Southampton Airport Footprint 2022

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

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

VERSION FINAL 15/06/2023

Produced by Ricardo
https://www.ricardo.com/en/markets/aerospace-and-defence/airports

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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_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 CO2 during the growth phase as the CO2 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 Southampton International Airport Limited (SOU). The airport operates 365 days per year and in 2022 served 640,000 passengers and handled 20,000 aircraft movements. AGS Airports employ around 350 full time employees (FTE), of which around 60 are based in Southampton Airport, many of whom commute to the airport by car or public transport.

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, national restrictions on travel were no longer in place following the Covid-19 pandemic. This has continued to have an impact on passenger numbers for Southampton Airport, which have increased, but not yet to pre-pandemic numbers. Aircraft movements have also increased from 2021.

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 GHG Protocol, to ACA Level 3+ standard and ISO 14064-1. The emissions sources included are shown in the figure below.

Emissions figures are reported using the market-based methodology unless clearly indicated otherwise. A location-based baseline emissions profile can be seen towards the end of this report. For a detailed explanation on this, please see this slide.

The emissions included within each scope of the footprint can be seen below.

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

Scope 1

"Direct Emissions"

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

Scope 2

"Indirect Emissions"

- Electricity used by Southampton 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 & business travel
- Tenant electricity
- Electricity well-to-tank and transmission and distribution losses
- Waste: disposal & virgin material production
- 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 Southampton 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.

14,014 tCO_2e/year

97.7% from scope 3 emission sources

Market Based Emissions Figures

88% increase from 2021 emissions

Scope 3

"Indirect Emissions"

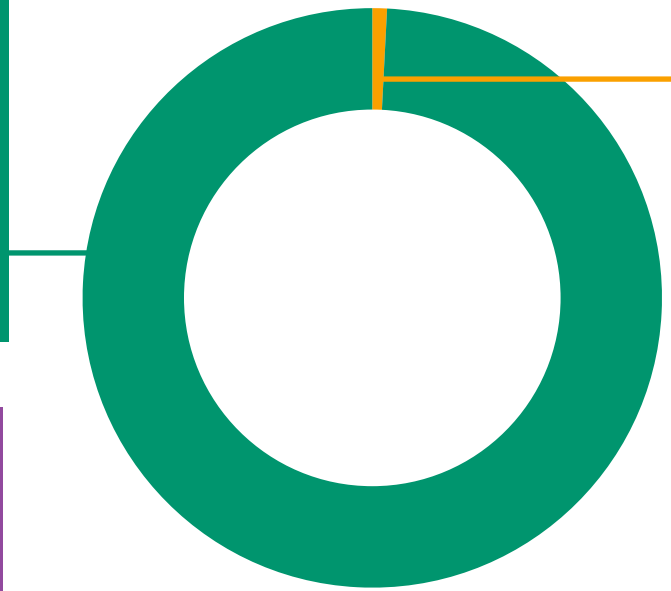
Emissions that arise as a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

13,692 tCO2e (97.7%)

Out of Scope

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

18 tCO2e (0.1%)



Scope 1

"Direct Emissions"

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

304 tCO2e (2.2%)

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 - 1

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	677	547	496	269	304
Scope 2	615	0	0	0	0
Scopes 1 and 2	**1,292**	**547**	**496**	**269**	**304**
Scope 3	28,226	21,811	4,508	7,200	13,692
Outside of Scope	20	1	6	3	18
Total emissions	**29,539**	**22,359**	**5,011**	**7,473**	**14,014**

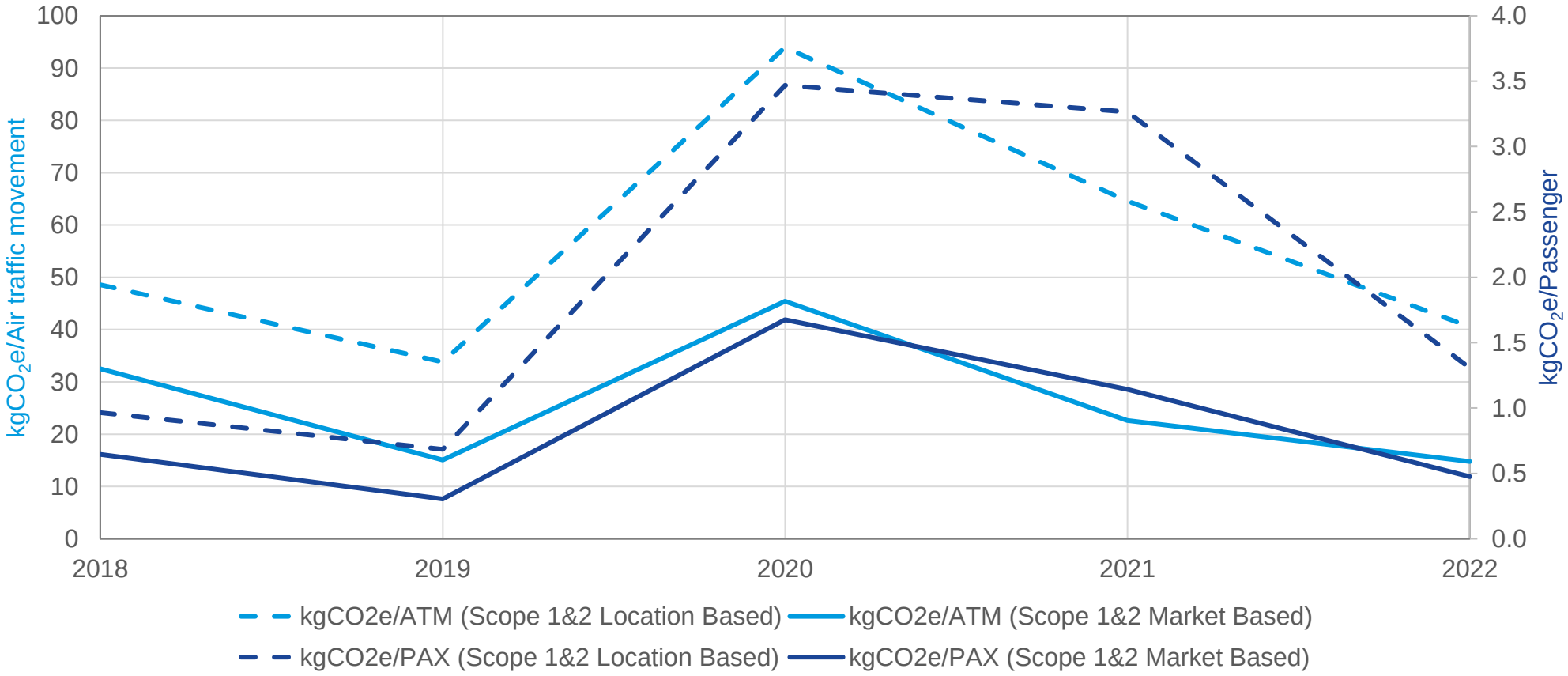
Scope 1 % y-o-y change	-5%	-19%	-9%	-46%	13%
Scope 2 % y-o-y change	-60%	-100%	N/A	N/A	N/A
Scope 1 & 2 % y-o-y change	**-43%**	**-58%**	**-9%**	**-46%**	**13%**
Scope 3 % y-o-y change	-7%	-23%	-79%	60%	90%
Outside of Scope	-15%	-96%	628%	-51%	468%
Total % y-o-y change	**-9%**	**-24%**	**-78%**	**347%**	**88%**

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 $kgCO_2e$/PAX and $kgCO_2e$/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.



