Etihad Airways

2023 Etihad Environmental Report

The Etihad Greenliner Programme Aviation Stocktake

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ETIHAD
AIRWAYS

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Antonoaldo Neves

ETIHAD AIRWAYS CEO

Since embarking on our sustainability journey, we have worked to deliver a strategy which would sustain change, growth, and economic development.

In the years that have passed since, we have seen significant results in the form of meaningful reductions, impactful partnerships, innovative trials and testing, and more.

We have insisted that the journey toward sustainable aviation development will be the coming together of *'a million little things'*; to seek the path to tangibly neutralise the negative impacts of the industry. We commit to a comprehensive and coordinated approach which will see us act with intention and purpose.

As a hard-to-abate sector, the expectation that aviation can rapidly phase out fossil fuels is extremely challenging; the notion itself requires a complete redesign of the industry. Engine and airframe redesign and alternative fuels alone will require not only an entirely new infrastructure, but vastly different skill sets for a specialised workforce, trillions in investment, and a remodel of our operating ecosystem. It is a transformation which won't happen all at once, but slowly over time.

Air travel is forecast to continue to expand and we are committed to meet that need in the way which best balances carbon reduction with commercial demand.

Every step we take must be diligently assessed, for feasibility, longevity and impact. We must ensure our efforts in sustainability are sustainable in every sense of the word. That is a highly simplified description of the challenge posed, but it does well to demonstrate why the belief in a million little things is core to Etihad's direction in sustainability.

The report you are about to read aims to critically assess our performance toward successfully implementing and scaling up the defined 'basket of measures' for aviation's decarbonisation. We're using ourselves as a case study to determine the real capacity for the swift, just transition needed to go from theory to reality, while preserving our capacity to deliver on the other elements of sustainable development and our own business performance goals.

I hope you, the reader, find this document to be insightful, useful, and encourage you to read critically and challenge the assumptions we make; are we going in the right direction? Is there anything we have missed? With this approach, we know our achievements are earned, our failures become opportunities, and we deliver on our commitments and ambitions.

Warm regards,

Antonoaldo Neves

Chief Executive Officer

Etihad Airways
20 Years

It was the dawn of a new millennium when Etihad Airways took its first flight. And in 2023, as we celebrate 20 years of flying, it's impossible not to be awed by the incredible journey we've embarked upon.

The national airline of the UAE, Etihad Airways was established in July 2003 following a royal decree issued by the late President, Sheikh Khalifa. Etihad Airways was founded with a vision to redefine air travel, connecting the world through our hub at Abu Dhabi International Airport. And with our first flight in November 2003, we began to realise that vision; setting new standards of innovation, comfort and entertainment in aviation.

In just two decades, Etihad Airways has built a global network that spans continents, covering over 75 destinations across Africa, Asia, Australia, Europe, the Middle East and North America.

Since its inception, Etihad has been defined by its substantial growth. The workforce has increased from 1,761 employees in 2004 to nearly 10,000 in 2023. Notable developments include significant growth in the Etihad Guest loyalty programme, an expansion of our fleet to more than 90 aircraft, and an increase in global markets served to over 70 destinations around the world.

Since the airline was founded, one of our core principals has been an indelible commitment to providing opportunities for growth and development for Emirati nationals at all levels of their career. This dedication to developing Emirati talent within our business and leveraging our country's dynamic workforce is not just important, it's central to our collective vision for the future of the UAE.

On this special occasion, Antonoaldo Neves, Chief Executive Officer, said: "We wish to express our profound pride in Etihad as we turn 20. Our journey so far has been about more than flights, it has been about bringing people and cultures together, creating strong connections, and making Abu Dhabi a key travel hub.

"Looking ahead, we have big plans. By 2030, we aim to double our fleet and welcome three times as many guests, reaching 33 million people each year. We will increase visitors to our home, Abu Dhabi, and continue to connect travelers across the globe through our growing network."

Learn more here

FROM ABU DHABI *for* THE WORLD

In 2023, the UAE played host to the 28th United Nations Climate Change Conference of Parties (COP28), serving as a platform for a comprehensive assessment of global progress towards fulfilling the objectives outlined in the Paris Agreement. This pivotal event underscored the urgent need for decisive action to address pressing environmental challenges.

COP28 set the precedent that complacency around the climate crisis is untenable, that the transition away from fossil fuels must be achieved rapidly, and inaction or failure to do so will have dire consequences.[1]

We proudly saw our nations leader, UAE President His Highness Sheikh Mohamed bin Zayed Al Nahyan declare 2023 as the 'Year of Sustainability', drawing upon the UAE's deep-rooted values of sustainability, inspiring collective action, fostering global collaboration, and taking meaningful action for environmental protection.

"Sustainability has been a fundamental principle in the United Arab Emirates since its unification. The nation continues to serve as an exceptional model for environmental conservation and resource management. The late Sheikh Zayed was a global leader in environmental and climate action, leaving behind a legacy that we continue to follow today."

UAE President, H.H. Sheikh Mohamed bin Zayed[2]

As host of COP28, the third ICAO Conference on Aviation and Alternative Fuels (CAAF/3) also took place in the UAE, focusing on strengthening the global framework for aviation's environmental roadmap, pinpointing Environmental aviation fuels.

In hosting these important events, and in the declaration of 2023 as the Year of Sustainability, the UAE is delivering on its commitment as a leader in promoting sustainability and climate action, domestically and internationally, and its responsibility to protect the future.

To bolster this position, the UAE has launched many strategic initiatives to drive collective progress, such as: the Net Zero by 2050 Strategic Initiative, the National SAF Roadmap for the UAE, Today for Tomorrow campaign, UAE Hydrogen Roadmap, Environment Vision 2030, Abu Dhabi Economic Vision 2030 (including the long-term plan for reduced reliance on oil sector), Abu Dhabi Transportation Mobility Management Strategy, and more.[3]

Delivering on the promise to continue the prioritisation of sustainability in the years ahead, in addressing the matters raised during the COP28 summit, the UAE leadership has extended the 2023 theme, declaring 2024 the Year of Sustainability.

Etihad, as the national airline of the UAE, is fully aligned with the direction and commitments of the country and its leadership and aims to deliver continued progress towards sustainability.

Etihad Airways
Performance

2023

Etihad Airways
Environmental Footprint

2019-2023 CO_2 emissions

TONNES CO_2/YEAR

SCOPE	SOURCE	UNIT	2019	2020	2021	2022	2023
1	Actual Aircraft Fuel Burn	t/CO_2	9,014,084	4,207,328	4,215,343	5,039,313	6,169,252
	Scope 1 Total	t/CO_2	9,014,084	4,207,328	4,215,343	5,039,313	6,169,252
2	Property electricity	t/CO_2e	12,386	11,132	11,269	23,899	25,335
	Property district cooling water	t/CO_2e	9,673	8,505	9,352	117,171	90,736
	Property potable water	t/CO_2e	678	566	691	3,826	4,561
	Scope 2 Total	t/CO_2e	22,737	20,203	21,312	144,896	120,631
3	Waste to landfill	t/CO_2e	62,952	43,923	71,367	173,100	200,542
	Scope 3 Total	t/CO_2e	62,952	43,923	71,367	175,393	200,542
	Total Tonnes (CO_2)	t/CO_2	**9,099,773**	**4,271,454**	**4,308,022**	**5,359,602**	**6,490,425**

Corrections:

- Retained under Scope 1 for previous years
- Increased 2022 Scope 2: Property electricity data, additional data sources identified (previously 23,225 tCO_2e)
- Increased 2022 Scope 2: Property district cooling water data, additional data sources identified (previously 43,808 tCO_2e)
- Increased 2022 Scope 2: Property potable water data, additional data sources identified (previously 3,531 tCO_2e)
- Total 2022 Scope 2 Data adjusted (70,564 tCO_2e)
- Updated passengers carried: 3.5M in 2021, previous reporting inaccurate
- Updated freight carried; previous reporting inaccurate

Etihad uses fuel management systems to monitor and report fuel consumption after which the relevant conversion methodologies are followed for emissions reporting. Conversion methodology for fuel to CO_2 emissions is calculated as per the CORSIA framework.

The data published here is the airline's overall emissions **without** the exclusions which are applied through other emissions trading schemes; such as humanitarian flights or those to certain developing countries. This data is internally verified and reconciled against finance and procurement records. This means we can reliably report both the fuel we consume and the demand our operations generate. Our fuel burn data is verified through internal and external audits which is a mandatory requirement for various emissions trading schemes and CORSIA.

In order to verify and authenticate our actions, we are required to fulfill monitoring responsibilities as part of the European Union's Emissions Trading Scheme (EU-ETS) and the International Civil Aviation Organisation's CORSIA Program.

CO_2 Emissions

The company works continuously to develop and improve its reporting standards and comply with the introduction of new industry and global frameworks, reporting standards, and enhanced knowledge in the field. Our goal is to continuously improve our reporting capabilities in accordance with these developments.

Scope 1 emissions from aircraft fuel burn remain below Etihad's 2019 emissions, the baseline for CORSIA and most industry roadmaps. This is largely due to the long-term impacts of COVID-19, and as Etihad continues its recovery, a focus on fuel efficiency (performance details on following page) will help ensure we grow responsibly, maximising our operating capabilities with less impact on emissions per journey.

Occupancy rates for Etihad Offices and Residences have increased to 99% in 2023, though buildings have been consolidated, seeing a reduction in overall Scope 2 emissions.

Scope 2: Facilities & Utilities

Scope 3: Downstream Activities

Etihad Airways:

Business Activities & Performance

2023 Business Performance			
Business Activity	**2021**	**2022**	**2023**
Flights (passenger and freight)	43,794	55,418	70,220
Passenger flights			66,324
Freight flights			3,896
Passengers carried	3.5M	10.3M	14M
Freight carried (tonnes)	729K	582K	528K
Routes/Destinations	71	76	75
Available Seat Kilometers	56 billion		72 billion
Load factor	81.9%		85.8%
Carbon Intensity			
Total (gCO_2/RTK)	585	482	479
Passenger (gCO_2/RTK Pax)	741	483	475
Improvement against targets			
Total against 2017	14.1%	29.1%	29.7%
Passenger against 2017	14.7%	44.5%	45.3%
Total against 2019	10.2%	25.8%	26.5%
Passenger against 2019	7.8%	39.9%	40.9%

The definition of carbon intensity is derived from EY ESG Loan agreements4 (TTW) and does not align with the definition provided by SBTi (WTW).

2023 Business Performance		
Fleet	**2022**	**2023**
Operating Fleet	71	85
Airbus 320 Family	15	21
Airbus 350-1000	5	5
Airbus A380-800	0	4
Boeing 777	7	9
Boeing 777 (Freighter)	5	5
Boeing 787 Family	39	40
Next Gen		
Next Gen – Widebody Fleet		72%
Next Gen – Narrow Body Fleet		0%*
Next Gen – Widebody Passenger Fleet		78%
**See Fleet section for fleet transformation*		
Total Operating Fleet Age		7.9
Total Widebody Fleet Age		6.6
Total Narrow Body Fleet Age		10.1
Total Passenger Only Fleet Age		7.3
Total Passenger Widebody Fleet Age		6.2

Principles

- Achieve Net Zero by 2050 in line with the commitments of the government of UAE, ICAO, and industry to the Paris Agreement
- Achieve majority of emissions reductions through in-sector measures
- Ensure longevity and value of environmental credentials and business capabilities; mitigating environmental impacts of operations without sacrifice to our obligations as a business.
- Maintain environmental performance throughout business growth.
- Support UAE and Abu Dhabi wildlife and biodiversity, and where most valuable, globally
- Align with industry voluntary roadmaps and frameworks
- Achieve compliance in all mandatory frameworks
- Ensure economic viability in sustainability roadmaps toward 2050 target
- Remain transparent and proactive in sustainability issues
- Continually develop strategic roadmap for targets
- Create initiatives which positively contribute to guest experience and engagement
- Collaborate with UAE industrial ecosystems to maintain thought leadership
- Involve supply chain partners in roadmap through innovation and collaboration

Objectives

- Meet mandatory compliance targets
- Set company targets with focus on Scope 1 & Scope 2 emissions
- Abate 80% of the emissions in value chain through decarbonisation and uptake of SAF/CEF (CORSIA eligible fuels) and maximum 20% of emissions as offsets (CORSIA eligible).
- Time sustainability initiatives to meet company objectives Continuously improve operational fuel efficiency, by being better at what we do every single day
- Leverage next-generation aircraft technology to enhance fuel efficiency and reduce emissions per flight
- Maintain thought leadership in advocacy and innovation, with in house expertise and ecosystem partnerships
- Achieve financial viability for sustainability through involving individual guests, shippers and corporate customers
- Maintain integrity through information sharing and meticulous communications
- Extensive management of technical communications and risk mitigation for green washing and misleading practices
- Strategic planning to deliver to growing consumer demand for environmentally-sustainable products

Etihad Airways: Business Scope

2023 Environmental Footprint Scopes

Scope 1 – Owned Assets	2023
Flights (total)	70,220
Passenger flights	66,324
Freight flights	3,896

Scope 2 – Facilities and Utilities	Energy	District Cooling	Potable Water
Offices, Training, Operational Buildings		***Tonnes CO_2e***	
Etihad Headquarters Complex	4,514	4,897	
Etihad Airways Centre	1,083	2,627	481
Etihad Plaza (Retail & Offices)	248	16,176*	77
Commercial Locations	2,620	N/A**	7
Residential Properties			113
Etihad Plaza (Residential & Common Areas)	4,943	16,176*	
Leased Accommodations***	10,779	67,544	1,531
			2,216

*Meter reading for Etihad Plaza District Cooling for all business activity – duplicated for continuity; one figure for all Etihad Plaza.
**For areas with N/A District Cooling, chiller readings included in energy consumption
***Etihad Leased Accommodations for crew increased with new hires. Occupancy in 2022 was 93% now at 99%. These figures encompass 8 employee accommodations.

For instance, where Etihad is the main tenant of a leased location, we will include Scope 2 Utilities data, where available from landlord. This data, where possible, is collected via meter reading or as stated on leasing material.

Scope 3 - Downstream		
Waste	***Tonnes CO_2e***	
Aggregated Waste Data All waste including paper, general waste. Not including recycled waste	194,069	Etihad Plaza Offices & Common Areas, Etihad Headquarters Complex & Training Academy, Etihad Airways Centre, Crew Briefing Centre (Airport) and Logistics Centre (Warehouse)

Please note that this report will not showcase the airline's 'Social' and 'Governance' activities and impacts associated with our operations, such as humanitarian or charity activities, or efforts related to diversity and equality. While acknowledging the importance of these activities and references to these approaches will appear in this report as the definition of 'Sustainable Development', our focus for this report remains on environmental sustainability within the context of climate change mitigation. The elements for Social and Governance related Sustainability matters will be addressed in a separate CSR Report, issued by Etihad.

Furthermore, we recognise the significant societal benefits derived from the transport and air travel industry as a whole. Beyond economic contributions, air travel facilitates global connectivity, trade, tourism, cultural exchange, humanitarian aid, and collaboration. While these broader social impacts are not the focus of this report, we acknowledge their importance and remain committed to responsible and sustainable practices that benefit society as a whole.

Etihad Airways
Aviation Stocktake

Including contribution from Boeing, General Electric, CarbonClick, EcoMatcher, The Storey Group and SATAVIA

The Etihad Greenliner Stocktake

Following the global stocktake undertaken in COP28[5], Etihad Airways 2023 report will conduct a similar exercise. Aiming to perform a comprehensive assessment of ourselves and the sector, we will use our strategy and operations as a case study, evaluating against the four pillars of our stocktake (below).

As we conduct this stocktake, we will use past reporting, historic and on-going efforts, alignment to industry benchmarks, and our strategic roadmap as an outline.

Reader Guide

The structure for this section of the document is designed to allow the reader to gain as much context as possible as we address both the high-level principles, and in-depth technical elements of aviation and sustainable development. This structure has been designed to maintain continuity with past Etihad Airways Environmental Sustainability Reports (having dedicated sections per action area in the next section 'Etihad Case Study'), while accommodating narrative, position and critical analysis of the current state of aviation's sustainable development.

The global stocktake is a process for countries and stakeholders to see where they're collectively making progress towards meeting the goals of the Paris Climate Change Agreement – and where they're not. We know we are not on track to limit global warming to 1.5 degrees Celsius. The window for meaningful change is closing, and the time to act is now.

United Nations Climate Change statement[6]

Our long-standing partners Boeing, GE Aerospace, SATAVIA, CarbonClick, The Storey Group and Eco Matcher have contributed valuable insight and commentary for this report. We would like to thank them for their contribution; we know the journey to sustainable aviation cannot be taken alone, and we thank those partners who have stepped up and answered the call to arms.

By leveraging the stocktake to evaluate our current climate targets, commitments, and the effectiveness of policies and regulations aimed at advancing sustainability in aviation, we can refine our existing strategies.

Etihad's Aviation Stocktake

The Greenliner Programme

Pillar	Enviromental Development	Mitigation Pathways	Means of Implementation	Self Assessment; Case Study
Intention	How we must act	What we can do	How we can do it	What we have done
	Discuss the principles of legitimate sustainable development - reduced inequality and vulnerabilities, improved socio-economic conditions.	Understand the basket of measures for aviation and how they should be applied; availability of existing, and viability/feasibility of potential mitigation solution.	Reviewing the mechanisms which exist to enable action; governance, oversight and capacity for the regulatory frameworks to support delivery of mitigation solutions.	Critically assessing the actions we as Etihad have taken over the years and how well our efforts deliver on point 1, 2 and 3 (with references to the overall industry direction)
Themes	Adaptability,Resilience & Support	Solar Energy, Wind Energy, Reduced conversion of forests and other ecosystems, Improving energy efficiency, Reducing fluorinated gas emissions	Finance, Capacity Building, Technology Transfer	Global Stocktake Performance, UNFCCC Key Technical Findings
Transport	Universal Access, Enhanced Safety, Reduced Environmental & Climate Impact, Improved Resilience, Greater Efficiency	Operations, Efficiency, Technology, Energy & Fuels, Carbon Offsets/ Nature Based Solutions, CCUS	Reporting, Target Setting, Infrastructure, Policy & Governance, Advocacy, Finance	Progress, Challenges, Outlook, Areas for Improvement, Missed Opportunities Key technical findings

Figure: Etihad Stocktake pillars

Aviation's role in Enviromental Development

As the global community gains more knowledge and delivers more solutions, all items within any industry or state climate strategy must be revisited and revised. We aim not just to be responsive to these developments, but to be at the forefront of those discoveries.

This report, like those published in years past, is both a factual account of our environmental performance and a critical position piece for a story we feel compelled to tell. The following excerpts are derived from the literature, guidance and direction available from parties on a global, industry/sector and individual level (see page 43/45).

The Paris Agreement, a legally binding international treaty on climate change, was launched in 2015 at the UN Climate Change Conference (COP21). 196 Parties, including the UAE, signed the agreement which holds each signatory nation accountable to support the overarching goal of "limiting the global temperature increase to 1.5C above pre-industrial levels".	The premise of the industry's ICAO LTAG (Long Term Aspirational Goal) governments and the industry set the overall objective to continue to develop in a sustainable manner in recognition of the vital role which the aviation sector plays in global economic and social development – inferring the importance of the industry and the acceptance of its existence.	In the opening paragraph for the UN SDG Sustainable Transport Interagency Report, it is stated, "Sustainable transport – with its objectives of universal access, enhanced safety, reduced environmental and climate impact, improved resilience, and greater efficiency – is central to sustainable development."
This is aligned under the UN Sustainable Development Goal: 9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all.	ICAO-run CORSIA (Carbon Offsetting and Reduction Scheme for International Aviation) is one of the key frameworks for climate action in aviation. International standards for implementation for CORSIA have been adopted as an Annex into the Chicago Convention, to which all 193 member states of ICAO must apply from 2019.	With ICAO commitments backed by the United Nations, those 196 nations signatory to the Paris Agreement are therefore aligned under the Chicago Convention. This alignment endorses the commitments of the aviation industry. ICAO's Strategic Objectives are strongly linked to 15 of the 17 United Nations Sustainable Development Goals (SDGs).
The UAE Framework for Global Climate Resilience notes "enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change" included under article 7.1 of the Paris Agreement. This details a long-term vision for achieving the "collective well-being of all people, the protection of livelihoods and economies, and the preservation and regeneration of nature."	With the commitments of the government of the United Arab Emirates and ICAO (International Civil Aviation Authority) Aviation to Net Zero by 2050, Etihad has designed a Enviromental strategy focused on achieving this target and, like many other airlines, has aligned to multiple industry frameworks designed to address CO_2 emissions from international aviation.	Etihad: Achieving net-zero by 2050 will require substantial financing, and unprecedented transformation, capacity building and global cooperation in all regions, and we must keep these principles in mind as we integrate the 'basket of measures'/ 'mitigation pathways' which we will assess further on in this report.

Identifying aviation's Mitigation Pathways

There are fundamentals principles and goals of sustainable development, and from the outset, we should understand the role of aviation in reference to Sustainable Development Goals and the aviation industry's 2050 ambitions.

