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Aviation

Australian aviation forecasts – 2024 to 2050

May 2024

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Research Report 157

Department of Infrastructure, Transport, Cities, Regional Development, Communications and the Arts

Canberra, Australia

Acknowledgement of Country
The Department of Infrastructure, Transport, Regional Development, Communications and the Arts acknowledges the Traditional Custodians of Country of the land on which we work and live. We recognise and respect the continuing connections to land, waters and communities. We pay our respects to them and their cultures and to their Elders both past and present and to all Aboriginal and Torres Strait Islander people.

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Foreword

This report presents long-term forecasts of total domestic and international air passenger and freight movements in Australia, and forecasts of passenger and freight movements through Australia's 14 busiest airports / air catchments. The forecasts are based on econometric models of air passenger and air freight demand and the most recent long-term economic outlooks for Australia and developed and major developing countries.

The report updates BITRE's previous long-term forecasts of air passenger movements through capital city and other major airports.

The forecasts are intended to help inform long-term Australian aviation policy development and planning. For example, all leased federal airports in Australia are required to produce updated Master Plans every five years that provide a 20-year strategic vision for the airport, including the long-term air traffic outlook. The long-term air catchment forecasts presented in this report provide an independent source of information that can be used to inform development or compare with Master Plan traffic forecasts.

This report was prepared by David Mitchell with input from Joe O'Sullivan and Marcus To, and early development work by Joseph Mosaad. BITRE's aviation statistics unit staff, in particular Andrew Platt, Neb Pavlovic and Mano Manorajan, assisted in the provision of BITRE's aviation data.

Georgia O'Cianain

A/g Head of Bureau
Bureau of Infrastructure and Transport Research Economics
May 2024

At a glance

This report presents long-term forecasts, to 2050, of total Australian air passenger and freight movements, and total passenger numbers and freight volumes through Australia's 14 busiest airports / air catchments.

- Australian commercial aviation activity grew significantly in the 30 years following domestic deregulation, introduced on 30 October 1990, and the onset of the COVID-19 pandemic in 2019. In particular:
    - Total domestic regular scheduled air passenger movements grew approximately five-fold between 1988–89 and 2018–19, to around 71.1 billion revenue passenger kilometres and 61 million revenue passenger movements through Australian airports, in 2018–19.
    - Over the same period, total international air passenger movements through Australian airports also increased five-fold, to approximately 347.4 billion revenue passenger kilometres and 47 million revenue passengers moving through Australian airports, in 2018–19.
    - Domestic air freight, which accounts for only a small fraction of total domestic freight, increased from around 90 million tonne kilometres in 1988–89 to around 295 million tonne kilometres in 2018–19.
    - International air freight grew from around 416 thousand tonnes (3.5 billion tonne kilometres) in 1998–99 (data not available prior to 1995) to around 1,279 thousand tonnes (10.2 billion tonne kilometres) in 2018–19.
- The COVID-19 pandemic represented the largest exogenous shock to domestic and international commercial aviation in the past 50 years. At the height of the pandemic, domestic air passengers fell to less than 5 per cent and international air passengers fell to around 3 per cent of levels in 2018–19, the last full financial year prior to the onset of the pandemic. Previous domestic and international aviation shocks – such as the domestic pilot's dispute (October 1989), 9/11, Ansett financial collapse, SARS and the GFC – were far less significant.
    - As of June 2023, both domestic and international air passenger numbers, though recovering, were still below pre-pandemic levels – domestic aviation around 95 per cent and international aviation around 80 per cent of June quarter 2019 levels.
- Climate change represents a significant risk to future aviation sector growth. The forecasts take into account the impact of announced emissions reduction measures and prospective future technological developments, through their impact on aviation costs. The forecasts do not explicitly model the potential direct effect of future global and regional temperature increases on future air travel patterns.
- BITRE forecasts that domestic and international air passengers will continue to grow relatively strongly over the medium-to-longer term, albeit at slower rates than exhibited over the previous three decades.
    - All forecasts presented in this report implicitly presume *full recovery* of both the domestic and international aviation sectors to pre-COVID-19 trend levels. While it is not yet clear whether the aviation sector will return to pre-pandemic trend levels, or whether the pandemic will have lasting effects on aggregate air travel, BITRE notes aviation activity has generally recovered from all previous shocks.
- Total domestic air passenger travel is projected to grow by 2.6 per cent per annum between 2018–19 and 2049–50, to around 157.1 billion revenue passenger kilometres in 2049–50 and total passengers through Australian airports are projected to grow by around 2.2 per cent per annum between 2018–19 and 2049–50, to around 237.5 million passengers by 2049–50. (All long-term forecast growth rates are presented relative to pre-pandemic (2018–19) levels, to remove the impact of the COVID.)
- Total international air passenger movements are projected to grow by around 2.7 per cent per annum between 2018–19 and 2049–50, to around 689.6 billion revenue passenger kilometres by 2049–50.
    - International visitor numbers are projected to increase by around 2.2 per cent per annum between 2018–19 and 2049–50, to around 19.7 million passengers by 2049–50.
    - International travel by domestic residents is projected to increase 3.1 per cent per annum) between 2018–19 and 2049–50, to around 29.9 million passengers by 2049–50.
- Total passengers through Australian airports are projected to increase by around 2.3 per cent per annum between 2018–19 and 2049–50, to around 332.2 million passengers in 2049–50.

    - Passengers through capital city airports / air catchments are projected to increase by around 2.5 per cent per annum between 2018–19 and 2049–50, to around 288 million passengers by 2049–50.
    - Passengers through the next six busiest airports – Gold Coast, Cairns, Townsville, Launceston, Newcastle, Sunshine Coast – are projected to increase by 1.9 per cent per annum between 2018–19 and 2049–50, to around 29.2 million passengers by 2049–50.
- Total domestic air freight volumes are projected to decline by around 0.9 per cent per annum between 2018–19 and 2049–50, from around 330 million tonne kilometres in 2018–19 to around 250 million tonne kilometres in 2049–50.
- Total international air freight volumes through all Australian airports are projected to grow by around 0.52 per cent per annum between 2018–19 and 2049–50, from 966 thousand tonnes in 2018–19 to around 1,136 thousand tonnes in 2049–50.
- The report also includes estimates of the range of uncertainty in the forecasts and the impact of alternative assumptions about future growth in key activity drivers, i.e. productivity growth, population growth, airfares/oil prices and exchange rates.

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Executive Summary

Introduction

This report presents long-term forecasts, to 2050, of future total Australian air passenger and freight movements, and forecasts of air passenger numbers and freight volumes through Australia's 14 busiest airports / air catchments.

The forecasts are based on econometric models of historical domestic and international air passenger and freight movements, and the latest economic outlooks for Australia, other OECD countries and large non-OECD countries.

BITRE has previously produced long-term forecasts of Australian aviation activity – the most recent published forecasts were BITRE (2012). BITRE's aviation forecasting models have been re-developed for this report, to now incorporate both short- and long-term impacts of domestic and international air passenger travel to changes in aviation and general economic conditions, and to include forecasting models for domestic and international air freight movements. The forecasts presented in this report update and supersede previous BITRE aviation forecasts: BITRE (2012), BITRE (2010) and BITRE (2008).

The forecasts are intended to help inform long-term aviation policy development and planning, including, for example, providing an independent source of long-term forecasts that may help inform development of future airport Master Plans, required to be regularly prepared for federally-leased airports in Australia.

Historical trends in Australian aviation

Aviation plays a key role in Australia's transport system, providing regular scheduled services between Australia's highly dispersed major population centres and vital connectivity for rural and remote communities. As a large island nation, located significant distances from neighbouring countries, aviation is also the primary means of transport for international visitors and for domestic residents travelling overseas.

Domestic and international scheduled air passenger trends

In the 30 years following domestic aviation deregulation (introduced on 30 October 1989), total Australian domestic air passenger activity (revenue passenger kilometres) grew around five-fold, from 14.2 billion revenue passenger kilometres in 1988–89 to around 71.1 billion revenue passenger kilometres in 2018–19. The total number of revenue passengers more than tripled, from 16.8 million passengers (measured on a traffic-on-board (TOB) basis) in 1988–89 to around 61 million passengers in 2018–19.[1]

Over the same period, total international air passenger arrivals and departures also grew approximately five-fold, from around 9.5 million passengers in 1988–89 to around 47 million passengers in 2018–19.

Airport passenger trends

The number of passengers through Australia's major commercial airports increased four-fold between 1988–89 and 2018–19, from around 40.9 million passengers in 1988–89 to around 163.5 million passengers in 2018–19 (an average rate of growth of 4.7 per cent per annum.)

Total passengers through all other airports increased by around 4.3 per cent per annum between 1988–89 and 2018–19, from around 5.7 million passengers in 1988–89 to around 20 million passengers in 2018–19.

External shocks and impact of the COVID-19 pandemic

Over the thirty years to 2018–19, growth in both domestic and international commercial aviation activity has been punctuated by several aviation-specific or external shocks. Notable shocks have included the domestic pilot's dispute in September–December 1989, the September 11 (2001) terrorist event in the United States, Ansett Australia's financial collapse (September 2001 – 4 March 2002), the Severe Acute Respiratory Syndrome

1 Revenue passengers measure all fare-paying air passengers travelling on a regular scheduled or chartered air service. For simplicity, all references to 'revenue passengers' or 'revenue passenger kilometres' are hereafter shortened to 'passengers' or 'passenger kilometres'.

(SARS) outbreak in Asia between November 2002 and May 2004, and the Global Financial Crisis in 2007–08. Most of these events had a temporary impact on commercial air passenger and freight activity, but little discernible impact on long-term trend growth.

By contrast, the COVID-19 pandemic had a very significant impact on domestic and international commercial aviation activity – at the height of the pandemic, in the June quarter of 2020, domestic air passenger numbers in Australia were less than 5 per cent of total passenger numbers in June quarter of 2019, and remain below pre-pandemic levels. As of the June quarter 2023, domestic passenger numbers were approximately 90 per cent of June quarter 2019 levels.

International aviation was even more significantly affected by the pandemic – total air passenger numbers in the June quarter of 2020 were less than 3 per cent of total passengers in the previous June quarter, and numbers have been slower to recover – as of June 2023, total international air passenger numbers were still around 80 per cent of June quarter 2019 levels.

Domestic and international air freight trends

Domestic air freight is predominantly carried in the cargo holds of scheduled passenger services and by a small fleet of dedicated freight aircraft. Air freight is predominated by high-value, low-density freight, such as mail, small parcels and high-value perishables, and accounts for less than 0.1 per cent of total domestic freight (by weight).

Over the thirty years to 2018–19, domestic air freight increased from around 172 thousand tonnes (uplift-discharge basis) in 1988–89 to around 213 thousand tonnes, an average annual growth rate of 0.7 per cent per annum on a tonnage uplift basis. (Total air freight activity, on a mass-distance basis, increased from around 161.7 million tonne kilometres in 1988–89 to around 330.1 million tonne kilometres in 2018–19.)

Over the same period, international air freight to and from Australia, which accounts for less than 1 per cent of total Australian merchandise trade by weight, but around 21 per cent of total trade by value, increased from approximately 416 thousand tonnes in 1988–89 to around 1,279 thousand tonnes in 2018–19, an average annual rate of growth of 3.8 per cent per annum over that period.

COVID-19 also impacted domestic and international air freight volumes, due to the reduction in air cargo space resulting from fewer passengers flights. At the start of the pandemic, in the June quarter of 2020, domestic air freight volumes fell to around 61 per cent of total domestic air freight volumes in June quarter 2019. Since then, domestic air freight volumes have remained below 2015–2019 levels. And total international air freight volumes fell in the June quarter 2020 to 69 per cent of previous year levels. By June 2023, international air freight had recovered to around 81 per cent of pre-pandemic levels.[2]

Forecast approach

BITRE's long-term aviation forecasts are derived using a suite of empirical forecasting models that relate historical trends in air passenger and air freight activity to relevant socio-economic factors. Significant explanatory factors include domestic and overseas population growth, real incomes, airfares, aviation fuel prices, and effective (real) exchanges rates. All models also include terms to capture the impact of significant sectoral and external shocks, including COVID-19.

Separate forecasting models cover:

- domestic regular scheduled air passenger movements
- domestic air freight
- international air passenger movements
  - domestic resident departures and arrivals
  - international visitor arrivals and departures
- international air freight
  - exports
  - imports.[3]

Domestic air passenger and freight movements are modelled at national and airport / air catchment level, with separate models for each major air catchment. Domestic resident international departures are also modelled at

2 The Australian Government provided temporary targeted support to Australian commodity exporters whose products could not be sent by alternative means through the International Freight Assistance Mechanism (IFAM). IFAM operated between April 2020 and June 2022 (DITRDCA (2023), p. 25).

3 BITRE also modelled and forecast domestic general aviation activity, the results of which are not included in the main body, but provided in a separate appendix.

national and airport level, with separate models for each major international airport. Foreign visitor arrivals are modelled separately for each of nine separate major world regions:

- Americas
- North Africa and Middle East
- North-East Asia
- North-West Europe
- Oceania and Antarctica
- South-East Asia
- Southern and Central Asia
- Southern and Eastern Europe, and
- Sub-Saharan Africa.