KEY STATS

INTENSITY METRICS COMPARISON OVER TIME – 2

This chart shows intensity metrics for Scope 1&2 $kgCO_2e$/passenger (PAX) and $kgCO_2e$/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	39,764	36,308	10,932	11,917	20,613
PAX	2,002,767	1,793,744	296,260	235,760	640,408
% Change in ATM (year-on-year)	-10.5%	-8.7%	-69.9%	9.0%	73.0%
% Change in PAX (year-on-year)	-3.8%	-10.4%	-83.5%	-20.4%	171.6%
Scope 1 & 2 (tCO_2e) Location Based Scope	1,931	1,227	1,027	770	836
$kgCO_2e$/ATM	48.6	33.8	94.0	64.6	40.5
$kgCO_2e$/PAX	1.0	0.7	3.5	3.3	1.3
Scope 1 & 2 (tCO_2e) Market Based Scope 2	1,292	547	496	269	304
$kgCO_2e$/ATM*	32.5	15.1	45.4	22.6	14.8
$kgCO_2e$/PAX*	0.6	0.3	1.7	1.1	0.5

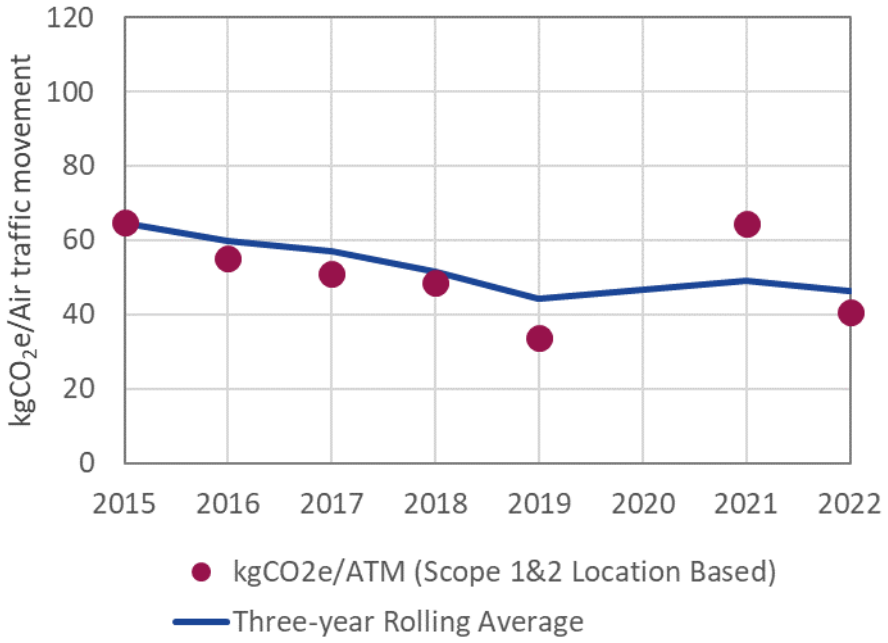
KEY STATS

THREE YEAR ROLLING AVERAGE – LOCATION BASED

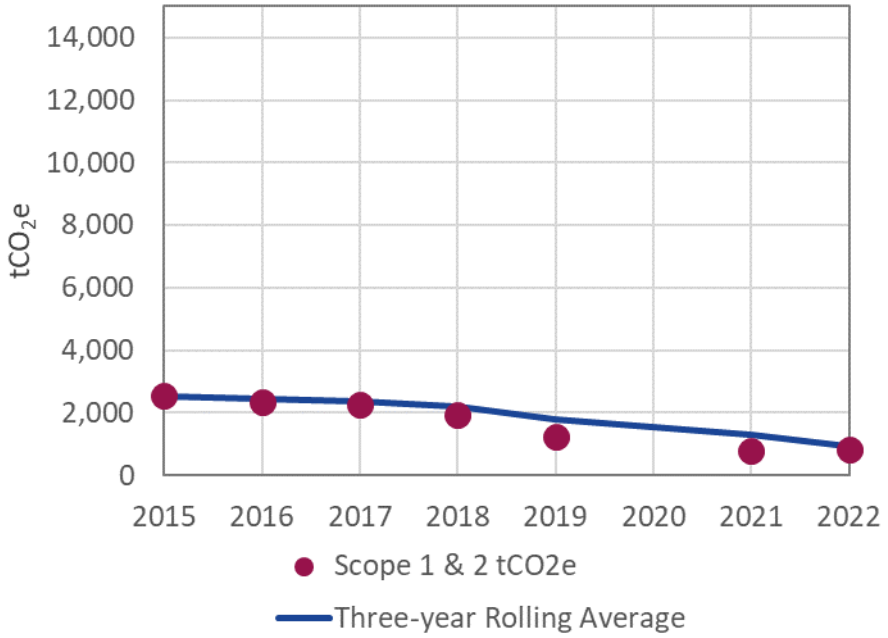
As per the requirements of Level 3+ of the Airport Carbon Accreditation scheme, Southampton Airport have demonstrated a reduction in their Scope 1&2 emissions against the three-year rolling average, both in terms of absolute and intensity based emissions, as shown in the charts below.

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)



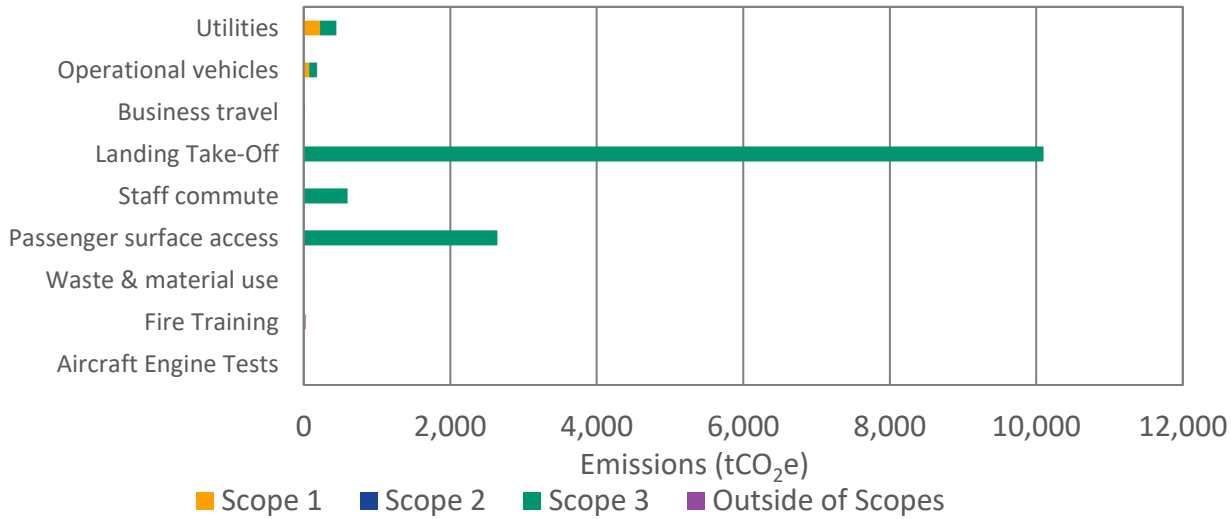
Absolute Emissions (tCO2e)