In the findings from the UNFCCC Technical Dialogue of the first global stocktake, a focus on diligence, longevity and transparency is needed for successful systems transformations.[6], [7]

'To strengthen the global response to the threat of climate change... governments need to support systems transformations that mainstream climate resilience and GHG (Greenhouse Gas) emissions development."[7]

"Efforts to continue this progress must be sustained over decades,building on progress made in every cycle of Nationally Determined Contributions and in the Global Stock Take." [7], [11],

Reviewing the available material (see Page 45) [7], [11], we can state, in summary:

- Sustainable Development requires collective responsibility, shared benefits and fair expectations
- "How" we work toward our goals is equally as important as achieving them
- It is fundamental to reduce inequality and vulnerabilities and ensure a 'just' transition
- For means and mitigation, 'sustainable' also infers accessible benefits and fair equity distribution

Etihad's Assessment

The structure we have developed to support our sustainability efforts depicts our 'translation' of the criteria for sustainable development and how we hope to deliver on those goals.

We must consider the unique condition of the industry when proposing solutions for the environmental impacts:

- Capacity to progress incrementally and collectively versus individually
- Sustainable Development priority to prevent negative socio-economic impacts from transition
- Protection for industry and global development from risks associated with disruption from rapid transition

What are those pathways, as advised or recommended by the governing bodies, partners and industry commentators?

Reviewing overall guidance of global mitigation strategies, we can analyze the aviation industry's 'basket of measures' which more tangibly demonstrate how action can be taken from conceptual to practical. It is an inherent challenge to the industry, and the individual players within it, to outline or produce a roadmap which aligns to the global climate action targets and offers any guarantees to reach them.

We may remember this is the job we are trying to do, so as not to become demotivated by the challenge.

In IATA's Net Zero Tracking report[8], it admits that while the industry has agreed to the 2050 target of Net Zero, there is no defined or reliable roadmap to get there. Without such a roadmap, progress is near-impossible to monitor and track. However, without such a target, 'sustainable aviation', in all iterations of the phrase, does not exist.

The guidance set forth provides confidence that the various factors which will enable transition exist alongside a focus on biodiversity (afforestation and reforestation, adapting coastal ecosystems, conservation for protected areas, nature-based solutions), agriculture (climate-smart agriculture, reducing food waste, vertical farming), and consumer infrastructure (circular

Criteria for Pillars of Environmental at Etihad

	Decarbonisation & CHG Emissions	*Waste & Resource Management*	*Biodiversity & Wildlife*	*Advocacy & Innovation*
Initiatives should:	• Reduce Etihad Airways carbon and greenhouse gas emissions directly • Reduce Etihad Airways reportable emissions through approved and monitored industry schemes • Improve or maintain Etihad Airways environmental performance proportionate to operations	• Reduce single-use plastic and waste production directly • Support the streamlining of waste management processes • Reduce waste production through approved and monitored industry schemes	• Improve environmental biodiversity by promoting and aligning with the environmental goals of the government of the UAE and globally • Reduced pollution impact by entities/persons other than Etihad (even if on behalf of) • Improve Etihad Airways biodiversity standards directly	• Focus on ESG trust building and improve compliance credentials of Etihad or it's partners • Support initiatives with the intention of accelerating roadmaps • Improve reporting capabilities • Support reducing emissions from non-reportable scope areas • Demonstrate alignment, effort or participation with/in global targets
Initiatives may:	• Offer a direct reduction of emissions, or the potential reduction of emissions if the intiative matures (exploratory intiatives) • In-sector indirect emissions reductions (market based measures)	• Reduce waste production and improve waste management not directly associated with Etihad • Reduce associated with excess consumption (if not directly reported as Etihad waste)		
Initiatives should not:	• Reduce (or claim to reduce) emissions from areas without defiened scopes • Cannot reduce emissions directly from Etihad's operations	• Cannot be proven to reduce waste (whether for lack of data, third party validation or otherwise) • Appear to contribute a greater impact for the airlines overall environmental footprint (must be contextualized)	• Cannot be aligned to an internal or external policy, industry practice or other scientific method • Cannot be vetted in a robust and traceable way • Cannot be proven to improve areas under Etihad's influence	• Do not align with the sustainability messaging of Etihad • Contradics efforts in other spaces and cannot be accurately justified • Cannot be proven to improve supply chain or areas under Etihad influence

Figure: Etihad Environmental Sustainability Pillars Criteria

Fundamentals of a Net Zero Strategy

Our efforts over the years have been geared towards finding solutions to maximise available direct reductions or promote indirect reductions with the highest value and potential. Etihad's 'Sustainability' initiatives fall under four pillars (above): Decarbonisation, Waste Management, Biodiversity and Wildlife, and Advocacy and Innovation. In our 2022 Environmental Sustainability Report[9], (page 47) we produced a forecasted 'Net Zero roadmap', considering a 3% growth factor and retro fit with 'intentions' for the mitigation value of offsets (not including Sustainable Aviation Fuels) and direct emissions reductions (such as operational efficiencies and those 'inset' pathways to be made available with said alternative fuels).

We can broadly categorise the 'basket of measures' into two types:

1. In-sector Direct 'reductions'/avoidance; New Technology, Infrastructure & Operational Efficiencies. When measured against a baseline, these would be direct and data-backed reductions, and if incremental, could be counted as 'avoidance' of otherwise unmanaged emissions. We can measure these solutions in energy efficiency and overall fuel data.

2. Out-sector Indirect 'reductions'; SAF, Carbon Offsets, CCUS. These are those which will not, without infrastructure (accounting structures and policy) reduce emissions in any 'actual' sense, and will require a value stream of producers, suppliers, brokers, certifications within a market place (market-based measures).

Reducing emissions per journey; Carbon Intensity

In understanding theoretical and forecasted mitigation pathways, we must identify and assign appropriate performance indicators to measure and report impact.

This is our first great challenge.

The benefits derived from direct reductions in emissions are clear and obvious, with the greatest environmental benefit proven when viewed in "black and white": reduction in absolute emissions.

Uniform and consistent reporting standards and methodologies are needed to ensure an appropriate measure of progress toward environmental targets and goals, as well as to monitor business performance and comparable growth.

If we measure progress in terms of absolute emissions (i.e. the % share of aviation to overall global emissions, the projected growth (and recovery) between 2020-2050, etc.), efforts made in energy efficiency ('responsible growth' in proportion to use of energy), technology development maturity, scale up and transfer, and aviation's other indications of positive development are undermined (or disqualified entirely) and we will, inevitably, fail in achieving the targets.

Not all progress is created equal.

With CO_2/RTK as a valuable indicator of efficient operations, fleet planning principles exist that can improve the fuel efficiency of an aircraft. Carbon Intensity is a KPI measuring the efficiency of our operations against fuel usage. Tracking the evolution of the CO_2 intensity of our operations is essential to assess the impact of network planning decisions, operational efficiency measures, market conditions and policy frameworks on the overall sustainability credentials of Etihad.

Improved energy efficiency can deliver positive benefits on less tangible element of sustainable development; like greater equality, accessibility, improved quality of life, reduced poverty, while delivering on the aforementioned basket of measures.

These levers improve energy efficiency credentials, as well as long-term emissions reductions value per flight/route overall and improvements in the industry's operational priorities. Further to this, the conservation of fuel on a per-flight basis under the mission of fuel efficiency naturally results in reduced fuel consumption – not only less emissions demand, but less cost to airlines. This is the crux of a reliable sustainability strategy; to leverage the nuance to maximise benefits which meet the greatest number

Etihad Airways Carbon Intensity (gCO_2 /RTK) - 2010-2023

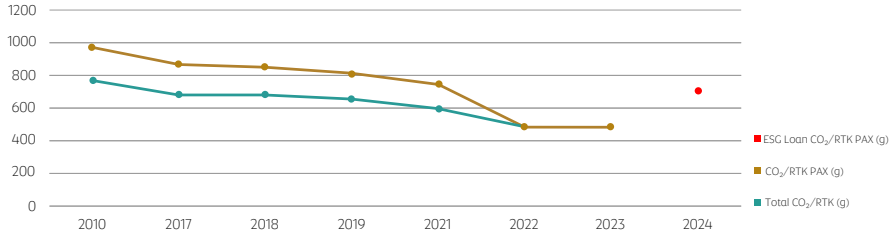


Figure: Etihad Carbon Intensity Graph years 2017-2024 with ESG Loan targets

Etihad's Efficiency Journey

Through our fleet transformation and increased utilization (page 16), continuous fuel efficiency initiatives (page 19), and overall prioritization of improved carbon intensity, Etihad's carbon intensity has improved significantly over the years. This is a valuable indicator for performance in line with our objectives around sustainable development and environmental impact. While the ultimate priority will always be to see reduction of absolute emissions, as this report will aim to illustrate, we must look for solutions which can be activated today, sustained for years to come, and provide valuable insight to how the aviation industry of the future will operate.

Summary of pathways and approaches [10, 11, 12]

UNFCCC NDC
UNFCCC Nationally Determined Contributions
Based on the UNFCCC NDC (Nationally Determined Contributions) report, specific areas of priority for mitigation pathways include:

- Solar Energy (3.3 Gt CO_2 eq/year)(50% of parties)
- Wind Energy (3.08 Gt CO_2 eq/year)(36% of parties)
- Reducing conversion of forests and other ecosystems (2.28 Gt CO_2 eq/year)(38% of parties)
- **Improving energy efficiency in industry** (1.14 Gt CO_2 eq/year)(30% of parties)
- Reducing fluorinated gas emissions (0.94 Gt CO_2 eq/year)(39% of parties)

UNFCCC
United Nations Framework Convention on Climate Chanage
The only direct. readily available solution for aviation listed is 'improving energy efficency in industry.

The UNFCCC NDC report, noting adaption actions (such as economic diversification and mitigation co-benefits), references ***'increasing the share of renewable sources in energy generation, improving energy efficiency, carbon dioxide capture and storage, fuel switch and fuel price reforms in transport sector'.***

SBTi - Sector Guidance
Science-Based Targets Initiative
Per SBTi framework, 'to align with the Paris agreement, the aviation sector is required to ***reduce average carbon intensity by ~35-40% between 2019-2065, or ~65% from 2019-2050."***

In aviation, the designated KPI used is CO_2 per RTK. Aligned with SBTI Sector Guidance, the general rule is 'the faster the sector is expected to grow, the faster its CHG (Greenhouse Gas) intensity must decrease."

Internatinal Energy Agency -
Energy Technology Perspectives for Su stainable Deuelopment Scenarios
"Reducing emission in long-distance transport modes is particularly difficult because of their power and energy density requirements".

In the case of the three sub-sectors of long-distance transport (trucking, maritime and aviation), **"operational and technical innovations unlock energy efficiency gains in the short to medium term, while switching to low-carbon fuels and electric powertrains drives emissions reductions in the long term".**

IATA
International Air Transport Association
IATA's Net Zero Resolution and emissions reduction strategy is made up of four mitigation pathways: **Sustainable Aviation Fuels, New technologies, Infrastructure/operations, Offsetting/Carbon Capture.**

"Overall, achieving net zero is expected to be driven primarily by the increasing deployment of sustainable aviation fuel (SAF), next generation aircraft and propulsion technologies, infrastructure and operational improvements, complemented by carbon offsetting/removal of residual emissions."

High Efficiency Scenarios

In the 2 Degree (high efficiency) scenario, emissions from the global aviation industry are estimated to decrease down to 375 grams of carbon dioxide (CO_2) per revenue tonne kilometers (RTK). This is a positive outlook for the industry, but if not well understood and benchmarked, it is easily dismissed, and along with it, the drivers for improving carbon intensity lose their value. [13]

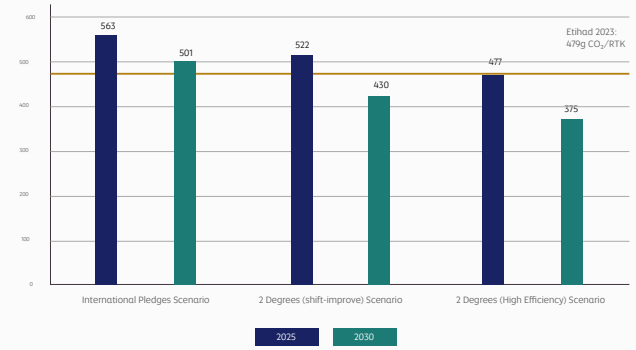


Figure: Statista 2 Degree efficiency scenario forecast

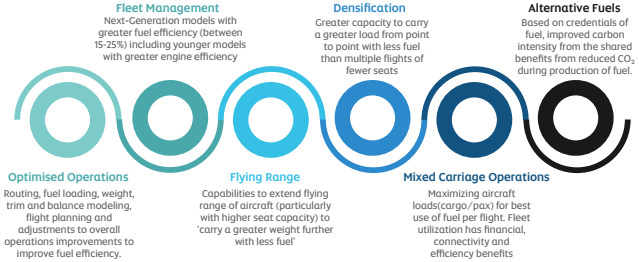


Figure: Levers for Carbon Intensity and overall Fuel Efficiency Performance

Etihad Airways

Case Study

The Million Little Things

In numbers
2023

In 2023, Etihad experienced remarkable growth in passenger numbers, with a total of 14 million passengers, marking a substantial ~40% increase.

Etihad's passenger load factor stood at 86%, up from 82% in 2022, among the highest of our competitors, demonstrating the airline's ability to optimise fleet usage and route planning to effectively meet demand.

Our Fuel Efficiency Working Group, part of our Operations division for more than a decade, saved over 35,000 tonnes of CO_2 via optimised planning, which is over 11,000 tonnes of fuel saved.

We saw a reduction in our cost per Available Seat Kilometer of 8%, which, paired with an 11% improvement of fleet utilization, demonstrates a streamlined business model which maximises passenger capacity, fleet utilization and efficiency.

Over 233 million single use plastic items have been removed from our on board service with Economy Evolution; our new economy class product developed after years of testing on ecoFlights and with supply chain partners.

Etihad's network expanded to 72 destinations, showcasing its commitment to increasing accessibility and connectivity for its Abu Dhabi hub and customers, while also exploring new markets and opportunities for growth. With the extensive work done to continuously improve carbon intensity, such as our fleet transformation efforts, we are focused on growing responsibly.

Etihad Airways remains steadfast in its pursuit of innovation, sustainable development, and operational excellence. Our modern and fuel-efficient fleet profile exemplifies our commitment to delivering exceptional service while working to improve our environmental performance.

Etihad was named Environmental Airline of the Year by Airline Ratings for the second year in a row and continues its streak of success in 2023 by maintaining Stage 2 rating in IATA's Environmental Assessment Programme; a testament to our commitment to environmental excellence across all our business functions.

	**75** *Destinations*	**14m** *Passengers flown*	**43** *countries*	**72%** *Next Gen widebody fleet*	**11%** *Improvement in fleet utilization*
	**85** *Boeing and Airbus aircraft*	**14** *Aircraft added*	**7.5yrs** *Average fleet age*	**475g** *CO_2/RTK Passenger (Carbon Intensity)*	**45.3%** *Improvement in passenger carbon intensity from 2019*
	**72.5b** *Available Seat Kilometres*	**+40%** *Passengers flown*	**86%** *Load factor*	**479g** *CO_2/RTK Total (Carbon Intensity)*	**26%** *Improvement in carbon emission intensity from 2019*
	**11,351** *Tonnes fuel saved from Fuel Efficiency measures*	**35,860+** *Tonnes CO_2 saved from Fuel Efficiency measures*	**2,655** *Tonnes fuel saved from Boeing Jeppesen FliteDeck Advisor*	**8,389** *Tonnes CO_2 saved from Boeing Jeppesen FliteDeck Advisor*	
	**277** *Aircraft washes with new Dry Wash*	**5,500L** *Water saved per widebody aircraft wash*	**3,500L** *Water saved per narrow body aircraft wash*		
	**233m+** *Single Use Plastic items removed from onboard service*	**36%** *On board products locally sourced*	**182,000** *Mangroves planted in total in Etihad Mangrove Forest*	**1.5m+** *kgs CO_2 offset by guests via CarbonClick*	**1,000+** *Passengers engaged via CarbonClick*

Our most important asset;
Next Generation Aircraft

As outlined in 'Mitigation Pathways', fleet composition (under the banner of optimised operations) is a readily available tool to airlines to improve their relative environmental impact. Fleet transformation, technology development, fuel efficiency measures and all those elements which influence our operational performance, and are therefore most in our control, are the most proven and attainable solutions available today. Our commitment to sustainability is evidenced through our adoption of next-generation aircraft technology and continuous investment in efficiency.

Since 2015, Etihad has undergone a fleet transformation journey which has focused on the Boeing 787-9 and 787-10 aircraft as the backbone of our long-haul fleet. The first commercial aircraft to be constructed of primarily lightweight materials, it is one of our most valuable assets.

Thanks to the step-change technology of the GEnx engines, its increased flying range, reduced weight, and fuel efficiency credentials compared to earlier-model aircraft of similar size earn its place as the flagship aircraft of the Etihad Greenliner Programme. This transformation has also seen the retirement of older model aircraft, such as the A330 and A340, and a focus on 5 B777s to operate freighter/cargo operations. Due to global supply chain delays for aircraft, many types awaiting delivery have been pushed back, which has seen Etihad continue its reliance on the B777 passenger fleet (9 aircraft in total in 2023) and reintroduction of the Airbus 380-800 (4 in operation in 2023).

To meet growing demand as the industry recovers from impacts of Covid-19, Etihad's diversified fleet profile has allowed the airline to continue to deliver on its obligations as a business while utilising those assets to maximum capacity.

This has been reflected in the performance data in 2023 which showed fleet utilization increased 11%, and load factor (the percentage of occupied seats) increase from 82% to 86%. With a 40% increase seeing Etihad fly 14 million passengers in 2023, we're seeing the efforts in our fleet transformation deliver on a responsive, flexible and efficient operating model.

Boeing Commentary

Next Generation Fleets

According to the Boeing Cascade Climate Impact Model, deploying the latest generation airplanes is the most significant opportunity for commercial aviation to reduce CO_2 emissions over the next decade.[14]

Fleet Renewals

Many airlines and operators such as Etihad have accelerated retiring older airplanes to optimize their fleets with the latest, most-efficient models. Underpinning the shared work towards a more sustainable fleet is the Boeing 787 Dreamliner. Etihad is the largest 787 Dreamliner operator in the Middle East, and the airplane's lighter, composite structure enables the airline to reduce fuel use and emissions. Boeing's newest airplanes are 20-30% more efficient than the in-service airplanes they typically replace.

Advanced Technology

To further reduce emissions, Boeing expects future airplanes will incorporate emerging innovations in airframe, aerodynamics, propulsion and systems technology, and different power and energy solutions will apply to different market segments and aircraft sizes. Boeing is making long-term investments to explore and mature sustainable innovations, which include its fleet of demonstrator airplanes.

CarbonClick Commentary

Comparative analysis and benchmarking

For understanding an airlines position within the industry, metrics should go beyond simple CO_2 emissions to consider factors like:

- Fleet Age and Efficiency: Modern, fuel-efficient aircraft contribute significantly towards lower emissions.
- Route Network Optimization: Direct flights and optimized routing strategies minimize fuel consumption. Understanding the political challenges but working hard to overcome these is one such difficult investment of time by key leaders.
- Passenger Load Factors: Higher occupancy translates to lower per-passenger emissions.

Aircraft represent one of the most significant investments for airlines, both in terms of capital expenditure and operational costs. With the primary source of Scope 1 emissions for an airline being aircraft fuel burn, our fleet credentials must maximise opportunity to ensure efficient operations using the most important asset available to us.

Airlines, recognising the long-term benefits of fuel-efficient fleets, have made substantial investments totaling hundreds of billions over the years in acquiring and operating modern, next-generation aircraft. Advancements in fuel efficiency require substantial investment. Manufacturers have consistently dedicated significant resources to development of advanced technology, with the industry spend towards the development of more efficient aircraft estimated at around 6-11 billion dollars annually.[15]

Much of this is out of our control, relying on engineers and manufacturers to create and invent. With one of the highest ratios of next-generation aircraft in the industry, Etihad Airways continues to maximise all efforts in reaching our goals in an effort to demonstrate that, through our investment in next-generation aircraft, if they create it, we will buy it.

Future Strategy

Etihad's immediate strategy in the coming years is to focus on what it can do now to reduce its emissions per journey. This is being done by investing some $8bn over the next five years in new generation aircraft, thereby flying one of the youngest fleets in the world, with engines which burn up to 20 per cent less fuel than previous generation power units.

This will see aircraft joining our fleet, such as more Boeing 787's, Airbus 350's and introducing the next generation of narrow body A321 LRs; including the A321 and A320 NEO's. These are all next generation models, offering an average of 15-20% greater fuel efficiency compared to previous or competitive models. As part of Etihad's decarbonisation strategy, we have one of the youngest, most innovative and fuel-efficient fleets in the world.

These benefits are inherent to the OEM-airline relationship, and if naturally occurring in the interest of reduced operating costs (such as fuel) and efficient operations, doubling down in this area and setting policies and targets will surely encourage even greater collaboration and innovation. As is shown on page 32, policies, incentives or even mandates are lacking, instead favouring SAF and indirect measures, which airlines and most actors in this area have little to no control over. We commit to exploring all efforts around fleet and operational improvements, as shown in the following sections 'Fuel Efficiency', under the banner of a million little things. This is a core principle of our strategy; placing a focus on direct development or investment into solutions which can deliver proven, tangible, data-backed and direct impacts to our overall impact.

