

Glasgow Airport Footprint 2022

In accordance with the UK
Government's Conversion Factors
for Company Reporting

Report for Glasgow International
Airport Limited (part of AGS
Airports Ltd)

VERSION FINAL 15/06/2023

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GLOSSARY

	Definition
Arisings	Materials forming the secondary or waste products of industrial operations.
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 ₂ e)	The carbon dioxide equivalent (CO ₂ e) allows the different greenhouse gases to be compared on a like-for-like basis relative to one unit of CO ₂ . CO ₂ e 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 ₂ e).
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 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.

PROJECT SUMMARY

BACKGROUND

AGS Airports Limited, a partnership between Ferrovial and Macquarie Infrastructure and Real Assets (MIRA), owns Glasgow International Airport Limited (GLA). The airport operates 365 days per year serving around 6.5 million passengers and handling around 71 thousand aircraft movements. AGS Airports employ around 346 full time employees, of which 219 are based in Glasgow Airport. Many of these commute to the airport by car or public transport, though cycling has become more popular in recent years.

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.

During the reporting year of 2022, there were no longer national travel restrictions in place in the UK as a result of the Covid-19 pandemic. As a result passenger numbers, air traffic & business travel movements increased at Glasgow Airport since 2021 in lieu of the lifting of COVID-19 national travel restrictions. The reporting year 2022 saw an increase in aircraft movements, passenger numbers and employee commuting, however these are not yet at pre-pandemic levels.

The calculation of the annual carbon footprint will help AGS Airports Limited 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.

For the first time this year AGS Airports Limited and the individual airports have estimated their supply chain emissions on all applicable sources that are not already covered in their carbon footprint.



CARBON FOOTPRINT

SUMMARY

All emissions have been calculated in line with the Greenhouse Gas (GHG) Protocol, to Airport Carbon Accreditation (ACA) Level 3+ standard and ISO 14064-1.

Emissions figures are reported using the market-based methodology unless clearly indicated otherwise. A location-based baseline emissions profile is presented towards the end of this report. For a detailed explanation on this, please see [this slide](#).

The emission sources included within each scope of the footprint are presented below.

A detailed explanation of the methodology and assumptions used to estimate the footprint can be found in the appendices.

Scope 1

“Direct Emissions”

- Natural gas
- Fuel used in: Vehicles and ground support equipment owned by Glasgow Airport, generators and other equipment
- Refrigerant gases lost to atmosphere from chillers and air conditioners
- De-icer used on ground by Glasgow Airport

Scope 2

“Indirect Emissions”

- Electricity used by Glasgow Airport



GREENHOUSE
GAS PROTOCOL

Scope 3

“Indirect Emissions”

- Aviation emissions: LTO, engine testing
- Passenger surface access
- Fuel used in vehicles and ground support equipment owned by third parties
- Staff commute and business travel
- Tenant electricity
- Tenant natural gas
- Electricity well-to-tank and transmission and distribution losses
- Waste Disposal
- De-Icer used on aircraft by third parties
- Water supply and wastewater treatment
- Non-road construction vehicles

CARBON FOOTPRINT

SUMMARY: MARKET BASED REPORTING

The Market Based methodology as outlined in the GHG Protocol, allows for organisations to report their carbon emissions reflecting their energy procurement decisions.

For Glasgow Airport, their electricity is purchased under a zero emissions contract that is fully backed by Renewable Energy Guarantees of Origin (REGO) certificates. This means that under Market Based reporting rules, the Scope 2 electricity emissions are reported as zero emissions.

The following slides show the emissions reported under this methodology.

108,812 tCO₂e/year

97.5% from scope 3 emission sources

Market Based Emissions Figures

106%

 increase from 2021 emissions

Scope 3

“Indirect Emissions”

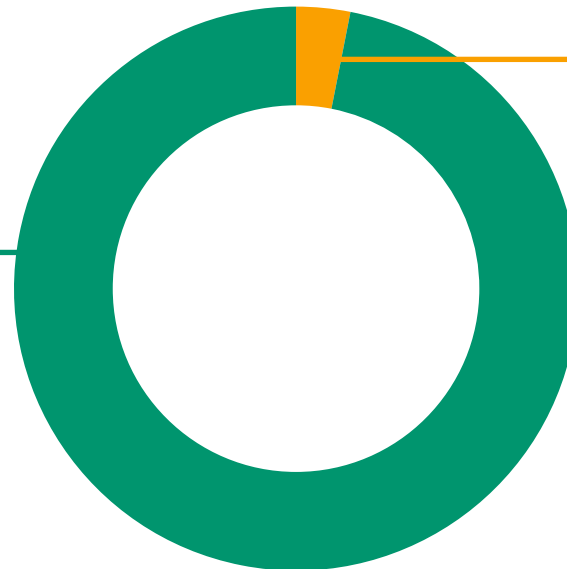
Emissions that arise as a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

106,0470 tCO₂e (97.5%)

Out of Scope

Emissions from fuels with biogenic content. Scope 1 impact of these fuels has been determined to be net “0”

15 tCO₂e (0.01%)



Scope 1

“Direct Emissions”

Emissions produced from sources linked to a company's assets.

2,750 tCO₂e (2.5%)

Scope 2

“Indirect Emissions”

Emissions produced by the generation of electricity purchased from third parties and consumed in the company's assets.

0 tCO₂e (0%)

CARBON FOOTPRINT

ANNUAL EMISSIONS TRENDS: MARKET BASED REPORTING

The table below shows the figures from the charts on the previous slide, as well as the % year-on-year (y-o-y) change of the different emissions scopes.

Emissions by Scope	2018	2019	2020	2021	2022
Scope 1	3,234	2,806	2,915	3,007	2,750
Scope 2	5,667	0	0	0	0
Scopes 1 and 2	8,900	2,806	2,915	3,007	2,750
Scope 3	128,396	134,745	40,495	49,925	106,047
Outside of Scope	4	5	7	6	15
Total emissions	137,300	137,556	43,417	52,938	108,812

Scope 1 % y-o-y change	5%	-13%	4%	3%	-9%
Scope 2 % y-o-y change	N/A	-100%	N/A	N/A	N/A
Scope 1 & 2 % y-o-y change	-34%	-68%	4%	3%	-9%
Scope 3 % y-o-y change	-21%	5%	-70%	23%	112%
Outside of Scope	-19%	23%	32%	-3%	128%
Total % y-o-y change	-22%	0%	-68%	22%	106%

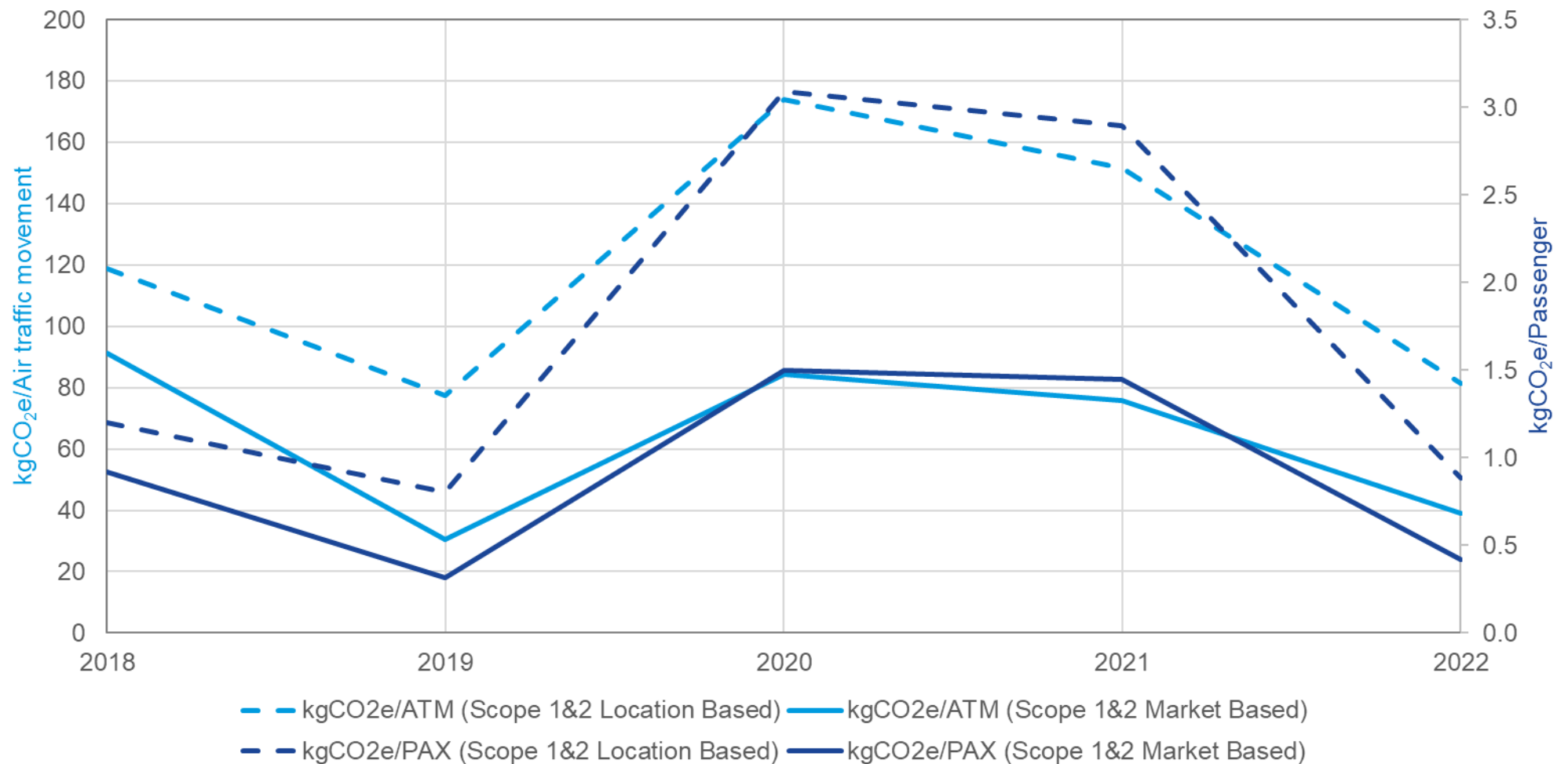
*Figures rounded to nearest number

KEY STATS

INTENSITY METRICS COMPARISON OVER TIME - 1

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 for Scope 1&2 kgCO₂e/PAX and kgCO₂e/ATM for both [location and market based](#) reporting methodologies.



