Ricardo Energy & Environment

Sumburgh Airport Carbon Footprint 2021

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

Report for Highlands and Islands Airports Limited

Highlands and Islands Airports Limited
Puirt-adhair na Gàidhealtachd is nan Eilean Earranta

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Included Emissions Sources

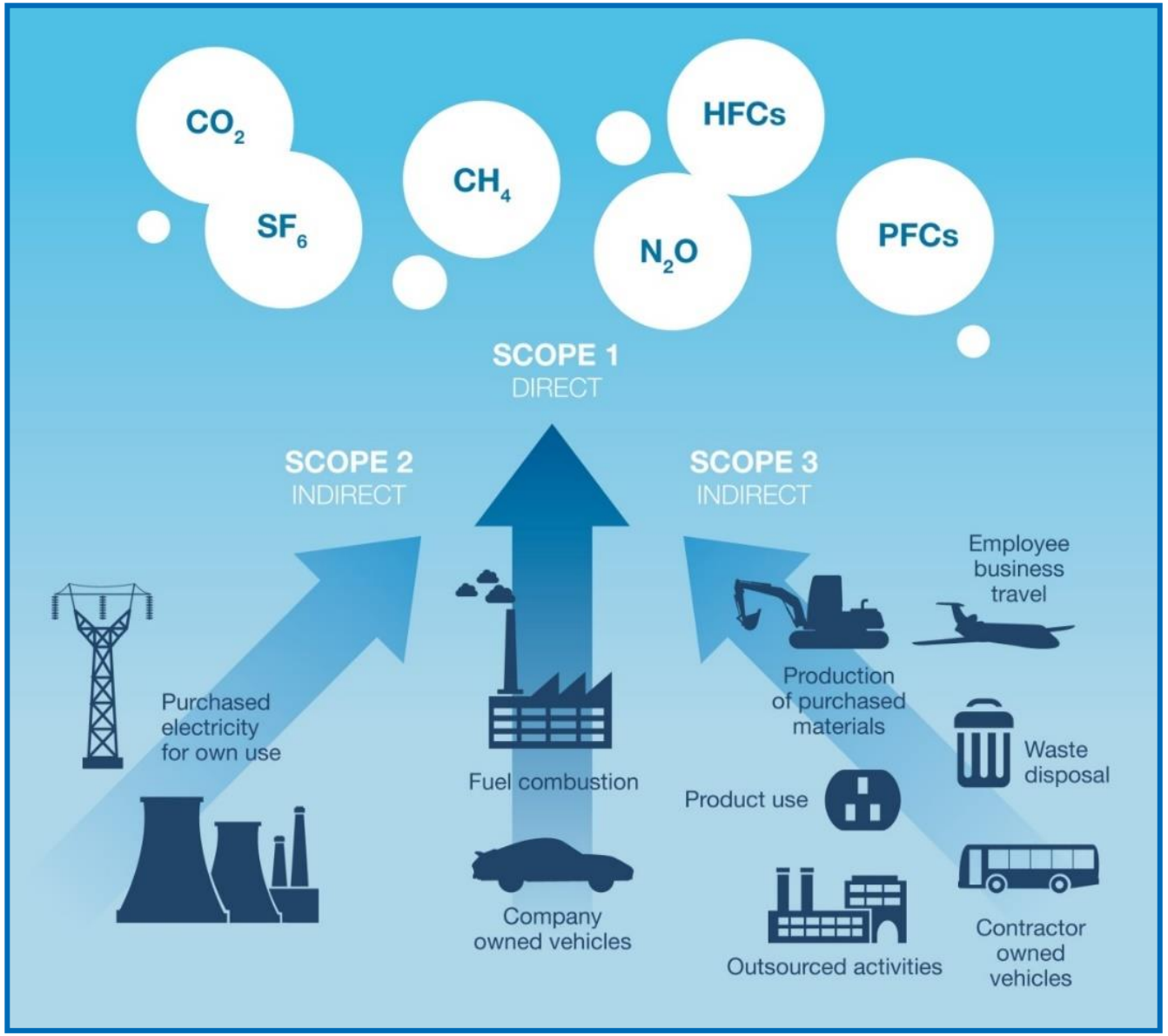
The following emissions sources are included in the 2021 carbon footprint for Sumburgh Airport:

Scope 1: Direct emissions:
- Fuels burnt on site (boilers, generators, ground support equipment, fire training)
- Refrigerant gas losses
- Airport de0icer