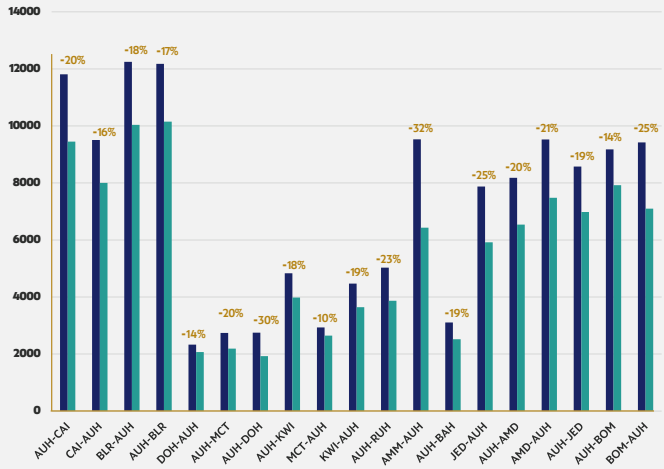


Figure: Old vs. New Generation narrow body aircraft fuel performance per flight

Following the remarkable results in next-generation transformation for our wide body fleet, we will shift focus to our narrow body next-gen composition will improve from 0% to 20.7% in 2024, to 42.5% in 2025.

As Etihad's fleet transformation continues into 2024, the introduction of new generation Airbus 321 LRs will focus on efficiency gains and reduced emissions per flight under the same principles. This new aircraft type will see further improvements to Etihad's next generation fleet mix, as well as continue the focus on young and modern aircraft types which maximise the operating credentials of our most important asset.

Please note this data includes actual data sets made available in 2024, collected during preparation for this report. As such, these actual data sets show proven improvements, however are utilised in this section to demonstrate the potential of next-generation aircraft though are not considered in the fuel efficiency and CO_2 reduction measures mentioned in prior and following sections related to 2023. This data set considers the period between May-June 2024, comprising of 515 previous gen A321 against 107 new generation A321LRs.

Fleet Credentials & Potential of *Next Generation Aircraft*

Boeing 787
27% more efficient than Boeing 777 Family
10-15% more efficient than Airbus A330

A350
25% more efficient than Boeing 777 Family

A321neo (LR)
27% more efficient than previous gen Boeing 737 Family
39% more efficient than previous gen Airbus A321

Fleet Credentials *2023*

7.5 yrs
Average fleet age

6.6yrs
Average widebody fleet age

11%
Improvement in fleet utilization

85
Boeing and Airbus aircraft

14
Aircraft added

72%
Next Gen widebody fleet

The development of more efficient aircraft types has been part of the aviation industry since the very first commercial aircraft entered service.

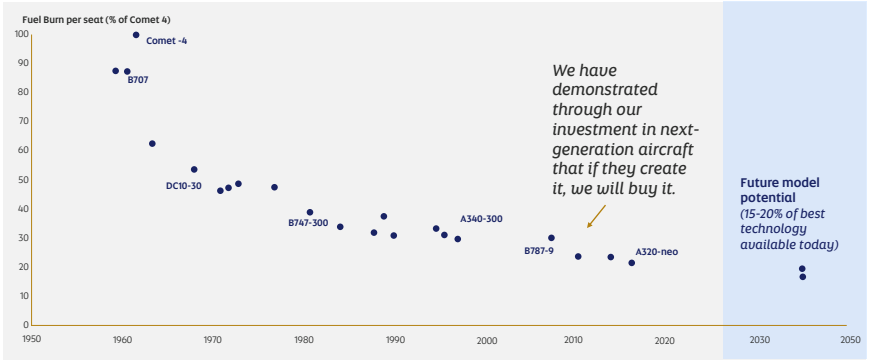


Figure: Fuel burn per seat for aircraft – 1950/60 – present comparison against Comet-4

Focus on next-generation and continuous development within industry for more modern aircraft

Next-generation aircraft models offer remarkable advancements in fuel efficiency, with improvements ranging from 15% to 25% compared to previous generations. Over the past few decades, the aviation industry has made significant strides in enhancing fuel efficiency. This collaborative effort between airlines and OEMs has been instrumental in realising tangible environmental benefits while maintaining operational excellence.

"Some estimates propose that jet fueled aircraft could still gain 15-20% in terms of efficiency compared to the best technology available today. These improvements of new aircraft technology alone could avoid 125-140-million tonnes (Mt) CO_2 by 2050. Cutting aviation's in-flight energy needs by 7-10%, a significant focus on advancing next-generation technology for existing jet-fuelled airframes preserves aviation's ability to deliver accessible, safe and efficient transport globally."[8, 16]

From the mid-1980s, where airlines operated on average 8 liters of fuel per passenger per 100 kilometers, to 2005, when this figure decreased to 5 liters per passenger per 100 kilometers, we have witnessed a remarkable evolution. Today, flagship aircraft like the Boeing 787, comprising the majority of our fleet, and the Airbus A350, of which we operate five, operate on less than 3 liters of fuel per passenger per 100 kilometers, aligning with fuel efficiency levels comparable to modern road cars."[8, 16, 17]

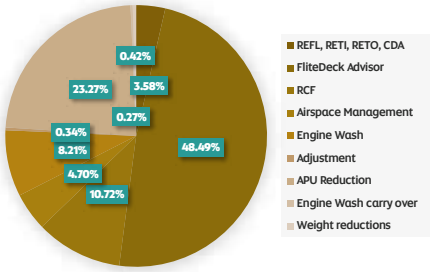
The pursuit of a million little things

We prioritise fuel efficiency as a cornerstone of our commitment to sustainability. While we wait for newer airframes, engines and fuels, we focus on the million little things we can do today.

Where the industry has earmarked fuel efficiency improvements (including those improvements to carbon intensity gained from use of biofuels, or SAF) as only 3% contribution, what must be acknowledged is that those solutions will continue to provide a statistical and direct .5-1% improvement year on year.[18]

Fuel efficiency is arguably the least disruptive, long-term, most cost effective, highest potential (exponential) activity for airlines, OEMs and ANSP's, airports and other providers to undertake. Benefits realised today will grow continuously over time from fuel efficiency initiatives, and the collaborative effort required to find solutions will benefit the entire ecosystem.

CO_2e savings from Fuel Efficiency Measures



In 2023, fuel efficiency efforts at Etihad saw cumulative savings of 11,351 tonnes of fuel, equating 35,869 tonnes of CO_2 – the latest reductions achieved under Etihad's Fuel Efficiency Steering Group, dedicated to continuous improvements in optimisations and reductions across our operations.

It is important to understand in fuel efficiency modeling that data is not aggregated when collected; once we have met our fuel target for the year, the next is set with the reduction achieved as a new 'baseline'. By calculating improvements year after year, we no longer track the benefit/value of these initiatives, and the new baseline is drawn from the previous year.

Efficiency needs an integrated approach

In 2010, at the 66th IATA Annual General Meeting, the International Air Transport Association (IATA) set ambitious targets for fuel efficiency improvements.

Their goal aimed for an average annual (YoY) fuel efficiency improvement of 1.5% from 2010 to 2020.

This target was issued with demands that governments, air service providers and airlines work to eliminate inefficiencies in air traffic management and airspace infrastructure.

Airlines have achieved an average improvement of over 2% YoY, with cumulative improvement of 21.4% from 2009 to 2019.[18] This was achieved with the investment of hundreds of billions into more efficient aircraft.

Continuous, incremental, integrated improvements into operations and equipment underscore the commitment of airlines and original equipment manufacturers (OEMs) to driving continuous innovation and sustainability in aviation.

Etihad's efforts prior to and during 2023 were made up of a mix of both long-term incremental optimisations we have practiced over many years with new initiatives alongside our partners.

Boeing Commentary

Operational Efficiency

The commercial aviation industry continues to work together on how to fly more efficiently, which collectively can reduce fuel use and emissions by about 10%. Boeing helps airlines achieve this objective through nearly every phase of flight – from optimized flight planning to the use of real-time weather and traffic information, and leveraging the power of data analytics. We also work with government customers, air navigation service providers and airports on efficiency improvements.

Boeing Jeppesen FliteDeck Advisor for Fuel Efficiency

Long running use of FliteDeck Advisor continues to show extensive benefits of efficient flying and informed flight planning

This report highlights our journey with Boeing Jeppesen FliteDeck Advisor (FDA) since our participation in the Boeing ecoDemonstrator Programme in 2020. The FDA application has been instrumental in identifying and capitalising on opportunities for fuel savings, particularly during cruise phases and continuous descent and arrival procedures.

Through rigorous testing, including on the B787, we have observed substantial fuel and emissions reductions, with initial trials in 2020-2021 showcasing 1.4% fuel savings, 350kg average fuel saving per flight, and 1,100kg average CO_2 saving per flight.

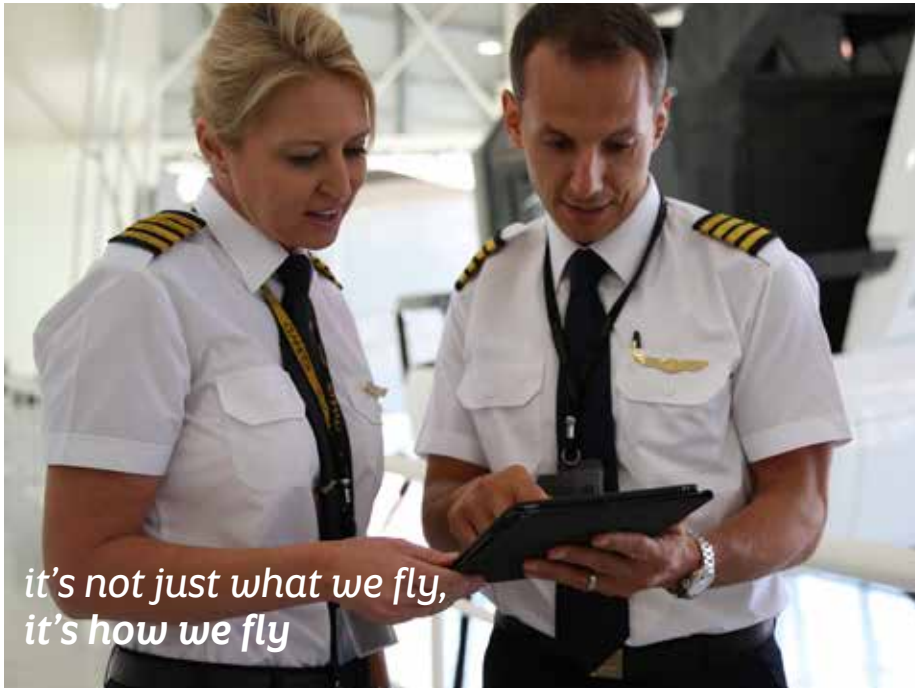
In 2023, we introduced a new module within FliteDeck Advisor in collaboration with Boeing, focusing on optimising climb speed. This initiative has the potential to achieve 1% climb fuel savings with a 50% capture rate, our implementation of FDA on the B787 and B777 fleets has already yielded significant results, with a total of 2,655 tonnes of fuel saved, corresponding to 8,389 tonnes of CO_2 emissions reduction.

Looking ahead, we are planning to extend the use of similar software solutions to our A380 and A350 fleets, with early predictions indicating the potential to annualise 1,950 tonnes of fuel saved or 6,162 tonnes of CO_2 emissions reduction.

Boeing Jeppessen FliteDeck Advisor ***2023***

2,655
Tonnes Fuel Saved

8,389
Tonnes CO_2e Saved



The Etihad Greenliner Programme has enabled Etihad and its partners to test and evaluate a series of procedures aimed at improving aviation sustainability. The initiative is seen as a means to demonstrate fuel efficiency and optimization potential.

CarbonClick Commentary carbonClick

Operational Efficiency
Continuous investment in fuel-efficient technologies and optimized flight operations can significantly reduce emissions. Globalising & regionalising airspace is a key example that requires no technology, but operational coordination & political agreement between regions in order for flights to take more direct pathways.

Airspace Navigation
Currently flights either can't go more direct due to ATC limitations, or they avoid more direct routes due to airways charges for specific airspaces. Europe's SES (Single European Sky) proposal is an example that is politically delayed. The ATC / Pilot interaction shows much room for improvement to avoid holding patterns through earlier planned continuous descents / speed guidance, through to less taxiing under engine power at Airports.

Reduced fuel use on ground

Reduced Engine Taxi (RETI/RETO) Procedures, Single Engine Taxi on ground, APU Usage/Reduction

- Adopting 'reduced engine taxi' procedures to minimise engine use on the ground during taxiing, reducing fuel consumption and emissions.
- Reducing reliance on auxiliary power units (APUs) and transitioning to ground power units for aircraft operations, minimising fuel usage and emissions.

Reduction of weight across aircraft to reduce fuel burn

Various initiatives to reduce weight carried to minimise fuel burn per flight

- Potable Water: Data-driven optimisations have also been implemented on the use of potable water carried on aircrafts for toilets and wash basins. This means flights are able to determine the optimal volumes of water to be loaded, reducing weight, fuel consumption, and water usage.
- Equipment weight management: assessment of on-board service equipment to identify weight reduction opportunities.

Efficient Flying

Airspace Management, Flight Planning, Modernization of Flight Deck Systems:

- Collaborating closely with Air Traffic Control (ATC) to identify and implement routing shortcuts during cruise, minimising fuel consumption.
- Conducting continuous, low-power descents towards airports to optimise fuel burn during descent phases.
- Leveraging GPS technology for efficient final approach routings, enhancing operational efficiency.
- Utilising the LIDO flight planning system to minimise fuel consumption and emissions through optimised routings, including leveraging high-altitude jet streams.
- Optimising fuel levels using detailed statistical analysis, ensuring efficient use of resources.

Boeing Commentary BOEING

Continuous enhancement of products
To support Etihad's drive towards operational efficiency, Boeing provides multiple services for the airline's 777 and 787 fleet, including charting and electronic flight bag tools – specifically a fuel efficiency solution that provides pilots with real-time, in-flight speed advisories for fuel optimization.

Reduced Drag and Improved Aerodynamics

Reduced Flap Landings, Engine & Airframe Wash, Optimum Loading & Trim

- Implementing reduced flap settings to ensure streamlined aerodynamics and minimise drag during landing.
- Actively targeting optimum trim through improved payload forecasts during flight planning, resulting in enhanced operational efficiency.
- Continuously improving trim optimization across our fleet to further reduce fuel consumption.

Modernization and digitization of flight deck and systems

Enhancement of processes and procedures in operating procedures

- Introducing iPads to reduce weight and paper usage while providing a platform for advanced software solutions.
- Equipping pilots with real-time, continuously updated information to optimise flight plans and enhance decision-making processes.
- Utilising smart programs for weather and turbulence predictions, improving routing efficiency and enhancing safety.

Cabin Product Weight Reduction

Incremental reductions in weight of cabin interiors

Carpets: Beginning with aircraft types A350 V2 and A321LR, our onboard carpets will be 15.6% lighter than previous definition (1300 vs 1540 grams per sqm). Deliveries of our newer B789 will be using the same lighter weight carpets in service.

This initiative aims to deliver a high quality product while identifying any potential opportunities for important incremental weight reduction which improves our overall fuel demand for our aircraft, thus improving our carbon intensity.

Thales and GCAA for Improved Aerospace Efficiency

Driving Enviromental through Data Analysis

This project was a joint effort between Etihad and Thales to utilise data analysis by optimising Continuous Descent Profile (CDP) – where the aircraft follows a slope trajectory on arrival as opposed to a stepped descent which requires higher fuel. The project commenced in Q3-2022, aiming to improve sustainability within Etihad's A350 Fleet, with continuous monitoring throughout H1 2023. This required continuous collaboration with our key stakeholders, including Thales, GCAA, ADQ, GANS, and ADA.

Thales estimates that CDP optimization saves 150-200kg per arrival on the A350, showcasing the potential environmental impact of data-driven initiatives. Collaboration with the GCAA Air Traffic Centre (SZC) ensured active coordination and engagement in key stakeholders. Future directions involve continued collaboration and data analysis to refine CDP optimization strategies, maximise fuel savings, and reduce emissions across Etihad's fleet.

The below data illustrates potential benefits from incremental reduction in weights, using historic data of the three aircraft types (A350, B787-9, A321 LR – all next generation models) and the calculations for weight reduction to fuel demand. These calculations consider expected departures/sectors for the aircraft between July 2024-December-2025, with a forecasted total saving/avoidance of 483.6 tonnes of fuel, or 1,464.92 tonnes of CO_2. Incremental and diligent efforts for the basket of measures within operational improvements continue to prove they should not be overlooked.

Potential savings by weight/fleet	Carpet area, sq.m.	Approx. weight – original (kgs)	Approx. weight – lighter carpet (kgs)	Delta – Per tail (kgs)	Weight to CO_2 savings/potential
B787 -9	195.55	301.15	254.22	-46.93kgs | 15.8%	81,438.8kg
A351	242.72	373.79	315.53	-58.25kgs | 15.9%	331,009.2kg
A321LR	96.25	148.23	125.13	-23.10kgs | 15.8%	51,137.1kg

Based on estimates and average calculations for 3.16 coefficient for carbon emissions from fuel burn. Calculations made based on fuel density of 775kg/m3 and standardised fuel to CO_2 calculations.

Aircraft Dry Wash

The initiative focused on reducing water consumption, improving aerodynamic performance, minimising emissions, and optimising operational processes.

In 2023, our aircraft dry wash initiative achieved notable milestones for more sustainable ground operations, while enhancing operational efficiency.

Performance Highlights:

- Dry wash procedures resulted in significant water savings, wide-body aircraft saving 5,500L per aircraft and narrow-body aircraft saving 3,500L per aircraft.
- A total of 227 full washes were conducted, showcasing the scalability and impact of the initiative.
- Cleaner aircraft surfaces resulted in reduced fuel consumption and emissions, due to aerodynamic improvements.
- Dry wash tasks were seamlessly integrated into maintenance schedules, optimising downtime and facilitating quicker return to operational service.
- Dry washing led to faster return to service, reduced towing, reduced disruptions, and enhanced productivity,
- Dry washing proved to be a cost-effective solution compared to traditional methods, demonstrating financial viability alongside environmental benefits.
- Maintained high cleanliness and safety standards, ensuring aircraft integrity and passenger satisfaction.

Future Objectives (2024 and Beyond):

- A380 Dry Wash Operation Trials: Expanding dry wash operations to include A380 aircraft to further enhance sustainability and operational capabilities.
- Increased Dry Wash Volume: Anticipating growth in demand, aiming to conduct 425-450 dry washes in 2024, emphasising commitment to sustainability and efficiency.
- Service Expansion: Offering dry wash service to other airlines operating in AUH, sharing expertise and contributing to industry-wide sustainability initiatives.

GE Aerospace

Greenliner Programme Focus: GE Aerospace

Approach
At GE, the fundamentals are clear and efforts from all sides converge to promote quality services and sustained impacts:

Improve Fuel Efficiency
More efficient engine maintenance results in lower fuel consumption.

Reduce CO_2 emissions
Efficient Engines = Lower Fuel burn = reduced CO_2 emissions

Lower Maintenance Costs
Reduced wash events and preventative maintenance results in higher cycles and overall lower maintenance costs.

One of our most significant the Greenliner Programme initiatives was with GE Aerospace, when we introduced GE Foam Wash 360 engine cleaning system to optimise performance of the GE90 and GEnx-1B engines. As the first airline to receive the technical license for this foam wash, these improvements have resulted in significant reductions of water-use in engines, and reduced fuel consumption.

GE Aerospace's 360 Foam Wash

Continuous and incremental benefits from engine wash

Etihad was the first airline to receive the GE 360 Foam Wash Technical License, an important credential for the airline's services to ensure our fleet of GEnx powered B787's maximised its fuel efficiency potential.

In addition to improved engine lifecycle, less time 'off wing' (in maintenance), the cleaning system ensured the engines ran efficiently, minimising fuel consumption.

As is demonstrated by Figure A (right), engine foam wash events resulted in significantly lower fuel flow in comparison to sister engines which underwent standard water wash procedures.

Figure B demonstrates the benefit of GE 360 Foam wash over the life of an engine between shop visits. On Average, Engines have seen significantly increased retention of efficiency 360 Foam Wash.

Etihad have continued to expand the use of 360 Foam Wash to more engine programs in their fleet, from beginning with GEnx and GE90 engines to now also washing GP7200 and CFM LEAP-1A engines.

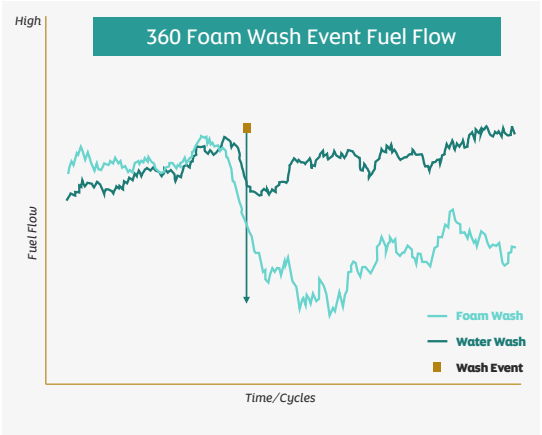


Figure A: Sister Engines fuel flow performance pre/post wash event

Current Fleet annual fuel savings	FoamWash GEnx	FoamWash GE90
Delta Fuel Flow Recovery (%)	-0.17	-0.12
CO_2 savings (Tonnes/ fleet/year)	4,900	1,800

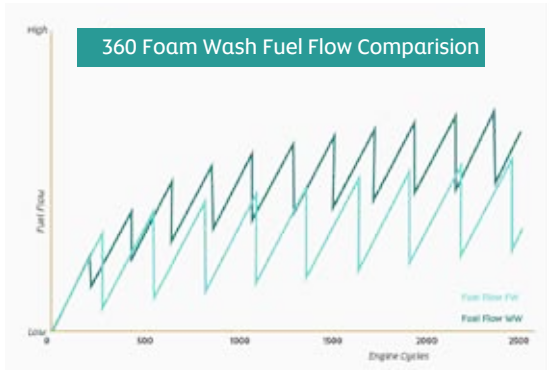


Figure B: Fuel flow engine analysis pre/post wash event

Future recovery over current water wash practice	Foam Wash			
	GEnx	GE90	GP7000	LEAP 1A
Delta Fuel Flow Recovery (%)	-0.39	-0.24	-0.2	-0.23
CO_2 savings (Tonnes/ fleet/year)	11,582	3,525	1,046	173

GE Aerospace Flight Analytics Tools

Long running partnerships and Data driven fuel savings

In 2023, Etihad and GE Aerospace Software as a Service reached an agreement to introduce the Fuel Insight tool within Etihad's operations. The primary objective of this transition was not merely to achieve direct fuel savings but rather to leverage advanced analytics for gaining a comprehensive understanding of end-to-end fuel efficiency performance. Fuel Insight serves as an enabler, facilitating the identification, tracking, and implementation of key initiatives aimed at optimising fuel efficiency across various operational channels.

