Aberdeen Airport Carbon Footprint 2024

Aberdeen International Airport

Report for Aberdeen Airport

VERSION: 2

Produced by Ricardo
https://www.ricardo.com/en/markets/security/aerospace

Project Summary

AGS Airports Limited is held by AviAlliance, one of the world's leading private industrial airport investors and operators and owner of Aberdeen International Airport Limited (ABZ). The airport operates 365 days per year and in 2024 served more than 2 million passengers and handled more than 72,000 aircraft movements. As of the end of 2024, AGS Airports employed around 380 full time employees (FTE), of which around 72 were based in Aberdeen Airport, many of whom commute to the airport by car or public transport.

This report presents the carbon footprint for the 2024 calendar year for Aberdeen Airport, covering the period 1st January 2024 to 31st December 2024.

To continue operating in an environmentally responsible manner, it is important for the airport to monitor and manage all its emissions from all operations – both those the airport is directly responsible for, and those it can influence under its Scope 3 emissions.

The calculation of the annual carbon footprint will help AGS Airports, and the individual airports understand the different areas which contribute to their overall carbon footprint and monitor changes on a yearly basis. This process will help identify improvement opportunities, which will ultimately reduce AGS Airports' carbon footprint and associated costs. In addition, the success of any management strategies previously implemented can be evaluated year-on-year through monitoring emissions reductions.

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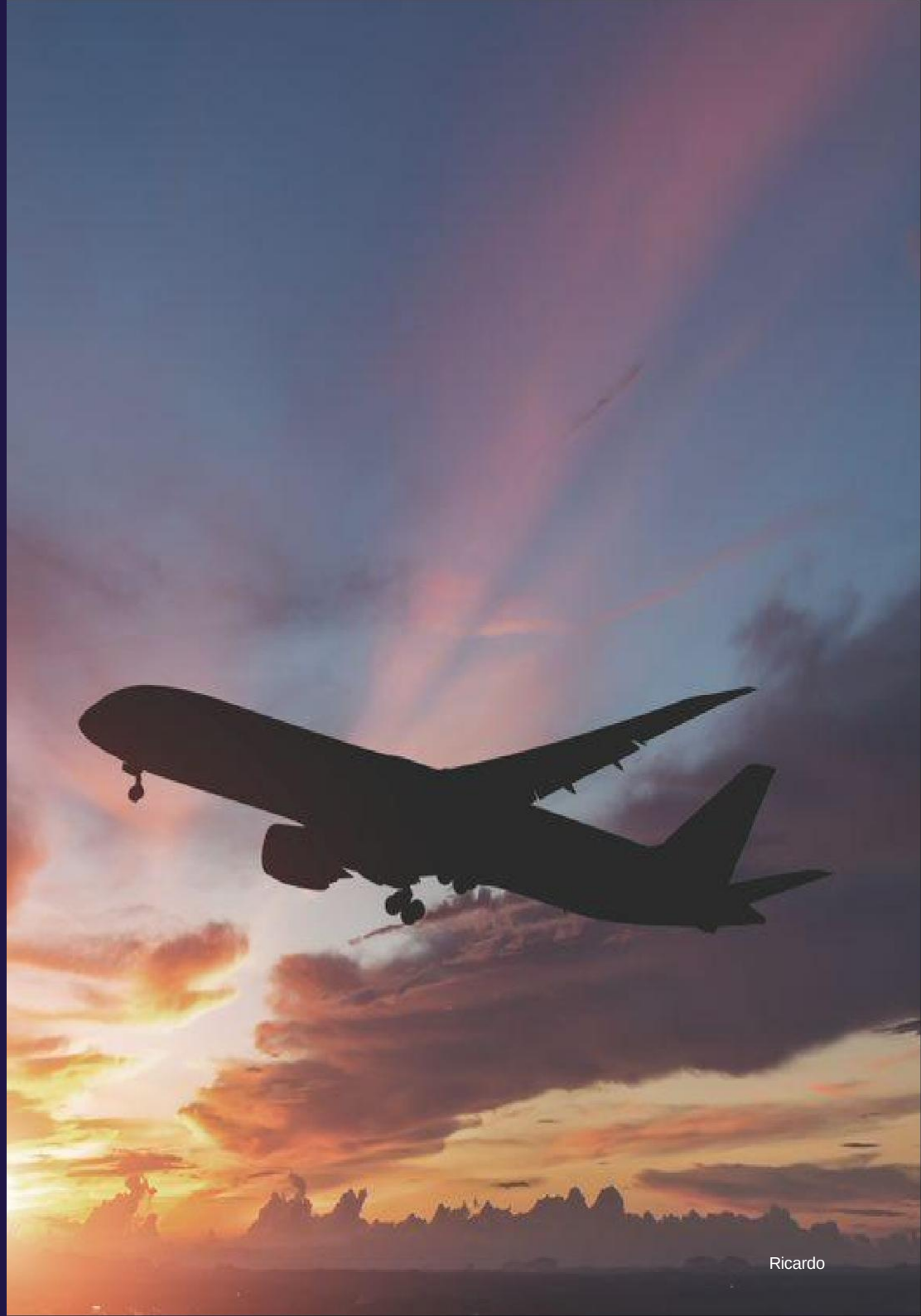


CARBON FOOTPRINT

2024 EMISSIONS OVERVIEW

2024 EMISSIONS OVERVIEW

SUMMARY

All emissions have been calculated in line with the GHG Protocol Corporate Reporting Standard, ACA Level 3 and ISO 14064-1.

Emissions are reported using the market-based methodology unless clearly indicated otherwise. For an explanation of location and market-based reporting methodologies see this slide.

The GHG Protocol requires organisations to report their GHG emissions under 3 scopes: Scope 1, 2 and 3. The emission sources included within each scope of the footprint can be seen to the right.

A detailed explanation of the methodology and assumptions used to estimate the carbon footprint is provided in the GHG Inventory Methodology Document.

Scope 1

"Direct Emissions"

- Owned operational vehicles and equipment
- Natural gas
- Fuel used in generators and other equipment
- Fuel used in fire training
- Refrigerant losses from chillers and air conditioners
- Surface de-icer used by the airport

Scope 2

"Indirect Emissions"

- Electricity consumption by the airport

Outside of Scope

"Biogenic Fuel Emissions"

Emissions from fuels with biogenic content. Scope 1 or 3 impact of the biogenic component of these fuels has been determined to be net "0".
For complete reporting of emissions at point of combustion, the emissions associated with the biogenic component of the fuel is reported as Outside of Scopes and are not includes in Scope 1-3 total.