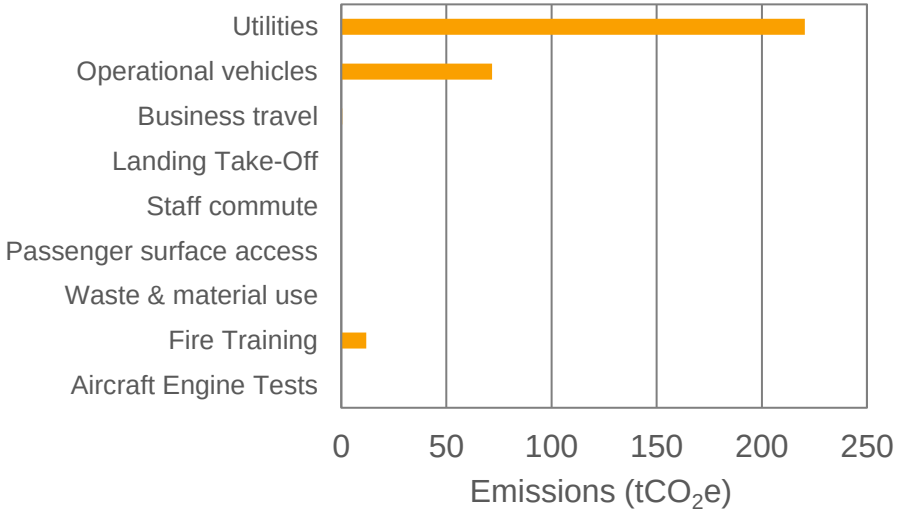
CARBON FOOTPRINT

BY EMISSION SOURCE

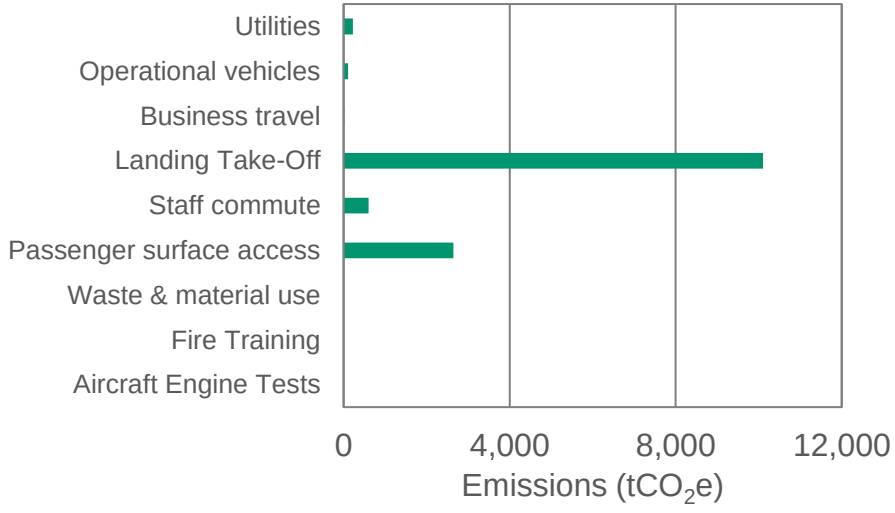
All Scopes carbon emissions split by source/activity



Scopes 1 and 2 carbon emissions split by source/activity



Scope 3 carbon emissions split by source/activity



CARBON FOOTPRINT

BY EMISSION SOURCE

Market Based tCO_2e	Emissions (tCO_2e)	% of Scope	% of Total Emissions
Scope 1 – Total	**304**	**100%**	**2.2%**
Natural gas	220	72.4%	1.6%
Airport operational vehicles	72	23.6%	<1%
Fuel (heating and power)	0	0.0%	0.0%
Refrigerants	0	0.0%	0.0%
Airport de-icer	0	0.0%	0.0%
Fire training	12	3.9%	<1%
Business travel	0	<1%	<1%
Scope 2 – Total	**0**	**100.0%**	**0.0%**
Airport electricity (Market Based)	0	0.0%	0.0%
Scope 3 – Total	**13,692**	**100%**	**97.7%**
Landing Take-off (LTO)	10,100	73.8%	72.1%
Passenger surface access	2,644	19.2%	18.9%
Tenant natural gas	0	0.0%	<1%
Tenant electricity (Location Based)	0	0.0%	0.0%
Electricity WTT	161	1.2%	1.2%
Electricity T&D	57	<1%	<1%
Waste	5	<1%	0.4%
Staff commute	596	4.3%	4.3%
Third party operational vehicles	106	0.8%	0.8%
Third party de-icer	0	0.0%	0.0%
Aircraft engine tests	4	<1%	<1%
Water	6	<1%	<1%
Business travel	13	<1%	0.1%
Out of Scopes – Total	**18**	**100.0%**	**0.1%**
Diesel OoS	6	35.0%	<1%
Petrol OoS	0	0.1%	<1%
Fire training OoS	11	64.9%	<1%
Total	**13,849**		**100.0%**

CARBON FOOTPRINT

SCOPE 1 EMISSION SOURCES

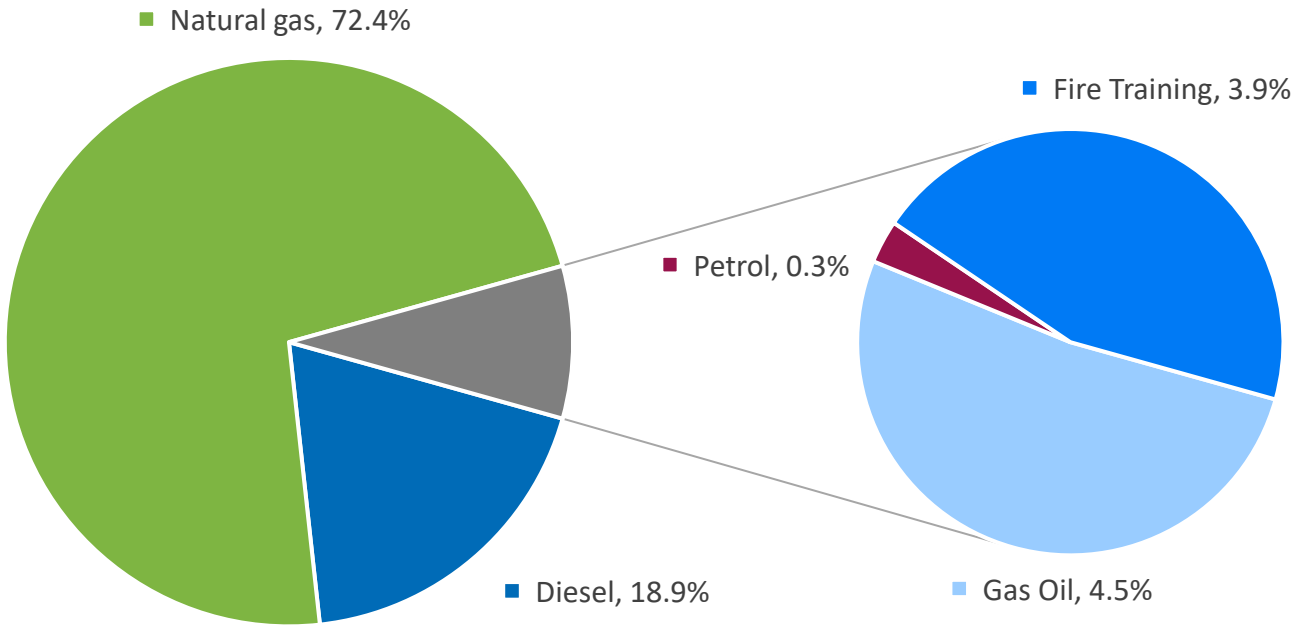
Scope 1 emissions are produced from sources linked to a company's assets.

For Southampton 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.

304 **tCO_2e/year**

2.2% 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:

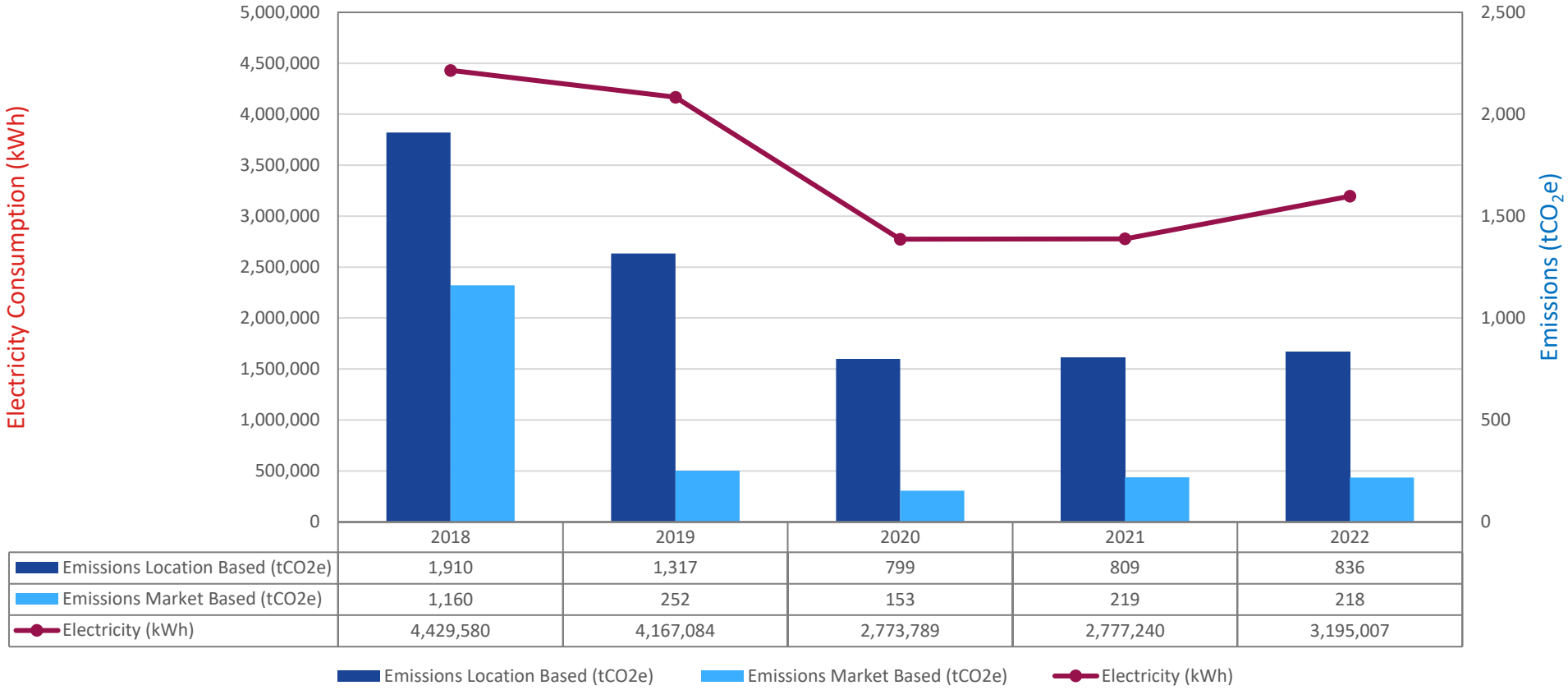
- **Location-based method**; this reflects the average emissions intensity of macro-scale (regional/national) electricity grids where energy consumption occurs. Companies reporting using this method should use the regional/National Grid average emission factor. In the UK, this would be sourced from the 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_2e)	Market-based (tCO_2e)
Airport Electricity Emissions (Scope 2)	531	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 Southampton 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



