AtkinsRéalis

Net Zero Roadmap Report

Donegal Airport

December 2023

DONEGAL AIRPORT CARBON REDUCTION MASTERPLAN

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Glossary

Term	Definition
Airport Carbon Accreditation (ACA)	The ACA[1] is an 'institutionally endorsed, global carbon management certification programme for airports. It independently assesses airports through 7 levels of certification, moving towards comprehensive carbon management.
Airports Council International (ACI)	The ACI[2] is an organization of airport authorities that works to 'promote excellence in the aviation industry', contributing under the headings of safety, security, and sustainability. It develops policies, programs, and best practices to advance aviation standards internationally.
Net Zero	A condition in which human-caused residual greenhouse gas emissions are balanced by human-led removals over a specified period and within specified boundaries. According to the ISO Net Zero Guidelines (IWA 42:2022)[3].
Passive intervention	Future changes in Donegal Airport's emissions as a result of policies and developments outside of its control and over which it has no influence. These changes are unconfirmed, hence were not included in BAU modelling.
Residual	Residual emissions are those emissions that remain at the point of net zero, despite abatement efforts[4].
Carbon dioxide removals	Carbon dioxide removal (CDR) refers to the process of removing CO2 from the atmosphere[5].
Greenhouse Gas Emissions (GHG)	Greenhouse gases (also known as GHGs) are gases in the earth's atmosphere that trap heat[6].
Scope 1 emissions	Scope 1 covers direct GHG emissions which occur from sources that are owned or controlled by Donegal Airport, such as diesel consumed for emergency generation and vehicles.
Scope 2 emissions	Scope 2 emissions are indirect GHG emissions associated with the purchase of electricity, steam, heat, or cooling.

[1] Home - Airport Carbon Accreditation

[2] ACI World - The Voice of the World's Airports

[3] https://knowledge.bsigroup.com/products/net-zero-guidelines/standard#:~:text=The%20Net%20Zero%20Guidelines%20cover,and%20national%20and%20international%20regulation.

[4] Net zero and the unexplored politics of residual emissions - ScienceDirect

[5] FAQ Chapter 4 — Global Warming of 1.5 ºC (ipcc.ch)

[6] What are greenhouse gases? | GHGs explained | National Grid Group

Scope 3 emissions	Scope 3 covers all other indirect emissions of Donegal Airport as a consequence of their activities but occurring from sources not owned or controlled by them, such as Landing and Take Off (LTO) emissions and employee commuting.
Baseline emissions	The emissions quantified for the baseline year act as a reference, against which emissions savings from the proposed interventions are measured.
Business-as-usual (BAU) scenario	The BAU scenario uses historic emissions data, as well as confirmed future actions, to predict what the organization's emissions will look like in future, assuming no further effort is made to decarbonize (beyond what has already been committed to).
Renewable energy certificate (REC)	This certificate authenticates to the consumer that renewable sources produced that portion of energy[7].
Sustainable Aviation Fuel (SAF)[8]	SAF is a biofuel used to power aircraft that has similar properties to conventional jet fuel but with a smaller carbon footprint.

[7] How do renewable energy certificates work? | Drax
[8] Sustainable Aviation Fuels | Department of Energy

Executive Summary

Donegal Airport (hereafter “the Airport”) is a small regional airport in Northwest Donegal, in the Republic of Ireland. The Airport recognises the urgent need to decarbonise its operations to address the challenges of climate change by committing to greenhouse gas (GHG) emission reductions. The Airport has a target to achieve net zero GHG emissions by 2050 (including all scope 1-3), based on a 2022 baseline, aligned with the Irish Government decarbonisation target. This document outlines the measures that the Airport can utilise to reduce its GHG emissions to work towards its net zero target.

To understand the current emissions trajectory of the Airport, a BAU (Business-as-usual) scenario was modelled to understand how the emissions of the Airport will change over time assuming no effort is made to decarbonise, beyond what has already been committed. This considers factors such as, the 5% annual rise in passenger numbers up to 2027, and the commencement of summer (2023) and summer and winter (2024) Glasgow flights. Following this, the Airport have worked collaboratively with AtkinsRéalis to develop a decarbonisation pathway to better understand how to holistically decarbonise their operations. This pathway consists of a range of carbon reduction interventions that were discussed during a workshop conducted virtually between AtkinsRéalis and the Airport. During this workshop, a long list of possible interventions was filtered using criteria such as cost, timescale of implementation and carbon-reduction potential to produce a short list of interventions to model in this roadmap.

Following the decarbonisation programme of interventions developed within this study, the Airport could see their annual emissions fall from a 2022 baseline of 1,251.8 tCO_2e to 479.6 tCO_2e in 2050, displayed in Figure 0-1-1.

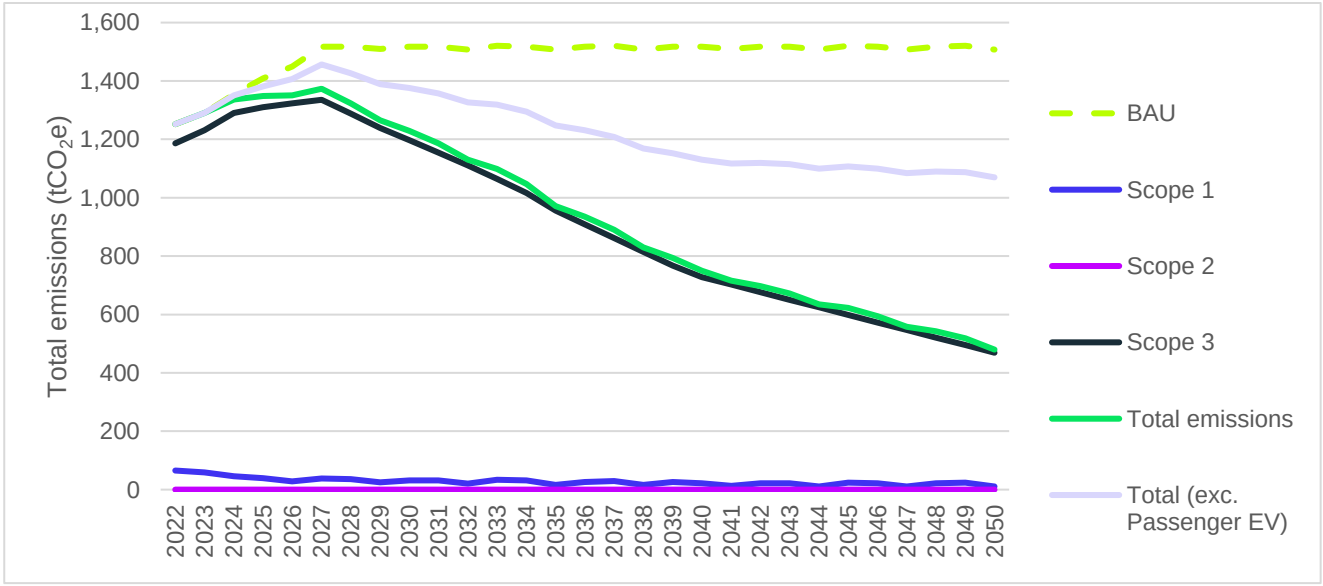


Figure 0-1-1 Decarbonisation roadmap of the Airport's emission to 2050, following the modelled programme of interventions, with BAU for reference.

As demonstrated in Figure 0-1-1, Scope 3 emissions present the biggest challenge in the Airport’s decarbonisation journey as they contribute 94.8% of the 2022 baseline and prove difficult to reduce due to the need to significantly engage external stakeholders such as the airlines, to realise emission savings.

Based on the current projections, over the next 5 years the Airport should focus on the following interventions to decarbonise its operations, based on the highest decarbonisation potential.

- Facilitation of electric vehicle taxis

- Facilitate travel by public bus
- Facilitate transition to use of sustainable aviation fuel (SAF)
- Encourage passenger awareness of benefits of transition from Internal Combustion Engine (ICE) cars to electric vehicles

Due to a lack of data, the programme of interventions modelled in this roadmap are not sufficient to achieve net zero by 2050. This is because not all Greenhouse Gas Protocol (GHGP) scope 3 emissions categories have been considered in this initial scope of work. To help improve data accuracy, and to assist in achieving net zero, the Airport should:

- Collect spend data on the outlined GHGP categories above with a focus on Purchased Goods and Services (PG&S) and Capital Goods.
- Collate a detailed passenger survey of average distance travelled, transport type and fuel type of vehicle.
- Discuss with airport partners or suppliers, alternatives which could be used to de-icing glycol on the runway which are more environmentally friendly.
- Consult third parties on carbon removal purchases to ensure the Airport is able to remove residual emissions after all mitigation measures have been explored.

1. Introduction

Donegal Airport (hereafter "the Airport") is a small regional airport in Northwest Donegal, in the Republic of Ireland (ROI). It was founded in 1986 with the first established scheduled flights operating to Glasgow Airport. Daily flights to Dublin were introduced in the late 1990's and continue to operate on a twice daily schedule. The Glasgow service was suspended during the Covid-19 Pandemic but was reintroduced in July 2023 for the summer season. Glasgow flights are expected to recommence in May 2024 and operate year-round on a 2 to 4 flight per week schedule (based on seasonality). As part of its annual Environmental Improvement Plan which was first introduced in 2018 under the EcoMerit scheme the Airport recognises the urgent need to decarbonise its operations to address the challenges of climate change and is therefore committed to greenhouse gas (GHG) emission reductions.

To better understand its GHG emissions profile in order to decarbonise its operations, the Airport has commissioned AtkinsRéalis to support the development of a decarbonisation roadmap. This roadmap report outlines specific targets, actions and milestones to guide the Airport's efforts towards its net zero goals, with actions falling under estates and assets, operations and behaviour change. This report includes the airports historical annual carbon footprint summary (Section 2.1), with a more detailed analysis of such documented within a separately commissioned Carbon Management Plan 5220713DG003 rev 1 - Donegal Carbon Management Plan.docx. As part of the roadmap modelling, a Business-as-Usual Scenario (BAU) has been produced, which gives an emission projection for the Airport if no further action was taken by the Airport to decarbonise beyond what it has already committed to.

This roadmap is aligned with the Airports Council International (ACI) Europe net zero carbon roadmap standards[9], providing a clear plan and a specific set of interventions that the Airport can take to reduce its GHG emissions, noting that the Airport has already made significant progress in decarbonising its scope 1 and 2 emissions. A high-level strategic action plan (Section 6) outlines how the interventions proposed can be implemented to enable the Airport to achieve the modelled emission reduction potential. This report concludes with a carbon removals strategy (Section 7.1), proposing options to remove residual emissions from the atmosphere.

