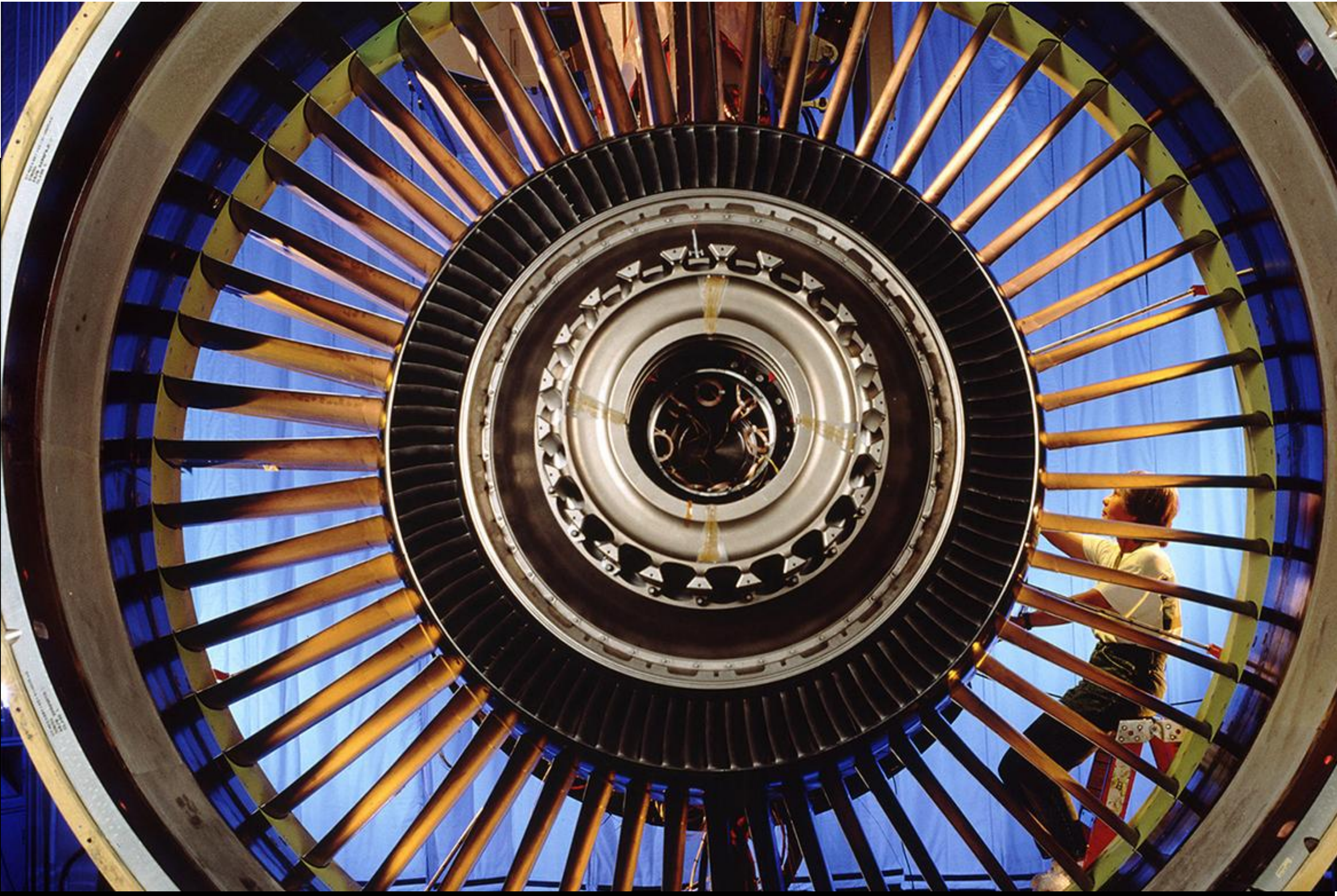


Preliminary Climate Impact Report

Doncaster Sheffield Airport

24th July 2025

Official: Sensitive

Table of Contents

1 Executive summary

This preliminary climate impact report supports the reopening and development of Doncaster Sheffield Airport (DSA) under the South Yorkshire Airport City (SYAC) initiative. The report evaluates the climate implications of resuming operations, grounded in traffic forecasts developed by ICF, and proposes mitigation strategies aligned with national and regional net-zero carbon reduction strategies. With the airport infrastructure largely intact following its closure in 2022, the site is positioned for reactivation under FlyDoncaster Ltd., a council-backed operator.

Scope 1 and 2 emissions — stemming from ground services and landside operations — are evaluated, with electrification, heat pump integration, and on-site renewable energy presented as key reduction opportunities. This report identifies aircraft operations (Scope 3 emissions) as the dominant source of climate impact, projected to contribute up to 98% of the climate impact associated with the airport by 2030. While improvements in aircraft efficiency and fleet renewal will mitigate some emissions growth, traffic expansion is forecast to outpace these gains. Mitigation measures include promoting Sustainable Aviation Fuel (SAF) uptake, incentivising newer aircraft technologies, and enabling emissions reductions through operational efficiencies. Scope 3 surface access further presents an impact, which requires active management to reduce through electrification and the provision of improve transport links as per the May 2025 Doncaster Sheffield Airport and Gateway East Surface Access Statement.

The report recognises the demand displacement from other airports, highlighting that very little of the climate impact is new, rather than relocating from other airports, with a reduced surface access footprint per movement. This indicates that the net climate impact may be significantly lower than gross emissions estimates, which implies that with proactive management of emissions, the net climate impacts can be aligned with regional and national climate goals.

Beyond climate impacts, the report highlights the requirement for a wider environmental impact report to assess effects on local air quality, nose and human health, water consumption and treatment, waste management, and biodiversity. Recommendations include monitoring air and noise pollution, upgrading waste systems, conserving habitats near Finningley Big Wood and Hurst Wood.

2 Background and context

Doncaster Sheffield Airport previously operated as a commercial airport for until its closure in November 2022. At its peak, the airport saw 1.4 million passengers annually and freight operations grew to nearly 24,000 tonnes by 2021. The airport comprises of existing runway and terminal infrastructure and recent technical due diligence reports assessed the condition of the terminal building, including internal areas, roofs, and external elevations. While some areas of improvement were noted the overall infrastructure remains intact and suitable for reactivation.

The airport is set to reopen under the operation of FlyDoncaster, a company established by Doncaster City Council. ICF has conducted a traffic forecast under base and high scenarios, on which this EIR is based. The broader development vision includes the creation of South Yorkshire Airport City (SYAC), a regional hub for logistics, advanced manufacturing, and mixed-use development. The SYAC initiative is aligned with net-zero carbon goals and includes plans for renewable energy generation and smart energy systems.

3 Scope definition

Understanding the scope definitions in airport environmental impact reporting is crucial as they delineate the categories of emissions and their sources by what is directly and indirectly under the sphere of DSA's influence. As a commercial airport, the site's scope 1 and scope 2 emissions are activities under its direct influence - scope 1 being direct emissions and scope 2 being the indirect emissions from energy purchase. In many industries scope 3 emissions – those not directly emitted by the organisation but are a result of its operations - are considered lower priority. Scope 3 emissions from aircraft operating at the airport and surface access are the two most significant impact of an airport's contributions to regional and national climate goals, as such will be a high priority for this report.

Scope	Definition	Relevant airport activities
Scope 1	Direct	Ground services equipment, landside operations
Scope 2	Indirect (energy)	Purchased electricity and heating
Scope 3	Indirect (value chain)	Aircraft emissions, surface access

4 Climate change impact

The dominant source of climate change impact from airport operations is the scope 3: emissions from aircraft departing from and arriving at the airport. The impact of emissions on the climate is expressed as CO_2 equivalent (CO_2e) and includes direct CO_2, CH_4, and N_2O emissions from the aircraft. In 2030, for DSA, this is forecast to constitute 81% of all emissions, which rises to 98% if the emissions of fuel extraction are not considered. Scopes 1 and 2 have clear measures for mitigation. Scope 3 emissions are of more significant impact, and due attention is to be made to scope 3 measurement and mitigation actions.

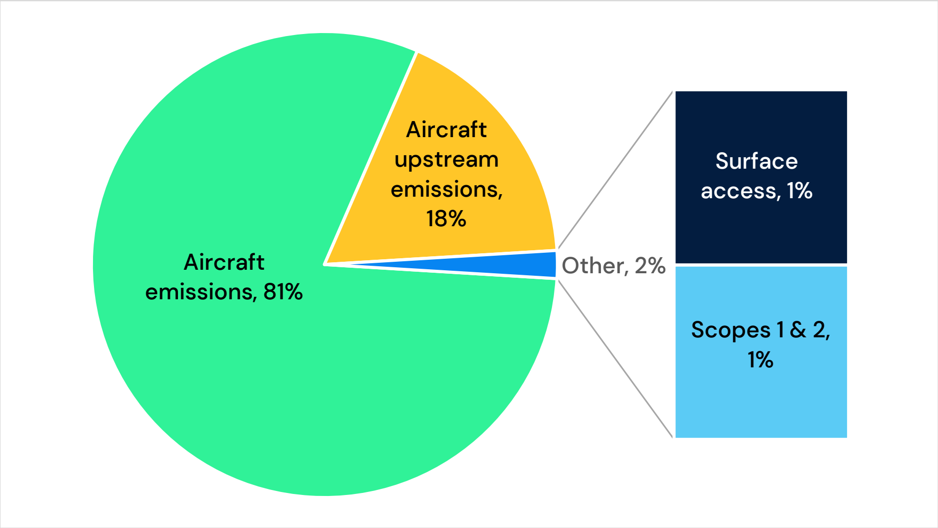


Figure 1: 2030 DSA CO_2e by source share

The net climate impact must further be examined including the effects of displaced emissions from other airport and induced demand in passenger or GA traffic due to shortened journey times to the airport.

4.1 Scope 3 – Aircraft CO_2e emissions outlook

The direct emissions from aircraft are the largest single climate share impact by a large margin and are highly dependent on the aircraft technology operating and the number of flights. While new aircraft technology reduces the fuel consumption per passenger, freight tonne, or aircraft movement over time, the growth in traffic outstrips aircraft decarbonisation and emissions will increase over time. Aircraft direct CO_2e emissions in the base case scenario reach 171 kilotons in 2030, rising to 296 by 2035. Between 2035 and 2050, the rate of increase per year slows as both traffic growth slows, and new generation efficient aircraft replace older generation technology. The largest single determinant of the rise in CO_2e is the forecasted traffic.