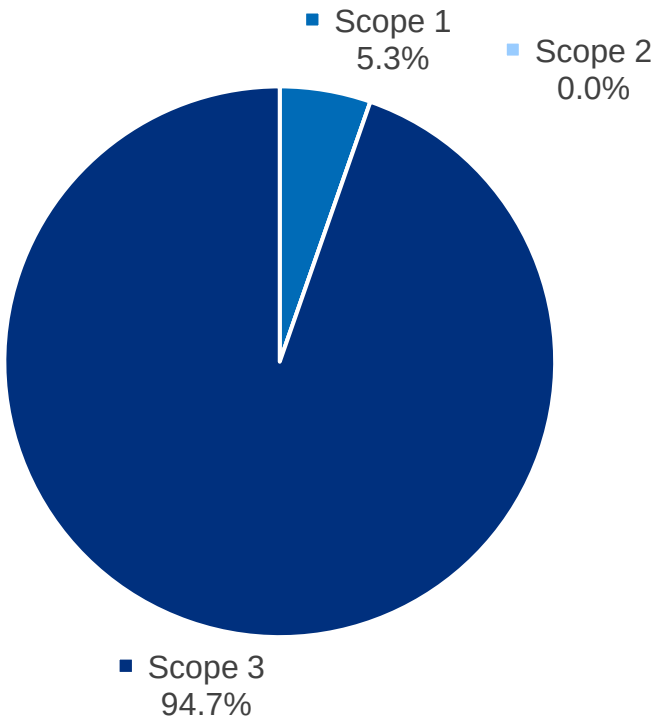
Scope 2: Indirect emissions:
- Purchased electricity

Scope 3: Indirect emissions:
- 3rd party de0icer
- Tenant energy
- Aircraft movements: LTO cycle and CCD
- Business travel
- Water supply and wastewater treatment
- Staff commute
- Passenger surface access
- Waste (disposal and virgin material production)

The above sources of emissions were captured for the period April 20190March 2020 but are hereafter referred to as 2020 in this report.



Key Stats - Carbon Emissions by Scope 2021



	Total 2021 emissions (tCO_2e)	% of total emissions
Scope 1	819	5.3
Scope 2	0.0	0.0
Scope 3	14,513	94.7
Outside of Scopes	0.0	0.0
Total	**15,332**	**100.0%**

Scope 1:
Emissions on0site, or an associated process, from the combustion of fossil fuels, e.g. natural gas, oil, LPG and company0owned vehicles.

Scope 2:
Emissions 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.

Scope 3:
Emissions arising as a direct consequence of the use of goods or services provided by the company. For Sumburgh airport this would be the operation of the airport. Sources include aircraft movements, passenger and staff travel to the airport, airside activities, waste disposal, water and business travel.

Outside of scope emissions:
Outside of scope emissions account for the direct carbon dioxide (CO_2) 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’.

Key Stats - Annual Comparison

Total Scope 1 and 2 emissions at Sumburgh airport increased from 2020 to 2021 due to increased gas oil consumption. This increase was 9% under market based reporting and 7% under location based.

Scope 3 emissions showed a 41% decrease as a result of impacts associated with the COVID pandemic such as decreased flight movements.

	Total 2020 emissions (tCO_2e)	Total 2021 emissions (tCO_2e)	Percentage change (%)
Marked Based			
Scope 1	571	819	43%
Scope 2	3	0	0 100%
Scope 3	25,562	14,513	0 43%
Total	26,136	15,332	0 41%
Location Based			
Scope 1	571	819	43%
Scope 2	372	329	0 12%
Scope 3	25,562	14,522	0 43%
Total	26,514	15,670	0 41%

Key Stats - Intensity Metrics

Intensity metrics demonstrate the emission rate of a given pollutant (CO_2e) in relation to a specific activity/process. This allows for a fair comparison of activities for airports of varying sizes, who may produce significantly different levels of absolute emissions.

For the HIAL airports, the intensity metrics calculated are tCO_2e/PAX (PAX = passenger) and tCO_2e/ATM (ATM = air traffic movement), for both location and market based Scope 2 methodologies.

When comparing the 11 HIAL airports' emissions intensity factors from the least to the most intensive (market based Scope 2), Sumburgh ranks 8th for aircraft movement emissions intensity and 4th for passenger emissions intensity.

	2020	2021
ATM (Air Traffic Movements)	18,784	12,815
PAX	307,923	162,553
Scope 1 & 2 (tCO_2e) Location Based Scope 2	943	1,148
$kgCO_2e$/ATM	50.2	89.5
$kgCO_2e$/PAX	3.1	7.1
Scope 1 & 2 (tCO_2e) Market Based Scope 2	574	819
$kgCO_2e$/ATM	30.6	63.9
$kgCO_2e$/PAX	1.9	5.0

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Background

Highlands and Islands Airports Limited (HIAL) is a public corporation owned by the Scottish Ministers and subsidised by the Scottish Government in accordance with Section 34 of the Civil Aviation Act 1982.HIAL operates and manages 11 airports in total; Barra, Benbecula, Campbeltown, Dundee, Inverness, Islay, Kirkwall, Stornoway, Sumburgh, Tiree, and Wick. Sumburgh airport served 162,553 passengers with a total 12,815 aircraft movements in the 2020/2021 financial year.

The calculation of the annual carbon footprint will help HIAL and the individual airports to understand the different areas which contribute to their overall carbon footprint and monitor changes on a yearly basis. HIAL has committed to creating a Net Zero Aviation Zone by 2040 and so this process will help to identify improvement opportunities, which will ultimately reduce HIAL Airports' carbon footprint and associated costs. In addition, the carbon footprint will also form the baseline for emission reduction targets, allowing HIAL to measure the success of any management strategies implemented.