To help support the adoption of fuel initiatives that are being tracked by Fuel Insight, our flight crews started testing the FlightPulse application. The FlightPulse app empowers pilots to conduct self-debriefs of their flights from a fuel efficiency perspective, enabling them to identify areas for improvement and take proactive measures during future operations.

Currently, the application is undergoing configuration, and collaborative efforts with Fleet management are underway to roll out the first test version in 2024. We anticipate that the deployment of FlightPulse and Aerospace Fuel Insight will drive notable enhancements in key metrics such as RETO (Reduced Engine Thrust Operations), RETI (Reduced Engine Taxi-In), RFL (Reduced Fuel Loads), and CDA (Continuous Descent Approaches), among other initiatives, leading to improvements in overall fuel efficiency and operational performance.

GE Aerospace Commentary

Collaboration and Innovation
Etihad is partnering with GE Aerospace Carbon Solutions to conduct a comprehensive analysis on the financial and operational impacts of emerging policies. GE Aerospace, Software as a Service's Fuel Insight solution leverages real aircraft data to enhance flight planning and operational efficiency.

Policy and Regulation Compliance
Using Fuel Insight, which is currently deployed across 113 active aircraft and has captured data from 42,666 flights with a 98% match rate, Etihad can ensure it remains compliant with environmental regulations, aiding in detailed monitoring and precise reporting.

Assessment of Performance
The utilization of different efficiency initiatives deployed and managed through advanced analytics, with plans for continuous optimization, supports this effort, allowing Etihad to continuously monitor and optimize its environmental and operational performance.

Efficiency has always been a tremendous driver of progress in aviation and has made air travel and mobility central to modern life. Indeed, today, our engines are at the cutting edge of efficiency and our aircraft are more aerodynamic and lighter than ever before. We are making improvements in air traffic control efficiency, how we fly our aircraft and in developing less environmentally-impacting operations at airports...

Aviation's drive for fuel and operational efficiency has helped the industry limit its emissions.

But we are still, for the vast majority of flights, using the same fuel. That is now changing...

To go even further, the aviation industry has embarked on a journey that will lead us to net-zero carbon emissions by 2050. Sustainable aviation fuel (SAF) has a crucial role to play in providing a cleaner source of energy to power the world's fleet of aircraft and help the billions of people who travel by air each year to lower the impact of their journeys. The industry's Waypoint 2050 analysis suggests that SAF will contribute between 53 and 71% of the emissions reductions needed to get to net-zero by 2050.[19]

ATAG

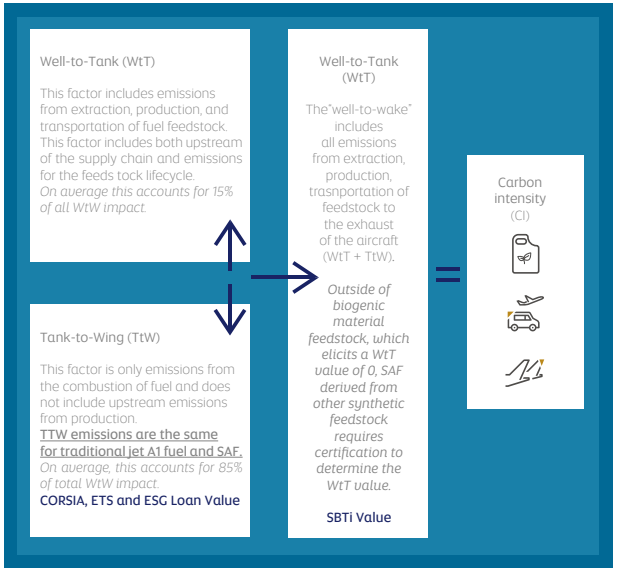
Alternative Fuels & Energy

Etihad has been involved in projects and studies around many forms of Sustainable Aviation Fuels and their offtake options for more than a decade.

Ultimately, SAF/other-bio fuels do not directly impact an airline's scope 1 emissions. The CO_2 produced by SAF at the tail of the aircraft (during combustion) is the same as the emissions from A1. As the reduction comes from the production and lifecycle of the raw material (carbon), SAF/etc., is a product that reduces the scope 1 emissions of the fuel producer.

Such fuels do, however, impact carbon intensity from the application of environmental benefits improving the lifecycle footprint for fuel production. Additionally, via aviation's vast audience of corporate customers and partners, there is opportunity to engage our supply chain to advance the development of such fuels while offering high quality and meaningful solutions to an otherwise detached sector.

As aviation fuel development can offer a trickle-down effect to other industries as they develop their alternative energies, we continue to pursue SAF within our strategy.



Air-CRAFT – Centre for Research in Advanced Fuel Technologies

Coalition with Boeing, ADNOC, ENOC, Masdar, Emirates, Honeywell and Khalifa University

Joining forces with 6 leading UAE entities in the aviation sector; Boeing, ADNOC, ENOC, Masdar, Emirates, Honeywell, Khalifa University in partnership around applied research, industrial infrastructure, policy, underscored by financing pathway development. Air-CRAFT will position the UAE as a leader in aviation decarbonisation through accelerating the deployment of globally competitive, locally produced sustainable aviation fuels, leveraging leading technology that supports the sustainable growth of the UAE aviation sector and contributing to the implementation of UAE national policies and roadmaps.

Boeing Commentary

Renewable Energy

Forms of renewable energy such as sustainable aviation fuel (SAF) can help reduce the lifecycle impacts to climate change. SAF offers the largest potential to reduce lifecycle carbon emissions over the next 30 years in all aviation segments. For nearly two decades, Boeing has been pioneering global efforts to make the use of SAF a reality, including robust initiatives in the UAE in collaboration with Etihad.

Waste to Fuel Study

Collaborative Feasibility Study with Masdar, ADNOC, bp and Tadweer

In 2023, Etihad initiated a collaborative feasibility study alongside Masdar, ADNOC, bp, and Tadweer to explore the potential for commercial production of Sustainable Aviation Fuel (SAF) utilising Municipal Solid Waste (MSW) and renewable hydrogen. Aligned with the overarching UAE SAF roadmap and driven by collective efforts from entities spanning various sectors, including aviation, this endeavor reflects Etihad's sustained commitment to its strategic objectives.

The study, launched during the Abu Dhabi Sustainability Week (ADSW) 2023, aims not only to evaluate the feasibility of SAF production but also to investigate the possibility of generating additional products such as renewable diesel and naphtha. Leveraging the combined expertise of the five partnering entities, the study looks to assess both the technical and commercial viability of the proposed project. Positive outcomes from the study could pave the way for the development of the UAE capital's first commercial-scale SAF production facility. This study is particularly significant as it seeks to diversify potential feedstocks, crucial for ensuring the sustainability and scalability of SAF production.

"Sustainable Aviation Fuel" is a commonly used industry term, (it is not Etihad's term). Such fuels still produce approximately the same CO_2 when burnt as fossil based fuel. The "sustainable" as aspect relates to the production process. For more information please see page 43.

Enviromental Aviation Fuels

By 2025, at least 7.2mtCO_2 will need to be mitigated by using SAF (page 45) to satisfy the IATA Net Zero Resolution – Abatement Strategy8. Simply, to meet these expectations, the industry must produce a fully developed, approved and harmonised SAF accounting infrastructure and scale SAF supply from 0.2% (around 260,000 tonnes) to 2% (at least 6 million tonnes) in the next 12-24 months.

Frameworks such as CORSIA convert the benefits of SAF usage into carbon credits, to encourage airlines to adopt these fuels. The long-term impact of reliance, however, will result in significant cost bearing to aviation, with no direct emissions reduction. The percentage of aviation absolute emissions, already at 2%, will grow exponentially in comparison to industries capable of faster technology advancements.[20]

IATA [20]

Approximately 23 billion litres of SAF would be required by 2050 to meet the expectation/target for SAF/alternative fuels to reduce 50-65% of aviation's emissions. Predictions suggest that to reach this, the industry will require an estimated $1.45-3.2 trillion in capital spending.

The headlines behind the headlines[21], [22]

- Airlines' demand for SAF, in line with their commitment to net zero carbon emissions by 2050, vastly exceeds the availability of SAF today, which is limited to 0.2% of airlines' jet fuel consumption in 2023.
- All SAF produced in 2022 was bought, at an additional cost to the industry of around $500 million, as SAF is priced at a significant premium over the price of jet fuel.
- There are increasing examples of airlines vertically integrating into the supply chain, with some committing equity and risk capital into SAF projects.
- Despite ambitious goals to mitigate nearly 49 million tonnes of CO_2 using SAF by 2030, current supply constraints underscore the urgent need for concerted action across the entire value chain and government support to realise this vision.
- Airlines have entered into forward purchase agreements for SAF worth a total of some $45 billion, more than today's SAF availability.

In the 2022 Etihad Sustainability Report, three main obstacles were detailed which prevent the full integration, adoption and scale up of a meaningful SAF economy. Despite the continued expectation for SAF to deliver relief for the industry to the order of 50-65% of emissions, none of the three challenges have been resolved since publishing that report.

1. Cost
2. Supply
3. Accessibility

Instead, new challenges have been shown to add to the list, expanding upon the original issues.

Development Challenges to Integration of SAF

Accounting & Reporting – Accessibility

While ICAO, under the 'ACT SAF' campaign, has introduced the relevant standards and reporting requirements for CORSIA approved Sustainability Certification Schemes (CORSIA Eligibility Framework), it will be the responsibility of individual states to introduce/recognise their own standards for acceptable 'biofuel' types (REDII) or preferred registries (RSB, ISCC, etc.).

However, in a hypothetical where airlines were mandated to offtake only SAF starting today, no progress will be made towards this target as there is no approved or harmonised accounting or reporting system in place which would allow those benefits to be claimed toward Scope 1 for an airline or Scope 3 from customers, such as freight forwarders.

In the context of Sustainable Aviation Fuel (SAF) purchases, the absence of a structured framework for accountability complicates reporting practices, hindering efforts to track and evaluate the environmental impact of SAF adoption.

Addressing these discrepancies and establishing standardised reporting protocols will be crucial to fostering transparency, accountability, and meaningful progress towards sustainability goals within the aviation sector.

Demand management – Accessibility

The demand for SAF extends beyond airlines to include freight forwarders and corporate clients seeking mutually beneficial emissions reduction solutions. This collective demand prompts the global SAF market to expand production and establish realistic pricing structures. Despite challenges, the micro-ecosystem surrounding SAF sustains itself, with airlines demonstrating a strong commitment through forward purchase agreements and vertical integration into the supply chain.

Demand may be enforced and legally required of carriers by governments and individual states via mandates, however the actual capacity to sustain this demand, invoke a thriving economic balance between JetA1 and SAF, competitive and managed market prices, and fair access and distribution of SAFs and their development globally, is not becoming a naturally occurring facet of the conversation.

While mandates may mitigate risks for fuel producers, they do not necessarily alleviate challenges for airlines. Even with hypothetical mandates, progress towards Net Zero or intermediate targets may remain elusive without a developed SAF accounting infrastructure and scaled-up supply.

Production – Supply

There is little to no benefit in shifting blame when the task itself is extraordinarily challenging, so there must be understanding paid to the would-be SAF producers who are delayed and inhibited in production by constantly changing standards and un-secured credential validations. The types of impacts to reliable long-term production and offtake activity include:

- Alternating conditions for feedstock (type, aggregation)
- Introduction of mandates which eliminate option for competitive market pricing for SAF
- Different certification and regulatory requirements (i.e. REDII SAF versus CEF (CORSIA Eligible Fuels))
- Undefined voice of authority and acceptance; exploration into alternative types of 'SAF' (eFuels, LCAF, etc.) result in inconsistent calculation methodology and therefore acceptability

Alongside the proposed targets, this generates a disproportionate amount of pressure on airlines to resolve issues we have no control over or make offtake commitments we cannot quantify. This is creating market distortion and provides opportunity for the fuel industry to increase profits from the artificial demand created for SAF/LCAF. More pressure or incentives needs to be placed on, or provided to, fuel suppliers to develop sustainable products at the same price as today's products. This will mitigate the societal risk of aviation drastically increasing in cost and becoming (once again) a luxury only open to the wealthiest in society (contravening other UNSDGs).

Greenwashing Risks

Above and beyond the viability of these infrastructures to build integrity in the solution and provide confidence to airlines, their customers and regulatory bodies, the lack of infrastructure has one secondary potential consequence: greenwashing.

We continue to see accusations of greenwashing levelled at any fossil fuel related company – and while the intent is to draw away from these energy sources and promote the use of alternative, renewable or clean energies – the lack of infrastructure for SAF results in lack of traceability and chain of custody mechanisms which airlines (or any participant in this mitigation pathway) would rely on to prove their action.

Signals of high risk are sent not just to airlines, but beyond to oil producers, venture capitalists, technology start ups, investors and all other actors on a more global stage, those currently involved in the oil economy and those within financial markets, who rely on predictions and patterns to inform decision making.

It would not be difficult, if so inclined, to leverage this confusion to lobby against airlines (et al.) and find a greenwashing accusation that sticks. Lack of infrastructure breeds lack of trust. Lack of trust is not something that aviation tolerates

It is not for airlines to claim in their own right, the climate impact of using fossil based jet fuel vs biofuel or other fuels from sustainable sources. This is for governments and producers and those that audit them. They must decide what labels they want to attach to them, and accept any criticism. Airlines can only act in good faith on that these claims, assume that they are correct and share the information in a transparent and clear way with consumers"

UAE SAF ROADMAP[23]

This roadmap establishes 5 principles for the UAE to scale up SAF. These principles will maximise the benefits of SAF, while reducing aviation emissions and providing substantial economic benefits. These principles will serve as building blocks for the UAE's SAF vision, and will be delivered with strong public private collaboration, alongside the SAF committee:

- Principle 1: Establishing the Ambition
- Principle 2: Accelerating SAF Technology Deployment and Innovation
- Principle 3: Developing the National Regulatory Environment for SAF
- Principle 4: Building Local Capacity to Boost In-Country Value
- Principle 5: Leading International Collaboration

Decarbonizing long-haul aviation is particularly challenging, as long-distance flights must be powered by fuel with a high energy density, low weight, and small volume. In the short to medium term, emerging clean aviation technologies such as electricity and hydrogen will be limited in their ability to meet these demands, while drop-in SAF can be used today to decarbonize existing and future aircraft. SAF will therefore be critical to decarbonize the UAE's aviation sector.

GE Aerospace

GE Aerospace Commentary

Policy Analysis – for graph click here
Etihad partnered with GE Aerospace Carbon Solutions to perform analysis which highlighted that compliance with these emerging policies will necessitate substantial investments, but with strategic planning, these costs can be effectively managed.

Given SAF market dynamics, airlines that proactively engage in the development and procurement of both biogenic and power-to-liquid (PtL) SAF could see substantial economic benefits.

The deployment of SAF faces challenges such as high cost of production, limited availability of cost-effective and sustainable feedstock, limited investment, and competition for resources and incentives with other sectors. To overcome these challenges, effective SAF-enabling policies are needed. These should be stable, predictable and consistent, and link incentives to performance, among other characteristics. [We] highlight three key themes that influence policy effectiveness: feasibility, effectiveness, and practicality. Effective policies should also be customized to the unique resources, economic and social factors, political barriers, and existing regulatory structure of a particular State or region.[23]

Persisting through challenges
Book & Claim

Looking ahead

Stated in our 2022 report, in order to share the burden for increased cost and to avoid competitive disadvantages, a framework is required where voluntary contributions of corporate customers can be counted against the different scope 3 obligations.

Book & Claim is an opportunity to develop a global marketplace for SAF – solving many (but not all) problems of regional availability, pricing, and distribution. Efforts here would pay dividends for both the fuel industry and the aviation industry – and help move the needle on emissions from aviation. What is needed is alignment in calculation of emissions savings (to ensure standardization), oversight of fuel production and blending (to provide vigour), and incentivization of fuel suppliers to invest in development of SAF and to keep prices in line with A1.

As has been demonstrated through our own efforts, we have willingly taken those risks and proven the system does work.

Book & Claim

Book and Claim methodology has existed for many decades to accelerate energy roadmaps for different sectors. The system has been innovated to enable adoption into the aviation industry and encourage uptake of alternative fuels by allowing the benefits to be shared. Book and Claim allows an external party (typically a corporate customer who travels on an airline) to 'book' the SAF quantities needed to offset the emissions of their flight, and 'claim' it against their own Scope 3 reporting. By 'adding' benefits to previously disconnected parties, the value of SAF credentials – which are, as mentioned, highly regulated by industry certifications – can be received by a more globalized audience.

Etihad 2022 Report – For more, **click here**

There are many benefits to a Book & Claim model, including the ability for lump sum purchases to be incrementally 'sold' off – attracting more potential buyers, allowing access at many price options, allowing customised activity for third-party (corporate customers) to offset Scope 3 emissions, and allowing SAF purchases to be made from anywhere in the world. This allows untold access to developing countries to a) invest in SAF and other clean energies, or b) develop economies which can support the production of SAF. The process for B&C relies on many parties to facilitate the chain of custody for SAF production to delivery and registration of BCU's, but also offers a degree of flexibility in selection for specific certifications. If well managed, this will support a competitive and diversified SAF economy.

Extensive BCU study

Continuing Book & Claim Proof of Concept

To confidently offer a Book & Claim product to our corporate partners, cargo and freight forwarders, and hopefully in future as a standard business practice, we need to ensure the appropriate measures in transparency and chain of custody mechanisms are in place. We engaged lawyers & consultants to support in reviewing the pathways around carbon credits, BCU (Book & Claim Units), VERs (Voluntary Emissions Reductions), etc. This ensures that when the industry matures, we can activate the correct procedures for minimal risk and liability, for ourselves and our customers.

CarbonClick Commentary carbonClick

Enviromental Aviation Fuel

Increased adoption of SAF is essential. Collaborative efforts to expand production, incentivize wider use, and bring down costs are key. The airline needs to remain competitive when presenting flight options to market alongside competitors, and although passengers want SAF, they are not widely willing to pay the price to offset where 100% of their fuel equivalent is apportioned to SAF. Scaling the production of SAF to meet the theoretical demand has been hard while it is priced so far out of the market.

While these challenges appear separate, they are intrinsically linked. The 'SAF' challenge must be tackled as a whole, and not as individual obstacles because each element relies on the another for success, with success being implementation and scale up of a SAF economy, (fair and just) commercialization of sustainable solutions for aviation industry, appropriate and transparent anti-greenwashing messaging, and self-fulfilling and sustainable demand.

Even in instances where Etihad has overcome the obstacles for lack of accounting structures, funding taken from marketing budgets where no return can be made, ad hoc delivery of SAF to wing and the assembly and activation of all members along the supply chain to enable a singular, one-off delivery of a (most often) nominal quantity of SAF... even then, despite all reason, it is still seen as the 'panacea'.

Ultimately, these challenges related to SAF are a microcosm for the danger of politicising the climate roadmap for aviation; no two markets, airlines, organisations are the same, and any broad strokes attempts to pioneer the new SAF economy are showing signs of inadequacy.

A registry must exist for the benefits of SAF to be claimed, the reporting standards must be set for a baseline for qualifying SAF – inclusive of feedstock, production, carbon intensity potential, the targets must be in line with what is realistically possible given the actual, existing reality, not the optimum, desired conditions. If these issues are not resolved, there is no option except failure.

A registry must exist for the benefits of SAF to be claimed, the reporting standards must be set for a baseline for qualifying SAF – inclusive of feedstock, production, carbon intensity potential, the targets must be in line with what is realistically possible given the actual, existing reality, not the optimum, desired conditions. If these issues are not resolved, there is no option except failure.

Before we commit to the huge investments required to adopt SAF with the current relative ease and cost of Jet A-1, we must ask ourselves the question; *with questionable emissions reductions, does the investment outweigh the benefit?*[9]

Purposefully designed Products

Since the launch of Etihad's sustainability agenda in 2018, all product development scope for new programmes includes sustainability as a key requirement. This includes supply chain, material, production methodology and innovation.

Etihad has been committed to the removal of single use plastics and the development of circular economy on-board products which can meet our performance requirements of being high quality, meeting safety and hygiene standards, and affordable or cost effective. Further, products which are used in the aviation ecosystem need to be durable, logistically manageable and have end of life processes considered.

Etihad has removed 233million+ SUP items from service.