Scope 3

"Indirect Emissions"

- Category 1: Water consumption and non-road construction vehicles
- Category 3: Fuel- and energy-related activities (not included in scope 1 or 2)
- Category 5: Waste generated in operations
- Category 6: Business travel
- Category 7: Employee commuting
- Category 11: Use of sold products:
  - Aviation emissions: Landing take-off (LTO), auxiliary power unit (APU), engine testing
  - Third party operational vehicles
  - Aircraft de-icer used by third parties
  - Passenger surface access
  - Tenant staff commuting
- Category 13: Downstream leased assets – includes tenant electricity consumption

2024 EMISSIONS OVERVIEW

ANNUAL SUMMARY – MARKET BASED

Scope 3

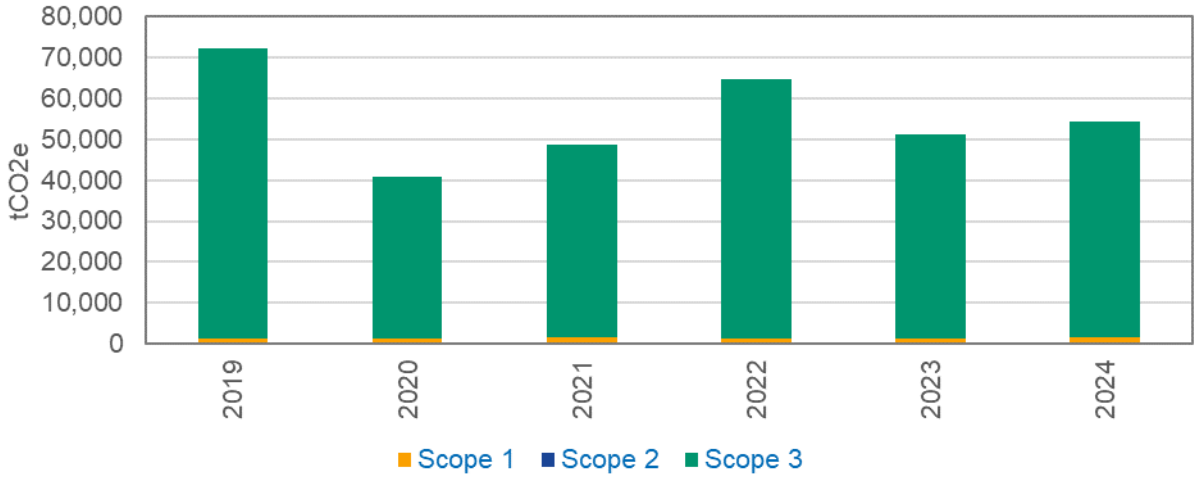
52,767tCO$_2$e 97.0%

Scope 1

1,619tCO$_2$e 3.0%

Scope 2

0tCO$_2$e 0.0%



54,387 tCO$_2$e/year

Market-based emissions figures

3.0%

Scope 1

0.0%

Scope 2

97.0% (61% Aviation)

Scope 3

All emissions have been calculated in line with the GHG Protocol, to ACA Level 3 standard and ISO 14064-1. Outside of scope emissions have not been shown.

Emissions are reported using the market-based methodology. In 2024, Aberdeen Airport purchased green electricity, reducing market-based scope 2 emissions to zero. For an explanation of location and market-based and annual trends see this slide.

2024 EMISSIONS OVERVIEW

ALL EMISSION SOURCES – MARKET BASED (1 of 3)

Scope 1

Direct GHG emissions that occur from sources that are owned and/or controlled by the airport

Summary Category	ACA Category	Emissions (tCO_2e)	% of Scope	% of Total Emissions
Scope 1 – Total		1,619	-	3.0%
Mobile sources	Operational vehicles (airport)	106	6.5%	0.2%
Stationary sources	Heating and generation	34	2.1%	0.1%
	Natural gas (airport)	987	60.9%	1.8%
	Fire training	41	2.5%	0.1%
Process emissions	Refrigerant losses	11	0.7%	0.0%
	De-icing (surfaces)	441	27.2%	0.8%

Scope 2

Indirect GHG emissions that occur from the generation of purchased electricity, steam, heat, or cooling consumed by the airport

Summary Category	ACA Category	Emissions (tCO_2e)	% of Scope	% of Total Emissions
Scope 2 – Total		0	-	0.0%
Purchased electricity	Purchased electricity (airport)	0	100.0%	0.0%

2024 EMISSIONS OVERVIEW

ALL EMISSION SOURCES – MARKET BASED (2 of 3)

Scope 3

All other indirect emissions in the value chain of the airport operator that occur from sources not owned and/or controlled by the company

Summary Category	ACA Category	Emissions (tCO_2e)	% of Scope	% of Total Emissions
Scope 3 – Total		52,767	-	97.0%
Category 1: Purchased goods and services	Water consumption	14	0.03%	0.02%
	Non-road construction vehicles	49	0.1%	0.1%
Category 3: Fuel- and energy-related activities	WTT/T&D (for scope 1&2 sources)	431	0.8%	0.8%
Category 5: Waste generated in operations	Waste	1	0.003%	0.003%
	Wastewater	16	0.03%	0.03%
Category 6: Business travel	Business travel	20	0.04%	0.04%
Category 7: Employee commuting and home office	Staff commute	1,876	3.6%	3.4%
Category 11: Use of sold products	Aircraft LTO and APU	32,040	60.7%	58.9%
	Aircraft engine testing	1,209	2.3%	2.2%
	Operational vehicles (third party)	407	0.8%	0.7%
	Aircraft de-icing	567	1.1%	1.0%
	Passenger surface access	15,573	29.5%	28.6%
	Heating and generation (tenant)	35	0.1%	0.1%
	Refrigerant losses (tenant)	21	0.04%	0.04%
Category 13: Downstream leased assets	Purchased electricity (tenant)	449	0.9%	0.8%
	Natural gas (tenant)	59	0.1%	0.1%

2024 EMISSIONS OVERVIEW

ALL EMISSION SOURCES – MARKET BASED (3 of 3)

Outside of Scopes

The direct CO_2e emissions released through the combustion of biofuels

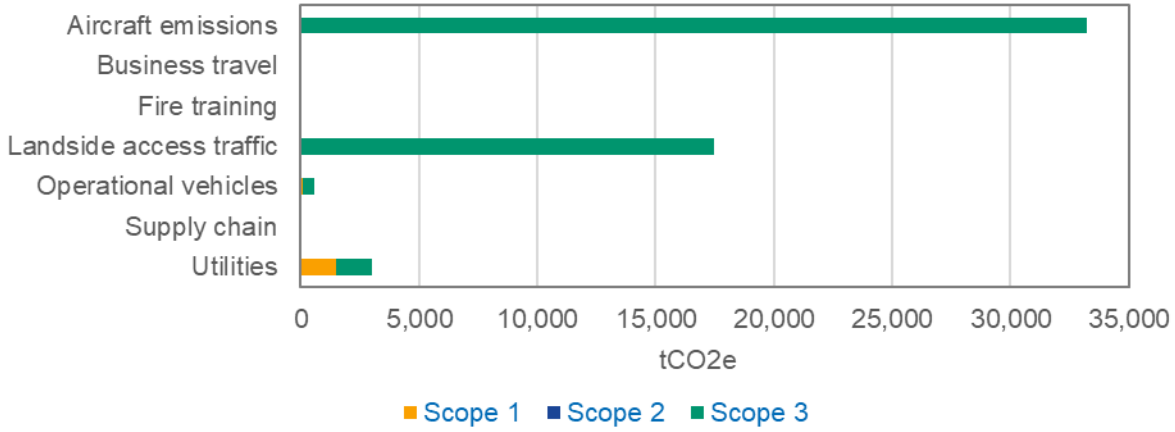
Summary Category	ACA Category	Emissions (tCO_2e)	% of Scope	% of Total Emissions
Outside of Scopes – Total		1,706	-	N/A
N/A	Heating and generation	1	0.0%	N/A
	Fire training	1	0.1%	N/A
	Business travel	0.05	0.003%	N/A
	Operational vehicles (airport)	7	0.4%	N/A
	Operational vehicles (third party)	210	12.3%	N/A
	Non-road construction vehicles	3	0.18%	N/A
	Purchased electricity (airport)	728	42.6%	N/A
	Purchased electricity (tenant)	757	44.4%	N/A

