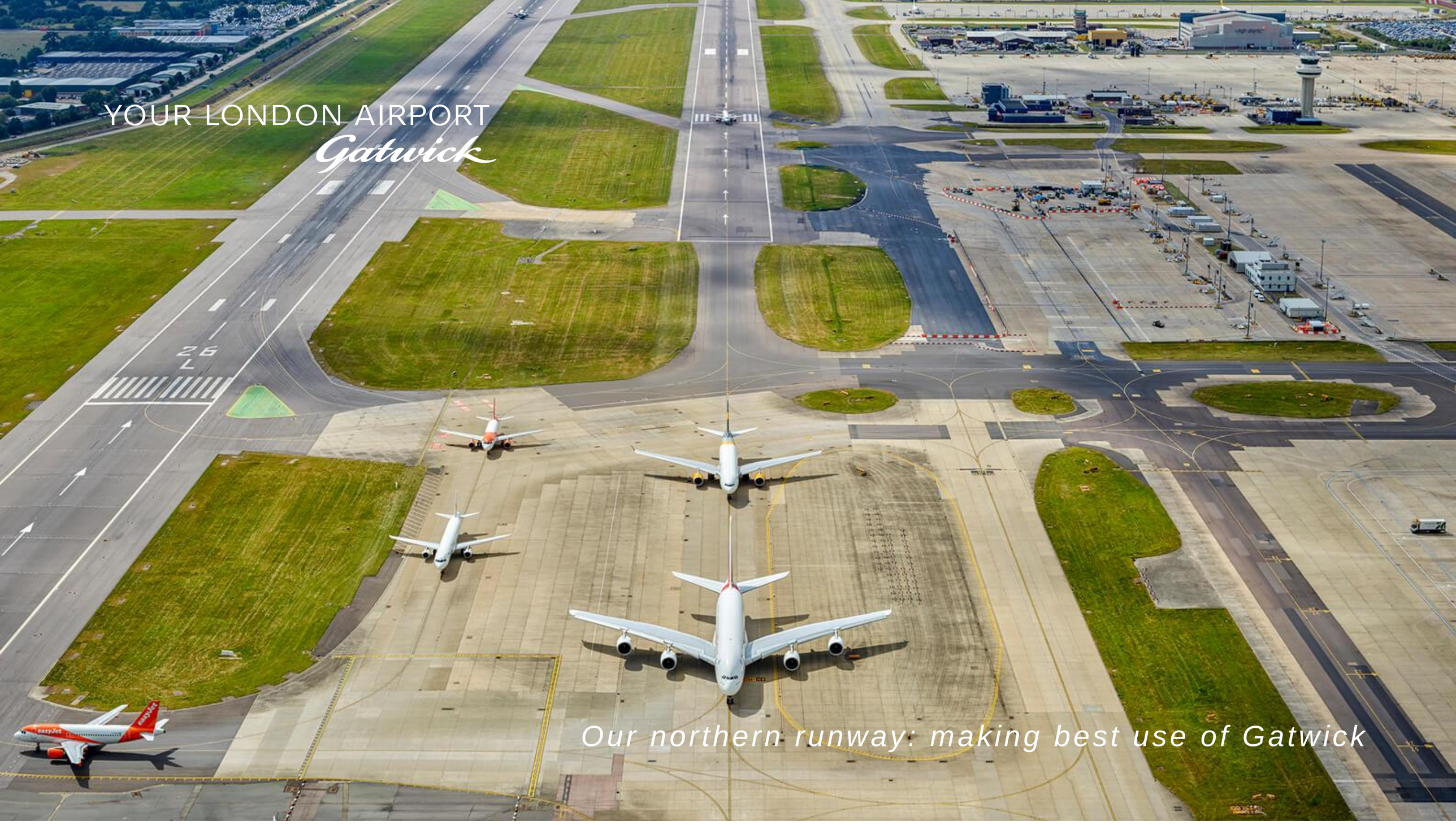

Our northern runway: making best use of Gatwick

Preliminary Environmental Information Report
Appendix 15.4.1: Climate Change and Carbon Technical Appendix

September 2021

Table of Contents

1 Introduction

1.1 General

1.1.1 This document forms Appendix 15.4.1 of the Preliminary Environmental Information Report (PEIR) prepared on behalf of Gatwick Airport Limited (GAL). The PEIR presents the preliminary findings of the Environmental Impact Assessment (EIA) process for the proposal to make best use of Gatwick Airport's existing runways (referred to within this report as 'the Project'). The Project proposes alterations to the existing northern runway which, together with the lifting of the current restrictions on its use, would enable dual runway operations. The Project includes the development of a range of infrastructure and facilities which, with the alterations to the northern runway, would enable the airport passenger and aircraft operations to increase. Further details regarding the components of the Project can be found in Chapter 5: Project Description.

1.1.2 This document provides the Climate Change and Carbon Technical Appendix for the Project.

2 Baseline Development

2.1 Data Sources for 2018 Baseline

2.1.1 The following activity data sources were used to develop the 2018 baseline.

Table 2.1.1: 2018 Baseline Data Sources

Data	Source	Provider
2018 air traffic movements (ATMs)	2018 ATMs Full List	Gatwick Airport Ltd
Passenger surface access	2018 Passenger survey report	Civil Aviation Authority (CAA, 2018)
Staff surface access	Gatwick Airport Staff survey 2016	Gatwick Airport Ltd
Freight surface access	Gatwick's Economic Contribution through Trade and Investment (Oxford Economics, 2018)	Gatwick Airport Ltd
London Gatwick (LGW) 2018 corporate Greenhouse Gas (GHG) reporting	Gatwick Airport Ltd 2018 Greenhouse Gas Assessment	Gatwick Airport Ltd
EU ETS reporting for Gatwick Airport Ltd for 2018	2018 ETS Fuel Report	Gatwick Airport Ltd
3rd party energy consumption	Written enquiries to 3rd parties within the airport	Gatwick Airport Ltd
Consented project parameters	Project description	Gatwick Airport Ltd
GHG intensity factors	Greenhouse gas reporting: conversion factors 2018	Department for Business, Energy & Industrial Strategy (BEIS)

3 Future Baseline Information

3.1 Data Sources for Future Baseline

3.1.1 In addition to data sources for the 2018 baseline the following data sources and forecasts have informed the future baseline development.

Table 3.1.1: 2018 Future Baseline Data Sources

Data	Source	Provider
Forecast ATMs	Development Consent Order (DCO) Primary Forecasts – Annual data sheets	Gatwick Airport Ltd
Passenger surface access	DCO Secondary Forecasts – Annual data sheets	Gatwick Airport Ltd
Staff surface access	DCO Secondary Forecasts – Annual data sheets	Gatwick Airport Ltd
Freight surface access	DCO Secondary Forecasts – Annual data sheets	Gatwick Airport Ltd
Project programme, workforce estimates, construction plant estimates	ConVehMod2021 v1.0	Gatwick Airport Ltd
Material quantity estimated by project	Portfolio Quantities	Gatwick Airport Ltd
Building footprints / areas, hotel capacity, car parking, consented projects	Project Description	Gatwick Airport Ltd
Water usage profile	Water usage profile	Gatwick Airport Ltd
GHG intensity factors	Greenhouse gas reporting: conversion factors 2021	Department for Business, Energy & Industrial Strategy (BEIS, 2021)

4 Baseline Methodology

4.1 Methodology Notes

4.1.1 An explanation of the methodology and assumptions for each element of the baseline assessment is set out below. Specific details on the timing and shift working on specific parts of the Project are not yet developed. Conservative assumptions have been made at a Project-wide level to estimate GHG emissions impacts.