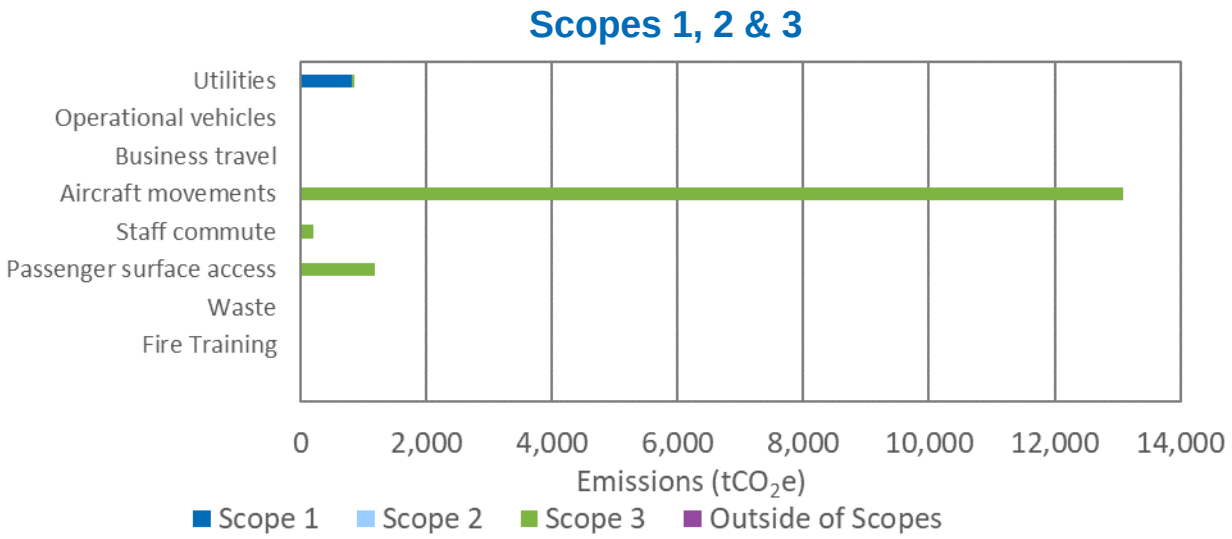
Carbon Emissions by Source and Activity - 1

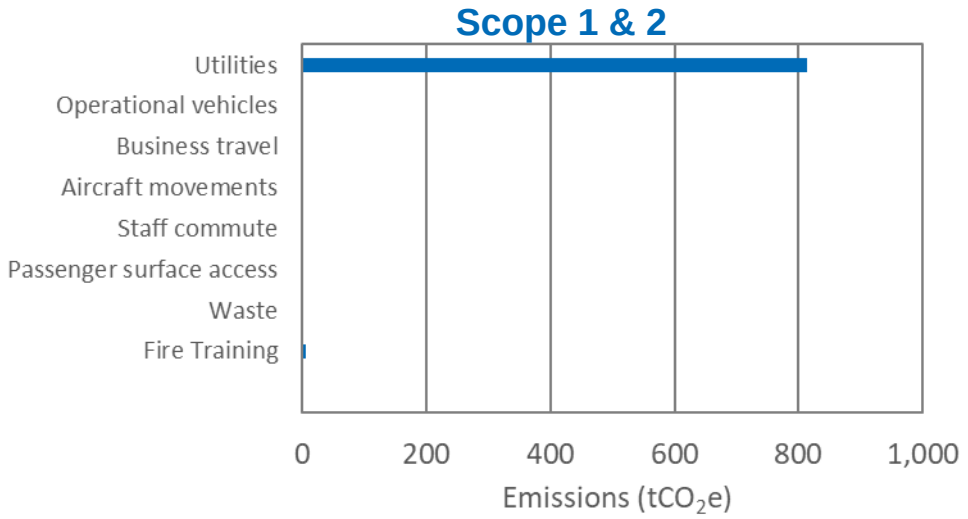
Sumburgh Airport's emissions can be broken down by activity as seen in the table below.

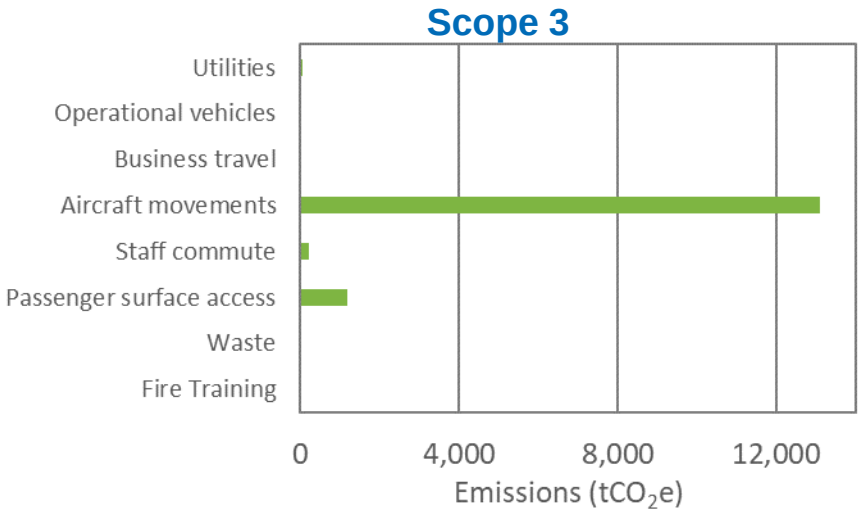
- Unless specified otherwise, emissions are reported under a Market Based methodology
- Utilities includes electricity consumption (Scope 2) as well as heating fuels, refrigerant usage (Scope 1) and de0icer usage (Scope 3)
- The HIAL group provided a supplier statement that determines all electricity is supplied from renewable sources. This results in Scope 2 emissions of 0tCO_2e under a Market Based reporting methodology

