CITY AIRPORT DEVELOPMENT PROGRAMME
(CADP1) S73 APPLICATION

ENVIRONMENTAL STATEMENT

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City Airport Development Programme (CADP1) S73 Application

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Appendix 11.1 Greenhouse Gas Footprint Methodology

December 2022

Air Quality Consultants

Appendix 11.1: Greenhouse Gas Footprint Methodology

LCY S73 Application

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Experts in air quality management & assessment

1 Introduction

11.1.1 This appendix sets out the methodology for the calculating the baseline Greenhouse Gas (GHG) footprint, and GHG footprint for the with (DC) and without development (DM) scenarios. The GHG footprint considers GHGs released as a result of the Airport's activities in terms of three emissions 'scopes' described in the Greenhouse Gas Protocol, which are explained in Table 1.

Table 1: GHG Emissions Scopes 1, 2 and 3

Scope	Description
Scope 1	These include emissions from activities owned or controlled by the Airport that release GHG emissions into the atmosphere. They are known as direct emissions and can be **controlled** by the Airport.
Scope 2	These include emissions released into the atmosphere associated with the Airport's consumption of purchased electricity, heat, steam and cooling. These are indirect emissions that are a consequence of the Airport's activities. Whilst the Airport does not directly emit these emissions it can **control** them through its energy management and purchasing decisions.
Scope 3	Emissions that are associated with the Airport but occur from sources which are not owned or controlled by the airport and are not classed as Scope 2 emissions. The Airport can **influence** these emissions but not control them.

11.1.2 Details of the emissions sources that have been included in the GHG footprint are provided in Table 2, showing which scope each emissions source is categorised into.

Table 2: GHG Footprint Emissions Sources Summary

Scope	Emissions Source	Description
Scope 1	Heating Fuel Consumption by the Airport	Emissions from consumption of natural gas for heating and hot water by the Airport.
	Airport Airside Vehicles and Plant	Emissions from vehicles owned by the Airport that operate on or around the airfield including, but not limited to car park buses, fire service vehicles and security vehicles.
	Fire Training	Fuel used for fire service training exercises on the fire training rig.
	Refrigerant Losses	Losses of F-gases from refrigerant units such as air conditioners.
Scope 2	Airport Electricity Consumption	Consumption of metered electricity by the Airport.
Scope 3	Terminal and Ancillary Building Energy Consumption by Tenants	Emissions from consumption of natural gas and fuel oil for heating and hot water by tenants.
	3rd Party Airside Vehicles and Plant	Emissions from vehicles and plant owned and operated by 3rd parties on the airfield including but not limited to aircraft tugs, mobile ground power units, fuel vehicles and catering service vehicles.
	Airport Staff Business Travel	Emissions from vehicles used for the Airport company business mileage.
	Staff Travel	Emissions from staff travelling to and from the airport for work predominantly by DLR or bus.
	Passenger Travel	Emissions from passenger travel to and from the airport to catch flights, including car, bus, taxi and DLR/rail.
	Aircraft Landing and Take Off Cycle	Emissions from aircraft operating up to an altitude of 3,000 ft, including take off, landing, and taxiing to and from the runway and the terminal.
	Aircraft Climb, Cruise and Descent	Emissions from aircraft on their climb from 3,000 ft to cruising altitude, the cruise and the descent from cruising altitude to 3,000 ft at the destination airport.
	Auxiliary Power Units	Emissions from auxiliary power units used to provide power and conditioned air to aircraft systems while they are parked at stand after arrival or prior to departure.
	Aircraft Engine Testing	Emissions from testing of aircraft engines on the airfield following maintenance.
	Waste	Emissions from the management and treatment of waste generated by the Airport, including recycling and energy recovery.
	Construction: Embodied Carbon	Carbon 'embodied' in construction materials (i.e. the emissions from extraction, processing and manufacture of materials).
	Construction: Transport	Emissions from transport of goods and products to the Airport during construction works, and export of waste.
	Construction: Site Activities	Emissions from plant and machinery used for construction works, electrical energy consumption, and waste disposal.

11.1.3 A GHG footprint for the Airport, covering all the emissions sources outlined in Table 2 has been produced for the following scenarios:

- 2019 Baseline (existing operations in 2019);
- 2027 Without Development;
- 2027 With Development (Airport first exceeds the current 6.5 mppa capacity);
- 2031 Without Development; and
- 2031 With Development (Airport reaches 9 mppa capacity).
- 2050 Without Development (airport remains at 6.5mppa); and
- 2050 With Development (Airport remains at mppa capacity).

11.1.4 In addition to these scenarios cumulative GHG emissions been calculated between 2024 (the proposed opening year of the development and 2050 (the UK's target year to achieve net zero) for the with and without development scenarios.

11.1.5 Furthermore, two sensitivity scenarios for air transport emissions have been considered to account for uncertainty about how fast the Airport activity will grow in the future:

- Faster Growth scenario: the Airport reaches 9 mppa capacity two years earlier than expected, in 2029. This is assessed for 2029; and
- Slower Growth scenario: the Airport reaches 9 mppa capacity two years later than expected, in 2033. This is assessed for 2031 and 2033.

11.1.6 Details of the methodology to calculate the GHG emissions from each of the emission sources included in the GHG footprint is provided in the following sections.

2 Scope 1 Emissions

Heating Fuel Consumption

11.2.1 The GHG emissions from natural gas consumption within the terminal building, offices, workshops and outbuildings at the airport have been calculated using metered energy consumption data provided by the Airport. Data on the consumption of natural gas have been provided for 2019.

11.2.2 GHG emissions for 2019 have been calculated from the fuel consumption data using GHG emissions factors for fuel consumption from BEIS[1].

[1] BEIS (2019) GHG Factors for Company Reporting 2019.

11.2.3 Natural gas consumption is primarily related to space heating within the terminal and ancillary buildings. As these spaces will not be changed by the Development, it has been assumed that the 2019 natural gas consumption will remain the same in all future assessment years, up until 2030 when it is assumed that the natural gas heating will have been removed from the Airport in line with its 2030 net zero Scope 1 and 2 emissions targets.

11.2.4 The new eastern energy centre constructed as part of the consented CADP scheme will not include gas combustion plant so additional heating and hot water provision associated with the consented expanded terminal areas is accounted in the electricity consumption data, discussed later in this appendix.

11.2.5 GHG emissions from natural gas consumption in all future years have been calculated using the 2019 BEIS GHG factors for natural gas consumption. A summary of the inputs and assumptions for the calculation of GHG emissions from natural gas consumption are shown in Table 3.