	2018	2019	2020	2021	2022
Emissions Location Based (tCO2e)	1,910	1,317	799	809	836
Emissions Market Based (tCO2e)	1,160	252	153	219	218
Electricity (kWh)	4,429,580	4,167,084	2,773,789	2,777,240	3,195,007

The emissions in the figure show the location and market based electricity emissions.

There has been little deviation in total electrical consumption since 2018. The major savings in emissions from 2018 – 2019 is due to the increase of renewables on the national grid and the purchasing of 100% renewable electricity from 2018. The sudden drop in electricity consumption in 2020 is a result of the Covid-19 pandemic, which increased slightly into 2021 and 2022. Whilst these emissions now include WTT emissions, there has been a slight reduction in emissions in 2022 due to the decarbonisation of the grid.

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

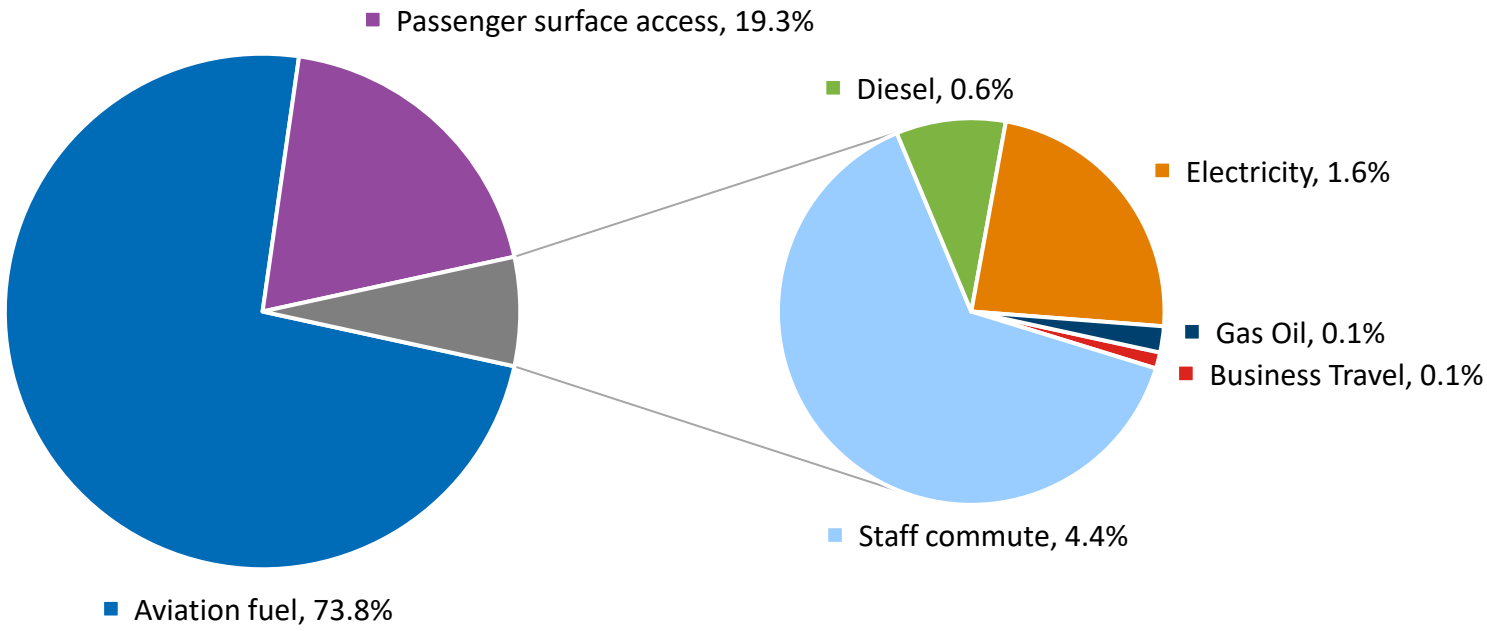
Scope 3 emissions are those that arise as a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

For Southampton 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.

13,692 **tCO_2e/year**

97.7% of total emissions

Market Based Emissions Figures



CARBON FOOTPRINT

Landing take-off cycle (LTO)

10,100 tCO_2e/year

Total LTO emissions

Landing Take-Off Cycle emissions account for aircraft movements which occur below 3,000 feet during flight.

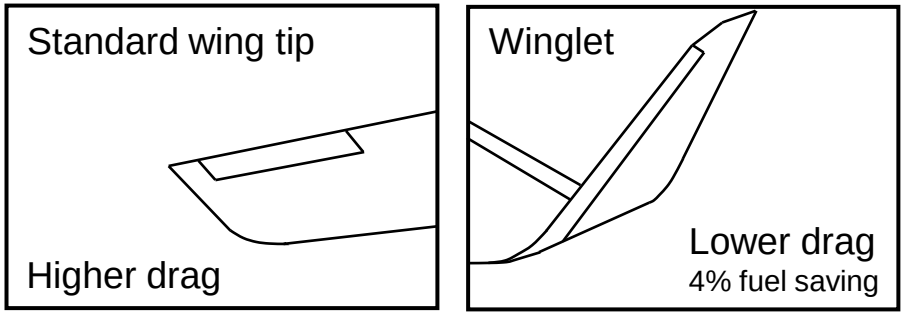
EasyJet offset 100% of their aviation fuel emissions as per ACA guidelines and can therefore be claimed as carbon neutral. AGS airports have decided to continue reporting these emissions in their carbon footprint for clarity.

Total emissions from EasyJet that are offset are **165 tCO_2e** which is 1.63% 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.

