Australian Government
Department of Infrastructure, Transport,
Regional Development, Communications and the Arts

TRANSPORT GROUP / INTERNATIONAL AVIATION, TECHNOLOGY & SERVICES

Australia's State Action Plan – International Civil Aviation Organization (ICAO) Assembly Resolution A37-19 on Climate Change

October 2022

ISBN: 978-1-922521-75-0
October 2022

Ownership of intellectual property rights in this publication

Disclaimer

Creative Commons licence

Use of the Coat of Arms

Contact us

Director – Creative Services
Communication Branch
Department of Infrastructure, Transport, Regional Development, Communications and the Arts
GPO Box 594
Canberra ACT 2601
Australia

Email: publishing@infrastructure.gov.au

Website: www.infrastructure.gov.au

Table of Contents

List of Figures and Tables

Sustainable International Aviation Development

Australia continues to support the International Civil Aviation Organization's goal of carbon neutral growth in the international aviation sector. Our aviation industry is implementing initiatives to achieve this.

Chapter 1: Executive Summary

Australia published its first State Action Plan in 2012 in response to the 2010 International Civil Aviation Organization (ICAO) Assembly Resolution A37-19 relating to climate change. An updated plan was published in 2017.

The 2022 State Action Plan demonstrates Australia's continued commitment to progress toward reducing carbon dioxide (CO_2) emissions from aviation and highlights achievements to date.

Since 2017, activity in Australia's international aviation sector has decreased significantly due to impacts of COVID-19 on air travel demand. Border restrictions on international passenger movement saw scheduled international passenger numbers decrease from 3.421 million passengers in November 2019 to 155,796 in November 2021.

Over the same period, demand for international scheduled freight fluctuated, with 103,442 tonnes in November 2019, 81,467 tonnes in November 2020 and 89,909 tonnes in November 2021[1][2][3]. The reduction in international air services has had various effects, including reducing fuel efficiency as load factors reduced.

Having a safe, secure and efficient aviation industry enables movement of people, goods and services to drive our economy and support quality of life in our communities.

International aviation services are predicted to return to pre-COVID-19 levels over the next few years. Recovery will see growth in airline traffic that will increase CO_2 emissions despite anticipated improvements in aircraft technology and operations.

The initiatives highlighted in this State Action Plan will contribute to reduction of CO_2 emissions by Australian international aviation operators but still facilitate growth in the aviation industry. These initiatives include encouraging the adoption and integration of new, sustainable technologies[4]. The Australian Government is also developing an updated Aviation White Paper, which will include a focus on sustainability.

This approach recognises that a continued focus on sustainable industry practices will ensure the sector's viability in the longer term. Industry practices will include the introduction of more fuel-efficient aircraft and engines, development and use of sustainable aviation fuels (SAF), creating more efficient systems for on-ground movement of aircraft and support vehicles, and partnership with industry.

Australia has a new ambitious 2030 target to reduce greenhouse gas emissions by 43 per cent below 2005 levels, putting us on track to achieve our net zero emissions by 2050 target. On 16 June 2022, the Australian Government lodged the new 2030 target and reaffirmed the 2050 target as an updated Nationally Determined Contribution under the Paris Agreement.

---

[1] © Commonwealth of Australia (Bureau of Infrastructure and Transport Research Economics) 2020. International Airline Activity – November 2019. See *https://www.bitre.gov.au/sites/default/files/documents/international_airline_activity_1911.pdf*

[2] © Commonwealth of Australia (Bureau of Infrastructure and Transport Research Economics) 2021. International Airline Activity – November 2020. See *https://www.bitre.gov.au/sites/default/files/documents/international_airline_activity_1120.pdf*

[3] © Commonwealth of Australia (Bureau of Infrastructure and Transport Research Economics) 2022. International Airline Activity – November 2021. See *https://www.bitre.gov.au/sites/default/files/documents/international_airline_activity_1121.pdf*

[4] © Commonwealth of Australia (Department of Infrastructure, Transport, Regional Development and Communications) 2021. Aviation Recovery Framework. See *https://www.infrastructure.gov.au/infrastructure-transport-vehicles/aviation/future-australias-aviation-sector*

Chapter 2: Context

Australia strongly supports ICAO's goal of carbon neutral growth for the international aviation industry from the global baseline. It has been involved in the development of the ICAO Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA) since its inception and volunteered in 2016 for participation in the Pilot Phase of the scheme.

Impacts of the COVID-19 pandemic

In 2019, the air and space transport sector in Australia employed approximately 63,000 people and added $10 billion in gross value to Australia's economy. In 2021, due to COVID-19, it employed only 37,200 people and in 2020-21 added only $1.8 billion in gross value to Australia's economy[5]. Globally, passenger traffic decreased by 49% from 2019 to 2021[6].

Border restrictions on international movement saw scheduled international passenger numbers decrease from 3.421 million in November 2019 to 67,211 in November 2020 (a decrease of 98 per cent) before recovering slightly to 155,796 in November 2021. Over the same period, demand for international scheduled freight fluctuated, with 103,442 tonnes in November 2019, 81,467 tonnes in November 2020 and 89,909 tonnes in November 2021[7][8][9].