KEY STATS

INTENSITY METRICS COMPARISON OVER TIME - 2

This chart shows intensity metrics for Scope 1&2 kgCO₂e/passenger (PAX) and kgCO₂e/air traffic movement (ATM) for both location and market based reporting methodologies.

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

	2018	2019	2020	2021	2022
ATM	97,415	91,848	34,589	39,720	70,724
PAX	9,659,818	8,850,565	1,947,877	2,078,962	6,524,783
% Change in ATM (year-on-year)	-5.0%	-5.7%	-62.3%	14.8%	78.1%
% Change in PAX (year-on-year)	-2.4%	-8.4%	-78.0%	6.7%	213.8%

Scope 1 & 2 (tCO ₂ e) Location Based Scope 2	11,579	7,109	6,017	6,022	5,762
kgCO ₂ e/ATM	118.9	77.4	173.9	151.6	81.5
kgCO ₂ e/PAX	1.2	0.8	3.1	2.9	0.9

Scope 1 & 2 (tCO ₂ e) Market Based Scope 2	8,900	2,806	2,915	3,007	2,750
kgCO ₂ e/ATM*	91.4	30.6	84.3	75.7	38.9
kgCO ₂ e/PAX*	0.9	0.3	1.5	1.4	0.4

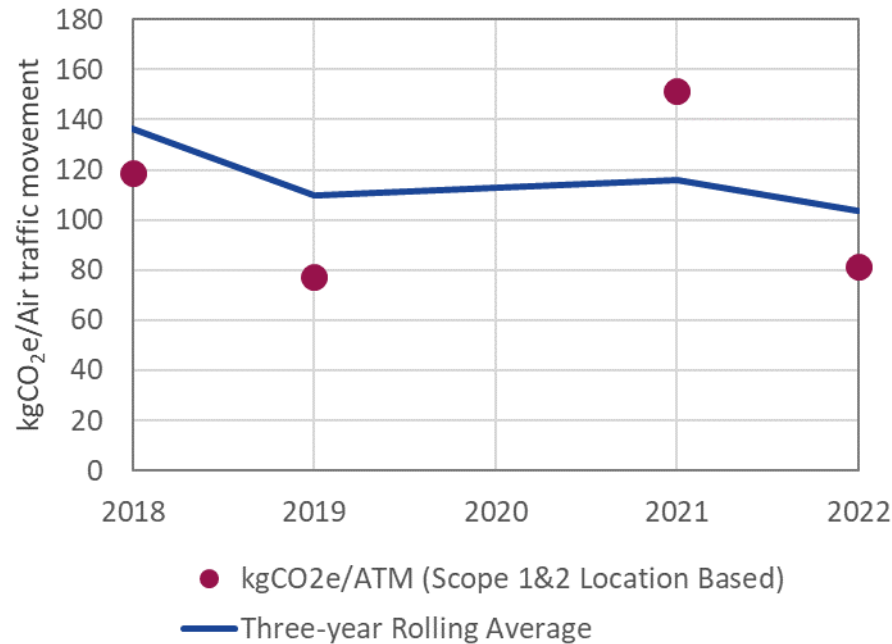
KEY STATS

THREE YEAR ROLLING AVERAGE

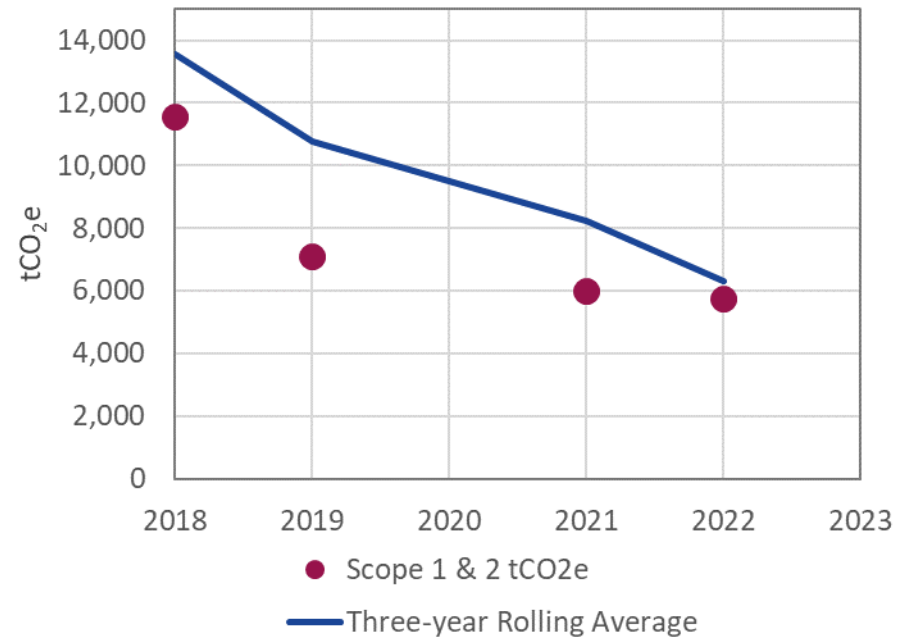
As per the requirements of the Level 3+ of the Airport Carbon Accreditation scheme, Glasgow Airport have demonstrated a reduction in their Scope 1&2 emissions against the three-year rolling average, both in terms of absolute and intensity based emissions, as shown in the charts below.

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 (kgCO₂e/ATM)



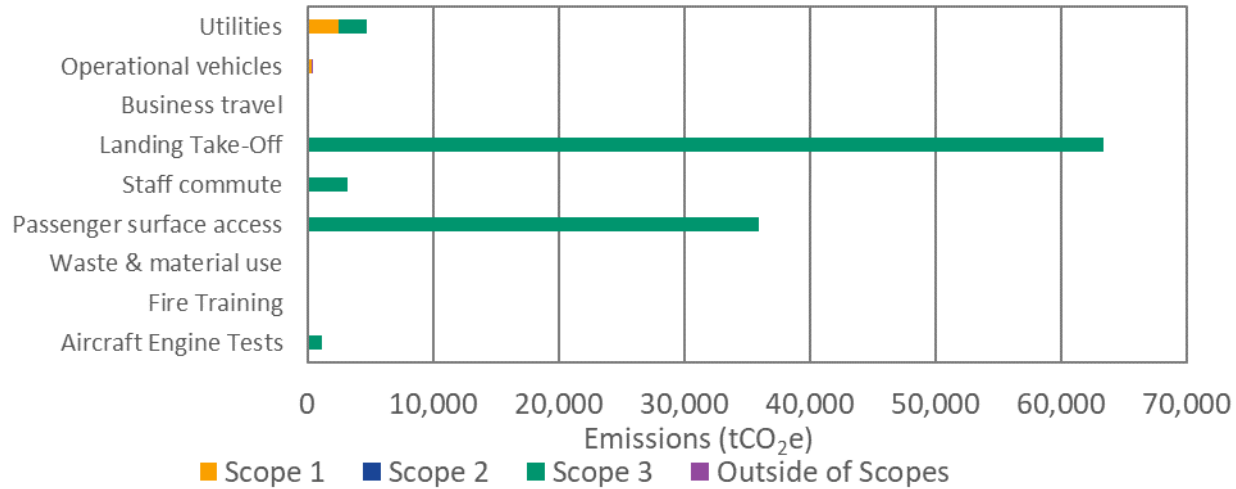
Absolute Emissions (tCO₂e)