Table 4.1.1: 2018 Methodology Notes

Activity	Methodology
Air transport	
GHGs arising from the landing and takeoff (LTO) cycle in the vicinity of the airport	Emissions from LTOs were calculated in line with the methodology as set out in Chapter 13: Air Quality.
GHGs arising from the climb, cruise and decent (CCD) phases of outgoing flights only	ATM data for 2018 was provided by Gatwick airport detailing the source/destination for all flights in 2018 along with details of aircraft type. These flights were then classed as UK/EU-ETS/non-EU International, and each was assigned a modelling category reflecting the type of aircraft/engine combination used. The EMEP/EEA Air Pollution Inventory Guidebook Additional File *1.A.3.a Aviation – Annex 5 – Master emission calculator 2019* (European Environment Agency, 2019) was then used to determine CCD emissions for outgoing flights only based on the aircraft modelling category, and on the estimated distance between Gatwick Airport and the destination airport, with an allowance for additional distance due to elevation from the earth's surface and impacts of non-direct routes (5% for short-haul flights and 6% for long-haul flights). Based on these the EMEP/EEA calculation methodology provided estimates of CO_2 emissions from each modelling category. These were aggregated to provide summary emissions totals for UK, EU ETS and non-EU International flights for the baseline year of 2018. Future forecast ATMs were then used to develop an estimate of future flight distances by aircraft modelling category (scaling 2018 total flight distances per modelling category by ATMs for UK, EU ETS and non-EU International categories) for 2029, 2032 and 2038 to scale the UK, EU and non-EU International CCD emissions to provide a forecast for the relevant year.
Surface access	
Passenger surface access	Passenger survey information developed by the CAA provides a percentage breakdown of source/destination for passengers, and a mode split by vehicle type of journeys. Based on passenger numbers this was converted into an estimated km distance travel by mode for 2018. For private cars occupancy was assumed at 2.4 people per vehicle, and for taxi usage assumed at 1.8 people per vehicle. BEIS conversion factors were then used to develop a footprint for 2018. Cars were assumed to be 'average vehicle' for private cars. Future passenger numbers for the period 2020-2038 were then used to scale total vehicle km by transport mode for future years. No mode shift has been assumed for the PEIR assessment although it is expected to incorporate mitigation of surface access emissions into the final ES. The efficiency and fleet mix for future years was based on Department for Transport (DfT) forecasts as set out in Table 6.3.1; GHG emissions were calculated using BEIS carbon factors for company reporting (using 2018 factors for the 2018 baseline, and using 2021 factors for future years). Calculation of emissions from road vehicles included all of tail pipe emissions, 'Wheel-to-tank' emissions, and Transmission and Distribution losses for electricity. An allowance was made to reflect improvements in fuel efficiency of vehicles, taken from WebTAG data book Table A1.3.10 (DfT, 2021b).
Staff surface access	Staff transport details for 2016 were received from the transport modelling consultants, based on a 2016 staff travel survey, providing a modal shift and distance breakdown across all employees based at Gatwick Airport (GAL and also 3rd party staff). The data represents a single/typical day in June 2016. No allowance was made for fluctuations across the year, this was assumed to be an average day in the year. Based on this, and using BEIS carbon factors, the 2018 baseline was developed. The staff surface access future baseline was then calculated based on scaling for future years based on passenger numbers under each scenario. The efficiency and fleet mix for future years was based on DfT forecasts as set out in Table 6.3.1; GHG emissions were calculated using BEIS carbon factors for company reporting. Calculation of emissions from road vehicles included all of tail pipe emissions, 'Wheel-to-tank' emissions, and Transmissions and Distribution losses for electricity. An allowance was made to reflect improvements in fuel efficiency of vehicles, taken from WebTAG data book Table A1.3.10 (DfT, 2021b).
Freight surface access	For this PEIR only cargo freight has been estimated. Tonnage of cargo freight was obtained from Gatwick Airport Ltd and an estimated transportation distance developed from the Oxford Economics study into Trade and Investment[1]. Transport was assumed as 100% Heavy Goods Vehicles (HGV) for an 'average laden' vehicle. Emissions were calculated using BEIS carbon factors. Emissions arising from freight associated with retail are not included in this assessment but will be include in the full ES. Decarbonisation effects on freight transport have not been included in the estimation of future years within this PEIR.

[1] https://www.gatwickairport.com/globalassets/business--community/new-community--sustainability/economy/20180621-gatwick-trade-report_oe_web.pdf

Activity	Methodology
Use of airport, buildings and facilities	
Energy and fuel use for buildings, Ground Support Equipment (GSE), Auxiliary Power Units (APUs), Ground Power Units (GPU), and Fixed Electrical Ground Power (FEGP)	The 2018 baseline for the assessment was developed based on reported energy consumption for the airport and 3rd parties based on the airport which have direct energy supply contracts. The future baseline for the airport energy consumption was developed based on assuming like-for-like energy consumption for existing buildings, plus the additional heating/cooling/power loads from new development. Further details on the Preliminary Energy Assessment and Strategy can be found in Appendix 5.2.1 of the PEIR.
Firefighting activities	These emissions have been developed using the methodology as set out in the Chapter 13: Air Quality.
Aircraft engine testing	These emissions have been developed using the methodology as set out in Chapter 13: Air Quality.
Potable water supply	Potable water supply has been forecast based on scaling the 2018 baseline consumption by passenger numbers. GHG emissions arising from these have been calculated using the BEIS carbon factor for 'Water supply'. The future baseline has assumed no change in the emissions intensity per m^3 supplied.
Pumping and treatment of wastewater	Energy consumption associated with pumping of wastewater has been included in the energy modelling for the airport. Emissions from wastewater treatment are based on scaling the 2018 wastewater discharge volumes by passenger numbers. GHG emissions arising from these have been calculated using the BEIS carbon factor for 'Water treatment'. The future baseline has assumed no change in the emissions intensity per m^3 supplied.
Waste treatment and disposal	Emissions from waste management are based on scaling the 2018 waste arisings volumes by passenger numbers. GHG emissions arising from these have been calculated using the BEIS carbon factors for 'Waste treatment' for Commercial and Industrial waste. The future baseline has assumed no change in the emissions intensity per m^3 supplied. A known limitation of this assessment is that it does not reflect all wastes from 3rd party operators within the airport, some of which have direct waste management contracts. Waste arisings also exclude those from British Airways and Virgin hangars, cargo facilities, and maintenance-related aircraft waste. Given the overall contribution from known waste quantities it is not expected that these omissions will materially change the assessment of impact.
Other aviation fuel usage	These emissions have been calculated using the methodology as set out in Chapter 13: Air Quality.
Construction emissions	
GHGs arising from the extraction, processing and manufacturing of construction materials	Floor areas of proposed development within the Capital Investment Plan as provided by Gatwick Airport Ltd and benchmarks used for estimating quantities of key construction materials within those building. Material quantities were converted to tonnes using typical density factors. Conversion factors from the ICE 3.0 database were used to calculate embodied emissions from the extraction, processing, manufacture of materials on a cradle-gate basis.
GHGs arising from transportation of materials from factory to site	Aggregated masses of construction materials were used based on the calculation process set out above. Based on typical HGV loading of 33 tonnes the number of vehicle trips required was calculated. An estimated distance of 330 km was used in the absence of more detailed information to calculate vehicle-km. Carbon emissions were then calculated based on BEIS conversion factors for average laden articulated HGV. Vehicle movements were assessed as two-way trips (at average loading)
GHGs arising from energy use in construction activities (ie operation of plant etc)	The estimated peak number of operators per month was obtained from the GAL Construction Team for the airport construction project. An assumption of 8 hours of plant operation per day, and 5 day working, was used to estimate total aggregated working hours of plant per year. Five representative plant types were used and published fuel consumption rates per hour of operation were used to calculate fuel consumption, which were then multiplied by BEIS conversion factors to develop an estimate of CO_2e emissions.
GHGs arising from transport and disposal of construction and demolition waste	Estimates of waste arisings from demolition and excavation were developed from the project material estimate provided by the GAL Construction Team. Waste quantities were averaged across the development period and an assumption made of 70% recycling offsite and 30% disposal to landfill. Waste quantities were multiplied by BEIS conversion factors for waste disposal to develop an estimate of CO2e emissions. For landfill the conversion factors cover emissions from waste collection, transport and landfill emissions and for recycling the conversion factors cover transport to an energy recovery or materials reclamation facility.
GHGs arising from surface access for construction staff arising from the Project	Peak workforce values were provided by GAL Construction Team. It is assumed that no staff live onsite during construction and all staff travel to work each day. Working days are assumed to follow a 5-day per week pattern. An average commuting distance of 35km was used representing mean distance for worker travel to site in the South East (CITB, 2019). A reasonable worst case assumption of 100% single occupancy car transport was used and BEIS conversion factors for car travel were used to estimate CO2e emissions.