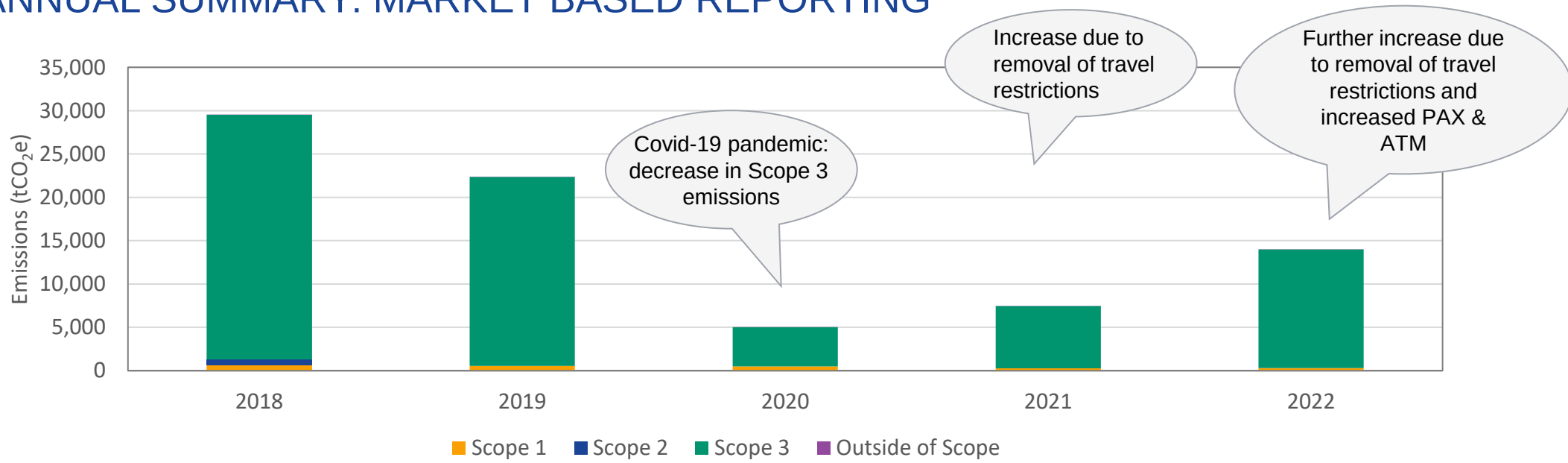
New designs for the tips of the aircraft wings can reduce drag and improve fuel efficiency. An example of a modern wingtip design is shown in the diagram on the right.

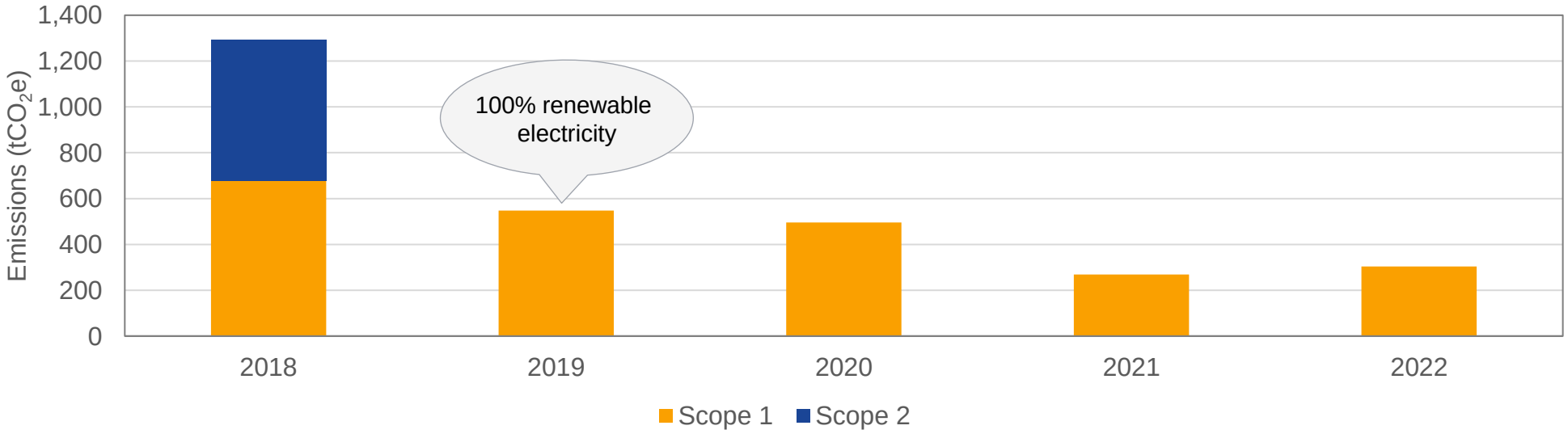
Wingtips can reduce fuel burn by 4-6% for larger aircraft, which reduces the carbon emissions by the same amount. A 4% reduction in fuel use was used as a conservative estimate of fuel burn savings for the calculations for Southampton Airport's LTO emissions.



CARBON FOOTPRINT

ANNUAL SUMMARY: MARKET BASED REPORTING





CARBON FOOTPRINT

ANNUAL EMISSIONS TRENDS

Emissions have increased for 2022 across most of the emissions categories due to the increase in air traffic movements (73%) and passenger numbers (171.6%) in comparison to 2021.

Emissions sources with the largest increases from 2021:

- Diesel (Scope 1 and 3) emissions have increased by 5320% because of the increase of flights post-covid and the switch from using gas oil (red diesel) to diesel as of April 2022.
- Business travel (Scope 3) emissions have increased by 415% because of the significantly reduced figures in 2020 and 2021 due to COVID-19.
- Landing Take-Off (Scope 3) emissions have increased by 88% because of the increased number of flights compared to in 2021 with COVID restrictions still in place internationally.
- Passenger surface access (Scope 3) emissions have increased by 139% because of a increased number of flights compared to in 2021 with COVID restrictions still in place internationally.

Emission sources with the largest decreases from 2021.

- Gas Oil (Scope 1) emissions have decreased by 69% because of the increase of the switch from using gas oil (red diesel) to diesel as of April 2022.
- Waste (Scope 3) emissions have decreased by 80% because primary material production emissions are now excluded from Southampton's carbon footprint, and are now represented within Supply Chain emissions.

CARBON FOOTPRINT

ANNUAL EMISSIONS TRENDS - 2

Market Based tCO_2e	2018	2019	2020	2021	2022
Scope 1 – Total	**677**	**547**	**496**	**269**	**304**
Natural gas	304	327	250	216	220
Airport operational vehicles	131	104	52	47	72
Fuel (heating and power)	7	32	14	0	0
Refrigerants	165	32	164	0	0
Airport de-icer	0	0	0	0	0
Fire training	70	50	16	6	12
Scope 2 – Total	**615**	**0**	**0**	**0**	**0**
Airport electricity	615	0	0	0	0
Scope 3 - Total	**28,226**	**21,811**	**4,508**	**22,119**	**13,692**
Landing Take-off (LTO)	12,699	11,573	2,659	5,364	10,100
Passenger surface access	13,487	7,869	1,354	1,106	2,644
Tenant natural gas	7	4	1	<1	<1
Tenant electricity	236	0	0	0	0
Electricity WTT *(reported since 2021)*	202	161	97	167	161
Electricity T&D	107	90	56	52	57
Waste	886	648	16	24	5
Staff commute	123	1,052	163	404	596
Third party operational vehicles	436	357	89	66	106
Third party de-icer	0	0	25	0	0
Aircraft engine tests	14	23	12	11	4
Water	20	20	20	4	6
Business travel	11	14	17	2	13
Out of Scopes – Total	**20**	**1**	**6**	**3**	**18**
Diesel OoS	20	1	0	<1	6
Petrol OoS	0	0	0	0	<1
Wood OoS	0	0	6	3	11
Total	**29,539**	**22,359**	**5,011**	**7,473**	**14,014**

CARBON FOOTPRINT

SCOPE 3 SUPPLY CHAIN EMISSIONS

SCOPE 3 SUPPLY CHAIN

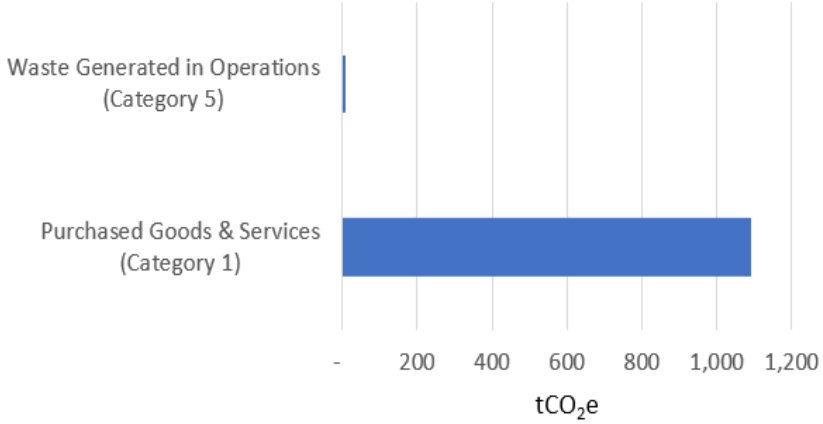
EMISSIONS FROM SUPPLY CHAIN - SUMMARY

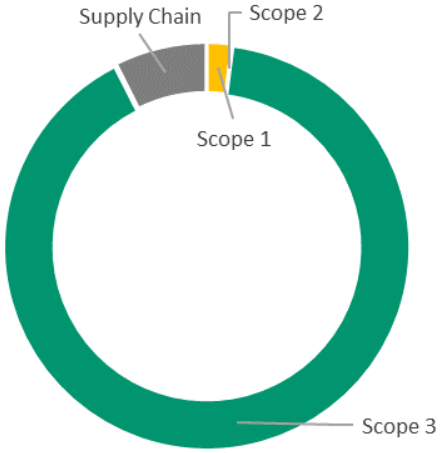
Southampton Airport reports its Green House Gas (GHG) emissions in line with United Kingdom mandatory GHG reporting and Airport Carbon Accreditation (ACA) Level 3+ emission regulations. The Scope 3 emissions sources included in this report represent the majority of emissions associated with airport operations. Southampton 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, Southampton Airport already report the emissions under many of these categories, and some are not applicable due to organisation type and activities undertaken.