Total Emissions Summary by Scope

Scope	Emissions (tCO_2e)	% of Total Emissions
Scope 1	1,619	3.0%
Scope 2	0	0.0%
Scope 3	52,767	97.0%
Scopes 1-3 Total	54,387	100.0%
Outside of Scopes	1,706	N/A

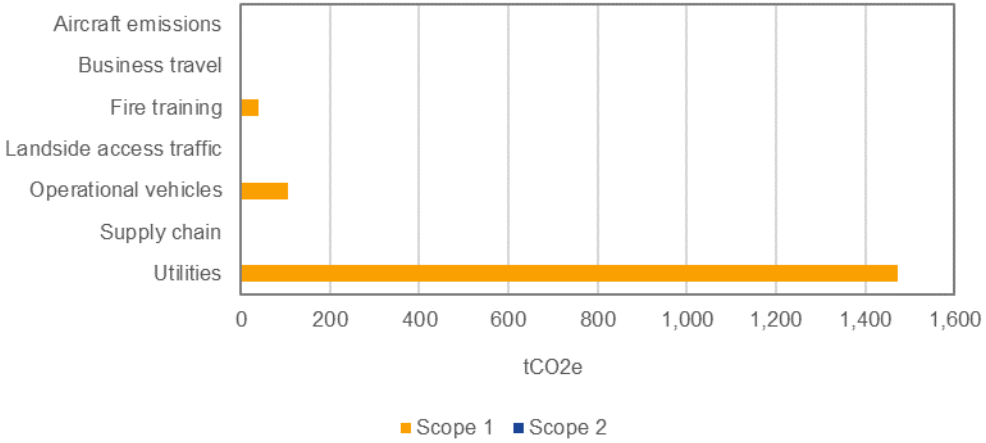
Carbon Footprint – By Emissions Source (Market-Based)

All Scopes Emissions Split by Source

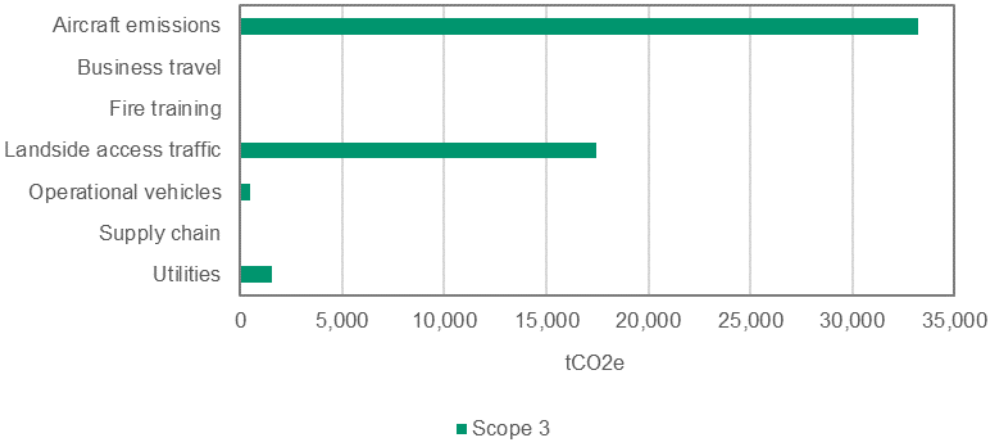


Note: 'Aircraft emissions' includes emissions from LTO, APU and engine testing.

Scopes 1 and 2 Emissions Split by Source



Scope 3 Emissions Split by Source



CARBON FOOTPRINT

ANNUAL EMISSIONS TRENDS

ANNUAL EMISSIONS TRENDS

ANNUAL EMISSIONS BY SOURCE – MARKET BASED (1 of 3)

Scope 1

Direct GHG emissions that occur from sources that are owned and/or controlled by the airport

		Emissions (tCO_2e)			2023 to 2024 % Change
Summary Category	**ACA Category**	**2019**	**2023**	**2024**	
Scope 1 – Total		1,351	1,334	1,619	21.4%
Mobile sources	Operational vehicles (airport)	137	89	106	19.0%
Stationary sources	Heating and generation	8	1	34	4,085.8%
	Natural gas (airport)	988	897	987	10.0%
	Fire training	175	62	41	-34.9%
Process emissions	Refrigerant losses	43	-	11	-
	De-icing (surfaces)	-	284	441	55.2%

Scope 2

Indirect GHG emissions that occur from the generation of purchased electricity, steam, heat, or cooling consumed by the airport

		Emissions (tCO_2e)			2023 to 2024 % Change
Summary Category	**ACA Category**	**2019**	**2023**	**2024**	
Scope 2 – Total		0	0	0	-
Purchased electricity	Purchased electricity (airport)	0	0	0	-

ANNUAL EMISSIONS TRENDS

ANNUAL EMISSIONS BY SOURCE – MARKET BASED (2 of 3)

Scope 3

All other indirect emissions in the value chain of the airport operator that occur from sources not owned and/or controlled by the company

		Emissions (tCO_2e)			2023 to 2024 % Change
Summary Category	**ACA Category**	**2019**	**2023**	**2024**	
Scope 3 – Total		71,004	49,790	52,767	6.0%
Category 1: Purchased goods and services	Water consumption	36	14	14	-6.0%
	Non-road construction	-	-	49	-
Category 3: Fuel- and energy-related activities	WTT/T&D (for scope 1&2 sources)	324	412	431	4.7%
Category 5: Waste generated in operations	Waste	556	5	1	-68.7%
	Wastewater	71	16	16	0.1%
Category 6: Business travel	Business travel	11	8	20	140.0%
Category 7: Employee commuting and home office	Staff commute	5,476	2,264	1,876	-17.1%
Category 11: Use of sold products	Aircraft LTO and APU	43,634	29,431	32,040	8.9%
	Aircraft engine testing	251	1,019	1,209	18.6%
	Operational vehicles (third party)	631	616	407	-33.9%
	Aircraft de-icing	-	311	567	82.7%
	Passenger surface access	19,895	15,178	15,573	2.6%
	Heating and generation (tenant)	-	0.4	35	9.694.1%
	Refrigerant losses (tenant)	-	3	21	622.5%
Category 13: Downstream leased assets	Purchased electricity (tenant)	-	451	449	-0.6%
	Natural gas (tenant)	121	62	59	-4.2%

ANNUAL EMISSIONS TRENDS

ANNUAL EMISSIONS BY SOURCE – MARKET BASED (3 of 3)

Outside of Scopes

The direct CO_2e emissions released through the combustion of biofuels

Summary Category	ACA Category	Emissions (tCO_2e)			2023 to 2024 % Change
		2019	2023	2024	
Outside of Scopes – Total		6	1,677	1,706	1.7%
N/A	Heating and generation	-	25	1	-97.5%
	Fire training	-	7	1	-79.9%
	Business travel	-	0.06	0.05	-14.1%
	Operational vehicles (airport)	6	5	7	34.4%
	Operational vehicles (third party)	-	175	210	20.0%
	Non-road construction vehicles	-	-	3	-
	Purchased electricity (airport)	-	699	728	4.1%
	Purchased electricity (tenant)	-	766	757	-1.2%

Total Emissions Summary by Scope

Scope	Emissions (tCO_2e)			2023 to 2024 % Change
	2019	2023	2024	
Scope 1	1,351	1,334	1,619	21.4%
Scope 2	0	0	0	-
Scope 3	71,004	49,790	52,767	6.0%
Scopes 1-3 Total	72,355	51,124	54,387	6.4%
Outside of Scopes	6	1,677	1,706	1.7%

ANNUAL EMISSIONS TRENDS

ANNUAL EMISSIONS TRENDS: SCOPES 1 & 2

Scope 1 (3.0% of total emissions)

Scope 1 emissions have increased in 2024 across most of the emissions categories, with an overall increase of 21%.