1.1 Airport Information

Donegal Airport is a small regional airport in Northwest Donegal (Figure 1-1), with coordinates 55.0379° N, 8.3417° W. It is located 3.7km Southwest of Bunbeg in Carrickfinn, Kincasslagh. Donegal Airport is owned and operated by a private limited company 'Aerphort Idirnaisiúnta Dhún na nGall Teo'[10]. The IATA identifier code for Donegal Airport is CFN. The Airport recorded 2,277 Aircraft movements and 36,934 passengers in 2022. Historical passenger numbers and aircraft movements are illustrated in **Table 1-1**.

Table 1-1 Historical passenger numbers and aircraft movements at the Airport (2017-2022)

Information	2017	2018	2019	2020	2021	2022
Aircraft movements	2,331	2,356	2,550	1,952	2,271	2,277
Total Passenger movements	46,514	46,537	48,542	18,067	14,603	36,934

[9] ACI Guidance - Developing a Roadmap to Net Zero Carbon (aci-europe.org)

[10] About Us - Donegal Airport

Figure 1-1 – 'Aerfort Dhún na nGall' marks the location of the Airport.

1.2 Operational boundary

Table 1-2 displays the emissions sources that fall within the Airport's operational boundary and are therefore included within this net zero roadmap. Emissions scopes are defined according to the Greenhouse Gas Protocol[11] (definitions in Glossary). These sources are aligned with those required to be included by the ACI standards.

Table 1-2 Donegal Airport operational boundary

Description of Emissions Sources	Emission Scope
Fuel for vehicles including airside transport, machinery, ground service equipment and de-icing trucks	Scope 1
Fuel used for heat and hot water generation	Scope 1
Fuel used for emergency generator	Scope 1
De-icing Chemicals	Scope 1
Refrigerants	Scope 1
Purchased electricity	Scope 2
Landing and take-off (LTO) emissions	Scope 3

[11] ghg-protocol-revised.pdf (ghgprotocol.org)

Land surface access (Including bus replacement services for cancelled flights)	Scope 3
Employee commuting	Scope 3
Business Travel	Scope 3
Waste management	Scope 3
Water consumption	Scope 3
Wastewater treatment	Scope 3

The Airport does not have landing and surface arrangements, or airport shuttle services in place due to its commercial size and as a result these have been excluded from the assessment of scope 3 emissions. In addition to this, Donegal Airport does not conduct scheduled aircraft maintenance which is instead completed at larger commercial airports such as Dublin and Belfast, therefore the emissions associated with this activity are not within the Airport's boundary.

1.2.1 Greenhouse Gas Protocol (GHGP) emission categories

This net zero roadmap does not consider all scope 3 emission source categories by the GHGP such as Purchased Goods and Services (PG&S), and Capital Goods (CG). This is because this roadmap is currently aligned to the emission sources required within ACI guidance. It should be noted that PG&S is often an organisation's largest source of corporate GHG emissions and therefore it is recommended that these emission categories are included upon revision of this roadmap and when data collection allows. A full list of the GHGP categories can be found in Appendix A.

1.3 Policy context

The Airport's roadmap is aligned to relevant international, national, and local policies to ensure its reputability and value, and to ensure that the Airport drives emission reduction consistent with the requirements of ROI in contributing to global emission reduction. A description of relevant policies is given in Table 1-3.

Table 1-3 Key policies relating to carbon reduction of aviation.

Institution	Policies
Irish Government	In relation to the aviation industry, the Irish government have committed to: • Net Zero by 2050, • Supporting the development of international **standards for market-based measures on aviation emissions**[12]**,** • Developing a **national capability for aviation emissions reporting,** • Update the National Action Plan for Emissions Reductions (2015) to align with

[12] 9b90e1b8a47d47c8950ead2492a54030.pdf (assets.gov.ie)

	the International Civil Aviation Organisation's (ICAOs) policies (Net Zero aviation by 2050[13]), • Encourage **research and development of sustainable fuels,** • Develop an adaptation plan for the transport sector, including adaptation options for airports and aviation services in line with national legislation and the EU Adaptation Strategy[14].
European Union	• The **commission aims to be climate neutral by 2050,** which equivalates to being a net-zero economy[15]. As part of the European Green Deal, the commission has set key targets to achieve by 2030, including a minimum decrease of greenhouse gas emissions of 55% compared to 1990 levels[16]. • Refuel Aviation Initiative, which aims to reduce greenhouse gas emissions by 55% by 2030 compared to 1990 levels[17]. • European Green deal[18] to gradually increase the proportion of Sustainable Aviation Fuel (SAF) from 2% in 2025 to 70% by 2050.
International	• UN 2015 Paris Agreement[19] was adopted by 196 Parties at the UN Climate Change Conference (COP21) in December 2015. The overarching goal is to hold the increase in global temperatures to well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C. Global Greenhouse gas emissions therefore must fall by 43% by 2030 to meet this threshold. • Civil Air Navigation Services Organisation (CANSO)[20] has set targets to continually improve fuel efficiency by 1.5% per annum until 2020 and to cap net GHG emissions through carbon neutral growth. Finally, it has committed to reduce aviation emissions by 50% by 2050.

1.4 Targets and commitments

The Airport has the following GHG emission reduction targets and commitments in place:

1. 51% reduction in scope 1 and 2 emissions by 2030, based on a 2017 baseline, achieved in 2019 as highlighted in Section 2.1

2. 70% reduction in scope 1 and 2 emissions by 2030, based on a 2022 baseline

3. Net Zero GHG emissions by 2050 (Including all scope 1-3, including GHGP categories), based on a 2022 baseline.

[13] ICAO's 2050 net-zero CO2 goal for international aviation - International Council on Clean Transportation (theicct.org)
[14] EU Adaptation Strategy (europa.eu)
[15] 2050 long-term strategy (europa.eu)
[16] A European Green Deal | European Commission (europa.eu)
[17] Fit for 55 - The EU's plan for a green transition - Consilium (europa.eu)
[18] New law agreed to cut aviation emissions (europa.eu)
[19] Net Zero Coalition | United Nations
[20] Home - CANSO

1.5 Governance structure, stakeholders and Communication

1.5.1 Overall responsibilities

In order to ensure that there is effective and ongoing ownership of the carbon management programme, it is important to define a clear governance structure. Successful implementation of the Net Zero roadmap will require cross-organisational support, with clearly established and serious commitment and accountability from senior management and through all levels of the organisation.

The ultimate responsibility for adherence to the carbon reduction commitments sits with Donegal Airport's Managing Director, Eilís Docherty. The Project Administrator, Padraig Carroll, has the day-to-day responsibilities of ensuring that appropriate carbon reduction measures are implemented and for monitoring progress in GHG emissions reductions from the Airport's operations.

The Safety and Security Manager (Trisha Gillespie), Compliance Officer (Kevin Gillespie) and Senior Air Traffic Control Officer (Breandán O'Baoill) all have the day-to-day responsibilities for measuring energy and activity data. The Compliance Officer has overall oversight of the Airport's assurance and auditing processes. As this is a small regional airport, the Managing Director has control over financial affairs at the Airport and therefore has overall oversight of the auditing, assurance, and certification of the Airport, with the support of the Compliance Officer. More information on roles and responsibilities can be found in Appendix B.

1.5.2 Stakeholder engagement and communication

The Airport frequently engages with stakeholders to ensure a smooth and functional operational environment. The engagement of stakeholders varies depending on the stakeholder involved with airport owners, financial providers, employees, regulators, and government in the form of Annual General Meeting (AGM) style quarterly meetings. For current engagement of stakeholders, refer to Appendix C. A list of airport stakeholders is below:

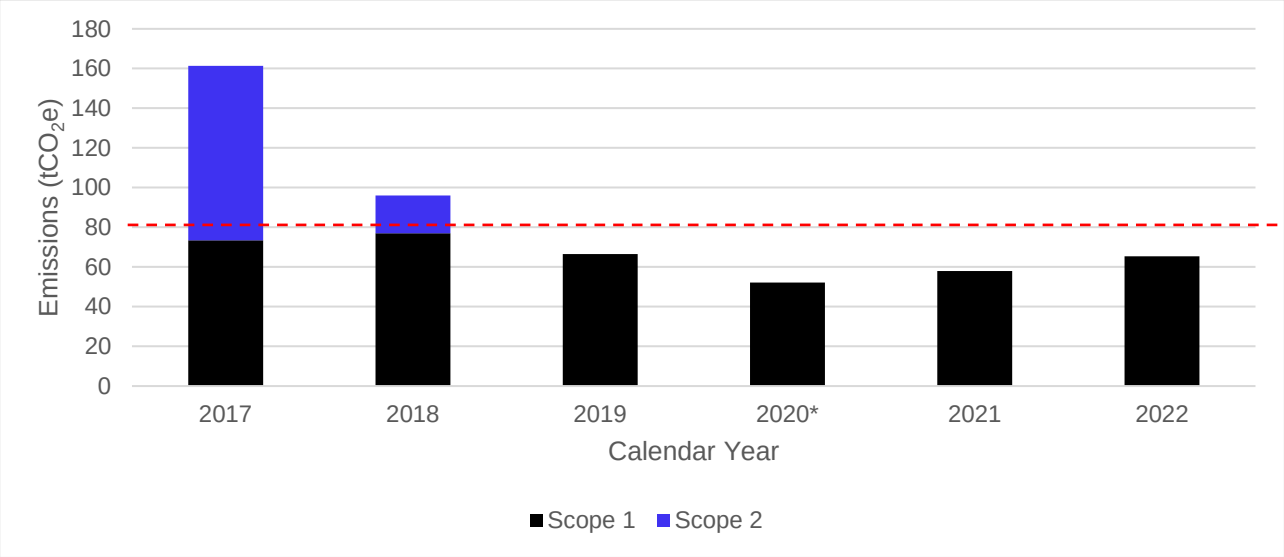
- Airport owners (shareholders)
- Government, regulators and civil authorities
- Finance providers
- Airlines
- Passengers
- Local communities
- Employees
- Environmental groups and NGOs
- Tenants (car-hire services)
- Suppliers and Contractors
- Public transport operators (and taxi rank)
- Other regional airports in ROI

2. Carbon footprint

2.1 Historical carbon footprint

**2020 lower due to the COVID-19 pandemic and not solely due to airport interventions*

Figure 2-1 shows the Airport's historical scope 1 and 2 emissions, dating from 2017-2022.



**2020 lower due to the COVID-19 pandemic and not solely due to airport interventions*

Figure 2-1 – The Airport's historical scope 1 and 2 GHG emissions, with red dotted line showing the 51% scope 1 and 2 reduction target (by 2030, on a 2017 baseline).

2.2 Emissions baseline

In 2022, the Airport collected data on scope 3 emissions for the first time. Therefore, 2022 is the baseline against which interventions proposed within this roadmap will be measured. The GHG emissions in 2022 are illustrated in Figure 2-2.

