



TaoClimate

Fly without Limits

GREEN PAPER
2025

Decarbonising Aviation





Abstract

The aviation industry stands at a critical juncture. With global air passenger numbers expected to double by 2040, the sector's environmental impact will escalate significantly unless transformative action is taken. Aviation currently accounts for around 2.5% of global carbon emissions, and without decisive intervention, its share could grow as other sectors decarbonise more rapidly. This green paper explores the challenges and opportunities of decarbonising aviation, setting out pathways for a sustainable future.

Challenges in Decarbonising Aviation

1. Technological Limitations

While advances are being made, current aircraft technology is still heavily reliant on fossil fuels. Fully electric or hydrogen-powered commercial aircraft are not yet available at scale.

2. High Costs of Transition

Developing and deploying new technologies, such as sustainable aviation fuel (SAF) and zero-emissions aircraft, require substantial investment and infrastructure changes. Direct air capture (DAC) carbon removal is currently prohibitively expensive to use at scale, too slow, and delivers no benefits from the removed carbon.





3. Infrastructure and Logistics

The global nature of aviation means that widespread adoption of sustainable practices is complex, with the need for coordinated international regulations and standards.

4. Consumer Expectations

Balancing the growing demand for affordable and frequent air travel with the need for environmentally sustainable practices remains a significant challenge.

Opportunities in Decarbonising Aviation

1. Sustainable Aviation Fuels (SAF)

SAF offers a near-term solution by reducing lifecycle emissions while being compatible with existing aircraft and fueling infrastructure.

2. Operational Efficiencies

Innovations in flight routing, air traffic management, and optimised ground operations can substantially lower emissions in the short term.

3. Carbon Removal Initiatives

Nature-based solutions, such as Hemp Carbon Removal, present opportunities for the aviation industry to offset residual emissions while making a positive impact on the climate.

4. Public and Private Partnerships

Collaboration across the public and private sectors can accelerate the development and adoption of new technologies, fostering a sustainable aviation ecosystem.

This green paper outlines the challenges and opportunities, offering insights into strategic interventions and innovations that can drive the aviation industry's transition to a net-zero future.

Industrial hemp is a versatile and sustainable crop that has been used for centuries in various industries. Recently, hemp has gained attention as a potential source of effective carbon removal credits and sustainable aviation fuel. In this white paper, we will explore how hemp can be used to help aircraft OEMs, airports and operating airlines meet sustainability targets and decarbonisation goals, with its multiple, measurable benefits.



How hemp's versatility can deliver multiple benefits while decarbonising aviation

The Way to Decarbonise Aviation

SAF
Hemp can be used to make high-energy Sustainable Aviation Fuel.

- SAF production infrastructure is located wherever the fuel is needed.
- Hemp is ideal for growing around airports.

Carbon Removal MRV
Delivering decarbonised air operations at scale.

- Fully verified, science-based and data-driven impacts.
- Nextgen MRV platform for airlines and airports to manage carbon footprints at megaton scale.
- Our mission is to help our partners effectively and profitably decarbonise aviation.

Carbon Removal Ancillary Revenues
Tao Climate brings a new category of carbon removal credit to the ancillary revenues market.

- Hemp can remove and permanently sequester CO₂ in 4-5 months.
- We're using hemp carbon in sustainable construction, locking the carbon away for centuries.

Sustainable Airport Infrastructure Construction
*Hemp biomaterial enables sustainable infrastructure
Passenger areas can be made less toxic.*

- Hangars will continue to absorb CO₂ through carbonation.
- Perfect for interiors and exteriors.

Airport Operational Carbon Footprint Removal
Hemp grows on the green spaces around runways

- Removes carbon emissions in real-time.
- Delivers carbon fibre for airport infrastructure construction.
- Provides hemp seed oil for SAF feedstock.

TaoClimate

Tao Climate's Lift Decarbonisation Programme with nextgen MRV tech
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At Tao Climate, we envision a future where airports are not just transportation hubs but also thriving green ecosystems that actively contribute to decarbonisation. In our innovative approach, we see the expansive green spaces surrounding airports being transformed into fields of hemp—a resilient, fast-growing plant with extraordinary carbon removal capabilities. This vision turns airport landscapes into powerful carbon sinks, removing operational carbon emissions in real time and revolutionising the role of aviation infrastructure in climate action.