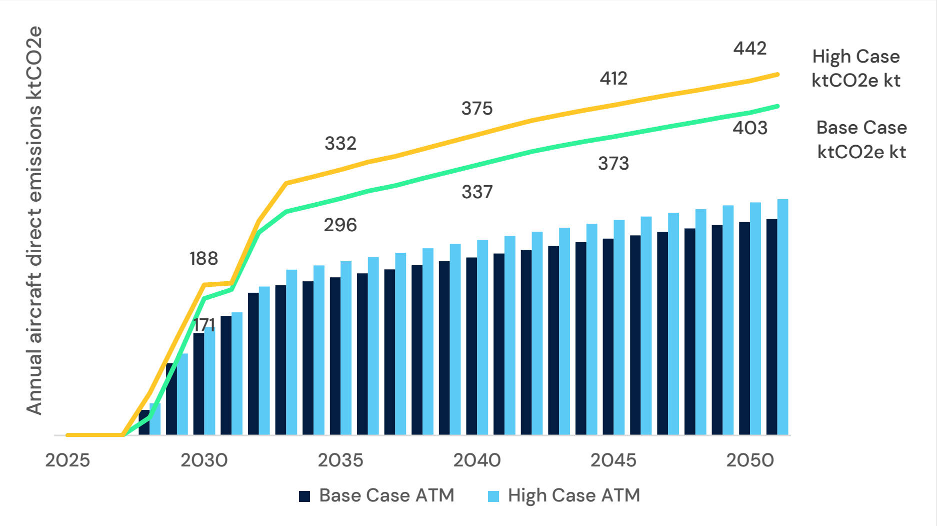


Figure 2: Base and high case aircraft direct emissions and ATMs[1]

4.1.1 Methodology

Creating an outlook of aircraft emissions required establishing a baseline at 2025 levels of aircraft efficiency and then reducing it based on expected future CO_2e reducing technology entry into service dates, the percentage reductions against today's technology and the rates of adoption. ICF's DSA traffic forecast provides an outlook for the number of movements and assumed baskets of aircraft types based on the potential operators at DSA. ICF reviewed prior DSA operations and typical flight patterns for the given baskets of aircraft types to determine a "typical" movement by operator type and aircraft type. These aircraft types and ranges were then applied to the Eurocontrol Small Emitters Tool (SET)[2] to create a baseline fuel consumption. 2025 DESNZ GHG conversion metrics for both direct and upstream emissions were then applied to the relevant aircraft based on the types of fuel required[3]. Using ICF's proprietary fleet and technology forecasts, ICF created an outlook of the rate of fuel burn improvement by aircraft and operator type to produce an average per movement fuel consumption forecast to apply to the forecast.

---

[1] Source: ICF analysis
[2] https://www.eurocontrol.int/tool/small-emitters-tool
[3] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2024

4.1.2 Traffic and technology

ICF conducted an independent traffic forecast for DSA under two scenarios, a base and high case. Both scenarios comprise of three categories of operation with very different emissions profiles and usage.

Table 1: traffic forecast technology operational characteristics[4]

Assumption	General Aviation	Passenger	Cargo
Number of movements	**Highest**	**High**	**Low**
Aircraft Size	**Very small** -Single engine, four-seater	**Medium** – Multiple twin-engine aircraft sizes (Turboprop, Regional Jet & Narrowbody Jet) with an average around 150 seats,	**Large** – multiple types carrying 10's to 100's of tons or cargo per movement. (typically, widebody jet, however narrowbody freighters are used)
Assumed flight range	**Very short** – 200km	**Medium** – various based on aircraft size with an average around 1500km	**Long** – average range over 4,000km
Aircraft Age	**Very old** – 1970's era technology still commonly in operation.	**New** – average ages vary across fleets, but operators are often early adopters of new technology	**Old** – new aircraft are used however the average age is much higher, often use converted aging passenger aircraft.

While GA aircraft are old, inefficient and have many movements, their short average range and small size means the CO_2e per movement is very low. Conversely the passenger operations are dominated by newer narrowbody aircraft which are very efficient per passenger and fly hundreds of passengers longer ranges with much larger CO_2 footprints per ATM. Cargo aircraft on the other hand are typically older, larger and fly much longer average ranges. As a result, the relatively small number or cargo movements create the largest single share of CO_2e.

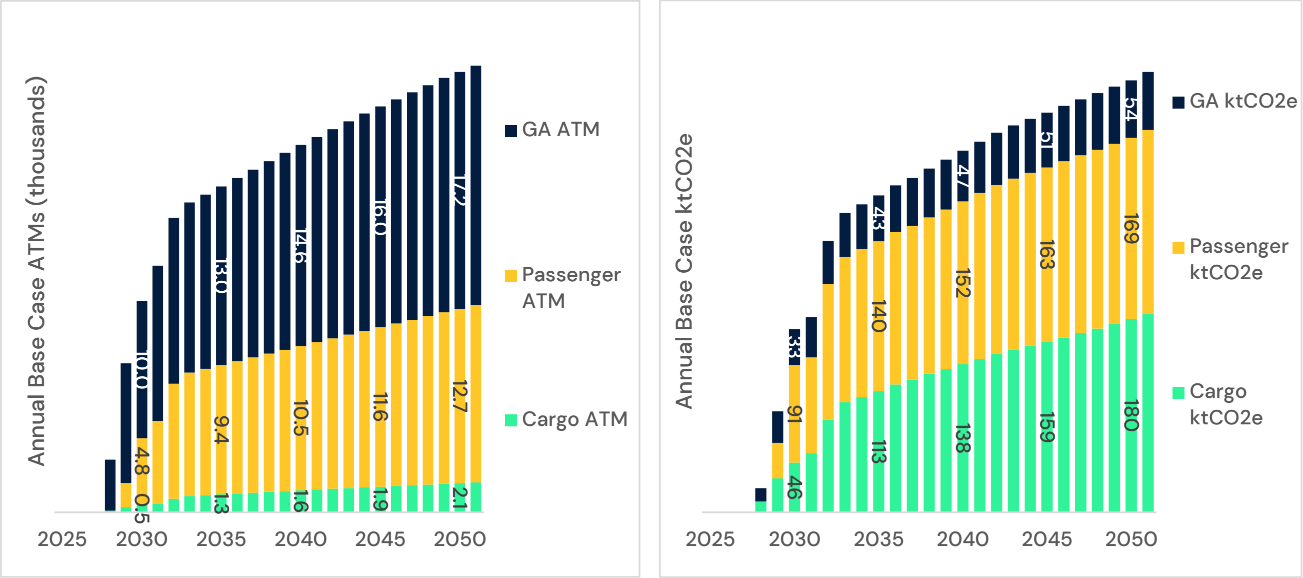


Figure 3: ATMs and direct CO_2e emissions by ATM category[5]

---

[4] Source: ICF analysis

[5] Source: ICF analysis

4.1.3 Aircraft technology improvements and generational replacement

New generation conventionally powered aircraft replacing old generation aircraft are continuously lowering the carbon intensity of flights.

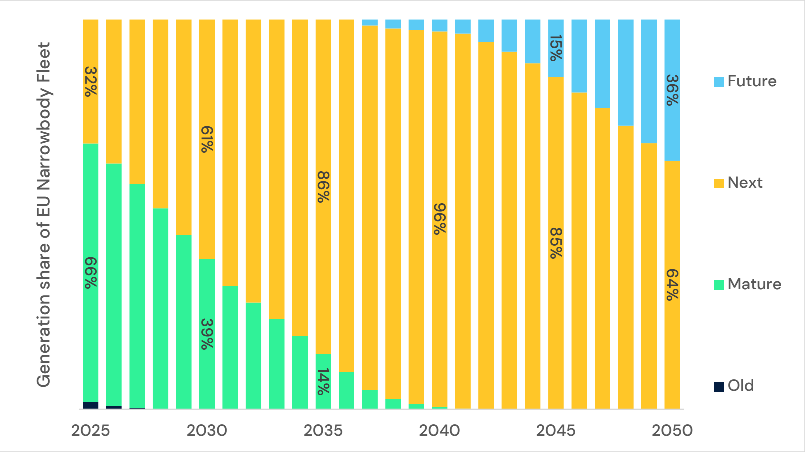


Figure 4: ICF narrowbody generational replacement outlook[6]

Over the horizon of the forecast, ICF expects a series of new generation technologies to enter service, bringing with them step change improvements above the best-in-class technology aircraft today. These new aircraft are typically between 10% and 20% better than the aircraft they replace, and some incremental improvements are made on current generation aircraft over time. Aging aircraft performance also deteriorates so fleet renewal is a key factor to progressively reducing emissions intensities over time.

As such, airports should incentivise airlines to use the latest generation aircraft where possible. While zero-emission aircraft are under development, we are unlikely to see them entering large-scale commercial service in the near term for the passenger and cargo aircraft which dominate the forecast.

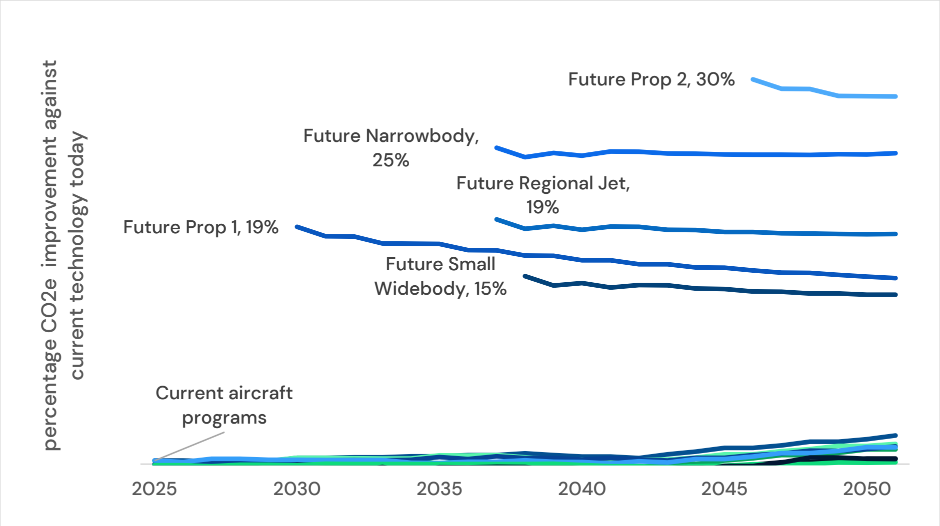


Figure 5: Future aircraft fuel consumption improvements against 2025 best-in-class technology[7]

The challenge with rapid fleet replacement is that aircraft technology design cycles are long and aircraft manufacturers are limited in how many they can produce to replace the installed fleet. Passenger aircraft generational replacement takes decades, with freighters sometimes even longer and GA are assumed to

---

[6] Source: ICF CAMRO fleet forecast
[7] Source: ICF analysis & opinion

incrementally improve at a much slower rate than either. European passenger carriers are forecasted to replace their fleets at a relatively fast rate to support incremental improvement in CO_2e per passenger emissions over time. Due to these limitations in technology driven CO_2e reductions, fuels play a critical role in aviation decarbonisation.

