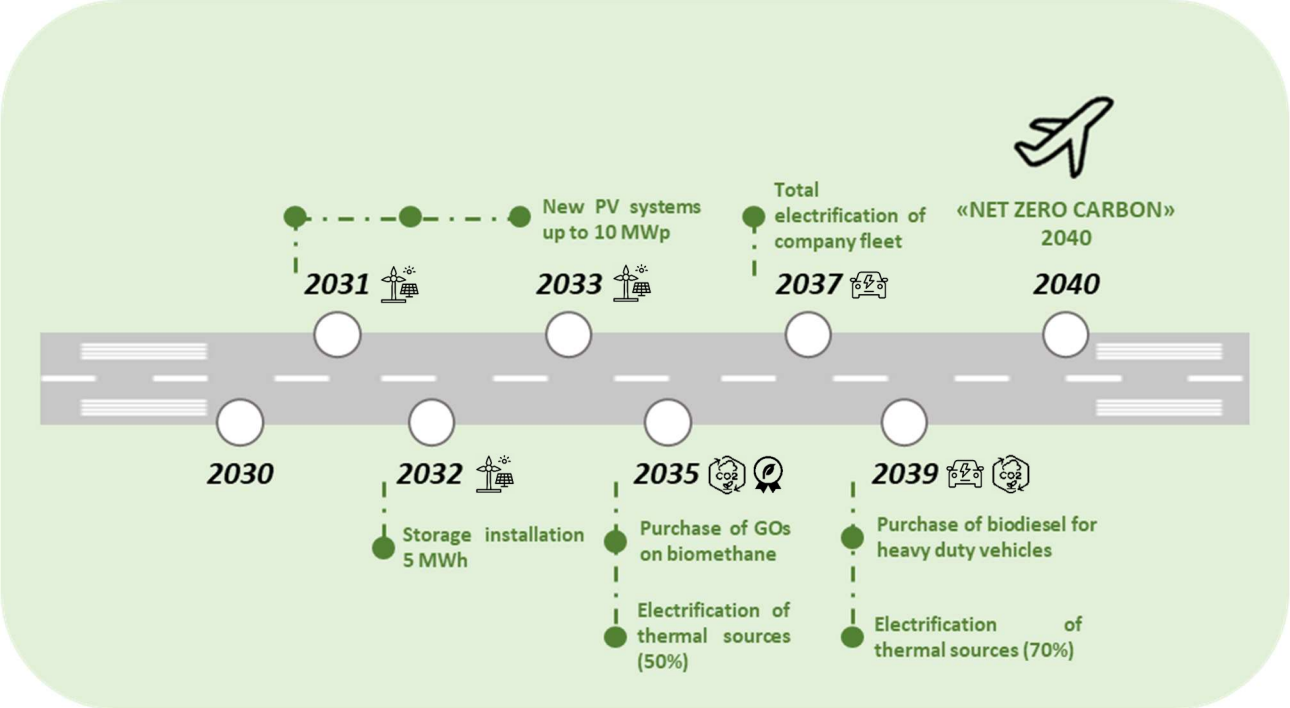
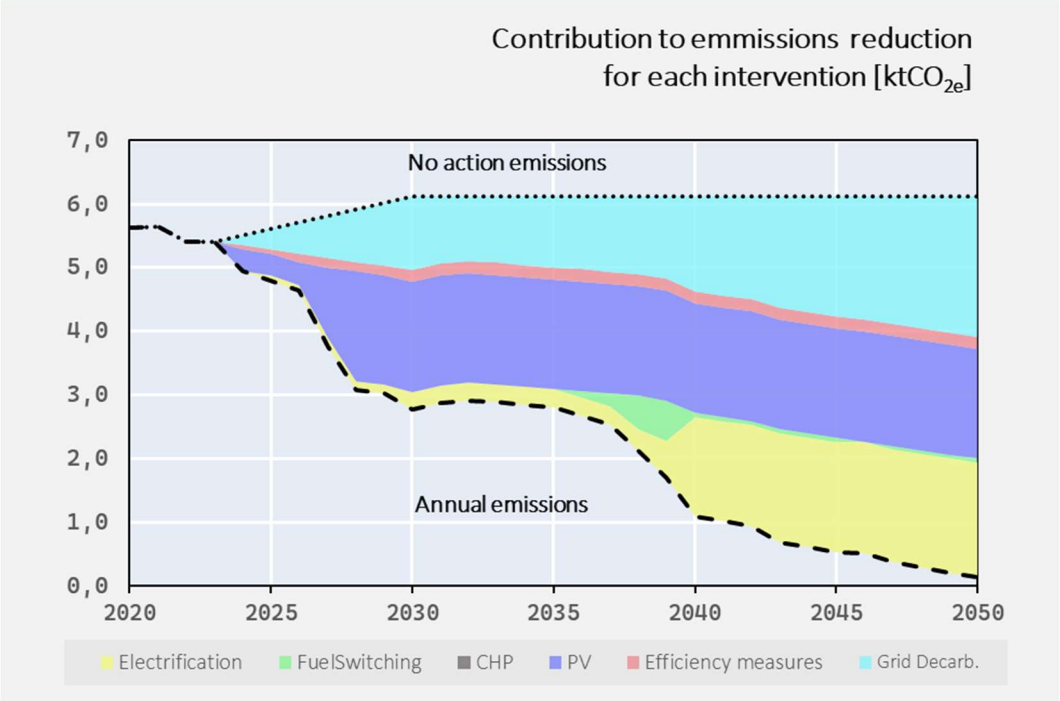


