



Ricardo
Energy & Environment

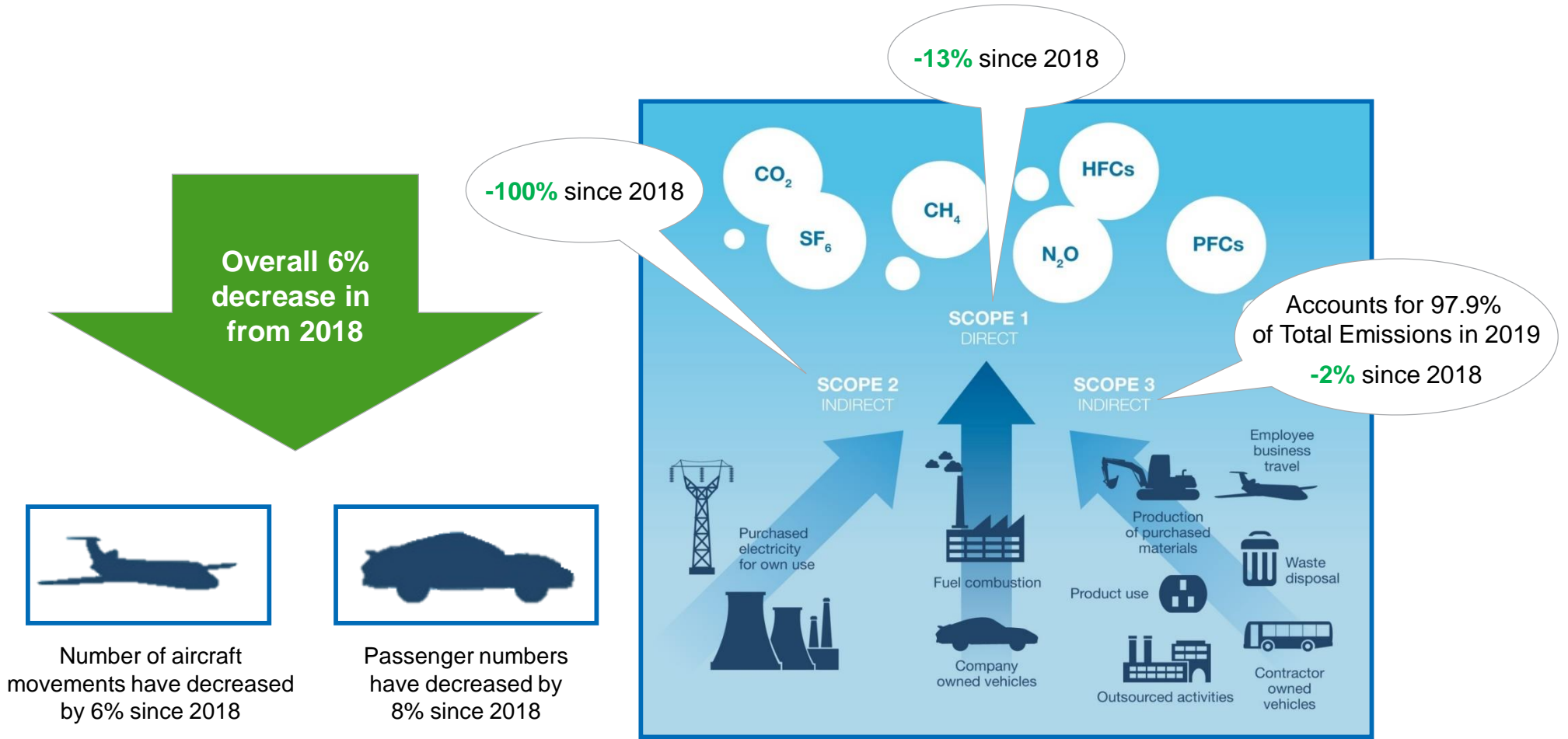
Glasgow Airport Carbon Footprint 2019

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

Report for Glasgow Airport Limited



All Scope emissions = 136,698 tCO₂e



Scope 1 and Scope 2 emissions have seen an overall decrease of **-57%** since 2018. This is largely due to changes in methodology and emission factor intensities.

Included Emissions Sources

The following emissions sources are included in the 2019 carbon footprint for Glasgow Airport:

Scope 1: Direct emissions:

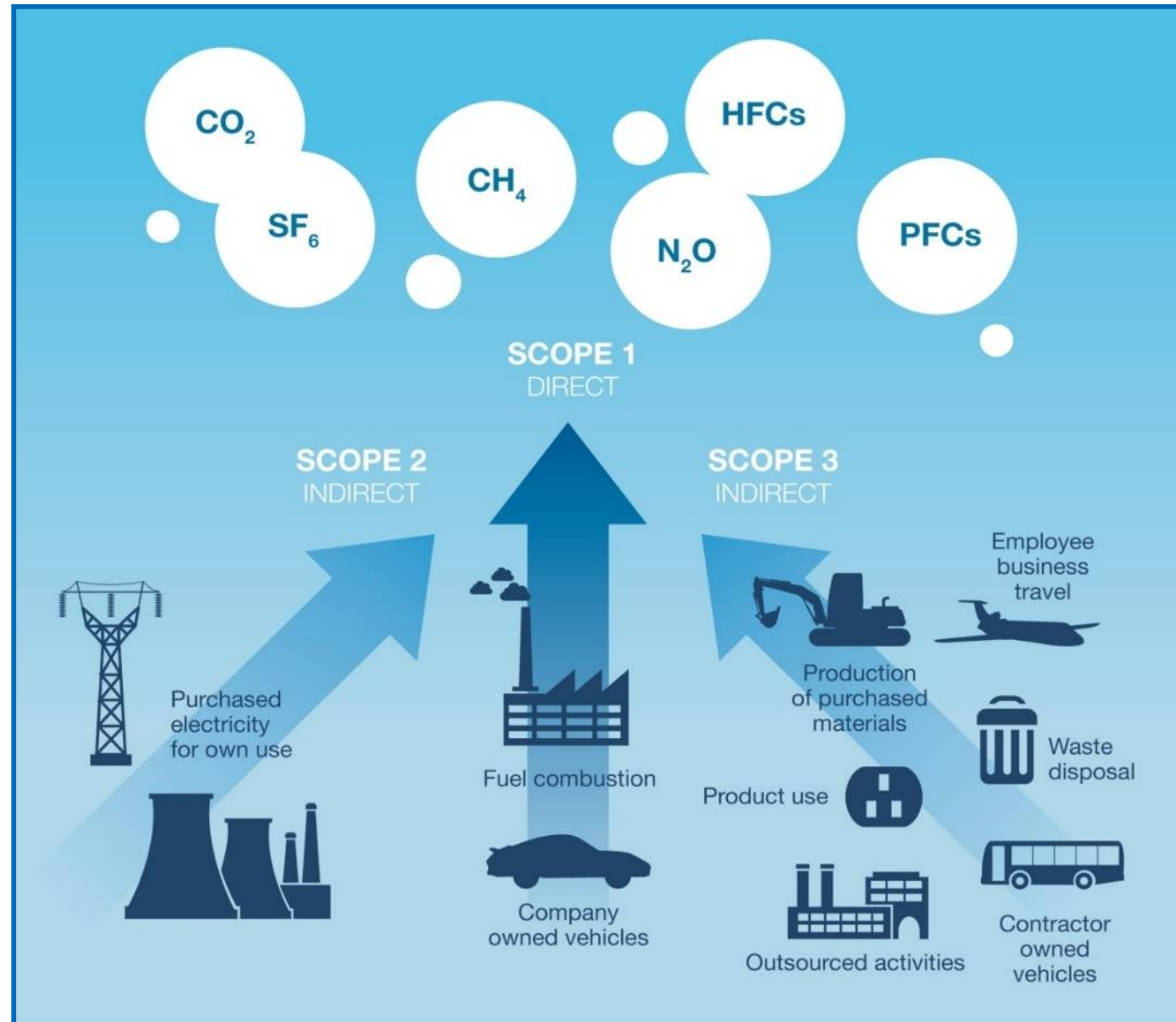
- Fuels burnt on site (boilers, generators, operational vehicles, fire training)
- Refrigerant gas losses