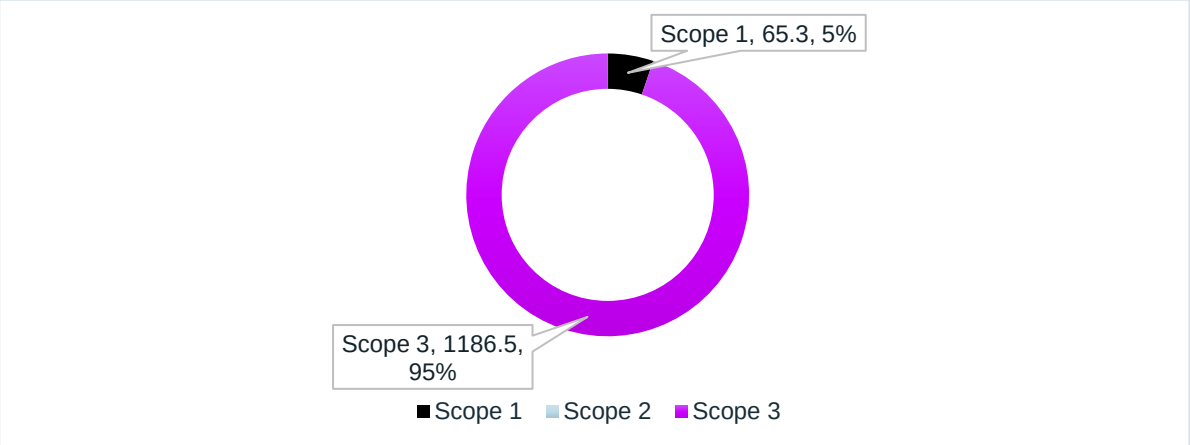


Figure 2-2 – The Airport's 2022 emissions baseline, broken down by scope in tCO2e (Scope 2 emissions are zero due to procurement of renewable energy)

2.3 BAU Scenario

Modelling of a BAU scenario has been undertaken to understand how the Airport's emissions would look by 2050 if no efforts were made to decarbonise its activities beyond what has already been committed to.

Actions which the Airport have committed to and therefore modelled within BAU scenario are:

- The phaseout of kerosene heating to be replaced by an electric radiator system by the end of December 2023.
- A 5% annual rise in passenger numbers as noted in the Airport's 5 Year Business Plan 2023-2027 up to 2027 (impacting building and commuting emissions, and Landing and Take off emissions only).
- Re-commencement of summer flight to Glasgow in 2023, and commencement of year-round flights from May 2024.

The BAU scenario for the Airport across scope 1, 2 and 3 can be found in Figure 2-3.

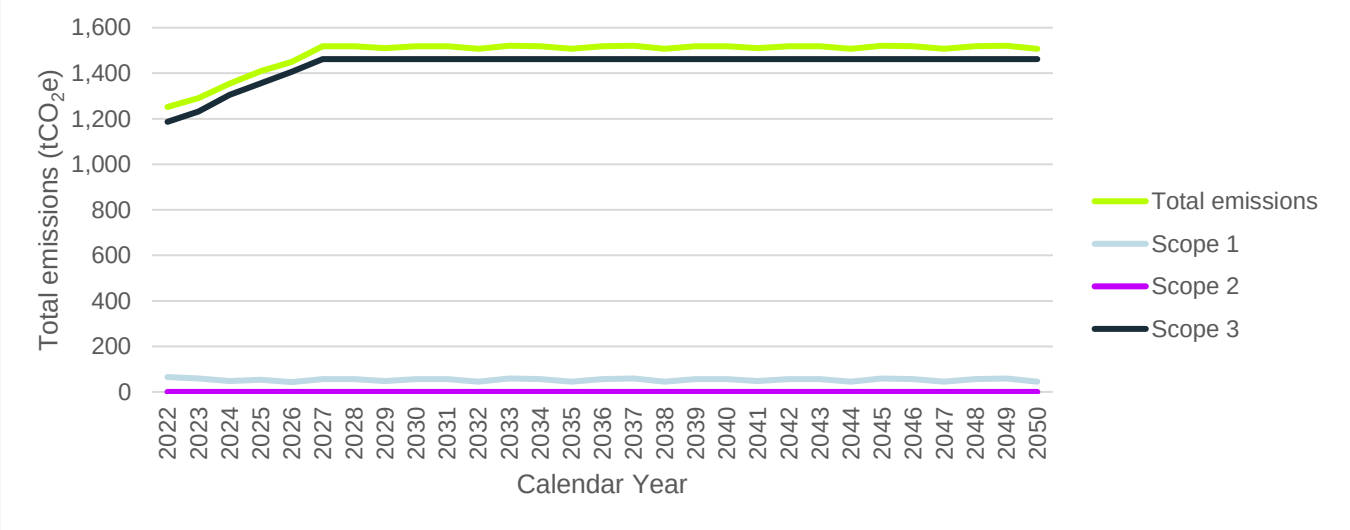


Figure 2-3 BAU emissions projections for the Airport's operations from 2022 to 2050.

2.4 Recent actions

In recent years, the Airport have made significant progress in decarbonising their operations, through interventions focussed on scope 1 and 2. A range of procurement and operational changes have been undertaken and have largely reached their maximum carbon reduction potential, meaning that further savings from these interventions were not modelled in the roadmap. These recent actions include the following:

- Switching to 100% renewable energy procurement with a Renewable Energy Certificate (REC) in 2018. Therefore, the Airport's scope 2 emissions are zero.
- Replacement of airport Ground Service Equipment (GSE) and tow tugs with electric vehicles (currently 25% of total fleet is electric).

- Installation of electric chargers to assist in charging fleet and passenger vehicles in car park.
- Installation of LEDs (although this has no emission impact as 100% renewable electricity procurement).
- Solar PV installation (although this has no emission impact as 100% renewable electricity procurement but builds additional local capacity for increased demand of electricity as a result of electric heating and electric vehicles).
- Staff workshops (covering topics such as recycling)
- Reduced plastic waste (shop moved away from plastic water bottles, water filter for passenger water bottle refills, change in food packaging)
- Reduced cup waste (additional 20% charge for takeaway cups in café)
- Firefighting foam changed 2 years ago (to reduce hazardous waste)
- Cycle-to-work scheme
- Transition of many business meetings to online (reducing the need to travel to Dublin and other locations).

3. Decarbonisation interventions

3.1 Intervention programme

A range of decarbonisation interventions have been proposed for implementation by the Airport over varying timescales between now and 2050 to help the Airport to progress towards its net zero targets. Interventions were decided during a workshop between AtkinsRéalis and the Airport, with attendance from all heads of department and the Managing Director. For each intervention, consideration was given to the following list of criteria, which was agreed between both parties.

- Cost of implementation
- Carbon reduction potential
- Co-benefits
- Timescale (deliverability pre-2050)

A Red Amber Green (RAG)-style system was used to rate each criterion through high, medium, and low priority across the list of produced interventions. This allowed the long list of potential interventions to be condensed into a concise and manageable list. The Airport then took the short list away to discuss with internal stakeholders. Following further refinement, a final list of interventions was produced which has been modelled in this study. Table 3-1 gives the full list of modelled interventions, alongside the emission reductions achieved by each individual intervention when compared against the BAU scenario. For further definitions of each intervention please see Appendix D.

Assumptions were made based on potential indicative dates that interventions should be rolled out and how many years interventions take to be fully realised. Timescales were decided based on typical implementation timelines (considering time for planning, physical works, etc.) and start dates considered the capacity of the Airport to conduct this work (avoiding overloading any particular staff teams and passenger disruption), how best to meet net zero timelines and any pre-requisite measures. Interventions related to EV transition also considered estimates for the rate of EV uptake in the ROI and ROI EV policy. Assumptions used for the analysis of the decarbonisation roadmap can be found in Appendix E.

The majority of interventions within this study are modelled to have achieved their full carbon reduction potential by 2050, to align with the Airport's net zero target of 2050 and as a result of wider Irish Government policies such as the ban of new ICE (internal combustion engine) cars by 2035. It should be noted however, that current modelling projects just 60% of passenger vehicles to be electric by 2050 aligned with Irish Government data[21].

Table 3-1 Decarbonisation interventions modelled within this study.

Intervention theme	Intervention	Proposed delivery timescale (referred to in calendar years)	Cumulative GHG emissions reduction by 2050 (tCO_2e)
Estates & Assets	Transition all airport-owned vehicles to EVs (electric vehicles), excluding fire engines	2027-2030	236.2

[21] Electric-Vehicle-Roadmap.pdf (seai.ie)

Intervention theme	Intervention	Proposed delivery timescale (referred to in calendar years)	Cumulative GHG emissions reduction by 2050 (tCO_2e)
	Transition airport-owned fire engines to EVs	2035-2040	166.5
	Purchase electric vehicle for business travel	2025-2028	16.8
	Transition diesel lawnmowers to EVs	2028	8.5
	Replace toilets with more efficient alternatives	2024	4.5
Operations	Facilitate transition to use of sustainable aviation fuel (SAF) through provision of fuel supply for aircraft.	2025-2050	1,622.2
	Transition to an EV cancellation bus	2035-2039	673.4
	Transition to the use of biofuels for emergency generation	2025	382.9
	Remove/replace all air conditioning with heat exchange system	2024	66.3
	Work with Local Council to support reduction in waste from beach-goers	2024-2025	0.4
Behaviour change	Facilitate passenger travel to airport by EV taxis	2028-2035	2,359.6
	Facilitate passenger travel to airport by public bus	2025-2040	1,716.1
	Facilitate staff travel by EVs	2024-2050	87.1
	Staff sustainability training	2024-2027	19.1
		Total cumulative carbon reduction by 2050 (tCO2e)	**7,359.8**

Figure 3-1 provides a visual representation of the cumulative impact of each intervention in reducing the Airport's emissions. Categorisation of the intervention under estates and assets, operations, and behaviour change allows for better understanding of where the greatest emissions reduction can be achieved.

Facilitating passenger travel to the Airport by EV taxis offers the greatest contribution to cumulative emissions reduction (32.1%), followed by facilitating passenger travel to the Airport by public bus (23.3%) and then facilitating transition to the use of sustainable aviation fuel (22.0%).