Table 3: GHG Emissions Data for Natural Gas Consumption

Parameter	Value	Unit
Annual Natural Gas Consumption	1,527,355	kWh/yr
GHG Emissions Factor	0.1839	kgCO_2e/kWh

LCY Airport Airside Vehicles and Plant

11.2.6 GHG emissions from Airport owned and operated airside vehicles and plant have been calculated based on fuel consumption data provided by the Airport. Total annual diesel consumption for the airside fleet in 2019 has been provided by the Airport, which has been combined with GHG emissions factors from BEIS[1] to calculate baseline GHG emissions.

11.2.7 In the future, it is expected that the amount of airside and vehicle fleet activity will grow in line with the growth of the airport, but there will be a steady rollover of vehicles where older diesel vehicles are replaced with zero-emission electric vehicles where possible. To estimate GHGs from the Airport airside vehicles and fleet in the future scenarios the following is steps are followed:

1) uplift the volume of fuel consumption based on the uplift in ATMs in each scenario vs the 2019 baseline; and

2) apply a fuel flow reduction to account for the rollover of older vehicles with newer, more efficient diesel vehicles and electric vehicles and plant.

11.2.8 From 2030, it is assumed that emissions from LCY airside vehicles and plant in both the DM and DC scenarios will be 0, as they are covered by the Airport's target for net zero Scope 1 and 2 emissions by 2030.

11.2.9 It should be noted that the increase in electricity consumption associated with the rollover of airside vehicles and plant from diesel to electric is accounted for in the Scope 2 electricity consumption emissions calculations described later in this appendix.

11.2.10 Table 4 provides a summary of the GHG model inputs for diesel consumption by airside vehicles and plant.

Table 4: LCY Airside Vehicles GHG Emissions Model Input Data

Parameter	Value	Unit
2019 LCY Airside Vehicles Diesel Consumption	196,621	Litres
Diesel Fuel Consumption Annual Reductions 2019-2024	0	% per annum compared to previous year
Diesel Fuel Consumption Annual Reductions 2025-2027	5	% per annum compared to previous year
Diesel Fuel Consumption Annual Reductions 2028-2029	10	% per annum compared to previous year
Diesel Consumption GHG Factor	2.59411	$kgCO_2e/L$
Emissions from 2030	0	In line with net zero target.

Fire Training

11.2.11 Emissions from combustion of fuel for fire training exercises have been calculated using fuel consumption data provided by the Airport for 2019. The 2019 annual fuel consumed during fire training exercises has been converted to GHG emissions using BEIS emission factors[1] for fuel consumption.

11.2.12 It is not expected that the frequency of fire training exercises will increase in the future, so fuel consumption and resultant GHG emissions from fire training are assumed to remain the same in all future scenarios as in the 2019 baseline.

11.2.13 Table 5 shows the GHG model inputs for fire training exercises.

Table 5: GHG Emissions Data for Fire Training Exercises

Parameter	Value	Unit
Annual LPG Consumption	184	Litres
Annual Petrol Consumption	138	Litres
Annual Wood Consumption	1,133	kg
GHG Emissions Factor for LPG Consumption	2.31495	$kgCO_2e/L$
GHG Emissions Factor for Petrol Consumption	1.5226	$kgCO_2e/L$
GHG Emissions Factor for Wood Consumption	63.8468	$kgCO_2e/T$

Refrigerant Use

11.2.14 GHG emissions from refrigerant use have been calculated based on data provided by the Airport. This includes details of the type of refrigerant used in cooling systems and the annual loss of refrigerant from the system.

11.2.15 GHG factors for refrigerants have been obtained from BEIS[1] for the relevant Montreal Protocol listed gas.

11.2.16 It is not expected that refrigerant use will grow at the Airport, so the assumption for all future scenarios is that emissions from refrigerant use will be the same as in the 2019 baseline. Over time it is expected that refrigerant plant will be replaced and from 2030 refrigerant emissions are assumed to be zero (in both DM and DC scenarios) in line with the Airport's net zero 2030 target.

11.2.17 Table 6 shows the GHG model inputs for refrigerant losses.

Table 6: GHG Emissions Data for Refrigerant Losses

Parameter	Value	Unit
Annual Refrigerant Loss	15	kg
Type of Refrigerant	CFC-13	-
GHG Emissions Factor	14,400	$kgCO_2e/kg$

3 Scope 2 Emissions

Airport Electricity Consumption

11.3.1 Emissions from electricity consumption are associated with the production of the electricity as well as from transmission and distribution losses on the grid.

11.3.2 The Airport has provided total annual metered electrical consumption for 2019, which has been combined with a GHG emission factor for grid electricity supply obtained from BEIS[1], to estimate the GHG emissions from the Airport's electricity use in 2019.

11.3.3 Electrical consumption for the future scenarios has been estimated by uplifting the 2019 electricity consumption based on annual passenger throughput. Uplifting existing energy consumption by passenger numbers is conservative, as although electricity consumption (particularly unregulated electricity consumption) will likely increase, this is likely to some extent to be offset by continual improvements in energy efficiency (e.g. replacement lighting and electronic devices with lower energy consumption). The increase in electricity consumption when forecast this way exceeds the sum of the baseline energy consumption, and the additional CADP energy consumption described in the Energy Strategy produced to support the application. Overall, this approach is likely to overestimate the total airport electricity consumption, even accounting for the rollover from diesel to electric airside vehicles and plant.

11.3.4 The assumed Airport electricity consumption for the with and without development scenarios are presented in Table 7.

Table 7: Airport Electricity Consumption (kWh/year)

Year	Without Development		With Development	
	Passengers (mppa)	Electricity Consumption (kWh/yr)	Passengers (mppa)	Electricity Consumption (kWh/yr
2019	5,107,796	9,079,249	5,107,796	9,079,249
2024	4,900,000	8,709,886	4,900,000	8,709,886
2025	5,000,000	8,887,639	5,400,000	9,598,650
2026	5,300,000	9,420,897	6,300,000	11,198,425
2027	5,400,000	9,598,650	7,000,000	12,442,694
2028	6,000,000	10,665,166	7,600,000	13,509,211
2029	6,400,000	11,376,177	7,900,000	14,042,469
2030	6,500,000	11,553,930	8,600,000	15,286,739
2031-2050	6,500,000	11,553,930	9,000,000	15,997,750

11.3.5 Future GHG emissions factors for electricity have been derived from BEIS projections produced as part of supplementary guidance to the HM Treasury Green Book[2]. The factors, which are for electricity supply to the commercial/public sector, include transmission and distribution losses and take account of the expected decarbonisation of the UK electricity supply in the coming years through increased development of renewable energy sources. From 2030, the GHG emissions from Airport electricity use are assumed to be zero (in both the DM and DC scenarios), to account for the Airport's 2030 net zero target, and specifically the commitment to purchase electricity generated from renewable sources, The GHG emissions factors for electricity consumptions used in the assessment are shown in Table 8.