All passenger forecasting models are estimated using dynamic (unrestricted error correction) model specifications – which allow for differing short- and long-run responses of air passenger travel to changes in economic conditions. All freight models are estimated using static model specifications. All model specifications are outlined in Appendix A and all empirical model results are listed in Appendix B.

All domestic air passenger forecast models were estimated using quarterly data from 1985 to 2023. Domestic resident overseas departures were also estimated using quarterly data from 1984–85, where available. International visitor arrivals were estimated using quarterly data from 1994–95 onwards. Domestic air freight movement models were estimated using quarterly data from 2010–11 onwards – pre-2011 BITRE's domestic air freight data did not include freight carried in dedicated freight aircraft. All international air freight models were estimated using quarterly data from 1989–90 onwards.[4]

Forecasting model results

Domestic passenger model results

BITRE's domestic air passenger models are all statistically significant – long-run air passenger demand is relatively responsive (*elastic*) to changes in income, but relatively inelastic with respect to airfares. However, demand is relatively unresponsive to both income and airfares in the short run. Domestic passenger demand is also relatively responsive to changes in income across most major airports / air catchments, with the notable exceptions of Canberra and Newcastle, where recent demand appears to be less responsive to changes in income. Airport / air catchment-level passenger demand is also inelastic with respect to airfares, across all major airports. The Perth and Canberra airport / air-catchment models also include terms that attempt to capture the impact of mining construction boom (approximately 2005–2012) and associated surge in fly-in/fly-out passenger movements at the former, and changes in public-sector employment and impact on aviation activity at the latter.

Domestic air freight model results

The national domestic air freight models are also statistically significant, with domestic air freight demand statistically significantly related to domestic economic activity – but negatively so over the period 2010–11 to 2022–23 – and uncorrelated with air transport costs (proxied by with aviation fuel costs). Domestic air freight demand is also statistically significantly correlated with income across all major airport / air catchments, but again negatively so across most air catchments, and uncorrelated with air transport costs.

International passenger model results

All domestic resident international departure forecasting models are statistically significant – resident departures are relatively income elastic in the long run and relatively inelastic with respect to international air transport costs, but relatively unresponsive to changes in effective (real) exchange rates. In the short run, demand is relatively insensitive to income, transport costs and (real) exchange rates.

The international visitor arrival forecasting models are also all statistically significant. Arrivals are relatively elastic with respect to overseas visitor income levels across most major world regions, less responsive to changes in air transport costs and relatively responsive to changes in effective exchange rates. In the short run, visitor arrivals are relatively insensitive to income, transport costs and (real) exchange rates.

4 In estimating the forecasting models, BITRE did not test for structural change across the estimation period.

International air freight model results

The international air freight import models are all statistically significant, with total international air freight imports positively correlated with real domestic incomes, and also positively correlated with income across most airports / air catchments. The empirical results also imply that total air freight imports are positively correlated with real air transport costs, and also positively correlated with air transport costs at airport / air catchment level.

Total and airport / air catchment-level international air freight export models are also statistically significant. Total international air freight exports are positively correlated with real domestic income, and also positively correlated with income across most airport / air catchments. The model results imply that total and air catchment-level air freight exports are statistically significant and negatively correlated with real air transport costs.

The empirical model results are summarised in Chapter 5 and detailed estimation results are listed in Appendix B.

Forecast assumptions

The main forecast assumptions include domestic and foreign population growth, projected future domestic and overseas economic growth, world aviation fuel prices, and exchanges rates. (All major forecast assumptions are outlined in Appendix C.)

Australian population growth

Australian population projections used in this reported are based on the population projections input to the latest (2023) Intergenerational Report (IGR) (Treasury 2023, Centre for Population 2023). The IGR projects the total population will grow from around 26.6 million persons in June 2023 to around 36.4 million persons by June 2050, an average annual growth rate of 1.17 per cent per annum (Treasury 2023, p. 252).

Two domestic population growth sensitivity analysis scenarios are considered:

- the *high* population growth scenario assumes a higher fertility rate and higher net overseas migration rate, resulting in a projected population of around 38.2 million persons by 2050
- the *low* population growth scenario assumes a lower fertility rate and lower net overseas migration rate, resulting in a projected population of around 34.7 million persons by 2050 (Treasury 2023).

Domestic productivity growth

Australian economic growth projections are based on the 2023 IGR (Treasury 2023) productivity, participation and population growth assumptions. The base case IGR population projections assume a long-run labour force participation rate (15 years and older) of 63.8 per cent and long-run labour productivity growth of around 1.2 per cent per annum between 2022–23 and 2062–63.

Under these assumptions, real GDP per capita is projected to increase from around $83,900 per person in 2022–23 to around $114,600 per person by 2049–50, an average annual growth rate of 1.16 per cent per annum (Treasury 2023, p. 252).

Treasury (2023) also includes two GDP per capita growth sensitivity analysis scenarios:

- The *higher* productivity scenario assumes long-run labour productivity growth of around 1.5 per cent per annum between 2022–23 and 2049–50, resulting in GDP per capita increasing to around $120,700 per person by 2050.
- The *lower* productivity scenario assumes long-run labour productivity growth of around 0.9 per cent per annum between 2022–23 and 2049–50, resulting in GDP per capita increasing to around $108,200 per person by 2050 (Treasury 2023, p. 252).

World population projections

International country population projections are based on the United Nations' 2022 World Population Prospects (WPP) (UN 2022). The WPP provides historical annual population estimates and projections out to 2100 for 237 separate countries and world regions, based on analyses of historical country- and region-specific demographic trends.

The 2022 WPP includes ten different projection scenarios, based on varying fertility, mortality and migration assumptions. The WPP *medium* (baseline) scenario projection is used as the *baseline* population projection for these forecasts. Under the 2022 WPP medium scenario, the total world population is projected to increase from

around 7.96 billion persons in 2022 to around 9.7 billion persons by 2050, an average growth rate of 0.71 per cent per annum (UN 2022).

Two world population sensitivity analysis scenarios are included:

- The *high* population growth scenario projects the total world population will increase to around 10.49 billion persons by 2050.
- The *low* population growth scenario projects the total world population will increase to around 8.93 billion persons by 2050 (UN 2022).

Country economic growth projections

International country economic growth projections are based on the latest OECD Economic Outlook Long-term Baseline (LTB) projections (OECD 2021b, OECD 2021a). The OECD LTB projections provide long-term outlooks of GDP (nominal and real), consumer prices, exchange rates and population for all OECD members and a limited number of non-member countries (including China, Brazil, India, Indonesia, Russia and South Africa), and also the total global growth outlook.

The OECD projections imply world economic activity will increase from an average of $US22,600 per person in 2022 to around $US38,500 per person by 2050, an average growth rate of 1.93 per cent per annum (OECD (2021a) and BITRE estimates).

No sensitivity analysis was conducted on overseas economic growth rates.

Aviation fuel costs

Oil price scenarios used in developing these aviation forecasts are based on the United States' Energy Information Administration (EIA) latest world oil price outlook scenarios (EIA 2021a). There is a close correlation between aviation fuel costs and world crude oil prices – see Appendix C. The EIA reference case, projects that world oil prices – as measured by West Texas Intermediate (WTI) crude oil price – will increase from around $US71.4 per barrel in 2021 to around $US per barrel by 2050 (EIA 2021a).

EIA (2021a) also includes two alternative – high and low – oil price scenarios. Under the low price case, world oil prices are projected to decline in the near term, but increase thereafter, to be around $US88.5 per barrel by 2050. Under the high price case, world oil prices are projected to increase to over $US406 per barrel by 2050.

Climate change and aviation

Climate change represents a significant risk to future aviation sector growth. Increases in future global temperatures could have significant effects on global economic growth, population growth and consumption preferences, and affect future aviation sector demand. Treasury has noted analysis that estimates the impact of increased global temperatures on total international tourist arrivals and departures – that analysis estimated that arrivals could be reduced by around 5 per cent by 2050 if warming is limited to below 2°C, but by over 15 per cent if warming exceeded 4°C (Treasury 2023).

The Australian Government has committed to reduce emissions by 43 per cent below 2005 levels by 2030, and to net zero by 2050. Reaching the target will require reductions in emissions across all sectors of the economy, including transport. Opportunities to reduce emissions in aviation broadly fall into the following categories: more energy efficient aircraft, lower carbon fuels, modal substitution and/or reduced aviation activity.

Near-to-medium term opportunities for significant reductions in commercial aviation emissions will include substitution of fossil-based aviation fuels – principally aviation turbine fuel (ATF) – with sustainable aviation fuels (SAF). For example, Qantas has outlined intentions to increase the share of SAF used in their operations from 2025 onwards and reach net zero by 2050 (Qantas 2023). SAFs are likely to be more expensive than ATF in the short-to-medium term. Australia will need access to sufficient SAF supply, either domestically produced or imported to help meet climate commitments in the medium- to long-term.

For the baseline scenario, SAF costs are based on CSIRO (2023) estimates of the cost of production of SAF from Australian agricultural and other by-products. CSIRO (2023) estimate the cost premium of SAF could be between 50 and 150 per cent of the cost of ATF in the near-to-medium term, but decline over next 20 to 30 years.

The Australian Government's Safeguard Mechanism (SGM) applies to facilities that emit more than 100,000 tonnes of carbon dioxide equivalent (CO_2-e) emissions per year. DCCEEW reports there were 215 Safeguard facilities across Australia in 2023, responsible for around 28 per cent of Australia's total greenhouse emissions

(DCCEEW 2023c). Aviation sector facilities required to report under the SGM include the two major domestic commercial airlines: Qantas and Virgin Australia,

In order to incorporate the potential future impact of the SGM and SAF uptake on future aviation fuel costs, BITRE considered several SAF uptake scenarios and also the impact of domestic aviation emissions offsets required to meet the SGM targets. These assumptions are outlined in Appendix C.

Forecasts of future Australian aviation activity

The domestic and international forecasting models are combined with the long-term Australian and overseas population and economic outlooks, to derive long-term national and airport / air catchment-level passenger and freight forecasts.

Forecasting future commercial aviation activity levels is particularly challenging at the present time as it not that long ago that the COVID-19 pandemic restricted personal mobility. Air passenger numbers and freight volumes are still below pre-pandemic levels and the long-term impact of the pandemic on commercial aviation is not yet clear. In the absence of clarity, BITRE's baseline scenario assumes aviation activity will return to pre-pandemic trend levels over the next several years. (This assumption is discussed further below.)

All long-term forecast growth rates referenced in this report are relative to pre-pandemic levels (i.e. financial year 2018–19), which ensures that the impact of the COVID-19 pandemic and assumed post-pandemic recovery does not artificially distort projected long-term growth rates – see further discussion of this assumption below.

Domestic and international passenger forecasts

Under the baseline scenario, total domestic air passenger travel is projected to increase by around 2.6 per cent per annum between 2019 and 2050, from around 71.1 billion passenger kilometres in 2018–19 to around 157.1 billion passenger kilometres by 2049–50. Total domestic passenger movements through Australian airports (i.e. counting both departures and arrivals) are projected to increase by around 2.2 per cent per annum between 2018–19 and 2049–50, from around 121.4 million passenger movements in 2018–19 to around 237.5 million passenger movements in 2049–50.

International air passenger travel is also projected to increase by around 2.7 per cent per annum between 2018–19 and 2049–50, from around 306.2 billion passenger kilometres in 2018–19 to around 689.6 billion passenger kilometres in 2049–50. Total international passenger numbers through Australian airports (i.e. visitor and resident departures and arrivals) are projected to increase at a similar rate, from 42.1 million passenger movements in 2018–19 to around 94.7 million passenger movements in 2049–50.

Table ES.1 provides a summary of actual passenger numbers, in 1988–89 and 2018–19, and forecast passenger numbers, in 2049–50, through Australia's busiest airports / air catchments.

Table ES.1 Actual and forecast air passenger movements, by airport / air catchment, 1998–99 to 2049–50

Airport / air catchment	Passengers (million)				Avg. annual growth (% p.a.)	
	1998–99	2018–19	2022–23	2049–50	1998–99 to 2018–19	2018–19 to 2049–50
Sydney	21.6	44.1	35.4	88.2	3.6	2.3
Melbourne	14.3	37.2	30.6	82.3	4.9	2.6
Brisbane	10.0	23.6	19.8	55.4	4.4	2.8
Adelaide	4.0	8.4	7.5	15.1	3.7	1.9
Perth	4.7	12.5	11.2	30.9	4.9	3.0
Hobart	0.9	2.7	2.5	6.2	5.9	2.7
Darwin	1.0	2.0	1.8	4.8	3.4	2.9
Canberra	1.8	3.1	2.7	5.1	2.7	1.6
Coolangatta	1.9	6.0	5.8	11.4	6.1	2.1
Cairns	2.7	4.9	4.2	8.4	3.0	1.8
Launceston	0.5	1.4	1.3	1.9	4.9	1.0
Townsville	0.7	1.6	1.6	3.2	4.6	2.3
Williamtown	0.1	1.3	1.1	1.4	11.2	0.4
Maroochydore	0.3	1.2	1.6	2.9	7.6	2.7
All airports	71.3	163.5	139.4	332.2	4.2	2.3

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Total passengers through all capital city airports / air catchments are projected to increase by 2.4 per cent a year between 2018–19 and 2049–50, from around 93.5 million passengers in 2018–19 to around 192.6 million passengers in 2049–50.