Scope 2: Indirect emissions:

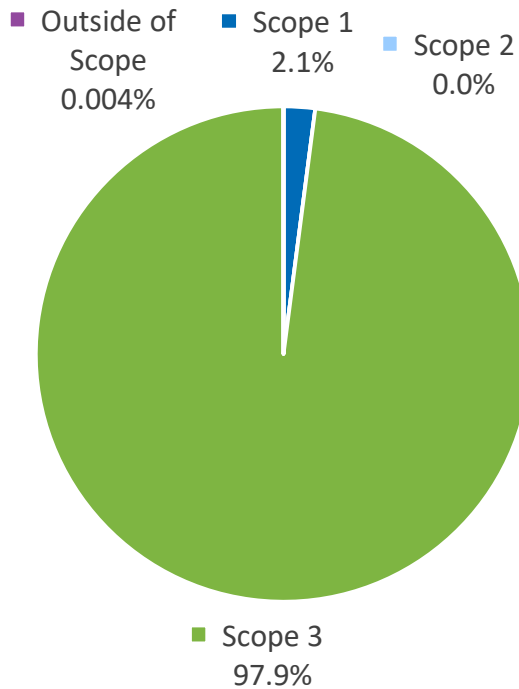
- Purchased electricity

Scope 3: Indirect emissions:

- 3rd party operational vehicle fuels
- Tenant energy
- Aircraft LTO cycle, APU usage and engine testing
- Business travel
- Water supply and wastewater treatment
- Staff commute
- Passenger surface access
- Waste (disposal and virgin material production)



Key Stats - Carbon Emissions by Scope 2019



	Total 2019 emissions (tCO ₂ e)	% of total emissions
Scope 1	2,806	2.1%
Scope 2	0	0.0%
Scope 3	133,887	97.9%
Outside of Scopes	5	0.0%
Total	136,698	100%

Scope 1:

Emissions on-site, or an associated process, from the combustion of fossil fuels, e.g. natural gas, oil, LPG and company-owned vehicles.

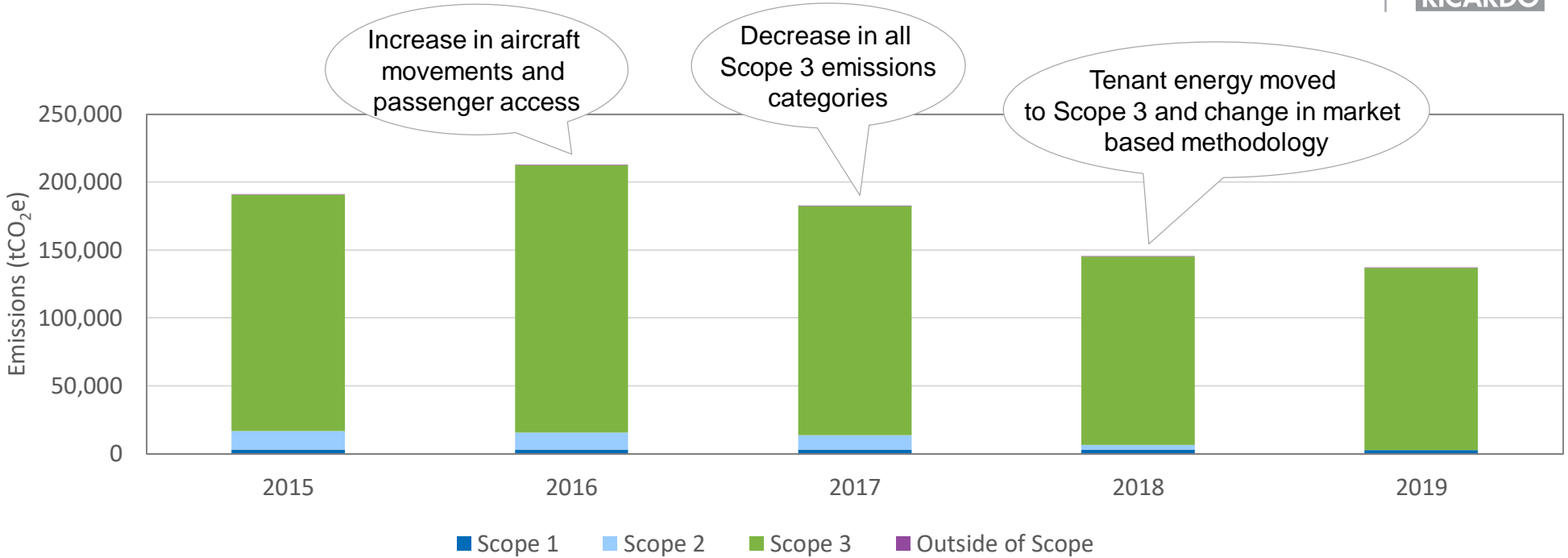
Scope 2:

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:

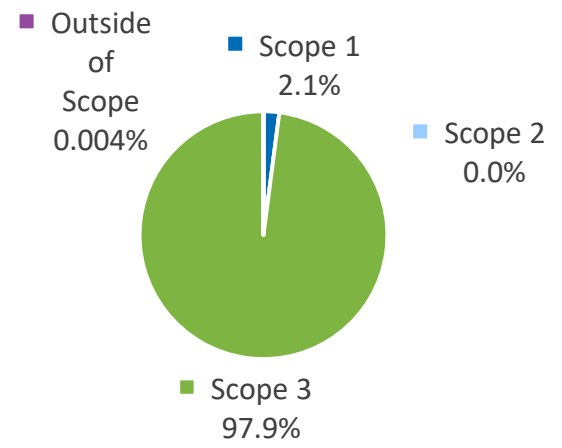
Emissions arising as a direct consequence of the use of goods or services provided by the company. For GLA this would be the operation of Glasgow Airport. Sources include aircraft movements, passenger and staff travel to the airport, airside activities, waste disposal, water and business travel.

Key Stats - All Scopes Summary



	Total 2019 emissions (tCO ₂ e)	% of total emissions
Scope 1	2,806	2.1%
Scope 2	0	0.0%
Scope 3	133,887	97.9%
Outside of Scopes	5	0.004%
Total	136,698	100%

Scope 3 emissions have always been the largest contributor to Glasgow Airport's carbon footprint. The majority of which are from aircraft activities and passenger access to the airport.