Enviromental integration into Business-as-Usual

We've seen great progress through the successful development and implementation of our Economy Evolution product (which was focused on SUP reduction) and our Business Class Armani Constellation product (focused on SUP and weight reduction (up to 10%) as well as supply chain) while improving the overall guest experience in parallel.

The Economy Evolution Product introduction means no single use plastic on economy tray, closed loop recycling, increase in locally produced equipment, and is the first in the region for 100% reusable dining tray including lids. All of the new Business Class Chinaware and bedding are produced locally in the UAE helping us reduce our carbon footprint, and 36% of our onboard products are produced locally in the UAE

The latest project – guest amenities, saw the removal of up to 100k pcs of SUP annually just by packing the loungewear and slippers in the First Class folio amenity bag. These programmes had a laser focus on eliminating single use packaging (SUP or others) through smart packing/packaging without impacting the guest experience and while remaining in compliance with hygiene standards.

A long road

We are proud of the story we have to tell from our beginning in 2018/2019 (with our early 'Greener together' campaign), the first ecoFlight to Brisbane, the many ecoFlights which followed and the high quality, sustainability integrated service we offer today. Having conducted 40+ ecoFlights – six of these unique operations had significant focus on SUP and waste management:

- Brisbane 2019 – 95 SUP items removed – after which, 43 items were permanently removed, saving 17 tonnes from landfill annually
- Brussels 2020 – 2,639 SUP items removed
- Rome 2021 – 1,731 SUP items removed
- London 2021 – 1,725 SUP items removed
- Washington 2022 – Introduction of Economy Evolution – circular economy products.

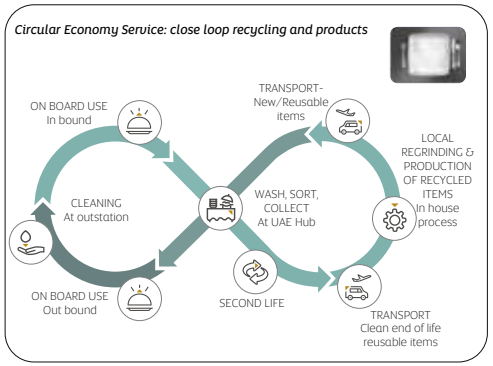


Figure: Circular Economy principles and process for Etihad products

Intentions moving forward

We intend to source an integrated catering management system which will allow us to learn more about guest consumption habits and crew equipment utilisation. This will bring us closer to being able to dynamically load and balance equipment to guest load and help us to learn which products and dishes are being consumed by guests and which are not. We can then reduce weight on board and source products which more closely match guest demographics.

With regards to weight, all new major projects have a mandate to secure reduction in weights against current (where possible) without impacting the quality and durability of the products.

Coordination and Collaboration

Supply Chain

Collaborating with the supply chain to find balanced and improved processes and techniques

The re-introduction of reusable economy tableware in 2023, as a result of lengthy experimentation, trials and supplier engagement has settled down to a business-as-usual status for caterers. Although the reduction in the use of disposable items on tray sets leads to less waste to dispose of, it also means more items to be washed, dried, stored and re-used. Caterers work closely with their equipment suppliers to design low water use industrial dish washers and find ways to reduce the need for chemicals in the wash and sanitisation process.

Caterers have had to adapt to having stored work-in-progress rotable materials ready for their production teams to use. By using lean and just-in-time techniques they try to maintain a constantly balanced supply of materials without holding excess stock on the shelf.

Challenges remain from a commercial perspective as sustainable products are on average more expensive than non-sustainable products. The availability of sustainable products that are right for our business is getting better but still progressing within the industry. Suppliers are now onboard the sustainability wagon and are starting to provide better options than before.

Replacing SUP/disposables with reusables does have an impact on workload and resources as this increases the handling requirements across various touchpoints such as production, delivery and post flight handling, as well as requiring a fine balance between energy consumption and waste reduction.

Catering & Logistics

Capital Catering current and future initiatives

- WasteMaster - innovative on-site food and organic waste valorising system which accelerates the decomposition of food waste, reducing it to a much smaller quantity of dry and odour-free residual material. Two machines are in use for the AUH airport facility with a capacity of processing 438,000 kg of food waste per year, covering the majority of our kitchen waste.

- Cooking Oil – the cooking oil is collected by a specialised company that converts it to biodiesel for resale. This is managed through a commercial contract that generates revenue for Capital Catering + Services.

Recycling Practice by caterers

Navigating International Waste Management Challenges

Recycling decisions are mainly driven by country or airport requirements rather than customer demand. Regulations vary across the world from very strict segregation in Scandinavia and Europe to less strict in China and USA. India has implemented strong SUP regulation which has changed many customer approaches to how to package their products. Remembering that IATA regulations demand that all international waste has to be incinerated for quarantine reasons, it can be difficult for caterers to segregate recyclable products from food waste generated on board.

Caterers are more in control of how goods are delivered to them by suppliers that they control rather than those airlines control. In UK and Australia for example, it is very common for fruit and vegetable suppliers to deliver their produce in reusable plastic crates. These are collected when empty and returned to supplier with new deliveries. Internationally transported goods are almost always packed in cardboard, and this is always bundled by caterers and sent to third party companies for recycling.

Catering & Logistics

Capital Catering current and future initiatives

Printing consolidation project – during 2023 we have undertaken a project to consolidate all our printers under a cloud solution at our airport facility.
This will enable us to upgrade the machinery by utilising 6 new printers that consume less energy, ink, and less maintenance. The solution promotes resource efficiency and energy saving as well as waste reduction through print job monitoring, duplex printing, and secure print release, which help minimise unnecessary printing and reduce paper waste. The cloud solution provides robust security features such as user authentication and secure printing protocols.

Local Food Sourcing

Working closely with Capital Catering to strengthen local suppliers and producers

Capital have worked closely with Etihad's Culinary team to identify opportunities to source products closer to Abu Dhabi, where available and where quality and supply is consistent. For example, dairy products are sourced from farms in Al Ain rather than imported from Europe. Every effort is made to source fruit and vegetables locally and by utilising produce seasonally, additional transportation can be reduced.

Local sourcing & local produce – as the UAE is progressing on its agenda of strengthening food security and increasing the agricultural production and availability supplies in the country, Capital Catering + Services is committed to support the local farms and businesses. Etihad sources all of our products locally with an estimated 20% being produced in the UAE. For our events sector we utilise up to 45% of local produce in our menus.

Nature, Biodiversity and Market Based Solutions

Offsets and Activities

Airlines' engagement in indirect environmental efforts, like exploring contrail avoidance, offering carbon offsets or developing nature-based solutions, harmonises with the guidance set forth by authoritative bodies for global climate action.

This form of indirect action not only facilitates accessibility to innovative solutions, but it fuels capacity building and fosters the transfer of cutting-edge technology, extending its impact from aerospace to various sectors in transport and energy.

From material available from the relevant governing bodies and leaders in climate transition, there exists a focus on biodiversity (afforestation and reforestation, adapting coastal ecosystems, conservation for protected areas, nature-based solutions), agriculture (climate-smart agriculture, reducing food waste, vertical farming), and consumer infrastructure (circular economy).

While the very nature of aviation makes it difficult to decarbonise, there are opportunities for airlines to make meaningful impacts. A challenge is balancing these opportunities; how difficult they are to achieve, how significantly they will contribute to goals, how long it will take to realise the impacts.

For Etihad, a useful strategy will encompass indirect measures, such as those related to biodiversity and ecological conservation alongside the mitigation pathways which will mitigate direct emissions (decarbonisation).

Increased awareness, opportunity to donate or contribute to projects, engagement activities and education building are valuable actions any brand can take to motivate, promote or make accessible environmentally-focused products and solutions to its consumers.

GE Aerospace Commentary

GE Aerospace

Evolving Strategies

Achieving net zero CO_2 emissions by 2050 will require a combination of SAF, new technology, infrastructure & operational efficiencies, and carbon credits under the IATA industry roadmap.

Carbon Credits

Navigating the procurement of quality carbon credits requires the consideration of key frameworks and standards such as CORSIA, ICVCM (Integrity Council for the Voluntary Carbon Market), and third-party ratings.

A main objective is to help customers meet 2030+ decarbonisation commitments by enabling a high-quality carbon removal market

CarbonClick Commentary

carbonClick

Progress in many forms

Decarbonisation is the first priority for all of us, however there will always be residual emissions, and a backlog of environmental damage on this planet to try and fix. Both of these can be tackled by carbon offsetting - both by the airline where possible, and also by its passengers. We are proud to be working together to tackle both of these opportunities. The most significant progress towards this, has been the integrated offering into the passenger booking flow in December 2023, which will pave the way for a highly improved impact in 2024. Having said that, in just 12 months (only some of which included the integrated offering), we've reached levels where over 1,000 passengers offset after purchase, removing a total of over 1.5 million kgs of CO_2 from our atmosphere, which if you imagine in tree terms over that period, would represent a forest of over 77,000 trees growing. That's significant progress!

Utilising our Etihad Guest Platform

Promoting climate projects with Etihad Guests

Etihad Guest, the airline's award-winning loyalty programme, allows frequent flyers to earn and spend miles on flights or across their exclusive range of partners.

Etihad Guest currently has more than 10 million members and collaborates with more than 120 international and domestic partners, including a large portfolio of leading UAE Banks and local attractions.

The audience granted by the Etihad Guest programme offers the chance to make a positive and great impact, outlining why Etihad uses its brand to promote and incentivise new behaviours'.

Carbon Offsets

Carbon offsetting is a tool that allows individuals or companies to reduce their environmental impact. Purchasing carbon offsets supports environmental projects that remove greenhouse gases from the air, these projects could be things like reforestation projects or investment into renewable energy. Purchasing one carbon offset credit removes the equivalent of one tonne of CO_2 from the atmosphere.

Carbon Click Guest Offsets[24]

Long-term partnership with CarbonClick

Etihad has collaborated with CarbonClick since 2021 to provide premium carbon offsets for our passengers. Offsets are accessible to all guests when booking flights on Etihad.com, while the Etihad Guest reward shop provides offsetting options for everyday activities like driving, further extending the reach of contributory choices to our Customers. It's important to note that Etihad does not include these offsets in any mandatory carbon footprint reporting.

CarbonClick Commentary

carbonClick

The importance of education and awareness across platforms

The education outcome that happens passively when people click to 'learn more' builds consumer knowledge of their carbon footprint for flying in the first place. The strong engagement statistics of over 10,000 interacting with our landing page suggests that even for those who did not offset, they were interested and able to learn the significance flying has on the environment.

The choices they make in the future including the class they fly, the airline they pick, even the weight of luggage they bring, all help to build consciousness into the customer base. This has the added benefit of aligning clients with Etihad's goals, so that they are more likely support any changes Etihad implements to reduce the emissions even if that means some compromises. We view this as a strong result for behavioral change outcomes, and there is much more that can be done in this space.

This does not, of course, absolve the brand (whether an airline like Etihad or any other business) of their environmental footprint. The accountability for the overall climate action and decarbonisation journey is the responsibility of the individual players and their industry infrastructure.

However, the power of collective action, combined effort and seamless integration into day-to-day lives of individuals can support more climate resilient economies and promote climate-action businesses. Etihad makes efforts to orchestrate solutions which reflect our values as a business, endorse partnerships (such as with the Environmental Agency of Abu Dhabi, Eco Matcher, The Storey Group and CarbonClick) and are viable commercially, with a focus on cost recovery over profit.

This allows us to use our business' brand value as a platform for advocacy, our sustainability program as a collaborative space and our product as a way to explore feasibility of various solutions.

Biodiversity & Wildlife
The Etihad Mangrove Forest

As the national carrier of the UAE, headquartered in Abu Dhabi, Etihad's efforts in biodiversity aligned seamlessly with the emirate's ambitions to become a global center for mangrove conservation research and innovation.

With an audience with a range of needs, the Etihad Mangrove Forest is more than a tree planting initiative. It is our attempt to diversify the opportunities available to create positive environmental impact, even if that impact is not attributable against a scheme or framework and purely to positively benefit the planet through collective action.

Etihad has committed to seeking the million little things that come together to make a difference. With the successful launch in 2022, the Etihad Mangrove Forest hopes to be a few thousand of those things, for anyone who wishes to participate.

The Etihad Mangrove Forest

Abu Dhabi's Jubail Island Mangrove Forest

Our sustainability journey, anchored by the ethos of 'Etihad Airways, from Abu Dhabi for the World' and our longstanding Memorandum of Understanding (MoU) with the Environmental Agency of Abu Dhabi, led to the development of the Etihad Mangrove Forest—an integral part of our strategic vision. This initiative was pivotal in advancing our commitment to environmental stewardship.

The Etihad Mangrove Forest initiative unfolded through strategic partnerships. After signing an MoU with The Storey Group and Jubail Island, we piloted mangrove adoption on the Etihad Sustainable Flight. Leveraging Eco Matcher, a digital tree planting platform, our guests worldwide could adopt a mangrove virtually, witnessing its growth and CO_2 sequestration impact. Through meticulous management and collaboration with partners like the Environmental Agency of Abu Dhabi and EMEG (Emirates Marine Environmental Group), we integrated mangroves into our booking systems, offering guests the opportunity to contribute sustainably without additional cost or hidden profit motives. This initiative not only fosters global participation but also underscores our dedication to community-based biodiversity
conservation and wildlife preservation.

Please note this is not part of any offsetting programme and a specific CO_2 reduction is not claimed.

Etihad Mangrove Forest

182,000
Mangroves Planted in Abu Dhabi

1.826
Tonnes CO_2 sequestered (2023)

2,776
Tonnes CO_2 sequestered (All years)

EcoMatcher & The Storey Group Commentary

The value of Collaboration within the Community

The partnership with Etihad has catalysed progress in specific areas that may not have been achievable otherwise. Learnings from this collaboration extend beyond Etihad, providing insights into effective project scaling through corporate value streams.The need to standardise process and reporting has been highlighted during this partnership and these are lessons we have taken to other large scale projects.

In conclusion, the collaborative efforts between Etihad, EcoMatcher, and The Storey Group underscore our commitment to sustainability.As we continue to innovate and adapt, we look forward to further contributing to Etihad's environmental goals and fostering positive change within the industry and the UAE's mangrove restoration and habitat protection.

About Mangroves

Ecosystems of coastal vegetation which store and sequester carbon are known as 'Blue Carbon' ecosystems. These include mangrove forests, salt marshes and seagrass beds.

Approximately 50% of the world's mangrove forests have disappeared over the past 50 years, with reports stating an additional 1% is lost each year.

Mangrove species differ across the world, specific to the climate features of their habitat. The Avicennia marina mangrove species is native to the UAE and, when compared to terrestrial forests and soils, is capable of sequestering and storing carbon at relatively high rates.

The species in the UAE is particularly robust, due to the arid climate of the country where temperatures fluctuate between 12-50°C and annual rainfall is <100 mm on average. Studies by the Environmental Agency of Abu Dhabi and partners show carbon sequestration rates of mangroves at 0.5 tonnes per hectare per year.

For the Etihad Mangrove Forest, Sequestration rates are based on species specific calculations by Eco Matcher. Carbon sequestration 'potential' for mangroves uses an average 25-year lifetime and factors include species, survivability rates, region, maintenance and ecosystem.

CarbonClick Commentary

The power of Collaboration

The CarbonClick-Etihad partnership exemplifies the power of collaboration

Increase Passenger Awareness: CarbonClick's platform empowers passengers to offset their flight emissions. Develop Educational Resources: Joint initiatives raise awareness about the environmental impact of aviation and potential solutions.

Support Green Initiatives: Collaborations on projects like tree-planting contribute to carbon sequestration and environmental restoration.

The airline seeks to ensure that any carbon, nature, biodiversity or offset related initiatives add value to local markets and complement its direct initiatives to reduce carbon emissions across its global operations. Etihad is committed to continuously explore meaningful and quickly deliverable initiatives.

Etihad will ensure that projects avoid eakage and comply with all social and environmental safeguards. Where Etihad purchases offsets under its commitments in this framework, these will be in addition to credits that are purchased as part of CORSIA commitments.

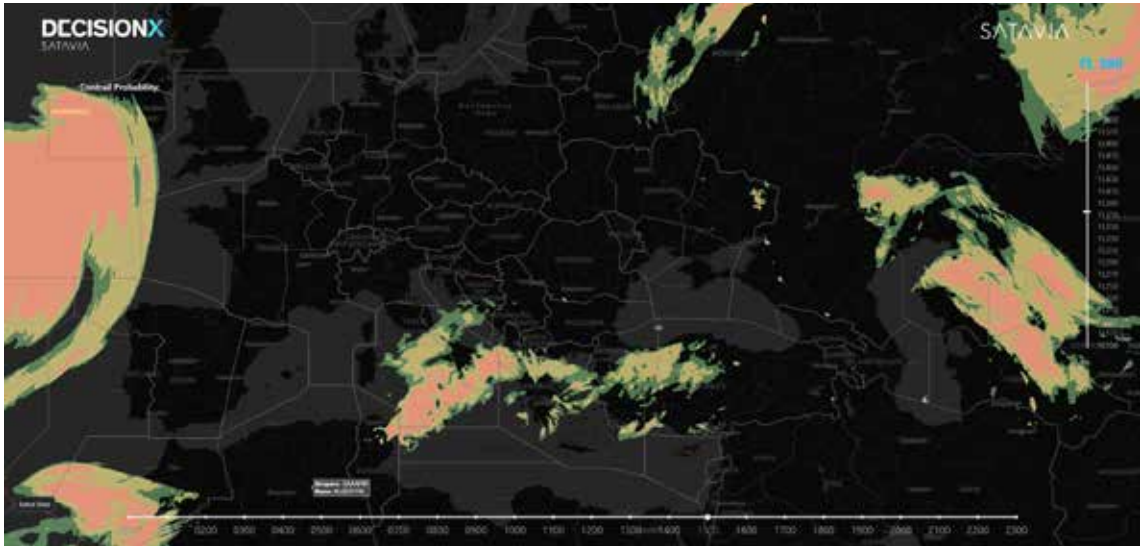


Image: SATAVIA DECISIONX:NETZERO contrail forecast showing likelihood of persistent contrails across time, space and flight level

Greenliner Programme Focus: *Contrail Management* SATAVIA

Non-CO_2 effects[25]

Non-CO_2 effects refer to the climate impacts of emissions other than carbon dioxide (CO_2) resulting from human activities. Non-CO_2 effects include greenhouse gases like methane (CH4) and nitrogen oxides (NOx).

Contrails

In aviation, non-CO_2 effects include the formation of contrails (condensation trails) alongside NOx and particulate emissions (e.g. soot).

Contrails are formed when aircraft fly through cold and moist areas of the atmosphere, causing water vapor emitted from aeroengines to turn into ice crystals. When contrails persist in the atmosphere, they can trap heat and amplify aviation's climate impacts beyond direct CO_2 emissions. Tackling these non-CO_2 impacts is one of the ways Etihad is working to strengthen aviation's sustainability and climate mitigation efforts.

SATAVIA: Contrail Management Trials

Contrail Management Research and Methodology Development

Etihad and SATAVIA have collaborated since 2021 to trial contrail management software, selecting >60 flights for modification, analysing >120,000 trajectories, and mitigating >6,000 tonnes of carbon dioxide equivalent (CO_2e) climate impact.

SATAVIA is now working with Etihad to scale contrail management technology across flight operations, integrate climate-optimised flight planning into day-to-day flying, and certify a Gold Standard methodology to incentivise action on contrails ahead of regulation.

Strategic Approach:

Etihad: What challenges and achievements do you foresee during trials? What steps are needed to achieve Net Zero through SATAVIA's product?

SATAVIA: SATAVIA's current engagement with Etihad incorporates a structured expansion of contrail management across scheduled flights, with concomitant increase over time of CO_2e prevented both in absolute terms and as a percentage of potential total mitigation.

In addition to complete scaling of SATAVIA's solution across flight schedules, achieving 'net zero' flight in terms of contrail management will require intensive coordination with internal and external stakeholders (e.g. flight planning software providers, flight dispatch & operations, pilots, air traffic control/air navigation service providers), in addition to planning for contingencies such as air traffic control strikes.

Transparency and reporting:

Etihad: How does transparency aid in the understanding of aviation's environmental impact?

Are current reporting standards sufficient?

SATAVIA: A precondition of effective mitigation is a clear understanding of present climate impact. Consequently, we see reporting standards as a platform on which to build practical steps towards climate action.

The European Union has led the way in terms of policy requirements, with all aircraft operators flying to, from, and within the European Economic Area mandated to report on their annual non-CO_2 climate impact (including contrails) from 2025 – a major step forward in recognition of surface warming arising from aircraft contrails.

In the context of SATAVIA's carbon incentive for operator action on contrails, currently in development with Gold Standard, annual reporting on contrail climate impact is a precondition for issuance of Certified Mitigation Outcome Units (CMOUs). SATAVIA will therefore incentivise transparent reporting of contrail climate impact as part of its business model.

Policy and Regulation Compliance:

Etihad: Why is Gold Standard Certification important for contrail management?

SATAVIA: The European Union has made a significant step forward in requiring non-CO_2 climate impact reporting from 2025. However, the EU does not yet require operators to take action against contrails, and may not do so until the end of the decade.

SATAVIA's approach is therefore to create an incentive for operators to mitigate contrail climate impact, primarily via the issuance of CMOUs in partnership with Gold Standard. Gold Standard's rigorous certification process ensures that credit/CMOU issuance takes place in a transparent and rules-based framework, giving operators and others assurance of mitigated climate impact.