Subsequently, scope 1 and 2 intensity- based emissions metrics have shown an increase on both a per passenger (+19%) and per ATM basis (+26%) in comparison to 2023.

Mobile Sources:

- Airport operational vehicles and equipment emissions have increased by 19%. The driver for increased scope 1 vehicle emissions was a significant increase in de-icing vehicle fuel use in January due to cooler weather.

Stationary Sources:

- Fire training emissions have decreased by 35%.
- Natural gas heating emissions have increased by 10%.

Process Emissions:

- Fugitive emissions from refrigerants losses have increased, as there were no refrigerant leaks in 2023. The leak rate for 2024 was still low considering the number of chiller units across the airport estate.
- Scope 1 airport de-icer emissions have increased by 55% due to an increase in snowdays requiring increased de-icing of surfaces.

Scope 2 (0.0% of total emissions)

- Emissions from purchased electricity have remained the same as the airport procures zero carbon electricity as reported under the market-based method.

ANNUAL EMISSIONS TRENDS

ANNUAL EMISSIONS TRENDS: SCOPE 3 & OUTSIDE OF SCOPES

Scope 3 (97.0% of total emissions)

Scope 3 emissions have increased by 6% overall in 2024.

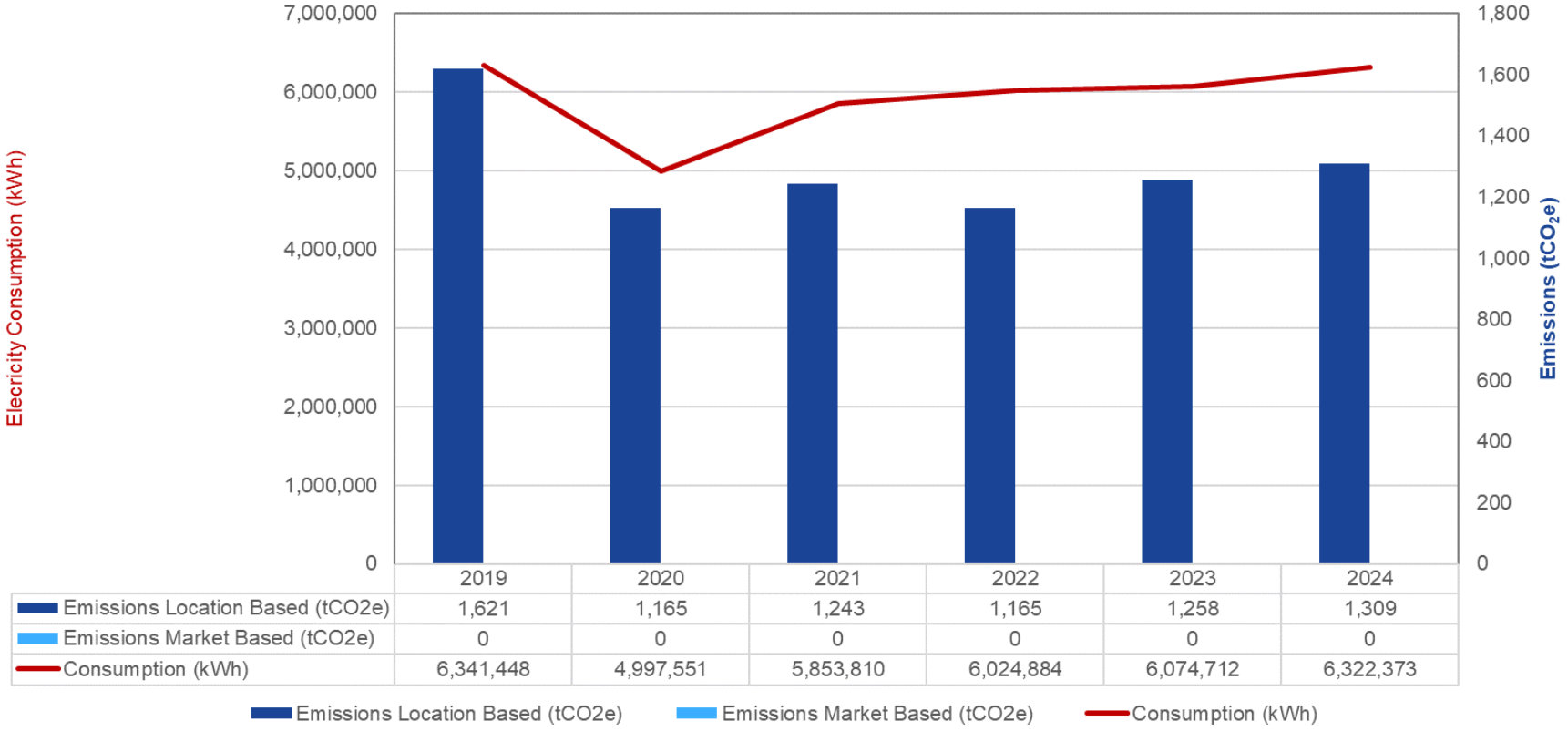
- Aircraft LTO emissions have increased by 9%. The increase in LTO emissions is reflective of the increase in passenger numbers (+1.7%), and an increase in the taxiing times at the airport compared to 2023.
- Third-party operational vehicles and equipment emissions have decreased 34%. The driver for decreased vehicle emissions is a gradual switch to more electric ground handling equipment.
- Business travel emissions have increased 140% due to updated distribution of AGS travel across Glasgow, Aberdeen and Southampton Airports.
- Passenger surface access emissions have increased by 2.6%, reflecting an increase in passenger numbers.
- Waste emissions have decreased by 69%, reflecting increasing rates of recycling at the airport.
- Third party de-icer emissions have increased by 83% due to an increase in snowdays requiring more de-icing of aircraft.
- Staff commute emissions (Airport staff only) have decreased by 17% due to updated distribution of AGS staff across Glasgow, Aberdeen and Southampton Airports.

ANNUAL EMISSIONS TRENDS

ELECTRICITY LOCATION AND MARKET BASED EMISSIONS

Electricity emissions can be reported using the following two methodologies:

- **Location based method**; this reflects the average emissions intensity of macro-scale (regional/national) electricity grids where energy consumption occurs. Companies reporting using this method should use the regional/National Grid average emission factor. In the UK, this would be sourced from the Department for Energy Security and Net Zero's Government conversion factors for Company Reporting.
- **Market based method**; this reflects the emissions from the electricity that a company is purchasing. Aberdeen Airport has purchased green electricity with all consumption covered by renewable energy guarantees of origin (REGO) certificates that cover all consumption for 2019-2024. Therefore, electricity emissions are reported as zero carbon under the market-based methodology.



	2019	2020	2021	2022	2023	2024
Emissions Location Based (tCO2e)	1,621	1,165	1,243	1,165	1,258	1,309
Emissions Market Based (tCO2e)	0	0	0	0	0	0
Consumption (kWh)	6,341,448	4,997,551	5,853,810	6,024,884	6,074,712	6,322,373

Note: The electricity consumption shown includes electricity use by the airport (scope 2) only.