4.1.4 Fuel lifecycles and SAF policy

The Well-to-tank (WTT) fuel emissions account for the emissions associated with extraction, refining and transportation of the raw fuel sources prior to combustion. 2025 DESNZ GHG conversion factors provides WTW metrics which for jet aircraft is equivalent to an 21% CO_2e above the direct aircraft emissions and for GA 25%. While not a requirement in disclosing airport environmental impact it is encourage and is an important metric to consider in how sustainable fuels can contribute to reducing scope 3 CO_2e. SAF enables over 70% reductions in the total emissions of aviation fuel by consuming atmospheric carbon during its production, rather than adding to it as demonstrated with the WTT conversion factor for fossil fuels.

The UK and EU have and are implementing mandates for the uplift of SAF, and a role of role of DSA in the decarbonisation of the industry is to support its use by aircraft operators. The ReFuelEU mandate means incoming flights from Europe have a share of SAF, and the UK mandate does the same for departures.

While the impact of current policies on DSA's climate goals remains uncertain, a reduction in aircraft-related CO_2e emissions of over 20% from SAF is a conservative outlook for the 2050 timeframe. This estimate, based on current policies, excludes future SAF production capacity and future likely policy advances in the UK and EU. These projections will require updating as SAF policies evolve, including the UK SAF Mandate, Revenue Certainty Mechanism (RCM)[8], and ReFuelEU aviation adaptations.[9][10]

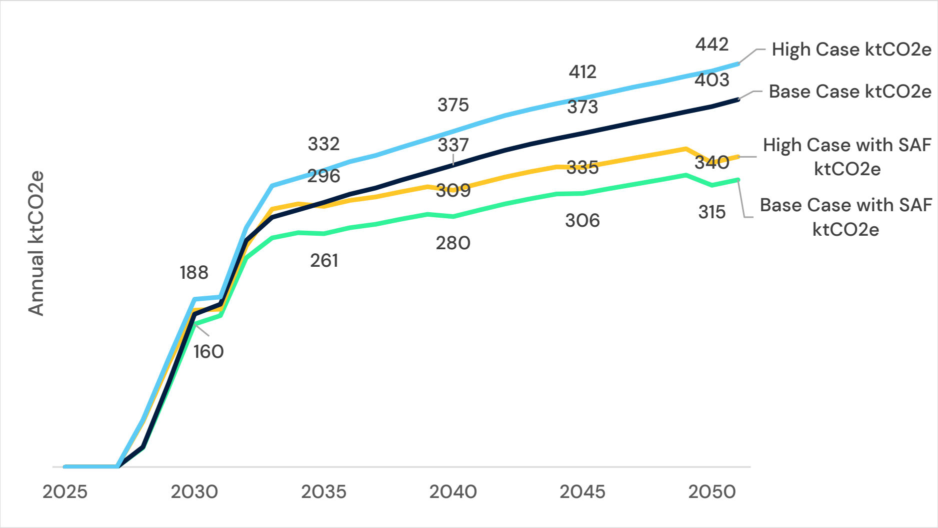


Figure 6: Example SAF policy impact mitigation[11]

A key method for DSA to support scope 3 carbon reductions is to play its role in facilitating aircraft operator SAF uplift.

---

[8] https://www.gov.uk/government/consultations/sustainable-aviation-fuels-revenue-certainty-mechanism-revenue-certainty-options

[9] https://transport.ec.europa.eu/transport-modes/air/environment/refueleu-aviation_en

[10] https://www.gov.uk/government/collections/sustainable-aviation-fuel-saf-mandate

[11] [11] Source: ICF analysis, RFEUA, UK SAF Mandate

4.1.5 Non-CO_2 climate impacts

Significant challenges exist to quality and mitigate the climate impacts of aviation contrails, NO_X and other impactful aircraft aerosols and while it is understood they likely play a significant role in the net impact of aviation, further research is required to understand how. [12] While appropriate metrics cannot be used at this time, a key measure to long term mitigation of aviation's climate impacts is industry wide cooperation in developing and implementing quantification and mitigation strategies.

4.2 Scope 3 -Surface access

Prior data from the UK government indicates that 91% of passenger journeys were made by car transportation, it is assumed that 25% of all journeys to the airport will be made by airport staff.[13] As a conservative benchmark, this will be used to evaluate the climate impact of surface access transport for staff and passengers.

Given the catchment area, population proximity drive times and the locality of longer journey distance passengers to larger airports with wider connections, the average drive time is assumed to be 30 minutes. At an assumed average speed of 60km/hr with an average journey distance of 30km. using 2025 DESNZ average car with unknown fuels of 0.16725 $kgCO_2e/km$[14] and assuming 1.93 passengers per journey[15] we can assume a passenger footprint of approximately 2.6$kgCO_2e$ per car journey. The remaining 9% of journeys are assumed to be made via bus from Doncaster interchange, a journey of approximately 11km at 1.2 $kgCO_2e$ per passenger kilometer (2025 DESNZ Local bus [not London]) – an average of 1.2$kgCO_2e$ per bus journey.

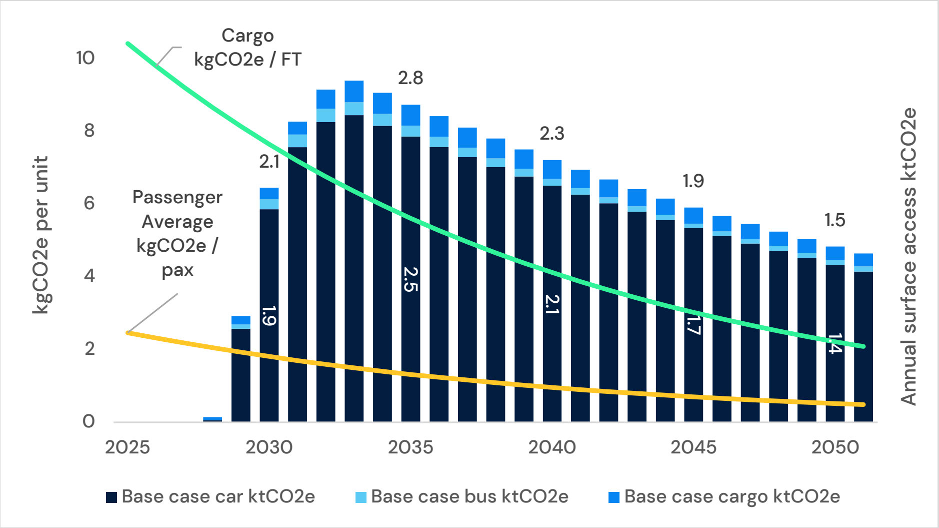


Figure 7: Surface access scope 3 $ktCO_2e$[16]

It is assumed car transport options improve at a rate of 1.5% CO_2e reduction per year over the term of the forecast and busses progressively undergo electrification[17]. In this assessment, a conservative view is

---

[12] https://www.gov.uk/government/publications/reviewing-aviations-non-co2-climate-impacts-and-existing-metrics
[13] https://publications.parliament.uk/pa/cm201516/cmselect/cmtrans/516/51605.htm
[14] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025
[15] https://www.transportforthenorth.com/wp-content/uploads/TfN-Transport-Decarbonisation-Strategy-FINAL-TfNDEC2021_V2.pdf
[16] Source: ICF analysis
[17] https://www.transportforthenorth.com/wp-content/uploads/TfN-Transport-Decarbonisation-Strategy-FINAL-TfNDEC2021_V2.pdf

taken that the X4 bus remains the primary bus transportation method and a rail connection to the Lincoln line is not achieved and as such, the shares of passengers by transportation mode for surface access does not change. Should a more efficient direct bus route or a rail connection be opened, these present significant options to improve accessibility and reduce scope 3 surface access emissions. GA is assumed to be equivalent to passengers at a rate of two passengers per GA ATM.

For cargo, each tonne moved is assumed to have a 107km haul[18], using 2025 DESNZ average laden HGV conversion factor of 0.89121kgCO_2e per km and assumed average of 9.7t per haul provides a footprint of 9.8kg of CO_2e per freight tonne. Cargo surface access is assumed to decarbonise at the same rate as car transportation for simplicity, given the current challenges of zero emissions HGV rollout offset coupled with EU and UK ambitious HGV decarbonisation goals.

When multiplied by the traffic forecast (Each GA movement is assumed to require two passengers). The net result is the CO_2e originating from surface access in the base case traffic forecast in a conservative scenario for ground vehicle decarbonisation peaks in 2033 at 3ktCO_2e, representing 1.1% of scope 3 transport emissions including aircraft. As such, while it is the responsibility of DSA to provide low carbon ground transportations to limit the CO_2e from car movements, it presents a small share of the overall scope 3 climate change impact.

4.3 Scope 1 & 2 – Ground service & landside operations outlook

Limited data is available on the prior operational baseline of scope 1 and 2 impacts, as such assumptions have been made to assess their likely climate impact. As the current site development includes the use of existing infrastructure for airport operations, and future infrastructure development activities are uncertain, the development of new built environment has not been included in the climate impact and must be subject to future evaluation as proposed development options are further evaluated.