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 Southampton Airport has decided to undertake this analysis to better understand its supply chain carbon footprint. These emissions represent 7% of all emissions estimated, which is higher than other AGS airports. 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	1,100
Capital goods		
Fuel & energy (upstream)	Reported within existing footprint in rest of report.	
Waste from operations		
Business travel		
Employee commuting		
Leaded assets (upstream)		
Transportation & distribution (upstream)	N/A	
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

Supply chain emissions at Southampton Airport are mainly made up of professional services, specialised construction works, cleaning services and products, and general building and construction works.

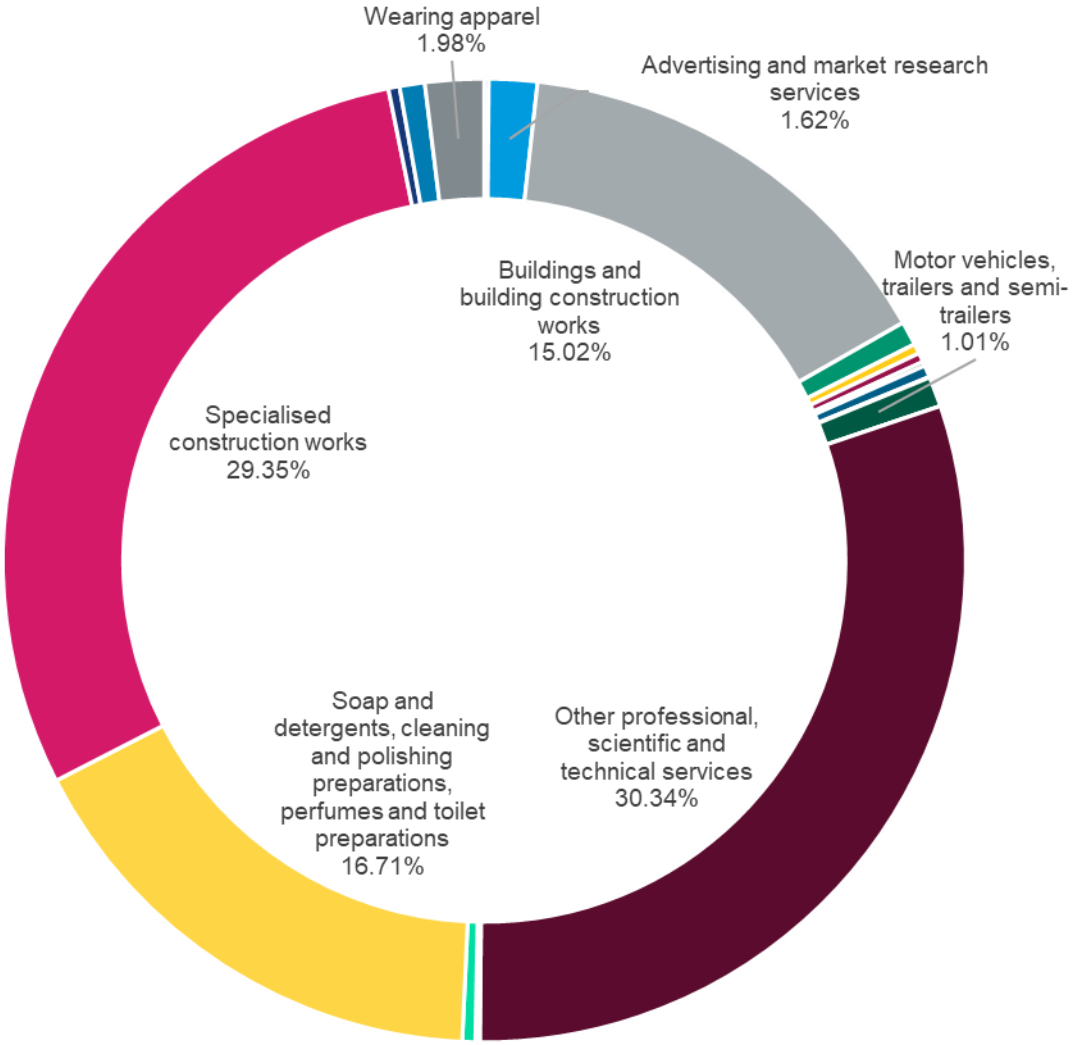
Professional and technical services are comprised of a mixture of environmental sampling and consultancy services. Foul mains diversion contributed to 83% of these emissions.

Specialised construction works include emissions from works such as pavement and runway maintenance.

Cleaning contributed to a sizeable portion of emissions and include a mixture of products and services.

Building and construction included services such as refurbishments and new line markings.

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

LOCATION BASED SUMMARY

Emissions by scope for Southampton Airport for 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 0.1% of emissions and are reported for all fuels that contain a biofuel component.

14,632 tCO_2e/year

94.2% from Scope 3 emission sources

Location Based Emissions Figures

Scope 3

"Indirect Emissions"

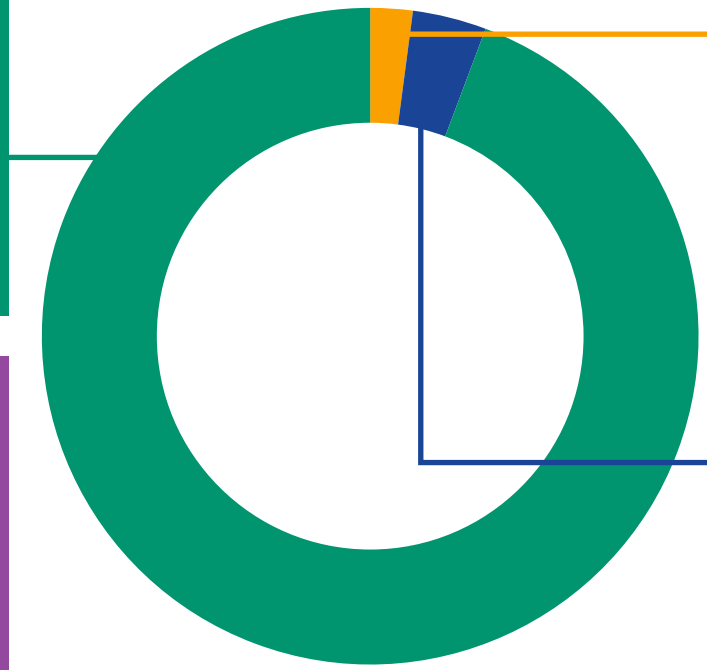
Emissions that arise as a consequence of the activities of the company, but occur from sources not owned or controlled by the company.

13,779 tCO_2e (94.2%)

Out of Scope

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

18 tCO2e (0.1%)



Scope 1

"Direct Emissions"

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

304 tCO_2e (2.1%)

Scope 2

"Indirect Emissions"

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

531 tCO_2e (3.6%)

CARBON FOOTPRINT

ANNUAL SUMMARY – 1 – LOCATION BASED

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	677	547	496	269	304
Scope 2	1,254	680	531	500	531
Scopes 1 and 2	**1,931**	**1,227**	**1,027**	**770**	**836**
Scope 3	28,338	22,196	4,624	7,290	13,779
Outside of Scope	20	1	6	3	18
Total emissions	**30,289**	**23,424**	**5,657**	**8,063**	**14,632**

Scope 1 % y-o-y change	-5%	-19%	-9%	-46%	13%
Scope 2 % y-o-y change	-19%	-46%	-22%	-6%	6%
Scope 1 & 2 % y-o-y change	**-15%**	**-36%**	**-16%**	**-25%**	**9%**
Scope 3 % y-o-y change	-6%	-22%	-79%	58%	-38%
Outside of Scope	-15%	-96%	628%	-51%	468%
Total % y-o-y change	**-7%**	**-23%**	**-76%**	**43%**	**-36%**

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 2,747,024 kWh supplied to Southampton Airport by the emission factor of 0.19338 $kgCO_2$/kWh calculates these emissions as 531 tCO_2e.