Passenger movements through the six busiest non-capital city airports / air catchments – Gold Coast, Cairns, Townsville, Launceston, Newcastle and Sunshine Coast – are projected to increase by 1.9 per cent a year between 2018–19 and 2049–50, from around 15.1 million passengers in 2018–19 to around 27 million passengers in 2049–50.

Domestic and international air freight forecasts

Under the baseline scenario, total domestic air freight is projected to decline slightly between 2022–23 and 2049–50, from around 330.1 million tonne kilometres (213.6 thousand tonnes) in 2018–19 to around 250.1 million tonne kilometres (174.2 thousand tonnes) by 2049–50. However, the domestic air freight forecasts have a high degree of uncertainty – between –36.4 and +70 per cent of the baseline scenario forecasts – due to the high degree of variation in historical domestic air freight activity. Domestic air freight movements through each of the five mainland capital city airports are also projected to decline slightly.

Total international air freight volumes are projected to increase by around 0.5 per cent per annum between 2018–19 and 2049–50, from around 966 thousand tonnes in 2018–19 to around 1,136 thousand tonnes in 2049–50. International air freight imports are projected to increase by around 1.78 per cent per annum over that period, to around 772 thousand tonnes in 2049–50, and international air freight exports are projected to grow from 2022–23 levels, but decline relative to 2018–19 by around 1.1 per cent per annum, to around 364 thousand tonnes in 2049–50.

Table ES.2 provides a summary of total air freight volumes through Australia's mainland capital city airports / air catchments and all airports in aggregate in 2010–11 and 2018–19, and forecast freight volumes, in 2049–50. Total air freight volumes through all airports are projected to increase from around 1140 thousand tonnes in 2022–23 to around 1420 thousand tonnes by 2049–50 – similar to 2018–19 levels – and implying average annual growth of around 0.8 per cent per annum between 2022–23 and 2049–50.

Table ES.2 Actual and forecast total air freight movements, by airport / air catchment, 2010–11 to 2049–50

Airport / air catchment	Freight (thousand tonnes)				Avg. annual growth (% p.a.)	
	2010–11	2018–19	2022–23	2049–50	2010–11 to 2018–19	2018–19 to 2049–50
Sydney	434.3	499.4	440.8	520.5	1.8	0.1
Melbourne	336.1	453.4	327.4	462.0	3.8	0.1
Brisbane	162.8	197.3	149.5	272.1	2.4	1.0
Adelaide	48.3	55.3	37.0	54.1	1.7	-0.1
Perth	110.5	149.2	116.8	213.4	3.8	1.2
Darwin	0.5	0.8	0.5	0.7	6.6	-0.5
All airports	1,171.8	1,439.1	1,137.6	1,494.8	2.6	0.1

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

General aviation

Australian general aviation (GA) activity covers all flying activity in Australian-registered aircraft other than commercial air transport. The major categories of flying include aerial work, own-use business flying, sport and pleasure flying and other flying in registered aircraft (BITRE 2023a). General aviation activity was not the principal focus of this report, however, long-term forecasts of GA activity are included in Appendix F for completeness.

GA sector activity (as measured by total aircraft flying hours) has exhibited little growth over the past three decades, with total flying hours generally ranging between 1.53 and 1.93 million hours per year, and averaging around 1.72 million aircraft hours per year between 1985 and 2019.

GA activity is modelled as a function of annual domestic economic activity and real aviation fuel prices. The forecast assumptions imply that GA activity will remain more or less around current levels over the forecast horizon, with total flying hours projected to be around 1.67 million flying hours in 2050.

Forecast uncertainty, COVID-19 and sensitivity analysis results

The forecasts are informed estimates of likely future trends based on observed historical growth and key assumptions about the future. All forecasts are inherently uncertain, because the future is essentially unknowable in advance. The forecasts presented in this report include estimates of the potential range of variation (prediction intervals), derived from repeated predictions from the empirical forecasting models. The prediction intervals capture the potential impact of variation in the estimated model parameters on the forecasts.

The report also includes sensitivity analysis of the forecasts to variations in the key forecast assumptions – i.e. variations in projected future domestic productivity growth, domestic and overseas population growth, world fuel prices and international currency exchange rates. The key sensitivity analysis results are summarised below – more detailed sensitivity analysis results are provided in Appendix E. In brief, most sensitivity analysis scenario outcomes are generally well within the 95 per cent prediction interval ranges.

Aviation forecasts and long-term impact of COVID-19

The COVID-19 pandemic had an unprecedented impact on the aviation sector in Australia and around the world – no previous global or sectoral event has had as large an impact on aviation activity.

Previous shocks, while not as significant as the impact of COVID-19, do not appear to have had a persistent impact on long-term trends in aviation activity. However, as of the June 2023 quarter, domestic and international aviation activity had not yet reached pre-pandemic levels – domestic passenger numbers were around 95 per cent of pre-pandemic (June 2019 quarter) levels and international air passenger numbers were around 80 per cent of pre-pandemic (June quarter 2019) levels.

At the time of writing, it is not yet clear whether the aviation sector will return to pre-pandemic trend levels, or whether experiences during and after the pandemic may have a permanent effect on air travel. For example, the pandemic forced significant changes in individual and business practices. Restrictions on personal mobility and travel during the pandemic resulted in increased uptake and use of video conferencing for both business and personal communication. The ease of use, ready accessibility and lower cost of video conferencing services, make it a potentially viable substitute for many long-distance trips, particularly business trips. On the other hand, the broader availability of video conferencing services appears to have reduced barriers to remotely-located employees across professional, managerial and administrative support (white collar) roles, with a consequent increase in remote employment in some sectors. Such employment could have a stimulatory effect on aviation to the extent it generates additional 'head office' related long-distance travel.

BITRE's current forecasting models do not differentiate between leisure and business travel, and make no explicit allowance for future technology-induced changes in air travel propensities.

In the absence of certainty about the long-term impact of COVID-19, and for the purposes of reporting on likely future trend growth, the forecasts presented in this report implicitly assume *full recovery* of both domestic and international aviation activity to pre-COVID-19 pandemic trend levels. In many cases, the 95 per cent prediction intervals appear to cover the potential range of future outcomes, including the case that aviation activity were to be permanently impacted by COVID-19.

Sensitivity analysis results

Australian population growth sensitivity analysis

The population growth sensitivity analysis tested high and low Australian population growth scenarios. Under the baseline scenario, Australia's population is projected to increase to around 36.4 million persons by 2050. Under the high population growth sensitivity scenario, the population is projected to reach 38.2 million persons by 2050. Under the low population growth sensitivity scenario, the population is projected to reach 34.7 million persons by 2050.

Under the high domestic population growth scenario:

- domestic air passenger movements would be approximately 4.3 per cent higher in 2049–50 than under the baseline scenario
- domestic resident international departures would be around 7.6 per cent higher in 2049–50 than under the baseline scenario.

Under the low domestic population growth scenario:

- domestic air passenger movements would be approximately 4.3 per cent lower in 2049–50 than under the baseline scenario
- domestic resident international departures would be around 7.3 per cent lower in 2049–50 than under the baseline scenario.

Overseas population growth sensitivity analysis

International country population projections are based on the United Nations' 2022 World Population Prospects (WPP) (UN 2022).

The 2022 WPP *medium* (baseline) scenario projects the world population to be 9.7 billion persons by 2050. Under the *high* WPP population growth scenario the world population is projected to reach 10.49 billion persons by 2050. Under the low WPP population growth sensitivity scenario the world population is projected to reach 8.93 billion persons by 2050.

- Under the high global population growth scenario international visitor arrivals would be approximately 11.9 per cent higher in 2049–50 than under the baseline scenario
- Under the low global population growth scenario international visitor arrivals would be approximately 11 per cent lower in 2049–50 than under the baseline scenario.

Productivity sensitivity analysis results

The economic productivity sensitivity analysis tested high and low domestic productivity growth scenarios – comprising long-run labour productivity growth of around 1.5 per cent per annum and 0.9 per cent per annum between 2022–23 and 2049–50, under the high and low scenarios, respectively.

Under the high Australian productivity scenario:

- domestic air passenger movements would be approximately 4.8 per cent higher in 2049–50 than under the baseline scenario
- domestic resident international departures would be approximately 8.4 per cent higher in 2049–50 than under the baseline scenario.

Under the low domestic productivity scenario:

- domestic air passenger movements would be approximately 5 per cent lower in 2049–50 than under the baseline scenario
- domestic resident international departures would be around 8.5 per cent lower in 2049–50 than under the baseline scenario.

Fuel cost price sensitivity analysis

The baseline aviation fuel price scenarios are based on the United States' EIA (2021a) long-term world oil price outlook scenarios – movements in jet fuel prices are highly correlated with movements in crude oil prices. The baseline fuel cost scenario also takes into account the projected industry efforts to reduce the carbon footprint of aviation activity, including the likely future uptake and higher costs of SAF.

The EIA reference case, projects that the world oil price (WTI) will increase from around $US 71.4 per barrel in 2021 to around $US 177.9 per barrel by 2050. The EIA also produces low and high oil price scenarios (EIA 2021a). Under the high oil price scenario, world oil prices are projected to increase to WPP population growth scenario the world population is projected to around $US 406 per barrel by 2050. Under the low oil price scenario, world oil prices are projected to increase to around $US 88.5 per barrel by 2050. The high and low oil price scenarios also include allowance for higher and lower future SAF costs.

Under the high fuel cost scenario:

- domestic resident international departures would be around 3.1 per cent lower in 2049–50 than under the baseline scenario, and
- foreign visitor international arrivals would be approximately 0.7 per cent lower in 2049–50 than under the baseline scenario.

Under the low fuel cost scenario:

- domestic resident international departures would be around 7.3 per cent higher in 2049–50 than under the baseline scenario, and
- foreign visitor international arrivals would be approximately 0.8 per cent higher in 2049–50 than under the baseline scenario.

Appendix E also includes sensitivity analysis results for international air freight imports and exports and of variations in exchange rates.

1. Introduction

This report presents long-term forecasts of likely future total air passenger and freight movements in Australia, and forecasts of air passenger and freight movements through Australia's 14 busiest airports / air catchments (by passenger throughput), and all other airports in aggregate. The forecasts have been developed using econometric models of air passenger and freight demand and the latest economic outlooks for Australia and its major trading partners.

1.1 Australian aviation sector

Aviation is a key part of Australia's transport system, providing regular passenger transport services between Australia's highly dispersed major population centres and vital connectivity for rural and remote communities. As a large island nation, located significant distances from neighbouring countries, aviation is also the primary means of access for international visitors and for domestic residents travelling overseas.

In the 30 years following deregulation of domestic aviation, introduced on 30 October 1990, and prior to the COVID-19 pandemic, Australian domestic air passenger activity grew five-fold, driven by strong economic conditions and lower real airfares resulting from increased competition and low-cost carriers on Australia's domestic and international routes. Over the same period, international air passenger arrivals and departures also grew almost five-fold.

Reliable long-term forecasts of likely future aviation activity are essential to understanding the likely future direction of the domestic aviation sector and informing policy and planning.

1.2 Report scope and purpose

This report presents long-term forecasts, to 2050, of likely future total Australian air passenger and freight movements, and forecasts of air passenger numbers and freight volumes through Australia's 14 busiest airports / air catchments. These include Australia's eight capital cities – Sydney, Melbourne, Brisbane, Adelaide, Perth, Hobart, Darwin and Canberra – and six busiest non-capital city airports – Gold Coast, Cairns, Townsville, Launceston, Newcastle and the Sunshine Coast.

The forecasts are derived using BITRE's aviation forecasting model suite – a set of econometric models covering domestic and international air passenger demand and domestic and international air freight activity – and the latest long-term socio-economic outlook for Australia and major developed and developing countries.

BITRE's forecasting models have been re-developed since BITRE's most recently published aviation forecasts (BITRE 2012) to include economic activity across a broader range of overseas countries and allow for dynamic response of passenger demand.

The forecasts presented in this study are the first update to BITRE's aviation forecasts since 2012, and supersede all previous published BITRE aviation forecasts: BITRE (2012), BITRE (2010) and BITRE (2008).

1.3 Report terminology

Domestic and international aviation

This report presents separate estimates of *domestic* and *international* air passenger and freight movements, based on BITRE's aviation statistics (BITRE 2023c, BITRE 2023e). *Domestic* air movements refer to passengers and freight carried on domestic air services between two Australian ports. *International* aviation measures refer to passengers or freight carried on an air service between an Australian port and an overseas (non-Australian) port. Importantly, international visitors travelling on a domestic air service (between two Australian ports) are considered a *domestic* passenger in BITRE's air passenger statistics.

The report also distinguishes between domestic residents and foreign visitors travelling on international flights. Domestic residents include all Australian citizens and permanent residents travelling on an Australian passport. Foreign visitors include all air passengers arriving in Australia on a non-Australian passport.