[2] BEIS (2021) Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions for appraisal

Table 8: GHG Emissions Factors for LCY Electricity Consumption ($kgCO_2e/kWh$)

Year	GHG Emissions Factor ($kgCO_2e/kWh$)	Year	GHG Emissions Factor ($kgCO_2e/kWh$)	Year	GHG Emissions Factor ($kgCO_2e/kWh$)
2019	0.2556	**2033**	0	**2043**	0
2024	0.1454	**2034**	0	**2044**	0
2025	0.1230	**2035**	0	**2045**	0
2026	0.0907	**2036**	0	**2046**	0
2027	0.0750	**2037**	0	**2047**	0
2028	0.0694	**2038**	0	**2048**	0
2029	0.0650	**2039**	0	**2049**	0
2030	0	**2040**	0	**2050**	0
2031	0	**2041**	0		
2032	0	**2042**	0		

4 Scope 3 Emissions

Tenants' Electricity Consumption

11.4.1 The GHG emissions from tenants' electricity consumption have been calculated based on metered data for 2019 provided by the Airport, combined with a GHG emission factors for grid electricity obtained from BEIS[2].

11.4.2 In the future without development scenarios, tenants' electrical consumption has been estimated based on the ratio between the Airport's electricity consumption and the tenants' electricity consumption in 2019, which is applied to the Airport electricity consumption in each future scenario. This accounts for an expected growth in tenants' electricity consumption associated with growth of the Airport (in both the DM and DC scenarios).

11.4.3 The assumed tenant's electricity consumption for the with and without development scenarios are presented in Table 9.

Table 9: Tenant's Electricity Consumption (kWh/year)

Year	Without Development		With Development	
	Passengers (mppa)	Electricity Consumption (kWh/yr)	Passengers (mppa)	Electricity Consumption (kWh/yr
2019	5,107,796	958,054	5,107,796	958,054
2024	4,900,000	919,078	4,900,000	919,078
2025	5,000,000	937,835	5,400,000	1,012,861
2026	5,300,000	994,105	6,300,000	1,181,672
2027	5,400,000	1,012,861	7,000,000	1,312,968
2028	6,000,000	1,125,401	7,600,000	1,425,508
2029	6,400,000	1,200,428	7,900,000	1,481,779
2030	6,500,000	1,219,185	8,600,000	1,613,075
2031-2050	6,500,000	1,219,185	9,000,000	1,688,102

11.4.4 Future GHG emissions factors for electricity have been derived from BEIS projections produced as part of supplementary guidance to the HM Treasury Green Book[2]. The factors, which are for electricity supply to the commercial/public sector, include transmission and distribution losses and take account of the expected decarbonisation of the UK electricity supply in the coming years through increased development of renewable energy sources. The GHG emissions factors for electricity consumptions used for tenants' electricity are shown in Table 10.

Table 10: GHG Emissions Factors for Tenants Electricity Consumption ($kgCO_2e/kWh$)

Year	GHG Emissions Factor ($kgCO_2e/kWh$)	Year	GHG Emissions Factor ($kgCO_2e/kWh$)	Year	GHG Emissions Factor ($kgCO_2e/kWh$)
2019	0.2556	**2033**	0.0306	**2043**	0.0118
2024	0.1454	**2034**	0.0278	**2044**	0.0111
2025	0.1230	**2035**	0.0248	**2045**	0.0094
2026	0.0907	**2036**	0.0205	**2046**	0.0086
2027	0.0750	**2037**	0.0183	**2047**	0.0079
2028	0.0694	**2038**	0.0178	**2048**	0.0075
2029	0.0650	**2039**	0.0169	**2049**	0.0070
2030	0.0516	**2040**	0.0153	**2050**	0.0069
2031	0.0408	**2041**	0.0127		
2032	0.0353	**2042**	0.0121		

3rd Party Airport Airside Vehicles and Plant

11.4.5 GHG emissions from 3rd party owned and operated airside vehicles and plant have been calculated based on fuel consumption data provided by the Airport. Total annual diesel consumption for the airside fleet in 2019 has been provided by the Airport, which has been combined with GHG emissions factors from BEIS[1] to calculate baseline GHG emissions.

11.4.6 In the future, it is expected that the amount of airside and vehicle fleet activity will grow in line with the growth of the airport, but there will be a steady rollover of vehicles where older diesel vehicles are replaced with zero-emission electric vehicles where possible. To estimate GHGs from 3rd party airside vehicles and fleet in the future scenarios the following is steps are followed:

1) uplift the volume of fuel consumption based on the uplift in ATMs in each scenario vs the 2019 baseline; and

2) apply a fuel flow reduction to account for the rollover of older vehicles with newer, more efficient diesel vehicles and electric vehicles and plant.

11.4.7 It should be noted that the increase in electricity consumption associated with the rollover of airside vehicles and plant from diesel to electric is accounted for in the tenants electricity consumption emissions calculations described in the previous section of this appendix.

11.4.8 Table 11 provides a summary of the GHG model inputs for diesel consumption by 3rd party airside vehicles and plant.

Table 11: 3rd Party Airside Vehicles GHG Emissions Model Input Data

Parameter	Value	Unit
2019 3rd Party Airside Vehicles Diesel Consumption	67,372	Litres
Diesel Fuel Consumption Annual Reductions 2019-2024	0	% per annum compared to previous year
Diesel Fuel Consumption Annual Reductions 2025-2027	5	% per annum compared to previous year
Diesel Fuel Consumption Annual Reductions 2028-2050	10	% per annum compared to previous year
Diesel Consumption GHG Factor	2.59411	$kgCO_2e/L$

Waste

11.4.9 Waste generation data for 2019 has been provided by the Airport. The waste data has been used to group wastes by type and fate (i.e. composting and anaerobic digestion, recycling, incineration and landfill (limited to hazardous wastes only). These are combined with GHG emissions factors obtained from BEIS[1] to calculate the GHG emissions. The input data for the waste GHG calculations is shown in Table 12.