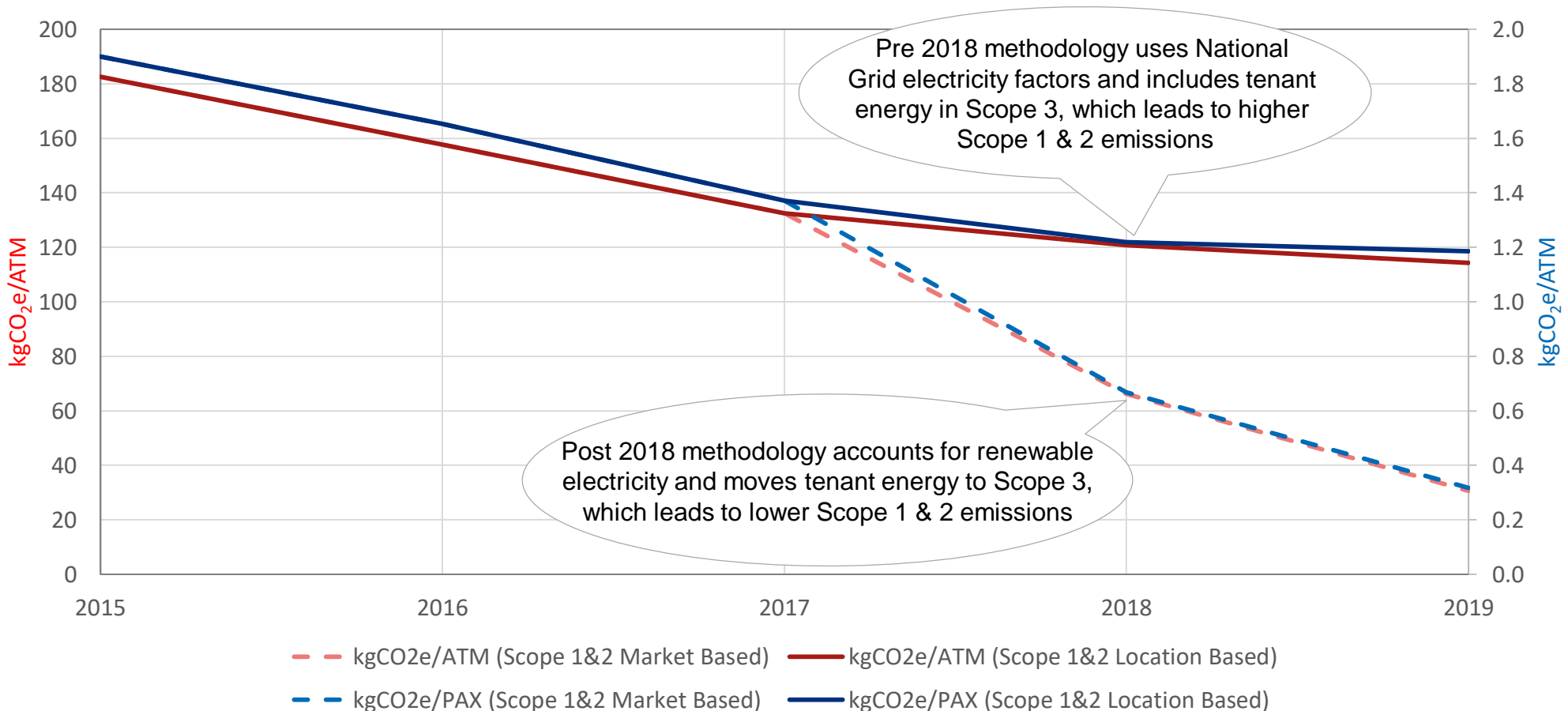
Key Stats - Intensity Metrics comparison over time - 1



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

This chart shows intensity metrics for:

- Location based Scope 2 and tenant energy included in Scopes 1 & 2
- Market based Scope 2 and tenant energy in Scope 3 (Reported since 2018)



Key Stats - Intensity Metrics comparison over time - 2



The table below shows the figures from the chart on the previous slide for:

- Location based Scope 2 and tenant energy included in Scopes 1 & 2
- Market based Scope 2 and tenant energy in Scope 3 (Reported since 2018)

	2015	2016	2017	2018	2019
ATM	90,782	98,264	102,490	97,415	91,848
PAX	8,718,269	9,370,402	9,902,239	9,659,818	8,850,565
% Change in ATM (year-on-year)	N/A	+8.2%	+4.3%	-5.0%	-5.7%
% Change in PAX (year-on-year)	N/A	+7.5%	+5.7%	-2.4%	-8.4%

Scope 1 & 2 (tCO₂e) Location Based Scope 2 Tenant energy in Scopes 1 & 2	16,571	15,500	13,584	11,774	10,492
kgCO₂e/ATM	182.5	157.7	132.5	120.9	114.2
kgCO₂e/PAX	1.9	1.7	1.4	1.2	1.2

Scope 1 & 2 (tCO₂e) Market Based Scope 2 Tenant energy in Scope 3	N/A*	N/A*	N/A*	6,461	2,806
kgCO₂e/ATM	N/A*	N/A*	N/A*	66.3	30.6
kgCO₂e/PAX	N/A*	N/A*	N/A*	0.7	0.3

* Note that for 2015-2017 no figures for this methodology are available

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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 9 million passengers and handling around 92,000 aircraft movements. AGS Airports employ 773 full time employees (FTE), of which 162 are based in Glasgow Airport after their recent outsourcing. 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.

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.



Carbon Emissions by Source and Activity 2019 - 1



Glasgow Airport's emissions can be broken down by activity as seen in this table.

The main activities that contribute to the footprint are aircraft movements and passenger surface access

Staff commute emissions have risen by 942% in 2019 as 3rd party staff are now included

Utilities include natural gas and refrigerant usage in the terminal as well as electricity consumption

Daily operation and staff activities at the airport contribute a small overall percentage of the carbon footprint

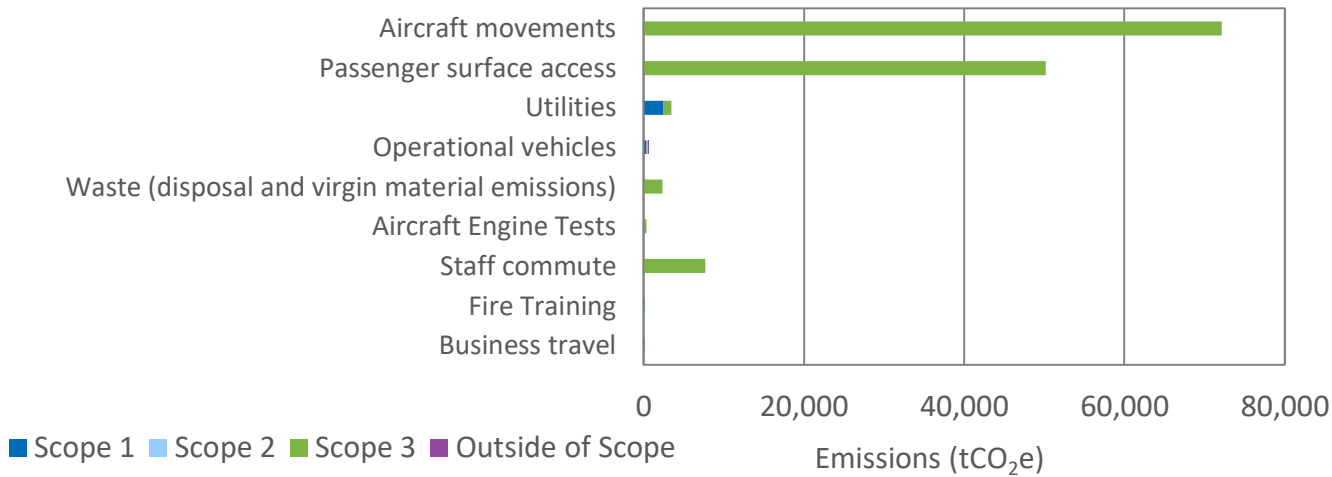
Emissions Source	Scope 1 (tCO ₂ e)	Scope 2 (tCO ₂ e)	Scope 3 (tCO ₂ e)	Outside of Scope (tCO ₂ e)	Total (tCO ₂ e)	% of Total Emissions
Aircraft movements	0	0	72,134	0	72,134	52.8%
Passenger surface access	0	0	50,161	0	50,161	36.7%
Staff commute	0	0	7,669	0	7,669	5.6%
Utilities	2,447	0	1,045	0	3,492	2.6%
Waste (disposal and virgin material emissions)	0	0	2,343	0	2,343	1.7%
Operational vehicles	321	0	200	5	526	0.4%
Aircraft Engine Tests	0	0	312	0	312	0.2%
Fire Training	38	0	0	0	38	0.03%
Business travel	0	0	23	0	24	0.02%
Total	2,806	0	133,887	5	136,698	100.0%

Accounts for the direct carbon dioxide (CO₂) impact of using biofuels in airport vehicles