Air passenger movement measures

BITRE's aviation statistics report passenger movements both in terms of number of 'revenue passengers' and 'revenue passenger kilometres'. Revenue passengers measure all fare-paying air passengers travelling on a regular scheduled or chartered air service. Revenue passenger kilometres reflect the number of revenue passengers carried on each flight stage multiplied by the great circle distance between the ports – revenue passenger kilometres are invariant to how passengers are measured (see next paragraph). For simplicity, all references to 'revenue passengers' and 'revenue passenger kilometres' are hereafter shortened to 'passengers' and 'passenger kilometres'.

BITRE's statistics also report domestic air passengers on both an uplift-discharge (UD) basis and traffic-on-board by stage (TOB) basis. Uplift-discharge statistics counts the number of passenger movements by the first port of boarding and last discharge port. Traffic-on-board by stage statistics count each passenger on each flight. UD and TOB measurement will produce slightly different estimates of total domestic passenger movements, according to the number of passenger movements involving more than one flight stage between origin and destination ports (BITRE 2023c). This report generally makes explicit where passenger movements are presented on a UD basis and on a TOB basis.

Airport, or air catchment, level air passenger and air freight statistics can be measured on an uplift (take-off), discharge (landing) or total *throughput* (i.e. sum of uplift and discharge) basis. Unless otherwise specified, all airport / air catchment passenger and freight movement estimates are presented in this report on a total throughput basis.

1.4 Aviation market shocks, COVID-19 and climate change

While Australian aviation has grown strongly over the last three decades, there have been several significant sectoral and/or external shocks over the last three and a half decades that have temporarily interrupted that growth. These include: the airline pilots' strike in Australia in 1989–90, the 9/11 terrorist attacks in the United States and the collapse of Ansett Australia airlines in 2001–02, the Severe Acute Respiratory Syndrome (SARS) epidemic and Bali bombings in 2002–03, and the Global Financial Crisis (GFC) in 2008–09. Outside of these events, the long term trend in air passenger movements remained generally positive over that period.

The COVID-19 pandemic was a historic crisis and had an unprecedented impact on aviation activity both in Australia and around the world. The pandemic had a larger impact on international air travel, than on domestic aviation. As at the time writing, domestic and international air travel to and from Australia, had not fully returned to pre-pandemic levels.

For the purposes of modelling and forecasting aviation activity, the COVID-19 pandemic period is taken to cover the World Health Organisation's declaration of a Public Health Emergency of International Concern (PHEIC), on 30 January 2020, up until WHO's decision to end the COVID-19 PHEIC on 5 May 2023.[5] Despite COVID-19 not significantly impacting Australia till May 2020, all references to the COVID-19 pandemic in this report are taken to refer to the official WHO declaration period – 30 January 2020 to 5 May 2023.

Forecasts and COVID-19 recovery

Previous aviation shocks, while not as large as the impact of COVID-19, did not have a significant permanent impact on growth in aviation activity. As of the June 2023 quarter, both domestic passenger activity had recovered to around 95 per cent of pre-pandemic (June 2019 quarter) levels and international air passenger numbers had recovered to around 80 per cent of pre-pandemic (June quarter 2019) levels.

At the time of writing, it is not yet clear whether the aviation sector will return to pre-pandemic trend levels, or whether the pandemic has altered travel preferences and will have a permanent effect on air travel behaviour – particularly international aviation. While the long-term impact of COVID-19 on aviation remains in doubt, for the purposes of reporting on likely future growth, the forecasts presented in this report implicitly assume *full recovery* of both domestic and international aviation activity to pre-COVID-19 pandemic trend levels.

Climate change and future aviation growth

The 2023 Intergenerational Report (Treasury 2023) also considered several climate change related scenarios that illustrated the potential impact of global climate change on global economic growth, population growth, consumption preferences and technological changes, and the implications for Australia.

5 WHO (2023), Statement on the fifteenth meeting of the International Health Regulations (IHR) Emergency Committee for COVID-19.

One of the scenarios considered was the impact of changes in global temperatures on total international tourist arrivals and departures. That analysis was based on modelling of global tourist flows and nation-specific average temperatures. While noting the significant uncertainty inherent in estimating the impact of climate change on tourism demand, the IGR reported the estimated impact of warming could reduce international visitor arrivals by around 5 per cent by 2050 if warming is limited to below 2°C, by around 10 per cent by 2050 if warming were kept below 3°C, and by around 17 per cent by 2050 if warming exceeded 4°C (Treasury 2023, Chart 5.5, p. 104).

The direct impact of potential climate change on air travel demand is not explicitly considered in BITRE's aviation forecasting models, and was beyond the scope of this report. The issue is important and could significantly impact future air travel activity.

Reducing aviation sector emissions

The Australian Government has committed to reduce total emissions by 43 per cent below 2005 levels by 2030, and to net zero by 2050. Reaching the target will require reductions in emissions across all sectors of the economy, including transport. Opportunities to reduce emissions in aviation broadly fall into the following categories: more energy efficient aircraft, lower carbon fuels, modal substitution and/or reduced aviation activity.

Near-to-medium term opportunities for significant reductions in commercial aviation emissions will include substitution of fossil-based aviation fuels – principally aviation turbine fuel (ATF) – with sustainable aviation fuels (SAF). SAFs are likely to be more expensive than ATF in the short-to-medium term. Australia will need access to sufficient SAF supply, either from domestic sources or imported, to help meet climate commitments in the medium- to long-term. The assumptions used in the report include the potential impact of announced and likely prospective future actions to reduce aviation-related emissions.

1.5 Data frequency and forecast horizon

Discussion of historical trends in domestic and international aviation activity is generally presented in terms of annual (financial year) activity. However, many of the historical charts presented in Chapters 2, 3 and 4, show quarterly frequency observations, providing more detail on the impact of shocks (e.g. COVID-19) on aviation activity, and illustrating seasonal variation in domestic and international aviation activity.

All commercial aviation forecasting models are specified, estimated and forecast using quarterly frequency historical data up to and including the June quarter 2023. However, all long-term forecasts provided in this report are presented on an annual (financial year) basis.

1.6 Report structure

The report is structured as follows:

- Chapter 2 provides an overview of recent and historical trends in Australian domestic aviation activity.
- Chapter 3 provides an overview of historical trends in international air passenger and freight to and from Australia.
- Chapter 4 provides a summary of trends in aviation activity across each of Australia's 14-busiest commercial airports / air catchments.
- Chapter 5 provides a broad overview of BITRE's aviation forecasting models, summarises the key findings and presents an overview of the key forecast assumptions.
- Chapter 6 presents long-term forecasts of total domestic and international aviation activity.
- Chapter 7 presents long-term forecasts of total aviation activity through Australia's 14 busiest airports / air catchments.
- Finally, Chapter 8 provides a comparison with previous BITRE aviation forecasts and recent airport master plan forecasts, and closes with some brief concluding remarks.

Several appendices provide supporting details about the forecasting model specifications, the empirical results, key forecast assumptions, and provide more detailed forecast outputs.

2. Australian domestic aviation activity

This chapter provides an overview of historical trends in domestic aviation activity in Australia. The chapter commences with a discussion of total domestic commercial aviation passenger movements, and provides a brief overview of long-term trends in passenger movements through Australia's major airports and across Australia's major commercial passenger routes. The chapter also provides an overview of domestic air freight trends and domestic air freight volumes through Australia's capital city airports.

2.1 Domestic air passenger activity

Total domestic air passenger trends

Over the three decades to 2018–19, and prior to the impact of COVID-19, total domestic passenger aviation activity in Australia grew by approximately 5.5 per cent per annum, from around 14.2 billion passenger kilometres in 1988–89 to around 71.1 billion passenger kilometres in 2018–19, a five-fold increase in total passenger kilometres. Over the same period, total domestic passengers carried grew nearly four-fold, from around 16.8 million passengers (TOB basis)[6] in 1988–89 to around 61 million passengers in 2018–19 (an average annual growth rate of approximately 4.4 per cent per annum over that period).

Figure 2.1 shows quarterly passenger numbers (TOB basis) and Figure 2.2 shows total quarterly passenger kilometres since June 1985. Table 2.1 shows annual domestic passenger kilometres and passenger numbers for selected financial years.

Over that period, the domestic aviation sector has also experienced several external and sector-specific shocks. These shocks, highlighted in Figures 2.2 and 2.1, have had varying impacts on domestic aviation activity. The major events have included:

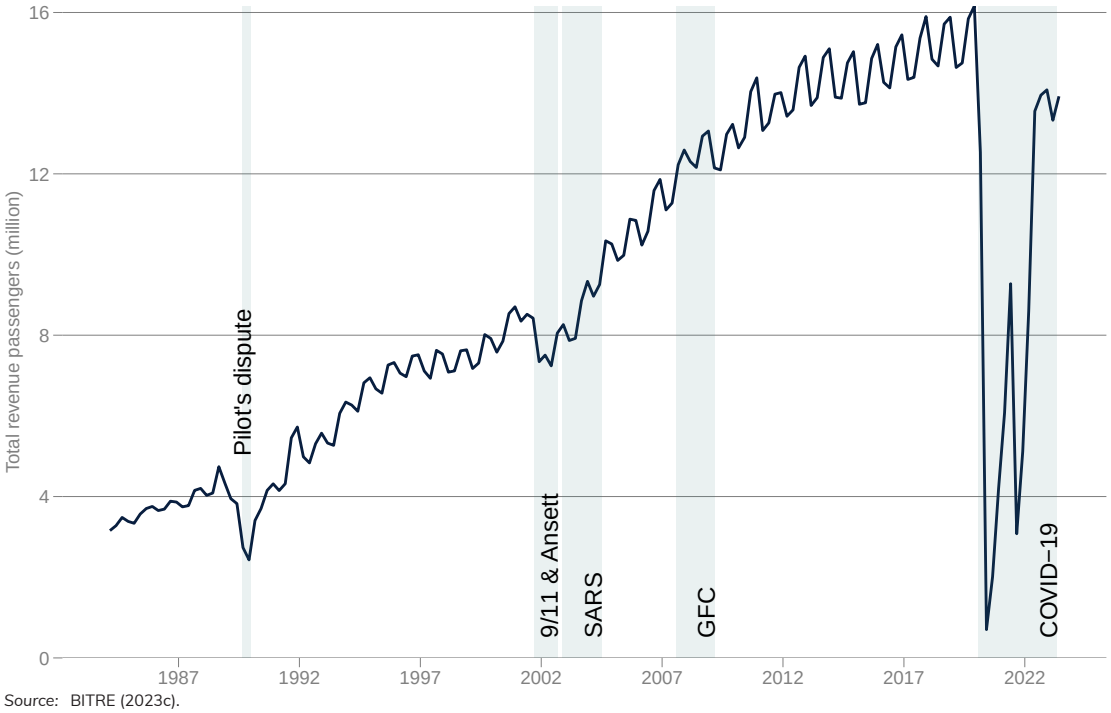
- Airline pilot's dispute
  - At the height of the dispute, in the month of September 1989, air passenger numbers were 20 per cent of levels the previous September (1988)
  - In the following several months, passenger numbers slowly recovered:
    - 40 per cent – October 1989 (over October 1988)
    - 60 per cent – November 1989 (over November 1989)
    - 75 per cent – December 1989 (over December 1989)
    - 85 per cent – January 1990 (over January 1989)
  - Air passenger volumes had rebounded back to trend growth levels by April 1990.
- Ansett Australia financial collapse and 9/11 terror event
  - The 9/11 terror event in the United States and Ansett Australia financial collapse occurred in quick succession in September 2001. Australian domestic air passenger travel dropped by 20 per cent in September & October 2001, over comparable levels 12 months prior, and averaged around 85–90 per cent of comparable monthly levels over the ensuing 10 to 12 months (to August 2002).
  - Domestic air passenger numbers had recovered to previous trend levels by October 2002.
- SARS outbreak 2002–2004
  - The SARS (SARS-CoV-1) outbreak began in November 2002 and significantly impacted China, Hong Kong, Taiwan, Canada, Singapore and Vietnam. (SARS-Cov-1 was officially recognised as having run from 16 November 2002, the date of the first recognised case, and 19 May 2004.)[7]
  - SARS did not appear to have a significant impact on Australian domestic aviation activity.
- Global Financial Crisis (GFC)
  - Australia's domestic air passenger numbers were relatively unaffected by the GFC.[8]
- COVID-19 pandemic – the impact of COVID-19 on domestic aviation is best illustrated by domestic passenger numbers in 2020 – in the June quarter of 2020, total air passenger numbers had fallen to less than 5 per cent of passenger numbers in the previous June quarter (2019) – only the domestic pilot's dispute approached the significance of COVID-19 on domestic aviation pandemic, and then only for one month (September 1989).