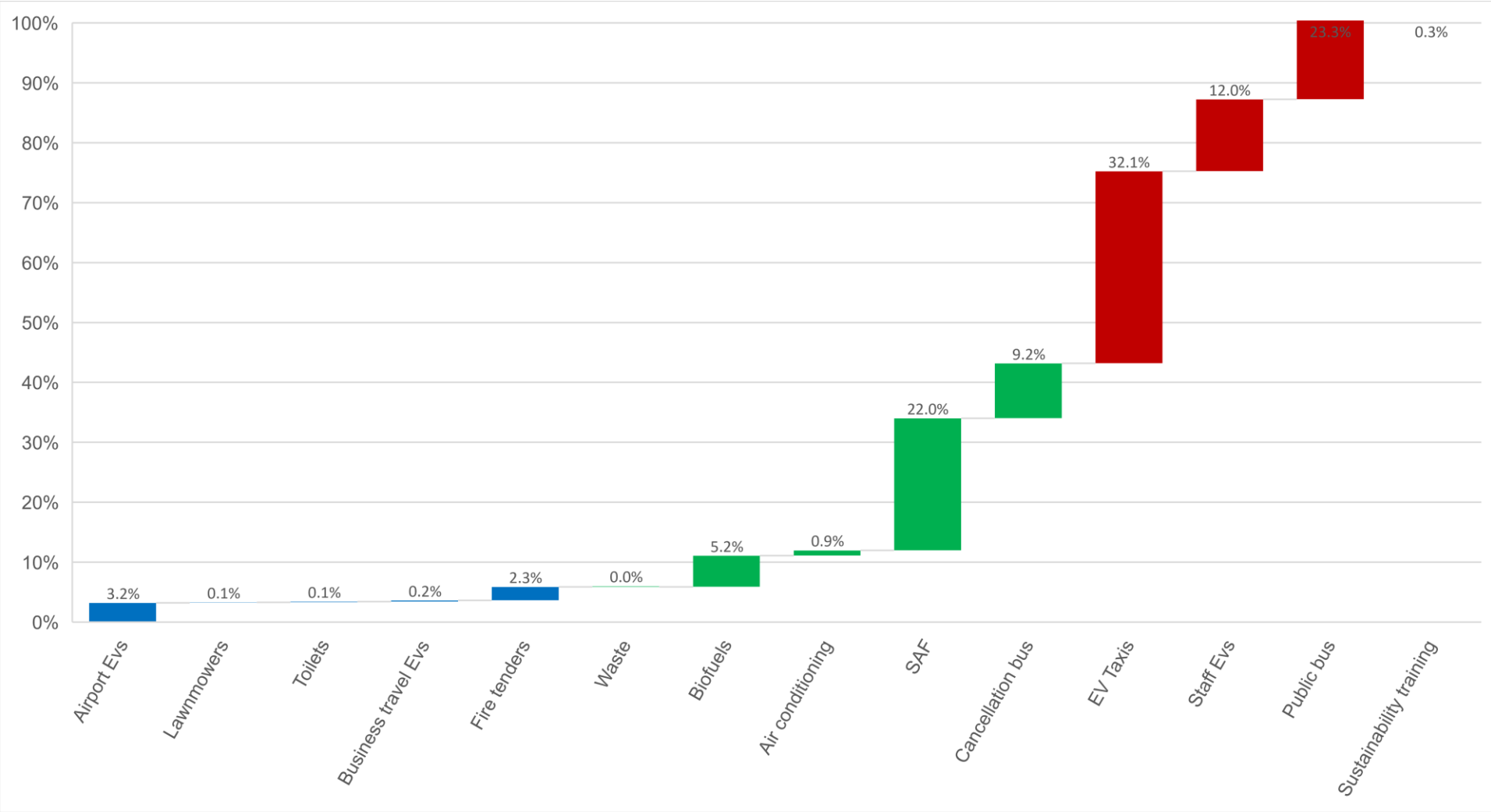


Figure 3-1 Breakdown of cumulate emissions savings from each modelled intervention- boxes surround intervention categories (blue: estates and assets, green: operations, red: behaviour change). To one decimal place, emissions savings from 'waste' round to 0.0%.

3.2 Discarded interventions

Following the shortlisting of interventions during the workshop, the decision was made to remove/reframe some of the interventions. This was as a result of further research which suggested either that the intervention would not result in significant emissions savings, that there was a better alternative or that the necessary technology was not yet available. This list should be reviewed in future updates to the roadmap to determine whether they become viable.

Table 3-2 Interventions discarded from the modelling (post-workshop).

Intervention	Reason for removal
Retrofits of existing toilets with automatic flushes	Research did not provide sufficient evidence that this would lead to a reduction in water consumption (and, hence, a reduction in emissions).
Refrigerant replacement (with less carbon intensive alternatives)	The use of refrigerants with lower Global Warming Potentials (GWP's) such as ammonia are relatively new. Such alternatives cannot be used within copper-based systems and can be harmful to human health. Therefore, an assessment of the airports refrigerant use and its associated systems is required to recommend emission reductions past the efficiencies of installing a heat exchange system modelled within this roadmap.
De-icer replacement (with less carbon intensive alternatives)	There are currently no available alternative de-icers that have been deemed appropriate for transition by the Airport. One possible alternative chemical for runway de-icing that is used by other airports is potassium acetate, but the carbon saving of this option is unconfirmed. Better alternatives may become available in future. This could include the procurement of recycled de-icing chemicals.
Social media promotion of passenger behaviour change	While this intervention offers some potential in the future, no specific actions could currently be identified.
Use of electric generators for emergency generation	Due to the requirement for emergency generators to operate during times of grid power outage, and to meet international aviation standards, the ability of an electric (battery powered) generator to meet the emergency generation needs of the Airport was deemed uncertain. However, some Airports (for example, Schiphol[22]) have started to trial a transition towards battery generators, suggesting a potential intervention for the future.
More efficient de-icing practices	While no specific interventions could be identified at this stage, there are a range of potential actions that the Airport could take to reduce its consumption of de-icing chemicals. These could include enhanced weather forecasting to facilitate pro-active anti-icing and the use of hot water de-icing. Alternatively, the Airport could consider installation of a heated runway by adding electrically conductive

[22] Amsterdam Schiphol Airport to Ditch Diesel Generators to Cut Emissions - Bloomberg

	materials to the runway concrete mix[23]. However, this technology is relatively young and would incur significant capital costs and embodied carbon which may outweigh the savings of de-icer reduction.

3.3 Passive intervention

Some passive interventions were modelled in the roadmap. These interventions require steps by the Airport to facilitate emission reduction, although the Airport action does not result in the emission reductions itself. It is predicted that private ownership of electric vehicles will increase significantly up to 2050, in line with the ban of sales of new non-electric cars in ROI from 2035. The Sustainable Energy Authority of Ireland (SEAI) medium scenario predicts a 60% EV contribution to the passenger car segment by 2050[24]. The emissions impact of this change is also connected to the decarbonisation of the ROI grid, from which these vehicles will be charged. This transition will have a significant impact on emissions from visitor travel to and from the Airport. While this is a passive change, it can be facilitated by the Airport through installation of electric vehicle charging points and promotional campaigns. The emissions reduction potential of this passive intervention is given in Table 3-3. Therefore, if the emission reductions outlined in Table 3-3 are achieved the airports cumulative emission reduction for this passive intervention is projected to be 8,322.3tCO2e by 2050.

Table 3-3 Emissions reduction potential from passive intervention.

Intervention	Proposed delivery timescale (referred to in calendar years)	Cumulative GHG emissions reduction by 2050 (tCO_2e)
Private uptake of EVs by passengers, to be used for travel to airport	2024-2050	8,322.3
Total cumulative carbon reduction by 2050- excluding passive intervention		7,359.8
Total cumulative carbon reduction by 2050- including passive intervention		15,682.1

[23] The Cost of Frost on Runways. A Look at Heated Pavement Technology | by FAA Safety Briefing | Cleared for Takeoff | Medium

[24] Electric-Vehicle-Roadmap.pdf (seai.ie)

4. Interventions by scope

4.1.1 Scope 1

Scope 1 emissions include all direct emissions by the Airport from consumption of diesel, and direct emissions from greenhouse gases in chemicals and refrigerants. This covers diesel consumed by the fleet and by emergency generators, and chemicals consumed for de-icing, fire extinguishing and refrigerant use.

Diesel consumption can be significantly reduced by transitioning to electric alternatives. Where a switch to fully electric is not yet feasible (for example, for emergency generation), the use of less carbon intensive fuels has been suggested. Assuming the Airport continues to procure 100% renewable electricity, this transition to electric alternatives will lead to a complete emissions reduction.

Emissions savings from chemical and refrigerant consumption can be achieved by either replacing chemicals with a less carbon-intensive alternative or by reducing the total quantity consumed through demand reduction or the replacement of inefficient equipment.

A breakdown of scope 1 emissions savings per intervention is given in Figure 4-1.

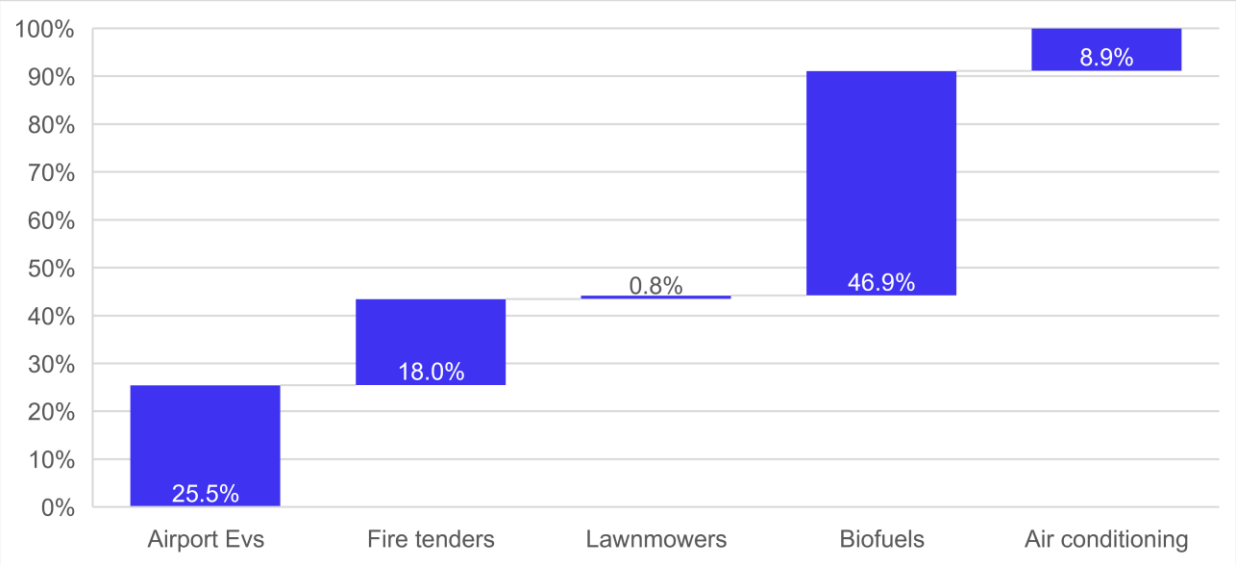


Figure 4-1 Breakdown of Scope 1 emissions savings from the listed interventions, given as a contribution to total scope 1 emissions savings.