4.2 Carbon Intensity Factors

4.2.1 The 2018 baseline GHG emissions arising from activities are based on the Greenhouse gas reporting: conversion factors 2018[2] developed by BEIS. These factors allow for the conversion of 'activity units' into emissions of either CO_2 and/or CO_2e. The conversion factors used in this assessment are presented in Table 4.2.1. For future baseline modelling the most recent BEIS factors (from 2021[3]) have been used.

4.2.2 It is acknowledged that the 2021 factors will change in future years, with implications for future forecast GHG emission. Where external trends suggest a continual reduction in GHG factors (eg through grid decarbonisation) then these have been modelled over time and incorporated into the future GHG emissions calculations.

4.2.3 The factors for electricity consumption and road vehicle use are influenced by external factors which is discussed in Section 6.

Table 4.2.1 2018 BEIS Conversion Factors

Activity	2018 factor	2021 factor	Unit
Average laden HGV (all HGVs)	0.11360	0.1075	$kgCO_2e$/tonne.km
Average Diesel car	0.17753	0.16843	$kgCO_2e$/km
Average Petrol car	0.18368	0.17431	$kgCO_2e$/km
Average Hybrid car	0.12568	0.11952	$kgCO_2e$/km
Average PHEV	0.12012	0.07054	$kgCO_2e$/km
Average Motorbike	0.11529	0.11355	$kgCO_2e$/km
Taxi - Regular	0.15344	0.14876	$kgCO_2e$/passenger.km
Taxi – Black cab	0.21420	0.20416	$kgCO_2e$/passenger.km
Average local Bus	0.10097	0.10227	$kgCO_2e$/passenger.km
National Rail	0.04424	0.03594	$kgCO_2e$/passenger.km
Wheel-to-tank Average Petrol Car	0.04985	0.04104	$kgCO_2e$/km
Wheel-to-tank Average Diesel Car	0.04196	0.04885	$kgCO_2e$/km
Wheel-to-tank Average Hybrid Car	0.03186	0.03132	$kgCO_2e$/km
Wheel-to-tank Average PHEV Car	0.02651	0.02657	$kgCO_2e$/km
Consumption of aviation fuel	2.53883	2.54514	$kgCO_2e$/litre
Consumption of aviation fuel[4]	2.51370	2.51973	$kgCO_2$/litre
Grid electricity	0.28307	0.21233	$kgCO_2e$/kWh
Natural gas consumption in buildings	0.20437	0.20297	$kgCO_2e$/kWh
Diesel consumption in plant (average biofuel blend)	0.26349	0.25165	$kgCO_2e$/kWh
Potable water supply	0.344	0.149	$kgCO_2e$/m3
Wastewater treatment	0.708	0.272	$kgCO_2e$/m3
Waste disposal: Recycling (average construction closed loop)	1.0192	0.989	$kgCO_2e$/tonne
Waste disposal: Landfill (average construction) - assumed	1.277	1.239	$kgCO_2e$/tonne
Waste disposal: Recycling (Commercial and Industrial waste closed loop)	21.3842	21.294	$kgCO_2e$/tonne
Waste disposal: Landfill (Commercial and Industrial waste)	99.7729	467.046	$kgCO_2e$/tonne
Waste disposal: Landfill (typical, excluding soils, mineral oil, plasterboard, tyres, wood)	1.277	1.239	$kgCO_2e$/tonne

4.2.4 Carbon emissions factors vary over time and are published annually by UK Government for use in relation to corporate reporting of that specific year's emissions. Future emissions factors will differ from these, and in many cases will reduce in line with wider national trends towards decarbonisation, and through improved efficiency of vehicles etc. The significant expected future effects (electricity decarbonisation, vehicle efficiency) are reflected in the individual future baseline and assessment models.

4.2.5 The estimation of GHG emission arising from the extraction, processing and manufacture of construction materials are based on the emissions factors set out in Table 5.1.2. No assessment of mitigation through the choice of specific materials has yet been made – this will be considered in the ES when the Project design is more developed.

[2] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2018

[3] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021

[4] aviation fuel is converted into either CO_2 or CO_2e depending on the context of the assessment (CO2 used for aviation emissions reporting)

Table 4.2.2 Construction Material Assumptions

Material	ICE Database[5] Description	Embodied emissions ($kgCO_2e/kg$)	Source
Pavement concrete	General in-situ concrete	0.10	ICE 3.0 (2019)
Structural concrete	25% blast furnace slag, RC40/50	0.14	ICE 3.0 (2019)
Mastic asphalt	Mastic asphalt	0.10	ICE 3.0 (2019)
Hot rolled asphalt	Asphalt, for roads	0.02	ICE 3.0 (2019)
Aggregate	Aggregates and sand	0.02	ICE 3.0 (2019)
Soil	General (rammed) soil	0.02	ICE 3.0 (2019)
Aluminium	Aluminium sheet, European mix	6.58	ICE 3.0 (2019)
Steel	Engineering steel	1.27	ICE 3.0 (2019)

5 2018 Baseline

5.1 Summary of Baseline Emissions

5.1.1 The 2018 baseline is set out in Table 5.1.1 to Table 5.1.3. Construction emissions are assumed as zero for the baseline assessment.

Table 5.1.1: 2018 Baseline: Air Transport

Activity	2018 baseline emissions ($MtCO_2e$)
Air transport	
UK domestic flights LTO CCD Total	 0.027 0.050 0.077
Non-domestic EEA flights LTO CCD	 0.225 1.346
Total	1.571
Non-EEA International flights LTO CCD Total	 0.146 2.927 3.073
Traded flight emissions (UK+EEA)	1.648
Non-traded flight emissions (Non EEA International)	3.073
Total international flight emissions	4.644
Total air transport emissions	4.721

Table 5.1.2: 2018 baseline: Surface Access

Activity	2018 baseline emissions ($MtCO_2e$)
Surface access	
Passenger surface access	0.256
Staff surface access	0.048
Freight surface access	0.004
Total surface access emissions	**0.308**

Table 5.1.3: 2018 Baseline: Other Usage

Activity	2018 baseline emissions ($MtCO_2e$)
Use of airport, buildings and facilities ('other usage')	
Energy and fuel use for buildings, GSE, APUs, GPU, FEGP, firefighting and engine testing	0.0799
Potable water supply	0.0002
Pumping and treatment of wastewater	0.0005
Waste treatment and disposal	0.0004
Total other usage emissions	**0.0810**

5.2 Traded and Non-traded Sector Emissions

5.2.1 The Airports National Policy Statement (NPS) (Department for Transport, 2018), requires emissions to be split into traded sector and non-traded sector. 'Traded' emissions are those that fall under Emissions Trading schemes. Until 2021 the UK participated in the EU ETS, which was replaced with the UK ETS in 2021.

5.2.2 Traded emissions included in this reporting (under both the historic EU ETS participation, and the current UK ETS) are:

- Emissions for departing flights which are domestic flights, or intra-EEA flights
- Emissions which fall under Gatwick Airport Ltd EU ETS reporting

5.2.3 Other emissions which fall under EU or UK ETS are considered beyond the scope of this assessment (including industrial emissions from manufacturing facilities for construction materials, and emissions associated with power generation outside the operations of Gatwick Airport).