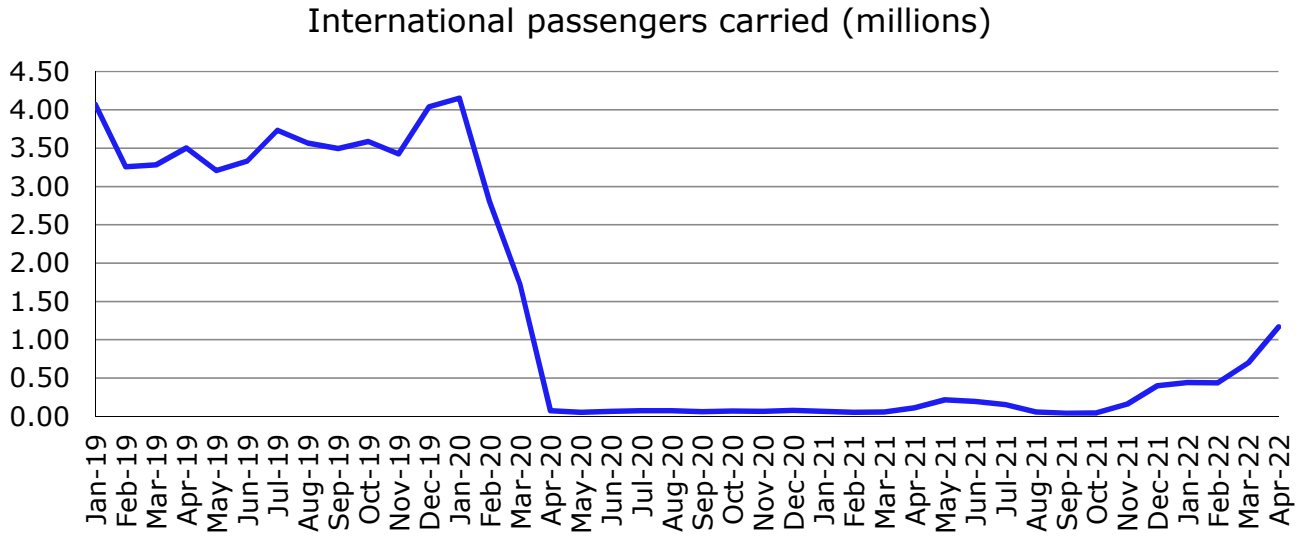

Figure 1 Annual international passengers carried (millions). Source: Bureau of Infrastructure and Transport Research Economics.

The COVID-19 pandemic's impacts continue to be felt in international aviation. In addition to COVID-19 recovery, pre-existing challenges remain for the aviation industry, such as ensuring safety remains a priority while exploring options for reducing emissions through new technologies and operations policies. The need for global harmonisation of safety,

---

[5] © Commonwealth of Australia (Bureau of Infrastructure and Transport Research Economics) 2021. BITRE Yearbook 2021. See *https://www.bitre.gov.au/sites/default/files/documents/Bitre-yearbook-2021.pdf*

[6] International Civil Aviation Organization 2022. Effects of Novel Coronavirus (COVID-19) on Civil Aviation: Economic Impact Analysis. See *https://www.icao.int/sustainability/Documents/COVID-19/ICAO_Coronavirus_Econ_Impact.pdf*

[7] © Commonwealth of Australia (Bureau of Infrastructure and Transport Research Economics) 2020. International Airline Activity – November 2019. See *https://www.bitre.gov.au/sites/default/files/documents/international_airline_activity_1911.pdf*

[8] © Commonwealth of Australia (Bureau of Infrastructure and Transport Research Economics) 2021. International Airline Activity – November 2020. See *https://www.bitre.gov.au/sites/default/files/documents/international_airline_activity_1120.pdf*

[9] © Commonwealth of Australia (Bureau of Infrastructure and Transport Research Economics) 2022. International Airline Activity – November 2021. See *https://www.bitre.gov.au/sites/default/files/documents/international_airline_activity_1121.pdf*

security and health-related Standards and Recommended Practices will remain a high priority, noting that harmonisation must also accommodate emerging aviation markets.

As the COVID-19 pandemic demonstrates, consistency in international standards, such as in vaccination recognition, certification and checks, will not only assist sustained recovery across all countries but provide a solid basis for future growth. In the same way, environmental protection standards and measures such as CORSIA provide opportunity to harmonise global approaches to reducing aviation emissions, potentially contributing to economies of scale in the production of new technologies like SAF.

Technological developments

While the reduction in international aviation activity had negative impacts, it also provided an opportunity to reflect on the importance of environmental protection measures as part of 'business as usual' in the international aviation industry. The aviation industry has committed to emissions reductions goals and is developing greener technologies such as SAF, efficiency improvements for new aircraft, hydrogen and electric power for short-haul flights.

Australia's work to support emissions reductions in aviation is supported by broader government initiatives to encourage businesses to reduce emissions. The 'safeguard mechanism' applies to facilities with certain types of emissions exceeding 100,000 tonnes of CO_2 equivalent per year. It limits the largest emitters in Australia to prevent significant increases above business-as-usual levels, and it applies to the domestic operations of Australia's major airlines[10].

Australia is working with our regional partners to ensure access and adoption of new technologies and help build climate resilience for our most impacted neighbours. By 2030, more than $80 billion of investment in low emissions technology will have been leveraged from government and the private sector[11].

Biofuels and hydrogen provide alternative pathways to electrification for the transport sector. The transport sector contributed around 19 per cent of the nation's emissions in 2020. Within the transport sector, domestic aviation accounted for 7 per cent, compared with cars which accounted for 44 per cent and railways contributing 4 per cent[12].