Source	Scope 1 (tCO_2e)	Scope 2 (tCO_2e)	Scope 3 (tCO_2e)	Outside of Scopes (tCO_2e)	Total Emissions (tCO_2e)	Percentage of total emissions
Aviation fuel	0	0	13,085.6	0	13,085.6	85.4%
Business Travel	0	0	16.2	0	16.2	0.1%
Staff commute	0	0	204.9	0	204.9	1.3%
Passenger surface access	0	0	1,170.0	0	1,170.0	7.6%
Electricity	0	0	29.1	0	29.1	0.2%
Gas Oil	720.4	0	0	0	720.4	4.7%
Water	0	0	5.3	0	5.3	0.0%
Waste	0	0	1.1	0	1.1	0.0%
De0icer	93.1	0	1.0	0	94.1	0.6%
Fire Training	5.0	0	0	0	5.0	0.0%
Total	**819**	**0**	**14,513**	**0**	**15,332**	**100%**

Carbon Emissions by Source and Activity - 2





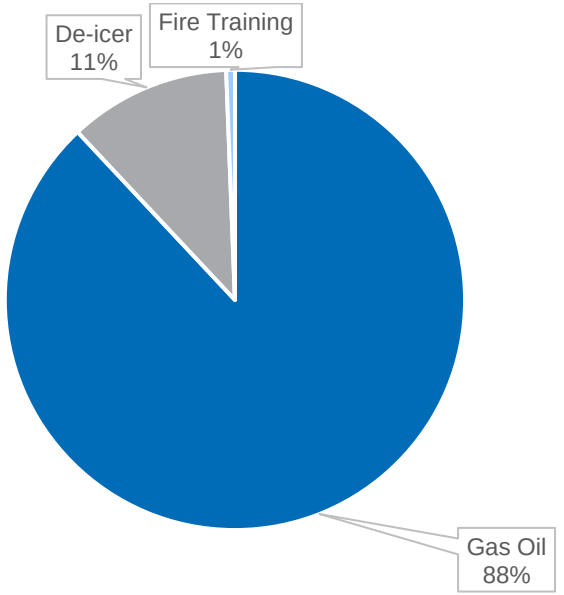


Scope 1 Emissions Sources

Scope 1 = 819 tCO_2e (5.3% of Total)

Scope 1 emissions are under the direct control of the airport, such as: Heating fuels for combustion, refrigerant gas use, and wood for fire training.

Sumburgh airport's Scope 1 emissions are predominantly derived from gas oil used in both generators and ground support equipment, de-icer, and fuels used in fire training.



Scope 2: Location and Market Based Emissions

Scope 2 = 0 tCO_2e (0.0% of Total)

Scope 2 emissions relate to the electricity consumption at the airport. These can be calculated as:

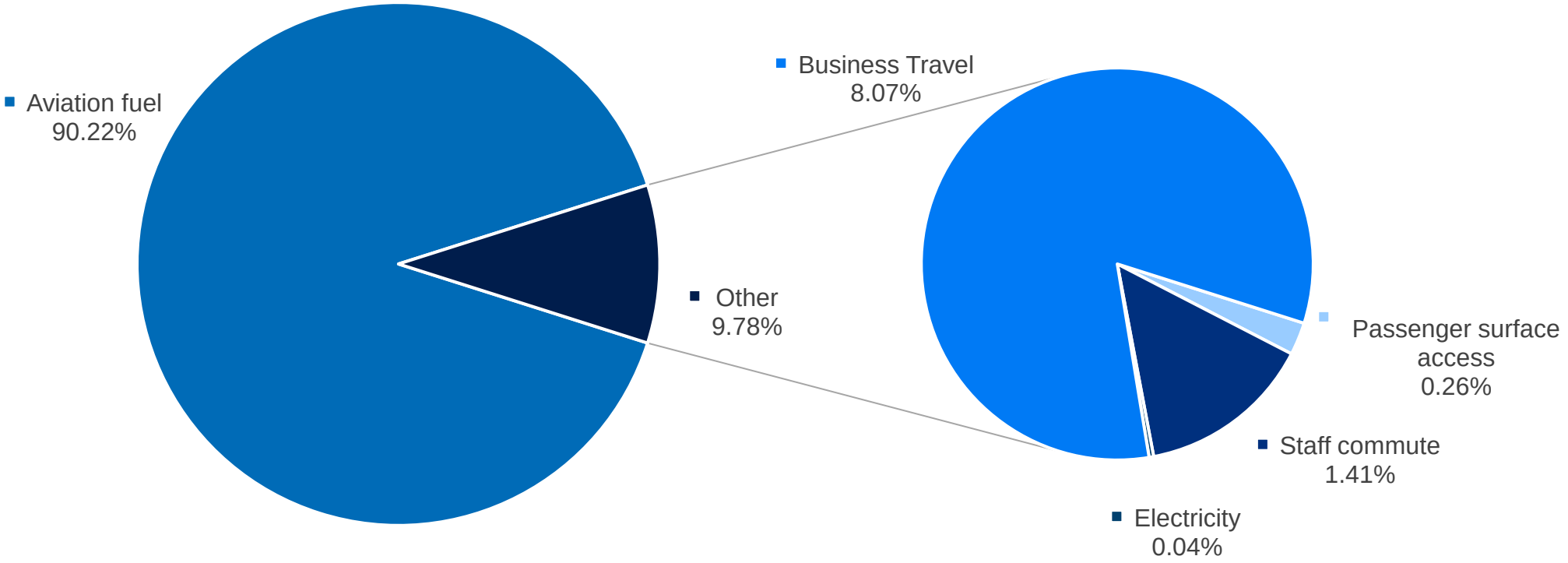
- Location-based method; this reflects the average emissions intensity of macro-scale (regional/national) electricity grids where energy consumption occurs. Companies reporting using this method should use the regional/National Grid average emission factor. In the UK, this would be sourced from the Defra/DECC 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 EU 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 energy that is greener than the National Grid average emissions factor. The advantage of procuring energy that is higher in renewable energy sources than that of the National Grid average emissions factor is outlined in the table below.

	Location-based (tCO_2e)	Market-based (tCO_2e)
Airport Electricity Emissions (Scope 2)	329	0

- Here, market-based emissions are less than location based. This is because the airport purchased electricity under a green 100% renewable electricity tariff. A supplier statement provided for the year April 2019 – March 2020 states that all electricity purchased is from renewable sources and is supplied by REGO's.

Scope 3 Emissions Sources

Scope 3 = 25,562.4 tCO_2e (97.8%% of Total)



*Petrol and diesel used in ground support equipment, waste, and water are not shown in the above figure because they contribute to <0.05% of Scope 3 emissions

**Electricity emissions above are from transmission and distribution only under market based reporting

The table below shows a full breakdown of all emissions sources at Sumburgh airport.

Source	Scope 1 (tCO_2e)	Scope 2 (tCO_2e)	Scope 3 (tCO_2e)	Outside of Scopes (tCO_2e)	Total Emissions (tCO_2e)	Percentage of total emissions
Aviation fuel	**0**	**0**	**13,085.6**	**0**	**13,085.6**	85.4%
Business Travel	**0**	**0**	**16.2**	**0**	**16.2**	0.1%
Staff commute	**0**	**0**	**204.9**	**0**	**204.9**	1.3%
Passenger surface access	**0**	**0**	**1,167.0**	**0**	**1,170.0**	7.6%
Diesel	**0**	**0**	**0**	**0**	**0**	0%
Electricity	**0**	**0**	**29.1**	**0**	**29.1**	0.2%
Gas Oil	**720.4**	**0**	**0**	**0**	**720.4**	4.7%
Fuel Oil	**0**	**0**	**0**	**0**	**0**	0%
Kerosene	**0**	**0**	**0**	**0**	**0**	0%
Natural gas	**0**	**0**	**0**	**0**	**0**	0%
LPG	**0**	**0**	**0**	**0**	**0**	0%
Petrol	**0**	**0**	**0**	**0**	**0**	0%
Refrigerant Gases	**0**	**0**	**0**	**0**	**0**	0%
Water	**0**	**0**	**5.3**	**0**	**5.3**	0.0%
Waste	**0**	**0**	**1.1**	**0**	**1.1**	0.0%
De-icer	**93.1**	**0**	**1.0**	**0**	**94.1**	0.6%
Fire Training	**5.0**	**0**	**0**	**0**	**5.0**	0.0%
Total	**819**	**0**	**14,513**	**15,332**	**100%**	**100%**

Annual Emissions Trends

In 2021,the following sources experienced the largest absolute decrease in emissions from 2020, largely due to impacts associated with the COVID pandemic:

- Aviation fuel emissions decreased by 41% due to reduced air traffic movements and fuel consumption
- Passenger surface access emissions decreased by 49%
- Staff commute emissions decreased by 80%

The following sources experienced an increase in emissions from 2020:

- Gas oil emissions increased by 34% due to increased consumption in generators and ground support equipment
- De-icer emissions by over 100% increased due to increased airport consumption of undiluted glycol.