Table 12: Waste GHG Emissions Model Input Data

Waste Type/Fate of Waste	2019 Annual Generation (T)	GHG Emissions Factor ($kgCO_2e/T$)
Food and Organic (Composting/AD)	36.22	10.20
Mixed Recycling	780.80	21.35
Other (Incineration)	526.74	21.35
Hazardous (Landfill)	0.66	8.99

11.4.10 For the future scenarios, growth in waste generation has been estimated using the passenger numbers in each year for each scenario (as shown in Table 9). As waste is only a very small contributor to the Airport's GHG footprint, the GHG factors have been kept the same out to 2050. This approach is very conservative as it takes no account of decarbonisation of the waste sector, nor of measures and initiatives by LCY to reduce waste volumes (such as its planned elimination of all unnecessary single use plastics by 2025).

Passenger Transport

11.4.11 In order to calculate the baseline GHG emissions from airport passenger transport the following equation is applied:

$CO_2e_a = Mode_{ab} * Dist_{ab} * GHGf_b$

Where:

CO_2e_a = Emissions of CO_2e in kilograms, produced by travel of passenger *a*;

$Mode_{ab}$ = Transport mode *b* used by passenger a for the journey;

$Dist_{ab}$ = Distance travelled to or from the Airport by passenger *a*, using mode *b;*

$GHGf_b$ = GHG emissions factor for mode *b* (as $kgCO_2e$/passenger/km)

11.4.12 Information has been gathered by the project transport consultants, Steer, using airport forecourt passenger surveys which provided passenger numbers using the Airport by origin/destination and the modal share of car, bus, taxi and rail used to access the Airport. These data have been obtained from CAA statistics and used to determine the 2019 mode share and average travel distances for passengers using the Airport.

11.4.13 The number of passengers travelling by each mode has been calculated by multiplying the total annual passengers by the mode share percentage for each mode. These are then multiplied by the travel distance and summed to calculate total passenger kms by mode to and from the Airport.

11.4.14 For car and taxi trips, the baseline assumption has been applied that average vehicle loading is 1.36 passengers per car/taxi. For the with development scenario, the average vehicle loading factor for cars and taxis is 1.46. The increase relative to the baseline reflects the different trends associated with the switch from a business-led to leisure-led Airport.

11.4.15 To account for the onward journey of taxi drop offs to next pick up, or the journey of a taxi to collect a passenger, the total taxi travel distances have been uplifted by 10%, as advised by Steer.

11.4.16 The passenger kms by mode for future scenarios have been uplifted based on predicted increase in passenger numbers. Data have been provided for the baseline year (2019) as well as 2027 and 2031. Beyond 2031, when the Airport is at capacity for passenger movements, the associated passenger transport trips are kept constant each year out to 2050.

11.4.17 A summary of the passenger transport trips (total passenger kilometres by mode) for the without and with development scenarios are shown in Table 13.

Table 13: Passenger Transport Trips (total km per annum)

Year	Car	DLR/Light Rail	Bus	Taxi	Cycle/Walk
Without Development					
2019	12,872,513	76,783,408	1,535,668	44,839,252	2,303,502
2027	10,895,618	95,494,036	4,939,347	33,292,165	8,232,244
2031-2050	14,572,328	120,892,034	5,945,510	32,059,122	11,891,020
With Development					
2019	12,872,513	76,783,408	1,535,668	44,839,252	2,303,502
2027	13,691,428	124,409,440	6,434,971	41,834,918	10,724,952
2031-2050	19,285,627	168,228,528	8,273,534	42,428,380	16,547,068

11.4.18 The calculated total passenger kms by mode in Table 13 have then been combined with GHG factors calculated using DfT WebTAG data[3] which includes projections of the split of vehicle mileage by engine type (petrol, diesel and electric), fuel and electricity efficiency improvements year to year, and average CO_2e emissions by mode (including rail) in each year accounting for decarbonisation of the electricity grid.

11.4.19 A summary of the GHG emissions factors for passenger transport are presented in Table 14.

[3] Dft (2022) Transport Analysis Guidance (WebTAG) Data Book v1.18 May 2022

Table 14: GHG Emissions Factors for Transport (kgCO_2e/km or TCO_2e/passenger.km)

Year	Car	DLR/ Light Rail	Bus	Taxi	Year	Car	DLR/ Light Rail	Bus	Taxi
2019	0.1644	0.0351	0.0821	0.2949	**2037**	0.0856	0.0034	0.0821	0.1536
2024	0.1444	0.0274	0.0821	0.2589	**2038**	0.0825	0.0027	0.0821	0.1480
2025	0.1403	0.0255	0.0821	0.2517	**2039**	0.0798	0.0022	0.0821	0.1431
2026	0.1361	0.0236	0.0821	0.2442	**2040**	0.0770	0.0018	0.0821	0.1381
2027	0.1319	0.0216	0.0821	0.2366	**2041**	0.0742	0.0015	0.0821	0.1331
2028	0.1277	0.0194	0.0821	0.2290	**2042**	0.0721	0.0014	0.0821	0.1294
2029	0.1235	0.0172	0.0821	0.2214	**2043**	0.0703	0.0014	0.0821	0.1260
2030	0.1177	0.0148	0.0821	0.2111	**2044**	0.0685	0.0013	0.0821	0.1229
2031	0.1120	0.0120	0.0821	0.2009	**2045**	0.0669	0.0011	0.0821	0.1200
2032	0.1067	0.0097	0.0821	0.1913	**2046**	0.0655	0.0010	0.0821	0.1175
2033	0.1017	0.0078	0.0821	0.1824	**2047**	0.0642	0.0009	0.0821	0.1151
2034	0.0971	0.0063	0.0821	0.1742	**2048**	0.0629	0.0009	0.0821	0.1129
2035	0.0929	0.0051	0.0821	0.1667	**2049**	0.0618	0.0008	0.0821	0.1109
2036	0.0891	0.0041	0.0821	0.1598	**2050**	0.0607	0.0008	0.0821	0.1089

Airport Staff Travel

11.4.20 A modal split of Airport and 3rd party staff by car, DLR/light rail, bus, walking, cycling, motorcycle and taxi has been provided by project transport consultants Steer, based on staff survey data at the airport.

11.4.21 Future year staff travel data have been estimated based on expected future airport staff numbers in the do minimum and do something scenarios, combined with measures to encourage a modal shift towards sustainable and active travel.

11.4.22 Average travel to work distances have been provided by Steer, which are based on Census data. The staff trips by mode have been combined with the average travel distance to provide an estimate of the total staff travel kms per annum by mode.