6 Traffic-on-board (TOB) basis – measures total outbound passengers on board by aircraft stage.

7 WHO - Severe Acute Respiratory Syndrome (https://www.who.int/health-tiopes/severe-accute-respiratory-syndrome).

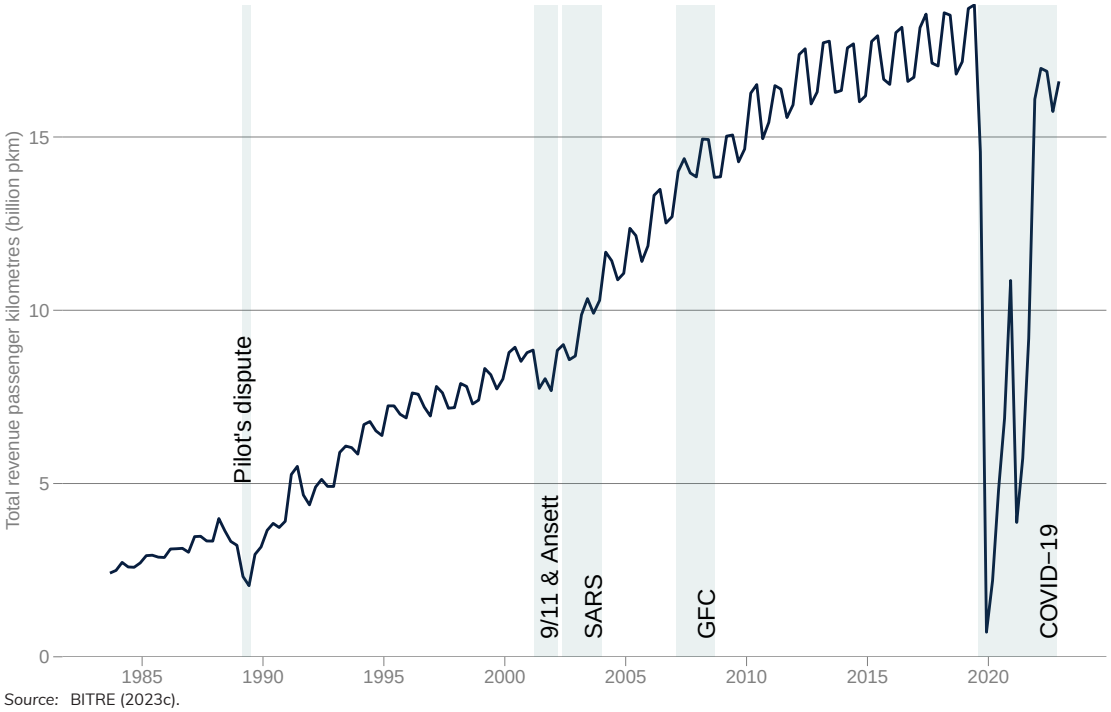
8 The GFC is considered to encompass the period covering the date the U.S. Federal Reserve began lowering the cash rate in response to financial issues at major U.S. financial firms (1 August 2007) and the date of the Dow Junes low (6 March 2009).

Figure 2.1 Quarterly total domestic passengers (TOB by stage), 1985–2023



Source: BITRE (2023c).

Figure 2.2 Quarterly total domestic passenger kilometres, 1985–2023



Source: BITRE (2023c).

Table 2.1 Annual total domestic passengers and passenger kilometres, 1989 to 2023

Year	Passengers (million)	RPKs (billion)
1989	16.84	14.17
1994	24.79	23.86
1999	29.73	30.39
2004	36.41	40.40
2009	50.24	57.55
2014	57.76	68.11
2019	60.98	71.08
2023	55.28	66.22

Source: BITRE (2023c).

Trends in domestic airport passenger movements

Trends in domestic passenger movements through most of Australia's major Australian airports, not surprisingly, broadly reflect trends in total domestic passenger movements.

Total domestic passenger movements through Australia's airports increased from 33 million passengers in 1988–89 to around 121.4 million passengers in 2018–19 (average annual growth of 4.4 per cent per annum).

Capital city airport passenger trends

Passengers through major capital city airports – Sydney (Kingsford-Smith), Melbourne (Tullamarine), Brisbane, Adelaide, Perth, Hobart, Darwin and Canberra – increased from around 23.7 million passengers in 1988–89 to around 93.5 million passengers in 2018–19 (an average annual growth of around 4.7 per cent per annum over that period). Capital city airports accounted for around 77 per cent of all regular scheduled domestic airport passenger movements in 2018–19.

Figure 2.3 shows quarterly trends in domestic passengers through each of the eight capital city airports, between 1985 to 2023. The trends are broadly similar to national passenger movements, albeit with differing rates of recovery from COVID-19 induced reductions (see Figure 2.1). Table 2.2 shows annual (financial year) total domestic passenger numbers through capital city airports and the six busiest non-capital city airports, between 1988–89 and 2022–23.

Table 2.2 Annual domestic passenger movements, 14 busiest airports, 1989 to 2023

	Passenger movements (million), financial year ending							
Airport	1989	1994	1999	2004	2009	2014	2019	2023
Sydney	7.96	11.63	14.45	17.50	22.01	25.39	27.47	23.26
Melbourne	6.16	9.01	11.56	15.03	19.62	23.23	25.71	22.33
Brisbane	3.86	5.89	7.54	10.87	14.65	17.01	17.38	15.80
Adelaide	2.15	3.03	3.81	4.64	6.31	6.67	7.31	6.83
Perth	1.58	2.36	3.22	4.15	6.76	8.88	8.07	7.98
Hobart	0.53	0.73	0.86	1.23	1.87	2.11	2.73	2.50
Darwin	0.41	0.59	0.86	0.99	1.35	1.75	1.75	1.63
Canberra	1.09	1.51	1.82	2.30	3.06	2.86	3.13	2.71
Gold Coast	1.26	1.71	1.85	2.37	4.14	4.91	5.45	5.39
Cairns	0.86	1.54	1.97	2.42	3.16	3.83	4.20	3.88
Townsville	0.89	0.51	0.65	0.92	1.44	1.52	1.59	1.65
Launceston	0.58	0.52	0.53	0.67	1.13	1.29	1.39	1.29
Newcastle	0.07	0.10	0.15	0.30	1.17	1.20	1.26	1.09
Sunshine Coast	0.09	0.21	0.29	0.43	0.92	0.89	1.24	1.61

Source: BITRE (2023c).

Chapter 4 provides a more detailed discussion of passenger and freight movements through Australia's major airports.

Figure 2.3 Quarterly total domestic passenger movements through Australian capital city airports, 1985–2023

Source: BITRE (2023c).

Trends in domestic air passenger activity – major routes

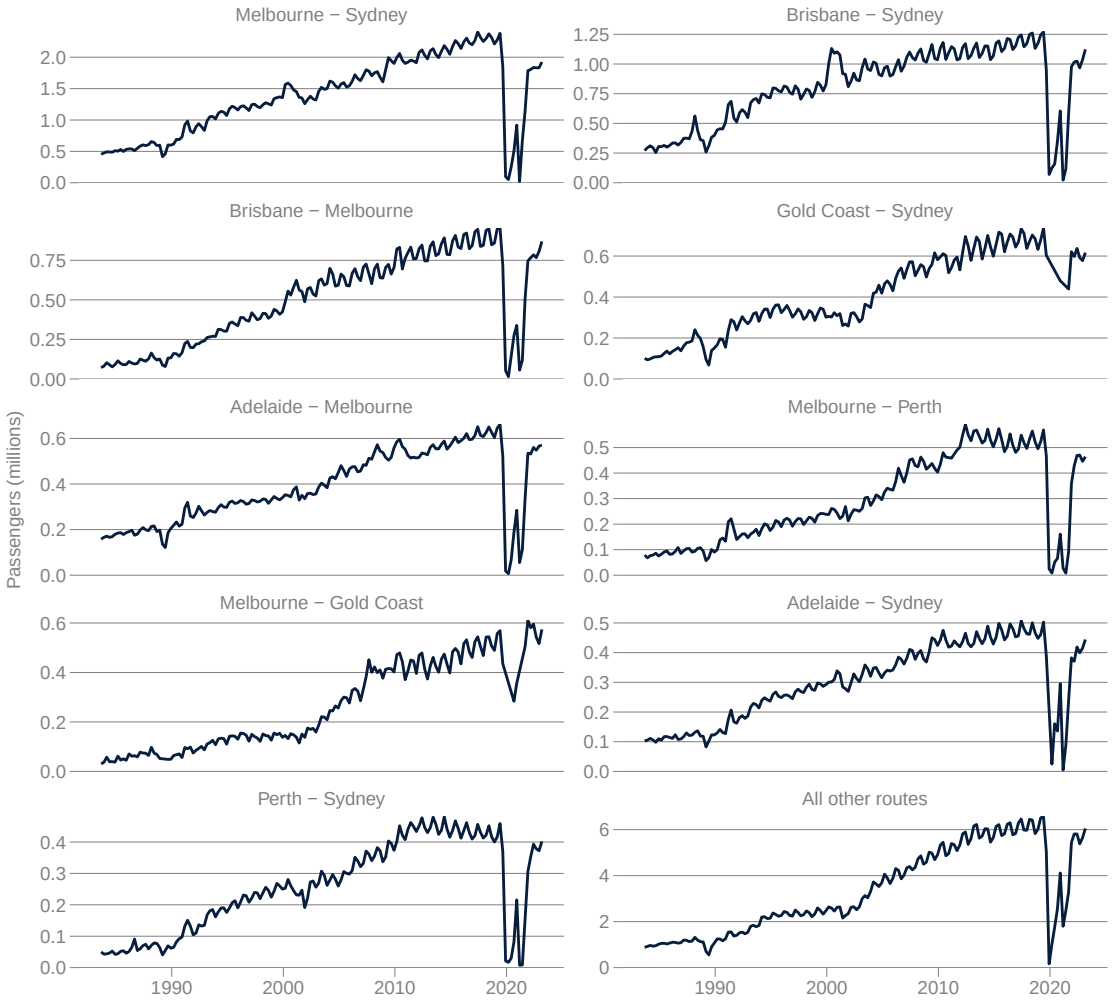
The growth in total domestic passenger aviation activity over the past three decades is also reflected in passenger numbers across Australia's major domestic commercial air passenger routes. The nine largest domestic passenger routes, based on total passenger numbers (both directions), in financial year 2018–19, were:

- Melbourne–Sydney
- Brisbane–Sydney
- Brisbane–Melbourne
- Sydney–Gold Coast
- Adelaide–Melbourne
- Melbourne–Perth
- Melbourne–Gold Coast
- Adelaide–Sydney
- Perth–Sydney

Figure 2.4 shows long-term trends in total quarterly passenger numbers across the top nine domestic routes, and all other routes combined, from 1985 to 2023. Table 2.3 summarises annual domestic passenger numbers across the nine busiest domestic passenger routes.

Across most of the largest domestic routes, passenger volumes increased more or less consistently between 1985 and the onset of COVID-19 in early 2020 – with the notable exception of routes to/from Perth, where passenger numbers appear to plateau in 2010. COVID-19 significantly impacted all major routes, with passenger numbers declining to less than 5 per cent of June quarter 2019 levels in the June quarter 2020.

Figure 2.4 Quarterly domestic air passengers by route, top nine domestic routes and all other routes, 1985 to 2023



Source: BITRE (2023c).

The remainder of this section briefly outlines trends in passenger numbers across these routes.

Sydney–Melbourne route

The Sydney–Melbourne route was Australia's busiest domestic passenger route, and the fourth busiest commercial air passenger route in the world (according to OAG (2023) data for September 2023). In 2018–19, Sydney–Melbourne route passenger numbers totalled 9.2 million passengers. Total passenger numbers have grown by an average of 4.5 per cent per annum since 1988–89 (2.49 million passengers).

In the June quarter of 2020, passenger numbers across the Sydney–Melbourne route fell to less than 5 per cent of June quarter 2019 levels (95.4 thousand passengers). By the June quarter of 2023, domestic passenger numbers had recovered to around 1.8 million passengers, approximately 83 per cent of pre-pandemic (June 2019 quarter) levels.

Sydney–Brisbane route

The Sydney–Brisbane route was Australia's second busiest domestic passenger route in 2018–19, with 4.81 million passengers. Total passenger numbers have grown by an average of 3.5 per cent per annum since 1988–89 (1.72 million passengers).

In the June quarter of 2020, passenger numbers across the Sydney–Brisbane route fell to less than 6 per cent of the previous year (69.9 thousand passengers). By the June quarter of 2023, domestic passenger numbers had recovered to around 1 million passengers, approximately 88.3 per cent of pre-pandemic (June 2019 quarter) levels.

Melbourne–Brisbane route

In 2018–19, Melbourne–Brisbane route passenger numbers totalled 3.59 million passengers. Total passenger numbers have grown by an average of 6.5 per cent per annum since 1988–89 (543.9 thousand passengers).

In the June quarter of 2020, passenger numbers across the Melbourne–Brisbane route fell to less than 7 per cent of the previous year (51.9 thousand passengers). By the June quarter of 2023 domestic passenger numbers had recovered to around 806.2 thousand passengers, approximately 93.9 per cent of pre-pandemic (June 2019 quarter) levels.

Sydney–Gold Coast route

In 2018–19, Sydney–Gold Coast route passenger numbers totalled 2.69 million passengers. Total passenger numbers have grown by an average of 4.1 per cent per annum since 1988–89 (808.2 thousand passengers).

BITRE's published route data does not enumerate passenger numbers on the Sydney–Gold Coast route during the height of the pandemic, but by the June quarter of 2023, domestic passenger numbers were around 577.7 thousand passengers, approximately 91.4 per cent of pre-pandemic (June 2019 quarter) levels.