Gold Standard Voluntary Carbon Project Certification

Gold Standard is a leading carbon programme with the aim of progressing the United Nation's Sustainable Development Goals (SDGs) through the voluntary carbon markets. By using stringent certification processes, Gold Standard ensures the integrity of carbon credits issued via certified methodologies. Gold Standard also has a category of CORSIA-eligible credits, which SATAVIA is targeting as part of its longer-term strategy.

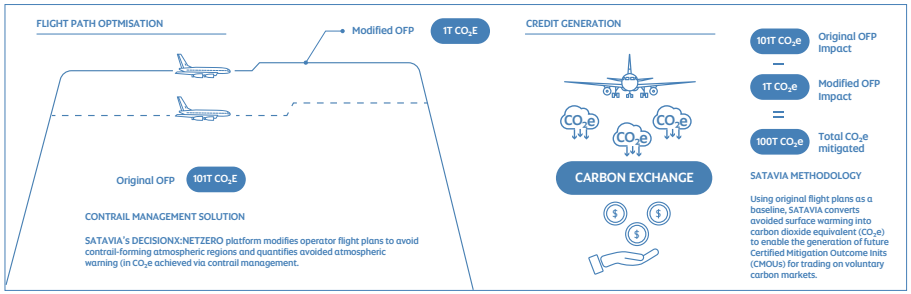


Image: Visualisation of SATAVIA flight path optimisation and climate benefit calculation

Assessment of performance

Etihad: How do you measure and evaluate key indicators for progress?

SATAVIA: The key indicator most relevant to contrail management is tonnes of mitigated carbon dioxide equivalent (T/CO_2e), which provides a tangible measure of climate benefit achieved via contrail management.

Recent SATAVIA trials supported by the European and UK Space Agencies demonstrated potential to avoid an average of >40 tonnes CO_2e per optimised flight*; this could increase significantly depending on length of flight (long vs short haul), time of year (winter vs summer) and geography (trans-oceanic vs cross-country).

**Contrails and their climate impacts are the subject of active scientific research, including SATAVIA atmospheric modelling validation presented in a forthcoming peer-reviewed article in the journal Atmospheric Research.*

Standards for non-CO_2 impacts are a topic that regulators and authorities are expected to address in coming years. Different methodologies and datasets provide a variety of hypothesised CO_2e savings and fuel burn changes arising from contrail management, which also vary depending on aircraft type, route pair, and seasonality.

Stocktake Findings

Etihad Assessment

Meta analysis of Policies & Targets

We can see there is great ambition to achieve a significant amount of emissions reduction for the industry via alternative fuels, however we also find that targets or focus on operational efficiencies and technology advancement are lacking. We provide this summary to paint a broad picture of what is being asked, what we are capable of, and the reality of the challenge.

Etihad's Sustainability Strategy, heavily aligned with the overall goals of the UAE and its various energy and infrastructure roadmaps, encompasses activity for all the basket of measures. In turn, we collaborate closely with OEM's and fuel producers to support development across the value chain. This allows us to firmly endorse or flag areas for advocacy or concern, from a place of experience and expertise.

This experience and expertise is critical to permit Etihad to produce objectives and roadmaps which are effective and achievable as possible, while remaining committed. As an airline, (1) In-sector Direct 'reductions'/avoidance are most in our control. We believe per most roadmaps, these solutions are mostly underrepresented and the penalties on the (fast approaching) horizon unfairly punish airlines for means outside of our control.

Keeping most of the forecast in theory, where technology development (Aviation energy transition, aircraft technology breakthrough) are concerned, we state the unknown, as do our counterparts, and are unable to hinge commitments or targets to aspirational goals in an individual sense.

As this report has aimed to show, there are few pathways we can take toward our net zero goals – and the expectations for us to reach net zero are ambitious. Those that show promise, even in the smallest, most incremental of ways, need to be magnified, for it will be the collective action across the industry that will see meaningful, exponential and long-term transformation.

Area/Measure	Party/Body	Expectation /Target	Target Date	Baseline/ Start Date	Applies to	Mechanisms – strategic milestones/guidance	Context – Forecast/Benchmark/Efforts
CO_2 Emissions	IATA (66th AGM – 2010)	50% reduction	2050	2005	Net Emissions from International Aviation	Cap on net aviation CO_2 emissions from 2019 Reporting/Compliance • CORSIA Guidance: • LTAG, Net Zero Resolution 'Sector' Guidance: • ATAG Waypoint, SBTi, Destination 2050 EU, ICCT Vision 2050, IEA 2050 Roadmap	• 2018 industry emissions: 914m t/CO_2 • The expected carbon emissions on a 'business as usual' trajectory over the 2021-2050 period is approximately 21.2 gigatons of CO_2, Emissions expected to grow 20% by 2030, • Pax demand expected to grow 5.6 billion by 2030, exceeding 10 billion in 2050 • 77th AGM – Resolution passed by IATA member airlines committing to net-zero by 2050. • 41st ICAO Assembly – LTAG agreement set same target for governments • SAF Volume expectation would be 23 billion litres by 2050
	IATA (77th AGM – 2021) ICAO (41st Assembly – 2022)	Net Zero	2050	2019			
Alternative Fuels (SAF, LCAF, etc.)	ICAO – LTAG	50-55% contribution to reduction	2050	2005/2019		• Minimum SAF volume 2% starting 2025 • Increase in 5 year intervals to reach 63% by 2050 • Of which 28% to consist of synthetic aviation fuels	• Current production levels only 0.2% of all aviation fuel use, All SAF produced in 2022 was bought; at additional cost to industry of $500million (over jet fuel) • $4.3 trillion spend on jet fuel in last 30 years • Forward SAF purchase agreements from airlines worth c.$45 billion. • 'Will require an estimated $1.45-3.2 trillion of capital spending'
	IATA	2% SAF volume	2050 (final)	2025			
	ICAO (CAAF/3) ICAO LTAG	5% less carbon intensive fuel	2030	2023	ICAO Member states	• Use of SAF, LCAF and other aviation cleaner energies • Collective Global aspiration for international aviation	• Critical agreement on: A global framework to promote Sustainable Aviation Fuel (SAF) production in all geographies around the world. • Requires harmonised accounting/accreditation standards – not yet defined • SAF types (SAF, LCAF, etc.) certification pending – not expected for at least 24 months
	UAE SAF Roadmap	Production 700M liters annually	2030	2022	UAE	• 700m litres annually • Estimated 4.8m t/CO_2 cumulatively by 2030 • 3-5 SAF facilities	• The current development of facilities, feedstocks and production: • Short-term: halophytes and MSW • Mid- to long-term: biogenic feedstock constraints to be targeted, while targeting increase in affordable renewable energy generation. • Long-term: Hydrogen production and carbon capture will allow Power to Liquid (PtL) SAF
	EU Parliament	90% decrease via SA (transport emissions) 55% (GHG emissions)	2050 2030	Intervals 2030-2050	Applies to Aviation Fuel Suppliers, Airline Operators	• EU-ETS/RefuelEU/EU 'Fit for 55 in 2030' Mandates - Minimum SAF uplift Fuel suppliers to supply % of overall fuels: • 2% in 2030/32% in 2040/63% in 2050	• All aircraft departing from airports within the EU including non-EU carriers to comply • Civil aviation contributes 13.4% CO_2 from EU transport sector *The European Parliament defined SAF as including synthetic fuels, biofuels, renewable electricity, and hydrogen-based fuels but excluding fuels from crops and feedstock.*
	Individual national policies/mandates	• Singapore (1% SAF 2026, 3-5% SAF, reduce domestic aviation emissions from airport operations by 20% from 2019 levels (404ktCO_2) by 2030) • Norway (0.5% since 2020, considering 30% by 2030) • Canada (Clean Fuel Standard from Dec 2022)			• Denmark ('Fossil-free domestic flights by 2030) • Sweden (Fossil-free domestic flights by 2030, 1% by 2021, 30% by 2030) • Finland (Considering 30% by 2030) • Turkey (proposed 5%) • UK (proposed at least 10% by 2030)		• France (1% - 2022, 2% by 2025, 5% by 2030) • Spain (2% by 2025) • Japan (proposed 10% target) • US (Incentives are part of Inflation Reduction Act, US Renewable Fuel Standard, SAF Incentives programs, increase SAF production to 3bn USG by 2030)
Fuel Reduction (Efficiency)	IATA (66th AGM – 2010)	Average 1.5% YoY	2020	2010	Airlines	Issued with demands that governments and air navigation service providers eliminating inefficiencies in air traffic management and airspace infrastructure	• Airlines have achieved average annual improvement of over 2% • Cumulative improvement of 21.4% from 2009-2019 • Achieved through investment of hundreds of billions in more efficient aircraft/technology • Between $6-11 billion/year on development new aircraft • 1985: 8L fuel/pax/100km / 2005: 5L fuel/pax/100km / B787/A350: <3L fuel/pax/100km / B787/A350: <3L fuel/pax/100km
Carbon Offsets	IATA Abatement Strategy	97% to 8% in nex 27 years	2025	2050	Industry	97% - 2025/93% - 2030/77.5% - 2035/44.5% - 2040/24% - 2045/8% - 2050	• Assessment of guidances (such as LTAG, Net Zero Resolution, ATAG Waypoint, Destination 2050 EU, ICCT Vision 2050, IEA 2050 Roadmap) categorise 'offsets' as 'residual' or 'carbon removals' • Only two programs are accredited by ICAO for the 2024-2026 phase of CORSIA. Not enough projects are registered under these two programs to produce CORSIA-eligible units for offsetting emissions.

All sources available on page 43

Etihad Aviation Stocktake: Key Technical Findings

Taking direction from reports published since the launch of the Paris Agreement, in the lead up to, and following the COP28 Global Stocktake, we have developed a strategy aligned to global pathways and structures.

1. Collaboration and alignment between public (government, state, industry) and private (OEM's, operators, suppliers) is crucial for collective progress.
2. Metrics of success must be realistic and consider capacity and capability for industry (and individual airlines, nations, solutions)
3. Target setting – both long and short term – must be led by practical availability and not theoretical potential
4. Pursuit of solutions within the basket of measures should not dismiss incremental gains available from 'lesser' attractive solutions
5. Assessments of success should not be determined solely by public perception
6. Infrastructure and accounting structures should come from within the industry and at state level

Self Assessment

We have, at all turns, delivered due diligence to justify our position on all manner of topics. A foundational piece of our strategy is to pursue blue-sky initiatives and focus on long term, incremental gains, via solutions which show potential for exponential growth. This requires significant investment, collaboration, research and testing, which may come at the cost of instant short-term impacts.

As such, the strategy Etihad has taken considers short-, medium- and long-term opportunities, and ensures that efforts taken today do not inhibit the acceleration of future-led technologies (such as Sustainable Aviation Fuel offtake and airframe re-design and development), and long-term aspirations do not cause complacency on solutions available today and the benefits which could be missed by waiting for the perfect solution.

Based on the performance data for the business, the comparative analysis for the footprint, our assessment of the parameters for global development, the measures available for aviation, the current state of policy and accounting structures, and the short- and long-term goals set for the industry globally, we are led to the the conclusion that, to the best of our ability and in accordance with the definition of sustainable aviation, our roadmap does encompass all efforts and caveats to achieve the intended goal.

Etihad has endorsed the "basket of measures" and mitigation pathways outlined previously since the beginning of its sustainability journey, however challenging or impractical they may appear at times. In many cases, Etihad has outlined with extreme detail the challenges faced or opportunities lost in various scenarios, accepting that while there are few options available to aviation, there are diligent approaches which can be taken to maximise benefits or minimise disruption.

There are still significant challenges which exist. These are pervasive and unfortunately have no quick fix. In many cases, we must simply accept we will not have a perfect solution and aim only for progress.

Given the tremendous effort required for aviation's transition – in technology development, investment/finance, infrastructure reform, etc. – we can categorise the challenges into implementation under four themes.

Main concerns for all the basket of measures:

- **Availability:** Supply, quantity to meet demand
- **Accessibility:** Market access, restrictions, are quantities earmarked to favor certain areas?, is liability/responsibility going to be passed down supply chain?
- **Accreditation:** Governance for solutions (particularly 'indirect' solutions) independently verified, or verified only to meet certain standards.
- **Acceptability:** Influences to what qualifies as appropriate solutions, such as improvements to intensity/efficiency not measured under absolute emissions terms.

We believe our efforts through the years have allowed us to build the foundation and begin construction for responsible, proportionate and manageable growth which maximises efficiency and proficiency in our operations and obligations as a business.

Monitoring the developments within the industry, it is clear we must embrace nuance and interpretation to produce messaging which is transparent, accepted and easily understood.

As such, Etihad's commitments in this space are to the sustainable development of aviation and our own operations, meaning we aim, as a business, to grow 'sustainably'; whereby every unit of capacity added does so with less CO_2. We are committed to leveraging next-generation aircraft technology to enhance fuel efficiency, reduce emissions per flight, and maintain environmental performance throughout business growth.

Importantly , as a hard to abate sector, the expectation to see linear and immediate reductions to absolute emissions is unrealistic – the capacity for the industry to do so requires a) availability of such solutions, and b) means to implement them. Both which are not universally agreed upon, nor available in cost, supply, access or regulation.

Enviromental Development Principle #1: Accessible and Fair Equity Distribution[26]

Noting the 'existing and emerging opportunities and creative solutions for bridging gaps', development of mitigation pathways and their required systems transformations are likely to be accelerated if solutions generate equity and economic value. Considerations must be made in this regard to ensure fair and proportionate distribution of such value, prevent monopolised profit or growth from the scale up and offtake of mitigation-driven solutions (for a specific individual, organisation, state, sector or industry), and promote the use of capital gained to further accelerate and enable systems transformations.

Enviromental Development Principle #2: Collective Capacity Strategies & Inclusive Policy Making

"Policies and measures that promote climate resilience and low GHG emission development can be made mutually supportive through whole-of-society approaches and integrated, inclusive policy making." "...Integrated assessments of economic, social, and environmental impacts and of the risks associated with new technologies are important for potentially adverse impacts are to be mitigated.

Continuing research is needed not only to refine existing solutions, but also to generate new ones for the more intractable issues, such as harder-to-abate emissions from particular transport modes."[26,27]

Enviromental Development Principle #3: Just transition must consider negative side-effects and embrace cross-industry benefits[26], [27]

Rapid decarbonisation through reduced aviation activity will result in economic distress and challenges for the region. Without the aforementioned 'means of implementation'; reporting, policies, accounting structures and targets, we cannot reliably set the pathway for a transition which resembles the definition of 'sustainable development'.

These issues are directly and persistently inhibiting progress for options outlined in the UNFCCC NDC report. As the above shows, there is misalignment and inconsistency in target setting, methodology and reporting, and of the options available for mitigation, other than fuel efficiency measures (the only means available for direct emissions reduction), SAF and CSR/CCS have no existing, approved, agreed-upon conditions for application.

"Alone We Can Do So Little;

Together We Can Do So Much.."

(Helen Keller)

A legacy;
The Greenliner Programme

Over the past few years, Etihad has undertaken a sustainability strategy, focused on realistic, deliberate and impact-driven action.

Our 2022 Sustainability Report made a point to say 'there is no glory in becoming the world's most sustainable airline... We seek for awards such as Environmental Airline of the Year to acknowledge we're on the right track, and for publishing of our achievements to demonstrate successful proof of concept.'

We're not shy about sharing uncomfortable truths, the challenges which stand in the way – of not just the minimal capability of early-model technology, inadequate infrastructure, lack of harmony, or limited supply alternative fuels. But of the challenges to business and industry growth, revenue or profit risks and reputational damage.

In the face of these challenges, we launched the most comprehensive, cross-organisational aviation sustainability initiative ever undertaken. We won Environmental Airline of the Year award twice. We've taken on the task of building a 2050 forecast which is as optimistic as it is foreboding.

The task at hand is great.

We've raised over $1.2 billion in aviation's first sustainability-linked ESG loan, allowing us to present sustainable fleet credentials that are near-impossible to beat. Our years-long fleet transformation strategy has allowed us to sustain business even when faced with global airframe supply chain issues.

We've produced SAF from Salicornia plants, bought SAF from more than 6 countries, tested it on over as many flights. Flown the highest volume permissible at times, trialed Book & Claim for the world's first Net Zero flight from Washington to Abu Dhabi.

We've operated over 40+ ecoFlights, where every department in Etihad put themselves to the test to operate and validate as many initiatives as possible. We've saved tonnes of CO_2 from operational efficiencies and fuel optimization measures. We've completely re-designed our onboard service in economy to have zero single use plastic on the tray and have a fully reusable offering for guests, and a business class offering which maintains our standards of luxury finely balanced with sustainable materials.

We've introduced high quality carbon offsets to our guests. Then launched Conscious Choices, a 'green' loyalty program within our Etihad Guest platform. We've launched a home-grown forest, called the Etihad Mangroves, allowing us to 'get into the weeds' of carbon offset projects and understand just what it takes to develop them, so that we ourselves can validate, trust, and scrutinise carbon activities.

But... what's missing from the above is the acknowledgement that almost everything we've done, we did not, and could not, do alone.

Where our industry is responsible for just over 2% of global man-made emissions, we're doing our best to take accountability and action.

This report is the testament that we cannot, did not, and should not, attempt to do any of this alone.

Together with **Boeing** and **GE** Aerospace, we painted a plane green and gave it the name 'The Etihad Greenliner'. A bold, loud call to the world – to draw eyes on us in a brave and somewhat provocative way – a call to arms.

And it's because of that courage, of that commitment to collaboration that the call to arms went out – a message which said let's do it 'For the world' and the 'most comprehensive, cross-organisational sustainability initiative ever undertaken' – our **Etihad Greenliner Programme,** has accrued over 50 partners in 4 years.

Boeing and **GE** Aerospace's B787 Dreamliners – or as ours are dubbed, **'Greenliners'** – accompanied by **Airbus** and **Rolls Royce's** A350 show just how powerful fleet credentials are to the industry.

With a fleet of 40 **Boeing 787 Dreamliners**, the flagship of the Etihad **Greenliner** Programme, Etihad is one of the world's largest operators of the technologically **advanced B787-9 and -10** aircraft type. Constructed primarily of lightweight materials, seeing significant reduction in weight, increased flying range and improved aerodynamics for fuel efficiency, the **GE** powered aircraft offers at least 15-25% more fuel efficiency than previously operated aircraft.

As the first airline to receive the **GEnx 360 Engine** Wash technical license, we stood at the front of the pack to demonstrate operational excellence and the impacts yet to be realised from step-change performance enhancements. GE Aerospace insights provide data analytics to identify areas for improvement per tail, per flight path to help us improve what we fly and how we fly it.

Joining our fleet are 5 **Airbus A350s,** one of the most innovative and sustainable aircraft in the world. Powered by **Rolls-Royce Trent XWB** engines are 25% more fuel efficient. Advanced materials make the A350 more than 1kg lighter per seat, and the A350 is 50% quieter than any other **Airbus** aircraft. With smart features – like Bluetooth headset pairing –our A350s help to eliminate the use of single-use plastics.

HSBC UAE and **First Abu Dhabi Bank** (FAB), strategic partners for the $1.2bn loan, act as Joint ESG Structuring Banks, as well as Coordinators, Bookrunners, Mandated Lead Arrangers and Facility Agents. This follows a 2019 partnership FAB and **Abu Dhabi Global Markets** to raise 100 million Euros, and another US$600m facilitated by **HSBC, Standard Chartered, Abu Dhabi Islamic Bank, Dubai Islamic Bank, Emirates NBD Capital, Abu Dhabi Commercial Bank and Mashrek Bank.**

Etihad is one of seven partners which launched the **Sustainable Bioenergy Research Consortium; Khalifa University, Masdar, Boeing, Total, Bauer** and **ADNOC** stood beside us. The flagship project, SEAS (**Seawater Energy and Agriculture System**) produced the first sustainable fuel from plants grown in the desert, irrigated by seawater and which does not compete with arable or food-resourced land.

World Energy, Twelve, EPIC, NESTE, Boeing, VITOL, Itochu, Tadweer, Siemens Energy, Marubeni, ADNOC, CEPSA, and airport after airport facilitated our efforts to develop the Sustainable Aviation Fuel supply chain. In 2022 **Lootah** biofuel with **Porsche** created over 50 tonnes of CO_2 savings from ground transport for our crew.

In the **UAE Year of Sustainability,** and at the 3rd **ICAO Conference on Aviation and Alternative Fuels** (CAAF/3) eight founding entities announced the launch of the "**Air-CRAFT**" initiative - a UAE based research consortium focused on developing, producing, and scaling sustainable aviation fuel (SAF) technologies: Etihad, **ADNOC, Masdar, Boeing, Emirates, ENOC Group, Honeywell, Khalifa University.**

ecoFlights brought nearly countless contributors to our sustainability journey; 'nearly', because Etihad has made a point to recognise and elevate each of them. The outcomes of these extensive trials resulted in the **Economy Evolution,** now seen on board.

Outside the cabin, those **ecoFlights** were activated by **Dublin, Brussels, Rome, London, Brisbane, Narita, Washington** and **Abu Dhabi airports. NATS, EuroControl,** UAE's **General Civil Aviation Authority** (GCAA), **Sheikh Zayed Air Navigation Centre**, and along-route Air Navigation Service Providers and Air Traffic Control supported flight paths, allowing us to find the most efficient routing possible.