Figure 9 - Timeline of "Net Zero Carbon" interventions 2040

The scenario involving total electrification of final energy uses with and without the purchase of Guarantees of Origin (GO) with reference to the supply of electricity has been assessed. The impact of actions on the decarbonisation trajectory looking towards 2050 is shown below.

Electrification scenario without GO



Electrification scenario with GO

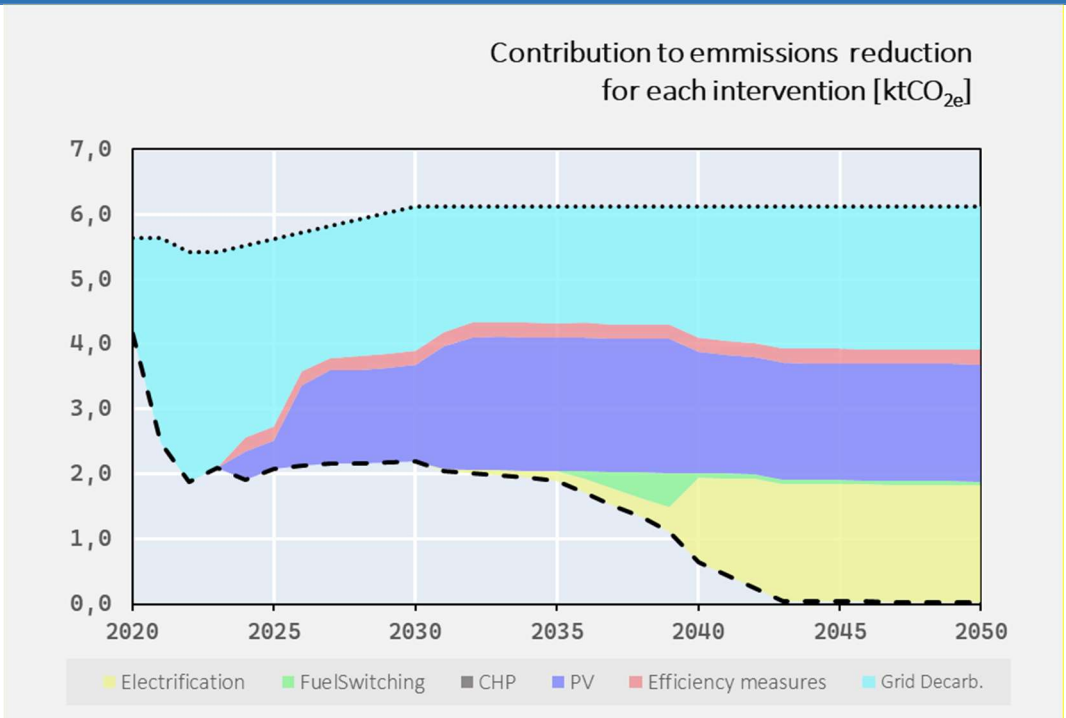


Table 7 - Comparison of 2020-2050 electrification scenario with and without Guarantees of Origin

A comparison of the graphs shows how the purchase of Guarantees of Origin for 100% of the supply of electricity does not influence technological choices but allows the reduction of the emission perimeter to be significantly anticipated.