5.2.4 The majority of EU ETS emissions associated with operation of Gatwick Airport, excluding emissions from aviation, arise from combustion of natural gas. In 2018 EU ETS reporting for Gatwick Airport Ltd the emissions from natural gas consumption represented 98% of reported EU ETS emissions. A small portion (2%) arises from use of fuels (gas oil and propane). EU ETS emissions for 3rd parties operating in the airport have not been estimated and are assumed to be small compared to the traded sector emissions from Gatwick Airport Ltd. Emissions associated with electricity for use in private electric vehicles (from transmission and distribution) have been excluded from the reported traded emissions.

5.2.5 The 2018 traded sector emissions are shown in Table 5.2.1.

[5] Material descriptions as set out in Circular Ecology Ltd. & University of Bath (2019) Embodied energy and carbon – The ICE database version 3.

Table 5.2.1: 2018 Traded Sector Emissions

Emissions category	2018 baseline emissions ($MtCO_2e$)
Traded emissions	
Departing domestic and intra-EEU flights	1.648
GAL EU ETS emissions	0.010
Total traded emissions	1.658

6 Future Baseline and Assessment Assumptions

6.1 Methodology of Future Baseline and Assessments

6.1.1 Generally the development of the future baseline and the assessment scenarios follow the same approach as for development of the baseline year, albeit activity data for future years is developed from a range of data sources provided by Gatwick Airport Ltd and the project design team, including specialists such as transport consultants and air quality specialists.

6.1.2 Construction was zero in the 2018 baseline, and for the future baseline considers only projects that are expected to be brought forward under existing consenting. The methodology for assessing the future baseline and assessment for construction activities is set out below.

Table 6.1.1: Future baseline and assessment assumptions

Activity	Methodology
Construction	
GHGs arising from the extraction, processing and manufacturing of construction materials	Floor areas of proposed development were provided by Gatwick Airport Ltd and benchmarks used for estimating quantities of key construction materials within those building. Material quantities were converted to tonnes using typical density factors. Conversion factors from the ICE 3.0 database were used to calculate embodied emissions from the extraction, processing, manufacture of materials on a cradle-gate basis.
GHGs arising from transportation of materials from factory to site	Aggregated masses of construction materials were used based on the calculation process set out above. Based on typical HGV loading of 33 tonnes the number of vehicle trips required was calculated. An estimated distance of 330 km was used in the absence of more detailed information to calculate vehicle-km. Carbon emissions were then calculated based on BEIS conversion factors for average laden articulated HGV. Vehicle movements were assessed as two-way trips (one full vehicle and one empty vehicle)
GHGs arising from energy use in construction activities (ie operation of plant etc)	The estimated peak number of operators per month was obtained from the GAL Construction Team for the airport construction project. An assumption of 8 hours of plant operation per day, and 5 day working, was used to estimate total aggregated working hours of plant per year. Five representative plant types were used and published fuel consumption rates per hour of operation were used to calculate fuel consumption, which were then multiplied by BEIS conversion factors to develop an estimate of CO_2e emissions.
GHGs arising from transport and disposal of construction and demolition waste	Estimates of waste arisings from demolition and excavation were developed from the project material estimate provided by the GAL Construction Team. Waste quantities were averaged across the development period and an assumption made of 70% recycling offsite and 30% disposal to landfill. Waste quantities were multiplied by BEIS conversion factors for waste disposal to develop an estimate of CO2e emissions. For landfill the conversion factors cover emissions from waste collection, transport and landfill emissions and for recycling the conversion factors cover transport to an energy recovery or materials reclamation facility.
GHGs arising from surface access for construction staff arising from the Project	Peak workforce values were provided by GAL Construction Team. It is assumed that no staff live onsite during construction and all staff travel to work each day. Working days are assumed to follow a 5-day per week pattern. An average commuting distance of 35km was used representing mean distance for worker travel to site in the South East (CITB, 2019). A reasonable worst case assumption of 100% single occupancy car transport was used and BEIS conversion factors for car travel were used to estimate CO2e emissions.

6.2 Grid decarbonisation assumptions

6.2.1 The future decarbonisation of the national grid is an influence on future emissions from the airport. The source of information used for this is the UK Government Green Book supplementary guidance: valuation of energy use and greenhouse gas emissions (BEIS, 2019) for appraisal which provides forecasts for the carbon intensity of grid electricity in the future. This was most recently updated in April 2019; from which Table 6.2.1 provides carbon intensities for grid electricity.

Table 6.2.1: Green Book Supplementary Guidance – Table 1: Grid Average Commercial/Public Sector Consumption-Based Emissions Factors (extract)

Year	Factor ($kgCO_2e/kWh$)
2018	0.177
2019	0.143
2020	0.138
2021	0.113
2022	0.105
2023	0.110
2024	0.102
2025	0.103
2026	0.097
2027	0.103
2028	0.098
2029	0.090
2030	0.081

Year	Factor (kgCO_2e/kWh)
2031	0.072
2032	0.060
2033	0.056
2034	0.048
2035	0.040
2036	0.040
2037	0.040
2038	0.040

6.3 Future Vehicle Fleet

6.3.1 The future make-up of the UK vehicle fleet has been taken from the UK Government TAG data book Table A 1.3.9 (BEIS, 2021a) which provides proportions of vehicle kilometres by fuel type for the period to 2038. The data are represented in Table 6.3.1.

Table 6.3.1: Web TAG Data Book – Table A 1.3.9 (extract)

Year	Cars		
	Petrol	Diesel	Electric
2018	48.10%	51.20%	0.70%
2019	48.34%	50.72%	0.93%
2020	48.69%	50.11%	1.19%
2021	48.97%	49.32%	1.71%
2022	49.25%	48.40%	2.35%
2023	49.53%	47.33%	3.13%
2024	49.80%	46.13%	4.08%
2025	49.97%	44.74%	5.28%
2026	50.00%	43.23%	6.76%
2027	49.89%	41.64%	8.47%
2028	49.67%	40.05%	10.28%
2029	49.33%	38.48%	12.19%
2030	48.80%	36.91%	14.29%
2031	48.17%	35.47%	16.36%
2032	47.45%	34.16%	18.39%
2033	46.65%	32.97%	20.38%
2034	45.79%	31.86%	22.34%
2035	44.90%	30.86%	24.24%
2036	43.99%	29.93%	26.08%
2037	43.06%	29.07%	27.87%
2038	42.13%	28.28%	29.59%

6.4 Surface Access Assumptions

6.4.1 The future surface access passenger/vehicle transport modes and distances have been linearly scaled in line with forecast passenger growth. The modal split has been assumed to remain the same as for the 2018 baseline, although this assumption will be re-examined as part of the production of the final ES. Resultant emissions have been calculated accounting for the changes in future vehicle fleet and improvements in vehicle efficiency set out in Table 6.3.1.

6.5 Construction Material Assumptions

6.5.1 In the absence of detailed design information benchmark building and infrastructure metrics set out in Table 6.5.1 have been applied to convert footprint estimates to material quantities.

Table 6.5.1: Assumed Building Material Quantity Benchmarks

Building type	Concrete (m3/m2)	Steel section & beams (tonne/m2)	Cladding (m2/m2)	Roofing (m2/m2)
Terminal	1.149	0.212	0.101	0.274
Pier	1.475	0.084	0.475	0.274
Multi Storey Car Park	0.617	0.046	0.038	0.274
Ancillary	1.475	0.084	0.475	0.274

6.6 Construction Waste Generation

6.6.1 All forecast material arising from demolition, breakout of existing surfaces, or excavation is assumed to be disposed offsite (albeit with high recycling rates). In reality mitigation is likely to identify on-site reuse/recycling of much of this material, however, that reuse has not taken into account within the PEIR. It will be considered and assessed within the ES.

6.6.2 No assumption has been made at this stage for construction material wastage and this has been assumed as zero for the PEIR assessment. This will be reviewed in preparation for the ES.