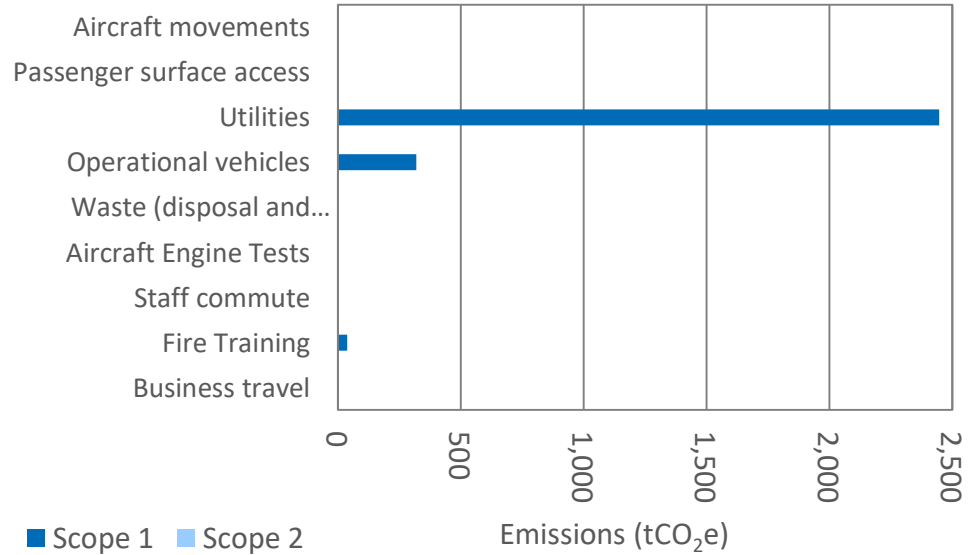
Carbon Emissions by Source and Activity 2019 - 2



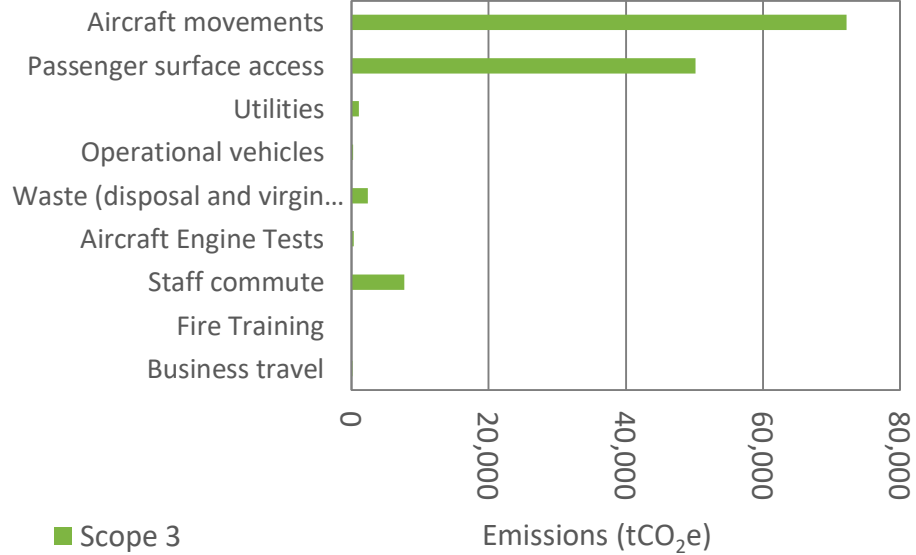
All Scopes carbon emissions split by source/activity



Scopes 1 and 2 carbon emissions split by source/activity



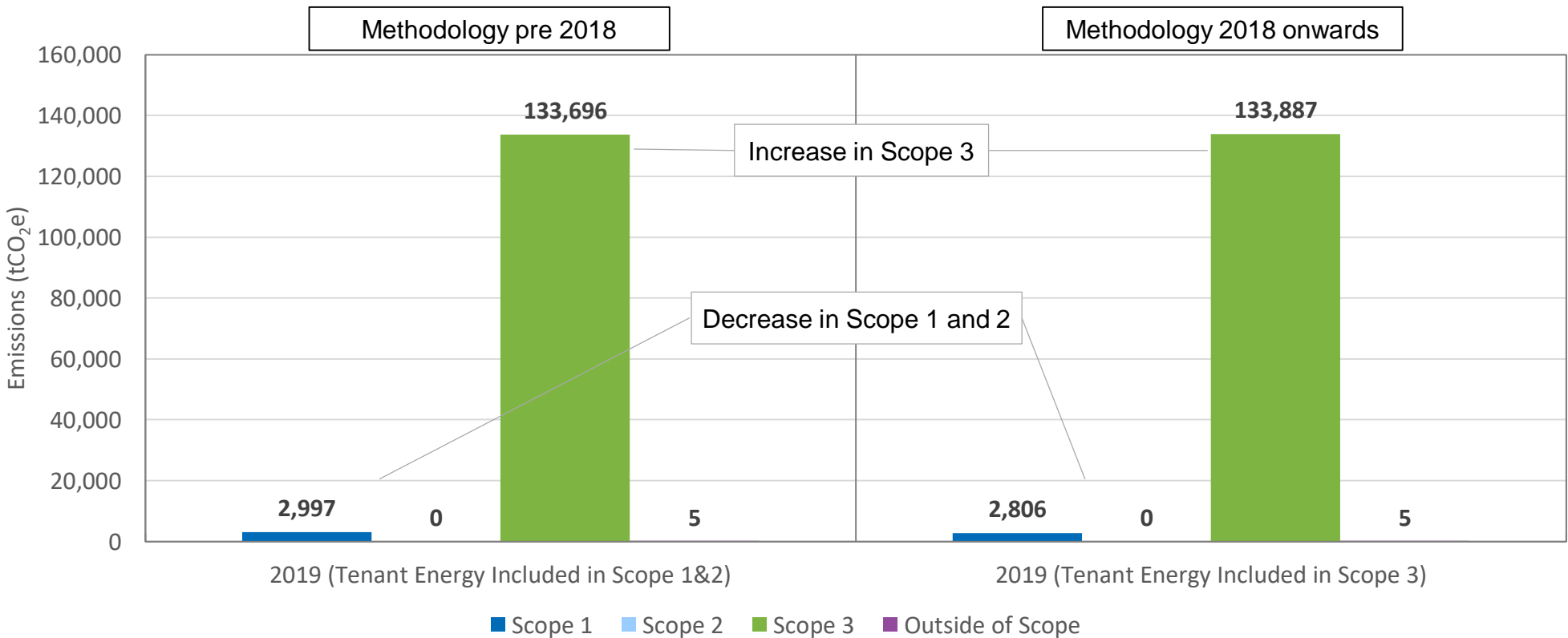
Scope 3 carbon emissions split by source/activity



Tenant Energy



- As tenant energy is out with the control of the airport, this has now been moved to Scope 3 emissions in order to more clearly identify the airports controllable emissions.
 - This has decreased the airports Scope 2 emissions but the Total Emissions figure accounts for both airport consumption and tenant consumption.
- All tenant energy that is contained in Scope 3 is metered data.
- Comparison of carbon emissions split by scope when tenant energy remains in Scopes 1 and 2 (old methodology, left), and separated out into Scope 3 (new methodology, right).