4.1.2 Scope 2

Scope 2 emissions include all consumption of purchased electricity by the Airport. Due to the procurement of 100% renewable energy (from 2019), scope 2 emissions are effectively zero. It should be noted that there will be a significant increase in electricity demand associated with the transition of employee and passenger vehicles to electric and through the utilisation of electric heating. It has been assumed for the modelling that a sufficient quantity of renewable energy can be procured to meet this demand, and that the airports current electrical capacity is sufficient/ or that it will be updated to facilitate these interventions.

4.1.3 Scope 3

Scope 3 covers all indirect emissions of the Airport, with aircraft LTO (landing-take-off) emissions and visitor travel to and from the Airport identified as the greatest emissions sources. Scope 3 interventions predominantly relate to collaborating with external stakeholders to drive change.

To reduce emissions from visitor travel to and from the Airport, it has been proposed that the Airport collaborate with Transport for Ireland and local taxi companies to offer more sustainable options for passengers to travel to the Airport. The Airport has begun to engage with public transport operators to facilitate these changes including making bus timetables more appropriate for flight times. In addition, collaborating with airlines to drive the transition to the use of sustainable aviation fuel (SAF), and sourcing the fuel for aircraft use has the potential to generate significant emissions savings.

It should be noted that some scope 3 emissions calculations are currently based on high-end estimates due to a lack of primary data. This includes the assumption that all passengers are travelling 70km (the approximate driving distance from Donegal to the Airport), which is predicted to be a significant overestimate. Such assumptions are stipulated in the ACI's ACERT aviation emission quantification tool. Therefore, collection of primary data through passenger surveys has the potential to lead to a reduction in modelled emissions. It has also been assumed for the modelling that the ROI electricity grid emission intensity will fall linearly from 2023 to 2035, whereby it will be zero-carbon, thus, affecting emissions from sources such as charging EVs from the grid. If the grid fails to decarbonise at the predicted rate, there is the potential for higher scope 3 emissions.

A breakdown of scope 3 emissions savings per intervention is given in Figure 4-2. While not included in Figure 4-2 due to the lack of influence of the Airport, it should be noted that the passive intervention of passenger uptake of EVs has a significant impact on the 'visitor travel to and from airport' scope 3 emissions category.

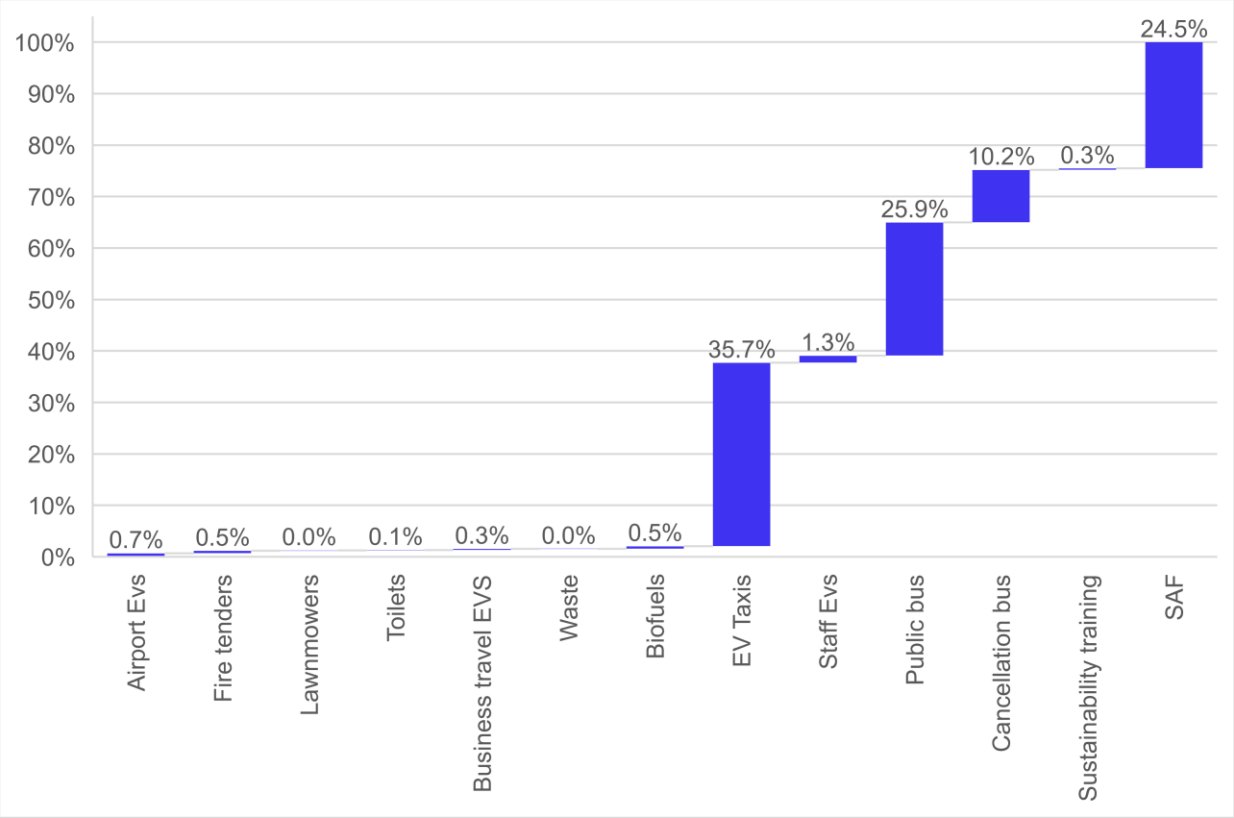


Figure 4-2 Waterfall breakdown of Scope 3 emissions savings from the listed interventions, excluding passive works, given as a contribution to total scope 3 emissions savings.

4.2 Headline interventions

Each of the following interventions contributes at least 20% to the overall emissions savings realised from this roadmap (excluding passive intervention of passenger vehicle transition to EV's).

Facilitate travel by EV taxis

According to a recent passenger survey conducted at the airport, 9% of passengers travel to the Airport by taxi. While there are currently limited EV taxi options available, it has been proposed that the Airport collaborate with local taxi companies to advocate/ stipulate a requirement for the provision of EV options. The Airport could then promote this option to its passengers. While the Airport can drive a more rapid uptake of EVs, it is likely that the local taxi companies will independently transition in line with the government policy relating to the ban of sales of new non-electric cars.

Facilitate travel by public bus

The transition of passenger travel from private car to public bus offers significant emissions reduction potential. In order to facilitate this shift, the Airport is encouraged to continue their collaboration with Transport for Ireland to develop a bus timetable and network that offers a viable travel option to passengers. The emissions savings from this intervention will be maximised following the predicted transition of public buses in ROI to EVs. This initiative can be driven in parallel with the National Policy on Sustainable Mobility[25].

Facilitate transition to use of sustainable aviation fuel (SAF)

Landing-take-off emissions contribute 20.0% of the 2022 emissions baseline and therefore offer significant potential for emissions reductions. Because taxi routes/times have already been optimised by the Airport, the greatest emissions reduction opportunity remaining is to transition to less carbon-intensive aircraft fuel. While the Airport is unable to enforce a transition to SAF, it can collaborate with its airlines to drive this transition. For example, the Airport could discuss with Emerald Airlines the potential to trial SAF on the regular flight between Dublin and Donegal. The Airport can ensure it is prepared for this transition through the provision of SAF's to airlines, as it will be required to do so through regulation.

Both Emerald Airlines (Aer Lingus)[26] and Logan Air[27] have already committed to significantly reducing their flight emissions up to 2050. They will also need to adhere to the new EU RefuelEU[28] aviation rules to increase uptake of sustainable aviation fuels, from 2% of overall fuel supply in 2025 to 70% by 2050.

[25] gov.ie - National Policy on Sustainable Mobility (www.gov.ie)

[26] Sustainability & Net-Zero Carbon Emissions by 2050 - Aer Lingus

[27] GreenSkies (loganair.co.uk)

[28] Carriages preview | Legislative Train Schedule (europa.eu)

5. Decarbonisation pathway

Following the implementation of the interventions proposed by this study, the resulting decarbonisation trajectory shows a gradual decrease in the Airport's emissions to 2050. By 2050, the interventions modelled within this roadmap are projected to reduce the Airport's annual emissions by 61.7% (772.2 tCO_2e) with a resulting 38.3% (479.6 tCO_2e) of residual emissions. This is compared to an emission baseline in 2022 of 1,251.8 tCO_2e and a BAU of 1,507.3 tCO_2e in 2050. The decarbonisation pathway is displayed in Figure 5-1.

This decarbonisation pathway shows a gradual and consistent decrease in both scope 1 and scope 3 emissions, with scope 2 emissions of 0tCO_2e throughout. Scope 3 emissions offer the greatest potential for further emissions reductions. If technology allows, or further assessment is carried out, some of the interventions in the discarded interventions (Section 3.2) could be modelled allowing further emission reduction.