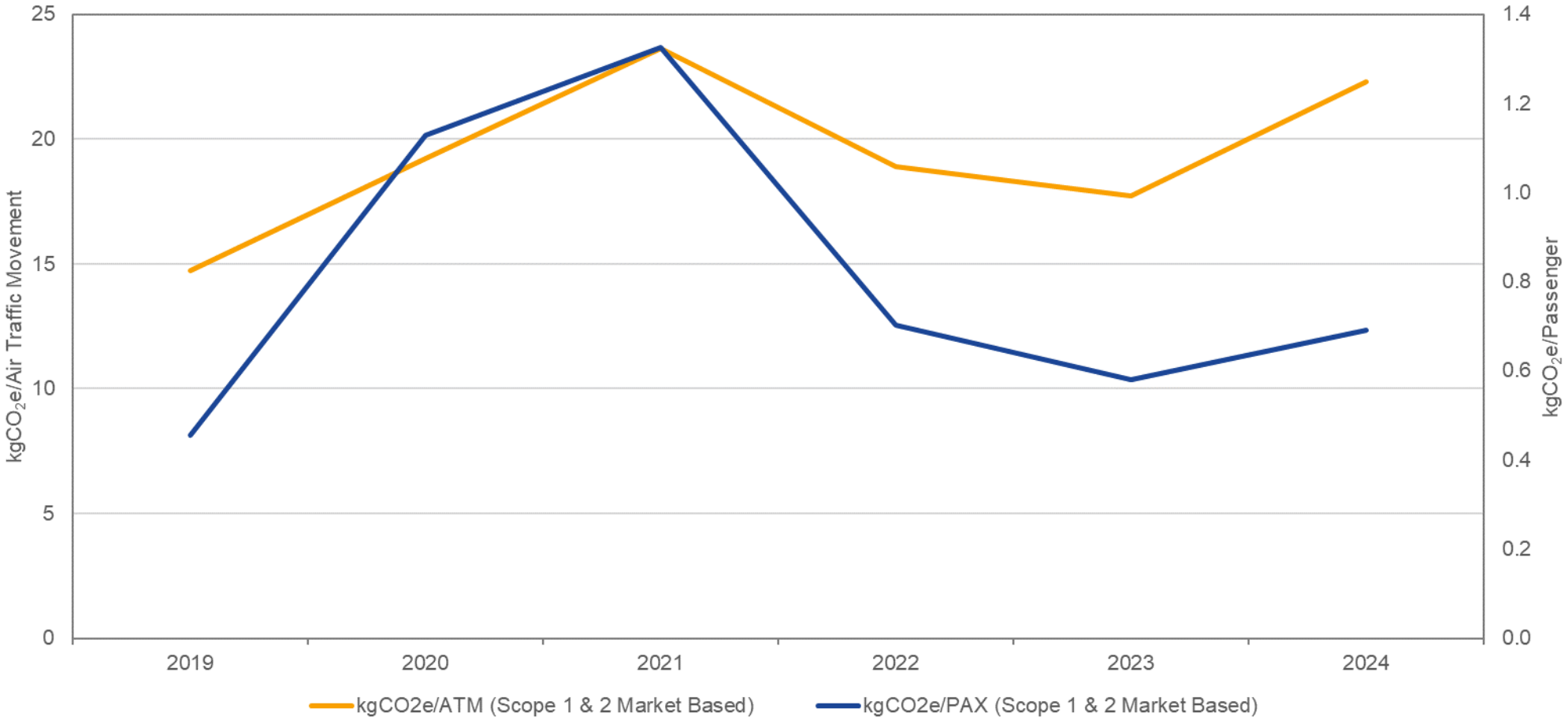
Emissions shown here exclude T&D losses and WTT emissions.

ANNUAL EMISSIONS TRENDS

INTENSITY METRICS COMPARISON OVER TIME – MARKET BASED

Intensity metrics allow comparison over time against other factors that fluctuate and have an impact on the environmental performance of the airport. The two chosen key performance indicators are aircraft traffic movements (ATM) and passenger numbers (PAX).

This chart shows intensity metrics Aberdeen Airport scope 1 and 2 $kgCO_2e$/PAX and $kgCO_2e$/ATM for market-based reporting. Note that the impacts of COVID-19 on airport operations led to increased carbon intensity per ATM and PAX in 2020 and 2021.



ANNUAL EMISSIONS TRENDS

INTENSITY METRICS COMPARISON OVER TIME

This table shows intensity metrics for scope 1 and 2 $kgCO_2e$/PAX and $kgCO_2e$/ATM for both location and market-based reporting.

Note that the impacts of COVID-19 on airport operations led to increased carbon intensity per ATM and PAX in 2020 and 2021.

	2019	2020	2021	2022	2023	2024
ATM	91,711	60,440	64,503	75,377	75,237	72,642
PAX	2,966,389	1,029,767	1,148,982	2,026,453	2,302,571	2,340,683
% Change in ATM (year-on-year)	-	-34.1%	6.7%	16.9%	-0.2%	-3.4%
% Change in PAX (year-on-year)	-	-65.3%	11.6%	76.4%	13.6%	1.7%
Scope 1 and 2 (tCO_2e) Location Based Scope	2,972.34	2,327.53	2,765.95	2,587.93	2,591.94	2,928.54
$kgCO_2e$/ATM	32.4	38.5	42.9	34.3	34.5	40.3
$kgCO_2e$/PAX	1.0	2.3	2.4	1.3	1.1	1.3
Scope 1 and 2 (tCO_2e) Market Based Scope 2	1,351.47	1,162.40	1,523.01	1,422.84	1,334.02	1,619.49
$kgCO_2e$/ATM	14.7	19.2	23.6	18.9	17.7	22.3
$kgCO_2e$/PAX	0.5	1.1	1.3	0.7	0.6	0.7

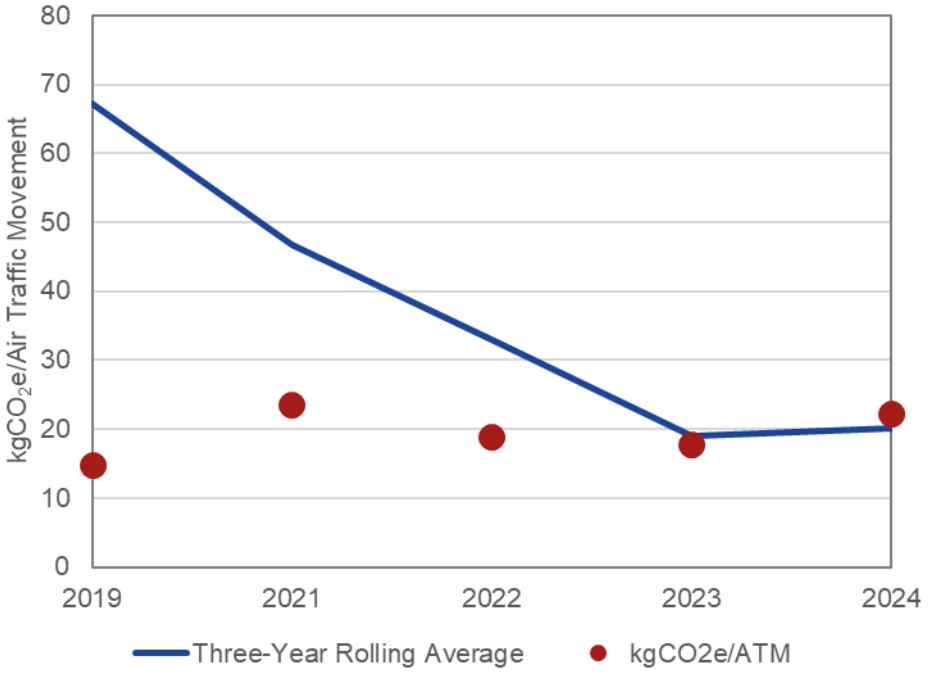
ANNUAL EMISSIONS TRENDS

THREE-YEAR ROLLING AVERAGE (MARKET BASED)