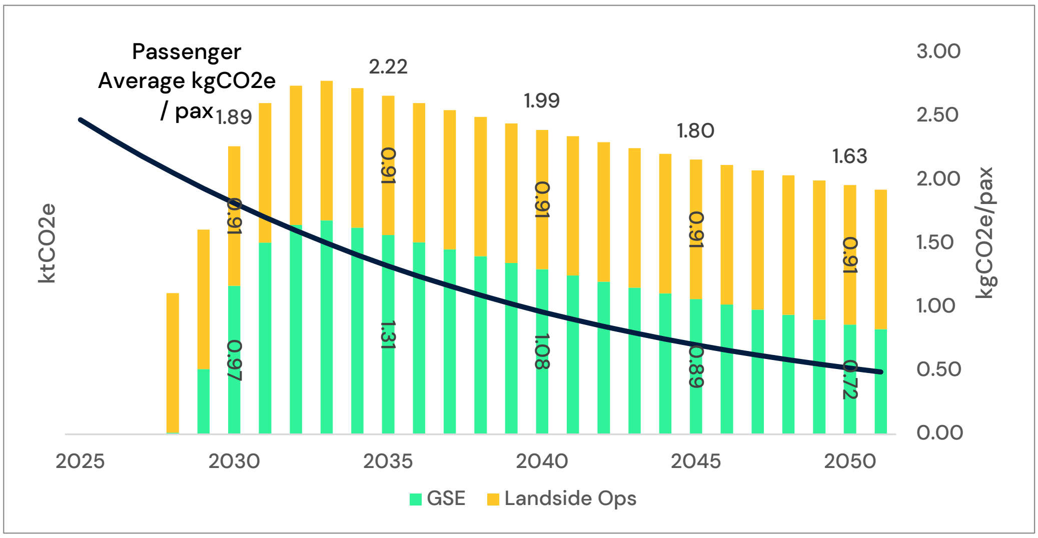


Figure 8: Scope 1 & 2 CO_2e emissions

4.3.1 Gound services equipment (GSE)

GSE includes airside essential equipment and vehicles for operations including passenger and staff transport, aircraft tugs, ground power units, fuel trucks, catering, cargo and baggage transportation,

---

[18] https://www.gov.uk/government/statistics/road-freight-statistics-2023/domestic-road-freight-statistics-united-kingdom-2023?

passenger stairs and de-icing vehicles, among others. Most are diesel powered, and electrification presents a key opportunity to reduce their scope 1 impact for the airport.

Currently here is no data available of the GSE operations at DSA. Measurement OF GSE fuel usage and/or energy consumption would be required for accurate assessment. As a benchmark, the Virgin Atlantic Flight 100 LCA can be used as a benchmark, as a public data source of GSE impact measurement. GSE (Cargo and Ramp operations) are assumed in the study to have 52% of the climate impact relative to surface access. It is assumed in this report that GSE scales at a similar rate as surface access as demand for GSE rises proportionally with the volumes of passengers and cargo and is assumed to decarbonise at the same rate as personal transport as a conservative option.

4.3.2 Landside airport operations (scope 1 and scope 2)

This segment includes scope 1 and scope 2 for ongoing airport operations for energy consumption from gas-powered boilers (scope 1) and electricity (scope 2), but does not include construction of airport infrastructure, or the onsite catering activities. These are less material scope 3 activities - being provided by third party vendors - than aircraft emissions and surface access. Without recorded prior utilities consumption, assumptions have been made using publicly available data. As airport operations are planned in further details, vendor scope 3 impacts must be measured and strategies around mitigation developed.

Prior utilities consumption data for the airport is not available, nor is energy demand forecasting. As such, as series of assumptions have been made to determine an estimate of the onsite power generation using data available and in the public domain. As such, further analysis is required as better data is made available.

The largest impact within an airport is typically heating and cooling of the airport buildings, and lighting. Airport building inspection findings indicate that heating of the terminal is through a combination of low temperature hot water (LTHW) gas-fired boilers for the office areas and Variable Refrigerant Volume (VRV) heat pump systems for selective areas of the terminal.

A solar array was installed in 2020, which was reported to reduce grid electricity demand emissions by 25%, equivalent to 220 tCO_2e[19]. This suggests that the airport's electricity emissions in 2019 prior to the installation were approximately 880 tCO2e and afterwards 660. In 2019 the BEIS grid intensity[20] was 0.2556 $kgCO_2e/kWh$, in 2024 the 2025 DESNZ figure is 0.177[21], implying airport electricity grid demand in 2019/2020 at 2025 UK grid electricity emissions of approximately 457 tCO_2e per year. Without data, it is generically assumed that scope 1 emissions are expected to be 50% electricity for cooling, heating and lighting, and 50% Natural gas for heating. With a 50% share of emissions from Gas, this indicates a landside operations footprint at 2019 passenger traffic in 2025 DESNZ GHG conversion factors of 914 tCO_2e per year. Corporate operations for the administration of DSA and electrically powered airside operations are assumed to be included. It is further assumed all landside operations energy consumptions starts from 2028.

No decarbonisation is assumed as a conservative outlook whereby any reduction in energy demand from existing processes is offset by increased vehicle electrification, scope 1 gas is transferred to a less energy efficient scope 2 via additional heat pumps, and grid decarbonisation is assumed to offset the higher services demand from increased passenger and cargo traffic.

---

[19] https://www.bbc.co.uk/news/uk-england-south-yorkshire-48824586

[20] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2019

[21] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2025

4.4 Climate impact forecast conclusion

The airport scope 1 and scope 2 climate change impacts are expected to rise to peak rapidly in 2033 at 2.5 ktCO_2e for the base case and 2.9 ktCO2e for the high case scenario. After this date, the slower growth in traffic and incremental decarbonisation of the grid and UK vehicles allows for progressive emissions reductions with mitigation actions recommended to accelerate the transition.

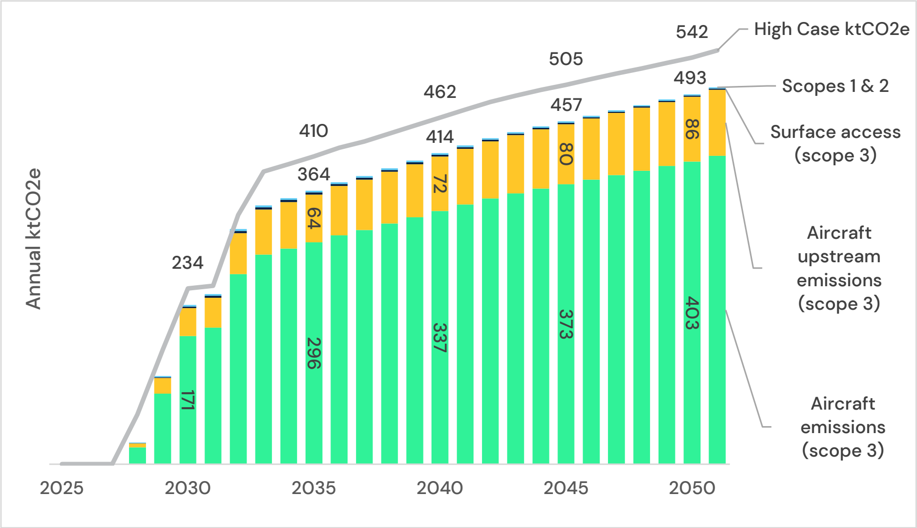
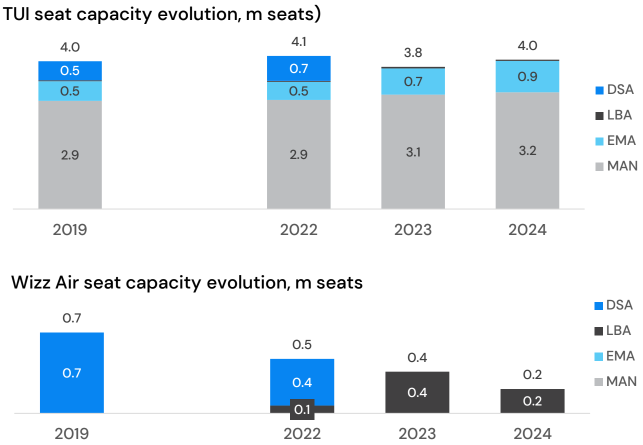


Figure 9: Scopes 1-3 outlook, excluding SAF and displacement analysis[22]

Scope 1 and 2 emissions however are a very small share of the overall climate impact, with Scope 3 surface access emissions and most notably aircraft direct and upstream emissions dominating the impact. Key actions for mitigation to ensure the restarting of DSA is aligned with the climate goals of the country and Yorkshire.

4.4.1 Net climate impact results – displacement & induced

The ICF traffic forecasts do not make any statement regarding whether the growth in traffic at DSA is because of induced demand, or from flights being displaced from neighbouring airport such as LBA, EMA or MAN.


TUI seat capacity evolution, m seats)

Wizz Air seat capacity evolution, m seats

Figure 10: Wizz and TUI capacity before and after DSA closure[23]

---

[22] Source: ICF analysis

[23] Source: UK CAA, ICF analysis

Reviewing the traffic impact on TUI and Wizz in the local region following the DSA 2022 closure, it appears that TUI saw a 7.5% decrease in regional passenger traffic (0.3m) without other operators having routes across the local network, recovering to a 4.1m decline in 2024. It is challenging to identify a cause-and-effect trend with Wizz traffic decline due to the airport closure given its challenges in recovering at DSA post-COVID, however the TUI traffic effect indicates that there is induced passenger demand from the reopening at DSA.

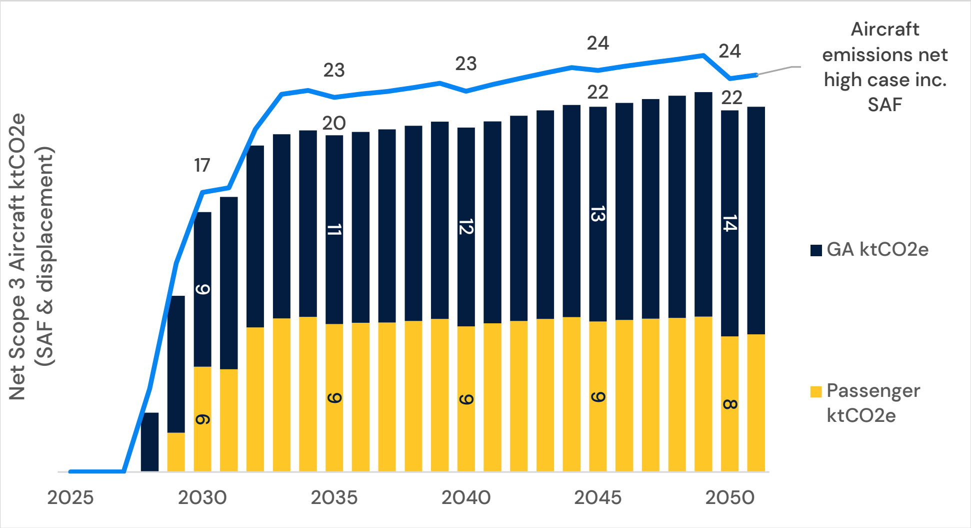


Figure 11: Scope 3 aircraft ktCO2e including SAF & displacement analysis[24]

A further study would be required to establish sensitivity of demand for reduced journey times in the West Yorkshire area. With currently no infrastructure constraints for capacity at competing airports, it is safe assume that a very marginal amount of induced demand from shorter drive times may exist in that it will reduce drive time opportunity cost and provide additional peak time slot availability.