Recommendations for improving your GHG footprint

Recommendation	Benefit
Develop infographic of carbon emissions	Infographics can be used to increase staff awareness of HIAL's carbon footprint and drive internal engagement, or be used to demonstrate to the public the good work being carried out to address the airport's carbon emissions.
Improve data collection processes & accuracy	Devise a uniform data collection process for all airports to accurately track and monitor emissions sources (e.g. fire training fuel use).
Implement a data collection process for fuels used onsite by third parties	Devise a uniform data collection process for all third parties operating on site to accurately track and monitor emissions sources.
Provide evidence that does not require assumptions	Evidence such as employee commuting surveys that have gaps e.g. have not been populated with responses, should be addressed through data cleaning exercises. For example, surveys could notify the respondent when they have not answered a question correctly. This will result in a more robust data collection process that doesn't require assumptions to be made.
Capture data on passenger surface access	Consider conducting a survey for passenger surface access. At present, emission estimates are based on assumptions.
Collect data for aircraft engine testing	At present, no information on engine testing is recorded. Ideally, the provided data should include: Engine type, engine UID number, number of engines tested, time at low thrust, time at high thrust.

Recommendations for improving your GHG footprint

Recommendation	Benefit
Provide an auditable trail for consumption figures	At present, some data on consumption of fuels has been provided through email correspondences e.g. fire training, ground support equipment/GSE. To improve the data accuracy and improve the audit trail, this should be provided through invoices, supplier statements, etc. instead.
Provide distance and/or fuel data for business travel rather than just financial costs	At present, cost data is the source of most data provided for business travel which is converted to distance travelled using several assumptions. To improve on emissions calculation accuracy the following data should include: Mode of transport, distance travelled, travel provider, class travelled (flights/trains only).

Other Environmental Initiatives to be Considered

- Engage third parties and on-site tenants to explore further carbon management opportunities and improve benefits of carbon management measures across the airport site
- Investigate the reduction in operational carbon on local air quality
- Change airside vehicles to electric vehicles in order to optimise use of lower carbon fuels
- Incorporate green procurement policies in all aspects of airport purchasing policy
- Incentivise alternative/sustainable aviation fuel use by aircraft
- Water management and water treatment
- Resource efficiency for food waste and recycling services
- Site development considerations to reduce environmental impacts

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Appendix – Outside of Scope Emissions

As per UK Government GHG Conversion Factors for Company Reporting guidance, Outside of Scope factors should be used to account for the direct carbon dioxide (CO_2) 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_2 during the growth phase as the amount of CO_2 released through combustion). As a result, full reporting of any fuel from a biogenic source should have the 'outside of scope' CO_2 value documented to ensure complete accounting for the emissions created.

2021 = **0 tCO_2e**

Methodology

The following sections provide a summary of the methodology adopted by Ricardo Energy & Environment to calculate the 2021 carbon footprint for HIAL Airports.

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 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. 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 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. Airports 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 are defined as those arising as an indirect consequence of the use of goods or services provided by the company. Airports do have some influence over Scope 3 emissions but the activities are not under its control. Sources included by Airports 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 (including production of the virgin materials), water (supply and treatment) and airport business travel.

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_2) 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_2 during the growth phase as the amount of CO_2 released through combustion). As a result, full reporting of any fuel from a biogenic source have included the 'outside of scope' CO_2 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 have uncertainty have arisen.

Business Travel

Accounts data was provided for business travel (Scope 1 & 3). Fuel volume information was provided for fuel used in some airport owned vehicles. Mileage claims for fuel used in personal vehicles on business travel were accounted for with HIAL's rate of 0.45p/mile. All other business travel data was provided in £ value and converted to distance travelled using the cost/km from Carbon Footprint and Project Register Tool (CFPRT) which can be found at https://sustainablescotlandnetwork.org/resources/carbon0footprint0and0project0register0tool . 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.

Passenger Surface Access

Since no survey for passengers of Sumburgh airport has been taken, emissions from passenger surface access have been estimated using a combination of assumptions. Geographical location and transport links were considered to generate assumptions on distance travelled and mode of transport. This was then scaled to the number of passengers at Sumburgh airport for the 2019/20 financial year.

Staff Commute

For staff commute, a 2021 survey was completed by the airport. The response rate was 23%, and so final data was scaled up to the total 94 FTE. The survey respondents provided information on their modes of transport, distance travelled to work and number of days worked per week. Public statutory holiday was taken into consideration in the calculations.