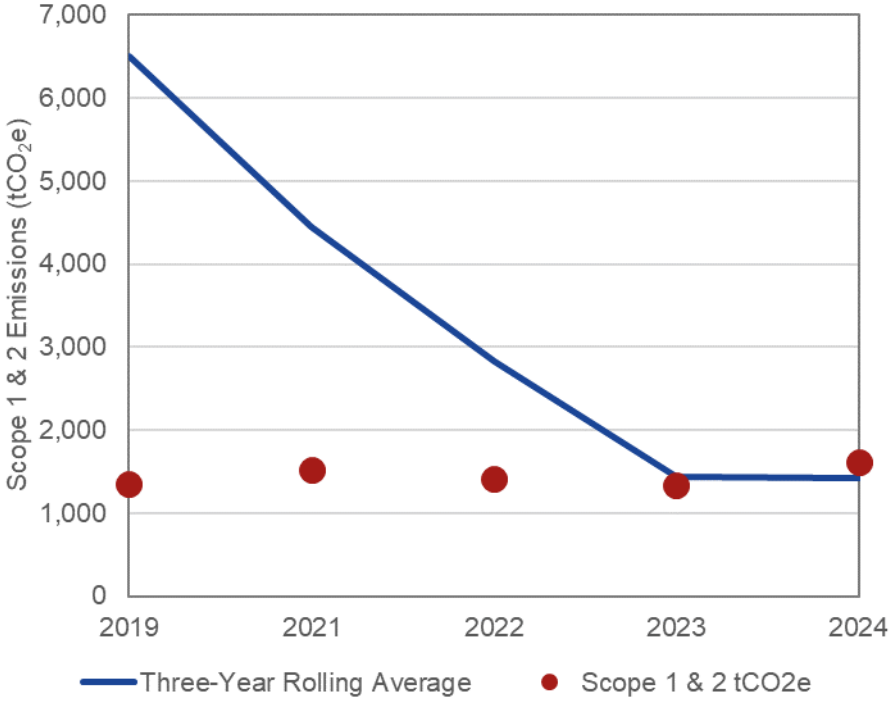
In 2024, Aberdeen Airport have demonstrated a slight increase in their Scope 1 and 2 emissions against the three-year rolling average, both in terms of absolute and intensity-based emissions, as shown in the charts below. This is primarily due to increased snowdays in 2024 requiring greater consumption of operational vehicle fuels and surface de-icer.

Note: due to impacts of COVID-19, 2020 data is not included within the three-year rolling average when reporting these figures for ACA purposes. Reduced passenger and flight numbers in 2021 also impacts the intensity-based emissions for 2021, but absolute emissions remained below the three-year rolling average.

Intensity-Based Emissions ($kgCO_2e$/ATM)



Absolute Emissions (tCO_2e)



* Note: ATMs are based on number of movements captured in the aircraft emissions calculations, which each year show slight variation from the annual airport statistics dataset.

CARBON FOOTPRINT

2024 LOCATION BASED EMISSIONS SUMMARY

2024 EMISSIONS OVERVIEW

ANNUAL SUMMARY – LOCATION BASED

Scope 3

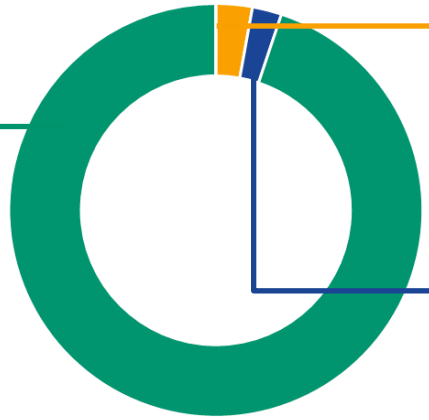
54,130tCO$_2$e 94.9%

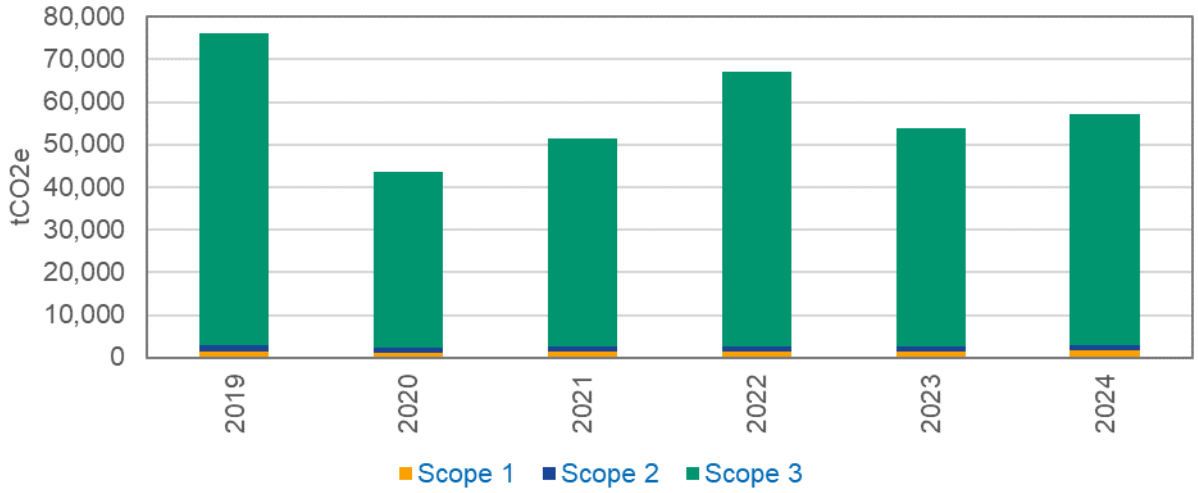
Scope 1

1,619tCO$_2$e 2.8%

Scope 2

1,309tCO$_2$e 2.3%





57,058tCO$_2$e/year

Location-based emissions figures

2.8%
Scope 1

2.3%
Scope 2

94.9% **(58% Aviation)**
Scope 3

All emissions have been calculated in line with the GHG Protocol, to ACA Level 3 standard and ISO 14064-1. Outside of scope emissions have not been shown.

Emissions are reported using the location-based methodology. In 2024, Aberdeen Airport purchased green electricity, reducing market-based scope 2 emissions to zero. For an explanation of location and market-based and annual trends see this slide.