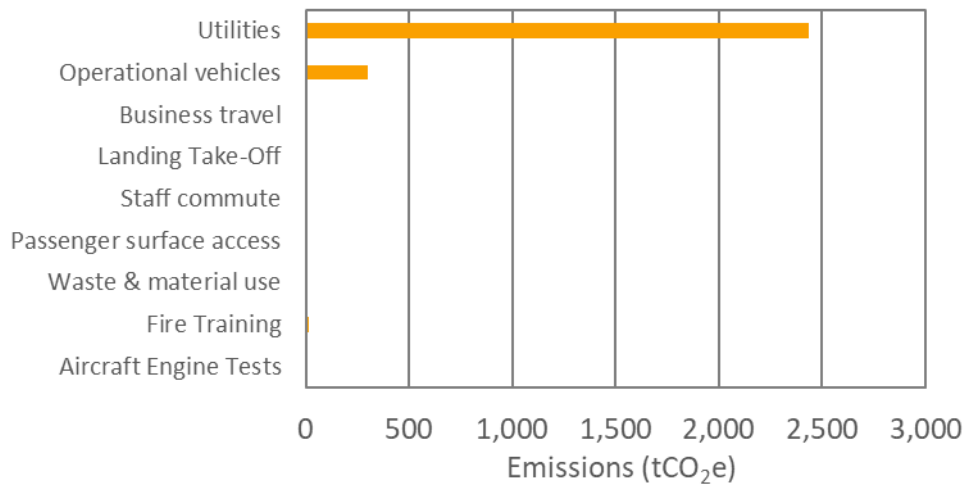
CARBON FOOTPRINT

BY EMISSION SOURCE- 1

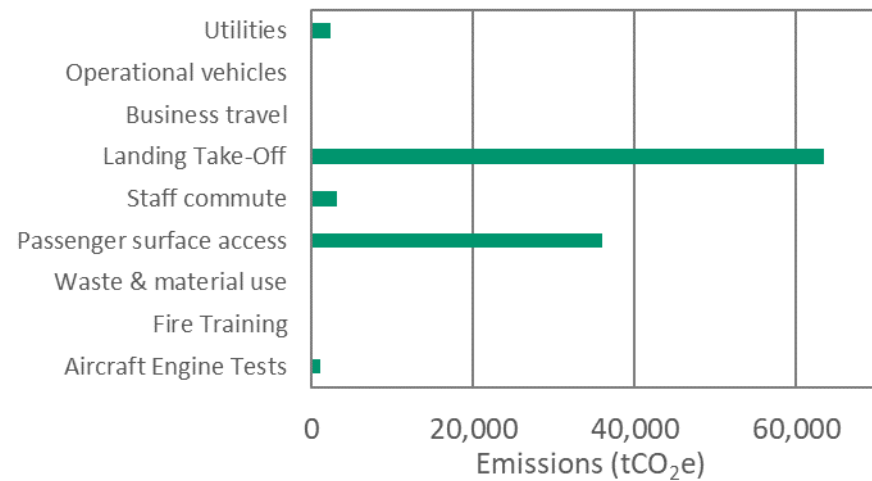
All Scopes carbon emissions split by source/activity



Scopes 1 and 2 carbon emissions split by source/activity



Scope 3 carbon emissions split by source/activity



CARBON FOOTPRINT

BY EMISSION SOURCE- 2

Market Based tCO ₂ e	Emissions (tCO ₂ e)	% of Scope	% of Total Emissions
Scope 1 – Total	2,750	100.0%	2.5%
Natural gas	2,169	78.9%	2.0%
Operational vehicles	299	10.9%	<1%
Fuel (heating and power)	2	<1%	<1%
Refrigerants	61	2.2%	<1%
Airport de-icer	204	7.4%	<1%
Fire training	15	<1%	<1%
Scope 2 – Total	0	100.0%	0.0%
Airport electricity (Location Based)	0	0.0%	0.0%
Scope 3 - Total	106,047	100.0%	97.5%
Landing Take-off (LTO)	63,393	59.8%	58.3%
Passenger surface access	35,921	33.9%	33.0%
Tenant natural gas	134	<1%	<1%
Tenant electricity (Market Based)	0	0.0%	0.0%
Electricity WTT	1,265	1.2%	1.2%
Electricity T&D	443	<1%	<1%
Waste	22	<1%	<1%
Staff commute	3,142	3.0%	2.9%
Third party operational vehicles	49	<1%	<1%
Third party de-icer	359	<1%	<1%
Aircraft engine tests	1,108	1.0%	1.0%
Water	130	<1%	<1%
Business travel	81	<1%	<1%
Out of Scopes – Total	15	100.0%	<1%
Diesel OoS	10	65.0%	<1%
Petrol OoS	2	15.6%	<1%
Fire training OoS	3	19.4%	<1%
Total	108,812		100.0%

CARBON FOOTPRINT

SCOPE 1 EMISSION SOURCES

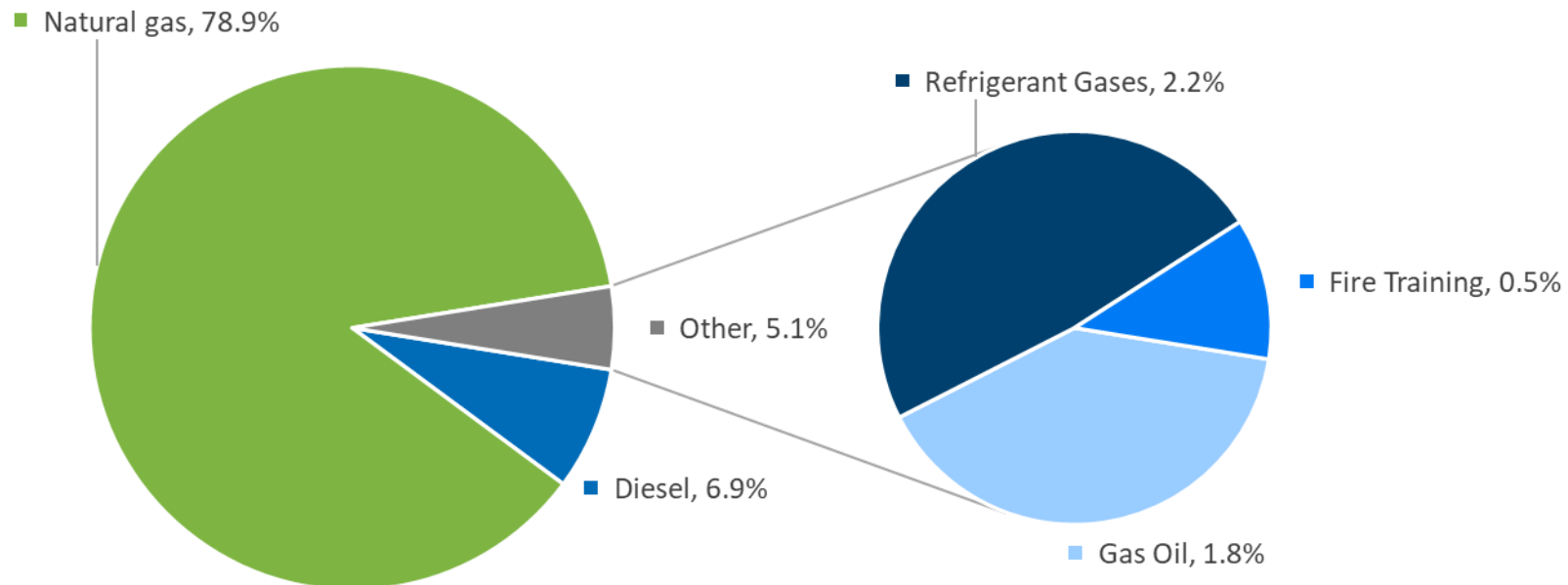
Scope 1 emissions are produced from sources linked to a company's assets.

For Glasgow Airport, the major emissions sources in this category include the emissions from natural gas used in heating systems and airport owned operational vehicle fuel. Other smaller sources include fuel burnt during fire training and refrigerant gasses lost to atmosphere from cooling systems.

2,750 tCO₂e/year

2.5% of total emissions

Market Based Emissions Figures



CARBON FOOTPRINT

SCOPE 2 LOCATION AND MARKET BASED EMISSIONS

Scope 2 emissions relate to the electricity consumption at the airport. These can be calculated using the following two methodologies:

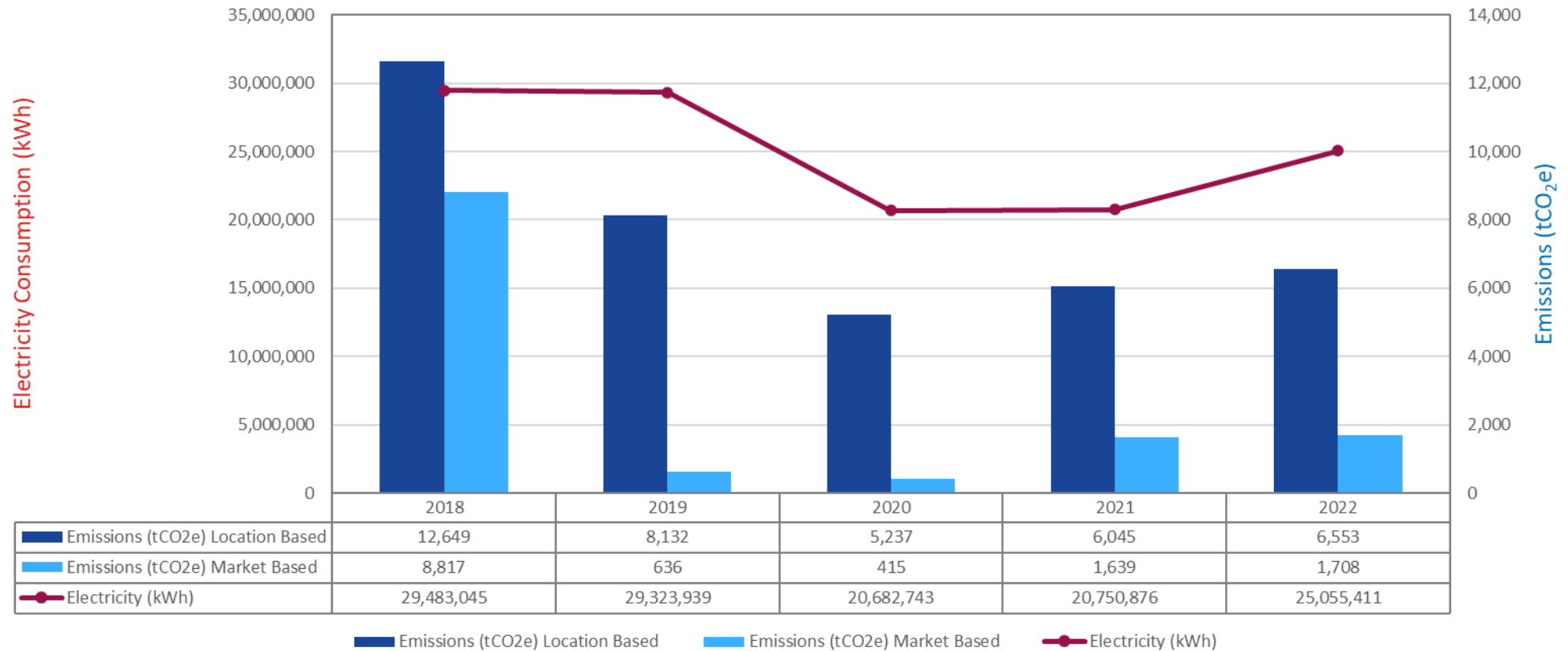
- **Location-based method;** this reflects the average emissions intensity of macro-scale (regional/national) electricity grids where energy consumption occurs. Companies reporting using this method should use the regional/National Grid average emission factor. In the UK, this would be sourced from the Defra/DECC UK Government conversion factors for Company Reporting.
- **Market-based method;** this reflects the emissions from the electricity that a company is purchasing. Energy suppliers in the UK are already required, by law, to disclose to consumers the fuel mix and GHG emissions associated with their portfolio or tariffs. This airport selects to purchase electricity that is greener than the National Grid average emissions factor. The advantage of procuring electricity that is higher in renewable energy content than that of the National Grid is outlined in the table below:

	Location-based (tCO ₂ e)	Market-based (tCO ₂)
Airport Electricity Emissions (Scope 2)	3,012	0

- Here, Market-Based emissions are zero because the airport purchased 100% green electricity from its energy suppliers. REGO certificates have been provided which indicates that the supply is 100% renewable.
- The following slide provides an annual comparison of the electricity consumption and relevant emissions at Glasgow Airport.
- This is airport electricity only and does not include emissions from WTT or T&D losses.

CARBON FOOTPRINT

SCOPE 2 ELECTRICITY CONSUMPTION AND CARBON EMISSIONS



The emissions in the figure above are the location based electricity emissions.

There has been little deviation in total electrical consumption since 2019, except for the sudden drop in 2020 and 2021 as a result of restrictions from COVID-19. As such, the majority of savings in emissions is due to the ongoing decarbonisation of the UK national grid. During 2022 there has been a slight increase, this is likely due to more staff using offices.

Note: The figures for electricity consumption above include both airport (Scope 2) and tenant (Scope 3) electricity use as well as Transmission and Distribution (T&D) and WTT emissions.

CARBON FOOTPRINT

SCOPE 3 EMISSION SOURCES

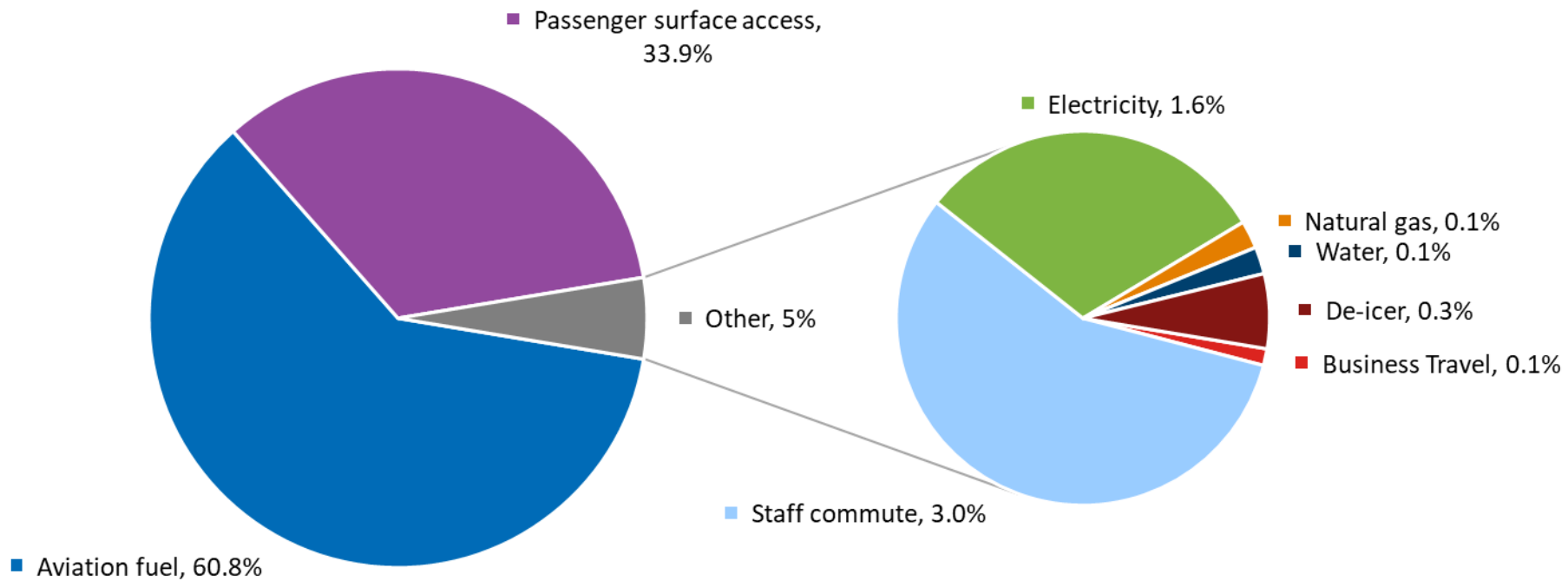
Scope 3 emissions are those that arise as a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

For Glasgow Airport, the major emissions sources in this category include the emissions from aircraft and passenger surface access. Other sources include third party electricity and operational vehicle fuel, staff commute, business travel, waste and water supply/treatment.

106,047 tCO₂e/year

97.5% of total emissions

Market Based Emissions Figures



CARBON FOOTPRINT

Landing take-off cycle (LTO)

63,393 tCO₂e/year

Total LTO emissions

Landing Take-Off Cycle (LTO) emissions account for aircraft movements which occur below 3,000 feet during flight. Total LTO emissions for 2022 are **63,393 tCO₂e**.

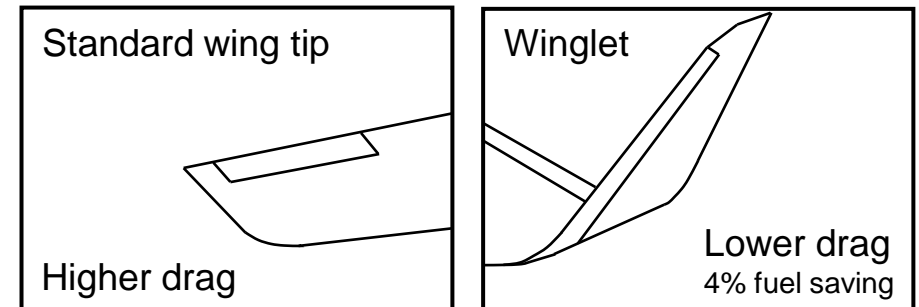
EasyJet offset 100% of their aviation fuel emissions as per ACA guidelines and can therefore be claimed as carbon neutral. AGS airports have decided to continue reporting these emissions in their carbon footprint for clarity.

Total emissions from EasyJet that are offset are **19,797 tCO₂e** which is 31% of total LTO emissions.

Additional efforts have been made to improve the accuracy of the LTO calculations in 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.