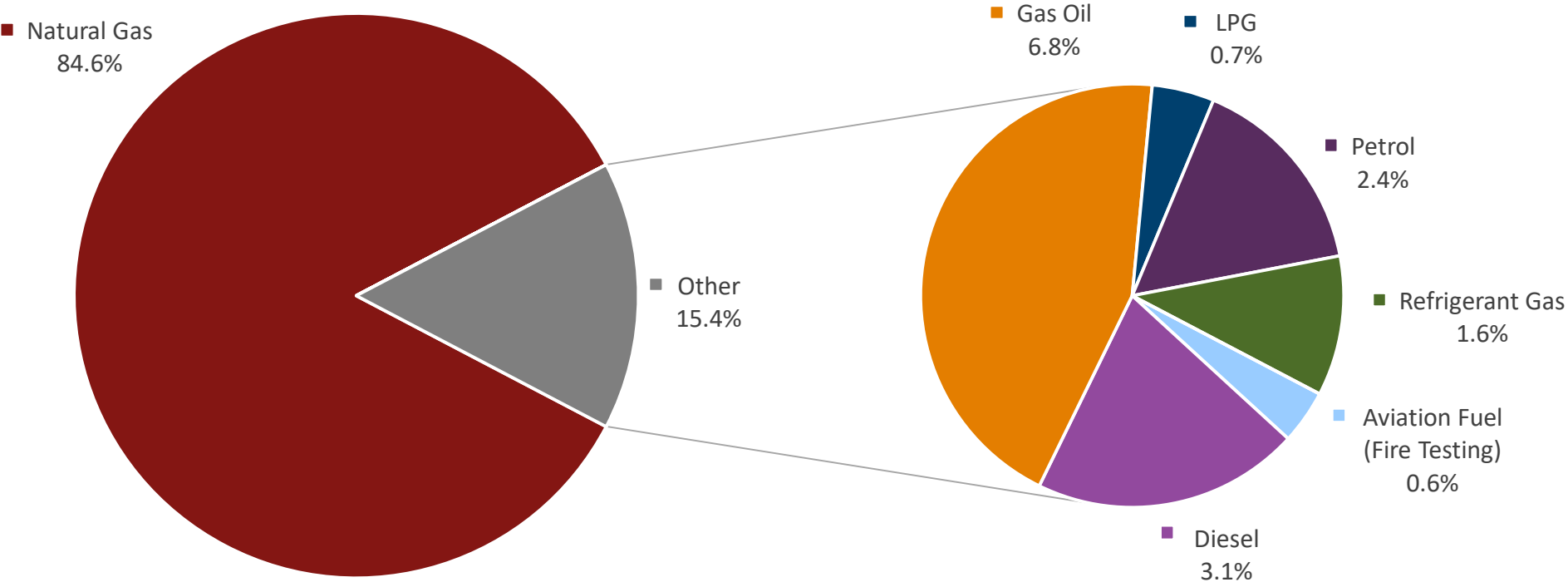


Scope 1 Emissions Sources



Scope 1 = 2,806 tCO₂e (2.1% of Total)

Scope 1 emissions are under the direct control of the airport.



Scope 2: Location and Market Based Emissions



Scope 2 = 0 tCO₂e (0% of Total)

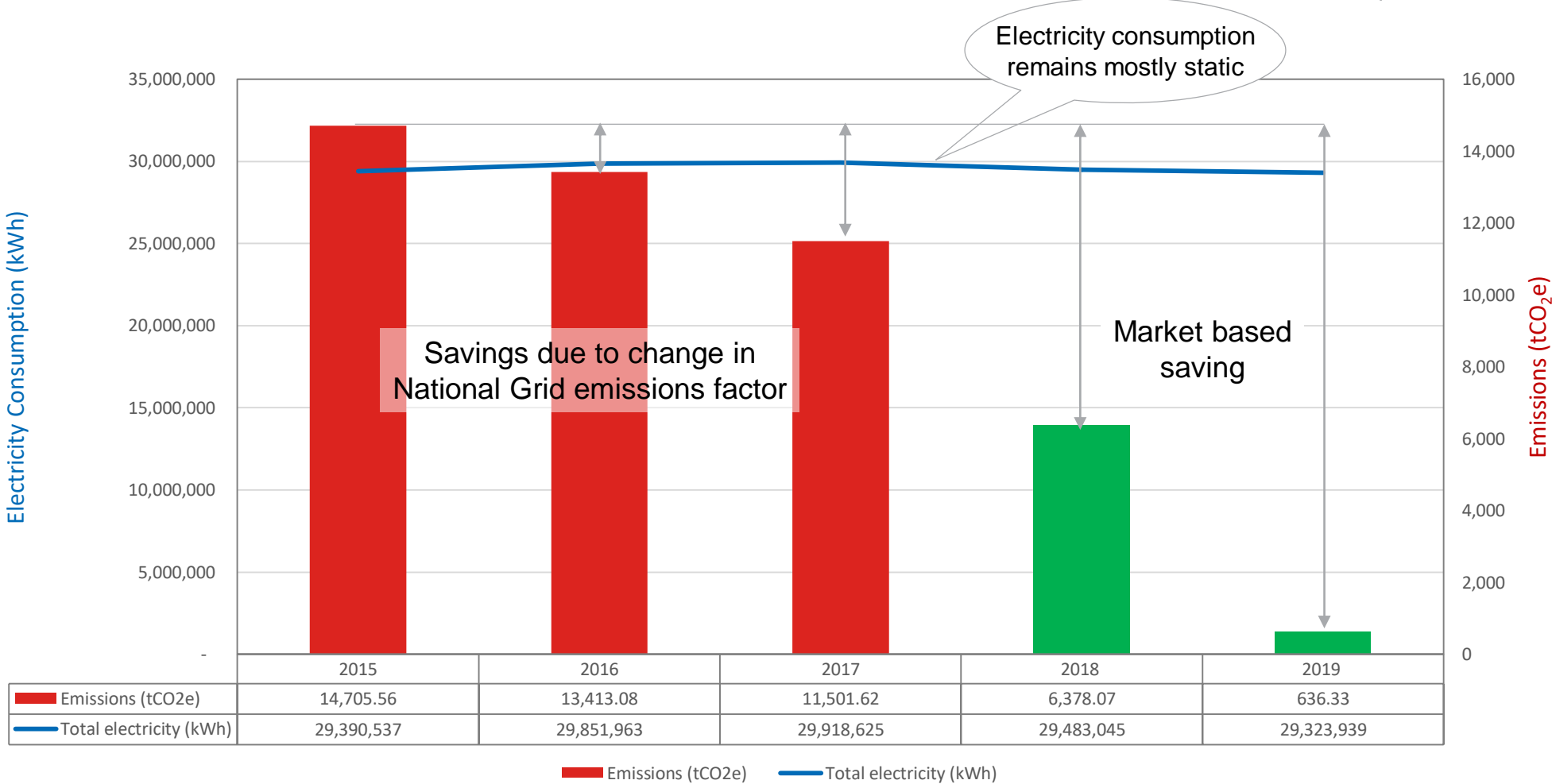
Scope 2 emissions relate to the electricity consumption at the airport. These can be calculated as:

- 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 ₂ e)	Market-based (tCO ₂ e)
Airport Electricity Emissions (Scope 2)	4,303	0

- Here, market-based emissions are zero because the airport purchased 100% green electricity from its energy suppliers. REGO certificates have been provided for electricity consumed between Jan-Mar 2019, and a supplier statement provided for the remainder of 2019 that indicates that the supply is 100% renewable and REGOs will be available in mid-2020.
- The following slide provides an annual comparison of the electricity consumption and relevant emissions at Glasgow Airport.

Comparison of Electricity Consumption and Carbon Emissions



There has been a small deviation in total electrical consumption since 2015. The majority of savings in emissions is due to the increase of renewables on the national electrical grid or purchasing electricity that is high in renewable energy (market based savings).

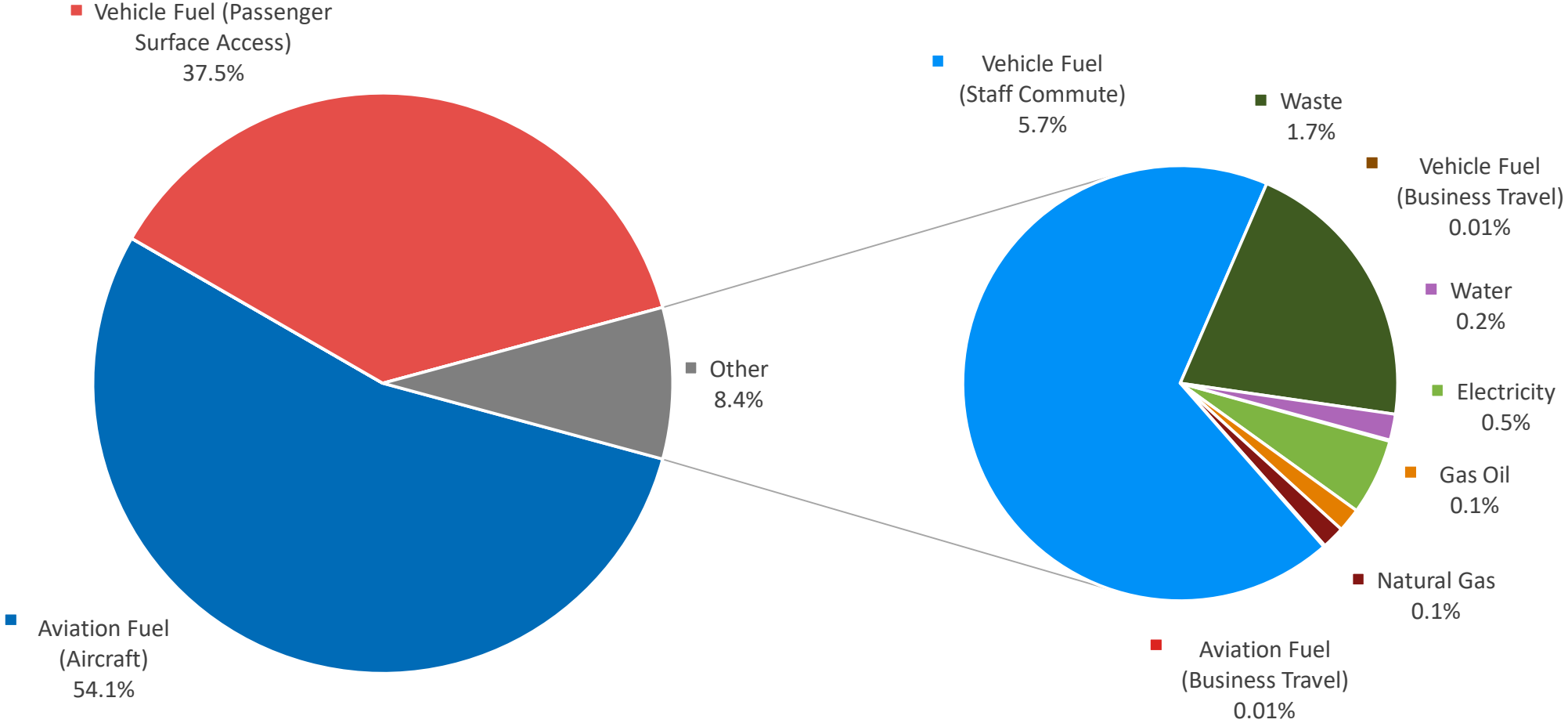
Note: to allow for better comparison to previous years, the figures for electricity emissions above include tenant electricity use, as well at Transmission and Distribution emissions.