The implementation of the actions described will allow a reduction of over 90% in emissions by 2040 compared to the baseline values in 2010 associated with the airport's Scope 1, 2 and business travel.
It will finally be possible to achieve the goal of reducing residual emissions to zero through certified CO_2 removal mechanisms.

There are several removal methods, each of which associated with a series of benefits and challenges linked to feasibility, efficacy, social, economic and environmental impacts, and connected benefits.
The available projects can be classified into three macro-categories:

1. **Ecosystems-based**: methods that use existing processes in nature to increase the absorption and storage of greenhouse gas emissions in carbon sinks. They are generally based on CO_2 storage within the ground but may also include activities related to the ocean cycle.
2. **Engineered**: methods based on human-developed processes to capture and store greenhouse gas emissions present in the environment.
3. **Hybrid**: methods that use both ecosystems-based and engineered greenhouse gas emissions removal technologies or that cannot easily be classified into one of the two categories.

Over time, an assessment will be carried out on which methodology is deemed most appropriate for completely reducing emissions to zero. Today, some technologies are still not very mature; it will therefore be necessary to better assess their reliability, accessibility, and availability in the upcoming years.

Category	*Type of Offset*	*Definition*
Ecosystems-based	Afforestation (AR)	Process whereby trees are planted in areas where no kind of forest was originally present.
	Reforestation (RF)	Regeneration of forests that have been destroyed due to the exploitation of wood, fires, or their conversion into pasture and agricultural land
	Soil Carbon Sequestration (SCS)	Process for removing and storing CO_2 in the ground by improving land management
Engineered	Direct Air Capture (DAC)	Process of capturing carbon dioxide directly from the air using physical/chemical processes
	Enhanced weathering (EW)	Acceleration of the process whereby minerals absorb CO_2, for example through the pulverisation and spreading of basalt on the soil
	Bioenergy with carbon capture and storage (BECCS):	The production of heat, electricity or biofuels with biomass, followed by the capture and storage of the CO_2 produced from exhaust gases underground
Hybrid	Biochar	Pyrolysis of the biomass via high temperatures and subsequent fixing of resulting carbon in the soil

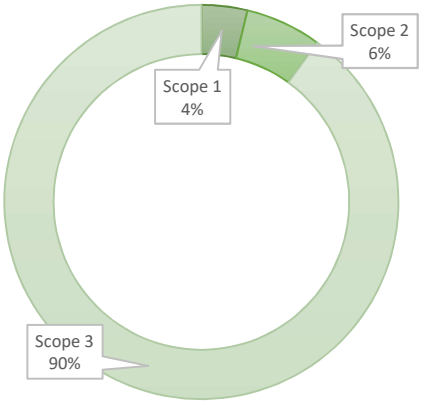
Table 8 - Defining Offsetting measures

7 COMMUNITY INVOLVEMENT

Achieving the goals set out in this Roadmap cannot ignore the active involvement of the local communities surrounding the airport and the airport community itself.
This chapter aims to explore the crucial role that community involvement can play in achieving airport decarbonisation goals and in helping to foster a greater sense of responsibility and sustainability.
Such involvement is possible through participatory approaches that enhance transparency, collaboration, and inclusion of community perspectives in planning and implementing emissions reduction strategies.

Airport community involvement

Made up of employees, parties, companies, and bodies that are part of the airport fabric, the airport community has a fundamental and active role in ensuring the success of decarbonisation initiatives.
When looking at global emissions and considering the impact of Scope 3 emissions compared to the overall amount of Scope 1 and 2 emissions, it can be seen that indirect emissions play a significant role.
In this sense, the airport's role in actively involving stakeholders and in guiding them to gradually reduce and eliminate emissions associated with their activities is crucial.



The main emissions sources that constitute Scope 3, not directly attributable to SAGAT, are shown in the following table.