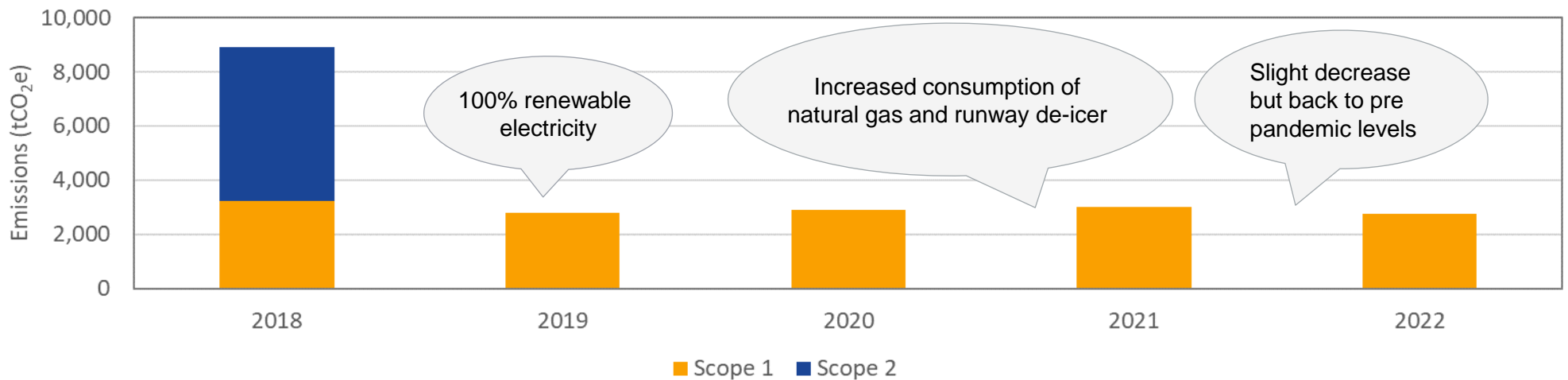
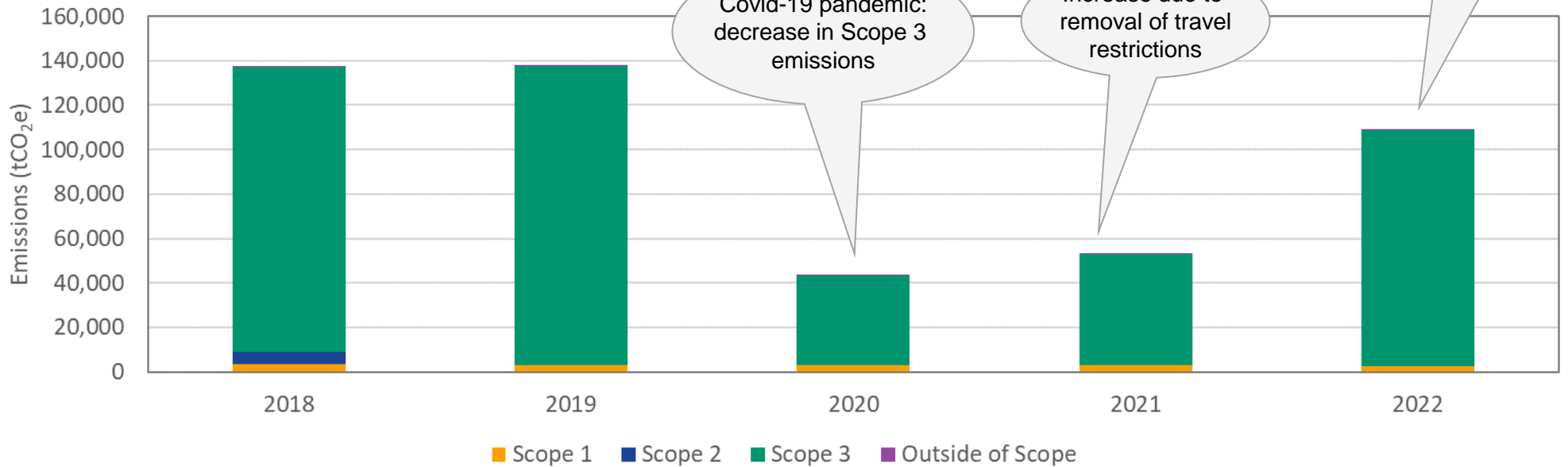
New designs for the tips of the aircraft wings can reduce drag and improve fuel efficiency. An example of a modern wingtip design is shown in the figure to the right.

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 Glasgow Airport's LTO emissions.



CARBON FOOTPRINT

ANNUAL EMISSION TRENDS - 1



CARBON FOOTPRINT

ANNUAL EMISSIONS TRENDS - 2

Emissions have increased from 2022 across most of the emissions categories due to the increase in air traffic movements (78.1%) and passenger numbers (213.18%) in comparison to 2021.

The following sources experienced an **increase** in emissions from 2021:

- Passenger Surface Access **increased** by 179%. This increase in passengers is due to the further reduction of Covid-19 travel restrictions. The numbers are still below pre-pandemic figures but are likely to continue to rise as more people begin to travel more.
- Aircraft movements emissions **increased** by 108%%, due to a 78.1% increase in movements as well as using a better data base that has reduced the number of unknown aircraft within the aircraft movement calculations.
- Engine Testing **increased** by 52% from 2021 to 2022. However, in 2022, the number of engine tests conducted decreased by 39% compared to the previous year, which does not align with the increase in emissions. The increase in emissions is likely due to a methodology improvement from previous years, where ICAO codes are now used to determine more of the engines. In previous years, where an aircrafts engine is unknown, average fuel usage would have been assumed, which will not accurately represent the engines actual emissions.
- Business Travel **increased** by 1402%. This is due to 2022 being the first year with no Covid-19 restrictions, therefore opening up business travel opportunities.
- Operational Vehicles **increased** by 20%. This increase will be from the increase in aircraft movements as well as passenger numbers.

The following sources experiences the largest **decrease** in emissions from 2021:

- Waste **decreased** by 95% because we have moved virgin material production emissions to now be included in the supply chain.
- Fire Training **decreased** by 18% due to a reduction in fuel consumption used for training.
- Staff Commute **decreased** by 6%. This could be as a result from employing a more up-to-date survey that provides a more precise depiction of the commuting distances undertaken by the majority of staff.

There has been a 0% change in emissions from Utilities.

CARBON FOOTPRINT

ANNUAL EMISSIONS TRENDS - 3

Market Based tCO ₂ e	2018	2019	2020	2021	2022
Scope 1 – Total	3,234	2,806	2,915	3,007	2,750
Natural gas	2,544	2,375	2,476	2,226	2,169
Operational vehicles	411	321	264	255	299
Fuel (heating and power)	25	25	15	10	2
Refrigerants	228	46	86	171	61
Airport de-icer	0	0	64	324	204
Fire training	26	38	11	21	15
Scope 2 – Total	5,667	0	0	0	0
Airport electricity	5,667	0	0	0	0
Scope 3 - Total	128,396	134,745	40,495	49,925	106,047
Landing Take-off (LTO)	71,602	73,876	24,766	30,484	63,393
Passenger surface access	49,223	49,277	11,734	12,869	35,921
Tenant natural gas	195	191	144	155	134
Tenant electricity	2,439	0	0	0	0
Electricity WTT (<i>reported since 2021</i>)	0	0	0	1,249	1,265
Electricity T&D	711	636	415	390	443
Waste	2,578	2,343	275	453	22
Staff commute	736	7,669	2,134	3,325	3,142
Third party operational vehicles	228	200	303	38	49
Third party de-icer	0	0	320	185	359
Aircraft engine tests	444	312	266	730	1,108
Water	218	218	115	42	130
Business travel	21	23	23	5	81
Out of Scopes – Total	4	5	7	6	15
Diesel OoS	4	3	4	5	10
Petrol OoS	0	2	2	2	2
Fire training OoS	0	0	0	0	3
Total	137,300	137,556	43,417	52,938	108,812

CARBON FOOTPRINT

SCOPE 3 SUPPLY CHAIN EMISSIONS

SCOPE 3 SUPPLY CHAIN

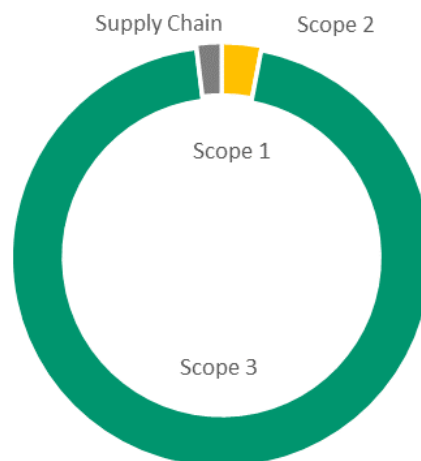
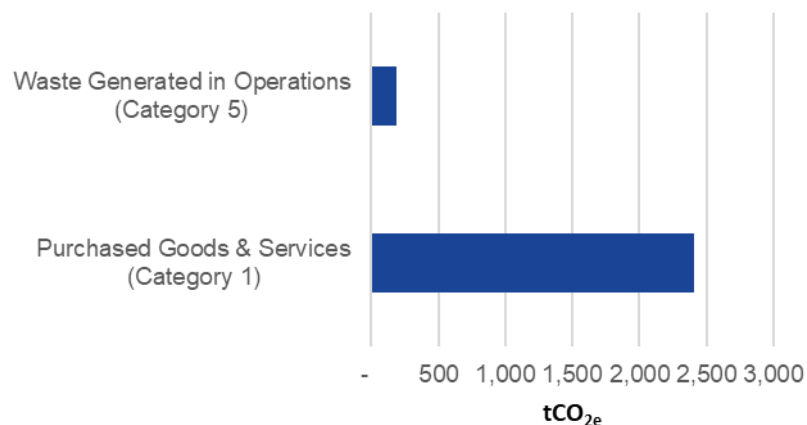
EMISSIONS FROM SUPPLY CHAIN - SUMMARY

Glasgow Airport reports its Green House Gas (GHG) emissions in line with United Kingdom mandatory GHG reporting and Airport Carbon Accreditation (ACA) Level 3+ emission regulations. The Scope 3 emissions sources included in this report represent the majority of emissions associated with airport operations. The airport has also undertaken a full GHG Inventory in line with the GHG Protocol and setting a Science Based Target.