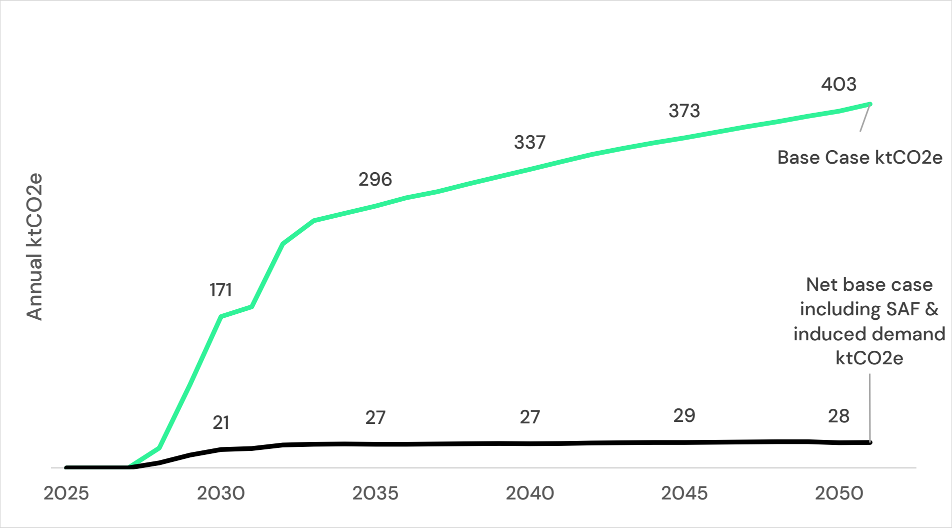


Figure 12: Scopes 1-3 outlook, including SAF and displacement analysis, vs baseline[25]

As an illustrative example we can assume that 30% of the GA movements are new operations as hobbyists leverage the locality of the airport, however this is an assumption with little data to confirm. 7.5% of the passenger traffic is assumed to be induced demand via more peak capacity availability lowering effective

---

[24] Source: ICF analysis
[25] Source: ICF analysis

costs and reduced airport travel time providing an opportunity cost for other transport modes or holiday options, as per the declines seen by TUI at DSA's closure.

It is assumed that for all displaced traffic, the net scope 3 aircraft emissions are zero, the scope 3 surface access passenger emissions are a net CO_2e reduction of -50% of the movement CO_2e emissions as an due to displacement from further afield airports. No adjustment is made for cargo surface access. However, without data and insights to competing GSE operations or airport utilities consumption, no adjustments are made to scope 1 and scope 2 emissions as a conservative view.

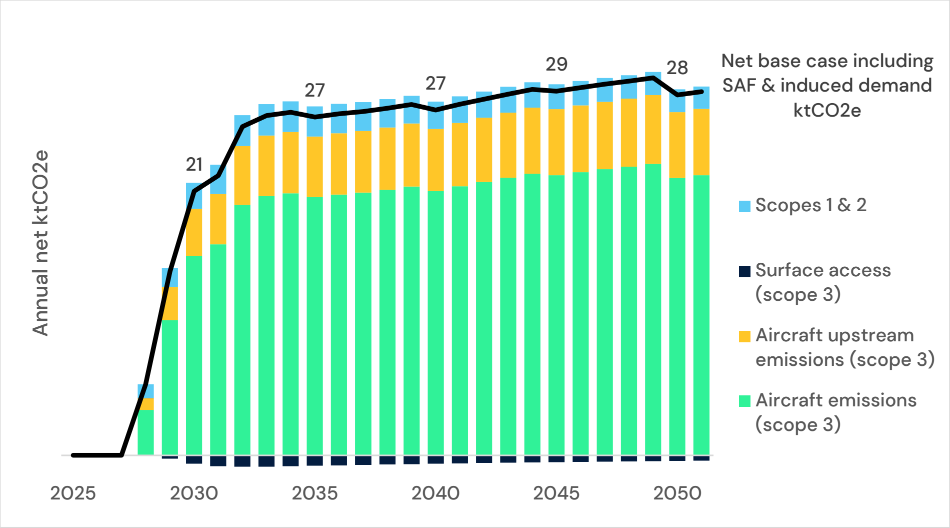


Figure 13: Scopes 1-3 outlook, including SAF and displacement analysis, detail[26]

The remaining operations are displaced from other airports due to cheaper operations, peak time availability and shorter surface access times, including 100% of cargo operations as the airport development is not expected to generate new air cargo traffic. The high case at this stage, having no changes in GA, the largest share of growth in emissions, is between 10 and 15% higher net emissions over the forecast term.

The result is a substantial reduction in the net contribution to climate change in terms of CO_2e, reaching 27 $ktCO_2e$ in 2033 as the airport commences operations, with marginal increases over the forecast term and reductions possible with applied mitigation measures, such as the facilitation the use of Sustainable Aviation Fuels.

This outlook is for illustrative purposed only and warrants further investigation regarding the elasticity of remand for GA, passenger and Cargo flights based on demand stimulating factors such as reduced drive times.

5 Non-climate environmental impacts

The impacts of airport operations on local air quality, noise disturbance, waste, water consumption and biodiversity are further considerations which must be evaluated, however again are dominated by scope 3 aircraft emissions. While aircraft emissions of non-volatile particulate matter (nvPM), Volatile Organic Compounds (VOC), Sulphur Oxides (SO_X) Nitrous oxides (NO_X) and noise profiles can be predicted from the based-on aircraft certification requirements. their local air quality and noise disturbance impacts, are more challenging to predict without onsite measurement. Moreover, predicting how these will improve

---

[26] Source: ICF analysis

over time is extremely challenging as carbon reducing technologies come with engineering trade-offs including increased particulate matter, NO_X and indeed noise.

Given no new technologies are expected to enter the market before 2030, an example expected profile of emissions volumes for the base traffic case is calculated using the EEA master emissions calculator[27] assuming the ICAO default landing-take-off-cycle (LTO) times multiplied by ATMs. GA aircraft are excluded due to lack of available data and noise is not included as the process of measurement to disturbance is not simple and displays of noise measurement may be misleading.

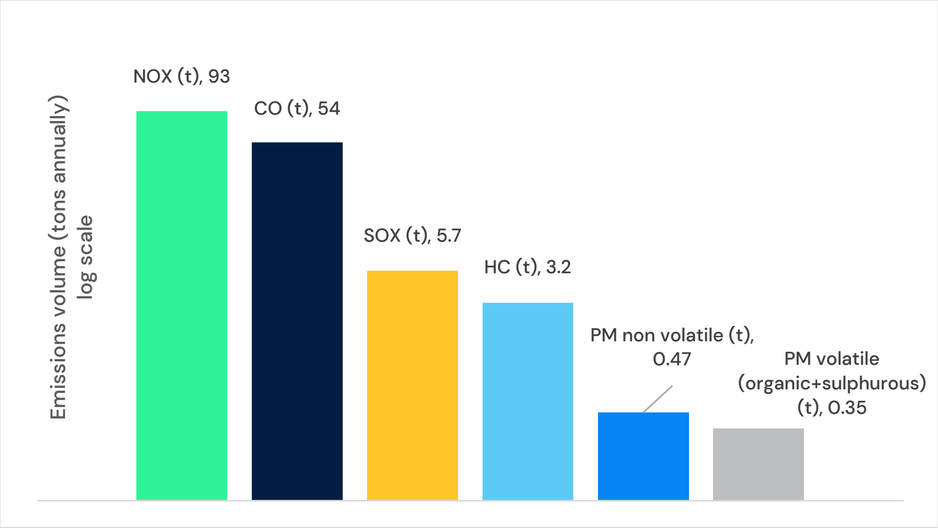


Figure 14: 2030 EEA EMEP estimated volumes of human health impact emissions in the LTO cycle[28]

It is recommended that a measurement plan is implemented as plans for site development progresses, including establishing aircraft peak movement times and flight paths to establish the noise disturbance patterns.

Furthermore, the impact on water consumption and waste management will be closely tied to the airport development design and integration with local services. Assessment is required as operational planning for the airport reopening continues to establish the material impacts of the airport reopening on water consumption and waste management.

The proposed development at DSA Airport will have significant implications for local biodiversity. The areas surrounding Finningley Big Wood and Hurst Wood are home to ecosystems that could be affected by construction and operational activities. These areas are integral to the development plan and expansion efforts may disrupt existing habitats, potentially leading to a decline in local flora and fauna. Moreover, the introduction of new infrastructure could alter the natural landscape, impacting the connectivity and movement of species. It is essential to consider these biodiversity impacts carefully as planning progresses to ensure the preservation and enhancement of these valuable natural resources.

---

[27] https://www.eea.europa.eu/publications/emep-eea-guidebook-2023/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-a-aviation.3/view

[28] Source: EEA & ICF analysis https://www.eea.europa.eu/publications/emep-eea-guidebook-2023/part-b-sectoral-guidance-chapters/1-energy/1-a-combustion/1-a-3-a-aviation.3/view

6 Mitigation action recommendations

6.1 Facilitate SAF Uptake

As Doncaster Sheffield Airport (DSA) grows it can play a proactive role in accelerating the uptake of Sustainable Aviation Fuel (SAF) in several ways:

- DSA can offer incentives to airlines that use SAF blends. This could include reduced landing fees for flights where the operator can demonstrate deliveries of SAF to the origin airport.
- Collaboration with fuel suppliers to ensure SAF is available as a commercial option to aircraft operators.
- DSA can also support SAF adoption by facilitating on-site SAF storage or blending infrastructure, partnering with conventional aviation fuel suppliers and sustainable fuels producers.
- Collaborating with government and industry schemes such as the UK SAF mandate and price certainty mechanism is necessary to ensure all appropriate requirements are met and any incentive mechanisms for operators are leveraged to the full extent possible.

By positioning itself as a low-carbon aviation hub, DSA can attract environmentally conscious carriers and align with national decarbonisation targets.

6.2 Facilitate aircraft emissions reductions

6.2.1 Aircraft on-ground and ATC emissions reduction

Operational improvements offer options to reduce direct aircraft emissions from optimised ground and ATC operations. As a conservative outlook, these have not been considered however best practice should be employed by DSA to collaborate with ATC to support operator in reducing emissions. Such initiatives include route optimisation, aircraft congestion reduction, optimising taxi time and enforcing one-engine-taxi and providing options for continuous descent. Further on-ground support to operators should be provided to enable emissions reduction including the provision of ground air and power to reduce APU fuel consumption.