Recognising the opportunities in the sector, the Australian Government has invested in bioenergy projects through the Australian Renewable Energy Agency and the Clean Energy Finance Corporation. The Backing the Bioenergy Roadmap Package measure provides a further $33.5 million to co-fund additional research, development and deployment on sustainable aviation and marine biofuels. This funding will support the technical or commercial advancement of sustainable aviation and marine biofuels for application in the Australian context.

Additional incentivising schemes include Climate Active, which certifies businesses that have credibly reached a state of carbon neutrality by measuring, reducing and offsetting their carbon emissions, and the Renewable Energy Target scheme, which encourages investment in renewable power for electricity generation.

To further support the research, development and implementation of new technologies that will reduce emissions and ensure sustainability in a broad range of Australian industries, the Government in 2021 released Australia's Bioenergy Roadmap Report[13]. The Roadmap Report identifies aviation as a sector which is hard-to-abate, and identifies actions for industry and government to take including assessing ways to reduce production costs for biojet fuels, to encourage production on a commercial scale. The Australian Government is taking an active role in this space, having convened the Indo-Pacific Clean Energy Supply Chain Forum in July 2022, which led to eight identifiable actions that can be

---

[10] © Commonwealth of Australia (Clean Energy Regulator) 2022. Emissions Reduction Fund. See *http://www.cleanenergyregulator.gov.au/ERF*.

[11] © Commonwealth of Australia (Department of Industry, Science and Resources) 2021. Australia's Long-Term Emissions Reduction Plan. See *https://www.industry.gov.au/data-and-publications/australias-long-term-emissions-reduction-plan*

[12] © Commonwealth of Australia (Department of Climate Change, Energy, the Environment and Water) 2022. National Inventory Report. See *https://www.industry.gov.au/sites/default/files/May%202022/document/national-inventory-report-2020-volume-1.pdf*

[13] © Commonwealth of Australia (Australian Renewable Energy Agency) 2021. Australia's Bioenergy Roadmap Report. See *https://arena.gov.au/knowledge-bank/australias-bioenergy-roadmap-report/*

implemented in our region, among them boosting technical assistance and mobilising finance, and supporting commercialisation of emerging technologies[14].

Australia has also established the Indo-Pacific Carbon Offsets Scheme which will run to 2031 and support partner countries to develop a carbon trade market to enable the emissions offsets. It continues to participate in the United Nations Framework Convention on Climate Change, regularly completing greenhouse gas inventories and reporting them, and is collaborating with the Indonesian, Thai and Chinese governments on emissions monitoring, reporting and verification initiatives. Its work through the Global Forest Observations Initiative, an international partnership to develop monitoring, reporting and verification systems, is supporting country partners to establish systems that calculate changes to forests and the contribution of greenhouse gas emissions from forest destruction and degradation[15].

---

[14] © Commonwealth of Australia (Department of the Prime Minister and Cabinet) 2022. Sydney Energy Forum - Outcomes and Next Steps. See *https://www.sydneyenergyforum.gov.au/outcomes*

[15] © Commonwealth of Australia (Department of Industry, Science and Resources) 2022. Supporting climate action in developing countries. See *https://www.industry.gov.au/policies-and-initiatives/international-climate-change-commitments/supporting-climate-action-in-developing-countries*

Chapter 3: International Engagement on Climate Change

International Civil Aviation Organization (ICAO)

At the 2016 ICAO Assembly, Australia supported a landmark agreement by Member States to adopt a global market-based measure scheme in the form of a carbon offsetting scheme to help reduce CO_2 emissions from international aviation (the CORSIA). The agreement was the culmination of over six years of negotiations and was the first time an industry sector committed to reducing its carbon footprint on a global scale. Australia continues to support CORSIA as the market-based mechanism to reduce emissions along with the support of Australian international airlines.

Australia has committed to join the ICAO's newest scheme to encourage support and collaboration amongst ICAO Member States, the Assistance, Capacity-building and Training for Sustainable Aviation Fuels (ACT-SAF), and continues to participate in ACT-CORSIA.

United Nations Framework Convention on Climate Change (UNFCCC)

Australia has a new ambitious 2030 target to reduce greenhouse gas emissions by 43 per cent below 2005 levels, putting us on track to achieve our net zero emissions by 2050 target. On 16 June 2022, the Australian Government lodged the new 2030 target and reaffirmed the 2050 target as an updated Nationally Determined Contribution under the Paris Agreement.

The Australian Government is implementing a substantial and rigorous suite of new policies across the economy to drive the transition to net zero. These new policies include support for renewables manufacturing and deployment of low emissions technologies as well as making significant investment into zero emissions vehicle charging and refuelling infrastructure. This is in addition to existing and new emissions reduction and low emissions technology accelerator policies and programs, including those delivered through the Australian Renewable Energy Agency, the Clean Energy Finance Corporation and the Clean Energy Regulator.

Emerging Australian clean energy export industries will be important in reducing global emissions and creating economic opportunities particularly for regions with less abundant renewable energy. Supply chains for products like solar cells, electrolysers and batteries will be crucial in powering the clean energy economies of our region.

Chapter 4: Airlines, fuel suppliers and airports

Australia continues to contribute to ICAO's aspirational goal of capping the global net CO_2 emissions from international aviation. Australia's airlines and airports are supporting this goal by considering sustainability and environmental impacts when investing in new technology and infrastructure. Some highlights of their actions are summarised below.