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

Market-based method:

All of the 2,747,024 kWh of electricity consumption was supplied to Southampton Airport by a single supplier. Southampton 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%**

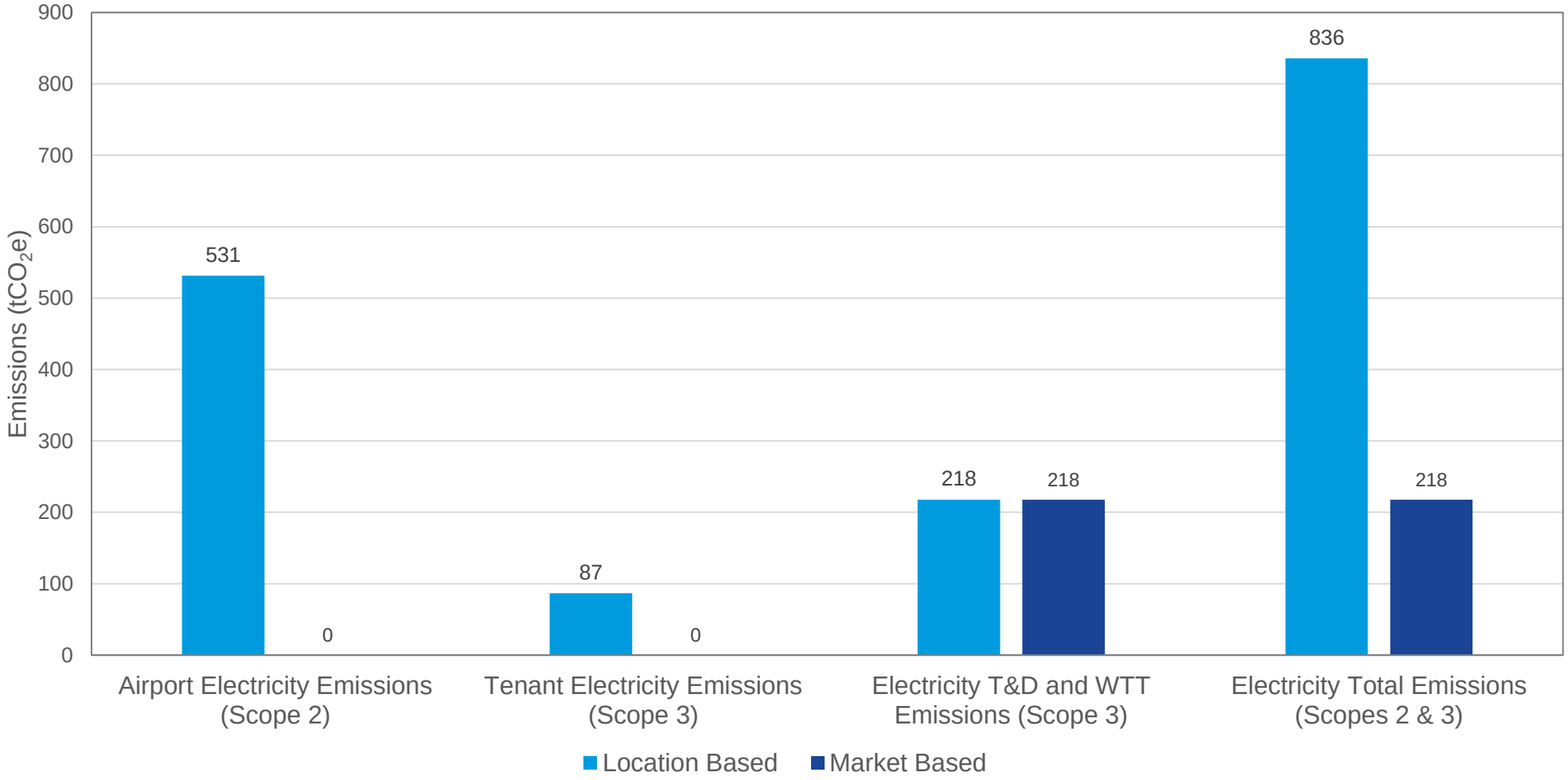
A REGO certificate has been provided, which indicates that the supply is 100% renewable.

The weighted emission factor was provided as 0 gCO_2/kWh (or 0 $kgCO_2$/kWh). Multiplying the electricity consumption of 2,747,024 kWh by the emission factor of 0 $kgCO_2$/kWh calculates the emissions as 0 tCO_2e.

CARBON FOOTPRINT

LOCATION v MARKET BASED 2022

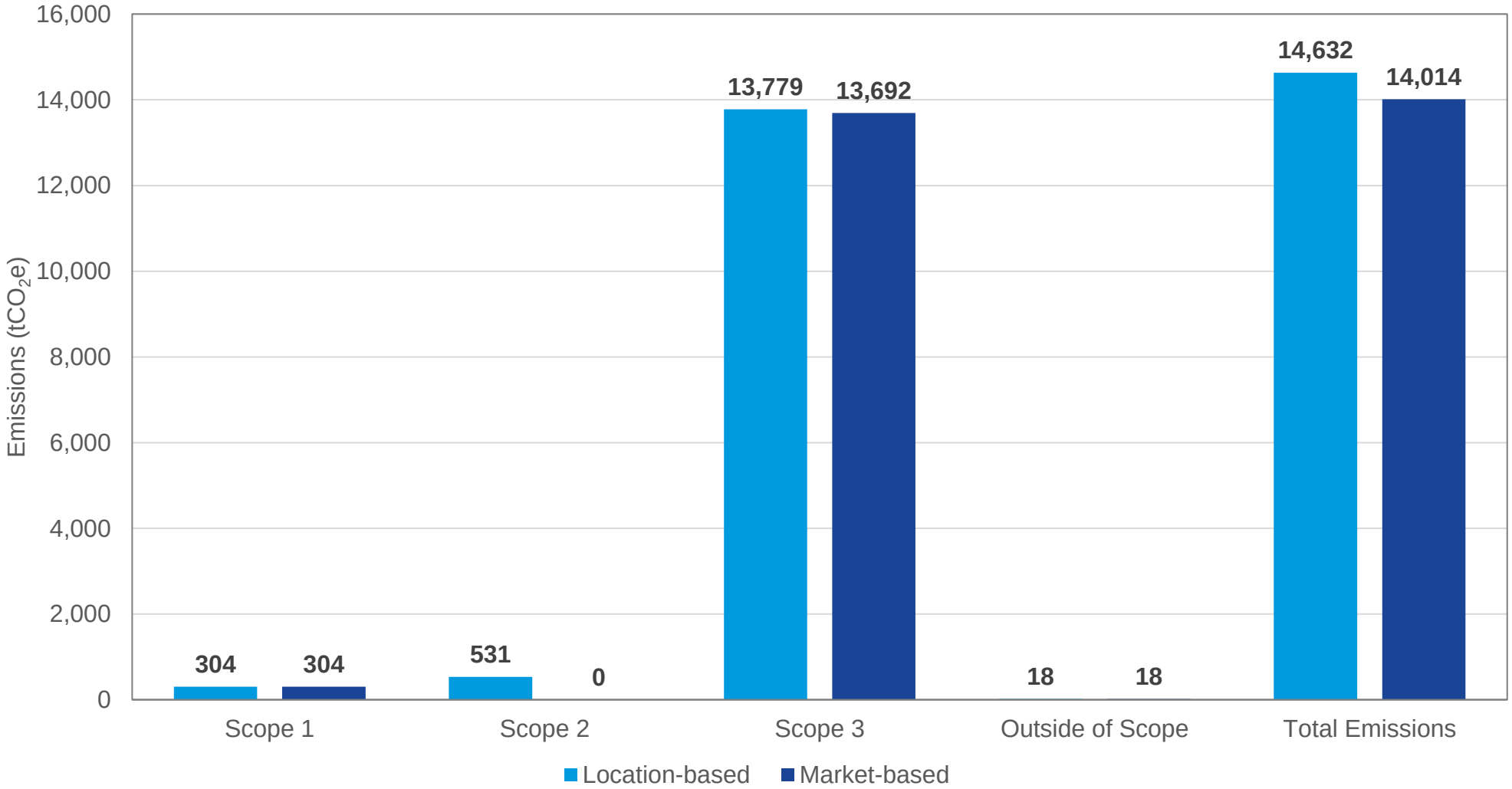
Scope 2 and 3 emissions due to electricity consumption (airport and tenant), calculated using either the location or market based emissions factors.