6.2.2 Incentivise newer and lower fuel consumption technology

While airline fleet decisions are outside control of DSA, providing preferential slots and landing charges calculated to attract the newest aircraft of an operator’s fleet can be provided, however is an airport unconstrained by slot availability such as DSA, it is understood that this may not be effective.

When reviewing the scheduling of regional aircraft operations, turboprop aircraft have significantly lower emissions than jet aircraft operating similar segments. Passengers are commonly less attracted to the perceived additional noise or incorrect safety perceptions of such aircraft, and customer education regarding the environmental benefits of such technology for short-range air travel should be encouraged.

The continued targeted attraction of operators with the newest and most efficient fleets, operating on European segments where policy actively supports decarbonisation is encourages to promote best in class operator performance.

6.3 Accelerate scope 1 decarbonisation

6.3.1 Ground Services Equipment

More rapid electrification or deployment of renewable fuels use for GSE (such as HVO) is a key method of DSA's scope 1 footprint reduction, particularly in conjunction with the airport planning for a large share of its energy to come from on-site photovoltaic cells. A scope 1 and 2 monitoring and decarbonisation plan should be carefully considered as mid-to-long term planning progresses.

6.3.2 Landside operations

Decarbonisation likely to be performed by electrification of landside airport operations such as employing the further use of heat pumps to replace gas boilers the purchasing or onsite generation of renewable power, and upgrading of the building infrastructure for lighting, insulations and power use monitoring are key methods of DSA scope 1 footprint reduction, particularly in conjunction with the airport planning for a large share of its energy to come from on-site photovoltaic cells. A scope 1 and 2 monitoring and decarbonisation plan should be carefully considered as mid-to-long term planning progresses.

6.4 Reduce surface access emissions

The Surface Access Statement outlines several key actions to improve DSA's surface access. These include enhancing public transport links to the airport, promoting the use of electric and low-emission vehicles, and improving infrastructure for walking and cycling. The goal is to reduce the environmental impact of surface transport and encourage sustainable travel options for passengers and staff.

6.5 Monitor developments in non-CO_2 climate impacts

Extensive research is underway to determine how to monitor, quantify and mitigate the potential climate impacts of non-CO_2 emissions such as contrails. DSA can contribute to the development of this system by monitoring progress in the field, encouraging aircraft operators to implement developed measures early and actively participating in data collection and research efforts by governments, academia and industry.

6.6 Non-climate environmental impacts

To address the environmental impacts of local air quality and noise disturbance from airport operations, it is essential to conduct continuous monitoring and assessment. Implementing noise abatement procedures, such as flight path adjustments and time restrictions, can help mitigate noise pollution. Additionally, the installation of air quality monitoring stations around the airport can provide real-time data to inform further action.

Effective waste management strategies are crucial to minimizing the environmental footprint of airport operations. Measures include comprehensive waste segregation, recycling programs, and the use of biodegradable materials. Partnering with local waste management services to ensure efficient processing and disposal is also recommended.

Preserving and enhancing the natural habitats around the airport is vital for maintaining biodiversity and the development plans without careful management pose risk to the local ecosystem. Initiatives such as woodland planting to create green corridors and natural separations, as well as supporting active travel and habitat connectivity, should be prioritized. Special attention should be given to areas like Finningley Big Wood and Hurst Wood, incorporating them into the development plans to foster biodiversity.

7 Annex

Table 2: Base case traffic forecast with assumed traffic revenue tonnes and km

Traffic Forecast	Base Case												
	Base Case ATM	Total Passengers	Cargo (kt)	Cargo ATM	Passenger ATM	GA ATM	Passenger mass (kt)	GA mass (kt)	Passenger RTK	GA RTK	Cargo RTK	**Total RT**	**Total RTK**
Units	**000's**	000's	kt	000's	000's	000's	kt	kt	millions	millions	millions	**kt**	**millions**
2025	**-**	-	-	-	-	-	-	-	-	-	-	**-**	**-**
2026	**-**	-	-	-	-	-	-	-	-	-	-	**-**	**-**
2027	**-**	-	-	-	-	-	-		-	-	-	**-**	**-**
2028	**3.8**	-	2.9	0.1	-	3.7	-	0.7	-	0.1	12.6	**3.6**	**12.7**
2029	**10.8**	316	9.1	0.4	1.8	8.7	31.6	1.7	52.9	0.3	39.7	**42.4**	**93.0**
2030	**15.4**	788	13.3	0.5	4.8	10.0	78.8	2.0	162.2	0.4	58.2	**94.1**	**220.8**
2031	**17.9**	1,088	15.9	0.6	6.0	11.3	108.8	2.3	158.1	0.5	69.2	**126.9**	**227.7**
2032	**21.4**	1,265	24.9	1.0	8.3	12.0	126.5	2.4	222.8	0.5	108.7	**153.8**	**332.0**
2033	**22.5**	1,378	29.6	1.2	9.0	12.3	137.8	2.5	240.5	0.5	129.2	**169.8**	**370.2**
2034	**23.1**	1,415	31.0	1.2	9.2	12.6	141.5	2.5	247.1	0.5	135.5	**175.0**	**383.0**
2035	**23.7**	1,451	32.6	1.3	9.4	13.0	145.1	2.6	253.5	0.5	142.2	**180.3**	**396.2**
2036	**24.3**	1,487	34.2	1.4	9.6	13.3	148.7	2.7	259.8	0.5	150.2	**185.6**	**410.5**
2037	**24.9**	1,524	35.7	1.4	9.8	13.6	152.4	2.7	266.3	0.5	155.9	**190.8**	**422.8**
2038	**25.5**	1,561	37.3	1.5	10.0	14.0	156.1	2.8	272.8	0.6	162.8	**196.2**	**436.2**
2039	**26.1**	1,599	38.6	1.5	10.3	14.3	159.9	2.9	279.5	0.6	168.5	**201.4**	**448.6**
2040	**26.7**	1,638	40.0	1.6	10.5	14.6	163.8	2.9	286.3	0.6	174.5	**206.7**	**461.4**
2041	**27.2**	1,676	41.4	1.7	10.7	14.9	167.6	3.0	293.2	0.6	180.7	**212.0**	**474.5**
2042	**27.8**	1,715	42.9	1.7	10.9	15.2	171.5	3.0	300.0	0.6	187.2	**217.4**	**487.7**
2043	**28.4**	1,753	44.0	1.8	11.1	15.5	175.3	3.1	306.7	0.6	192.2	**222.5**	**499.6**
2044	**29.0**	1,792	45.2	1.8	11.4	15.8	179.2	3.2	313.5	0.6	197.4	**227.6**	**511.6**
2045	**29.5**	1,830	46.5	1.9	11.6	16.0	183.0	3.2	320.3	0.6	202.7	**232.7**	**523.7**
2046	**30.0**	1,869	47.7	1.9	11.8	16.3	186.9	3.3	327.1	0.7	208.2	**237.8**	**536.0**
2047	**30.5**	1,907	49.0	2.0	12.0	16.5	190.7	3.3	333.9	0.7	213.8	**243.0**	**548.4**
2048	**31.0**	1,946	50.3	2.0	12.2	16.8	194.6	3.4	340.7	0.7	219.6	**248.3**	**561.0**
2049	**31.5**	1,985	51.7	2.1	12.4	17.0	198.5	3.4	347.6	0.7	225.5	**253.5**	**573.8**
2050	**32.0**	2,023	53.1	2.1	12.7	17.2	202.3	3.4	354.4	0.7	231.6	**258.8**	**586.7**
2051	**32.4**	2,061	54.5	2.2	12.9	17.4	206.1	3.5	360.4	0.7	237.9	**264.1**	**598.9**

Table 3: High case traffic forecast with assumed traffic revenue tonnes and km

	High Case												
Traffic Forecast	**High Case ATM**	Total Passengers	Cargo (kt)	Cargo ATM	Passenger ATM	GA ATM	Passenger mass (kt)	GA mass (kt)	Passenger RTK	GA RTK	Cargo RTK	**Total RT**	**Total RTK**
Units		000's	kt	000's	000's	000's	kt	kt	millions	millions	millions	**kt**	**millions**
2025	**-**	-	-	-	-	-	-	-	-	-	-	**-**	**-**
2026	**-**	-	-	-	-	-	-	-	-	-	-	**-**	**-**
2027	**-**	-	-	-	-	-	-	-	-	-	-	**-**	**-**
2028	**4.8**	150	5.8	0.2	0.9	3.7	15.0	0.7	-	0.1	12.6	**21.5**	**12.7**
2029	**12.3**	620	9.1	0.4	3.2	8.7	62.0	1.7	96.8	0.3	39.7	**72.8**	**136.8**
2030	**16.2**	963	13.3	0.5	5.7	10.0	96.3	2.0	192.2	0.4	58.2	**111.7**	**250.7**
2031	**18.4**	1,196	15.9	0.6	6.6	11.3	119.6	2.3	172.1	0.5	69.2	**137.7**	**241.8**
2032	**22.3**	1,437	24.9	1.0	9.3	12.0	143.7	2.4	247.8	0.5	108.7	**171.0**	**356.9**
2033	**24.8**	1,783	29.6	1.2	11.3	12.3	178.3	2.5	303.0	0.5	129.2	**210.4**	**432.7**
2034	**25.4**	1,831	31.0	1.2	11.6	12.6	183.1	2.5	310.9	0.5	135.5	**216.7**	**446.8**
2035	**26.1**	1,879	32.6	1.3	11.8	13.0	187.9	2.6	318.6	0.5	142.2	**223.1**	**461.3**
2036	**26.7**	1,926	34.2	1.4	12.1	13.3	192.6	2.7	326.1	0.5	150.2	**229.5**	**476.8**
2037	**27.4**	1,973	35.7	1.4	12.3	13.6	197.3	2.7	333.8	0.5	155.9	**235.8**	**490.3**
2038	**28.0**	2,021	37.3	1.5	12.6	14.0	202.1	2.8	341.6	0.6	162.8	**242.2**	**504.9**
2039	**28.7**	2,071	38.6	1.5	12.8	14.3	207.1	2.9	349.5	0.6	168.5	**248.5**	**518.6**
2040	**29.3**	2,121	40.0	1.6	13.1	14.6	212.1	2.9	357.6	0.6	174.5	**255.0**	**532.7**
2041	**29.9**	2,171	41.4	1.7	13.3	14.9	217.1	3.0	365.7	0.6	180.7	**261.5**	**547.0**
2042	**30.5**	2,221	42.9	1.7	13.6	15.2	222.1	3.0	373.7	0.6	187.2	**268.1**	**561.5**
2043	**31.1**	2,271	44.0	1.8	13.9	15.5	227.1	3.1	381.7	0.6	192.2	**274.3**	**574.5**
2044	**31.7**	2,321	45.2	1.8	14.1	15.8	232.1	3.2	389.6	0.6	197.4	**280.5**	**587.6**
2045	**32.3**	2,371	46.5	1.9	14.4	16.0	237.1	3.2	397.6	0.6	202.7	**286.8**	**600.9**
2046	**32.8**	2,422	47.7	1.9	14.6	16.3	242.2	3.3	405.5	0.7	208.2	**293.1**	**614.4**
2047	**33.3**	2,472	49.0	2.0	14.9	16.5	247.2	3.3	413.4	0.7	213.8	**299.5**	**627.9**
2048	**33.9**	2,522	50.3	2.0	15.1	16.8	252.2	3.4	421.3	0.7	219.6	**305.9**	**641.6**
2049	**34.5**	2,572	51.7	2.1	15.4	17.0	257.2	3.4	429.2	0.7	225.5	**312.3**	**655.4**
2050	**34.9**	2,622	53.1	2.1	15.6	17.2	262.2	3.4	437.1	0.7	231.6	**318.7**	**669.4**
2051	**35.4**	2,672	54.5	2.2	15.9	17.4	267.2	3.5	443.9	0.7	237.9	**325.2**	**682.5**