The Qantas Group (Qantas)

Qantas was one of the first airlines in the world to commit to net zero emissions by 2050 and continues its commitment to environmental sustainability, having released its Climate Action Plan in March 2022 setting out interim targets for reducing carbon emissions by 25 per cent by 2030.

Fleet renewal

To support its fuel efficiency ambitions, in May 2022 the Qantas Group announced several major fleet decisions that will reshape its network. The next generation aircraft ordered have lower emissions, longer range and produce less noise. The newer aircraft and engines will reduce emissions by at least 15 per cent if running on fossil fuels, and significantly more when using SAF. During the COVID-19 pandemic Qantas replaced the last of its B747-400 aircraft with the B787-9 Dreamliner, and it continues to 'rightsize' its A380 fleet to ensure high aircraft loads.

Use of lower carbon fuels and push towards establishing a domestic sustainable aviation fuel market

In additional to fuel efficiency through fleet renewal and operational improvements, the airline is reducing its reliance on traditional fuels, integrating SAF to its operations. As of January 2022, blended SAF will represents up to 15 per cent of annual fuel purchased out of London Heathrow Airport and reduce carbon emissions by around 10 per cent on this route. The fuel will be produced from with certified bio feedstocks (from used cooking oil and other waste products). Likewise, flights from Los Angeles and San Francisco will use blended SAF, derived from waste products (including animal tallow and agricultural waste), from 2025. These measures will support Qantas' goal of achieving 10 per cent SAF use overall by 2030.

SAF has been shown to lower lifecycle carbon emissions by up to 80 per cent compared with regular jet fuel; as they are "drop-in" fuels, they can be used in current generations of aircraft without modification.

Qantas has also committed to fostering a domestic SAF industry through securing offtake volumes and supporting a portfolio of projects to increase SAF supply. In June 2022, Qantas and Airbus committed to invest up to US$200 million to accelerate the establishment of a SAF industry in Australia, in a landmark agreement. The Qantas and Airbus partnership will invest in locally developed and produced SAF and feedstock initiatives. Projects will have to be commercially viable and meet a strict set of criteria around environmental sustainability.

Whole-of-operations approach

Qantas has also electrified a number of its ground transport fleet and will continue to do so along with implementing employee and customer-facing programs to encourage sustainable behaviour and offset some carbon emissions. It supports research and development of future technologies through collaborations with industry partners. It is a participant in CORSIA and is certified as carbon neutral for passenger services on an opt-in basis under Climate Active, a partnership between the Australian Government and Australian businesses to drive voluntary climate action. Carbon emissions are calculated using a Life Cycle Assessment of energy usage. This includes aviation fuel use, on ground activities and embodied energy of the aircraft.

Virgin Australia

Fleet renewal

Since emerging from administration in November 2020, Virgin Australia has been consolidating its fleet, reducing the number of operating aircraft types from 6 to 3 and facilitating fuel savings. This process will be further enhanced when

Virgin Australia's 737-8 and 737-10 Max aircraft deliveries commence in 2023. These are highly efficient aircraft with between 14 and 22 per cent greater fuel efficiency depending on the network and flight patterns operated.

The average age of Virgin Australia's aircraft is 10.2 years at December 2021. It continues to work with industry to ensure its fleet renewal program leaders to greater fuel efficiency through technological and operational enhancements.

Use of lower carbon fuels

In October 2017, Virgin Australia entered into a partnership with the State of Queensland, Gevo Inc. and Caltex to test the supply chain readiness for SAF in Queensland.

From June 2018 to May 2019, Virgin Australia received four deliveries of SAF into the Port of Brisbane. This was the first time that any airport in Australia had SAF incorporated into the regular airport fuelling infrastructure. The blended Jet A-1 was introduced into the tanks at Brisbane Airport on the 10th June 2019 and consumed within that day. Virgin Australia continues to investigate the ways to integrate SAF into its operations.

Virgin Australia is a member of Bioenergy Australia, and a member of the International Air Transport Association's Sustainable Aviation Fuel User Group.

Whole-of-operations approach

Virgin Australia committed in November 2021 to net zero emissions by 2050. It is also certified as carbon neutral for passenger services on an opt-in basis under Climate Active. Innovation will support the move to net zero emissions, with SAF playing a large role. The airline will also be looking into other ways to reduce emissions, including the reduction of single use plastics in operations, improving the sustainability of ground practices, and looking into supply chain opportunities.

Fuel suppliers

Fuel manufacturers and suppliers globally are investing in research and development into SAF and forms of alternative energy, such as hydrogen and electrics. One example is Oceania Biofuels' announcement of a new plant in Gladstone, Queensland to produce lower carbon fuel, with electricity to be supplied by renewable sources.

Viva Energy Australia

Viva Energy Australia has committed to net zero Scope 1 and 2 emissions across its retail, non-refining fuels and marketing sectors of the business by 2030, and a 10% reduction in emissions intensity at its Geelong Refinery by 2030. By 2050, it aims to achieve net zero emissions across all operations alongside the potential to repurpose the Geelong Refinery's advanced manufacturing capabilities.

Viva Energy Australia's Carbon Neutral Jet A-1 fuel is certified as carbon-neutral by Climate Active, a partnership between the Australian Government and Australian businesses to encourage voluntary climate actions. The CO_2 impacts of the production through to the combustion of the fuel are offset by Viva Energy Australia's purchase of carbon credits, a mechanism which provides a carbon neutral option to aviation customers[16].