How it works

1. Hemp Carbon Removal:

Hemp plants absorb carbon dioxide as they grow, providing a continuous, nature-based method of capturing carbon. By planting hemp around airports, we can offset emissions produced by airport operations, creating a real-time, measurable impact on the airport's carbon footprint.

2. Carbon Fibre for Infrastructure:

Once harvested, the hemp crop's sturdy stalks can be processed into carbon fibre, a sustainable and lightweight material. This material can be used to construct and upgrade airport infrastructure, such as terminal buildings, hangars, and walkways, reducing the need for traditional, carbon-intensive construction materials. It gets better: When hempcrete infrastructure is deployed, the buildings continue to absorb CO₂ from the air, through carbonation. Airport infrastructure can become a CO₂ remover.

3. Sustainable Aviation Fuel (SAF) Production

The hemp seeds, which are rich in oil, can be used as a feedstock for the production of sustainable aviation fuel. By processing the seeds onsite, airports can establish a local, circular SAF supply, reducing dependency on fossil fuels and cutting emissions associated with transporting fuel from distant suppliers.



Impact and Benefits

- **Real-Time Carbon Removal:** By using hemp's natural carbon sequestration properties, airports can achieve significant reductions in their operational emissions.
- **Circular Economy:** The integration of hemp-based materials and onsite SAF production creates a circular economy model that maximises resource efficiency and minimises waste.
- **Sustainability Leadership:** Airports embracing this vision will be at the forefront of sustainability innovation, setting a powerful example for the aviation industry and creating new opportunities for green investments and partnerships.

Tao Climate's holistic vision combines nature-based solutions with cutting-edge technology, making decarbonised aviation a reality and transforming airports into beacons of environmental progress.

Industrial hemp has the potential to benefit the global aviation industry in a variety of ways, including effectively offsetting emissions from aircraft manufacturing and flight operations, as well as providing sustainable materials for aircraft production and biofuel for carbon-neutral flights.

One of the most promising applications of industrial hemp in the aviation industry is the production of sustainable aviation fuel (SAF). Hemp-based SAF has a high energy density, making it an effective replacement for fossil

fuels in aircraft engines. SAF made from hemp can significantly reduce greenhouse gas emissions from aircraft, helping the aviation industry to achieve its emissions reduction targets - fast.

The use of industrial hemp in the aviation industry can also help to offset emissions from aircraft production and operations. Hemp can be grown as a carbon sink, absorbing carbon dioxide from the atmosphere and safely sequestering it in the plant biomass and soil. This can help to offset emissions from the production, as well as from the aircraft's operational activities.

High-quality Hemp Carbon Removal Credit sales as part of the flight booking process provide a viable option for airlines to offset the emissions generated by passenger travel. This would enable the generation of substantial ancillary revenues with a truly effective, measurable carbon offset add-on. Hemp can be used as a mechanism for massive-scale carbon removal, with airlines supporting hemp planting and cultivation projects to offset their overall carbon emissions - in real time.

In addition to providing effective carbon removal and a sustainable SAF source, industrial hemp can also be used to manufacture a range of sustainable materials for aircraft construction. Hemp fibres can be used to create lightweight, high-strength biocomposites, which can be used in everything from interior components to structural parts. Hemp bioplastics in particular can also be used to replace traditional petroleum-based plastics in aircraft manufacturing, further reducing the carbon footprint of the industry.



Tao Climate Products



Tao CX

Channel carbon removal sales through airlines for a delightful passenger sustainability experience

- Aviation TAM = €190bn
- SAM: 3% ready to buy = €5.7bn
- SOM: European Flights = €912m

Tao CX (Customer Experience)

- **Purpose:** Engages passengers by offering carbon removal options integrated into the booking process.
- **Key Features:** Seamless integration with ticket sales, loyalty programmes, and personalised sustainability experiences.
- **Impact:** Increases passenger engagement and supports global carbon removal efforts.



Tao Ops

Effective delivery of operational carbon measurement, removal, and compliance

- Air passenger numbers to double by 2040.
- Airlines pledged to be carbon neutral by 2050.
- EU Compliance pressure.

Tao OPS (Operational Optimisation)

- **Purpose:** Enhances operational efficiency to reduce emissions and fuel consumption.
- **Key Features:** Data-driven insights, predictive analytics, and optimisation strategies for flight routes and ground operations.
- **Impact:** Reduces carbon footprint and operational costs for airlines and airports.