6.7 Freight, Construction Transport and Waste Transport

6.7.1 Vehicle transport distances have been calculated based on forecast growth in freight, and the construction and waste estimates set out above. The efficiency and fleet fuel mix of HGVs has been assumed as constant throughout the assessment period.

6.8 Energy Strategy

6.8.1 Gatwick airport is currently developing its future energy strategy. The interim outputs from this work have been used to inform the future baseline and future assessed scenarios in terms of energy and fuel use in the airport.

6.8.2 The energy model has included forecast energy demand from new development, as set out in Chapter 5: Project Description, and the associated increases in heating and cooling loads associated with increase passengers and ATMs under both the do-minimum and the do-something scenarios.

6.8.3 The energy modelling has considered a number of measures to reduce the overall building energy emissions in future. These are summarised in Table 6.8.1.

Table 6.8.1: Energy Model Assumptions

Energy component	Modelling assumption
Energy efficiency improvements	Limited improvements to the existing estate
New building performance	20% improvement in new buildings over current benchmarks
Heating strategy (existing buildings)	Heating technology remains as is, but with improvements in gas boiler efficiencies
Heating strategy (new buildings)	Use of air source heat pumps supplying 100% of annual heat
Cooling strategy (existing and new)	Increase in cooling plant efficiency by 21% between 2020 and 2035
Electrification of vehicles	30% electrification of airside vehicles by 2040
Onsite solar photovoltaic	Installation of 5MWp on canopies on some open car parking areas

6.9 Aviation Emissions

6.9.1 Aviation emissions in future years have been assumed to grow in line with the main project forecasts and have been calculated to

reflect the expected split in domestic and international flights and aircraft fleet mix.

6.9.2 Aircraft efficiencies are represented within calculations up to 2038 based on expected changes in aircraft fleet through this period. After 2038 aircraft emissions are calculated based on changes in ATMs only through to 2050, and are additionally calculated incorporating a 1.4% p.a. efficiency in line with the Balanced Pathway Scenario within the CCC Sixth Carbon Budget report (CCC, 2020).

7 Future Baseline Emissions by Category

7.1 Introduction

7.1.1 The future baseline, in the absence of the Project, has been developed in line with the methodology and assumptions set out in Section 6 of this Appendix. The tables below set out the detailed estimation of emission for the future baseline scenario.

7.2 Construction

7.2.1 Several construction projects will be taken forward in the absence of the Project, under existing consents, as detailed in the Project Description in Chapter 5. Principally these are:

- the construction of an extension to Pier 6
- construction of an extension to South Terminal International Departures
- construction of two multi-storey car parks
- extensions to two hotels within the boundary of the airport

7.2.2 Other consented works have not been included in the future baseline assessment at this stage but will be reviewed and considered for inclusion in the Environmental Statement. These are not considered likely to be of such scale as to affect the overall assessment of impact.

7.2.3 Construction related emissions have been calculated across six source categories:

- embodied carbon in the extraction and manufacture of materials/products;
- operation of plant for construction, including operation of the construction compounds;
- transportation of construction materials to the Project site;
- transportation of construction workers to/from the Project site;
- construction waste management; and
- water us in construction.

7.2.4 The future construction-related emissions for the Project are presented in these categories in Table 7.2.1 to Table 7.2.6.

Table 7.2.1: Project Construction Emissions for Embodied Carbon of Materials

Year	Embodied carbon of construction materials (cradle-gate) ktCO2e
2019	0.00
2020	0.00
2021	26.41
2022	26.41
2023	11.83
2024	0.00
2025	0.00
2026	0.00
2027	0.00
2028	0.00
2029	0.00
2030	0.00
2031	0.00
2032	0.00
2033	0.00
2034	0.00
2035	0.00
2036	0.00
2037	0.00
2038	0.00

Table 7.2.2: Project Construction Emissions for Energy Use during Construction

Year	Construction energy (ktCO2e)
2019	0.00
2020	0.00
2021	7.73
2022	7.73
2023	3.46
2024	0.00
2025	0.00
2026	0.00
2027	0.00
2028	0.00
2029	0.00
2030	0.00
2031	0.00
2032	0.00
2033	0.00
2034	0.00
2035	0.00
2036	0.00
2037	0.00
2038	0.00

Table 7.2.3: Project Construction Emissions for Transportation of Materials

Year	Transportation of construction materials (ktCO2e)
2019	0.00
2020	0.00
2021	4.88
2022	4.88
2023	2.18
2024	0.00
2025	0.00
2026	0.00
2027	0.00
2028	0.00
2029	0.00
2030	0.00
2031	0.00
2032	0.00
2033	0.00
2034	0.00
2035	0.00
2036	0.00
2037	0.00
2038	0.00

Table 7.2.4: Project Construction Emissions for Commuting of Construction Workers

Year	Construction worker transport (ktCO2e)
2019	0.00
2020	0.00
2021	0.79
2022	0.79
2023	0.35
2024	0.00
2025	0.00
2026	0.00
2027	0.00
2028	0.00
2029	0.00
2030	0.00
2031	0.00
2032	0.00
2033	0.00
2034	0.00
2035	0.00
2036	0.00
2037	0.00
2038	0.00

Table 7.2.5 Project Construction Emissions for Construction Waste Management

Year	Construction waste management (ktCO2e)
2019	0.00
2020	0.00
2021	1.62
2022	1.62
2023	0.73
2024	0.00
2025	0.00
2026	0.00
2027	0.00
2028	0.00
2029	0.00
2030	0.00
2031	0.00
2032	0.00
2033	0.00
2034	0.00
2035	0.00
2036	0.00
2037	0.00
2038	0.00

Table 7.2.6 Project Construction Emissions for Water Use in Construction

Year	Construction water use (ktCO2e)
2019	0.00
2020	0.00
2021	0.01
2022	0.01
2023	0.00
2024	0.00
2025	0.00
2026	0.00
2027	0.00
2028	0.00
2029	0.00
2030	0.00
2031	0.00
2032	0.00
2033	0.00
2034	0.00
2035	0.00
2036	0.00
2037	0.00
2038	0.00

7.3 Airport Operation

7.3.1 Emissions from energy consumption for operation of airport buildings, 3rd party buildings within the study area, and use of fuel in vehicles and equipment are set out in Table 7.3.1.

Table 7.3.1: Emissions from Energy Use

Year	Operational emissions by source (ktCO2e)				
	Grid electricity (Gatwick Airport Ltd)	Grid electricity (3rd parties)	Natural Gas (Gatwick Airport Ltd)	Natural Gas (3rd parties)	Fuel use of vehicles
2018	24.24	2.54	10.52	3.38	7.69
2019	18.46	2.64	9.77	4.07	7.15
2020	1.52	2.54	0.83	4.07	0.93
2021	9.20	2.08	6.00	4.07	5.33
2022	10.05	1.93	7.02	4.07	5.74
2023	11.72	2.02	7.78	4.07	5.99
2024	11.89	1.88	8.40	4.07	6.21
2025	12.94	1.90	8.97	4.07	6.47
2026	12.96	1.78	9.49	4.07	6.77
2027	14.70	1.90	9.99	4.07	7.05
2028	14.62	1.87	10.40	4.38	7.25
2029	13.44	1.72	10.27	4.38	7.14
2030	12.24	1.55	10.28	4.38	7.05
2031	10.88	1.37	10.39	4.38	6.95
2032	9.24	1.16	10.50	4.46	6.86
2033	8.63	1.08	10.58	4.46	6.77
2034	7.54	0.94	10.65	4.46	6.68
2035	6.29	0.78	10.73	4.46	6.58
2036	6.34	0.78	10.81	4.46	6.49
2037	6.38	0.78	10.90	4.46	6.39
2038	6.43	0.78	10.98	4.46	6.30