Methodology

De-icer

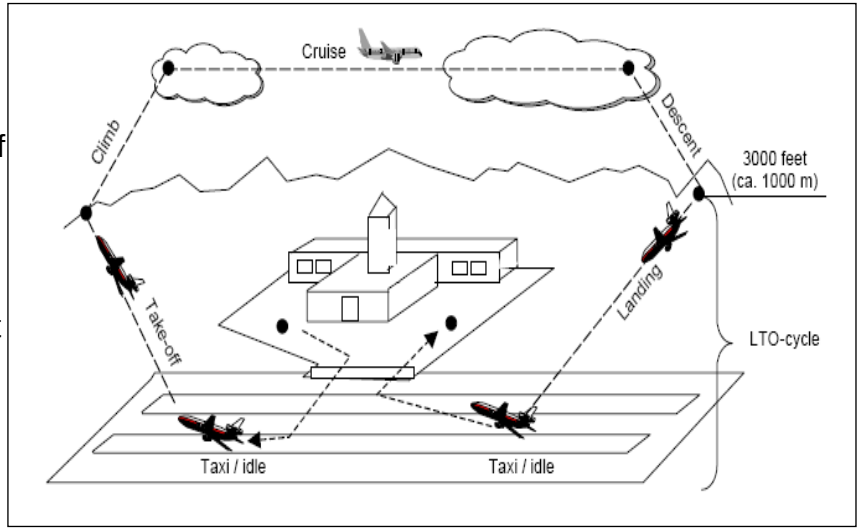
We have calculated de0icer emissions using the emissions factors provided in the latest version of the ACERT tool from the Airport Carbon Accreditation scheme. Where diluted glycol was used (e.g. 50:50 glycol to water), the dilution rate has been taken into account in calculations.

Aircraft Movements: Landing Take-off (LTO) cycle

Data provided by Sumburgh airport included the following information for each aircraft movement in 2020: Carrier, Aircraft registration, aircraft IATA code, aircraft ICAO code, Arriving/departing, and date of movement.

This data is used to identify the number and type of engines that each aircraft has, and the fuel burn per second at each stage of the landing take0off cycle (shown right) can be referenced from the latest version of the ICAO databank for jet engines, and the FOCA Aircraft Piston Engine database for propeller aircraft.

Emissions are calculated from the fuel consumption per LTO, using the BEIS emissions factor for aviation turbine fuel.



Methodology

Aircraft Movements: Climb, Cruise and Descent (CCD)

The ACA scheme outline three methodologies for the allocation of CCD emissions:

1. **Half way approach**: Where emissions from half of the distance of all flights going to/from the airports is allocated to the reporting airport.
2. **Departing only approach**: Emissions for the full flight distance for departing aircraft are allocated for the reporting airport.
3. **Fuel sales approach**: Emissions for all fuel sold at the airport is allocated to the reporting airport.

Of the three options above, it was decided to utilise the first approach as this is perceived to be the most neutral and comprehensive methodology.

Data provided by Sumburgh airport included the following information for each aircraft movement in 2021: Carrier, Aircraft registration, aircraft IATA code, aircraft ICAO code, engine type, Arriving/departing, destination/origin airport, and date of movement.

Flight distance was calculated with the great circle equation, utilising the origin and destination airport latitude and longitude. This flight distance was uplifted by 5.5% to reflect the fact that aircraft do not fly in a perfect straight line from one airport to another. This figure has come from studies carried out by Ricardo Energy and Environment for the UK Department for Transport, and is an update to the commonly used figure of 9%.

Fuel kg/km in-flight for each aircraft type is calculated using data from the EMEP0EEA Fuel Database.

Emissions are calculated from the fuel consumption per flight, using the BEIS emissions factor for aviation turbine fuel.

No non-carbon warming impacts have been taken into account as part of the CCD emissions.

Flights under the operator EasyJet were removed from the analysis under Market Based reporting due to the operator offsetting 100% of their CCD emissions as per ACA guidelines.

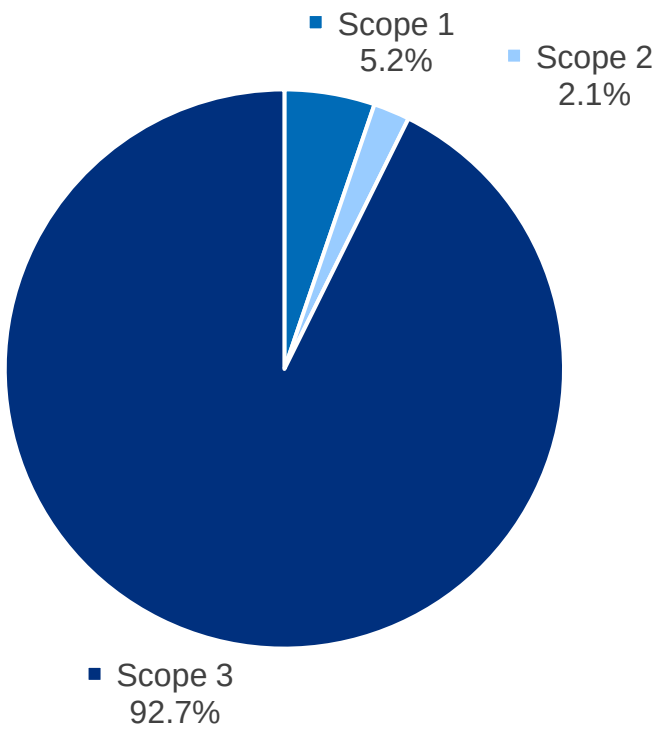
Location v Market Based

Market-based method: In 2020, the following breakdown was provided for the year-ending 31st March 2020 (Source of Electricity, Percentage):

- **Renewables - 100%**

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

Carbon Emissions by Scope (location based)



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Scope 1	819	5.2%
Scope 2	329	2.1%
Scope 3	14,522	92.7%
Outside of Scopes	0	0
Total	**15,670**	**100.0%**

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Emissions on0site, or an associated process, from the combustion of fossil fuels, e.g. natural gas, oil, LPG and company0owned vehicles.