Lufthansa Technik has led the way in exploration of digital solutions to use data collection and processing to target fuel efficiency and reduce emissions, Etihad Cargo introduced lightweight Unit Load Devices (ULDs), **eTech** logs were approved by the **GCAA** to reduce paper in the cockpit. **FliteDeck Advisor** produced by **Boeing** and **Jeppesen** is regularly trialed on our flights, and the license for **GE's** Aerospace **360 Engine Wash** has allowed us to save water, improve engine lifespan and maximise fuel efficiency.

Etihad, NASA and **Safran** conducted the world's most comprehensive noise testing during the 2020 **Boeing ecoDemonstrator Programme** on one of our new B787 aircrafts; with **Boeing, WorldEnergy** and EPIC operating all test flights on 30-50% SAF and the highest permissible blend on its delivery flight to Abu Dhabi.

SATAVIA stepped up to the plate with Contrail Avoidance software; working closely with us to continuously test and validate non-CO_2 impacts of aviation while using huge volumes of data to forecast atmospheric conditions and modify flight plans to avoid generation of condensation trails during flight.

Together with **ADQ**, a roadmap now exists to scale up contrail avoidance as a legitimate and verified solution to tackle the primary cause of aviation's non-CO_2 impact; nearly 60% of global aviation's total climate impact, equivalent to 1.8b tonnes CO_2.

Within our ecosystem with **ADQ**, Abu Dhabi based **Capital Catering,** previously Etihad Airways Catering Services, in addition to **Zayed International Airport** and **ADA** have fast-tracked the catering processes to reduce weight and support the implementation of Etihad's new Economy and Business Services, targeting waste and weight reduction.

CarbonClick, starting with Etihad as a pilot project to offset guest flight emissions, has, as of the end of 2022 allowed our guests to fly 4.9million carbon neutral air kilometers. We were able to electively purchase 80,000 tonnes of carbon offsets with Carbon Tanzania – CORSIA eligible, VERRA certified – to offset a years operation of the Greenliner aircraft.

The Storey Group, Eco Matcher, Jubail Island, Environmental Agency – Abu Dhabi and **Emirates Marine Environmental Group** raised their hands to help develop the **Etihad Mangrove Forest; Marriott Hotels** become one of our first commercial partners to begin to plant their own forest with us, joined by **Breitling** and others.

Lumitics and **WasteMaster** by **Green Eco Tech** tackled waste production and processing from our catering facilities. **Al Ain water, Agthia, Bambuu Brush, Sola Cutlery, EcoWare, Butterfly Cup** tested their products on board our flights; and **The Concept: NEOS Fly+** and **Ditto** trialed AI technology to monitor food consumption and waste for passengers. **deSter** and **Tadweer** made it possible for us to trial waste management from those flights once we arrived at our destinations.

WingsCraft and students from **Zayed University** upcycled aircraft parts, carpets, fabric, windows, sidewalls, emergency equipment and seats into art installations. **DGrade, PeaHead ECO** and **Al Ghadeer** transformed material into amenities and personal items. **New York University Abu Dhabi's StartAD NextGen** incubator launched a challenge for students to develop ecofriendly products we were able to trial on board.

For the World
Collective Action

This is a snapshot. And an over-simplification of the tireless work of our partners.

As such, the world has heard directly from Etihad for a few years now. We believe in our integrity, our grit; we hope our reports and recognition impart our trustworthiness to you. We've been humbled by the awards we've received, and the support and collaboration of our partners, both in the public and private sector. To do justice to these privileges, we're sending out the call to arms once again.

For 2023, the world underwent the COP28 'Global Stocktake'; a point in time in which we are all called to answer for our progress, or lack thereof, toward Net Zero goals. How much of an impact we've made in the name of climate action.

We are all united not by sector, industry or even business model. We're united by humanity, altruism, and that our very industry is a symbol of human perseverance, ingenuity, and proven contribution to global development.

As such, we have prepared this next edition of our Annual Sustainability Report, reflecting not on Etihad's own progress, opinion, challenge or adversity.

But all of ours.

Aviation has a very real strength: access to multiple audiences, industries, individuals, operators, suppliers, manufacturers... and so on... and for Etihad, Sustainability is not, and has never been, a competitive space. Commercial competitiveness is not something we permit to impede our progress in this climate action.

As this message opened, our accolades tell us one thing: we're going in the right direction. Which means we must, in the interest of our industry, the interest of our planet, meticulously assess the collective efforts of each member of this ecosystem, in the corners in which we have awareness, experience, expectations and influence.


Etihad Airways
Position
We cannot do this alone

Final Comments

As in most scenarios of innovation and invention, with each potential new measure, we tend to see significant entrepreneurship, capital investment, exciting headlines, a flock of opportunity. But it is never a sure thing, and in the pursuit of impact and folly of enthusiasm, it may well be we end up lost down the wrong road.

We will engage and embrace ideas and opportunities from any sector, big or small, existing or blue sky, and run alongside them, chasing hope. The solutions expected of us must be informed from within the industry but embraced from all corners; Etihad has long held this mentality.

But we have also insisted we do not buy 'products off the shelf' – we must be involved in every step of the projects we endorse; to develop SAF and its supply chain, operational testing of software and systems, real-time feedback for products and services, performing our own flight footprint calculations for thousands of actual flights to test calculators, planting our own forest to understand carbon sequestration and blue carbon/tree planting projects, and making our findings available.

Every step must be made extremely carefully; not just in performing the necessary due diligence, but in the efforts to protect against greenwashing, justifying our intentions and running the risk of going in a direction which may lead to a dead end.

We must hold ourselves accountable progress and performance appear to be left up to the interpretation of the public rather than inf ormed by our peers and those who carry the same intent as ourselves.

The philosophy goes that breakthroughs come from diligent, long-term, consistent work that can often feel futile. Success is about persistence.
Etihad has been though one such period over the last year, the year when all energy should be in this one direction, we found we had explored all avenues, to the best of our abilities, aligned to the principles of sustainable development, worked from the very start to the very end of the value chain.

And yet, felt that progress slowed significantly.

It felt useless for us to simply repeat what we had done in the past, for the sake of a headline. Increased awareness didn't need our voice, against the backdrop of COP28, and the world's leaders at the microphone... So instead, we observed, assessed and reflected inward on our activities while watching what may come across the horizon.

The Power of Words[31]

Based on IATA's most recent 'Finance roadmap' for 2050, estimates of investments required in the 27-year period between 2023-2050 amount up to USD5.3 trillion[28].

For a sector which already experiences resource scarcity[29], significant risk comes when opportunities to raise capital are slashed or generate trepidation based on public opinion (greenwashing risks) or policed by inconsistent and un-harmonised standard While studies show the majority of the public are 'concerned' about the climate crisis , are 'willing' to pay for more sustainable alternatives and 'rethink' their consumer choices regarding their footprint, it remains to be seen that destinations, safety and elapsed journey time are now favored any less than sustainability credentials or varied meal options. Few passengers have the luxury to make such a choice.[32]

These initiatives appear to – if not deliberately then indirectly – diminish diversified strategies which source investment, production, feedstock, supply, etc. from other sources than those approved by certain geographies.

The road ahead[30]

The expectation that the solution to the climate crisis will be perfect is tragically mistaken. Aviation, in its ability to compare and apply lessons or practices to almost any industry, and almost any sector, is once again reflecting back this reality. We need to ensure the message is not spun in such a way to isolate the industry further.

We must hold many concepts simultaneously; transition away from fossil fuels is indeed absolutely necessary, however, inclusivity is a core tenant of sustainable development, and while those nations which have benefited from centuries of technological advancement (and subsequent economical foot holding) may therefore be better equipped to change direction swiftly with minimal disruption and ready access to alternatives, others who have been left on catch-up are not so lucky.

As aviation contributes approx. $87 billion to tourism linked GDP in the region and provides globally 44.8 million jobs for aviation linked tourism, at least in the short term, we fulfil the objective to enable global development through air travel. We can simultaneously acknowledge that 1.2 billion people could be displaced globally by 2050 due to climate change, and the reality of life as a climate refugee is an ever increasing threat[33]

This does not diminish the now 2.5-3% contribution aviation is making to global carbon emissions, we simply hope we have provided context that we are not operating a high-polluting, hard-to-abate business despite the climate crisis, we are trying in all areas to fulfil our obligations in a way which contributes to social global development.

To view the issue pragmatically, we could ultimately reduce 20% of aviations emissions entirely from flights of under 1,500 kms (mostly in North America or Europe), which are not barred or fractured by ocean or any physical border but political. Monopolization in our industry is rarely, if ever, a good thing. However, the excessive amount of ultra-short and short-haul, low cost carriers operating domestically or intra-continental schedules, 10 minutes apart to the same destination for 1-2 hour flights is a flagrant overcorrection.[34]

As the forecasts see CORSIA treating the entire industry as a whole when assessing absolute emissions, reporting any incremental progress becomes impossible, If we must remove both of maritime and aviation, the respite of only approximately 5% of emissions is a small reward for what would ultimately change the course of global sustainable development. Reminiscent, if nothing else, of the trade-off being asked of airlines to purchase SAF with little to no payout.

Developments and discourse across the industry see law- and policy-makers hoping to deliver the SAF transition through mandates and penalties. Of course, we will, where required, comply. When overpoliticised and hyper-scrutinised, will we find any sufficient and acceptable outcomes? As this report clearly states, the intention of a SAF-based rescue differs greatly from any reality.

The argument to stop flying altogether will result in the loss of millions of jobs, the end of meaningful global cooperation, and an expectation for loss of year-round agriculture and reliance on seasonal food production. The possible negative impacts are far reaching.

We must resist the urge to make so much noise about what we're doing wrong, we undermine any investment or consideration into what it takes to do it right, as this report outlines, often all we can do is advocate and lobby, while we wait for the technology advancements from manufacturers required to deliver on our basket of measures.

Sometimes, that is the only power we have. Should we turn inward and focus only on one piece of the puzzle, strategise in silos and speak only to closed rooms.... Hopefully this report demonstrates the very danger of isolation.

Silencing anyone who makes an attempt to put their head above the parapet and offer a guess will polarise the conversation and inevitably in 2030, this report will read the same.

And again, in 2050.

Perhaps this is why the pressure on the neck of aviation won't let up – to prevent complacency and hold the industry to account. With aviation emissions expected to rise as much as 20% by 2030, no single airline will deny the commercial intention of continued growth – nor would any industry – but it can only grow where there is demand.

In the race against climate change, with the global effort required, it's not as simple as elevating change to the responsibility of governments, and 'blue zone' attendees. Like everything social, cultural, and human, progress is often the result of emotional, altruistic, enduring persistence. We must keep this in mind as we continue the journey; it is hard, it has always been hard, and it will always be hard.

To achieve what we do as an industry daily; not simply the miracle of flight but the contribution globally – in metrics of GDP, trade, job creation, or in influence of culture, connectivity, collaboration – must not be understated. Equally, it should not be taken for granted.

Efficiency improvements will come first, data will be available which hasn't previously been considered, alternative fuels will become accessible, initiatives will need to be scaled up, and new technologies and solutions will enter the sphere.

As this report has also likely shown, we are not in any position to overlook any potential benefit, no matter how small. We will continue to search for the million little things. And make extremely loud noise when we think we have found an answer. We hope in performing this stocktake, we can speak loudly enough over the din.

In all the ways that the fight against climate change needs science, infrastructure, economy, policies, and all other big broad concepts for implementation, it needs something that isn't found in a text book, at conference, or in a formula.

It needs perseverance; that is the only way to maintain motivation and determination in a fight as great as this.

So, we will endure, and remain motivated, despite the lack of progress. In the hope, and the absolute necessity, for there to be a breakthrough on the horizon.

In all the ways that the fight against climate change needs brilliance, science, and reform, it needs perseverance.

That is the nature of being an airline, and we accept the challenge.

The statement being made here is that accountability and responsibility do not inherently afford us all the solutions – or the access to them.

Progress for aviation when compared to other industry isn't like for like. Due to the complex and technical nature of aerospace and flight, options available 'on ground' don't translate as easily in the air.

As quoted: *"Aeronautics was neither an industry nor a science. It was a miracle"*; for all that it took to achieve the marvel of flight, pushing the limits of possibility in physics, engineering, and science, connecting the world in a shift to globalization on a scale that had never been seen; it would be misguided to assume the task to reform the industry would be easy.

If the accomplishment of air travel is anything to go by, when presented with a seemingly impossible challenge, this is where we, in our nature as humans, excel the most. For all that aviation has given us, it is our responsibility to ensure that 'simply because it is hard', we do not become complacent. We do not become deterred. We do not become afraid – of failure, or backlash. And we do not become dismissive in seeking actionable solutions for mitigation pathways.

If we do, we become undeserving and lose the privileges that air travel brings.

A fundamental truth of sustainability is that it is inevitably only going to be achieved within the world as it exists today. Therefore, the most effective solutions will require complete transformation, but to expect any industry to sacrifice itself entirely is a sad, though very real, delusion.

We don't have time to lament and woe on the challenges which face us. We must continue to pull in every direction, continue in diligence and perseverance.

The only moment we should panic is when we are out of ideas.

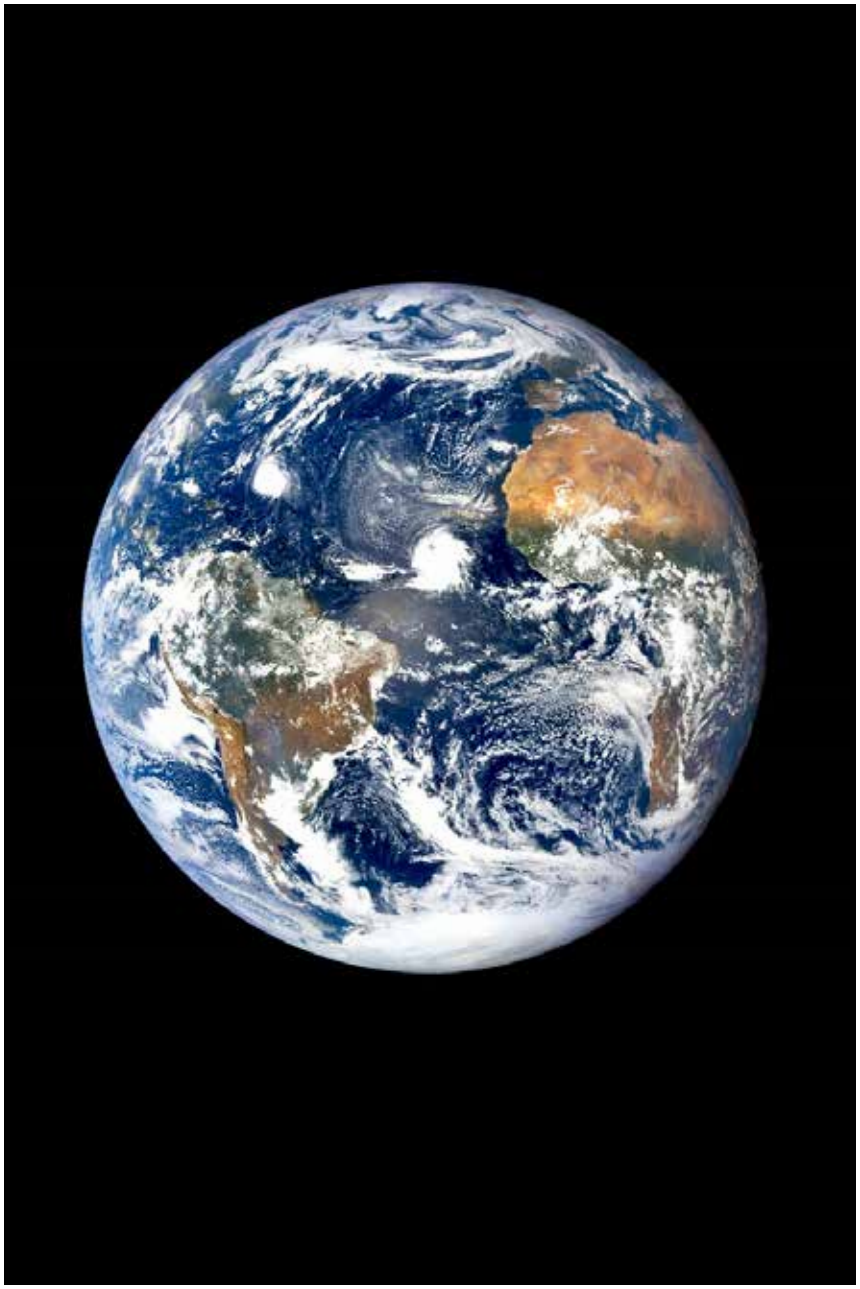
Where do we find hope? In the fact that, if aviation teaches us anything, by putting man in the sky, we are never out of ideas. It just comes down to one thing:

The willingness to try.

We didn't set out to change the world, nor did we think we could even make a dent. But we refuse to be found wanting when called to answer for the role we played in the fight against climate change.

So, any commitment to sustainability is to accept fault and agree:

There is no enough.



FROM ABU DHABI *for* THE WORLD

Annex

Resources

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25	Nature.com	Climate Impacts: Non-CO_2 – Contrails, NO_x, etc. Growth trends, climate-neutral aviation	Link Link	30
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33	World Economic Forum World Bank Group CNN	Climate refugees – the world's forgotten victims Climate Change Could Force 216 Million People to Migrate Within Their Own Countries by 2050 Climate crisis could displace 1.2 billion people by 2050, report warns	Link Link Link	39
34	International Airport Review	The role of ANSPs in European aviation	Link	32, 39
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Supplementary References: Mitigation Pathways & Resource			
	McKinsey	Fuel efficiency: Why airlines need to switch to more ambitious measures Decarbonizing aviation: Executing on net-zero goals	Link Link
	IPCC	IPCC	Link
	International Energy Agency	Innovation needs in the sustainable development scenario Energy technology perspectives – Long Distance transport	Link Link
	Insurance Development Forum	Progress since the Paris Agreement	Link
	BCG	The Sustainability Opportunity for Aerospace	Link
Supplementary References: SAF			
	ICAO	SAF Guidance Potential Policies Meeting notes CAAF/3 Net Zero 2050 air industry commitment	Link Link Link Link
	ICAO	Environmental Protection Submission	Link
Supplementary References: Setting Targets			
	International Energy Agency	Net Zero by 2050 Analysis	Link
	UN	Net Zero Coalition	Link
Supplementary References: Impact Meta Analysis/Available Literature			
	Our World in Data	What share of global CO_2 emissions come from Aviation?	Link
	Commentary	Euronews: COP28 President Statement Euronews: Fossil Fuel Companies BBC: The fastest way aviation could cut its carbon emissions	Link Link Link
	Oliver Wyman	Aviation's Emissions Problem	
Supplementary References: Fuel Efficiency			
	Aviation Outlook	Aircraft Fuel Efficiency	Link
	IEA IATA	IEA: Charts + Supplementary Data for intensity and trends IATA: Supplementary Data for intensity and trends	Link Link

Sources & References: *Additional Source Material*

#	Source	Item	Ref
Supplementary References: Mangroves & Blue Carbon			
	Environmental Agency of Abu Dhabi	*Abu Dhabi Mangrove Initiative, Environment Agency – Abu Dhabi plants one million mangrove seeds by drone*	Link
	AGEDI – Abu Dhabi Global Environmental Data Initiative	*Trial Assessment of UAE Mangroves Soil Carbon Sequestration Final Report*	Link
	Eco Matcher	*How to calculate CO_2 sequestration*	Link
	IUCN – International Union for Conservation of Nature	*My Mangroves, My Livelihood*	Link
	Future Science Group	*Carbon sequestration in mangrove forests*	Link
	NOAA – National Oceanic and Atmospheric Administration	*Coastal Blue Carbon*	Link
	BGCI Conservation Initiative	*Site*	Link

Sources & References: Links

Identifying aviation's Mitigation Pathways

There are fundamental principles and goals of sustainable development, and from the outset, we should understand the role of aviation in reference to Sustainable Development Goals and the industry's 2050 ambitions.

In the findings from the UNFCCC Technical Dialogue of the first global stocktake, a focus on diligence, longevity and transparency is needed for successful systems transformations.

*'To strengthen the global response to the threat of climate change... governments need to support systems transformations that mainstream climate resilience and GHG (Greenhouse Gas) emissions development."**

*"Efforts to continue this progress must be sustained over decades, building on progress made in every cycle of Nationally Determined Contributions and in the Global Stock Take."**

Reviewing the available material on the topic (right), we can state, in summary:

- Sustainable Development requires collective responsibility, shared benefits and fair expectations
- "How" we work toward our goals is equally as important as achieving them
- It is fundamental to reduce inequality and vulnerabilities and ensure a 'just' transition
- For means and mitigation, 'sustainable' also infers accessible benefits and fair equity distribution

Etihad's Assessment

The structure we have developed to support our sustainability efforts depicts our 'translation' of the criteria for sustainable development and how we hope to deliver on those goals.