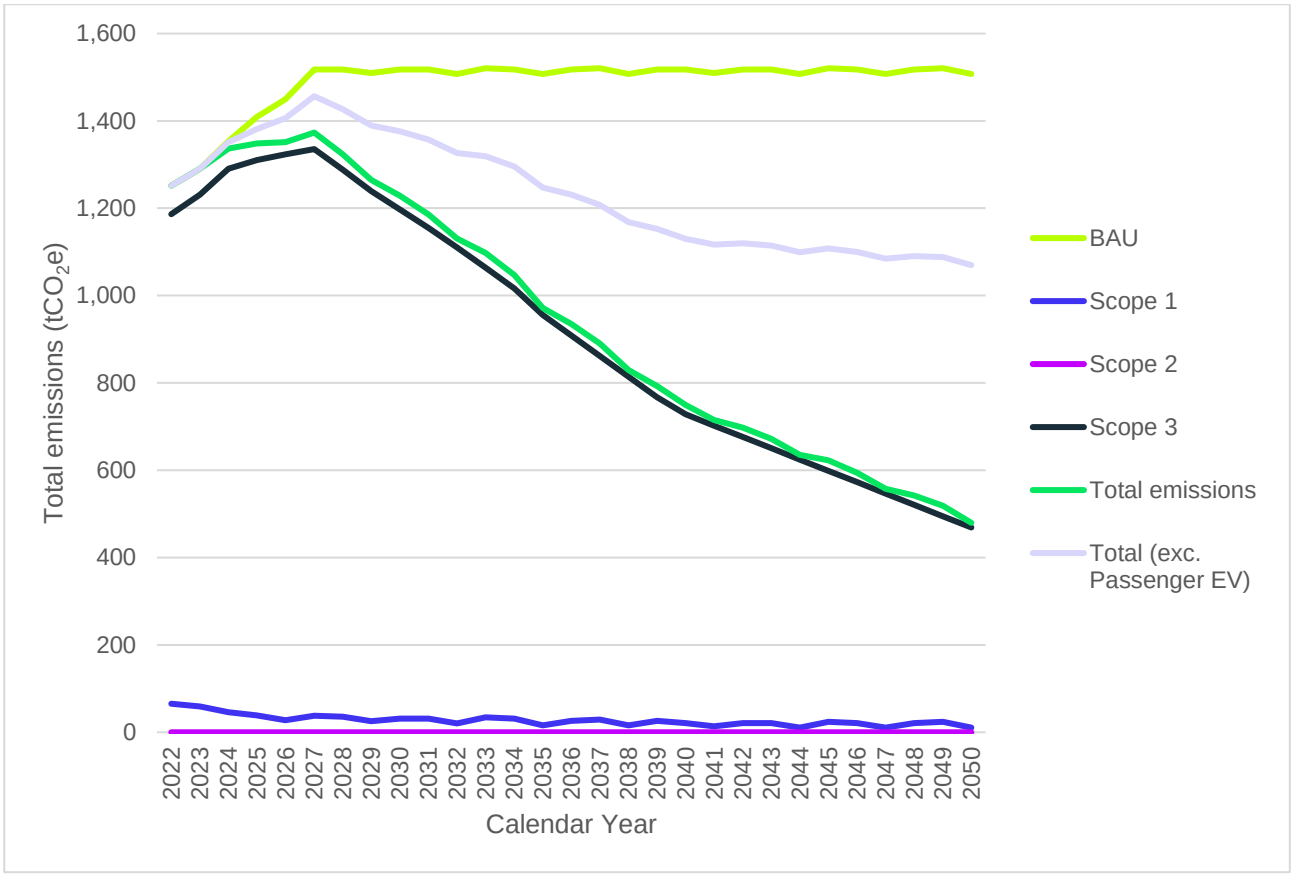


Figure 5-1 Decarbonisation roadmap of the Airport's emission to 2050, following the modelled programme of interventions, with BAU for reference.

6. Strategic Action Plan

Using the findings of this roadmap, a strategic high level action plan has been developed, setting out the specific actions that the Airport can take to achieve the modelled carbon reductions. Table 6-1 outlines an action plan for the Airport to roll out to progress towards its decarbonisation goals. Actions have been categorised into ‘quick wins’ and ‘long-term goals’. While quick wins frequently have a lower carbon reduction potential, their short timescale of implementation makes them an effective approach for achieving short-term carbon reductions. While the long-term goals take longer to achieve their full GHG emissions reduction potential, the total savings are often greater, and the Airport can continue to see annual emissions reductions many years after first implementation.

Table 6-1 Action plan to implement decarbonisation interventions, split by 'quick wins' in pink and 'long-term goals' in grey.

Year to initiate intervention	Decarbonisation intervention	Action	Action owner(s)
2024	Staff sustainability training	• Source an external provider of staff sustainability training. • Commence training rollout across all staff.	Managing director
2024	Reduce waste from beachgoers	• Engage with Donegal County Council to discuss the provision of bins and waste collection services for Carrickfinn Beach.	Managing director
2024	Replace toilets with more efficient alternatives	• Source new toilets that offer optimal reductions in water consumption. • Replace all terminal toilets.	Maintenance
2024	Remove/replace all air conditioning	• Remove/replace air conditioning, with heat exchange system. • Monitor the efficiency of heat exchange system and its consumption of refrigerants.	Maintenance

2025	Transition to the use of biofuels for emergency generation	• Discuss with the relevant team to ensure that the current emergency generators are compatible with the use of biofuel and, if not, plan for the procurement of a biofuel generators, making use of any available government funding. • Research and procure a high-quality biofuel (for example, pure biodiesel), for use in the emergency generator(s).	Managing director
2025	Purchase electric vehicle for business travel	• Procure an electric jeep to replace the patrol vehicles currently used for business travel e.g. for firefighting training. • Draft a policy/booking system to facilitate the use of this vehicle by staff for business travel.	Managing director
2025	Facilitate staff travel by EVs	• Consider installation of additional EV charging points in the car park • Facilitate free or discounted charging for staff if they purchase an electric vehicle.	Managing director
2025	Facilitate passenger travel to airport by public bus	• Continue to engage with Transport for Ireland, providing high quality passenger travel survey data to inform the review of local bus services.	Managing director
2025	Facilitate transition to use of sustainable aviation fuel	• Engage with airlines to understand their plans for future use of SAF. • Discuss with Emerald Airlines the potential to trial SAF on the regular flight between Dublin and Donegal. • Research and discuss the potential for a transition to SAF by private aircraft. • Procure and plan to supply SAF's to meet EU regulations and growing demand.	Managing director

2027	Transition all airport-owned vehicles to EVs, excluding fire engines	• Conduct a full review of the fleet, identifying all non-electric vehicles. • Create a procurement plan, considering timescales and cost of replacement, aiming for a complete transition by 2030.	Managing director
2028	Facilitate passenger travel to airport by EV taxis	• Engage with local taxi firms to discuss the potential to collaborate on the provision of EV taxi services for passenger travel to the Airport. • Consider stipulation/ requirement of EV's in contracts for taxi providers.	Managing director
2028	Transition diesel lawnmowers to EVs	• Research and procure fully EV lawnmowers to replace the current models at their end-of-life.	Managing director
2035	Transition airport-owned fire engines to EVs	• Research and procure fully EV fire engines to replace the current vehicles at their end-of-life.	Managing director
2035	Transition to an EV cancellation bus	• Engage with the current supplier of the cancellation bus to discuss the procurement of/ transition to an EV bus.	Managing director

7. Meeting targets

7.1 Carbon removals strategy

Carbon Reductions and Carbon Removals

In order for the Airport to reach net zero without intervention beyond what is currently being proposed, it is likely that the Airport will need to offset its residual emissions. There are two types of carbon offsets that the Airport could purchase **carbon reductions (or avoidance offsets)** and **carbon removals**. Carbon reductions seek to reduce a given amount of carbon outside of the value chain, typically through investment in low carbon technology, such as LED lighting or low-carbon cooking systems, mainly in the developing world. Carbon reduction offsets mean emissions are still occurring, albeit at a lower rate than if the investment had otherwise occurred in a carbon-intensive alternative. Carbon removals take carbon from the atmosphere and store it permanently, through activities such as long-term forest restoration or removal technology, such as direct air capture. It is vital that high-quality carbon removals are sought to ensure that the amount of carbon theoretically "offset" is achieved in reality.

ACI Requirements

It should be noted that to align with the ACI, carbon reductions are not allowed, which means that the Airport will be required to pursue carbon removals.

ROI/ EU carbon removals market

In ROI, the Forest Carbon Code is a registered carbon removals service which provides certification for carbon removals. Organisations can contact this service to enquire about purchasing carbon removals for several years in the future. Other removal schemes within the UK and EU are highly subscribed. Therefore, alternative solutions to future carbon removals need to be explored, such as direct air capture, rock weathering solutions or internationally accredited removals of reforestation schemes.

The requirement by the ACI of using carbon removals solely means that any residual emissions by 2050 must be removed and certification sought to evidence their removal. Due to the amount of time it takes for reforestation and afforestation programmes to reach maturity and thus remove carbon dioxide from the atmosphere in large quantities, it is unlikely that the Airport will be able to claim removals from these types of schemes for several decades after purchase. The Airport could, however, claim removals in the shorter-term by utilising methods which offer more rapid returns. A review by the UK's Environment Agency[29] assessed a range of potential offset measures against criteria such as readiness for implementation, permanence, and cost. Carbon removal methods such as Biochar were found to have a high reduction potential and immediate impact.

Airport Strategy

It is recommended that the Airport pursues efforts to contact removal providers in ROI, the EU, or the UK to ensure it understands the costs of the removal of the residual GHG emissions contained within this roadmap. It should be noted that this roadmap does not yet consider all GHGP categories and therefore the residual emissions will in reality be higher than those stated within this roadmap. The Airport should consider whether partner organisations such as other Irish airports are planning to invest in carbon removals, to allow for a co-

[29] Environment Agency external corporate report template (publishing.service.gov.uk)

ordinated approach. The focus on carbon removals will increase significantly in the coming years and therefore engagement across the Airport's stakeholders will be needed to ensure the Airport evaluates all potential options.

7.2 Airport targets

The Airport has a range of net zero targets (introduced in Section 1.4). This section will outline whether these targets have been met based on this net zero roadmap.

Figure 7-1 displays the roadmap projection of scope 1 and 2 emissions compared to the trajectory required to achieve the target of reducing scope 1 and 2 emissions by 70% by 2030. The graph displays that while current modelled interventions do not reach a sufficiently low level of emissions (only 52.3%), this target is very much within reach. The reduction in refrigerant use, combined with reductions in the emission intensity or quantity of de-icer is needed to reach this target.

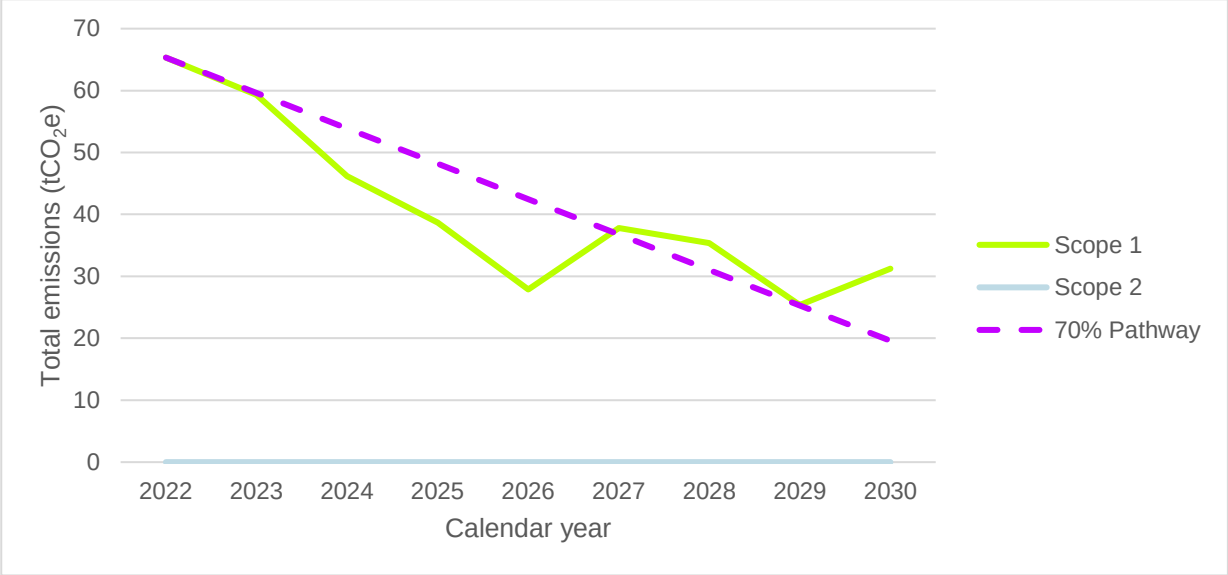


Figure 7-1 Projection of the Airport's scope 1 and 2 emissions from 2022-2030, alongside the combined emissions trajectory required to achieve a 70% reduction from 2022 to 2030.