Table 4: Total climate impact by scope and source

CO2e - ICF Base Case	Aircraft emissions (scope 3)	Aircraft upstream emissions (scope 3)	Surface access (scope 3)	Scope 1 & 2	**Base Case ktCO2e**
Metric	kt	kt	kt	kt	**kt**
2025	0	0	0.0	0.0	**0**
2026	0	0	0.0	0.0	**0**
2027	0	0	0.0	0.0	**0**
2028	23	5	0.0	0.9	**29**
2029	94	21	0.9	1.3	**117**
2030	171	37	2.1	1.9	**212**
2031	182	40	2.6	2.2	**227**
2032	253	55	2.9	2.3	**313**
2033	279	60	3.0	2.3	**345**
2034	287	62	2.9	2.3	**354**
2035	296	64	2.8	2.2	**364**
2036	305	66	2.7	2.2	**375**
2037	312	67	2.6	2.1	**384**
2038	321	69	2.5	2.1	**394**
2039	329	71	2.4	2.0	**404**
2040	337	72	2.3	2.0	**414**
2041	346	74	2.2	2.0	**424**
2042	354	76	2.1	1.9	**434**
2043	361	77	2.0	1.9	**442**
2044	367	79	2.0	1.8	**450**
2045	373	80	1.9	1.8	**457**
2046	379	81	1.8	1.8	**464**
2047	385	83	1.7	1.7	**471**
2048	391	84	1.7	1.7	**478**
2049	397	85	1.6	1.7	**486**
2050	403	86	1.5	1.6	**493**
2051	411	88	1.5	1.6	**502**

CO2e - ICF High Case	Aircraft emissions (scope 3)	Aircraft upstream emissions (scope 3)	Surface access (scope 3)	Scope 1 & 2	**High Case ktCO2e**
Metric	kt	kt	kt	kt	**kt**
2025	0	0	0.0	0.0	**0**
2026	0	0	0.0	0.0	**0**
2027	0	0	0.0	0.0	**0**
2028	53	12	0.5	1.3	**66**
2029	122	27	1.7	1.9	**152**
2030	188	41	2.5	2.3	**233**
2031	190	41	2.9	2.4	**237**
2032	267	58	3.3	2.6	**331**
2033	314	67	3.8	2.9	**388**
2034	323	69	3.7	2.8	**399**
2035	332	71	3.5	2.8	**409**
2036	341	73	3.4	2.7	**420**
2037	348	75	3.3	2.6	**429**
2038	357	77	3.2	2.6	**440**
2039	366	78	3.0	2.5	**450**
2040	375	80	2.9	2.5	**461**
2041	384	82	2.8	2.4	**472**
2042	393	84	2.7	2.4	**482**
2043	400	86	2.6	2.3	**490**
2044	406	87	2.5	2.3	**498**
2045	412	88	2.4	2.2	**505**
2046	419	90	2.3	2.2	**513**
2047	425	91	2.2	2.1	**520**
2048	431	92	2.1	2.1	**527**
2049	437	93	2.0	2.0	**534**
2050	442	95	2.0	2.0	**541**
2051	451	96	1.9	2.0	**551**

Table 5: Scope 1 & 2 emissions

Base Case Scope 1 & 2	GSE	Landside Ops	**Total scope 1 &2**
Metric	kt	kt	**kt**
2025	0.00	0.00	**0.00**
2026	0.00	0.00	**0.00**
2027	0.00	0.00	**0.00**
2028	0.01	0.91	**0.92**
2029	0.43	0.91	**1.34**
2030	0.97	0.91	**1.89**
2031	1.26	0.91	**2.17**
2032	1.37	0.91	**2.29**
2033	1.40	0.91	**2.32**
2034	1.35	0.91	**2.27**
2035	1.31	0.91	**2.22**
2036	1.26	0.91	**2.17**
2037	1.21	0.91	**2.12**
2038	1.17	0.91	**2.08**
2039	1.12	0.91	**2.04**
2040	1.08	0.91	**1.99**
2041	1.04	0.91	**1.95**
2042	1.00	0.91	**1.91**
2043	0.96	0.91	**1.87**
2044	0.92	0.91	**1.84**
2045	0.89	0.91	**1.80**
2046	0.85	0.91	**1.76**
2047	0.82	0.91	**1.73**
2048	0.78	0.91	**1.70**
2049	0.75	0.91	**1.66**
2050	0.72	0.91	**1.63**
2051	0.69	0.91	**1.60**

High Case Scope 1 & 2	GSE	Landside Ops	**Total scope 1 &2**
Metric	kt	kt	**kt**
2025	0.00	0.00	**0.00**
2026	0.00	0.00	**0.00**
2027	0.00	0.00	**0.00**
2028	0.21	1.07	**1.28**
2029	0.82	1.07	**1.89**
2030	1.18	1.07	**2.25**
2031	1.38	1.07	**2.45**
2032	1.55	1.07	**2.62**
2033	1.81	1.07	**2.88**
2034	1.74	1.07	**2.81**
2035	1.68	1.07	**2.75**
2036	1.62	1.07	**2.69**
2037	1.56	1.07	**2.63**
2038	1.50	1.07	**2.57**
2039	1.45	1.07	**2.52**
2040	1.39	1.07	**2.46**
2041	1.34	1.07	**2.41**
2042	1.29	1.07	**2.36**
2043	1.24	1.07	**2.31**
2044	1.19	1.07	**2.26**
2045	1.14	1.07	**2.21**
2046	1.10	1.07	**2.17**
2047	1.05	1.07	**2.12**
2048	1.01	1.07	**2.08**
2049	0.97	1.07	**2.04**
2050	0.93	1.07	**2.00**
2051	0.89	1.07	**1.96**

Table 6: Scope 3 aircraft emissions

Base Case Scope 3 Aircraft Emissions	Cargo ktCO2e	Passenger ktCO2e	GA ktCO2e	**Base Case ktCO2e**
	kt	kt	kt	**kt**
2025	0.00	0.00	0.00	**0.00**
2026	0.00	0.00	0.00	**0.00**
2027	0.00	0.00	0.00	**0.00**
2028	9.98	0.00	12.52	**22.50**
2029	31.54	33.24	29.26	**94.04**
2030	46.19	91.22	33.45	**170.86**
2031	54.98	89.49	37.61	**182.08**
2032	86.32	126.82	40.09	**253.23**
2033	102.60	135.65	40.95	**279.20**
2034	107.58	137.98	41.82	**287.38**
2035	112.91	140.06	42.72	**295.68**
2036	119.27	142.14	43.63	**305.04**
2037	123.80	143.55	44.57	**311.92**
2038	129.18	145.95	45.52	**320.66**
2039	133.58	148.96	46.50	**329.03**
2040	138.07	152.05	47.26	**337.38**
2041	142.81	155.09	48.04	**345.94**
2042	147.77	157.53	48.83	**354.13**
2043	151.64	159.64	49.63	**360.90**
2044	155.28	161.48	50.44	**367.20**
2045	158.87	163.01	51.02	**372.90**
2046	162.90	164.65	51.61	**379.15**
2047	167.06	166.00	52.20	**385.26**
2048	171.27	166.96	52.79	**391.02**
2049	175.67	168.17	53.40	**397.24**
2050	180.17	169.11	53.74	**403.02**
2051	185.04	171.65	54.09	**410.78**

High Case Scope 3 Aircraft Emissions	Cargo ktCO2e	Passenger ktCO2e	GA ktCO2e	**High Case ktCO2e**
	kt	kt	kt	**kt**
2025	0.00	0.00	0.00	**0.00**
2026	0.00	0.00	0.00	**0.00**
2027	0.00	0.00	0.00	**0.00**
2028	19.96	20.30	12.52	**52.78**
2029	31.54	60.81	29.26	**121.61**
2030	46.19	108.07	33.45	**187.71**
2031	54.98	97.45	37.61	**190.04**
2032	86.32	141.01	40.09	**267.42**
2033	102.60	170.89	40.95	**314.44**
2034	107.58	173.62	41.82	**323.02**
2035	112.91	176.01	42.72	**331.64**
2036	119.27	178.40	43.63	**341.31**
2037	123.80	179.95	44.57	**348.32**
2038	129.18	182.74	45.52	**357.44**
2039	133.58	186.27	46.50	**366.34**
2040	138.07	189.90	47.26	**375.23**
2041	142.81	193.45	48.04	**384.30**
2042	147.77	196.25	48.83	**392.85**
2043	151.64	198.63	49.63	**399.90**
2044	155.28	200.67	50.44	**406.39**
2045	158.87	202.31	51.02	**412.21**
2046	162.90	204.10	51.61	**418.60**
2047	167.06	205.52	52.20	**424.78**
2048	171.27	206.45	52.79	**430.51**
2049	175.67	207.68	53.40	**436.75**
2050	180.17	208.57	53.74	**442.48**
2051	185.04	211.45	54.09	**450.57**