7.4 Water, Waste Water and Waste Management

7.4.1 Emissions from potable water, waste water treatment and waste management are set out in Table 7.4.1.

Table 7.4.1: Emissions from Water Supply, Wastewater Treatment and Waste Management

Year	Operational emissions by source (ktCO2e)		
	Water supply	Waste water treatment	Waste management
2018	0.237	0.450	0.294
2019	0.243	0.462	0.302
2020	0.108	0.182	0.311
2021	0.111	0.187	0.319
2022	0.114	0.192	0.328
2023	0.117	0.197	0.336
2024	0.120	0.202	0.344
2025	0.123	0.207	0.352
2026	0.126	0.211	0.361
2027	0.131	0.220	0.376
2028	0.136	0.229	0.391
2029	0.141	0.238	0.406
2030	0.143	0.240	0.410
2031	0.144	0.243	0.414
2032	0.146	0.245	0.418
2033	0.147	0.248	0.422
2034	0.148	0.250	0.426
2035	0.150	0.252	0.430
2036	0.151	0.255	0.434
2037	0.153	0.257	0.439
2038	0.154	0.259	0.443

7.5 Other Fuel Use

7.5.1 Emissions from other fuel uses within the study area are set out in Table 7.5.1.

Table 7.5.1: Emissions from Other Fuel Uses

Year	Operational emissions by source (ktCO2e)			
	APUs	Engine testing	GSE	Fire training
2018	22.63	0.34	8.49	0.07
2019	22.80	0.34	8.44	0.07
2020	22.98	0.34	8.38	0.07
2021	23.16	0.34	8.33	0.07
2022	23.33	0.35	8.27	0.07
2023	23.51	0.35	8.22	0.07
2024	23.69	0.35	8.16	0.07
2025	23.87	0.35	8.11	0.07
2026	24.04	0.36	8.05	0.07
2027	24.22	0.36	7.99	0.07
2028	24.40	0.36	7.94	0.07
2029	24.57	0.36	7.88	0.07
2030	24.29	0.36	7.78	0.07
2031	24.00	0.35	7.68	0.07
2032	23.71	0.35	7.58	0.07
2033	23.68	0.35	7.48	0.07
2034	23.64	0.35	7.37	0.07
2035	23.60	0.35	7.27	0.07
2036	23.57	0.35	7.16	0.07
2037	23.53	0.34	7.06	0.07
2038	23.49	0.34	6.95	0.07

7.6 Surface Access

7.6.1 Surface access emissions are set out in Table 7.6.1.

Table 7.6.1: Emissions from Surface Access

Year	Surface access emissions by type (ktCO2e)		
	Passengers	Staff	Freight
2018	256.16	48.42	3.56
2019	260.35	47.93	3.68
2020	262.74	47.50	3.79
2021	266.98	47.10	3.91
2022	270.97	46.65	4.03
2023	275.29	46.33	4.15
2024	279.59	46.03	4.27
2025	283.48	45.61	4.39
2026	287.86	45.38	4.51
2027	297.80	45.64	4.72
2028	307.29	45.80	4.93
2029	317.22	46.12	5.14
2030	318.46	45.78	5.21
2031	319.40	45.36	5.28
2032	320.95	45.13	5.34
2033	322.64	44.95	5.41
2034	324.00	44.67	5.48
2035	325.90	44.56	5.55
2036	327.88	44.47	5.61
2037	329.49	44.28	5.68
2038	331.59	44.24	5.75

7.7 Aircraft Emissions

7.7.1 Future baseline emissions from aviation are set out in Table 7.7.1.

Table 7.7.1: Emissions from Aviation

Year	Aviation emissions (ktCO2e)					
	UK		Non-domestic EEA		Non-EEA International	
	LTO	CCD	LTO	CCD	LTO	CCD
2018	27.2	49.5	225.2	1,345.9	145.9	2,927.5
2019	26.9	49.3	226.9	1,360.9	147.1	2,986.3
2020	3.3	6.2	28.8	173.5	18.7	384.1
2021	19.2	35.7	168.6	1,018.1	109.4	2,272.4
2022	21.8	40.9	195.5	1,184.4	126.9	2,665.0
2023	23.9	45.1	218.4	1,327.2	141.8	3,010.1
2024	25.3	48.0	235.5	1,435.5	153.0	3,280.6
2025	25.0	47.7	237.2	1,450.4	154.1	3,339.4
2026	24.7	47.5	238.9	1,465.4	155.3	3,398.3
2027	24.4	47.2	240.7	1,480.3	156.5	3,457.1
2028	24.0	47.0	242.4	1,495.2	157.7	3,516.0
2029	23.7	46.7	244.1	1,510.2	158.9	3,574.8
2030	23.5	46.5	241.1	1,507.5	154.8	3,573.2
2031	23.3	46.3	238.2	1,504.9	150.7	3,571.5
2032	23.1	46.1	235.2	1,502.2	146.7	3,569.8
2033	23.1	45.9	235.2	1,506.6	146.7	3,602.7
2034	23.1	45.7	235.2	1,511.0	146.7	3,635.7

Year	Aviation emissions (ktCO2e)					
	UK		Non-domestic EEA		Non-EEA International	
	LTO	CCD	LTO	CCD	LTO	CCD
2035	23.1	45.5	235.2	1,515.4	146.7	3,668.6
2036	23.1	45.2	235.2	1,519.8	146.7	3,701.5
2037	23.1	45.0	235.2	1,524.1	146.7	3,734.5
2038	23.1	44.8	235.2	1,528.5	146.7	3,767.4

7.8 Future Traded Sector Emissions

7.8.1 Traded emissions in the future baseline from aviation and from operation of the airport by Gatwick Airport Ltd are presented in Table 7.8.1.

Table 7.8.1: Traded Sector Emissions in the Absence of the Project

Year	Traded sector emissions (ktCO2e)
2018	1,658.3
2019	1,673.7
2020	212.7
2021	1,247.6
2022	1,449.6
2023	1,622.5
2024	1,752.7
2025	1,769.3
2026	1,785.9
2027	1,802.5
2028	1,819.0
2029	1,834.0
2030	1,828.9
2031	1,823.0
2032	1,817.1
2033	1,821.3
2034	1,825.6
2035	1,829.8
2036	1,834.1
2037	1,838.4
2038	1,842.6

8 Assessment of Effects from Project Construction

8.1 Categorised Project Construction Emissions

8.1.1 Construction related emissions have been calculated across six source categories:

- embodied carbon in the extraction and manufacture of materials/products;
- operation of plant for construction, including operation of the construction compounds;
- transportation of construction materials to the Project site;
- transportation of construction workers to/from the Project site;
- construction waste management; and
- water use in construction.

8.1.2 The future construction-related emissions for the Project are presented in these categories in Table 8.1.1 to Table 8.1.6.

Table 8.1.1: Project Construction Emissions for Embodied Carbon of Materials

Year	Embodied carbon of construction materials (cradle-gate) ktCO2e
2019	0.00
2020	0.00
2021	0.00
2022	0.00
2023	0.00
2024	117.14
2025	166.61
2026	82.67
2027	67.31
2028	67.98
2029	62.18
2030	95.48
2031	163.68
2032	111.62
2033	46.22
2034	0.00
2035	0.00
2036	0.00
2037	0.00
2038	0.00

Table 8.1.2: Project Construction Emissions for Energy Use during Construction

Year	Construction energy (ktCO2e)
2019	0.00
2020	0.00
2021	0.00
2022	0.00
2023	0.00
2024	33.05
2025	29.65
2026	51.81
2027	43.57
2028	46.09
2029	35.69
2030	18.39
2031	14.40
2032	11.91
2033	7.92
2034	4.05
2035	3.11
2036	0.00
2037	0.00
2038	0.00

Table 8.1.3: Project Construction Emissions for Transportation of Materials

Year	Transportation of construction materials (ktCO2e)
2019	0.00
2020	0.00
2021	0.00
2022	0.00
2023	0.00
2024	22.73
2025	47.45