11.4.23 Data have been provided for the baseline year (2019) as well as 2027 and 2031. Between these years, emissions are extrapolated assuming linear growth in staff movements year to year. Beyond

2031, when the Airport is at capacity, the associated staff transport trips are kept constant each year out to 2050.

11.4.24 A summary of the staff transport trips (total staff kilometres by mode) for the without and with development scenarios are shown in Table 15.

Table 15: Airport Staff Transport Trips (total km per annum)

Year	Car	DLR/Light Rail	Bus	Cycle	Motorcycle	Walk	Taxi
Without Development							
2019	6,767,105	3,383,553	700,045	350,023	116,674	233,348	116,674
2027	5,077,679	2,778,353	670,637	383,221	95,805	479,026	95,805
2031-2050	4,119,626	3,257,379	862,247	574,832	95,805	574,832	95,805
With Development							
2019	6,767,105	3,383,553	700,045	350,023	116,674	233,348	116,674
2027	5,806,122	3,176,935	766,846	438,198	109,549	547,747	109,549
2031-2050	7,937,233	6,275,952	1,661,281	1,107,521	184,587	1,107,521	184,587

11.4.25 GHG emissions factors for staff travel are the same as those used for passenger travel shown in Table 14.

Airport Staff Business Travel

11.4.26 GHG emissions from Airport staff business travel has been calculated based on mileage data provided by the Airport from expense receipts.

11.4.27 For the future scenarios, business mileage has been scaled up based on predicted increases in Airport staff numbers.

11.4.28 GHG emissions factors have been derived using DfT WebTAG[3] and BEIS[1] data.

Aircraft Landing and Take Off Cycle (LTO)

11.4.29 The LTO cycle covers aircraft activity below an altitude of 3,000 ft. The GHG emissions arising from aircraft movements have been calculated as the sum of the emissions for each part ('mode') of the LTO cycle, i.e. approach, landing roll, taxi-in, warm-up, taxi-out, hold, take-off roll, and climb.

11.4.30 A full record of 2019 baseline aircraft movements was provided by LCY. A forecast summary of movements by aircraft type and destinations for each year between 2024 and 2031 for DC and DM scenarios was provided by York Aviation. For years between 2032 and 2050, the aircraft type and destination mix was assumed to be unchanged from 2031, with adjustments made for the expected evolution of the aircraft fleet made as described below.

11.4.31 In order to calculate the GHG emissions from each aircraft movement, engine fuel flow data have been obtained from the International Civil Aviation Organization's engine exhaust emissions databank[4] for turbofan aircraft and a Swedish Defence Research Agency (FOI) database[5] of emissions for turboprop aircraft.

11.4.32 The time spent by each aircraft in each mode within the LTO cycle (the activity data) is combined with the engine fuel flows for each aircraft engine in each mode within the LTO cycle (the unit conversion factor) and a GHG factor to calculate the total CO_2e emissions for each aircraft movement in the LTO cycle. The calculation is expressed in the following equation:

$$CO_2e_a = \sum (TIM_{ab}*60) * (FF_{ab}) * (NE_a) * GHGf$$

Where the expression is summed over each mode and:

CO_2e_a = Emissions of CO_2e in kilograms, produced by aircraft type *a* for each LTO cycle;

TIM_{ab} = Time-in-mode for mode *b* in minutes for aircraft type *a*;

FF_{ab} = Fuel flow for mode *b* in kg/s for each engine on aircraft type *a*;

NE_a = Number of engines on aircraft type *a*;

GHGf = GHG emissions factor (3.18 $kgCO_2e$/kg fuel).

11.4.33 The total annual fuel flows in the LTO cycle have been calculated as part of the airport emissions inventory that forms part of the air quality assessment and ES Chapter. Further technical details of the LTO cycle emissions inventory are provided in Chapter 9 of the ES and its appendices. Fuel flow outputs from the inventory have been multiplied by a GHG factor for the combustion of aviation fuel (3.18 $kgCO_2e$/kg fuel) to calculate total GHG emissions for each scenario. This factor is for Jet-A1 fuel, but is also applied to the small amount of aviation spirit used at the Airport.

11.4.34 A summary of the aircraft movements included in the GHG assessment is provided in Table 16 for the main scenarios, and Table 17 for the sensitivity scenarios.

[4] ICAO (2021) Engine Exhaust Emissions Databank, [Online], Available: https://www.easa.europa.eu/easa-and-you/environment/icao-aircraft-engine-emissions-databank.

[5] Swedish Defence Research Agency. FOI:s Database for Turboprop Engine Emissions

Table 16: Summary of Movements and Aircraft Types, Main Scenarios

Aircraft Type	Annual Movements by Aircraft Type						
	2019 Baseline	2025 DM	2025 DC	2027 DM	2027 DC	2031 DM	2031 DC
Airbus A318	525	0	0	0	0	0	0
ATR-42	0	2,740	2,740	2,740	2,740	2,740	2,740
ATR 72	864	2,195	2,195	2,195	2,195	2,195	2,195
Airbus A220-100	3,150	3,295	3,395	3,295	3,500	4,940	7,000
Cessna Citation Excel	952	783	783	1,096	783	1,409	0
Cessna Citation Sovereign	397	1,268	1,268	1,776	1,268	2,283	0
Bombardier BD-100 Challenger 350	6	1,284	1,284	1,798	1,284	2,311	0
Dash 8-Q400	11,966	3,840	3,940	3,840	4,045	3,840	4,045
Embraer E170	9,330	0	0	0	0	0	0
Embraer E190	45,923	57,170	52,940	56,070	18,875	24,355	17,235
Embraer E190-E2	0	3,295	11,805	6,035	45,250	36,040	52,420
Embraer E195-E2	0	0	0	2,195	14,555	9,780	24,270
Embraer Legacy 600	0	196	196	274	196	352	0
Embraer EMB-505 Phenom 300	379	525	525	734	525	944	0
Dassault Falcon 7X	398	694	694	972	694	1,250	0
Bombardier BD-700 Global Express	140	250	250	350	250	450	0
Dornier 328JET	943	1,095	1,095	1,095	1,095	1,095	1,095
RJ-85 Avroliner, BAe RJ-85	3,834	0	0	0	0	0	0
Saab 2000	2,073	0	0	0	0	0	0
Other [a]	3,170	0	0	0	0	0	0
TOTAL	**84,050**	**78,630**	**83,110**	**84,465**	**97,255**	**93,985**	**111,000**

[a] 'Other' includes a large number of aircraft with less than 500 movements per year from the Airport in 2019.