The net zero roadmap of interventions set out in this report would lead to significant progress towards this target. However, the target committed includes the scope 3 emission sources which are currently not within this roadmap, aligned to the GHGP. Therefore, revision of this roadmap and additional interventions to realise emission reductions associated with them are needed to evaluate progress against this target. It should be noted however, that only 38.3% of residual emissions of the sources within this roadmap remain and it is expected that with global supply chain decarbonisation the residual emissions of the Airport when the GHGP categories have been accounted for will largely be the same.

The ISO definition of 'net zero' used in this roadmap does not require a specified level of decarbonisation, provided that any residual emissions are offset using carbon removals. Therefore, it could be considered that the Airport is able to meet this target simply by quantifying the emissions from currently unconsidered scope 3 categories and removing these, alongside any residual emissions from categories already included in this roadmap.

7.2.1 IPCC 1.5°C Pathway

According to ACI standard, any interim emissions targets are required to align with the IPCC 1.5°C warming scenario, which shows progress against the 2015 UN Paris Agreement. The IPCC 1.5°C scenario for the Airport's emissions is displayed in Figure 7-2, alongside the BAU and decarbonisation pathway for reference.

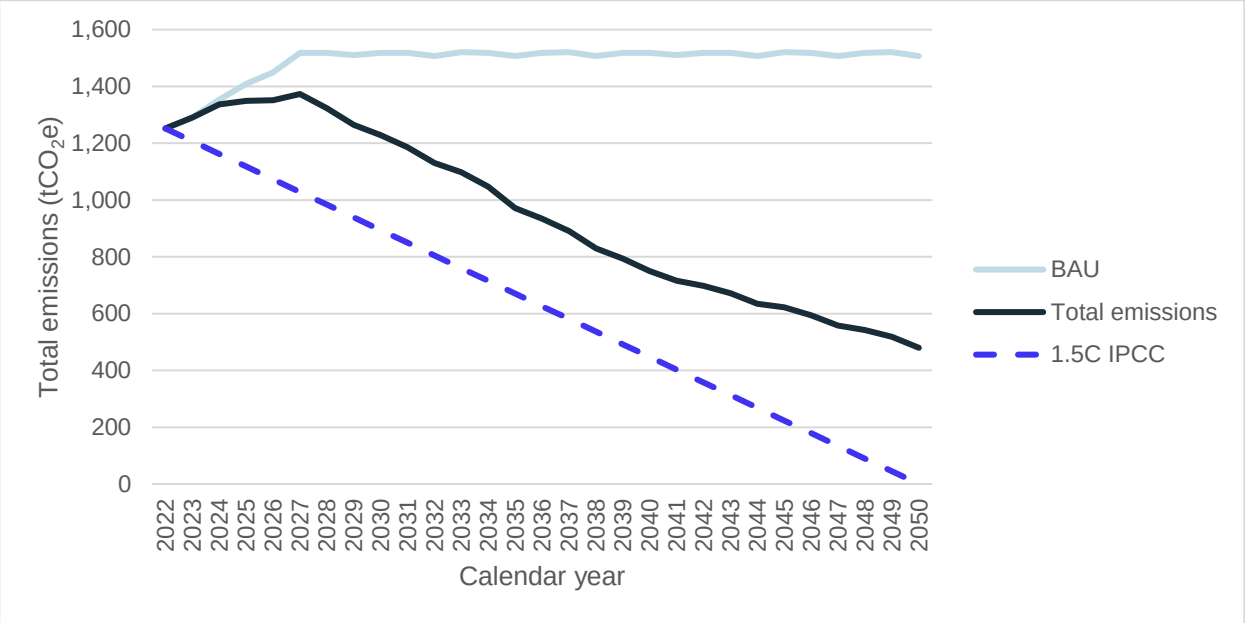


Figure 7-2 Decarbonisation roadmap of the Airport's emissions to 2050, alongside the emissions requirement to align with the 1.5 degrees warming scenario according to the IPCC.

8. Conclusions and recommendations

Following the decarbonisation programme of interventions developed within this study, alongside external passive interventions such as Passenger EV uptake and grid decarbonisation, the Airport could see their emissions fall from a 2022 baseline of 1,251.8 tCO_2e to a residual of 479.6 tCO2e in 2050. The emission reductions proposed within this roadmap also reduce scope 1 emissions by 52.3% (scope 2 already zero). The roadmap does not currently achieve the Airports target of a 70% reduction in scope 1 and 2 emissions by 2030, or the net zero target in 2050. Future work is therefore needed to identify further emissions as the industry and supply chain engage in delivering against ROI's net zero ambitions.

While scope 2 emissions are 0 tCO2e throughout the roadmap due to the procurement of 100% renewable electricity, scope 1 emissions reduction are limited by safety requirements and a current lack of viable alternatives for some chemicals. Scope 3 emissions interventions offer large and continuous reductions, often in association with government and EU policies on emissions sources such as ICE cars and aviation fuel. The largest emission reductions can be achieved through the facilitation of SAF's and working with taxi operators to procure electric vehicles, as well as working with transport operators to increase and amend bus service timetables.

It should be noted that the decarbonisation of aviation is considered as an inherently challenging sector to decarbonise. Current innovation in technology is slow around alternative aircraft fuels and due to the nature of the sector there is a significant safety barrier in the realisation of some interventions/ feasibility of them. Examples of this are the requirement by aviation regulators to have continuous and uninterrupted power supplies (negating full battery use) and the use of certain de-icing practices. Therefore, it is not a given that aviation as a sector will be able to reach net zero without advances in these technologies, as a result airports such as Donegal's own net zero plans are contingent on these advancements. Due to its commercial size, it has limited ability to enact wider sectoral decarbonisation and therefore the progress of international efforts to decarbonise aviation is critical for its pursual of net zero.

Recommendations and next steps

The following recommendations and next steps are required for the Airport to realise the emission reductions within this roadmap:

- Discuss strategic action plan with stakeholders internally and develop a costed implementation plan to enable emission reduction realisation.
- Obtain primary data where secondary data is currently used (i.e. passenger travel distances)
- Communicate with airlines to investigate possibility of 100% SAF flights which will end LTO emissions.
- Collate data on additional scope 3 GHGP categories (such as PG&S and Capital Goods), and produce emission interventions to reduce them, and reflect such changes within this roadmap.
- Contact carbon removal providers and work with industry partners to draft a removal strategy to achieve airport decarbonisation targets.
- Update and reflect this roadmap frequently and consider it 'live' to model new technology as it becomes available.

Appendix A. GHGP Category descriptions

Category 1 – Purchased Goods and Services:
This category includes all upstream (i.e., cradle-to-gate) emissions from the production of products purchased or acquired by the reporting company in the reporting year. Products include both goods (tangible products) and services (intangible products).

Category 2 – Capital Goods:
This category includes all upstream (i.e., cradle-to-gate) emissions from the production of capital goods purchased or acquired by the reporting company in the reporting year. Emissions from the use of capital goods by the reporting company are accounted for in either Scope 1 (e.g., for fuel use) or Scope 2 (e.g., for electricity use), rather than in Scope 3.

Category 3 – Fuel and energy related activities:
This category includes emissions related to the production of fuels and energy purchased and consumed by the reporting company in the reporting year that are not included in Scope 1 or Scope 2.

Category 4 – Upstream transportation and distribution:
Category 4 includes emissions from transportation and distribution of products purchased in the reporting year, between a company's tier 1 suppliers and its own operations in vehicles not owned or operated by the reporting company (including multi-modal shipping where multiple carriers are involved in the delivery of a product but excluding fuel and energy products). It also includes third-party transportation and distribution services purchased by the reporting company in the reporting year (either directly or through an intermediary), including inbound logistics, outbound logistics (e.g., of sold products), and third-party transportation and distribution between a company's own facilities.

Category 5 – Waste generated in operations:
Category 5 includes emissions from third-party disposal and treatment of waste generated in the reporting company's owned or controlled operations in the reporting year. This category includes emissions from disposal of both solid waste and wastewater.

Category 6 – Business Travel:
This category includes emissions from the transportation of employees for business related activities in vehicles owned or operated by third parties, such as aircraft, trains, buses, and passenger cars.

Category 7 – Employee Commuting:
This category includes emissions from the transportation of employees between their homes and their worksites. Emissions from employee commuting may arise from:

- Automobile travel
- Bus travel
- Rail travel
- Air travel
- Other modes of transportation (e.g., subway, bicycling, walking).

Companies may include emissions from teleworking (i.e., employees working remotely) in this category. A reporting company's Scope 3 emissions from employee commuting include the Scope 1 and Scope 2 emissions of employees and third-party transportation providers.

Category 8 – Upstream leased assets:
Category 8 includes emissions from the operation of assets that are leased by the reporting company in the reporting year and not already included in the reporting company's Scope 1 or Scope 2 inventories. This category is applicable only to companies that operate leased assets (i.e., lessees). For companies that own and lease assets to others (i.e., lessors), see category 13 (Downstream leased assets).

Category 9 – Downstream transportation and distribution:
This category includes emissions that occur in the reporting year from transportation and distribution of sold products in vehicles and facilities not owned or controlled by the reporting company.

Category 10 – Processing of sold products:
Category 10 includes emissions from processing of sold intermediate products by third parties (e.g., manufacturers) subsequent to sale by the reporting company. Intermediate products are products that require further processing, transformation, or inclusion in another product before use (see box 5.3 of the Scope 3 Standard), and therefore result in emissions from processing subsequent to sale by the reporting

company and before use by the end consumer. Emissions from processing should be allocated to the intermediate product.

Category 11 – Use of sold products:
This category includes emissions from the use of goods and services sold by the reporting company in the reporting year. A reporting company's Scope 3 emissions from use of sold products include the Scope 1 and Scope 2 emissions of end users. End users include both consumers and business customers that use final products.

Category 12 – End of life treatment of sold products:
Category 12 includes emissions from the waste disposal and treatment of products sold by the reporting company (in the reporting year) at the end of their life. This category includes the total expected end-of-life emissions from all products sold in the reporting year. (See section 5.4 of the Scope 3 Standard for more information on the time boundary of Scope 3 categories.)