There are 13 categories of Scope 3 emissions outlined in the GHG Protocol Corporate Value Chain (Scope 3) Accounting and Reporting Standard, shown in the table to the right. Currently, Glasgow Airport already report the emissions under many of these categories, and some are not applicable due to organisation type and activities undertaken. Emissions reported under Glasgow airport also include central procurement under AGS group.

The new categories of emissions that have been calculated for the first time for 2022 are: **purchased goods, services, capital goods and waste (primary material production)**. The emissions from these sources are shown below. They have not been included within the main carbon footprint report for 2022, but Glasgow Airport has decided to undertake this analysis to better understand its supply chain carbon footprint. These emissions represent 3% of all emissions estimated. Primary material production emissions have been removed from the existing footprint, as these emissions are better accounted for within the upstream supply chain.

Waste and water emissions already accounted for in the main footprint have not been included here. Therefore, related emissions below are from ad hoc and irregular waste services.



Scope 3 Category	Reporting	Emissions (tCO _{2e})
Purchased goods & services	New in 2022	2,601
Capital goods	Reported within existing footprint in rest of report.	
Fuel & energy (upstream)		
Waste from operations		
Business travel		
Employee commuting		
Leased assets (upstream)	N/A	
Transportation & distribution (upstream)		
Transportation & distribution (downstream)		
Processing of sold goods		
Use of sold products		
End-of-life emissions from sold goods		
Leased assets (downstream)		
Franchises		
Investments		

SCOPE 3 SUPPLY CHAIN

EMISSIONS FROM SUPPLY CHAIN – HOTSPOT ANALYSIS

Cleaning products and services, chemical products and specialised construction works make up the biggest share of supply chain emissions for Glasgow Airport.

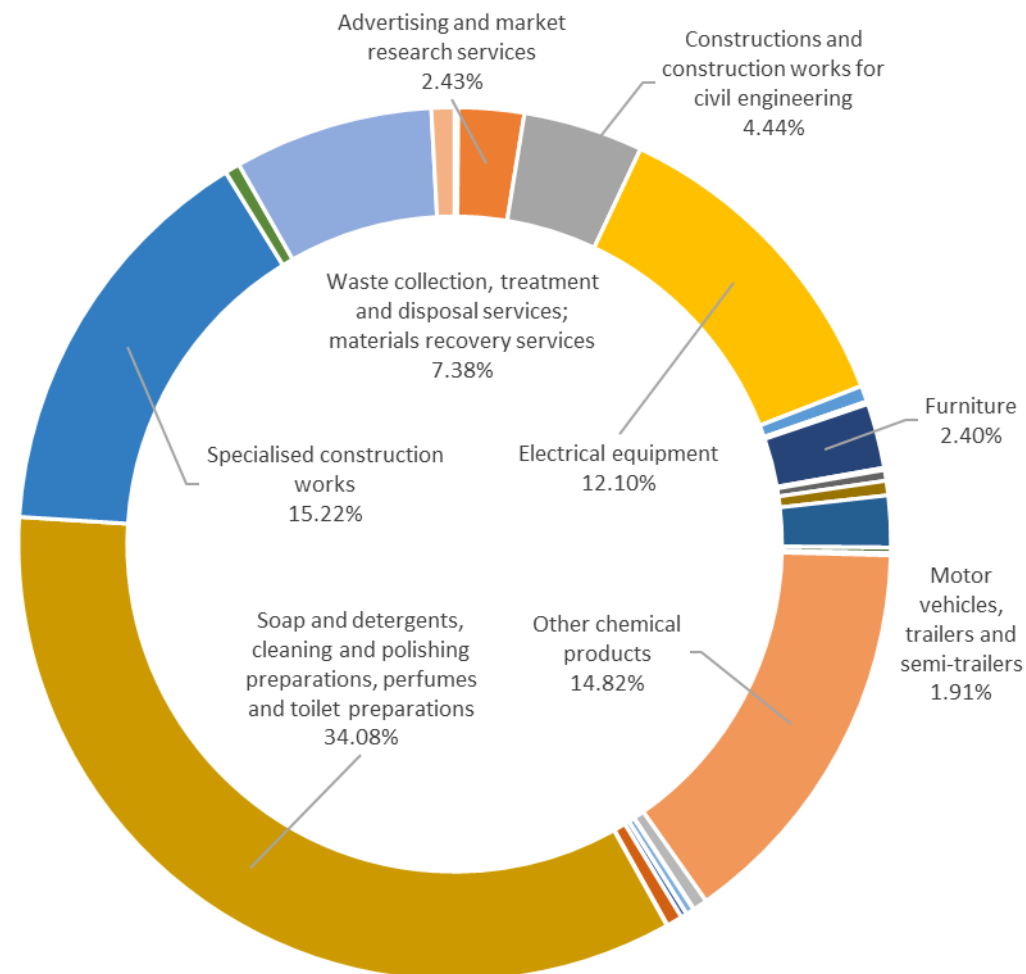
Chemical product emissions are from the airports purchase of de-icer. These are the emissions associated with the production of these de-icers. The emissions associated with their use downstream are produced through biological or chemical degradation on contact with air. Therefore, the latter emissions are included within the main carbon footprint.

Cleaning products and services also contribute a larger portion, shortly followed by specialised construction works such as pavement and runway maintenance.

The other large contributor to Glasgow Airport’s supply chain emissions is electrical equipment e.g. technology solutions. Construction works also contributed to emissions, from services such as repairs to flooring.

Emissions from waste are from ad hoc services. 30% of this in 2022 was from cleaning the lagoon.

All sources contributing to less than 1% of emissions are not labelled on the chart.



CARBON FOOTPRINT

APPENDIX

CARBON FOOTPRINT

LOCATION BASED EMISSIONS

CARBON FOOTPRINT

SUMMARY: LOCATION BASED REPORTING

Location based emissions by scope for Glasgow Airport in 2022. This reflects the average emissions intensity of the grid on which the electricity consumption occurs.

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 for simplicity, but these account for 0.05% of emissions and are reported for all fuels that contain a biofuel component.

113,657 tCO₂e/year

Location Based Emissions Figures

Scope 3

“Indirect Emissions”

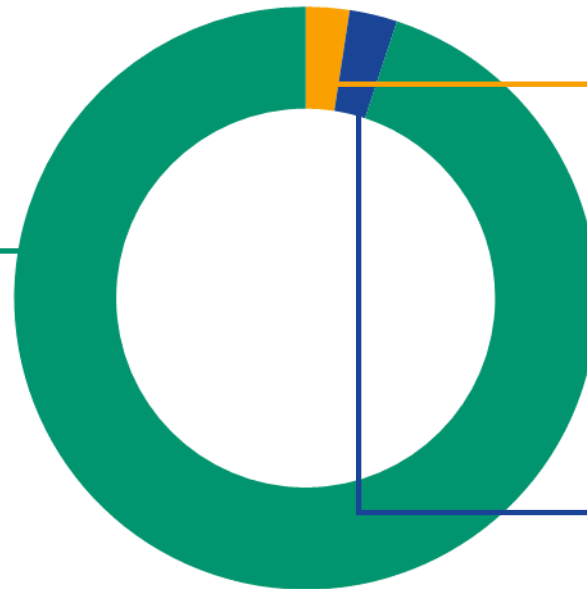
Emissions that arise as a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

107,880 tCO₂e (94.9%)

Out of Scope

Emissions from fuels with biogenic content. Scope 1 impact of these fuels has been determined to be net “0”

15 tCO₂e (0.01%)



Scope 1

“Direct Emissions”

Emissions produced from sources linked to a company's assets.

2,750 tCO₂e (2.4%)

Scope 2

“Indirect Emissions”

Emissions produced by the generation of electricity purchased from third parties and consumed in the company's assets.

3,012 tCO₂e (2.7%)

CARBON FOOTPRINT

ANNUAL SUMMARY – 1: LOCATION BASED REPORTING

The table below shows the figures from the charts on the previous slide, as well as the % year-on-year (y-o-y) change of the different emissions scopes.