Table 17: Summary of Movements and Aircraft Types, Sensitivity Scenarios

Aircraft Type	Annual Movements by Aircraft Type		
	2029 Faster Growth	2031 Slower Growth	2033 Slower Growth
Airbus A318	0	0	0
ATR42	2,740	2,740	2,740
ATR 72-	2,195	2,195	2,195
Airbus A220-100	5,355	7,000	7,000
Cessna Citation Excel	0	783	0
Cessna Citation Sovereign	0	1,268	0
Bombardier BD-100 Challenger 350	0	1,284	0
Dash 8-Q400	4,045	4,045	4,045
Embraer E170	0	0	0
Embraer E190	17,235	15,585	15,585
Embraer E190-E2	53,515	52,580	54,165
Embraer E195-E2	24,815	20,350	24,165
Embraer Legacy 600	0	196	0
Embraer EMB-505 Phenom 300	0	525	0
Dassault Falcon 7X	0	694	0
Bombardier BD-700 Global Express	0	250	0
Dornier 328JET	1,095	1,095	1,095
RJ-85 Avroliner, BAe RJ-85	0	0	0
Saab 2000	0	0	0
Other [a]	0	0	0
TOTAL	**110,995**	**110,590**	**110,990**

[a] 'Other' includes a large number of aircraft with less than 500 movements per year from the Airport in 2019.

Aircraft Climb, Cruise and Descent (CCD)

11.4.35 The GHG emissions released during aircraft climb, cruise and descent (CCD) have been calculated based on aircraft fuel consumption between the Airport and destination airports. CCD covers emissions at altitudes above 3,000 ft (i.e. those not covered by the LTO cycle).

11.4.36 A full record of 2019 baseline aircraft movements was provided by LCY. A forecast summary of movements by aircraft type and destinations for each year between 2024 and 2031 for DC and DM scenarios was provided by York Aviation. For years between 2032 and 2050, the aircraft type and destination mix was assumed to be unchanged from 2031, with adjustments made for the expected evolution of the aircraft fleet made as described below. These are summarised in Table 16 and Table 17 above.

11.4.37 For the 2019 Baseline, the destination airport for each movement was available. Distances to the destination airports (CCD Stage Lengths) have been calculated as the Great Circle Distance (GCD) between the Airport and each destination airport, and have been uplifted by 5% for short-haul flights in accordance with DfT[6] guidance to account for additional travel distances associated with factors such as divergence of flight tracks from GCD, standard instrument departure routes and stacking on arrival.

11.4.38 For the future scenarios, York Aviation provided an average route length for each aircraft type. These were uplifted by 5% in the same way as for 2019.

11.4.39 GHG emissions for each aircraft departure in the CCD phase has been calculated using the aviation emissions calculator tool published within the European Environment Agency/EMEP air pollutant emission inventory guidebook[7]. The tool uses the aircraft type (for which it obtains an engine fuel flow from an in-built database) and the CCD stage length to calculate total CO_2 emissions for each aircraft departure. The calculation is expressed through the following equation:

$CO_{2a} = CCD_{ab} * FF_a * GHGf$

Where:

CO_{2a} = Emissions of CO_2 in kilograms, produced by aircraft type *a* for each departure;

CCD_{ab} = CCD Stage Length to destination airport *b* in nautical miles (NM) for aircraft type *a*

FF_a = Fuel flow in kg/NM for aircraft type *a*

GHGf = GHG emissions factor (3.15 $kgCO_2$/kg fuel)

11.4.40 Emissions of CO_2e are calculated by multiplying the CO_2 emissions extracted from the EMEP/EEA calculator tool by 3.18/3.15 = 1.0095.

11.4.41 To avoid double counting the GHG footprint of international aviation, the CCD emissions from aircraft departures only are included in the GHG footprint and assessment as the GHG emissions from the CCD associated with aircraft arrivals at the Airport are owned and therefore managed by the relevant origin airports/nations.

11.4.42 A number of new generation aircraft are not included in the latest version of the EMEP tool, and therefore it has been necessary to run the tool for an older equivalent (the surrogate aircraft type) and adjust the fuel flows to account for newer more fuel efficient aircraft. The approach is consistent with the modelling assumptions for new generation types established by the DfT through an earlier research project[8] and has been applied in modelling future aviation emissions in the Jet Zero policy[9].

[6] DfT (2017), UK Aviation Forecasts.

[7] EEA (2019) EEA/EMEP air pollutant emission inventory guidebook 2019 Chapter 1.A.3.a Aviation , [Online], Available: http://www.eea.europa.eu/publications/emep-eea-guidebook-2019.

[8] Ricardo Energy & Environment (2017) Carbon Abatement in UK Aviation. ED 10281.

[9] DfT (2022) Jet Zero Strategy: Delivering net zero aviation by 2050. July 2022.

The aircraft that are not in the EMEP tool and need a surrogate are listed in Table 18, along with the surrogate aircraft types and adjustment factors applied.

Table 18: Fuel Efficiency Adjustments for Aircraft in the EMEP CCD Emissions Tool

Aircraft	Aircraft Assigned in EMEP	Fuel Efficiency Adjustment relative to Assigned Aircraft[8]
Airbus A220-100	Airbus A319	0.85
Dornier 328Jet	Embraer E135	1
Embraer 190-E2	Embraer E190	0.85
Embraer 195-E2	Embraer E195	0.85

Future Efficiency Improvements

11.4.43 The government expects that aircraft flights will continue to get more efficient in future, through improvements to both aircraft and airspace designs. The Government's Jet Zero Policy is based on the Jet Zero 'High Ambition' scenario, which predicts that these efficiency improvements will amount to 2% per year[10].

11.4.44 Therefore, carbon emissions from aircraft have been reduced by 2% per year from 2031 for the DC and DM scenarios. No reductions have been applied before then, because the forecast 2031 aircraft fleet already accounts for fuel efficiency improvements based on the fleet turnover that is forecast in the DC and DM scenarios. Adjustment factors are summarised in Table 20.

Sustainable Aviation Fuels (SAF)

11.4.45 Government policy aligns with the Jet Zero 'High Ambition' scenario, which predicts that SAF will be progressively introduced into the fuel mix. It predicts that SAF will make up 10% of the fuel mix in 2030, 22% in 2040 and 50% in 2050[10]. It also predicts that the lifetime saving in CO_2e emissions from SAF compared to Jet A1 kerosene is 70%.