ANNUAL EMISSIONS TRENDS

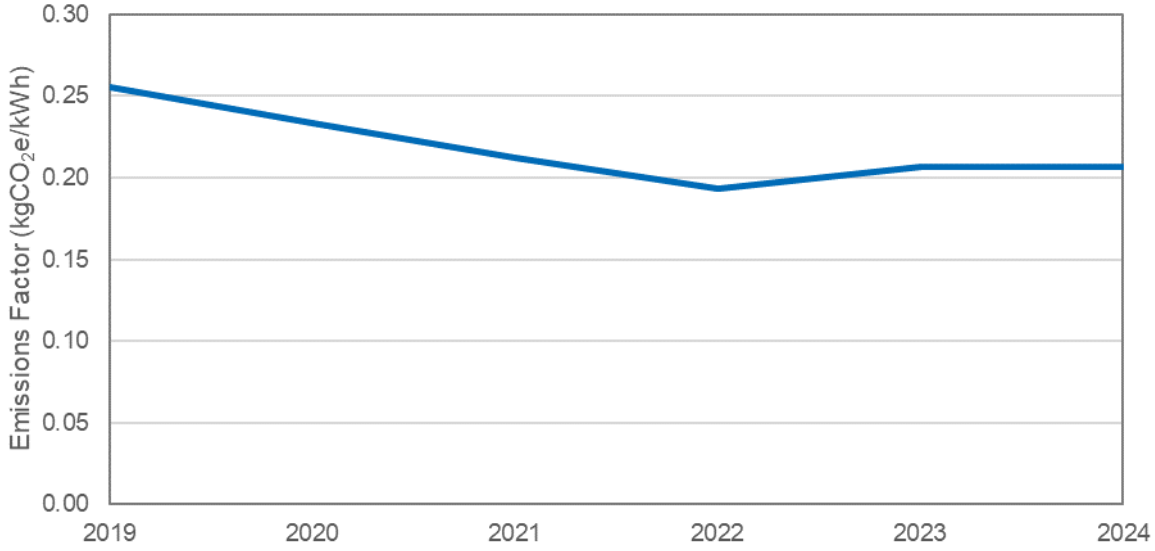
UK ELECTRICITY LOCATION BASED EMISSIONS FACTORS

The annual trends in electricity emissions reported under the location-based method can be attributed to two main factors: Consumption (kWh) and the UK grid emissions factor.

Aberdeen Airport can directly impact the consumption of grid electricity at the airport through energy efficiency measures, changes to operational practices, and the installation of on-site renewables that reduce the demand for imported electricity.

However, they cannot impact the emissions intensity of the UK grid. The UK grid average emissions intensity ($kgCO_2e/kWh$) has been reducing over the past decade due to changes in the fuel mix used to generate electricity, with significantly higher proportion of renewables and a decrease in the more carbon intensive fuels such as coal.

DEFRA release factors for the UK grid annually, and these have been plotted in the chart below to give some insight into how the UK grid has been decarbonising in recent years.



Year	Emissions Factor ($kgCO_2e/kWh$)
2019	0.25560
2020	0.23314
2021	0.21233
2022	0.19338
2023	0.20707
2024	0.20705

APPENDIX 1

CALCULATION METHODOLOGY

METHODOLOGY

CALCULATION APPROACH

This section provides a summary of the methodology followed by Ricardo to calculate the 2024 carbon footprint for the airport.

The standard approach to carbon footprinting is to use the GHG Protocol Corporate Accounting and Reporting Standard developed by World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI). This approach has been adhered to in the production of this footprint. Reporting is based on operations over which the airport has operational control and is aligned with the GHG Protocol 'operational control' approach, under which a company accounts for 100% of emissions from operations over which it, or one of its subsidiaries, has control to make decisions. The carbon footprint is also calculated in line with the requirements of ISO 14064-1, Specification with Guidance at the Organisation Level for Quantification and Reporting of Greenhouse Gas Emissions and Removals. Sector specific guidance for airports is provided by the Airport Carbon Accreditation (ACA) Scheme and the carbon footprint calculations have been completed to meet the requirements of Level 3 of the ACA Scheme. The GHG Protocol requires organisations to report their GHG emissions under 3 scopes:

SCOPE 1 EMISSIONS

Scope 1 emissions are defined as direct GHG emissions arising from sources that are owned or controlled by the company. The emissions result from activities that the company can have direct influence on through its actions. AGS Airports' emissions that are included are: natural gas use, company owned vehicles fuel use, fuel use for heating or in generators or equipment, refrigerant gas use (from leaks during maintenance or malfunction), surface de-icer and fuel (such as wood pallets and diesel) used for fire training.

SCOPE 2 EMISSIONS

Scope 2 emissions are associated with the use of electricity imported from the grid or from a third-party energy supplier in the form of heat or electricity. These indirect emissions are due to upstream emissions from the production and delivery of fuel to power stations. The airport can influence the amount of electricity it uses; however, it has little control over the generation of the electricity and these emissions are therefore classed as Scope 2. The footprint includes dual reporting using location and market-based approaches for electricity consumption to reflect use of a renewable electricity contract.

METHODOLOGY

CALCULATION APPROACH

SCOPE 3 EMISSIONS

Scope 3 emissions are defined as those arising as an indirect consequence of the use of goods or services provided by the company. The airport does have some influence over Scope 3 emissions, but the activities are not under its control. Sources included by the airport include aircraft LTO, engine testing, employees commuting to the airport, passenger surface access, airside vehicle activities by third-party operators, waste disposal, water (supply and treatment), airport business travel, tenant utilities consumption, aircraft de-icer used by third parties, fuel used for non-road construction vehicles, and electricity T&D losses

OUTSIDE OF SCOPE EMISSIONS

As per UK Government GHG Conversion Factors for Company Reporting guidance, Outside of Scope factors have been used to account for the direct carbon dioxide (CO_2e) impact of burning biomass and biofuels. The emissions are labelled ‘outside of scope’ because the Scope 1 impact of these fuels has been determined to be a net ‘0’ (since the fuel source itself absorbs an equivalent amount of CO_2e during the growth phase as the amount of CO_2e released through combustion). As a result, full reporting of any fuel from a biogenic source have included the ‘outside of scope’ CO_2e value, documented to ensure complete accounting for the emissions created.

METHODOLOGY

EMISSIONS SOURCE METHODOLOGY

The uncertainties associated with carbon footprint calculations can be broadly categorised into scientific uncertainty and estimation uncertainty. Scientific uncertainty arises when the science of the actual emission is not completely understood. For example, GWP values involve significant scientific uncertainty. Estimation uncertainty arises any time emissions are quantified. Estimations have been made within this footprint where areas of uncertainty have arisen. These are detailed in the methodology descriptions below.

Emissions factors are sourced from the Department for Energy Security and Net Zero's 2024 UK Government GHG Conversion Factors for Company Reporting. De-icer emissions factors are sourced from the Airport Carbon and Emissions Reporting Tool (ACERT) provided by the ACA Scheme. Emissions are reported in carbon dioxide equivalent (CO_2e), which allows different GHGs to be compared on a like-for-like basis.

UTILITIES

Utility emissions include electricity and natural gas (both airport and third parties), fuel used for heating and power generation, water supply and wastewater treatment, de-icer usage (aircraft and ground), and refrigerant lost to atmosphere from cooling systems (including from third-party units). Data was provided by the airport and converted to emissions using the appropriate emissions factors from UK Government and ACERT for de-icer.

Scope 3 refrigerant emissions were assumed to be nil where stated by the tenants, and otherwise estimated using default assumptions from IPCC Good Practice Guidelines on average refrigerant charge and annual leakage rate where refrigerant type or leaked volume information was missing.

OPERATIONAL VEHICLES

Operational vehicle fuel use was calculated by using fuel volume data provided by the airport for their own and third-party operations, including fuel used in off-road construction vehicles. Fuel volume was converted to emissions using the appropriate emissions factors from UK Government GHG Conversion Factors for Company Reporting.

FIRE TRAINING

Records of fuel and material consumed by fire training were reviewed and converted to emissions using the appropriate emissions factors from UK Government.