The company is also exploring options for SAF supply and handling, product stewardship and potential manufacture in Australia.

---

[16] Climate Active 2021. Public Disclosure Statement. See *https://www.climateactive.org.au/buy-climate-active/certified-members/viva-energy-aviation*

Airports Council International (ACI) Airport Carbon Accreditation (ACA) Scheme

Over the past three years, Adelaide, Brisbane, Gold Coast, Hobart, Melbourne, Parafield, Perth, Sydney and Sunshine Coast airports have all either achieved or renewed their accreditation with the Airports Council International (ACI) Airport Carbon Accreditation (ACA) Scheme (see Table 1). The ACI ACA Scheme is an international, voluntary and industry-recognised certification scheme, designed to assess and recognise the efforts of participating airports to map, manage and reduce their greenhouse gas emissions.

Under the ACI's voluntary scheme, airports move through a process of continual improvement from mapping their emissions footprints, to reducing them including those of third parties (optimisation), to achieving carbon neutrality for direct emissions by offsetting (neutrality) and beyond. Australia's largest international airports are listed below.

Airport	ACA Scheme Level	Current Status
Melbourne Airport	2	Reduction
Perth Airport	2	Reduction
Adelaide Airport	3	Optimisation
Brisbane Airport	3	Optimisation
Sydney Airport	3	Optimisation

Table 1: Australian Airports participating in the ACI ACA Scheme. Source: Airports Council International Airport Carbon Accreditation Programme.

Chapter 5: Airservices Australia Initiatives

Airservices Australia (Airservices), an Australian Government-owned organisation, is Australia's Air Navigation Services Provider. It manages airspace covering 11 per cent of the earth's surface and provides air traffic operations for over 90 million passengers on more than four million domestic and international flights each year. Airservices has been working in collaboration with national and regional regulatory authorities, airports and airlines to reduce aviation emissions through the following key initiatives and activities.

Airservices aims to support and assist the growth of the aviation industry, while minimising impact on the environment. The Aircraft Emissions Strategy Pillar of its Environmental and Sustainability Strategy includes a target of reducing CO_2 emissions per flight by an average of 10% by 2030[17].

Civil Military Air Traffic System (CMATS)

Emission reductions in the commercial aviation sector will be primarily driven through aircraft technology advances including the deployment of SAF and market measures. However, Air Traffic Management must play a role in improving flight efficiency. Airservices will deliver the world-leading integrated civil military air traffic management system for Australia that will yield $1.2 billion in economic benefits and deliver reductions in aviation noise and emissions through the new integrated system.

CMATS will harmonise Australia's civil and military air traffic management systems to deliver safety and efficiency improvements. Once fully operational in 2026, CMATS is anticipated to reduce CO_2 emissions by 145,000 tonnes per year within the Australian Flight Information Regions. These benefits will be delivered through:

- Shared use airspace – providing greater access for all users to available airspace, better fuel planning and optimal airspace design to deliver preferred routes and flight levels
- Trajectory based operations – airspace users will be able to plan their arrival using a continuous descent from cruise to landing enabling opportunities to not only save fuel but also decrease noise.
- Route optimisation – enabling airspace users to operate on User Preferred Routes (UPR) and access Dynamic Airborne Reroute Procedures. Both initiatives will allow aircraft to operate in a manner that aims to reduce fuel burn through using prevailing weather patterns.

Australia's Flight Information Region Enhancements

Long Range Air Traffic Flow Management (LR-ATFM) is a new initiative aiming to enhance demand and capacity management. It will shift airborne delays for international flights from the arrival to the enroute phase resulting in reduced fuel burn and is estimated to deliver a reduction of 48,535 tonnes of CO_2 emissions over seven years from 2023.

Likewise, Airport Collaborative Decision Making (A-CDM) is being implemented at Sydney, Melbourne, Brisbane and Perth airports to improve harmonisation between airports, aircraft operators, ground handlers and Air Traffic Control. This will mean better utilisation of runway and gate capacity, minimising taxiing and gate holding times for aircraft operators. An estimated 183,000 tonnes of CO_2 emissions are anticipated to be reduced over seven years from 2023.

By 2030 CMATS, LR-ATFM and A-CDM will enable a reduction in aviation's CO_2 emissions within the Australian Flight Information Regions by an average of 10 per cent per flight.

Airservices' measures to reduce emissions are outlined below.

---

[17] © Commonwealth of Australia (Airservices Australia) 2021.Environmental Sustainability Strategy 2021-2026 Strategy. See *https://www.airservicesaustralia.com/wp-content/uploads/PPJ017097-Environmental-Sustainability-Strategy-2021-2026.pdf*