11.4.46 Carbon emissions have therefore been adjusted by a factor of 0.93 in 2030, 0.846 in 2040 and 0.65 in 2050 for the DC and DM scenarios. No adjustment has been made for years before 2030. For years between 2030 and 2050, the adjustment factor has been linearly interpolated. Adjustment factors are summarised in Table 20.

[10] DfT (2022) Jet Zero illustrative scenarios and sensitivities.

Zero-Emission and Other Next Generation Aircraft

11.4.47 Government policy aligns with the Jet Zero 'High Ambition' scenario, which predicts that zero-emission aircraft with less than 150 seats will enter service in 2035. All aircraft at the Airport are in this size class.

11.4.48 York Aviation provided forecasts of which aircraft types in the 2031 DC forecast fleet are likely to have migrated to zero-emission types by 2050, and which will have been replaced by new generation conventionally-fuelled aircraft, as follows:

- Current generation turboprop aircraft replaced with zero emissions turboprop;
- Current generation jet aircraft (e.g. Embraer E190-E1) replaced with new generation jet (e.g. Embraer E190-E2);
- New generation jet (e.g. E190-E2) replaced with zero emissions jet;
- Jet Centre aircraft types (e.g. Falcon 7X) replaced by zero emissions aircraft (75%) or kept unchanged (25%) in 2050.

11.4.49 These rules have been applied to the 2031 DC fleet by York Aviation to create the 2050 DC aircraft fleet. The 2050 DM fleet was derived by York Aviation by "rolling over" the 2031 DM fleet using the same rules, as well as applying an additional adjustment so that the fraction of zero-emission aircraft in the 2050 DM fleet is the same as in the 2050 DC fleet. The rationale for this adjustment is that in years up to 2031, the DC scenario modernises the fleet faster than the DM scenario, but by 2050, the DM scenario is expected to achieve similar levels of uptake of zero-emission aircraft. Taking this approach ensures a worst case assessment.

11.4.50 The resulting 2050 fleets are summarised in Table 19, alongside the 2031 fleets for comparison.

Table 19: Summary of Movements and Aircraft Types, Main Scenarios

Aircraft Type	Annual Movements by Aircraft Type			
	2031 DM	2031 DC	2050 DM	2050 DC
ATR-42-600	2,740	2,740	0	0
ATR 72-600	2,195	2,195	0	0
Airbus A220-100	4,940	7,000	0	0
Cessna Citation Excel	1,409	0	168	0
Cessna Citation Sovereign	2,283	0	272	0
Bombardier BD-100 Challenger 350	2,311	0	0	0
Dash 8-400	3,840	4,045	0	0
Embraer E190	24,355	17,235	0	0
Embraer E190-E2	36,040	52,420	14,593	17,235
Embraer E195-E2	9,780	24,270	0	0
Embraer Legacy 600	352	0	42	0
Embraer EMB-505 Phenom 300	944	0	112	0
Dassault Falcon 7X	1,250	0	149	0
Bombardier BD-700 Global Express	450	0	54	0
Dornier 328JET	1,095	1,095	130	1,095
Zero Emissions Jet	0	0	69,690	83,690
Zero Emissions Turboprop	0	0	8,775	8,980
Total	**93,985**	**111,000**	**93,985**	**111,000**

11.4.51 For years between 2035 and 2050, the emissions saving from the introduction of zero-emission aircraft has been applied by linear interpolation. For years between 2032 and 2034, no adjustment for the introduction of zero-emission aircraft has been made. Adjustment factors are summarised in Table 20.

Aircraft Auxiliary Power Units (APU)

11.4.52 The aircraft APU provides systems power to aircraft whilst on the ground with the main engines turned off.

11.4.53 Activity data for APU usage (time on departure and arrival) provided by the Airport is combined with APU fuel flow data from ICAO's Airport Air Quality Manual[11] to calculate fuel consumption from APU usage.

11.4.54 Fuel consumption from APU use is dependent on the number and type of aircraft operating at the Airport in each of the assessment scenarios and these have been calculated within the airport emissions inventory that forms part of the air quality assessment and ES Chapter. Further technical details of the APU emissions calculation are provided in Chapter 9 of the ES and its appendices.

[11] ICAO (2020) Airport Air Quality Manual

11.4.55 Fuel flow outputs from the inventory have been multiplied by a GHG factor for the combustion of aviation fuel (3.18 kgCO_2e/kg fuel) to calculate total GHG emissions for each scenario. SAF has also been accounted for in the calculations, using the annual adjustment factors set out in Table 20.

Aircraft Ground Running

11.4.56 Aircraft ground running is required to test aircraft engines on apron areas at the airport. Engine testing is typically required after maintenance and may be undertaken at low or high thrust settings. Emissions from aircraft ground running have been estimated based on a 2019 aircraft ground run log provided by LCY, which identifies dates, times, duration, aircraft types and engine power levels for each test.

11.4.57 Fuel consumption during engine testing has been calculated using ICAO databank engine fuel flow data for each type of aircraft tested, with lower power operations assumed to be at 7% thrust and high-power operation at 100% thrust. The calculated total fuel flow has been multiplied by a GHG factor for the consumption of aviation fuel (3.18 kgCO2e/kg fuel) to calculate baseline GHG emissions from aircraft ground running. In the future scenarios the calculation of GHG emissions includes consideration to the uptake of SAF, using the adjustment factors shown in Table 20.

11.4.58 In the future scenarios, ground run emissions have been scaled based on total annual LTO emissions for each scenario, based on the assumption that a greater number of aircraft operating at the Airport will result in a greater number of ground engine tests being required, but taking into account the evolution of the aircraft fleet mix.

Aircraft Emissions from 2032 to 2050

11.4.59 Emissions from aircraft have been calculated in 2050. It is expected that the Airport will reach its 9 mppa capacity (DM scenario: 6.5 mppa) by 2031 and therefore the calculation to 2050 assumes that aircraft activity in terms of number and destinations of flights remain constant from 2031 up to 2050. It also assumes that the broad aircraft fleet mix and destinations remains the same, with aircraft types being progressively replaced by new-generation or zero-emission equivalents (see paragraph 11.4.47).

11.4.60 Emissions in 2050 have been calculated in the following steps:

- Begin with the 2031 aircraft forecasts for DM and DC scenarios;
- Migrate aircraft types to a later generation equivalent (possibly a zero-emission type), as detailed in paragraphs 11.4.47–11.4.48;
- Calculate emissions for this fleet, in the same way as for earlier years;
- Adjust emissions by applying correction factors to account for progressive improvements in aircraft and airspace efficiency (see paragraph 11.4.43), and the progressive introduction of SAF (see paragraph 11.4.45).