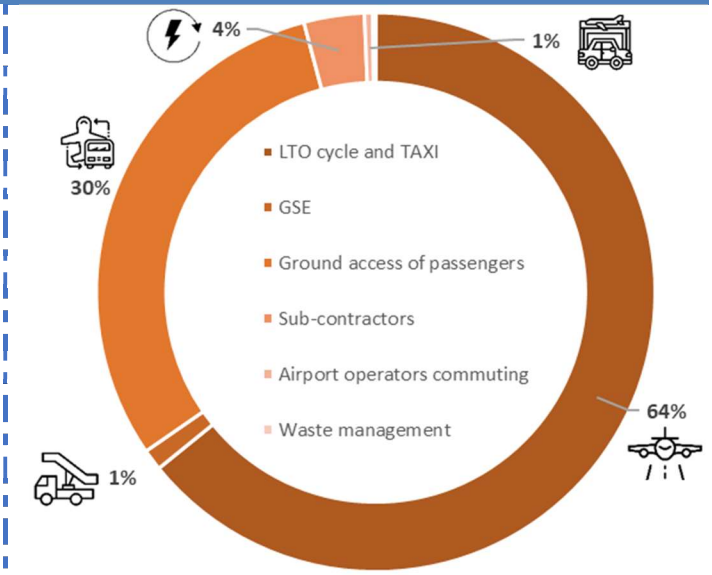
Scope 3 Activities	
Cycle of landing, taxiing, and take off of aircraft	
Ground access of passengers	
Activities associated with sub-contractors present in the terminal	
Ground handling activities (Ground Support Equipment - GSE)	
Airport operators' commuting	
Waste management	

Table 9 - Description of activities and Scope 3 emissions

The SAGAT group intends to implement a series of initiatives aimed at involving stakeholders and the airport community in concrete decarbonisation efforts. These initiatives do not only aim to mitigate the environmental impact of the airport operations, but also to create awareness, collaboration, and collective action towards a more sustainable future with limited emissions impact.
For each type of activity related to Scope 3, specific actions in relation to which the airport intends to assume an active role and those that can significantly reduce the impact have been identified.

Cycle of aircraft landing, taxiing and take off

Policies to incentivise airlines to change their fleets
Optimisation of the flight trajectories and LTO activities
Improving collaborative decision-making between airports (Airport-Collaborative Decision Making, A-CDM) to optimise taxiing phases
Promoting the use of single engine taxiing procedure entering and leaving the runway to reduce fuel consumption and ground emissions
Policies relating to reducing the use of APUs for delivering electricity and air conditioning
Introduction of alternative taxiing methods carried out with ground means to replace the most polluting engines of aircraft and assessment of feasibility linked to electric taxiing integrated in aircraft wheels
Membership of alliances and consortia aimed at studying infrastructure needed to introduce new aircraft powered by hydrogen and electricity
Foster the introduction of sustainable aviation fuels (SAF), promoting their use in line with the “ReFuel EU aviation” initiative, which sets forth increasing shares of supply starting from 2025

Table 10 - Emissions reduction action list aircraft landing, taxiing and take off cycle

Ground access of passengers

Widening the offer of public transport to reach the airport: increase the frequency of buses to connect the airport with Turin city center, favouring the introduction of vehicles with alternative powertrains to the current state-of-the-art, and growing the frequency of trains, thus increasing low-impact alternatives available for reaching the airport.
Promoting electric mobility: the primary goal in this sense is expanding the airport offer to facilitate the electrification of motor vehicles by providing increasingly widespread charging infrastructures for all types of vehicles that travel to the airport (car sharing, rent-a-car, taxis, and private vehicles).

Table 11 - Emissions reduction action list related to ground access

Activities associated with sub-contractors present in the terminal

Involvement of commercial businesses regarding the decarbonisation journey undertaken by the airport: sharing the annual evolution in consumption divided by a typical day with all sub-contractors so as to stimulate awareness regarding potential energy waste; informing parties on the possibility of carrying out joint analyses to study loading profiles and carrying out activities to reduce them over time
Supporting sub-contractors to purchase energy from renewable sources

Table 12 - Emissions reduction action list associated with sub-contractors consumptions

Ground handling activities (Ground Support Equipment - GSE)

Strengthening jet bridges and 400 Hz systems on parking aprons away from the main terminal thus minimising the use of APUs during turn around
Management of internal operations aimed at using the compact geometry of the airport to increase foot disembarking and via fingers so as to optimise the impact of vehicles linked to turn around
Progressive electrification of GSE vehicles involved in aircraft disembarking and embarking and recharging using green energy
Experiments relating to hydrogen GPUs so as to study their role in the future of aviation

Table 13 - Emissions reduction action list associated to ground handling activities

Airport operators' commuting

Incentives for SAGAT employees to use car-pooling for commuting, structuring of agile work so as to minimise the impact of employee travel
Availability of free electric recharging stations for SAGAT employees powered by electricity produced by newly installed solar panel plants and, thus, to incentivise the transition to electric vehicles
Consideration of incentive mechanisms for using public transport to reach the airport

Table 14 - Emissions reduction action list associated to airport operators' commuting