Scope 3 Emissions Sources

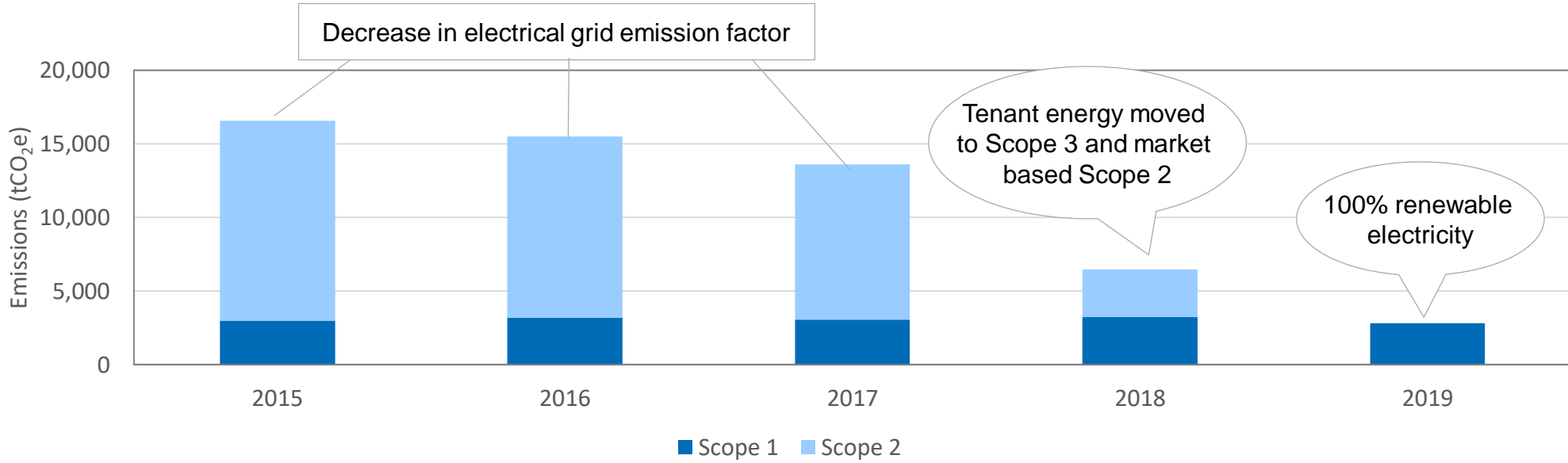
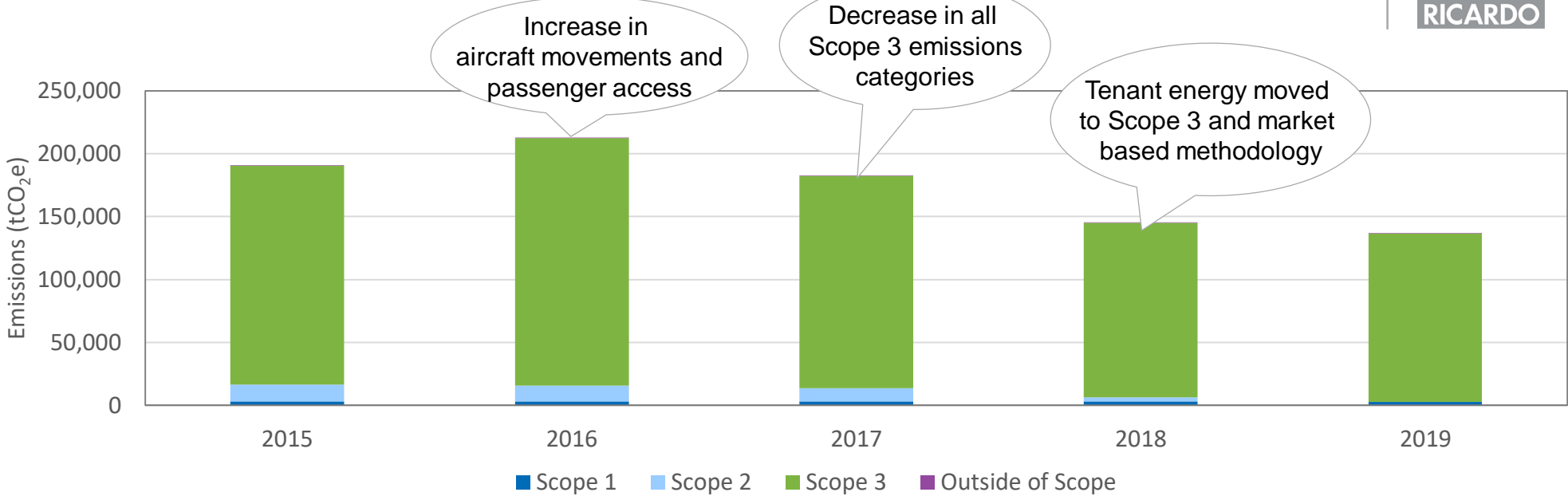


Scope 3 = 133,887 tCO₂e (97.9% of Total)

Unlike Scope 1 and Scope 2 emissions, emissions categorised as Scope 3 are not generally under the direct control of the airport.



Annual Emissions Trends - 1



Annual Emissions Trends - 2



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	2015 emissions (tCO ₂ e)	2016 emissions (tCO ₂ e)	2017 emissions (tCO ₂ e)	2018 emissions (tCO ₂ e)*	2019 emissions (tCO ₂ e)*
Scope 1	2,987	3,199	3,066	3,429	2,997
Scope 2	13,584	12,301	10,518	3,228	0
Scopes 1 and 2	16,571	15,500	13,584	6,461	2,806
Scope 3	174,051	196,956	168,739	138,588	133,887
Outside of Scopes	6	5	5	4	5
Total emissions	190,627	212,461	182,328	145,054	136,698
Scope 1 % y-o-y change	N/A	7%	-4%	5%	-13%
Scope 2 % y-o-y change	N/A	-9%	-14%	-69%	-100%
Scope 1 & 2 % y-o-y change	N/A	-6%	-12%	-52%	-57%
Scope 3 % y-o-y change	N/A	13%	-14%	-18%	-3%
Outside of Scopes % y-o-y change	N/A	-11%	5%	-19%	23%
Total % y-o-y change	N/A	11%	-14%	-20%	-6%

* Note that for 2018 and 2019 Scope 2 emissions are reported using the market based methodology and tenant energy is moved to Scope 3.