Measure	Results
Optimal Descent Procedures	Departure procedures that eliminate the need for aircraft to deviate from their ideal descent trajectories. The aim is to reduce fuel consumption, greenhouse gas emissions and aircraft noise by limiting fuel burn associated with aircraft levelling off or increasing descent rate unnecessarily. This approach can save up to 400 kilograms of fuel per arrival.
Airport Capacity Enhancement (ACE)	ACE improves air traffic flow management program at Australia's major airports by identifying enhancements using existing infrastructure and technologies to increase runway capacity and subsequently generate fuel efficiency improvements.
Advanced Surface Movement Guidance and Control System (A-SMGCS)	A-SMGCS is an air traffic surveillance system that allows Airservices to better manage aircraft on the ground. The system identifies and tracks aircraft, in turn avoiding incursions and collisions and improving airport operations, particularly in low visibility operations. This reduces ground delays in low visibility conditions and will reduce taxi times.
Performance Based Navigation (PBN)	Performance Based Navigation utilises satellite-based technology (GPS) to enable aircraft to fly with a higher degree of accuracy. Re-design of air routes and terminal procedures to take advantage of PBN capabilities are expected to generate fuel savings by reducing track miles flown and increased surety of arrival in marginal conditions.
Off Air Route Planning Options	Off air route operations allow aircraft to fly more efficient routes, rather than along fixed lines. Airservices continues to implement these as either FlexTracks or User-Preferred Routes (UPRs). FlexTracks are routes between specific city pairs, published daily by Airservices. They are designed with regard for forecast wind conditions and to maximise aircraft fuel efficiency and are typically not applied over Australia (except Brisbane to Perth) but provide significant benefit to long range flights in Oceanic airspace. A UPR is a track generated by an Aircraft Operator for a specific flight to take advantage of meteorological conditions to reduce the cost of the flight.
Digital Twin	Digital Twin creates a digital replica of Australian airspace, including aircraft and weather. This cutting-edge technology can be used to more accurately predict, collaborate and respond to changing requirements which maximises efficient routes.
Airport Collaborative Decision Making (A-CDM)	A-CDM enhances the accuracy and predictability of arrival and departure information. Flight punctuality and network efficiency are improved to optimise aircraft turnaround, reduce runway taxi times and optimise airport capacity. This contributes to reduced fuel burn, track miles and aviation emissions.
Long Range Air Traffic Flow Management (LR-ATFM)	LR-ATFM works by shifting some or all airborne delay for international flights from the arrival to the enroute phase resulting in reduced fuel burn and emissions, improved predictability into Australia's major airports and more equitable distribution of delay across the network.
Model Air Transport Efficiency (MATE)	MATE enables Airservices to periodically review, assess and select flight efficiency metrics for the airspace that Australia manages. Improvements in air traffic management, such as better scheduling, flight efficiency and higher aircraft utilisation rates, contribute to an overall reduction in fuel consumption and operational costs.
Metron Harmony	The Ground Delay Program, applied domestically, is run through the software-based tool Harmony which monitors demand and capacity across the network and then is used to implement ATFM Measures when demand exceeds capacity. Each year, this difference adds up to approximately 40,000 tonnes of CO_2, which is the equivalent of taking 10,000 cars off the road.

Chapter 6: Aviation Emissions Trends in Numbers

Since the previous State Action Plan in 2017, activity in Australia's international aviation sector has decreased significantly due to impacts of COVID-19 on the demand for air travel.

Australia's total energy consumption fell by 2.9 per cent in 2019-20, compared with average growth of 0.7 per cent per year over the previous ten years to 2018-19, with the largest reduction in energy use being in the transport sector, which fell 9 per cent. This was the first time in nearly 20 years that overall transport energy use fell. Use of jet fuel, in particular, fell by 22 per cent in 2019-20, as international aviation decreased in response to restrictions on passenger travel[18].

Fuel use

Use of jet fuel, or Aviation Turbine Fuel (Avtur), reflects the decline in international aviation during the COVID-19 pandemic, with fuel use having previously steadily increased from 2002-03 to 2017-18. Figures 2 and 3 show civil aviation use only; military use of jet fuel has been excluded. Annual fuel use and CO_2 emissions from international aviation shown in these figures can also be seen to have a relationship with annual international passenger movements (Figure 4).

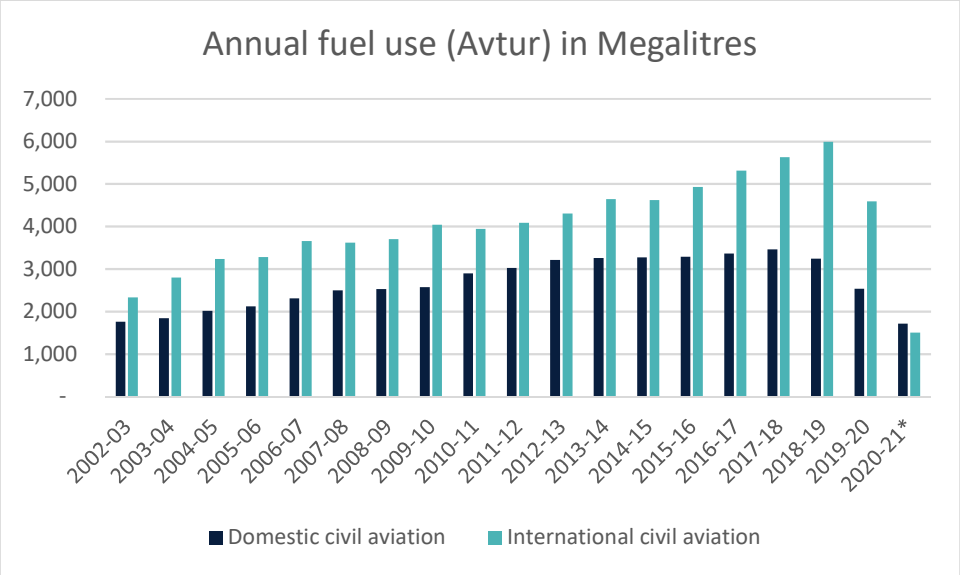

Figure 2 Annual fuel use. Source: Commonwealth Department of Industry, Science and Resources.

*Notes preliminary data.