Melbourne–Adelaide route

In 2018–19, Melbourne–Adelaide route passenger numbers totalled 2.51 million passengers. Total passenger numbers have grown by an average of 3.8 per cent per annum since 1988–89 (819.4 thousand passengers).

In the June quarter of 2020, passenger numbers across the Melbourne–Adelaide route fell to less than 3 per cent of the previous year (18.1 thousand passengers). By the June quarter of 2023, domestic passenger numbers had recovered to around 566.3 thousand passengers, approximately 93.8 per cent of pre-pandemic (June 2019 quarter) levels.

Melbourne–Perth route

In 2018–19, Melbourne–Perth route passenger numbers totalled 2.12 million passengers. Total passenger numbers have grown by an average of 5.7 per cent per annum since 1988–89 (400.2 thousand passengers).

In the June quarter of 2020, passenger numbers across the Melbourne–Perth route fell to less than 6 per cent of the previous year (24.8 thousand passengers). By the June quarter of 2023, domestic passenger numbers had recovered to around 446 thousand passengers, approximately 90.1 per cent of pre-pandemic (June 2019 quarter) levels.

Melbourne–Gold Coast route

In 2018–19, Melbourne–Gold Coast route passenger numbers totalled 2.08 million passengers. Total passenger numbers have grown by an average of 6.8 per cent per annum since 1988–89 (292.2 thousand passengers).

BITRE's published route data does not enumerate passenger numbers on the Melbourne–Gold Coast route during the height of the pandemic, but by the June quarter of 2023, domestic passenger numbers were around 516.6 thousand passengers, approximately 105.6 per cent of pre-pandemic (June 2019 quarter) levels.

Sydney–Adelaide route

In 2018–19, Sydney–Adelaide route passenger numbers totalled 1.88 million passengers. Total passenger numbers have grown by an average of 4.5 per cent per annum since 1988–89 (505.6 thousand passengers).

BITRE's published route data does not enumerate passenger numbers on the Sydney–Adelaide route during the height of the pandemic, but by the June quarter of 2023, domestic passenger numbers were around 415.1 thousand passengers, approximately 92.7 per cent of pre-pandemic (June 2019 quarter) levels.

Sydney–Perth route

In 2018–19, Sydney–Perth route passenger numbers totalled 1.69 million passengers. Total passenger numbers have grown by an average of 6 per cent per annum since 1988–89 (290.3 thousand passengers).

In the June quarter of 2020, passenger numbers across the Sydney–Perth route fell to less than 6 per cent of the previous year (21.3 thousand passengers). By the June quarter of 2023, domestic passenger numbers had recovered to around 372.2 thousand passengers, approximately 93.1 per cent of pre-pandemic (June 2019 quarter) levels.

Table 2.3 Annual domestic passenger movements, nine-busiest domestic air passenger routes

	Passenger movements (million), financial year ending							
Route	1989	1994	1999	2004	2009	2014	2019	2023
Melbourne - Sydney	2.49	4.11	5.01	5.96	6.81	8.27	9.20	7.31
Brisbane - Sydney	1.72	2.75	3.05	3.91	4.26	4.45	4.81	4.04
Brisbane - Melbourne	0.54	1.07	1.61	2.45	2.70	3.28	3.59	3.12
Gold Coast - Sydney	0.81	1.21	1.25	1.36	2.13	2.59	2.69	2.41
Adelaide - Melbourne	0.82	1.11	1.31	1.57	2.20	2.24	2.51	2.21
Melbourne - Perth	0.40	0.66	0.87	1.14	1.75	2.19	2.12	1.81
Melbourne - Gold Coast	0.29	0.46	0.57	0.84	1.61	1.71	2.08	2.24
Adelaide - Sydney	0.51	0.88	1.13	1.35	1.55	1.78	1.88	1.60
Perth - Sydney	0.29	0.70	0.96	1.13	1.45	1.81	1.69	1.50
All other routes	4.75	7.25	9.40	12.48	18.67	23.73	24.71	22.65
All routes	12.62	20.22	25.16	32.21	43.13	52.06	55.28	48.89

Sources: BITRE estimates.

All other routes

Domestic passengers across all other routes totalled 24.7 million passengers in 2018–19. Total passenger numbers have grown by an average of 5.6 per cent per annum since 1988–89 (4.75 million passengers).

In the June quarter of 2020, passenger numbers across all other routes fell to around 3 per cent of the previous year (163.3 thousand passengers). By the June quarter of 2023, domestic passenger numbers across all other routes had recovered to around 5.6 million passengers, approximately 93.9 per cent of pre-pandemic (June 2019 quarter) levels.

2.2 Domestic air freight trends

This section outlines long-term trends in domestic air freight movements in Australia. All data is sourced from BITRE (2023c).

Total domestic air freight movements

Domestic air freight is predominantly carried in the cargo holds of scheduled passenger services and by a small number of dedicated freight aircraft. Air freight predominantly comprises high-value, low-density freight, such as mail, small parcels and high-value perishables, and accounts for less than 0.1 per cent of total domestic freight (by weight). Domestic air freight volumes can be impacted by available scheduled passenger aircraft service capacity – with reductions in the number of services or increases in passenger numbers/baggage potentially reducing available freight capacity.

Importantly, prior to January 2010, BITRE's air freight statistics provide only partial coverage of total domestic air freight – capturing only freight carried by commercial passenger services operated by major carriers, but not freight carried by smaller operators and by dedicated freight services. Figure 2.5 shows BITRE-reported quarterly domestic air freight estimates (in both tonne kilometres and tonnes, measured on a TOB basis, since 1985. (The pre- and post-2010 break in series is apparent.)

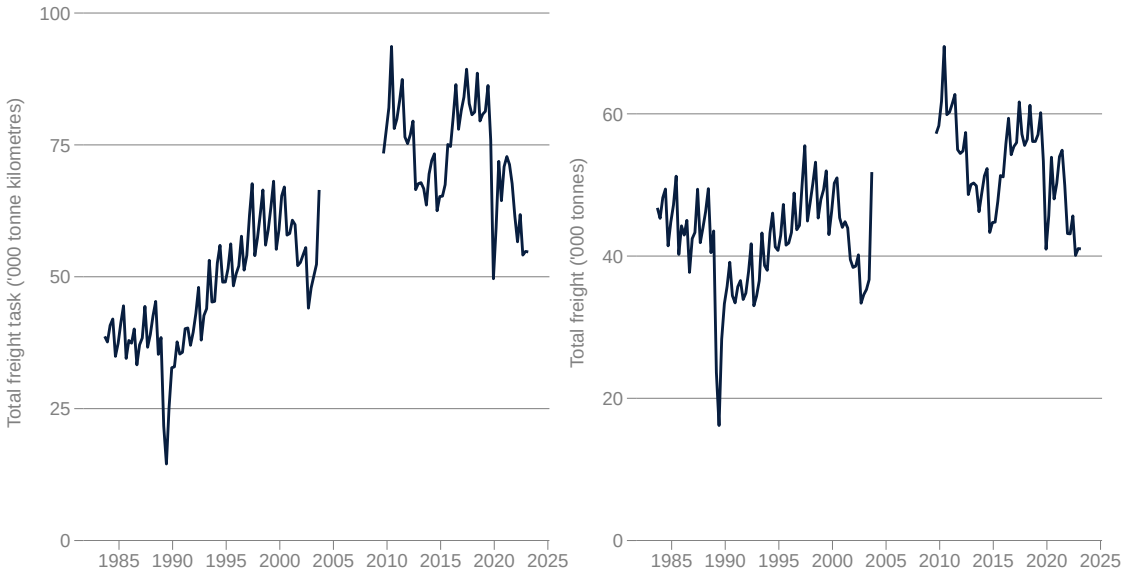
Table 2.4 shows total annual domestic air freight for selected years 2010–11 to 2022–23. In 2010–11, domestic air freight totalled 333.7 thousand tonne kilometres (251.4 thousand tonnes). The volume of domestic air freight was broadly unchanged in 2018–19, at around 330.1 thousand tonne kilometres (229.9 thousand tonnes). The visible drop in air freight between 2012 and 2016 was reportedly attributable to a single freight forwarder switching transport modes.

The reduction in domestic aviation capacity, induced by COVID-19 pandemic, also impacted domestic air freight activity. In the June 2020 quarter, domestic air freight fell to approximately 61 per cent of total activity in the June quarter of 2019. Domestic air freight activity is still below pre-pandemic levels, with 2022–23 air freight volumes were approximately 69 per cent of air freight volumes 2018–19.

Major airport domestic air freight movements

BITRE also collects information on air freight through all Australian airports, but only publishes statistics for mainland state capital city airports. Figure 2.6 shows trends in quarterly domestic air freight (both directions) through Australia's capital city airports since 2010, and Table 2.5 shows annual domestic air freight by airport over the same period.

Figure 2.5 Quarterly total domestic air freight estimates, 1985–2004 and 2010–2023



Note: Break in series between 2004 and 2010.
Sources: BITRE (2023c) and BITRE estimates.

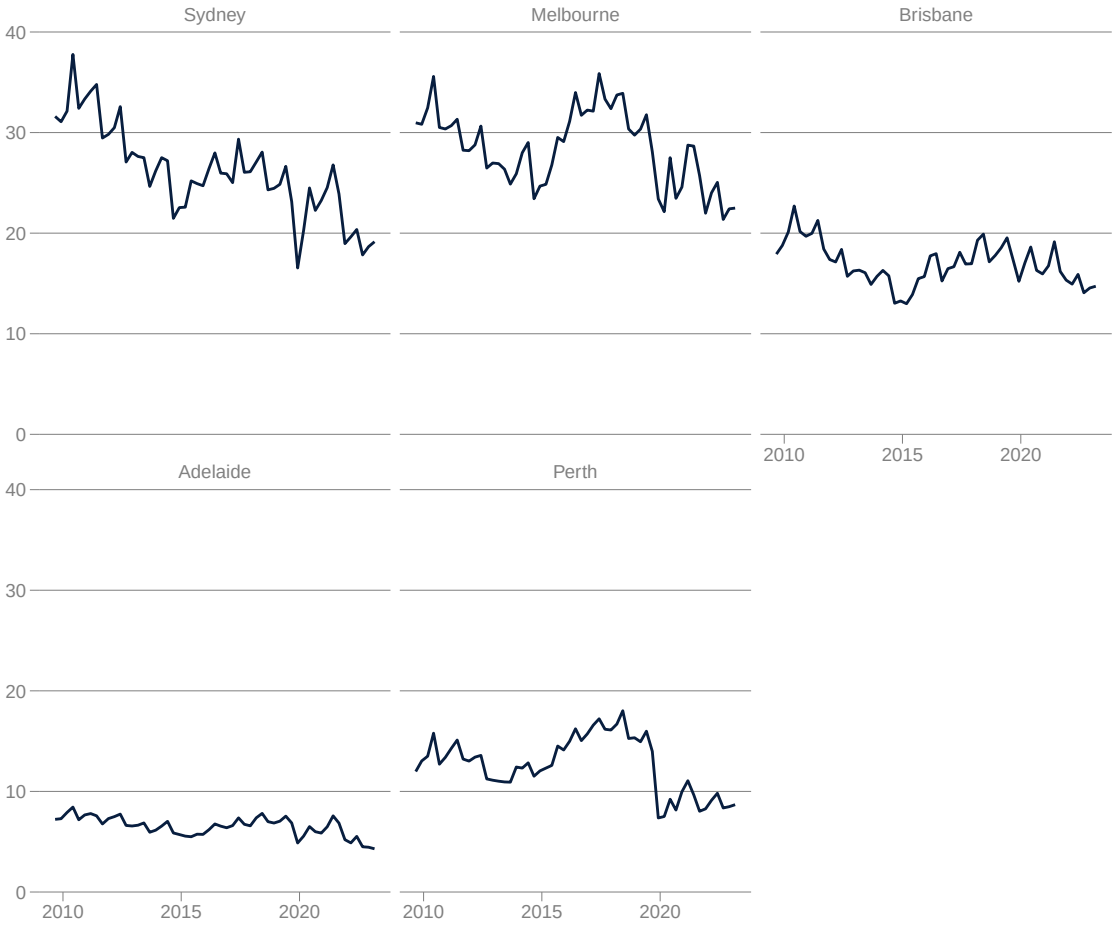
Table 2.4 Annual total domestic air freight, 2010–11 to 2022–23

	Air freight	
Year	('000 tkm)	('000 tonnes)
2011	333.7	251.4
2012	322.5	233.5
2013	290.6	210.9
2014	267.6	195.2
2015	273.1	191.6
2016	282.5	194.9
2017	326.2	224.8
2018	337.0	230.3
2019	330.1	229.9
2020	293.1	211.6
2021	266.5	197.8
2022	273.2	201.9
2023	227.4	169.9

Sources: BITRE (2023c) and BITRE estimates.