METHODOLOGY

EMISSIONS SOURCE METHODOLOGY

PASSENGER SURFACE ACCESS

Emissions are based on a survey undertaken in 2019, scaled to 2024 passenger numbers. Information was collated on the mode of travel and location of those who answered the survey to estimate distance travelled by each mode of transport.

STAFF COMMUTE

For emissions due to staff commuting, the 2022 staff travel survey for AGS employees data was utilised. There were 46 respondents out of 1,762 staff members (including both AGS and third-party staff), giving a response rate of 2%, so final data was scaled to the full headcount of airport and AGS staff in 2024. The survey respondents provided information on their modes of transport, distance travelled to work, number of days worked per week and number of days worked from home per week. This was scaled up to reflect a full working year by assuming that there are 47 working weeks per year (Mon-Fri), each staff member has 25 days of leave per year and there are 8 working hours in each day (used to estimate emissions produced by staff working from home). Total annual distance travelled was converted to emissions using the appropriate emissions factors from UK Government.

BUSINESS TRAVEL

Accounts data was provided for business travel (Scope 3) for the 2024 financial year. Purchased fuel and travel ticket data was provided in £ value and converted to fuel volume using the cost/litre assumptions from the Carbon Footprint and Project Register Tool (CFPRT). The CFPRT collates cost data for all forms of public transport across the UK and is managed and updated by Sustainable Network Scotland and Resource Efficient Scotland.

Reported distance travelled by grey fleet was converted to emissions using the appropriate emissions factors from UK Government. Where destination and transport data had been provided, online distance calculators were employed to estimate the distances travelled, from which emissions were calculated. Where information about the journey was missing, the ticket price was used to estimate distance travelled, again using the CFPRT. The following assumptions were made in the calculations: all flight, bus and train tickets assumed to be for single passenger, return journeys unless otherwise stated; and all taxi tickets were assumed to be for single passenger, one-way journeys unless otherwise stated. Within the ‘Coach, Bus and Rail’ spend category, there were some lines for which transport mode was not stated – an equal split between national rail and local bus journeys was assumed.

FUEL USED FOR NON-ROAD CONSTRUCTION VEHICLES

Due to limitations in data availability, ABZ emissions have been scaled from SOU by 1.5. Reflecting an AGS Airport split of GLA 50%, ABZ 30%, SOU 20%.

METHODOLOGY

EMISSIONS SOURCE METHODOLOGY

WASTE

A full breakdown of waste type, tonnage and destination (e.g. combustion, recycling, landfill) was provided by Aberdeen Airport's waste management provider for 2024. The emissions produced during waste disposal were calculated by using the appropriate factors from UK Government GHG Conversion Factors for Company Reporting. A 95% sewerage rate was assumed for all water supplied to the airport.

LANDING TAKE-OFF CYCLE (LTO)

The LTO cycle is split into several stages as defined by ICAO (Taxi out, take-off, climb out, approach/landing, taxi-in), and consist of all fuel consuming movements below 1,000 m altitude.

Fuel usage for each aircraft from the LTO cycle are calculated by using fuel burn rates (kg/second) from the ICAO Databank (Jet engines) or FOCA Aircraft Piston Engine database (Piston engines) for each aircraft, multiplied by the time the aircraft spends in each section of the LTO cycle (e.g. Taxi Out, Initial Climb). Fuel use is then converted to carbon emissions using the emissions factor for aviation fuel provided by the UK Government. Efforts have been made to improve the assumptions around the time aircraft spend in each stage of the LTO cycle, using real taxi time data for fixed-wing aircraft for example.

For 2024, the Ricardo aircraft emissions calculators have been updated to reflect the most recent aircraft database from EMEP/EEA air pollutant emission inventory guidebook 2023, and updates to fuel flow databases including the ICAO Databank. The EMEP/EEA database now includes next-generation aircraft types, so assumptions are no longer used to account for the reduction in emissions in comparison to last-generation aircraft they replace. The calculations also now include a full helicopter database from FOCA.

Additional efforts have been made to improve the accuracy of the LTO calculations from 2022 to reflect the impact of aircraft fuel efficiency improvements that were not otherwise captured by the methodology used in previous years. One improvement to the methodology was accounting for the fuel savings from the use of wingtips on aircraft. New designs for the tips of the aircraft wings can reduce drag and improve fuel efficiency. An example of a modern wingtip design is shown below. Wingtips can reduce fuel burn by 4-6% for larger aircraft, which reduces the carbon emissions by the same amount. A 4% reduction in fuel use was used as a conservative estimate of fuel burn savings for the calculations for the airport's LTO emissions. Note that wing tip fuel burn savings only apply to the following LTO stages: Take-off, Initial climb, Climb out.

Finally, data provided by the airport included actual taxi times, and so the time used for taxiing was updated to reflect the average times for 2024 aircraft movements.

METHODOLOGY

EMISSIONS SOURCE METHODOLOGY

AIRCRAFT ENGINE TESTING

To calculate the emissions from engine testing at the airport, the aircraft ICAO type, date of test and duration of test was provided. A similar process was carried out to identify the aircraft engine type and fuel used per second as per the LTO cycle, using the EMEP/EEA guidebook and engine fuel flow from the ICAO Databank and others. Other assumptions used for the calculations are:

If the number of engines tested is not stated, this was assumed to be 2 engines.

High power testing occurred for 5% of the full test time if not otherwise specified.

If engine information is not available from the databases, average fuel flow information is sourced from available data.

GLOSSARY

Term	Definition
ATM	Air traffic movements – an aircraft take-off or landing at an airport. For airport traffic purposes one arrival and one departure is counted as two movements.
Carbon dioxide equivalent (CO_2e)	The carbon dioxide equivalent (CO_2e) allows the different greenhouse gases to be compared on a like-for-like basis relative to one unit of CO_2. CO_2e is calculated by multiplying the emissions of each of the six greenhouse gases by its 100-year global warming potential (GWP).
Carbon footprint	A carbon footprint measures the total greenhouse gas emissions caused directly and indirectly by a person, organisation, event or product. A carbon footprint is measured in tonnes of carbon dioxide equivalent (tCO_2e).
Emission factor	An emissions factor is a representative value that attempts to relate the quantity of a pollutant released to the atmosphere with an activity associated with the release of that pollutant.
GHG	Greenhouse gas – a gas in an atmosphere that absorbs and emits radiation within the thermal infrared range. This process is the fundamental cause of the greenhouse effect. The primary greenhouse gases in Earth's atmosphere are water vapour, carbon dioxide, methane, nitrous oxide, and ozone.
Outside of Scope (OoS)	All fuels with biogenic content (e.g. 'Diesel and petrol (average biofuel blend)') should have the 'Outside of Scope' emissions reported to ensure a complete picture of an organisations' emissions are created. The emissions are labelled 'Outside of Scope' because the Scope 1 impact of these fuels has been determined to be a net '0' (since the fuel source itself absorbs an equivalent amount of CO_2 during the growth phase as the CO_2 is released through combustion).
PAX	Number of passengers.
APU	Auxiliary power unit.
CAA	Civil Aviation Authority
LTO	Landing and Take Off (LTO) is defined as the modes of operation by an aircraft below 1,000m altitude – idle, taxiing, approach, climb out and take off. Emissions in this category are from fuel used in aircraft engines during these modes of operation.
CCD	Climb, Cruise and Descent (CCD) emissions account for fuel used during all aircraft movements which occur above 1,000 m during flight.
WTT	Well-To-Tank (WTT) emissions are the emissions associated with extracting, processing and transporting fuel before application.

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