Year	Transportation of construction materials (ktCO2e)
2026	24.96
2027	13.34
2028	15.59
2029	12.59
2030	15.92
2031	24.48
2032	13.82
2033	5.33
2034	3.70
2035	0.06
2036	0.00
2037	0.00
2038	0.00

Table 8.1.4: Project Construction Emissions for Commuting of Construction Workers

Year	Construction worker transport (ktCO2e)
2019	0.00
2020	0.00
2021	0.00
2022	0.18
2023	0.74
2024	3.33
2025	2.79
2026	4.04
2027	3.51
2028	3.59
2029	3.29
2030	3.15
2031	2.10
2032	1.39
2033	0.92
2034	0.56
2035	0.48
2036	0.00
2037	0.00
2038	0.00

Table 8.1.5: Project Construction Emissions for Construction Waste Management

Year	Construction waste management (ktCO2e)
2019	0.00
2020	0.00
2021	0.00
2022	0.00
2023	0.00
2024	10.46
2025	24.05
2026	12.67
2027	3.12
2028	2.84
2029	3.62
2030	3.82
2031	3.74
2032	0.01
2033	0.01
2034	0.01
2035	0.01
2036	0.00
2037	0.00
2038	0.00

Table 8.1.6: Project Construction Emissions for Water Use in Construction

Year	Construction water use (ktCO2e)
2019	0.00
2020	0.00
2021	0.00
2022	0.00
2023	0.00
2024	0.03
2025	0.06
2026	0.05
2027	0.04
2028	0.05
2029	0.03
2030	0.04

Year	Construction water use (ktCO2e)
2031	0.01
2032	0.01
2033	0.00
2034	0.00
2035	0.00
2036	0.00
2037	0.00
2038	0.00

8.2 Construction Emissions Time Series

8.2.1 The aggregated construction emissions are presented in Table 8.2.1.

Table 8.2.1: Aggregated Project Construction Emissions by Year

Year	Aggregated construction emissions (ktCO2e)
2019	0.00
2020	0.00
2021	0.00
2022	0.18
2023	0.74
2024	186.74
2025	270.60
2026	176.20
2027	130.87
2028	136.13
2029	117.41
2030	136.79
2031	208.41
2032	138.76
2033	60.41
2034	41.15
2035	5.59
2036	0.00
2037	0.00
2038	0.00

8.3 2029 Assessment of Construction Emissions

8.3.1 The 2029 construction assessment is set out in Table 8.3.1.

Table 8.3.1: 2029 Assessment of Construction

Activity	Construction emissions (ktCO2e)
Construction	
GHGs arising from the extraction, processing and manufacturing of construction materials	62.18
GHGs arising from energy use in construction activities (ie operation of plant etc)	35.69
GHGs arising from transportation of materials from factory to site	12.59
GHGs arising from surface access for construction staff arising from the Project	3.29
GHGs arising from waste management of construction and demolition waste	3.62
Water use in construction	0.03
Total construction emissions	**117.41**

8.4 2038 Assessment of Construction Emissions

8.4.1 There is no construction within the Project in 2038 and therefore all construction emissions are taken to be zero.

8.5 Aggregated Construction Emissions

8.5.1 The aggregated construction emission across the full construction period for the Project (excluding baseline construction emissions) and incorporating all sources set out above, are **1,610 ktCO$_2$e**.

9 Assessment of Effects from Operation with the Project

9.1 Airport Operation

9.1.1 Emissions from energy consumption for operation of airport buildings, 3rd party buildings and use of fuel in vehicles and equipment for the Project are set out in Table 9.1.1.

Table 9.1.1: Emissions from Energy Use

Year	Operational emissions by source (ktCO2e)				
	Grid electricity (Gatwick Airport Ltd)	Grid electricity (3rd parties)	Natural Gas (Gatwick Airport Ltd)	Natural Gas (3rd parties)	Fuel use of vehicles
2018	24.24	2.54	10.52	3.38	7.69
2019	18.23	2.64	9.01	4.07	6.96
2020	1.39	2.54	0.73	4.07	0.90
2021	9.03	2.08	3.27	4.07	5.03
2022	9.83	1.93	3.61	4.07	5.34
2023	11.42	2.02	3.79	4.07	5.48
2024	11.52	1.88	3.87	4.07	5.59
2025	12.49	1.90	3.91	4.07	5.72
2026	12.49	1.78	3.99	4.07	5.87
2027	14.11	1.90	3.97	4.07	5.99
2028	14.07	2.02	3.94	5.01	6.03
2029	13.87	2.09	3.55	5.46	6.18
2030	13.29	1.89	3.34	5.46	6.25
2031	12.33	1.66	3.17	5.46	6.29
2032	10.87	1.49	3.00	6.08	6.27
2033	10.15	1.38	2.84	6.08	6.01
2034	8.89	1.20	2.66	6.08	5.75
2035	7.40	0.99	2.49	6.08	5.49
2036	7.46	0.99	2.33	6.08	5.23
2037	7.53	0.99	2.16	6.08	4.96
2038	7.59	0.99	1.99	6.08	4.70

9.2 Water, Wastewater and Waste Management

9.2.1 Emissions from potable water, wastewater treatment and waste management for the Project are set out in Table 9.2.1.

Table 9.2.1: Emissions from Water Supply, Wastewater Treatment and Waste Management

Year	Operational emissions by source (ktCO2e)		
	Water supply	Wastewater treatment	Waste management
2018	0.237	0.450	0.294
2019	0.243	0.462	0.302
2020	0.108	0.182	0.311
2021	0.111	0.187	0.319
2022	0.114	0.192	0.328
2023	0.117	0.197	0.336
2024	0.120	0.202	0.344
2025	0.123	0.207	0.352
2026	0.126	0.211	0.361
2027	0.134	0.226	0.385
2028	0.143	0.240	0.410
2029	0.151	0.255	0.435
2030	0.155	0.261	0.446
2031	0.159	0.268	0.457
2032	0.163	0.275	0.468
2033	0.167	0.281	0.480
2034	0.171	0.288	0.491
2035	0.175	0.294	0.502
2036	0.179	0.301	0.513
2037	0.183	0.307	0.525
2038	0.187	0.314	0.536

9.3 Other fuel use

9.3.1 Emissions from other fuel uses for the Project are set out in Table 9.3.1

Table 9.3.1: Emissions from Other Fuel Uses

Year	Operational emissions by source (ktCO2e)			
	APUs	Engine testing	GSE	Fire training
2018	22.63	0.34	8.49	0.07
2019	22.99	0.34	8.34	0.07
2020	23.35	0.35	8.19	0.07
2021	23.71	0.35	8.04	0.07
2022	24.08	0.35	7.89	0.07
2023	24.44	0.36	7.73	0.07
2024	24.80	0.36	7.58	0.07
2025	25.16	0.37	7.43	0.07
2026	25.53	0.37	7.28	0.07
2027	25.89	0.37	7.13	0.07
2028	26.25	0.38	6.97	0.07
2029	26.62	0.38	6.82	0.07
2030	27.42	0.39	6.85	0.07
2031	28.23	0.41	6.89	0.07
2032	29.03	0.42	6.92	0.07
2033	28.97	0.42	6.63	0.07
2034	28.91	0.41	6.35	0.07
2035	28.84	0.41	6.06	0.07
2036	28.78	0.41	5.77	0.07
2037	28.72	0.41	5.48	0.07
2038	28.65	0.41	5.19	0.07