Tao SAF

Supplying hemp SAF - sustainable aviation fuel - feedstock where it's needed, at scale

- ReFuel EU: 2% by 2025 to 63% SAF by 2050
- EU standards for compliance.
- Detailed MRV required.

Tao SAF (Sustainable Aviation Fuel)

- **Purpose:** Facilitates access to sustainable aviation fuels and develops supply chain partnerships.
- **Key Features:** Strategic sourcing of carbon-neutral fuels, support for SAF adoption, and integration into decarbonisation strategies.
- **Impact:** Promotes the use of sustainable fuels, helping achieve long-term emissions reduction goals.



Sustainable Aviation Fuel (SAF)

Aviation fuel is a critical component of the aviation industry, which is responsible for a significant amount of global carbon emissions. According to the International Energy Agency, aviation accounted for around 2.5% of global CO2 emissions in 2019. The aviation industry has been exploring alternative fuels to reduce its carbon footprint, and one of the most promising options is sustainable aviation fuel (SAF).

SAF is a renewable fuel that can be made from various feedstocks, including biomass, waste oils, and algae. One of the most exciting potential feedstocks for SAF is industrial hemp:

- Hemp is a fast-growing crop that can be cultivated with minimal environmental impact.
- It requires fewer (or no) pesticides and herbicides than other crops and has a net positive carbon footprint.
- The process of making SAF from hemp involves extracting oil from the plant's seeds, or fermenting stalks, and converting into hydrocarbon fuel.
- The oil is first cleaned and processed to remove impurities and then undergoes a process called hydroprocessing, which involves breaking down the oil molecules and reassembling them into a jet fuel-like hydrocarbon.
- Local production and supply, little to no delivery carbon footprint.

Hemp-derived SAF has several benefits:

1. It is a renewable and sustainable source of fuel that can reduce the aviation industry's dependence on fossil fuels.
2. Hemp cultivation can improve soil health and reduce erosion, making it a more environmentally friendly crop than other conventional crops.
3. SAF made from hemp has a lower carbon footprint than traditional jet fuel, which can help reduce the aviation industry's carbon emissions.
4. Hemp has a proven ability to support pollinators and biodiversity in general.

Hemp has significant potential as a feedstock for sustainable aviation fuel. Hemp-derived SAF can help to reduce the aviation industry's carbon emissions, improve soil health, and support sustainable farming practices. As the aviation industry continues to explore alternative fuels, hemp will emerge as a key player in the transition to a more sustainable future.



SAF Feedstocks Compared:

Feedstock	Feedstock	Speed of Growth	Ability to Grow Anywhere	Processing Required	Energy Density
Industrial Hemp	No	Fast	Yes	Moderate	High
Algae	No	Fast	Yes (coastal areas)	High	High
Jatropha	No	Medium	No	High	Medium
Camelina	No	Fast	Yes	Low	High
Soybeans	Yes	Medium	No	High	Medium
Sugar Cane	Yes	Fast	No	High	High
Corn	Yes	Fast	No	High	Medium
Used Cooking Oil	No	N/A	N/A	Low	High
Waste Wood	No	N/A	N/A	High	High

Note: Energy Density is a measure of the amount of energy per unit of weight that a feedstock can provide when converted into sustainable aviation fuel. Higher energy densities generally mean more efficient fuels.



Hemp can help Aviation Grow, Sustainably

Industrial hemp offers a range of potential benefits to the aviation industry, including sustainable aviation fuel, sustainable materials for aircraft manufacture, carbon offsetting, and carbon sequestration. By embracing the use of hemp-based products and fuels, the aviation industry can effectively decarbonise, helping to address the urgent challenge of climate change.

Tao Climate's technology revolutionises the Passenger Sustainability Experience by seamlessly integrating carbon removal options into every stage of a passenger's journey. Through our Tao CX platform, airlines and airports can engage customers in meaningful climate action by offering personalised and transparent carbon removal choices during ticket booking and loyalty programme interactions. This user-friendly approach empowers travellers to understand and contribute to sustainability efforts, making eco-friendly choices an integral part of their flying experience. By connecting passengers to impactful carbon removal projects, such as our nature-based solutions and housing and infrastructure projects, our technology enhances customer loyalty and positions airlines and airports as leaders in climate-conscious travel.