Table 7: Scope 3 surface access emissions

Base Case Surface Access CO2e	Base case car ktCO2e	Base case bus ktCO2e	Base case cargo ktCO2e	**Base case Surface access ktCO2e**
	kt	kt	kt	**kt**
2025	0.00	0.00	0.00	**0.00**
2026	0.00	0.00	0.00	**0.00**
2027	0.00	0.00	0.00	**0.00**
2028	0.02	0.00	0.02	**0.04**
2029	0.82	0.04	0.07	**0.93**
2030	1.87	0.09	0.10	**2.05**
2031	2.42	0.11	0.11	**2.63**
2032	2.64	0.12	0.16	**2.91**
2033	2.70	0.11	0.18	**2.99**
2034	2.60	0.11	0.17	**2.88**
2035	2.51	0.10	0.17	**2.78**
2036	2.42	0.09	0.17	**2.68**
2037	2.33	0.08	0.17	**2.58**
2038	2.24	0.08	0.16	**2.48**
2039	2.16	0.07	0.16	**2.39**
2040	2.08	0.06	0.16	**2.29**
2041	2.00	0.06	0.15	**2.21**
2042	1.92	0.05	0.15	**2.12**
2043	1.85	0.05	0.14	**2.04**
2044	1.77	0.04	0.14	**1.96**
2045	1.70	0.04	0.13	**1.88**
2046	1.64	0.04	0.13	**1.80**
2047	1.57	0.04	0.12	**1.73**
2048	1.50	0.04	0.12	**1.67**
2049	1.44	0.04	0.12	**1.60**
2050	1.38	0.04	0.11	**1.54**
2051	1.32	0.05	0.11	**1.48**

High Case Surface Access CO2e	High case car ktCO2e	High case bus ktCO2e	High case cargo ktCO2e	**High case Surface access ktCO2e**
	kt	kt	kt	**kt**
2025	0.00	0.00	0.00	**0.00**
2026	0.00	0.00	0.00	**0.00**
2027	0.00	0.00	0.00	**0.00**
2028	0.41	0.02	0.05	**0.48**
2029	1.57	0.07	0.07	**1.71**
2030	2.28	0.11	0.10	**2.48**
2031	2.65	0.12	0.11	**2.88**
2032	2.99	0.13	0.16	**3.28**
2033	3.48	0.15	0.18	**3.80**
2034	3.36	0.14	0.17	**3.67**
2035	3.24	0.12	0.17	**3.53**
2036	3.12	0.11	0.17	**3.40**
2037	3.00	0.11	0.17	**3.28**
2038	2.89	0.10	0.16	**3.15**
2039	2.78	0.09	0.16	**3.03**
2040	2.68	0.08	0.16	**2.91**
2041	2.58	0.07	0.15	**2.80**
2042	2.48	0.07	0.15	**2.70**
2043	2.38	0.06	0.14	**2.59**
2044	2.29	0.06	0.14	**2.49**
2045	2.20	0.05	0.13	**2.38**
2046	2.11	0.05	0.13	**2.29**
2047	2.03	0.05	0.12	**2.20**
2048	1.94	0.05	0.12	**2.12**
2049	1.86	0.06	0.12	**2.03**
2050	1.78	0.06	0.11	**1.95**
2051	1.71	0.06	0.11	**1.87**

Table 8: Assumed SAF mandate volume share and effective acarbon reduction by flight origin

Assumed SAF volumes and effective lifecycle CO_2e reductions	UK SAF Mandate	UK CO_2e Reduction	RefuelEU SAF Mandate	RefuelEU CO_2e Reduction
Metric	%	%	%	%
2025	2%	**1%**	2%	**1%**
2026	4%	**3%**	2%	**1%**
2027	5%	**4%**	2%	**1%**
2028	7%	**5%**	2%	**1%**
2029	8%	**6%**	2%	**1%**
2030	10%	**7%**	6%	**4%**
2031	11%	**8%**	6%	**4%**
2032	12%	**9%**	6%	**4%**
2033	14%	**10%**	6%	**4%**
2034	15%	**10%**	6%	**4%**
2035	16%	**11%**	20%	**14%**
2036	17%	**12%**	20%	**14%**
2037	18%	**13%**	20%	**14%**
2038	20%	**14%**	20%	**14%**
2039	21%	**15%**	20%	**14%**
2040	22%	**15%**	34%	**24%**
2041	22%	**15%**	34%	**24%**
2042	22%	**15%**	34%	**24%**
2043	22%	**15%**	34%	**24%**
2044	22%	**15%**	34%	**24%**
2045	22%	**15%**	42%	**29%**
2046	22%	**15%**	42%	**29%**
2047	22%	**15%**	42%	**29%**
2048	22%	**15%**	42%	**29%**
2049	22%	**15%**	42%	**29%**
2050	22%	**15%**	70%	**49%**
2051	22%	**15%**	70%	**49%**

Table 9: Net CO2e base case

Net CO2e – ICF Base Case	Aircraft emissions (scope 3)	Aircraft upstream emissions (scope 3)	Surface access (scope 3)	Scopes 1 & 2	**Net base case including SAF & induced demand ktCO2e**
	kt		kt	kt	**kt**
2025	0.00	0.00	0.00	0.00	**0.00**
2026	0.00	0.00	0.00	0.00	**0.00**
2027	0.00	0.00	0.00	0.00	**0.00**
2028	3.58	0.91	0.02	0.92	**5.43**
2029	10.63	2.60	-0.26	1.34	**14.31**
2030	15.69	3.70	-0.66	1.89	**20.61**
2031	16.60	3.94	-0.87	2.17	**21.84**
2032	19.70	4.61	-0.91	2.29	**25.69**
2033	20.39	4.76	-0.91	2.32	**26.55**
2034	20.61	4.81	-0.87	2.27	**26.81**
2035	20.31	4.76	-0.84	2.22	**26.45**
2036	20.52	4.81	-0.80	2.17	**26.69**
2037	20.67	4.84	-0.77	2.12	**26.87**
2038	20.89	4.90	-0.73	2.08	**27.14**
2039	21.14	4.95	-0.70	2.04	**27.43**
2040	20.79	4.89	-0.67	1.99	**26.99**
2041	21.16	4.97	-0.65	1.95	**27.44**
2042	21.50	5.05	-0.62	1.91	**27.85**
2043	21.83	5.13	-0.59	1.87	**28.24**
2044	22.14	5.20	-0.57	1.84	**28.61**
2045	22.03	5.19	-0.54	1.80	**28.48**
2046	22.27	5.25	-0.52	1.76	**28.76**
2047	22.50	5.30	-0.50	1.73	**29.03**
2048	22.70	5.35	-0.48	1.70	**29.27**
2049	22.92	5.40	-0.46	1.66	**29.53**
2050	21.82	5.18	-0.44	1.63	**28.19**
2051	22.03	5.22	-0.42	1.60	**28.44**

Table 10: Net CO_2e high case

Net CO2e - ICF High Case	Aircraft emissions (scope 3)	Aircraft upstream emissions (scope 3)	Surface access (scope 3)	Scopes 1 & 2	**Net high case including SAF & induced demand ktCO2e**
	kt		kt	kt	**kt**
2025	0.00	0.00	0.00	0.00	0.00
2026	0.00	0.00	0.00	0.00	0.00
2027	0.00	0.00	0.00	0.00	0.00
2028	5.04	1.21	-0.12	1.28	**7.41**
2029	12.60	3.01	-0.57	1.89	**16.92**
2030	16.86	3.94	-0.83	2.25	**22.23**
2031	17.15	4.05	-0.97	2.45	**22.69**
2032	20.68	4.82	-1.05	2.62	**27.07**
2033	22.79	5.26	-1.23	2.88	**29.71**
2034	23.03	5.32	-1.18	2.81	**29.98**
2035	22.60	5.23	-1.13	2.75	**29.46**
2036	22.81	5.28	-1.08	2.69	**29.71**
2037	22.96	5.32	-1.04	2.63	**29.87**
2038	23.19	5.38	-0.99	2.57	**30.14**
2039	23.45	5.44	-0.95	2.52	**30.45**
2040	22.98	5.34	-0.91	2.46	**29.87**
2041	23.38	5.43	-0.88	2.41	**30.35**
2042	23.74	5.52	-0.84	2.36	**30.78**
2043	24.08	5.60	-0.81	2.31	**31.18**
2044	24.41	5.68	-0.77	2.26	**31.57**
2045	24.22	5.64	-0.74	2.21	**31.34**
2046	24.47	5.70	-0.71	2.17	**31.63**
2047	24.70	5.76	-0.68	2.12	**31.90**
2048	24.90	5.81	-0.65	2.08	**32.14**
2049	25.13	5.86	-0.63	2.04	**32.40**
2050	23.73	5.57	-0.60	2.00	**30.70**
2051	23.96	5.63	-0.58	1.96	**30.96**

Table 11: Aircraft human heath impact emissions, forecast as of 2030

Forecast year 2030	NOX	SOX	CO	HC	PM non volatile	PM volatile (organic + sulphurous)	PM TOTAL
Aircraft Type	t	t	t	t	t	t	t
B38M	23.295	1.771	18.024	0.580	0.026	0.109	0.136
A321	29.442	1.518	17.662	1.748	0.085	0.101	0.186
A21N	22.266	1.200	6.792	0.098	0.250	0.072	0.322
B763	7.633	0.411	2.328	0.034	0.086	0.025	0.110
B738	8.312	0.559	6.455	0.698	0.021	0.040	0.061
B789	0.797	0.054	0.619	0.067	0.002	0.004	0.006
E170	0.768	0.070	0.710	0.006	0.001	0.004	0.005
AT72	0.286	0.027	0.391	0.000	0.000	0.000	0.000
AT76	0.221	0.020	0.277	0.000	0.000	0.000	0.000
AT46	0.197	0.023	0.545	0.000	0.000	0.000	0.000
AT43	0.221	0.020	0.277	0.000	0.000	0.000	0.000
Total	**93.436**	**5.674**	**54.081**	**3.231**	**0.471**	**0.354**	**0.825**

icf.com

twitter.com/ICF
linkedin.com/company/icf-international
facebook.com/ThisIsICF
#thisisicf

About ICF

ICF (NASDAQ:ICFI) is a global consulting and digital services company with over 7,000 full- and part-time employees, but we are not your typical consultants. At ICF, business analysts and policy specialists work together with digital strategists, data scientists and creatives. We combine unmatched industry expertise with cutting-edge engagement capabilities to help organizations solve their most complex challenges. Since 1969, public and private sector clients have worked with ICF to navigate change and shape the future. Learn more at icf.com.