[18] © Commonwealth of Australia (Department of Industry, Science and Resources) 2021. Australian Energy Update 2021. See *https://www.energy.gov.au/publications/australian-energy-update-2021*

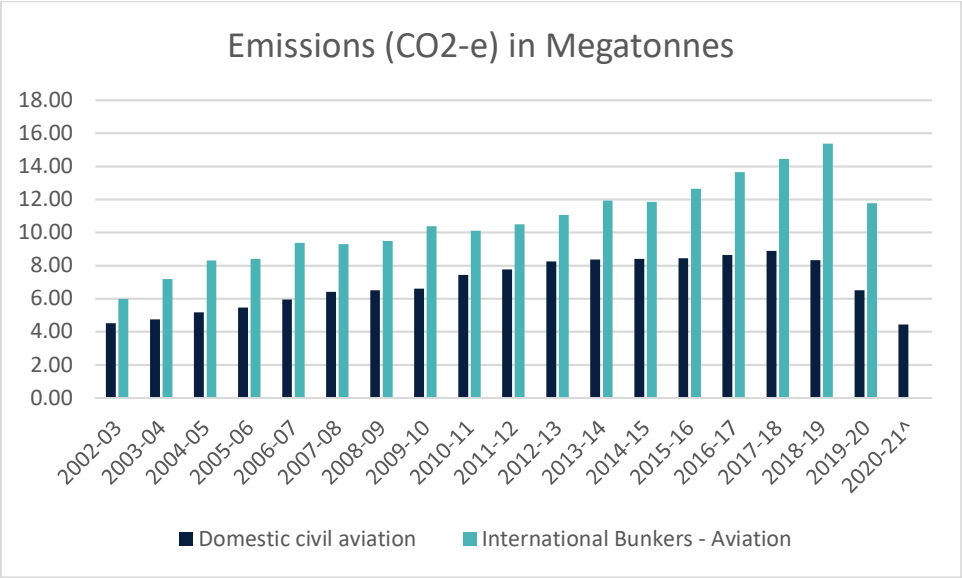

Figure 3 Annual CO_2-equivalent emissions. Source: Commonwealth Department of Industry, Science and Resources.

^2020-21 emissions estimates not available at time of publication.

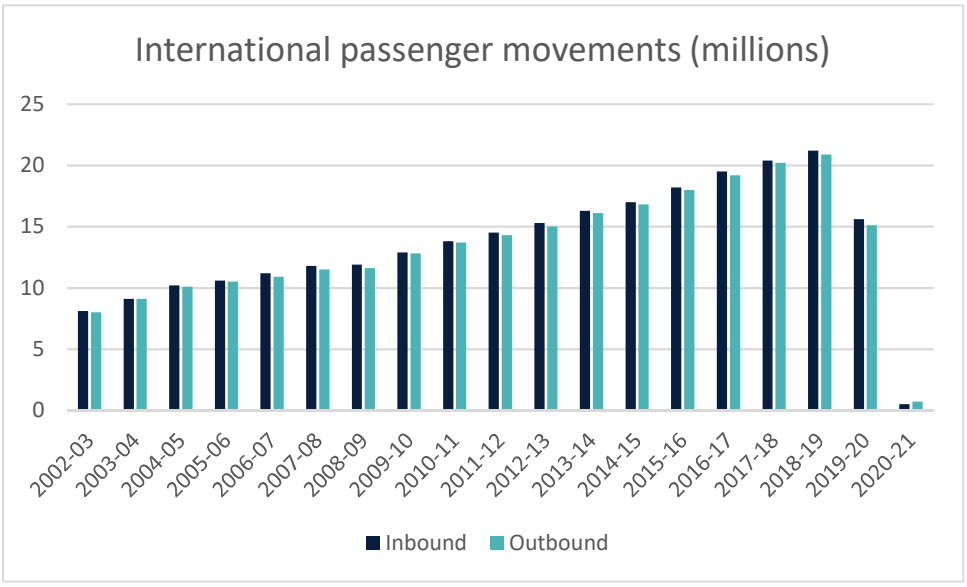

Figure 4 International passenger movements (millions). Source: Bureau of Infrastructure and Transport Research Economics.

Revenue Tonne Kilometres

Beyond total fuel use, another measure of aviation activity is litres of fuel (L) per Revenue-Tonne-Kilometre (RTK), where RTK represents the total tonnes of passengers, freight and mail carried – making up the revenue-generating load – multiplied by the distance flown. It can be broken up into:

- Passenger RTK: the total tonnes of revenue-paying passengers, produced by multiplying an average passenger weight including baggage estimated at 100 kilograms per passenger by the distance flown; and
- Cargo RTK: the total tonnes of revenue-generating cargo multiplied by the distance flown.

In 2020 and 2021, L/RTK increased significantly due to COVID-19 impacts, such as load factors being lower. This impact was seen in both domestic and international operations, and is expected to reduce in the domestic space as load factors increase in 2022.

Transport CO_2 emissions are measured as grams of Carbon Dioxide Equivalent (g CO_2-e) and are closely correlated to fuel use, as shown in Figure 5 and 6 below. Changes in the rate of g CO_2-e /RTK to L/RTK can demonstrate technology improvements.