We must consider the unique condition of the industry when proposing solutions for the environmental impacts:

- Capacity to progress incrementally versus individually
- Sustainable Development priority to prevent negative socio-economic impacts from transition
- Protection for industry and global development from risks associated with rapid disruption

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Enviromental Development in Climate Action Goals			
	Global	*Aviation*	*Etihad*
Core Objective	Global sustainable development goals and nationally determined contributions. Achieving net zero by mid-century or before (in line with national circumstances, capabilities and development priorities), peaking of Greenhouse Gases as soon as possible	Industry Long Term Aspirational Goal to deliver overall objective to continue to develop in a sustainable manner, universal access, enhanced safety, reduced environmental and climate impact, improved resilience, and greater efficiency	Solutions must be commercially viable, industry backed, sustainable in delivery and provide proven data driven impact. Commitment to leveraging next-generation aircraft technology to enhance fuel efficiency, reduce emissions per flight, and maintain environmental performance throughout business growth.
Considerations	There are fundamental principles to achieving 'Sustainable Development' and these apply holistically to the global efforts in climate change and can be translated specifically for the conditions of aviation.	"Any discussion on decarbonisation of the economy or a single sector inevitably raise the question on the associated costs and affordability without risking the growth or survival of the industry." ICAO	Ensure longevity and value of environmental credentials and business capabilities; the definition of Sustainable Aviation is the goal of mitigating environmental impacts of operations without sacrifice to our obligations as a business.
Principles	**Mainstreaming climate resilience** Systems transformations require integrated and inclusive policies • Must be credible, accountable and transparent • Must be collective civil and institutional responsibility • Must resolve existing systemic societal issues • Must improve/maintain positive conditions across sustainable development goals	**Multifaceted transformation approach and priorities** Interlinkages between sustainable transport, SDG's, and targets • Must be well understood • Must not detract from benefits gained from air travel • Must not detract from social, economic and humanitarian objectives • Must be intentionally leveraged to resolve trade offs • Must be designed to benefit from potential synergies	**Managing Sustainability** Deliberate and long term Ensuring initiatives are strategically planned and contribute to long term goals, and consider long-term opportunities/risks. Initiative lifecycle assessments must be done to maximise all environmental benefit possible. **Protecting Sustainability** Transparent and Trustworthy Maintaining the governance required to remain resilient, act with integrity and honesty in all sustainability related efforts. To be held accountable, gain expertise and educate within the ecosystem.
	Measures must take a whole-of-society approach Transition must consider, manage and improve the conditions of the global population and across economic and social dimensions · Should generate equity to promote implementation · Equity should be accessible across whole of society · Promote the use of capital gained to further accelerate and enable systems transformations	**'Leaving no one behind'** Sustainable transport cannot grow by neglecting those which it exists to support · Increased collaboration across diverse actors at all levels · Must deliver options for solutions which benefit the varying capabilities of infrastructure, investment capacity, cross-border connectivity · Progress capacity of certain nations should not exclude access for less privileged populations	**Representation and Collaboration** The airline deploys several public-facing "brands" to combine efforts and identify the million little things that the entire ecosystem can affect for industry wide change. **Corporate Sustainability** Compliant and Aligned Acting in full alignment to core divisional objectives (Safety, Service, Cost). Diversion from core company priorities will inevitably a) deter from genuine sustainability transformation and b) place any long-term strategy at risk.
	Ambitious but strategic action Transformative adaptation must be carefully designed Implementation of solutions should occur concurrently maximise benefits without major disruption • Should not center all targets or resource on singular solutions • Should be a combination of measures • Should include the restructure of existing systems along side integration of new systems	**A diligent and integrated approach** The benefits of transport to overcome vulnerabilities · Must work toward overcoming the historical fragmentation of the sector · Must consider the vulnerabilities/conditions of countries/population groups in ability to withstand large scale changes · Leverage the sectors inevitable growth to ensure efficiency	**Comprehensive and Thorough** Encourage participation from external companies to work alongside Etihad in the exploration of opportunity, focused on the value of knowledge sharing to support the sustainability journey. **Sustaining Sustainability** Responsible and Strategic Supporting Etihad to fulfil other business objectives and develop viable sustainability transformation. This must be done to secure the long-term, meaningful integration of sustainability to reach Net Zero, and beyond.

Additional Source Material

Expectations of mitigation pathways

IATA Abatement Strategy[8]

The relevant expectations for contribution from each of the identified mitigation pathways for aviation, their quantities required and % of value. Positioned against the definitions (page 12) for direct versus indirect efforts, identified opportunities for direct reductions (operational improvements above BAU and advanced technologies) (page 16-22).

This hopes to demonstrate the importance of pursuing all available options, working diligently to deliver the infrastructure needed to secure transparency and accountability, and reasonably set targets where each member of the value chain is required to fulfil their obligations to reach the ultimate, cohesive and harmonised goal.

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	IATA: Net Zero Resolution	2025	2030	2035	2040	2045	2050
	Emissions abatement strategy 2025-2050	CORSIA (2021-2035) Airlines must offset their emissions through use of carbon offsets or sustainable aviation fuels to achieve carbon neutral growth from 2019 levels. CORSIA Mandatory from 2027					
	Contributions/ Pathway	2021-2025 381 Mt CO_2	2026-2030 979 Mt CO_2	2031-2035 1,703 Mt CO_2	2036-2040 3,824 Mt CO_2	2041-2045 6,153 Mt CO_2	2046-2050 8,164 Mt CO_2
Indirect	Carbon Offsets	97% 369,570,000 tCO_2	93% 910,470,000 tCO_2	77.5% 1,319,825,000 tCO_2	44.5% 1,701,680,000 tCO_2	24% 1,476,720,000 tCO_2	8% 653,120,000 tCO_2
Indirect	Alternative Aviation Fuels (SAF & cleaner energies)	2% 7,620,000 tCO_2	5% 48,950,000 tCO_2	17.5% 298,025,000 tCO_2	40% 1,529,600,000 tCO_2	55% 3,384,150,000 tCO_2	65% 5,306,600,000 tCO_2
Direct	Operational Improvements (above BAU)	1% 3,810,000 tCO_2	2% 19,580,000 tCO_2	3% 51,090,000 tCO_2	3% 114,720,000 tCO_2	3% 184,590,000 tCO_2	3% 244,920,000 tCO_2
Indirect	Carbon Capture, Utilization & Storage			2% 34,060,000 tCO_2	5% 191,200,000 tCO_2	8% 492,240,000 tCO_2	11% 898,040,000 tCO_2
Direct	Non-Drop In Fuel (New Propulsion Technologies)				7.5% 286,800,000 tCO_2	10% 615,300,000 tCO_2	13% 1,061,320,000 tCO_2

Figure: IATA: Abatement Strategy expectation for basket of measures

Etihad's 'Net Zero Flight Plan' graphic prepared in 2021-2022 to demonstrate the breadth of topics under Sustainability efforts.

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Figure: 'Net Zero Flight Plan' infographic outlining categories and time frame expectations for mitigation pathways

Additional Reference Material

Seeking a Net Zero Pathway

Etihad's Net Zero Forecast – 2022 Updated

Using Etihad's principles that 80% of decarbonisation activity will come from direct reductions (inclusive of SAF based on the industries definition for accounting), and 20% from indirect (or supplementary) actions, such as offsetting.

This graph aims to visually demonstrate the timeline we are likely to see progress materialise by way of accounting for emissions reductions from each of the pathways (page 12 and 13).

This outlook is not ideal, indicating expectations to reach Net Zero (as opposed to carbon neutral), is unlikely to be realised within the expected timeframes (juxtaposed against the SAF requirements (page 22 and page 32) and capacity.

In response to this, Etihad's focus on fuel efficiency, carbon intensity and reducing emissions per journey aligns more holistically with the literature available (page 13, 43) which allows us to make progress incrementally in areas we can impact, while waiting for SAF, alternative technology and accounting structures to be developed.

This is in line with the narrative Etihad has shared in previous reports, accepting that until such a time as all solutions are made readily available, we will continue to work within the ecosystem to accelerate their relevant roadmaps, however, will continue to focus on the 'million little things' to harness incremental improvements in every corner.

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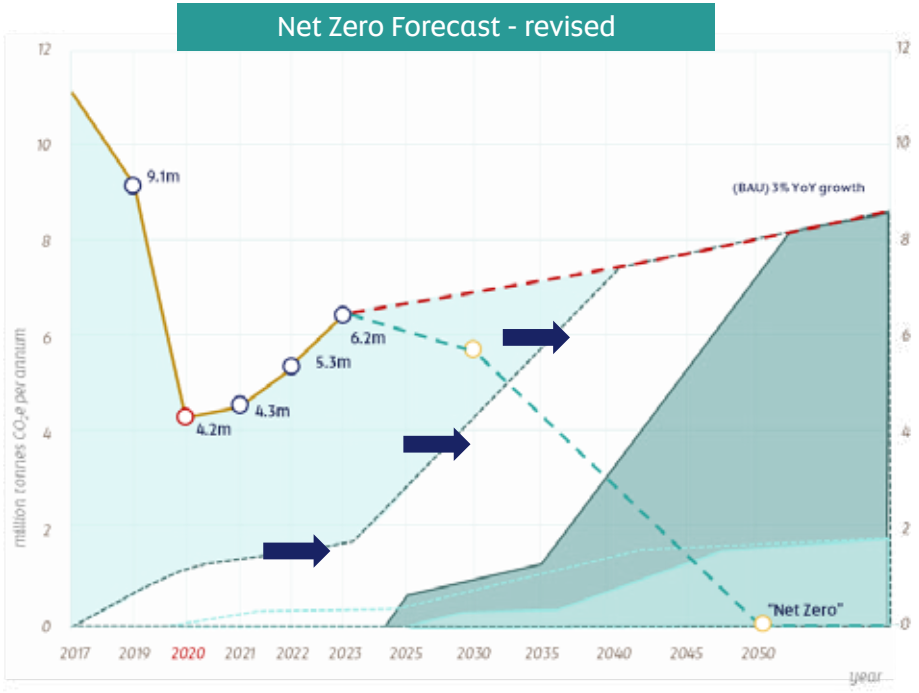
Net Zero vs. Carbon Neutral

Ecologi Definition

Carbon-neutral means purchasing carbon reduction credits equivalent to emissions released, without the need for emissions reductions to have taken place.

Net-zero means reducing emissions in line with latest climate science, and balancing remaining residual emissions through carbon removal credits.

Extract from Ecologi



Etihad Forecast (2020-2021) VS Etihad Actuals (2019-2023)		2017	2019	2021	2022	2023	2024	2025	2026
Intensity (Carbon Intensity g CO_2/RTK)	CO_2/RTK (g) Forecast (5YP)			591	542	462	446	442	436
	CO_2/RTK (g) Actual	869 (pax) 682 (total)	804 (pax) 679 (total)	741 (pax) 585 (total)	482 (pax) 483 (total)	475 (pax) 479 (total)	ESG Loan Year		
CO2/RTK PAX Improvement against 2017 (%)				14%	44.5%	45%			
Emissions (Scope 1 – Aircraft Fuel Burn)	CO_2 (t) Baseline		9.01						
	CO_2 (t) Forecast 5YP			4.22M	5.13M	5.03M	5.21M	5.33M	5.47M
	CO_2 (t) Actual*		9.01	4.21M	5.04M	6.2M			
CO_2 (t) 'Reduction' against 2019*			0%						
Mitigation Requirement (t) IATA Abatement Strategy Scenario***			0 tCO_2	5.2M tCO_2 via Carbon Offsets 106K tCO_2 via SAF 53k tCO_2 via operational efficiencies					

* Reduction in absolute emissions (CO_2 (t)) reflects impact from Covid-19 on all air travel in 2020. Growth is expected as industry recovers, air travel becomes more accessible, and business expands.
** Etihad 2035 target was to deliver 50% net reductions against 2019 emissions (4.5MtCO_2e) by 2035 and maintain this. Due to impact of Covid-19, this target was 'met' and Etihad made an ambitious 5-year plan to attempt to maintain this target. This target has been removed from the airline's Sustainability strategy as unfeasible at this time due to lack of available mitigation pathways and expected growth.
*** Making assumptions for % share of mitigation pathways to EY Operations (Abatement Strategy applies to global international emissions)

Extract from Etihad Airways Environmental Sustainability Report 2022 (page 39)

Figure: Etihad Carbon Intensity and CO_2 emissions forecast based on fleet plan

Uncomfortable Truth

Net Zero will rely on offsets

Until such a time as there are commercially-viable, realistic, reliable, and scaleable technologies to reduce aircraft emissions, we will rely on CEF and offsets to meet targets

We cannot do this alone

Airlines are the last step in a long, complex system and will rely on improvement along the entire supply chain. Achieving Net Zero with a combination of reductions and offsets will rely on a whole industry effort.

We still have a responsibility

Despite the clear and undeniable proof that airlines are left with a burden that is not entirely of our own making, and arguably less commercially fit to shoulder the investments needed alone.

We still cannot wait for someone else to solve the problem, as our consumers are calling for action.

Therefore, we will, as we must

We designed the Etihad Greenliner Programme to allow us to access the entire aviation ecosystem - to enable, consult and collaborate on the necessary advancements to unlock this roadmap...

Join us... *for* THE WORLD

Additional Reference Material

Book & Claim

Book & Claim Infrastructure

There are key parties and processes which are fundamental in Book & Claim. Each element is vital to supporting the development of a successful SAF economy. The system is designed to maintain transparency and involvement from all parties under reliable governance. For an airline to rely on Book & Claim and valuably participate in the SAF pathway, trust and integrity in the exchange of carbon credits must be assured. With the conversion of SAF credentials to carbon credits, retroactively applied to emissions reporting to demonstrate the indirect reductions of SAF, the verification process is perhaps the most important of the entire system.

TO RETURN TO SECTION, CLICK HERE

Throughout the 'Well-to-Tank' (WtT) phase of fuel production, fuel suppliers work with regulators to meet criteria for SAF classification.

This factor includes emissions from extraction, production, and transportation of fuel feedstock, with emissions upstream of the supply chain and feedstock lifecycle. On average this accounts for 18% of all WtW impact.

In Book & Claim, an airline can participate in the purchasing and use of SAF without requirement to physically uplift fuel into its own aircraft. This grants access to airlines to SAF purchased irrespective of geographical or logistical challenges.

Tank-to-Wing: This factor is only emissions from the combustion of fuel and does not include upstream emissions from production. TtW emissions are the same for traditional Jet A1 fuel and SAF. On average, this accounts for 82% of total WtW impact.

Finally, relationships between corporate customers and airlines permit the purchase of emissions reduction units for verified Scope 3 credits.

Airlines are able to receive verified Scope 1 emissions reductions, and documentation verified independently by a third party is recorded in a registry.

Extract from Etihad Airways Environmental Sustainability Report 2022 (page 19)

Additional Source Material
Expectations of mitigation pathways

The Etihad Sustainability Strategy falls under the airlines encompassing ESG Policy & Structure. Within this structure, Environmental matters are managed through the Sustainability Team, which directly reports into the airline's operations division, as part of the Operations Strategy & Business Development department.

This annual sustainability report is dedicated solely to the "E" component of Environmental, Social, and Governance (ESG). The scope of this report is limited to addressing environmental factors related to climate change and the airline industry's efforts to mitigate its impact. Specifically, we will focus on initiatives aimed at building climate resilience through the introduction of new technology, fostering more efficient flying practices, and implementing effective and inclusive environmental policies.

Etihad Airways Sustainability Representation

- Sustainability Team – Operations

The dedicated Sustainability Team falls within the airline's Operations Division. The Sustainability Team is responsible for the execution of, consultancy in and approval of sustainability related business activity and transformation.

- Fuel Efficiency Steering Group & Fuel Efficiency Working Group

The Fuel Efficiency Steering & Working Group exists to continually monitor, report and verify the fuel consumption patterns of our operations. A key output of the group is to set targets and implement valuable initiatives to monitor flight performance and technical behaviors.

- CSR Team – HROD

'Social' matters of ESG fall under the Human Resources & Organisational Development division for the airline.

- Ethics & Compliance, Legal

'Governance' lies with Executive Management and through our Legal, Finance and Ethics & Compliance functions.

Etihad is signatory to multiple internationally recognised compliance schemes and has backed world's first frameworks to promote diligent sustainable development. One such example is the UN Sustainable Development Goals.

These frameworks and targets are outlined in the airlines ESG Policy, which includes material related to:

- Environmental Policy (including Net Zero and Waste related targets)
- Animal Welfare and Anti-Wildlife Trafficking Policies (including cargo and animal product transportation)
- CSR Policy
- Ethics & Compliance Code of Conduct
- Modern Slavery and Anti-Human Trafficking policies.

Policies

#	Policy	Ref
1	ESG Policy	Link
2	Anti-Slavery Policy	Link
3	Modern Slavery Act 2019 Statement	Link
4	Animal Welfare and Conservation Policy	Link
5	Code of Business Conduct	Link

Compliance & Accreditations

#	Accreditation	Ref
	IEnvA – IATA Environmental Assessment	Stage 2

Presence in Industry Working Groups

#	Working Group
	UAE Aviation Environment Working Group
	AACO Environmental Policy Group
	ICAO - CAEP (Committee on Aviation Environmental Protection) Working Groups: • Fuel Task Group (FTG) • CORSIA
	UAE Centre for Renewable and Advanced Fuel Technologies for Aviation (Air-CRAFT)
	Abu Dhabi Sustainability Group (ADSG)
	Etihad Airways & General Electric Fuel Efficiency Working Group
	IATA Environment & Sustainability Policy

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ASSURANCE STATEMENT

Context

NORMEC VERIFAVIA has been engaged by ETIHAD AIRWAYS to perform an independent verification of carbon inventory data with reasonable assurance for Scope 1 and limited assurance for Scope 2 & 3 emissions and emissions intensity (gCO_2e/RTK) for fiscal year 2023 (January 1, 2023 - December 31, 2023) as presented in ETIHAD AIRWAYS's Carbon Footprint report. Scope 2 emissions were calculated using location-based emission factors provided by the Environment Agency – Abu Dhabi. Scope 3 emissions consist of waste to landfill emissions only.

A summary of the emissions data reported by the operator is given in the table below:

Environmental Footprint		
Source	**Unit**	**Emissions**
Scope 1	**tCO_2**	**6,169,252**
Aircraft Fuel Burn	tCO_2	6,169,252
Scope 2	**tCO_2e**	**120,631**
Property electricity	tCO_2e	25,335
Property district cooling water	tCO_2e	90,736
Property potable water*	tCO_2e	4,561
Scope 3	**tCO_2e**	**200,542**
Waste to landfill	tCO_2e	200,542
Carbon Intensity	**(gCO2/RTK)**	**479**

**As per the Environment agency – Abu Dhabi and utility provider guidelines, potable water consumption is classified as Scope 2 emissions.*

All other information in ETIHAD AIRWAYS's Carbon Footprint report is not subject to our assurance engagement and we do not report and do not opine on this information. The Sustainability team of ETIHAD AIRWAYS is responsible for the preparation and presentation of ETIHAD AIRWAYS's Carbon Footprint report, including the reported annual environmental data and information presented therein.

We are responsible for providing an Assurance Statement on the reported annual environmental data presented in the table above. NORMEC VERIFAVIA disclaims any liability or responsibility to a third party for decisions, whether investment or otherwise, based on this Assurance Statement.

Criteria

The criteria used by ETIHAD AIRWAYS to report the carbon inventory data is the carbon account platform issued by Environment Agency – Abu Dhabi and Greenhouse Gas Protocol – "A Corporate Accounting and Reporting Standard" (Revised Edition).

We conducted the independent audit based on the following verification criteria:

- ISO/IEC 17029:2019 - Conformity assessment - General principles and requirements for validation and verification bodies.
- ISO 14064-3:2019 – Greenhouse Gases – Specification with guidance for the validation and verification of greenhouse gas emissions and removals.
- ISO 14065:2020 - General principles and requirements for bodies validating and verifying environmental information.
- The GHG Protocol (Revised Edition) - Corporate Accounting and Reporting Standard.

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Responsibilities

ETIHAD AIRWAYS is solely responsible for the preparation and reporting of its carbon inventory data, for any information and assessments that support the reported data, for determining the group's objectives concerning carbon information and management, and for establishing and maintaining appropriate performance management and internal control systems from which reported information is derived.

In accordance with the verification contract, it is our responsibility to form an independent opinion, based on the examination of information and data presented in the Carbon Footprint report, and to report that opinion to ETIHAD AIRWAYS. We also report if, in our opinion:

- the carbon inventory data is or may be associated with misstatements (omissions, misrepresentations, or errors), non-conformities; or
- the verification team/verifier has not received all the information and explanations that it requires to conduct its examination; or
- improvements can be made to the group's performance in monitoring and reporting carbon inventory data.

We conducted our examination having regard to the verification criteria documents listed above. This involved a virtual site visit on 10.09.2024, to interview the staff responsible to reach to the specified level of assurance that the amounts and disclosures relating to the data have been properly prepared in accordance with the requirements of the Greenhouse Gas Protocol in terms of relevance, completeness, consistency, transparency, and accuracy. This also involved assessing where necessary estimates and judgements made by ETIHAD AIRWAYS in preparing the data and considering the overall adequacy of the presentation of the data in the Carbon Footprint report.

Independence statement

We confirm that NORMEC VERIFAVIA and the verification team are independent of ETIHAD AIRWAYS and have not assisted in any way with the development of the carbon inventory or in the preparation of any text or data provided in the Carbon Footprint report, except for this Assurance Statement.

Opinion

NORMEC VERIFAVIA conducted the verification of the carbon inventory data reported by ETIHAD AIRWAYS in its Carbon Footprint report and presented above. Based on the verification work undertaken and a virtual-site visit (dated 10.09.2024) interviews and walkthrough of the data, and assessment of technical assumptions and judgments to gain reasonable assurance for Scope 1 and limited assurance for Scope 2 & 3 and emissions intensity that the data is fairly stated and contains no material misstatements or material non-conformities above five percent.

Paris, 08.11.2024

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NORMEC VERIFAVIA

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NORMEC VERIFAVIA

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الإتحاد

ETIHAD

AIRWAYS