9.4 Surface Access

9.4.1 Surface access emissions for the Project are set out in Table 9.4.1

Table 9.4.1: Emissions from Surface Access

Year	Surface access emissions by type (ktCO2e)		
	Passengers	Staff	Freight
2018	256.16	48.42	3.56
2019	260.35	47.93	3.68
2020	262.74	47.50	3.79
2021	266.98	47.10	3.91
2022	270.97	46.65	4.03
2023	275.29	46.33	4.15
2024	279.59	46.03	4.27
2025	283.48	45.61	4.39
2026	287.86	45.38	4.51
2027	305.35	46.16	4.89
2028	322.28	46.81	5.28
2029	339.56	47.61	5.66
2030	346.25	47.60	5.85
2031	352.54	47.50	6.03
2032	359.43	47.59	6.21
2033	366.44	47.72	6.39
2034	373.02	47.75	6.57
2035	380.19	47.94	6.75
2036	387.41	48.16	6.93
2037	394.15	48.26	7.11
2038	401.45	48.51	7.29

9.5 Aircraft Emissions

9.5.1 Future emissions from aviation for the Project are set out in Table 9.5.1.

Table 9.5.1: Emissions from Aircraft

Year	Aviation emissions (ktCO2e)					
	UK		Non-domestic EEA		Non-EEA International	
	LTO	CCD	LTO	CCD	LTO	CCD
2018	27.2	49.5	225.2	1,345.9	145.9	2,927.5
2019	26.9	49.5	227.8	1,369.0	148.0	3,014.5
2020	3.4	6.2	29.1	175.6	18.9	391.2
2021	19.3	36.2	170.7	1,035.9	111.5	2,334.2
2022	22.0	41.7	198.7	1,211.7	130.1	2,759.8
2023	24.2	46.3	222.8	1,365.1	146.2	3,141.5
2024	25.6	49.5	241.2	1,484.2	158.6	3,449.4
2025	25.3	49.5	243.8	1,507.2	160.7	3,536.4
2026	25.1	49.5	246.5	1,530.2	162.8	3,623.4
2027	24.8	49.5	249.1	1,553.3	165.0	3,710.4
2028	24.6	49.5	251.8	1,576.3	167.1	3,797.4
2029	24.3	49.5	254.5	1,599.3	169.2	3,884.4
2030	25.3	51.2	263.9	1,670.3	173.1	4,089.2
2031	26.2	53.0	273.3	1,741.2	177.0	4,294.1
2032	27.2	54.7	282.7	1,812.1	180.9	4,498.9
2033	27.2	54.4	282.7	1,815.4	180.9	4,530.0
2034	27.2	54.1	282.7	1,818.7	180.9	4,561.0
2035	27.2	53.9	282.7	1,822.0	180.9	4,592.1
2036	27.2	53.6	282.7	1,825.3	180.9	4,623.2
2037	27.2	53.3	282.7	1,828.6	180.9	4,654.3
2038	27.2	53.0	282.7	1,831.9	180.9	4,685.4

9.6 Future Traded Sector Emissions

9.6.1 Traded sector emissions for the Project from aviation and from operation of the airport by Gatwick Airport Ltd are presented in Table 9.6.1.

Table 9.6.1: Traded Sector Emissions for the Project

Year	Traded sector emissions (ktCO2e)
2018	1,658.3
2019	1,682.3
2020	215.0
2021	1,265.5
2022	1,477.7
2023	1,662.1
2024	1,804.3
2025	1,829.8
2026	1,855.3
2027	1,880.7
2028	1,906.1
2029	1,931.1
2030	2,014.0
2031	2,096.9
2032	2,179.8

Year	Traded sector emissions (ktCO2e)
2033	2,182.6
2034	2,185.4
2035	2,188.3
2036	2,191.1
2037	2,194.0
2038	2,196.8

10 Assessment of 'Worst Case' Year

10.1 Aggregated Emissions

10.1.1 The Airports NPS requires consideration of 'worst case' year. The aggregated emissions from all sources are summarised below. This includes all construction activity (both the baseline construction activities and with the inclusion of Project construction emissions).

Table 10.1.1: Aggregated Emissions from the Project versus Baseline Emissions

Year	Baseline emissions ($ktCO_2$)	Project emissions ($ktCO_2$)	Difference from baseline ($ktCO_2$)
2018	5,110	5,110	0
2019	5,184	5,221	+ 37
2020	971	981	+ 10
2021	4,042	412	+ 81
2022	4,659	4,785	+ 126
2023	5,175	5,351	+ 176
2024	5,573	5,985	+ 412
2025	5,655	6,189	+ 534
2026	5,736	6,214	+ 478
2027	5,825	6,304	+ 478
2028	5,912	6,443	+ 530
2029	5,998	6,557	+ 560
2030	5,985	6,875	+ 890
2031	5,972	7,245	+ 1,273
2032	5,959	7,474	+ 1,514
2033	5,997	7,435	+ 1,438
2034	6,034	7,454	+ 1,421
2035	6,071	7,458	+ 1,387
2036	6,110	7,493	+ 1,383
2037	6,149	7,534	+ 1,385
2038	6,188	7,575	+ 1,387

10.1.2 The year with highest emissions is 2038, where aggregate emissions total 7,575 $ktCO_2e$. This is 1,387 $ktCO_2e$ higher than the baseline for that year.

10.1.3 The year where Project emissions exceed baseline emissions to the greatest extent is 2032, where aggregate emissions total 7,474 $ktCO_2e$, which is 1,514 $ktCO_2e$ greater than the baseline.

11 Projected UK Aviation Emissions to 2050

11.1.1 An estimate of emissions from aviation in 2050 based on the delivery of the Project has been developed based on expected changes in ATMs through to 2050. For the main case no changes in efficiency between 2038 and 2050 have been assumed. A second scenario has been modelled which includes for improved efficiency of aircraft over that period in line with the CCC Balanced Pathway for Net Zero, which assumed an improvement of 1.4% per year. No SAF replacement is assumed in the figures below. Summary aviation emissions for the period 2038 to 2050 with, and without, the efficiency trend are presented in Tables 11.1.1 and 11.1.2 respectively.

Table 11.1.1: Projected UK Aviation Emissions to 2050 with no Efficiency Improvement between 2038 and 2050 and with No Use of SAF

Year	Domestic flights ($MtCO_2$)	All flights ($MtCO_2$)
2038	0.080	7.061
2039	0.080	7.103
2040	0.080	7.145
2041	0.081	7.186
2042	0.081	7.227
2043	0.081	7.267
2044	0.081	7.308
2045	0.081	7.349
2046	0.081	7.390
2047	0.081	7.431
2048	0.081	7.471
2049	0.081	7.512
2050	0.081	7.512

Table 11.1.2: Projected UK Aviation Emissions to 2050 with 1.4% p.a. Efficiency Improvement between 2038 and 2050 and with No Use of SAF

Year	Domestic flights ($MtCO_2$)	All flights ($MtCO_2$)
2038	0.080	7.061
2039	0.080	7.103
2040	0.079	7.045
2041	0.078	6.986
2042	0.077	6.927
2043	0.076	6.869
2044	0.075	6.811
2045	0.074	6.753
2046	0.073	6.695
2047	0.072	6.638
2048	0.071	6.581
2049	0.071	6.524
2050	0.070	6.433

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Term	Description
FEGP	Fixed Electrical Ground Power
GHG	Greenhouse Gas
GPU	Ground Power Unit
GSE	Ground Support Equipment
HGV	Heavy Goods Vehicle
ICE	Inventory of Carbon and Energy
LGW	London Gatwick
LTO	Landing and Take Off
PEIR	Preliminary Environmental Information Report
PHEV	Plug-in Hybrid Electric Vehicle
RIBA	Royal Institute of British Architects
TAG	Transport Analysis Guidance

13 Glossary

13.1 Glossary of terms

Table 13.1.1: Glossary of Terms

Term	Description
APU	Auxiliary Power Unit
ATM	Air Traffic Movement
BEIS	UK Government Department for Business Energy and Industrial Strategy
BEV	Battery Electric Vehicles
CAA	Civil Aviation Authority
CCD	Climb, Cruise and Descent
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent
DCO	Development Consent Order
EEA	European Economic Area
EMEP	European Monitoring and Evaluation Programme
ES	Environmental Statement
EU ETS	European Union Emissions Trading Scheme