Category 13 – Downstream leased assets:
This category includes emissions from the operation of assets that are owned by the reporting company (acting as lessor) and leased to other entities in the reporting year that are not already included in Scope 1 or Scope 2. This category is applicable to lessors (i.e., companies that receive payments from lessees). Companies that operate leased assets (i.e., lessees) should refer to category 8 (Upstream leased assets).

Category 14 – Franchises:
Category 14 includes emissions from the operation of franchises not included in Scope 1 or Scope 2. A franchise is a business operating under a license to sell or distribute another company's goods or services within a certain location. This category is applicable to franchisors (i.e., companies that grant licenses to other entities to sell or distribute its goods or services in return for payments, such as royalties for the use of trademarks and other services). Franchisors should account for emissions that occur from the operation of franchises (i.e., the Scope 1 and Scope 2 emissions of franchisees) in this category.

Category 15 – Investments:
This category includes Scope 3 emissions associated with the reporting company's investments in the reporting year, not already included in Scope 1 or Scope 2. This category is applicable to investors (i.e., companies that make an investment with the objective of making a profit) and companies that provide financial services. This category also applies to investors that are not profit driven (e.g., multilateral development banks), and the same calculation methods should be used. Investments are categorized as a downstream scope 3 category because providing capital or financing is a service provided by the reporting company.

Appendix B. Roles and Responsibilities

Name and job title	Carbon Management Responsibilities
Eilís Docherty Managing Director/ ACA/ Net Zero Project Lead	• Overall responsibility of airport operations • Provide leadership in driving the reduction of carbon emissions. • Appoint a competent person to manage the implementation of the carbon reduction emission statement. • Responsible for finance, human resources, and auditing, assurance, and certification.
Padraig Carroll Aerodrome Firefighter ACA / Net Zero Project Admin	• Support the ACA Project Lead in gathering the data and information required for measuring Donegal Airport carbon footprint for Scope 1, 2 and 3 emissions. • Develop, plan, and implement carbon reduction measures in adherence to carbon reduction statement and monitor and review progress in reducing Scope 1 and 2 emissions from the airport's operations. • Provide guidance and training to the airport's personnel on steps to be taken to reduce Donegal Airport's carbon footprint. • Manage the ACA accreditation for the airport.
Breandán O'Baoill Senior Air Traffic Controller	• Promote actions which will contribute to the reduction of Scope 1,2 and 3 carbon emissions.
Trisha Gillespie Safety & Security Manager	• Promote actions which will contribute to the reduction of Scope 1, 2 and 3 carbon emissions.
Kevin Gillespie Compliance Officer	• Ensure compliance with environmental legislation. • Ensure effective auditing, assurance, and certification. • Manage the environmental compliance data at the airport.

Appendix C. Stakeholder Engagement

Engagement	Relevant stakeholders	Description	Communication Strategy	Frequency	Donegal person responsible	Benefits
AGM meetings	Airport Shareholders and Management	Annual update on all matters relevant to the airport, from financial performance to business continuity and planning	In person conference room meetings and Microsoft teams	Annual	Chairperson	Effective decision making on current and future matters and allows airport to evaluate financial and environmental performance towards its aims and ambitions.
Board meetings	Airport Directors, and Senior Management Team	Regular board meetings, providing updates on the airport's operations and an opportunity to raise any issues.	In person in the board room.	Minimum of 6 meetings per annum	Chairperson /Managing Director	Allows for effective senior discussion and decision making for all operational concerns including the environment. Early problem identification and mitigation put in place quickly when problems arise.
Environmental, Safety, Security & Quality Meeting	Managing Director and Heads of Departments	Quarterly meeting where all issues relating to ESSQ are discussed with action items identified.	In person in the board room.	Quarterly	Managing Director/Safety Manager	Allows for effective senior management discussion and decision making for all ESSQ issues. Feedback from this meeting disseminated to all staff members through a Bulletin issued subsequent to the meeting.

Head of department meetings	Employees	Heads of departments can raise any issues with airport operations.	In person in the board room and Microsoft teams.	Bi-weekly	Eilís Docherty	Ensures all employees and heads of departments are heard, and input sought, ensuring inclusive environment and engagement on environment and carbon matters.
Local runway safety team meeting	Relevant Airport employees, Airlines, private aircraft operators and the aviation regulator (IAA)	Discussions about airport's operations and safety protocols	Online, occasionally in person	Every 6 months	Breandán OBaoill, Senior Air Traffic Controller.	Ensures a safety-first approach and established working relationship between airport, airlines, and the regulator.
Charity days	NGO's, employees, local community, employees	Supporting of local charities in the area and hosting public days to raise money for charity	In person fundraising events	Annually	Pauline Sweeney, Marketing Manager.	Allows for greater connection with local community and to support matters important to local economy.
Environmental Dashboard Display	Employees, passengers	Updates of airport progress on safety and environmental matters	Digital screens in airport	Every day	Automatic	Updates employees on airport activities and promotes environmental and sustainability progress to passengers.

Social media campaigns	Employees, passengers, local communities	Targeted campaigns, offering feedback on airports sustainability initiatives, and overall feedback on airport operation.	Social media posts on Facebook, Instagram	Quarterly	Pauline Sweeney, Marketing Manager	Engrains community engagement within airport's business plans and allows airport to mitigate and act on poor feedback. Promotes its sustainability and carbon opportunities.
Site visits and reporting	Government	Check progress of initiatives which use taxpayers' funds, and to see progress of capital projects and upgrades.	Site visits	6 monthly-annual	Officials of the Department of Transport / IAA	Allows for a good working relationship with government on decarbonisation and allows airport to show benefits of using taxpayer funds for decarbonisation.
Communication with airlines	Airlines, airport owners	Regular communication with airlines on airport operations, functions, and safety.	Online call	Weekly	Trisha Gillespie, Safety and Security Manager	Early problem identification, and good working relationship allows for effective collaboration on environmental and sustainability matters.
Media engagement	Media, Airport Owners	Complete interviews on local radio stations	Interviews in person	As needed	Eilís Docherty, MD / Pauline Sweeney, Marketing Manager	Raises airport profile and carbon and sustainability initiative progress.

Appendix D. Decarbonisation Interventions Definitions

Estates and assets

- Transition all airport-owned vehicles to EVs (electric vehicles), excluding fire engines
  [Airport EVs]
  - Replace two patrol vehicles with EV equivalents

- Transition airport-owned fire engines (fire tenders) to EVs
  [Fire tenders]
  - Fire tenders can be transitioned to EV

- Transition diesel lawnmowers to EV
  [Lawnmowers]
  - To replace diesel lawnmower (Multihog unit) with electric alternative

- Replace toilets with more efficient alternatives
  [Toilets]
  - Replacing terminal toilets (~50% of all toilets) with modern alternatives
  - For example, propelair (https://propelair.com/)
  - Reduce overall water consumption and wastewater

- Purchase electric vehicle for business travel
  [Business travel EVs]
  - Procuring electric jeep in 2024 to replace one of patrol vehicles (can be used by staff for business travel)

Operations

- Transition to use of biofuels for emergency generation
  [Biofuels]
  - Replace traditional diesel fuel with pure biodiesel
  - Fully trace the supply chain to ensure that the biodiesel procured is of a high quality

- Remove/replace all air conditioning
  [Air conditioning]
  - AC already being phased out
  - Due to the growing efficiency of heat exchange systems, it is expected that the new system will reduce refrigerant emissions by 30%. This should however be confirmed in the coming years as increased data becomes available.

- Facilitate transition to use of sustainable aviation fuel
  [SAF]
  - Discuss with airlines- could trial on the Dublin to Donegal flight
  - Transition in line with EU requirements

- Reduce waste from beach-goers
  [Waste]
  - Work with the local council to manage waste from beach users, to prevent waste disposal in the Airport's bins

- Transition to an EV cancellation bus
  [Cancellation bus]
  - Work with local supplier to advocate for procurement of EV bus (aim to secure government funding)

Behaviour change

- Facilitate staff travel by EVS
  [Staff EVs]
  - Provision of EV charging points
  - Promote/incentivise purchase of EVs

- Facilitate passenger travel to airport by EV taxis
  [EV Taxis]
  - Collaborate with taxi firms to increase provision of EVs (aim to secure government funding)
  - Facilitate passenger taxi travel by 100% EV taxis by 2035

- Facilitate passenger travel to airport by public bus
  [Public bus]
  - Working with Transport for Ireland to increase the strength and convenience of the bus network (aiming for 10% uptake by passengers)

- Staff sustainability training
  [Sustainability training]
  - Encourage staff behaviour change by educating them on sustainable decision making

Appendix E. Modelling Assumptions

Intervention	Assumptions
Toilets	>Toilet replacements lead to a reduction in water use of 60% >50% of total water consumption is related to toilets >50% of the Airport's toilets will be replaced
SAF	> Planes landing/taking-off from the Airport will uptake SAF at the rate set out in the RefuelEU aviation rules >No further innovations in SAF
Waste	>All waste from beach goers is diverted from airport bins through effective bin placement and engagement with local council
Cancellation bus	>At full implementation, all cancellation services are provided by fully electric buses, charged from the grid >Grid is assumed to be 100% renewable by the start of implementation (2035)
EV Taxis	>Taxis will be fully electric by 2035
Public bus	>10% of passengers transition from travel to airport by car to by bus > ROI public buses start EV transition in 2035 > A new bus timetable (which facilitates passenger use) will be in place from 2025 > There will be a linear reduction in the public bus emissions factor 2035-2040, modelling the transition from ICE to EV
Business travel EVs	> Transition to EV company cars only impacts car emissions (no transition from flights/rail to EV cars) > The emissions associated with the drive from employee homes to the Airport in private vehicles to collect company EVs (for business travel) is negligible. >EV company cars are only charged onsite (hence 100% renewable electricity)
Airport EVs	> Vehicle diesel consumption is roughly 50% by fire engines, 40% by general airport vehicles and roughly 10% other vehicles (lawnmowers, etc.)

Passive works-passenger EV uptake	> Not modelling uptake of hydrogen fuel cars > Linear decline in ROI grid factor (2022-2035) > 2.7% of cars in ROI are currently fully electric[30]
Air conditioning	> 80% of current refrigerant consumption is related to air conditioning
Sustainability training	> 'Staff sustainability training' includes refresher training sessions to maintain positive behaviours and guarantee reductions
Fire tenders	> Operational life of a fire engine is approximately 15 years > One fire engine will be replaced in 2035 and the other in 2040
Staff EVs	> Employee private EVs are charged from the national grid

[30] Is Ireland ready to make the switch to electric vehicles? | bonkers.ie

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Donegal Airport Net Zero Roadmap
Report
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