Emissions by Scope	2018	2019	2020	2021	2022
Scope 1	3,234	2,806	2,915	3,007	2,750
Scope 2	8,346	4,303	3,101	3,015	3,012
Scopes 1 and 2	11,579	7,109	6,017	6,022	5,762
Scope 3	129,549	137,937	42,216	51,316	107,880
Outside of Scope	4	5	7	6	15
Total emissions	141,132	145,051	48,239	57,344	113,657

Scope 1 % y-o-y change	5%	-13%	4%	3%	-9%
Scope 2 % y-o-y change	-21%	-48%	-28%	-3%	0%
Scope 1 & 2 % y-o-y change	-15%	-39%	-15%	0%	-4%
Scope 3 % y-o-y change	-21%	6%	-69%	22%	110%
Outside of Scope	-19%	23%	32%	-3%	128%
Total % y-o-y change	-20%	3%	-67%	19%	98%

CARBON FOOTPRINT

LOCATION v MARKET BASED

Location-based method:

Reflects the average emissions intensity on the UK grid using emission factors sourced from the Defra/DECC UK Government. When multiplying the electricity consumption of 15,576,467 kWh supplied to Glasgow Airport by the emission factor of 0.19338 kgCO₂/kWh calculates these emissions as 3,012 tCO₂e.

However, since Glasgow Airport have purchased renewable electricity since 2019 onwards, the market based method is used for their company reporting.

Market-based method:

All of the 15,576,467 kWh of electricity consumption was supplied to Glasgow Airport by a single supplier. Glasgow Airport contacted the supplier in 2021 and asked for the details of the fuel mix, proportion of renewable electricity and details of REGO certificates to determine the market-based emissions associated with this electricity supply. The following breakdown was provided for the year-ending 31st March 2022 (Source of Electricity, Percentage):

- **Renewables - 100%**

A REGO certificate has been provided, which indicates that the supply is 100% renewable.

The weighted emission factor was provided as 0 gCO₂/kWh (or 0 kgCO₂/kWh). Multiplying the electricity consumption of 15,576,467 kWh by the emission factor of 0 kgCO₂/kWh calculates the emissions as 0 tCO₂e.

CARBON FOOTPRINT

BY EMISSIONS SOURCE

Location Based tCO ₂ e	Emissions (tCO ₂ e)	% of Scope	% of Total Emissions
Scope 1 – Total	2,750	100.0%	2.4%
Natural gas	2,169	78.9%	1.9%
Operational vehicles	299	10.9%	<1%
Fuel (heating and power)	2	<1%	<1%
Refrigerants	61	2.2%	<1%
Airport de-icer	204	7.4%	<1%
Fire training	15	<1%	<1%
Scope 2 – Total	3,012	100.0%	2.7%
Airport electricity	3,012	100.0%	2.7%
Scope 3 - Total	107,880	100.0%	94.9%
Landing Take-off (LTO)	63,393	58.8%	55.8%
Passenger surface access	35,921	33.3%	31.6%
Tenant natural gas	134	<1%	<1%
Tenant electricity	1,833	1.7%	1.6%
Electricity WTT (<i>reported since 2021</i>)	1,265	1.2%	1.1%
Electricity T&D	443	<1%	<1%
Waste	22	<1%	<1%
Staff commute	3,142	2.9%	2.8%
Third party operational vehicles	49	<1%	<1%
Third party de-icer	359	<1%	<1%
Aircraft engine tests	1,108	1.0%	0.97%
Water	130	<1%	<1%
Business travel	81	<1%	<1%
Out of Scopes – Total	15	100.0%	<1%
Diesel OoS	10	65.0%	<1%
Petrol OoS	2	15.6%	<1%
Fire Training OoS	3	19.4%	<1%
Total	113,657		100.0%

CARBON FOOTPRINT

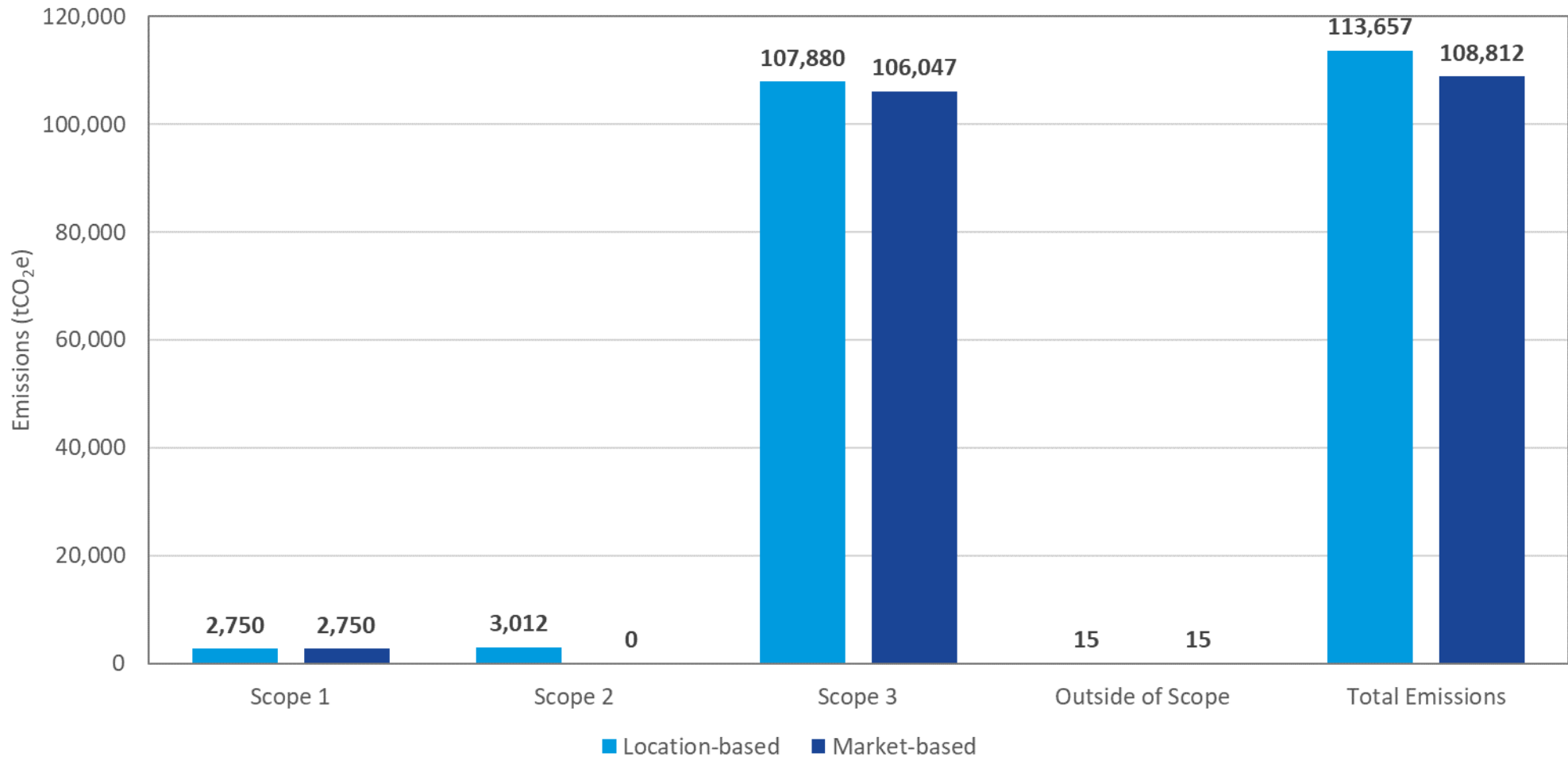
ANNUAL EMISSIONS BY SOURCE

Location Based tCO ₂ e	2018	2019	2020	2021	2022
Scope 1 – Total	3,234	2,806	2,915	3,007	2,750
Natural gas	2,544	2,375	2,476	2,226	2,169
Operational vehicles	411	321	264	255	299
Fuel (heating and power)	25	25	15	10	2
Refrigerants	228	46	86	171	61
Airport de-icer	0	0	64	324	204
Fire training	26	38	11	21	15
Scope 2 – Total	8,346	4,303	3,101	3,015	3,012
Airport electricity	8,346	4,303	3,101	3,015	3,012
Scope 3 - Total	129,549	137,937	42,216	51,316	107,880
Climb, Cruise and Descent (CCD)	0	0	0	0	0
Landing Take-off (LTO)	71,602	73,876	24,766	30,484	63,393
Passenger surface access	49,223	49,277	11,734	12,869	35,921
Tenant natural gas	195	191	144	155	134
Tenant electricity	3,592	3,192	1,721	1,391	1,833
Electricity WTT (<i>reported since 2021</i>)	0	0	0	1,249	1,265
Electricity T&D	711	636	415	390	443
Waste	2,578	2,343	275	453	22
Staff commute	736	7,669	2,134	3,325	3,142
Third party operational vehicles	228	200	303	38	49
Third party de-icer (<i>reported since 2021</i>)	0	0	320	185	359
Aircraft engine tests	444	312	266	730	1,108
Water	218	218	115	42	130
Business travel	21	23	23	5	81
Out of Scopes – Total	4	5	7	6	15
Diesel OoS	4	3	4	5	10
Petrol OoS	0	2	2	2	2
Fire training OoS	0	0	0	0	3
Total	141,132	145,051	48,239	57,344	113,657