Annual Emissions Trends - 3

Changes to footprint methodology in 2019:

- 3rd party staff commute included in Scope 3 emissions

Emissions sources with largest changes from 2018:

- Electricity emissions (Scope 2) **reduced** by 100% due to renewable energy supply
- Operational vehicle fuel emissions (Scopes 1 & 3) **reduced** by 18% (both airport and 3rd party)
- Waste emissions (Scope 3) **reduced** by 9%
- Natural gas emissions (Scope 1) **decreased** by 9%
- Employee commute emissions (Scope 3) **increased** by 942% as 3rd party staff are now included
- Fire training emissions (Scope 1) **increased** by 46%
- Business travel emissions (Scopes 1 & 3) **increased** by 14%



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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 (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 should have the 'outside of scope' CO₂ value documented to ensure complete accounting for the emissions created.

2019 = **5 tCO₂e** (0.004% of total emissions)

The following sections provide a summary of the methodology adopted by Ricardo Energy & Environment to calculate the 2019 carbon footprint for the 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.

Market Based Methodology

Market-based method: As all of the 29,323,939 kWh of electricity consumption was supplied to Glasgow Airport by a single supplier. Glasgow Airport contacted the supplier and asked for the details of the fuel mix. The following breakdown was provided for the year-ending 31st March 2019 (Source of Electricity, Percentage):

- Renewables: **100%**

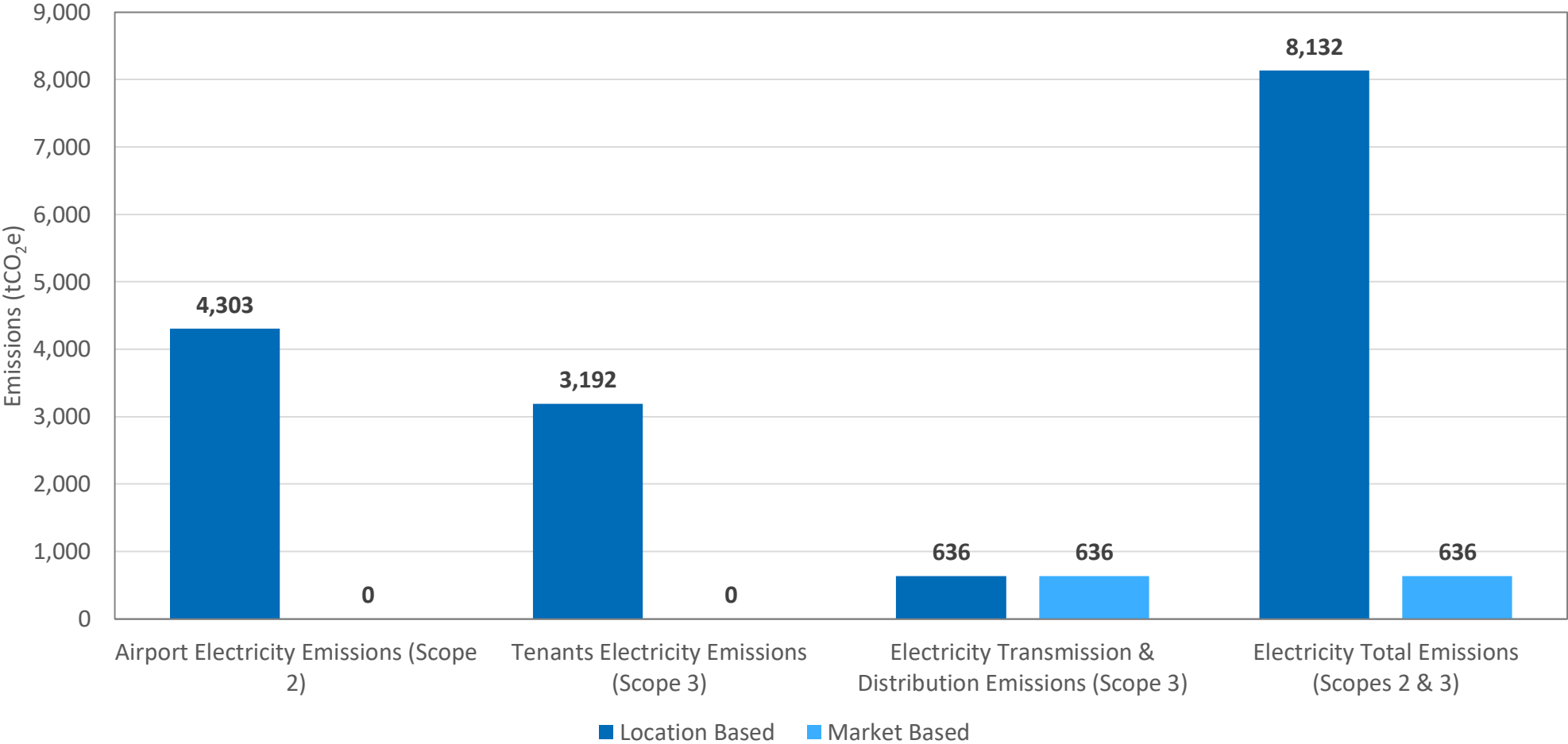
REGO certificates have been provided for electricity consumed between Jan-Mar 2019, and a supplier statement provided for the remainder of 2019 that indicates that the supply is 100% renewable and REGOs will be available in mid-2020.

The weighted emission factor was provided as 0 gCO₂/kWh (or 0 kgCO₂/kWh). Multiplying the electricity consumption of 29,323,939 kWh by the emission factor of 0 kgCO₂/kWh calculates the emissions as 0 tCO₂e.

Location vs Market Based Emissions 2019



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



Location Based Electricity Emissions Historical Comparison



To allow for a fair comparison to previous years, the figures for electricity emissions below include tenant electricity use (classified as Scope 3 in 2019 methodology).