11.4.61 Emissions in years between 2032 and 2049 have been calculated by applying adjustment factors to the 2031 emissions to account for the uptake of new and zero-emission aircraft models, progressive improvements in efficiency, and gradual uptake of SAF. These adjustment factors are shown in Table 20.

Table 20: Adjustment Factors, 2030–2050

Year	Adjustment Factor for Fuel Efficiency	Percent of SAF in Fuel	Adjustment Factor for SAF	Fraction of Zero Emission Movements
2030	**1**	**10**	0.93	0
2031	0.98	11.2	0.92	0
2032	0.96	12.4	0.91	0
2033	0.94	13.6	0.90	0
2034	0.92	14.8	0.90	0
2035	0.90	16	0.89	0
2036	0.89	17.2	0.88	0.06
2037	0.87	18.4	0.87	0.11
2038	0.85	19.6	0.86	0.17
2039	0.83	20.8	0.85	0.22
2040	0.82	**22**	0.85	0.28
2041	0.80	24.8	0.83	0.34
2042	0.78	27.6	0.81	0.39
2043	0.77	30.4	0.79	0.45
2044	0.75	33.2	0.77	0.51
2045	0.74	36	0.75	0.56
2046	0.72	38.8	0.73	0.62
2047	0.71	41.6	0.71	0.67
2048	0.70	44.4	0.69	0.73
2049	0.68	47.2	0.67	0.79
2050	0.67	**50**	0.65	0.84

Construction Embodied Carbon

11.4.62 Emissions from embodied carbon in construction materials used in building the CAPD buildings and infrastructure has been estimated using area schedules for the buildings and utilities provided by the project team, combined with carbon intensity factors for different building types obtained from RICS guidance[12].

11.4.63 The input data and assumptions used to calculate the embodied carbon in construction materials is presented in Table 21.

Table 21: Embodied Carbon Data and Assumptions

Item	GIA (m^2)	Embodied Carbon Factor ($kgCO_2e/m^2$)	Notes
Eastern Energy Centre	500	545	RICS carbon intensity factor for "Other industrial/utilities/specialist uses" has been applied. These construction elements are specialist low-rise structures or groundworks and therefore it is judged to be appropriate to apply the specialist carbon intensity factor from RICS.
Western Energy Centre	640	545	
East Pier	23,980	545	
Landside Attenuation	980	545	
Floating RVP Pontoon	1,800	545	
East Terminal Extension	20,310	935	RICS carbon intensity factor for "retail mall/shopping centre" has been applied. There is no factor for airport terminal, and it is judged that by nature of its use a large commercial building with retail outlets, escalators and lifts, steel frame, glass facades etc, retail/shopping developments are similar in terms of embodied carbon.
West Terminal Extension	5,020	935	
Car Park Deck	6,200	410	RICS carbon intensity factor for "depot/open storage" has been applied. These construction elements are surface construction (no buildings other than simple canopies etc) and therefore judged to be similar in terms of construction materials and quantities to depots and open storage.
Forecourt	18,000	410	
Dock Upgrade and Surface Parking	78,000	410	

11.4.64 The data in Table 21 has been used to calculate the total construction embodied carbon. This has then been apportioned equally to each of the construction years 2025-2030.

[12] RICS (2012) Methodology for calculating embodied carbon of materials. 1st edition, information paper.

Construction Transport

11.4.65 Emissions from construction transport have been calculated based on predicted construction vehicle movements presented in Chapter 6: Construction.

Table 22: Construction Transport Data and Assumptions

Year	Average Vehicles Per Day	Trips Per Annum [a]	HGV Trips per Annum [b]	LGV Trips per Annum [b]	HGV Average Distance (km) [c]	LGV Average Distance (km) [d]
Year 1 - 2025	8	5,840	2,920	2,920	175	50
Year 2 – 2026	29	21,170	10,585	10,585	175	50
Year 3 – 2027	24	17,520	8,760	8,760	175	50
Year 4 – 2028	24	17,520	8,760	8,760	175	50
Year 5 – 2029	46	33,580	16,790	16,790	175	50
Year 6 – 2030	46	33,580	16,790	16,790	175	50

[a] Trips per annum calculated by multiplying vehicles per day by 2 (one arrival and one departure per vehicle) and then multiplying by 365.

[b] Assumed that 50% of the vehicles will be HGVs and 50% LGVs.

[c] Assumes 50% of HGVs national in origin (300 km) and 50% local in origin (50 km). Distances used in accordance with RICS guidance[13].

[d] Assumes all LGV trips are local (50 km). Distance from RICS guidance[13].

11.4.66 For HGVs, there are two classes of vehicle; OGV1 (rigid vehicles with less than 4 axles) and OGV2 (rigid vehicles with four or more axles and all articulated vehicles). OGV2 vehicles are typically larger and therefore have higher emissions. For the purposes of the assessment is has been assumed that 50% of the HGVs are OGV1 and 50% are OGV2 vehicles.

11.4.67 Emissions have been calculated using GHG factors from DfT WebTAG data[3] which includes projections of fuel efficiency improvements for HGVs (OGV1 and OGV2) and LGVs, as well as the split of vehicle mileage by engine type for LGVs (petrol, diesel and electric).

11.4.68 The GHG emissions factors for construction transport are presented in Table 23.

[13] RICS (2017) Whole life carbon assessment for the built environment. 1st edition.

Table 23: Construction Transport Emissions Factors

Year	GHG Emissions Factor ($kgCO_2e/km$)		
	OGV1	OGV2	LGV
2025	0.481	0.960	0.194
2026	0.477	0.943	0.190
2027	0.473	0.926	0.186
2028	0.469	0.911	0.183
2029	0.465	0.897	0.179
2030	0.459	0.868	0.173

Construction Site Activities

11.4.69 Emissions from construction site activities (including fuel and energy use on the construction site and waste transport and disposal) have been estimated using project value, as guided by RICS whole life carbon guidance[13].

11.4.70 RICS guidance advises that construction emissions can be approximated by assuming 1,400 $kgCO_2e$ per £100,000 of project value.

11.4.71 The current cost estimate for the CADP1 works is £368M.

11.4.72 The data above has been used to calculate the total emissions from construction activities. This has then been apportioned equally to each of the construction years 2025-2030.