CARBON FOOTPRINT

LOCATION v MARKET BASED 2022

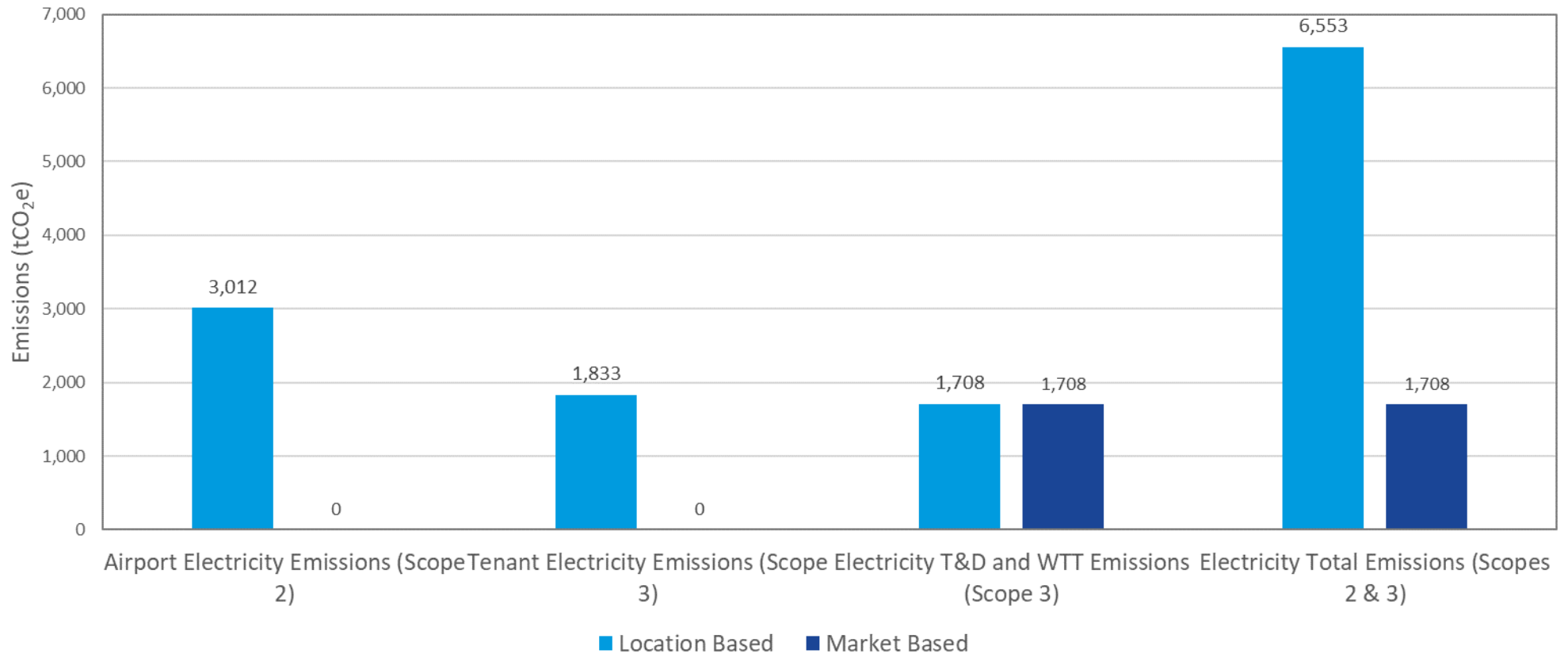
Emissions totals by scope calculated using either the location or market based emissions factors. Tenant energy is included in Scope 3.



CARBON FOOTPRINT

LOCATION v MARKET BASED 2022

Scope 2 and 3 emissions due to electricity consumption (airport and tenant), calculated using either the location or market based emissions factors.



METHODOLOGY

THE FOLLOWING SECTIONS PROVIDE A SUMMARY OF THE METHODOLOGY ADOPTED BY RICARDO TO CALCULATE THE 2022 FOOTPRINT FOR GLASGOW AIRPORT

The standard approach to carbon footprinting is to use the Greenhouse Gas (GHG) Protocol Corporate Accounting and Reporting Standard developed by World Business Council for Sustainable Development (WBCSD) and the World Resources Institute (WRI); this sets out a corporate accounting and reporting methodology for GHGs.

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. Glasgow Airports' emissions that are included are: natural gas use, company owned vehicles fuel use, fuel use for business travel, refrigerant gas use (from leaks during maintenance or malfunction), wood pallets and diesel use for fire training, propane combustion and kerosene combustion.

SCOPE 2 EMISSIONS

Scope 2 emissions are associated with the use of electricity imported from the grid or from a third-party supplier of energy in the form of heat or electricity. These indirect GHG 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.

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 (all aircraft movements up to a height of 1,000m above aerodrome level), employees commuting to the airport, passenger surface access to the airport, airside vehicle activities by third party operators, waste disposal, water (supply and treatment), airport business travel and engine testing.

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 (CO₂) 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 CO₂ during the growth phase as the amount of CO₂ released through combustion). As a result, full reporting of any fuel from a biogenic source have included the 'outside of scope' CO₂ value, documented to ensure complete accounting for the emissions created.

METHODOLOGY

BUSINESS TRAVEL

Accounts data was provided for business travel (Scope 1 & 3). All transport mode data was provided in £ value and converted to distance travelled using the cost/km from [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.

Distance travelled was converted to emissions using the appropriate emissions factors from UK Government GHG Conversion Factors for Company Reporting. Where destination and transport data had been provided, we employed the distance calculation tool provided by distance.to in order to determine the distance involved. Subsequently, this distance was utilized to compute the corresponding emissions generated by the specific mode of transportation in question.

UTILITIES

Utility emissions include: Electricity (Glasgow Airport and third parties), natural gas, fuel used for heating and power, water supply and wastewater treatment, de-icer usage (aircraft and ground), and refrigerant lost to atmosphere from cooling systems. Data was provided by Glasgow Airport and converted to emissions using the appropriate emissions factors from UK Government GHG Conversion Factors for Company Reporting.

OPERATIONAL VEHICLES

Operational vehicle fuel use was calculated by using fuel volume data provided by Glasgow 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.

WASTE

A full breakdown of waste type, tonnage and destination (e.g. combustion, recycling) was provided by Glasgow Airport's waste management provider for 2022. The emissions for waste disposal were calculated by using the appropriate factors from UK Government GHG Conversion Factors for Company Reporting. Virgin material production was not calculated in waste, as this was accounted for in supply chain emissions.

METHODOLOGY

LANDING TAKE-OFF CYCLE (LTO)

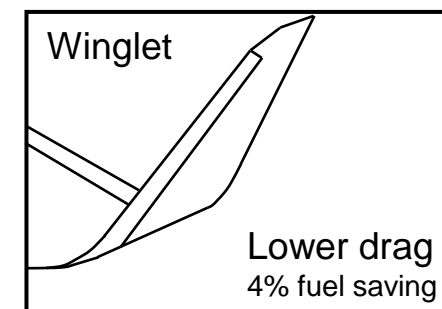
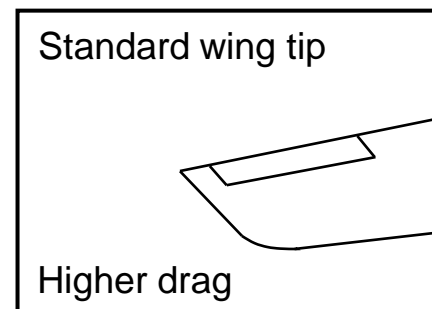
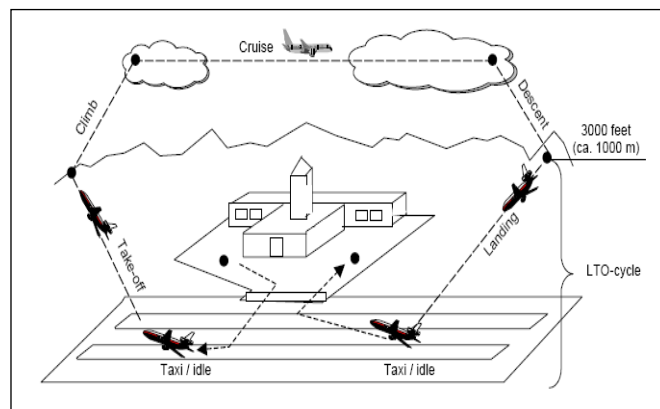
The LTO cycle is split into several stages which are shown in the diagram below, and consist of all fuel consuming movements below 1,000m altitude. The emissions from aircraft above 1,000m are calculated separately as Climb, Cruise and Descent (CCD) emissions, and have been included within Glasgow Airport's footprint for the first time as of 2022.

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.

Additional efforts have been made to improve the accuracy of the LTO calculations in 2022 to reflect the impact of aircraft fuel efficiency improvements that were not otherwise captured by the methodology used in previous years. By utilising the aircraft registrations from the raw data to search for ICAO codes, the accuracy of the calculations was enhanced as it enabled the identification of individual aircraft corresponding to each code.

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 Glasgow Airport's LTO emissions. Note that wing tip fuel burn savings only apply to the following LTO stages: Take-off, Initial climb, Climb out.



METHODOLOGY



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