1. Programme

- **Purpose:** Designed to accelerate the aviation industry's transition to net-zero emissions.
- **Target Audience:** Airports and airlines seeking innovative, measurable, and impactful sustainability solutions.

2. Core Components of the Programme

- **Tao CX (Customer Experience):** Empowering airlines and airports to engage passengers in carbon removal efforts through seamless integration into ticket sales and loyalty programmes.
- **Tao OPS (Operational Optimisation):** Leveraging data-driven insights to improve operational efficiencies, reduce fuel consumption, and lower carbon emissions.
- **Tao SAF (Sustainable Aviation Fuel):** Facilitating access to carbon-neutral fuels and supporting the development of sustainable fuel supply chains.

3. Key Benefits for Aviation Stakeholders

- **Enhanced Brand Image:** Position as a sustainability leader by showcasing a proactive commitment to climate action.
- **Operational Efficiency:** Improve cost efficiency through optimised operations and access to sustainable fuel solutions.
- **Regulatory Compliance:** Stay ahead of evolving environmental regulations and avoid potential penalties by participating in structured decarbonisation initiatives.
- **Passenger Engagement:** Engage environmentally conscious travellers and build loyalty by offering carbon removal options.
- **Credible Carbon Removal:** Benefit from Tao Climate's cutting-edge MRV (Monitoring, Reporting, and Verification) platform, ensuring transparency and trust in carbon reduction efforts.



4. How the Programme Works

- **Custom Assessment:** Each participant receives a tailored assessment to identify the most effective decarbonisation strategies.
- **Action Plan Development:** Collaborate to create a phased plan incorporating Tao CX, Tao OPS, and Tao SAF.
- **Implementation and Support:** Ongoing support from Tao Climate's experts to optimise performance and maximise impact.
- **Monitoring and Reporting:** Real-time tracking and detailed reporting of emissions reductions using Tao Climate's MRV technology.

5. Call to Action: Why Join the Lift Programme?

- **Drive Real Climate Impact:** Take decisive steps to mitigate climate change by lowering emissions and investing in nature-based carbon removal projects.
- **Lead the Way:** Join a community of forward-thinking aviation leaders committed to shaping a sustainable future.
- **Unlock New Opportunities:** Access partnerships, funding, and passenger engagement strategies that align with global sustainability trends.
- **Future-Proof Your Operations:** Prepare for a low-carbon future by integrating advanced, data-backed solutions into your business model.

Compelling Case for Participation

The Lift Decarbonisation Programme is your pathway to a sustainable, profitable, and future-ready aviation operation. With climate change posing an existential threat to the industry, acting now is not only a moral imperative but also a strategic business opportunity. By partnering with Tao Climate, your organisation will pioneer innovative carbon reduction practices, engage stakeholders meaningfully, and position itself as a beacon of environmental leadership in aviation.

Register for Lift now: <https://taoclimate.com/lift-aviation-decarbonisation-programme-for-airports-and-airlines/>



Learn more

- Tao Climate on the Green Age of Aviation
<https://taoclimate.com/green-aviation/>
- Join our Lift Decarbonisation Programme:
<https://taoclimate.com/lift-aviation-decarbonisation-programme-for-airports-and-airlines/>



About Tao Climate

Tao Climate is a FinTech company, building a next generation carbon removal MRV (measurement, reporting and verification) platform, for the creation and sale of carbon removal credits in real time, a real breakthrough. We're working with Google and the European Space Agency (ESA BIC Ireland member) to build our tech, which will use satellite imaging, AI and field data to deliver trust to carbon removal markets. Our main mechanism is industrial hemp, so we measure all aspects of our partners' farming and manufacturing processes, with the hemp carbon fibre used to make sustainable housing and infrastructure from hempcrete. Our pilot project is in Ukraine, and we also have a live project in the EU, with multiple other partners waiting to supply the demand we're creating. Our strategy is to help decarbonise aviation, and we're talking with multiple airlines and airports. We're in Elon Musk's XPRIZE Carbon Removal Top 100 in the world, and our breakthrough technology will also enable the supply of SAF (sustainable aviation fuel) from hemp seed oil feedstock, with full MRV.



Contact Details



Get in touch to learn more about how we can help you decarbonise aviation and achieve your sustainability goals.

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