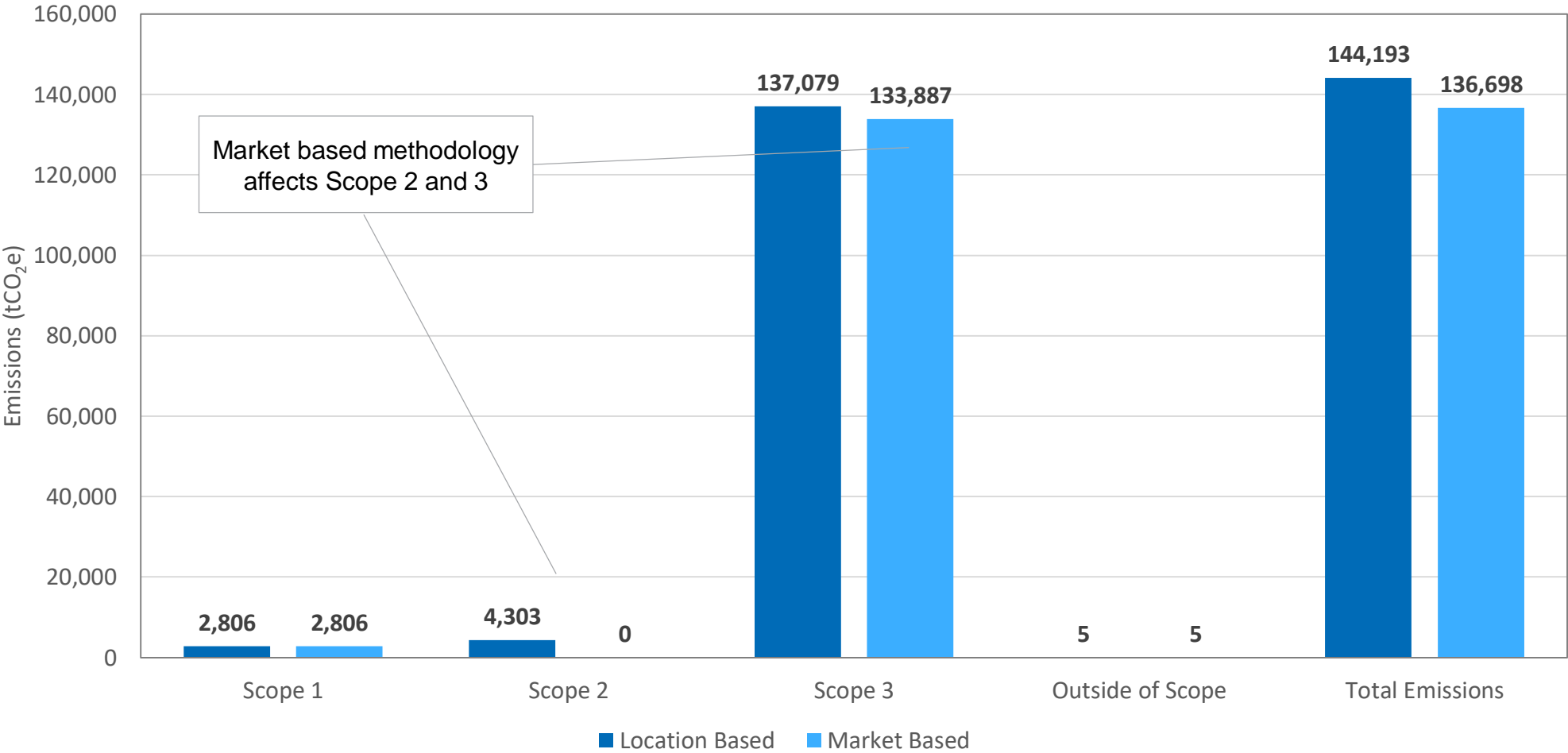
	2017 (Location Based)	2018 (Location Based)	2018 (Market Based)	2019 (Location Based)	2019 (Market Based)
Electricity (Scope 2 and 3) kgCO ₂ e/kWh <u>Airport (Scope 2) + Tenants (Scope 3)</u>	0.35156	0.28307	0.19220	0.25560	0
Electricity T&D* losses (Scope 3) kgCO ₂ e/kWh	0.03287	0.02413	0.02413	0.02170	0.02170
Electricity usage (kWh) total <u>Airport + Tenants</u>	29,918,625	29,483,045	29,483,045	29,323,939	29,323,939
Electricity (Scope 2 and 3) emissions tCO ₂ e <u>Airport + Tenants</u>	10,518	8,346	5,667	7,495	0
Electricity T&D* losses (Scope 3) emissions tCO ₂ e	983	711	711	636	636
Total electricity (Scope 2 and 3) emissions tCO ₂ e <u>Airport + Tenants</u>	11,502	9,057	6,378	8,132	636

* T&D = transmission and distribution

Location vs Market Based Emissions 2019: All Scopes



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



Historical Emissions Trends



The table below shows emissions figures where for all years Scope 2 emissions are reported using the location based methodology and tenant energy us included in Scopes 1 & 2 for fair historical comparison.

Emissions by Scope	2015 emissions (tCO ₂ e)	2016 emissions (tCO ₂ e)	2017 emissions (tCO ₂ e)	2018 emissions (tCO ₂ e)	2019 emissions (tCO ₂ e)
Scope 1	2,987	3,199	3,066	3,429	2,997
Scope 2	13,584	12,301	10,518	8,346	7,495
Scopes 1 and 2	16,571	15,500	13,584	11,774	10,492
Scope 3	174,051	196,956	168,739	135,955	133,696
Outside of Scopes	6	5	5	4	5
Total emissions	190,627	212,461	182,328	147,733	144,193
Scope 1 % y-o-y change	N/A	7%	-4%	12%	-13%
Scope 2 % y-o-y change	N/A	-9%	-14%	-21%	-10%
Scope 1 & 2 % y-o-y change	N/A	-6%	-12%	-13%	-11%
Scope 3 % y-o-y change	N/A	13%	-14%	-19%	-2%
Outside of Scopes % y-o-y change	N/A	-11%	5%	-19%	23%
Total % y-o-y change	N/A	11%	-14%	-19%	-2%

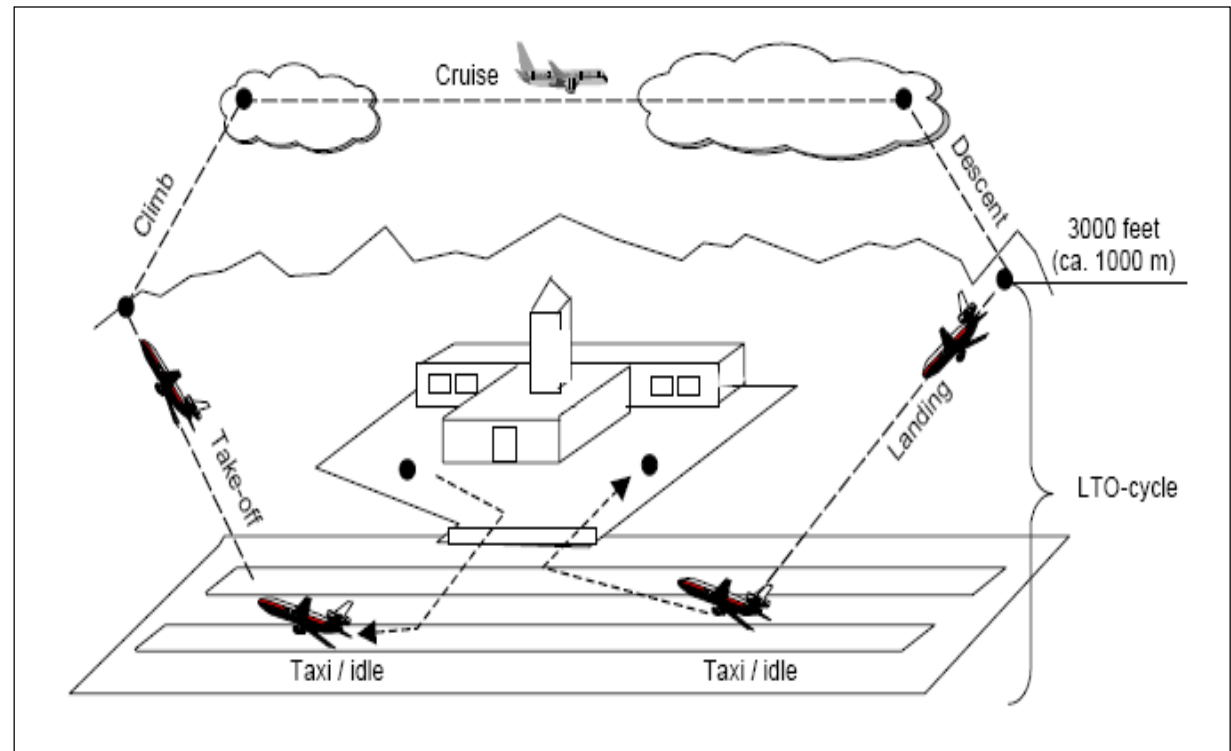
Methodology – changes and our approach to the LTO Cycle

New methodology approach for 2019 (used as of 2018) includes:

- Tenant Energy consumption has been moved to Scope 3, as outside direct control of airport
- Electricity emissions utilise a market based emission factor as it reflects the green procurement practices of the airport
- This means that previous Scope 2 emissions are now in Scope 3, and remaining scope 2 emissions will be lower than previous years due to green procurement practices
- Updated methodology to calculate Aircraft Movement Emissions which has been applied to historic years (2015 onwards) to maintain yearly comparisons

This assessment has considered a number of modes of aircraft operations within the LTO cycle, and assumptions have been applied based on the aircraft type, the typical aircraft engine thrust setting and the actual engine fitted to the aircraft. This study has considered the following LTO phases:

- Ground movements; Taxiing (in and out), time in runway hold, and use of auxiliary power units (APUs)
- Departing flights; Take-off roll, initial climb (to 450m), and climb (to 1,000m)
- Arriving flights; Approach (from 1,000m); landing Roll, and use of reverse thrust



Term	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 (CO₂e)	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).
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	<p>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.</p> <p>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 that CO₂ is released through combustion).</p>
PAX	Number of passengers.