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

BY EMISSIONS SOURCE

Location Based tCO_2e	Emissions (tCO_2e)	% of Scope	% of Total Emissions
Scope 1 – Total	**304**	**100.0%**	**2.1%**
Natural gas	220	72.4%	1.5%
Airport operational vehicles	72	23.6%	0.5%
Fuel (heating and power)	0	0.0%	0.0%
Refrigerants	0	0.0%	0.0%
Airport de-icer	0	0.0%	0.0%
Fire training	12	3.9%	0.1%
Business travel	<1	<1%	<1%
Scope 2 – Total	**531**	**100.0%**	**3.6%**
Airport electricity	531	100.0%	3.6%
Scope 3 - Total	**13,779**	**100.0%**	**94.2%**
Landing Take-off (LTO)	10,100	73.3%	69.0%
Passenger surface access	2,644	19.2%	18.1%
Tenant natural gas	0	0.0%	0.0%
Tenant electricity	87	<1%	<1%
Electricity WTT *(reported since 2021)*	161	1.2%	1.1%
Electricity T&D	57	<1%	<1%
Waste	5	<1%	<1%
Staff commute	596	4.3%	4.1%
Third party operational vehicles	106	<1%	<1%
Third party de-icer	0	0.0%	0.0%
Aircraft engine tests	4	<1%	<1%
Water	6	<1%	<1%
Business travel	13	<1%	<1%
Out of Scopes – Total	**18**	**100.0%**	**0.1%**
Diesel OoS	6	35.0%	<1%
Petrol OoS	<1	<1%	<1%
Wood OoS	11	64.9%	<1%
Total	**14,632**		**100.0%**

CARBON FOOTPRINT

ANNUAL EMISSIONS BY SOURCE – LOCATION BASED

Location Based tCO_2e	2018	2019	2020	2021	2022
Scope 1 – Total	**677**	**547**	**496**	**269**	**304**
Natural gas	304	327	250	216	220
Airport operational vehicles	131	104	52	47	72
Fuel (heating and power)	7	32	14	0	0
Refrigerants	165	32	164	0	0
Airport de-icer	0	0	0	0	0
Fire training	70	50	16	6	12
Business travel	1	1	0	0	0
Scope 2 – Total	**1,254**	**680**	**531**	**500**	**531**
Airport electricity	1,254	680	531	500	531
Scope 3 - Total	**28,338**	**22,196**	**4,624**	**7,290**	**13,779**
Landing Take-off (LTO)	12,699	11,573	2,659	5,364	10,100
Passenger surface access	13,487	7,869	1,354	1,106	2,644
Tenant natural gas	7	4	1	0	0
Tenant electricity	348	385	116	89	87
Electricity WTT *(reported since 2021)*	202	161	97	167	161
Electricity T&D	107	90	56	52	57
Waste	886	648	16	24	5
Staff commute	123	1,052	163	404	596
Third party operational vehicles	436	357	89	66	106
Third party de-icer *(reported since 2021)*	0	0	25	0	0
Aircraft engine tests	14	23	12	11	4
Water	20	20	20	4	6
Business travel	11	14	17	2	13
Out of Scopes – Total	**20**	**1**	**6**	**3**	**18**
Diesel OoS	20	1	0	0	6
Petrol OoS	0	0	0	0	0
Wood OoS	0	0	6	3	11
Total	**30,289**	**23,424**	**5,657**	**8,063**	**14,632**

METHODOLOGY

THE FOLLOWING SECTIONS PROVIDE A SUMMARY OF THE METHODOLOGY ADOPTED BY RICARDO TO CALCULATE THE 2022 FOOTPRINT FOR SOUTHAMPTON 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. Southampton 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

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 and/or removal process is not completely understood. For example GWP values involve significant scientific uncertainty. Estimation uncertainty arises any time GHG emissions are quantified. Estimations have been made within this footprint where areas of uncertainty have arisen.

PASSENGER SURFACE ACCESS

Emissions are based on a survey undertaken in 2018, scaled to 2022 Southampton Airport passenger numbers. Information was collated on the mode of travel and location of those who answered the survey. Methodology has been improved in the 2020, 2021 and 2022 calculations.

STAFF COMMUTE

For staff commute, the 2022 staff travel survey for AGS employees data was utilised. There were 117 respondents out of 346 staff members (34%), and so final data was scaled to the average annual headcount of Southampton and AGS staff in 2022. 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 250 working days per year (Mon-Fri) and each staff member has 25 days of leave per year.

Total annual distance travelled was converted to emissions using the appropriate emissions factors from UK Government GHG Conversion Factors for Company Reporting.

AIRCRAFT ENGINE TESTING

To calculate the emissions from engine testing at Southampton 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 detailed here. Other assumptions used for the calculations are:

- Only seven engines were tested
- High power testing occurred for 10% of the full test time

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 (Southampton 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 Southampton 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 Southampton 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 Southampton Airport's waste management provider for 2022. The emissions for waste disposal and virgin material production were calculated by using the appropriate factors from UK Government GHG Conversion Factors for Company Reporting.

METHODOLOGY

LANDING TAKE-OFF CYCLE (LTO)

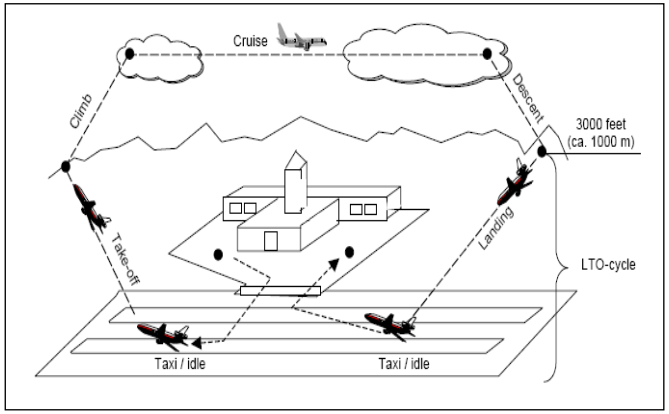
The LTO cycle is split into several stages which are shown in the diagram below, and consist of all fuel consuming movements below 1,000m altitude. The emissions from aircraft above 1,000m are calculated separately as Climb, Cruise and Descent (CCD) emissions, and have been included within Southampton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

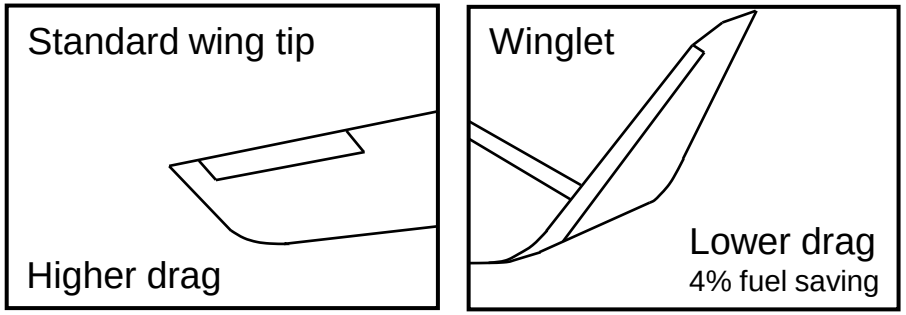
Fuel usage for each aircraft from the LTO cycle are calculated by using fuel burn rates (kg/second) from the ICAO Databank (Jet engines) or FOCA Aircraft Piston Engine database (Piston engines) for each aircraft, multiplied by the time the aircraft spends in each section of the LTO cycle (e.g. Taxi Out, 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.

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





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