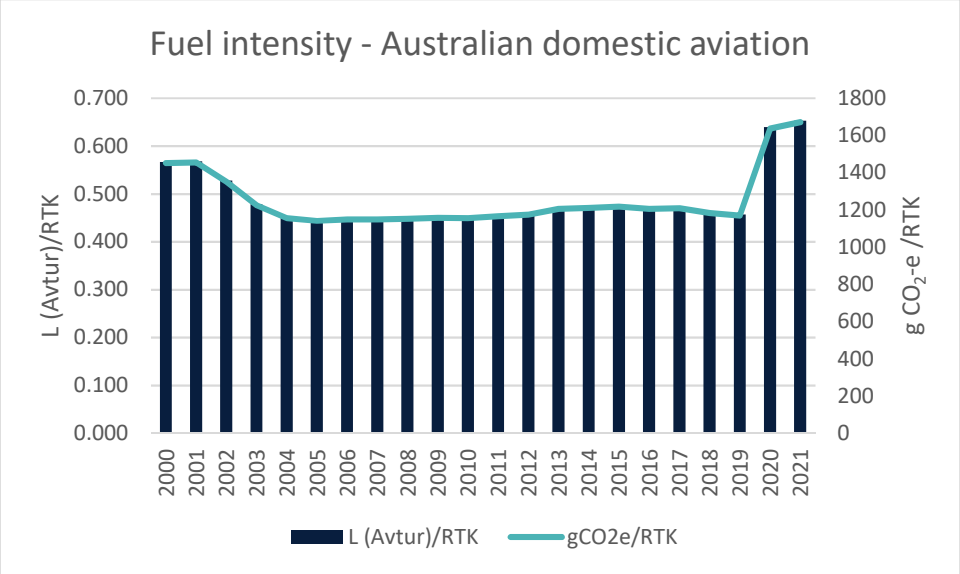

Figure 5 Fuel use – Australian domestic aviation from 2000 to 2021. Source: Bureau of Infrastructure and Transport Research Economics.

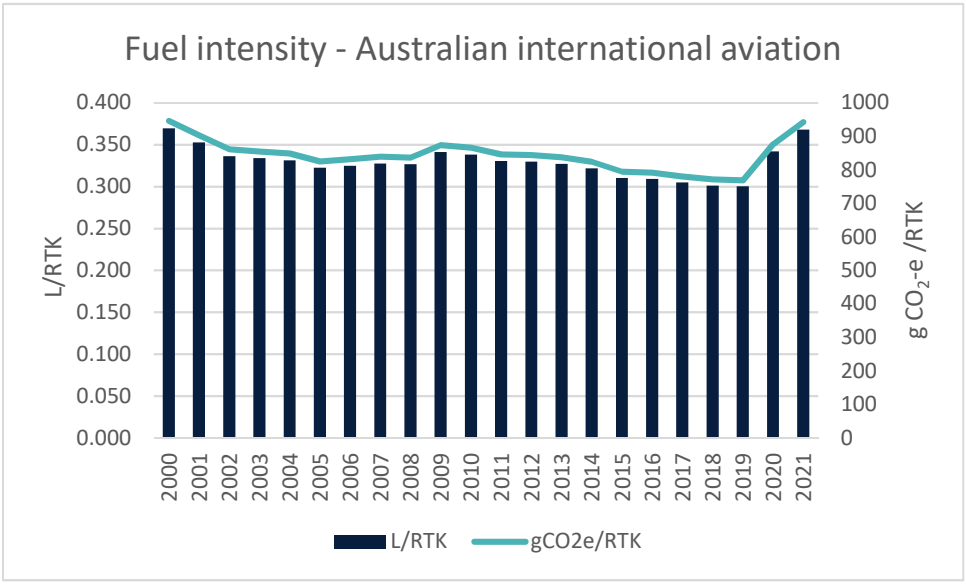

Figure 6 Fuel use – Australian international aviation from 2000 to 2021. Source: Bureau of Infrastructure and Transport Research Economics.

Chapter 7: Outlook

Recovery from the impacts of the COVID-19 pandemic will take time, however passenger and freight statistics show it has begun. In April 2022, international scheduled passenger traffic in Australia was 1.168 million compared with 155,796 in November 2021[19].

In time, it is expected passenger numbers will grow beyond 2019 levels. CO_2 emissions will increase accordingly, so the focus on environmentally sustainable actions in the aviation industry must increase if carbon neutrality is to be achieved in line with ICAO's commitment to carbon neutral growth. The Australian aviation industry is actively seeking ways to reduce emissions by pursuing green aviation projects and engaging across industry to research and develop sustainable fuels. The Australian Government is working with industry to support these endeavours and is developing a new Aviation White Paper with a focus on sustainability.

The Australian Government has also committed to establishing a Jet Zero style council to facilitate the Government and industry's shared goal of accelerating the Australian aviation sector towards net zero emissions by 2050. The council will have a large focus on developing a domestic SAF market by assessing and implementing policies to accelerate the uptake of SAF in the short term. The council will also seek to harness opportunities and overcome barriers to emerging technologies and alternative fuels/feedstocks.

The Australian Government will continue to engage internationally and locally to support businesses and our regional neighbours to ensure that we play our part in reducing global impacts from aviation activity. It looks forward to working with ICAO and its Member States to implement a long-term aspirational goal for international aviation, the establishment of which is expected to support better access to finance for innovative technologies and encourage emissions reductions.

---

[19] © Commonwealth of Australia (Bureau of Infrastructure and Transport Research Economics) 2022. International Airline Activity – April 2022. See *https://www.bitre.gov.au/sites/default/files/documents/international_airline_activity_0422.pdf*