Sydney and Melbourne airports together generally account for more than around 50 per cent of total domestic air freight through Australian airports. Freight through Sydney Airport has generally declined since 2011, from around 135.6 thousand tonnes in 2010–11, to around 103.9 thousand tonnes in 2018–19, and dropped further following the onset of COVID-19 to around 76.5 thousand tonnes in 2022–23. Air freight through Melbourne Airport was roughly similar in 2010–11 and 2018–19, at 128.9 thousand tonnes in 2010–11 and 127.7 thousand tonnes in 2018–19. Air freight was approximately 92.8 thousand tonnes in 2022–23. Air freight though Brisbane and Adelaide airports has declined slightly since 2010–11, but remained more or less around average levels since 2015. Air freight through Perth Airport increased between 2010–11 and 2018–19, from around 55.4 thousand tonnes in 2010–11, to around 65.3 thousand tonnes in 2018–19. Air freight through Perth Airport dropped by around one third at the onset of COVID-19, and was still around COVID-19 pandemic levels in 2022–23.

Figure 2.6 Quarterly domestic air freight estimates, by major airport, 2010 to 2023



Source: BITRE (2023c) and BITRE estimates.

Table 2.5 Total domestic air freight, by airport, 2010–11 to 2022–23

	Air freight by airport (thousand tonnes)					
Year	Sydney	Melbourne	Brisbane	Adelaide	Perth	All airports
2011	135.65	128.91	82.66	31.19	55.38	506.74
2012	128.18	118.46	77.05	29.43	55.61	472.88
2013	118.17	112.87	67.47	28.42	49.35	430.17
2014	105.97	104.05	62.99	25.60	45.30	393.98
2015	98.71	105.10	58.35	25.16	48.71	384.97
2016	97.42	110.25	58.04	22.52	53.54	390.26
2017	106.27	129.05	67.42	25.90	61.98	449.97
2018	106.53	133.70	68.66	27.28	66.09	462.43
2019	103.90	127.74	74.14	29.04	65.31	472.83
2020	91.17	113.61	70.68	26.32	52.26	426.38
2021	90.27	97.68	67.91	23.91	34.85	395.66
2022	94.18	105.11	67.43	26.11	37.01	409.04
2023	76.49	92.84	59.46	19.36	35.77	343.85

Note: Air freight by airport does not add to 'All airports'

Sources: BITRE (2023c) and BITRE estimates.

This chapter has provided an outline of historical trends in domestic aviation activity in Australia, providing some context for the forecasts presented later in the report. The following chapter (Chapter 3), outlines long-term trends in international air passenger and freight movements to and from Australia.

3. Australian international aviation activity

This chapter provides an overview of historical trends in international air passenger and air freight movements both into and out of Australia.

Like domestic commercial aviation activity, Australian international aviation activity has also grown strongly, exhibiting strong growth in both passenger numbers and freight movements in the three decades prior to the COVID-19 pandemic. Over that period, there have several global events that have temporarily impacted activity – the main events that affected Australian international aviation (and their impact) were:

- 9/11 terror event
  - In the aftermath of the 9/11 terror event in the United States, global air passenger movements were temporarily depressed, although the impact on international travel to and from Australia appears relatively minimal.
- SARS outbreak 2002–2004[9]
  - SARS had a temporary impact on total international passenger movements into and out of Australia, with the impact appearing to peak in the June 2003 quarter.
- Global Financial Crisis
  - Australian international air passenger numbers and air freight volumes were relatively unaffected by the Global Financial Crisis in 2007–08.
- COVID-19 Pandemic
  - International air services were heavily impacted by border closures enacted by Australian and overseas governments during the COVID-19 pandemic. Moreover, the lack of passenger movements impacted availability of air cargo space (in the cargo-holds of passenger aircraft) and international air freight movements.[10]

3.1 International air passenger activity

Between June 1989 and June 2019, total international air passenger kilometres grew approximately 360 per cent, from around 75.9 billion passenger kilometres in 1988–89 to around 347.4 billion passenger kilometres in 2018–19, equivalent to average annual growth of around 5.2 per cent per annum. Over the same period, the total number of international passengers increased from around 9.5 million passengers in 1998–89 to around 47 million passengers in 2018–19, an average annual growth rate of 5.5 per cent per annum.

Figure 3.1 shows trends in quarterly international passenger numbers into and out of Australia between 1984 and 2023, and Figure 3.2 shows quarterly total passenger kilometres, by direction over the same period. Table 3.1 shows total annual (financial year) international passenger arrivals and departures into and out of Australia, since 1988–89.

The two figures illustrate the long-term growth in international air passenger movements to and from Australia, and also highlight the impact of the above-mentioned events. In particular, 9/11 had a discernible impact on total international passenger arrivals and departures in the 12 months after the event, and the SARS outbreak in 2003–04 had a slightly larger impact on international arrivals and departures in the middle of 2003. By contrast, the GFC had little discernible impact on international passenger movements to and from Australia.

However, none of these events were as disruptive as the COVID-19 pandemic. The significance of the pandemic is best illustrated by international passenger numbers in calendar 2020 – in the June quarter of 2020, total air passenger numbers fell to less than three per cent of total passengers previous June quarter. As of the June quarter 2023, total international air passenger numbers were 9.17 million passengers, approximately 82 per cent of pre-pandemic air passenger numbers in the June quarter 2019.

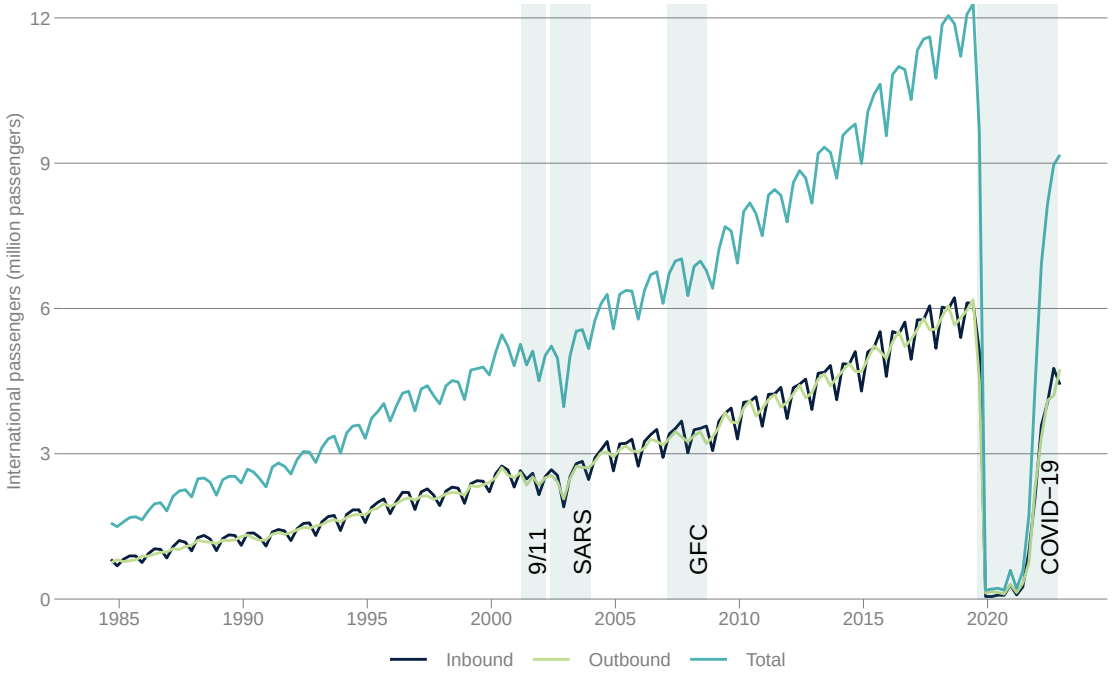
Trends in total international visitor arrivals and resident departures

Figure 3.3 shows quarterly trends in total visitor arrivals and resident departures since 1985 and Table 3.2 shows total annual visitor arrivals and resident departures for selected years. Both show that international

9 SARS-CoV-1 outbreak – 16 November 2002 to 19 May 2004.

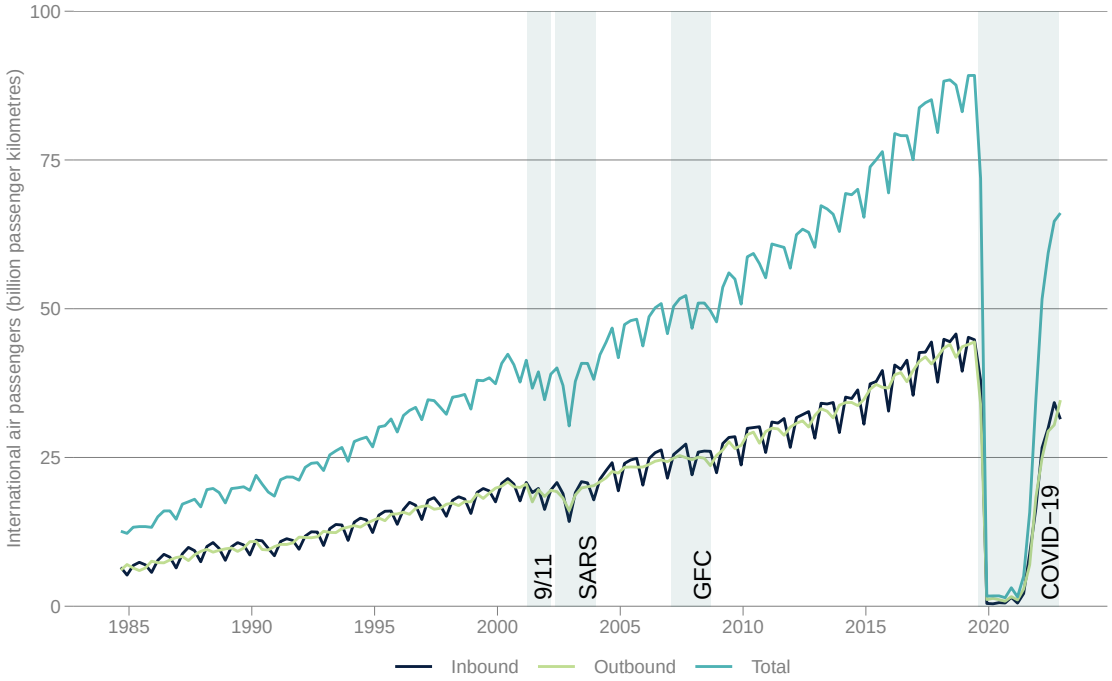
10 In response, the Australian Government established the International Freight Assistance Mechanism (IFAM), which provided temporary, targeted support to Australian commodity exporters whose products could not be sent by alternative means. IFAM operated between April 2020 and June 2022 (DITRDCA (2023), p. 25).

Figure 3.1 Quarterly total international air passengers, by direction, 1985 to 2023



Sources: BITRE (2023e) and BITRE estimates.

Figure 3.2 Quarterly total international air passenger kilometres, by direction, 1985 to 2023



Source: BITRE (2023e) and BITRE estimates.

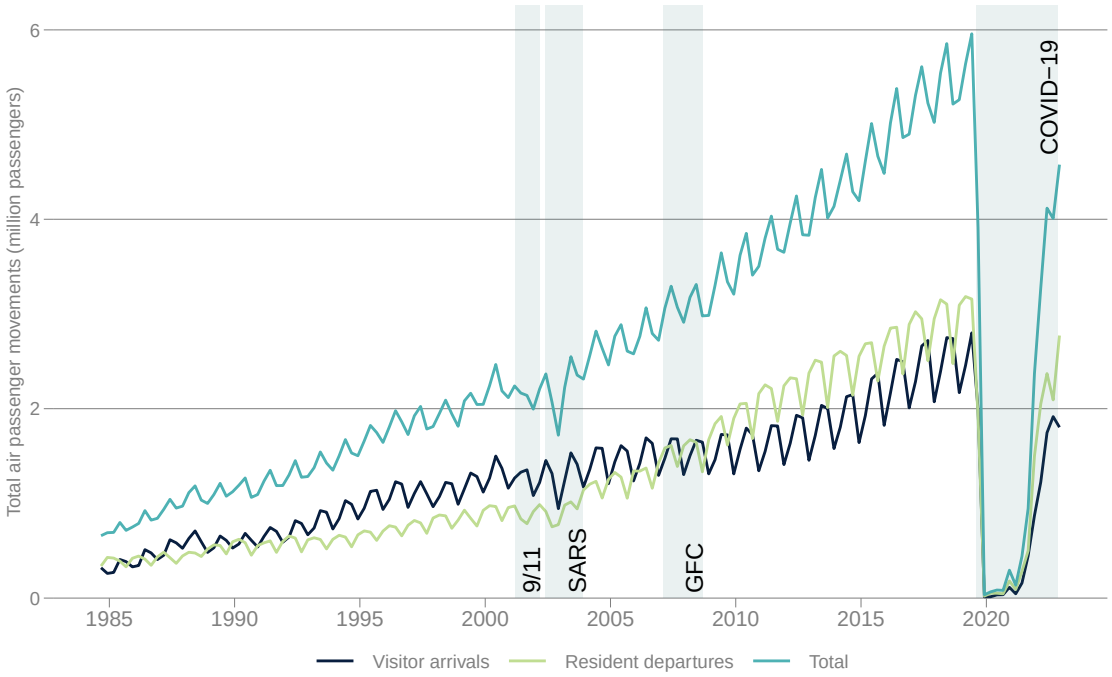
Table 3.1 Total international passenger movements, by direction, 1989 to 2023

	Passengers (million)		
Year	Inbound	Outbound	Total
1989	4.82	4.72	9.54
1994	6.44	6.38	12.81
1999	8.80	8.71	17.51
2004	10.63	10.65	21.28
2009	13.66	13.39	27.04
2014	18.28	18.16	36.44
2019	23.64	23.35	46.99
2023	16.84	16.39	33.23

Source: BITRE (2023e).

visitor arrivals accounted for the majority of total visitor arrivals and resident departures up until 2008, but since 2008 the balance has changed with more residents departing than visitors arriving in Australia each year. In 2018–19, resident departures accounted for around 54 per cent of total visitor arrivals and resident departures.