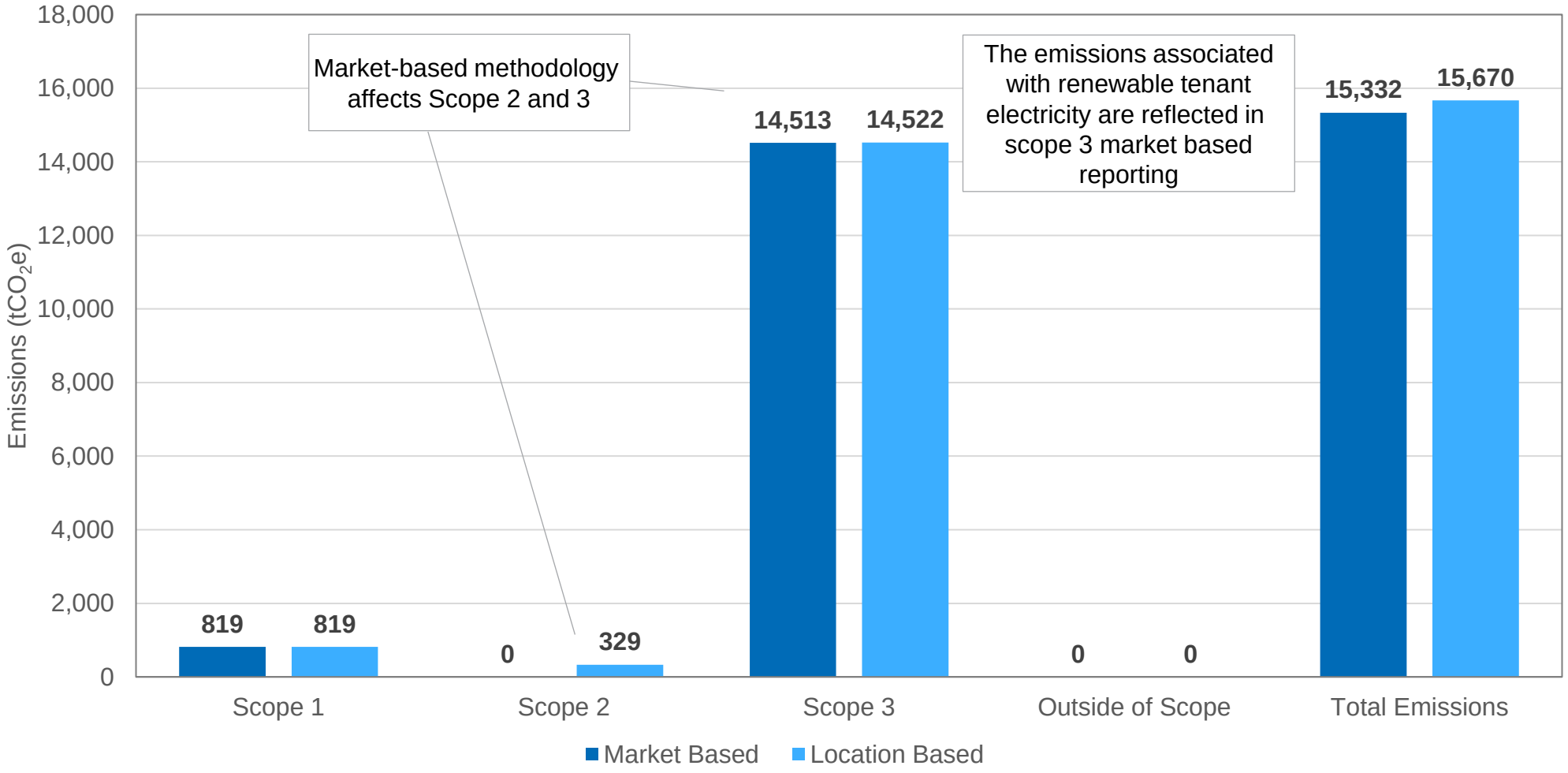
Scope 2:
Emissions associated with the use of electricity imported from the grid or from a third party supplier of energy in the form of heat or electricity.

Scope 3:
Emissions arising as a direct consequence of the use of goods or services provided by the company. For Sumburgh airport this would be the operation of the airport. Sources include aircraft movements, passenger and staff travel to the airport, airside activities, waste disposal, water and business travel.

Outside of scope emissions:
Outside of scope emissions account for the direct carbon dioxide (CO_2) 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’.

Location vs Market-Based Emissions: All Scopes

Emissions totals by scope calculated using either the location or market-based emissions factors.



Glossary

Term	Definition
ATM	Air traffic movements – an aircraft take0off 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 like0for0like 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 1000year 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).
Degree days	A unit used to determine the heating or cooling requirements of buildings, representing a fall or increase of one degree below a specified average outdoor temperature for one day.
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	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 that CO_2 is released through combustion).
PAX	Number of passengers.