Figure 3.3 Quarterly total international visitor arrivals and resident departures, 1985–2023



Sources: ABS (2023c) and BITRE estimates.

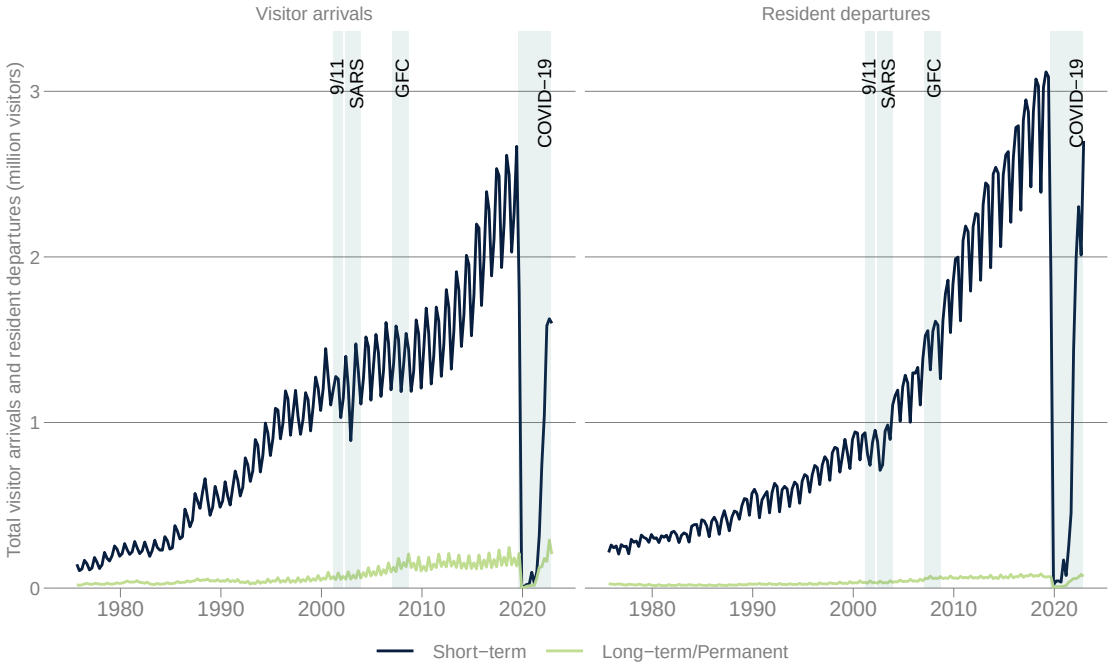
Table 3.2 Annual international visitor arrivals and resident departures, 1988–89 to 2022–23

	Visitor arrivals & resident departures (million)		
Year	Residents	Visitors	Total
1989	1.9	2.4	4.3
1994	2.4	3.3	5.7
1999	3.3	4.5	7.8
2004	4.1	5.4	9.4
2009	6.3	6.1	12.5
2014	9.6	7.3	16.9
2019	11.8	10.1	21.9
2023	9.3	6.7	16.0

Sources: ABS (2023c) and BITRE estimates.

Figure 3.4 shows quarterly international visitor arrivals and resident departures by trip duration – i.e. short-term and long-term/permanent duration trips. Short-term visitor arrivals and short-term resident departures each

Figure 3.4 Quarterly total international visitor arrivals and resident departures, by trip duration, 1985–2023



Sources: ABS (2023c) and BITRE estimates.

account for over 95 per cent of total visitor arrivals and resident departures, respectively. BITRE developed separate models of short-term and long-term/permanent visitor arrivals and resident departures. However, since long-term/permanent movements comprise such a small fraction of total visitor arrivals and resident departures, short- and long-term/permanent travellers were ultimately modelled and forecast jointly.

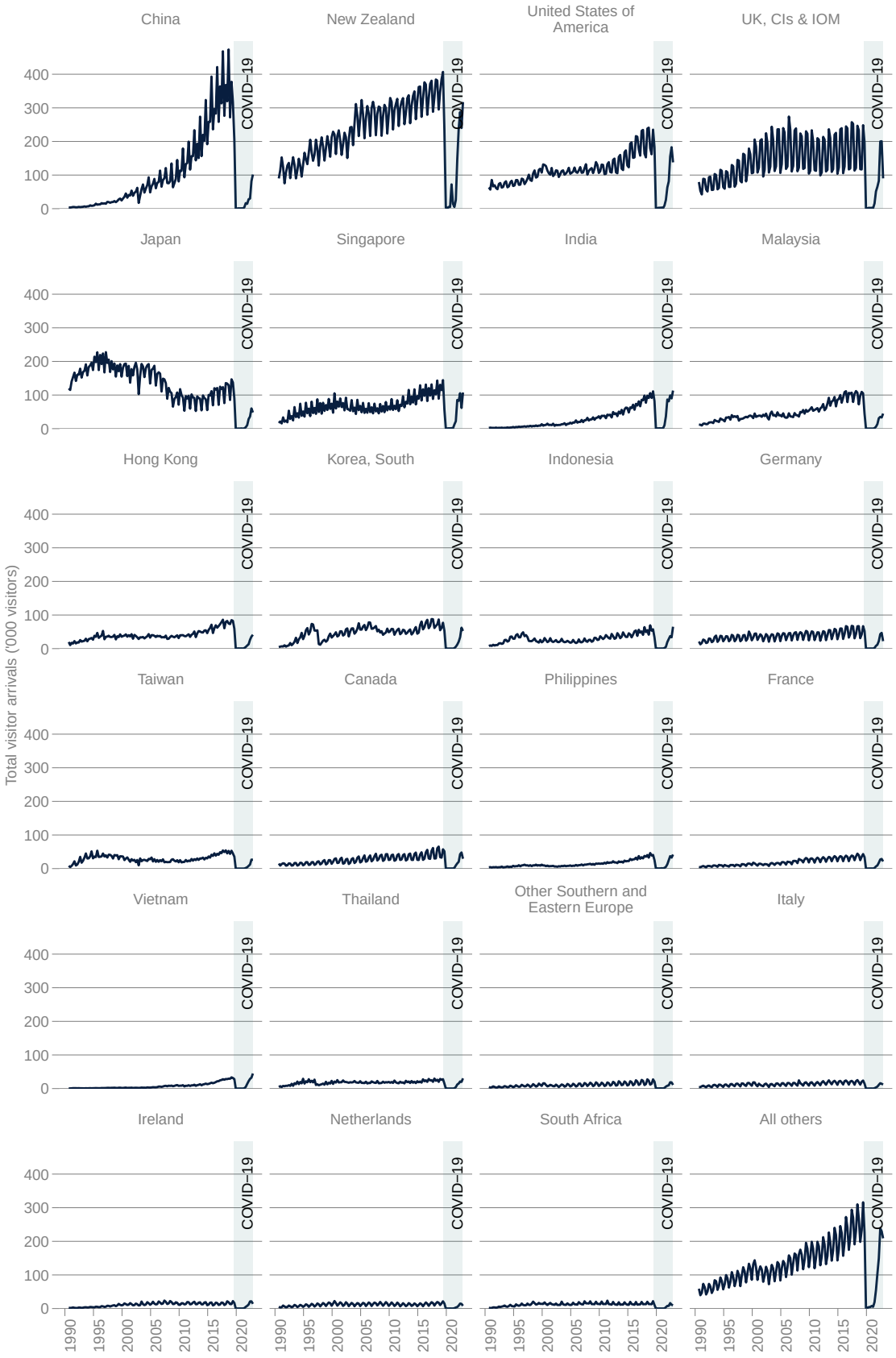
International visitor arrivals by country of origin

Figure 3.5 shows quarterly short-term visitor arrivals for the 23 largest visitor markets (in financial year 2018–19), and all other countries combined. The four largest countries – China, New Zealand, the United States of America and Great Britain – accounted for around 47 per cent of total short-term visitor arrivals in 2018–19. 'All other' countries (i.e. not ranked within the largest 23 visitor markets) accounted for around 10.8 per cent of all short-term visitor arrivals in 2018–19.

International domestic resident departures by destination country

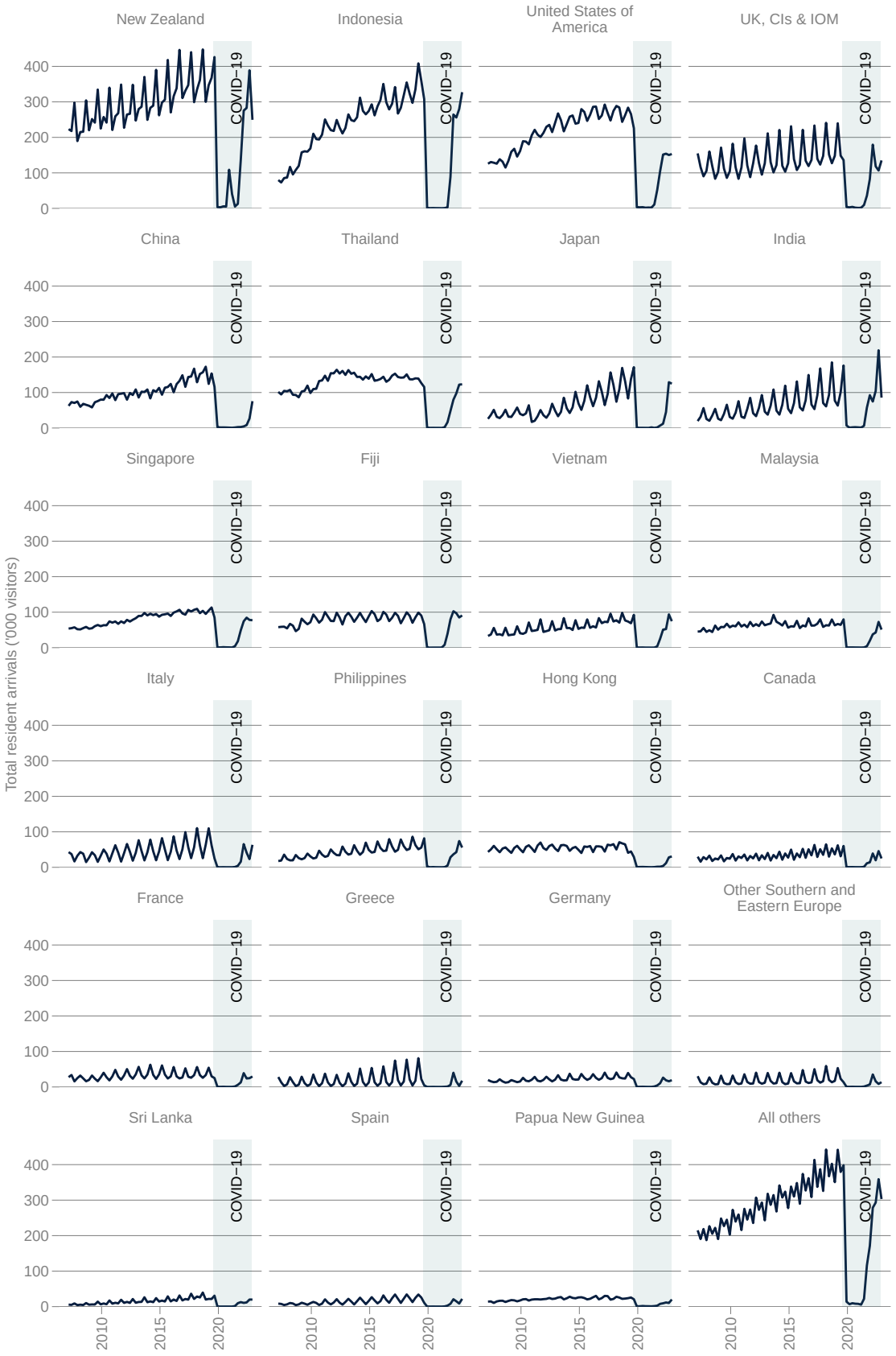
Figure 3.6 shows quarterly short-term resident arrivals for the 23 largest overseas destination markets (in financial year 2018–19), and all other countries combined. The four-largest short-term destination countries for domestic residents travelling overseas – New Zealand, Indonesia, the United States of America, and Great Britain – accounted for 40 per cent of total short-term residents returning in 2018–19. 'All other' countries (i.e. not ranked within the largest 23) accounted for around 13.9 per cent of all short-term residents returning in 2018–19.

Figure 3.5 Short-term international visitor arrivals, by country of residence (top 23 countries), 1985–2023



Sources: ABS (2023c) and BITRE estimates.

Figure 3.6 Short-term international residents returning, by country of visit (top 23 countries), 1985–2023

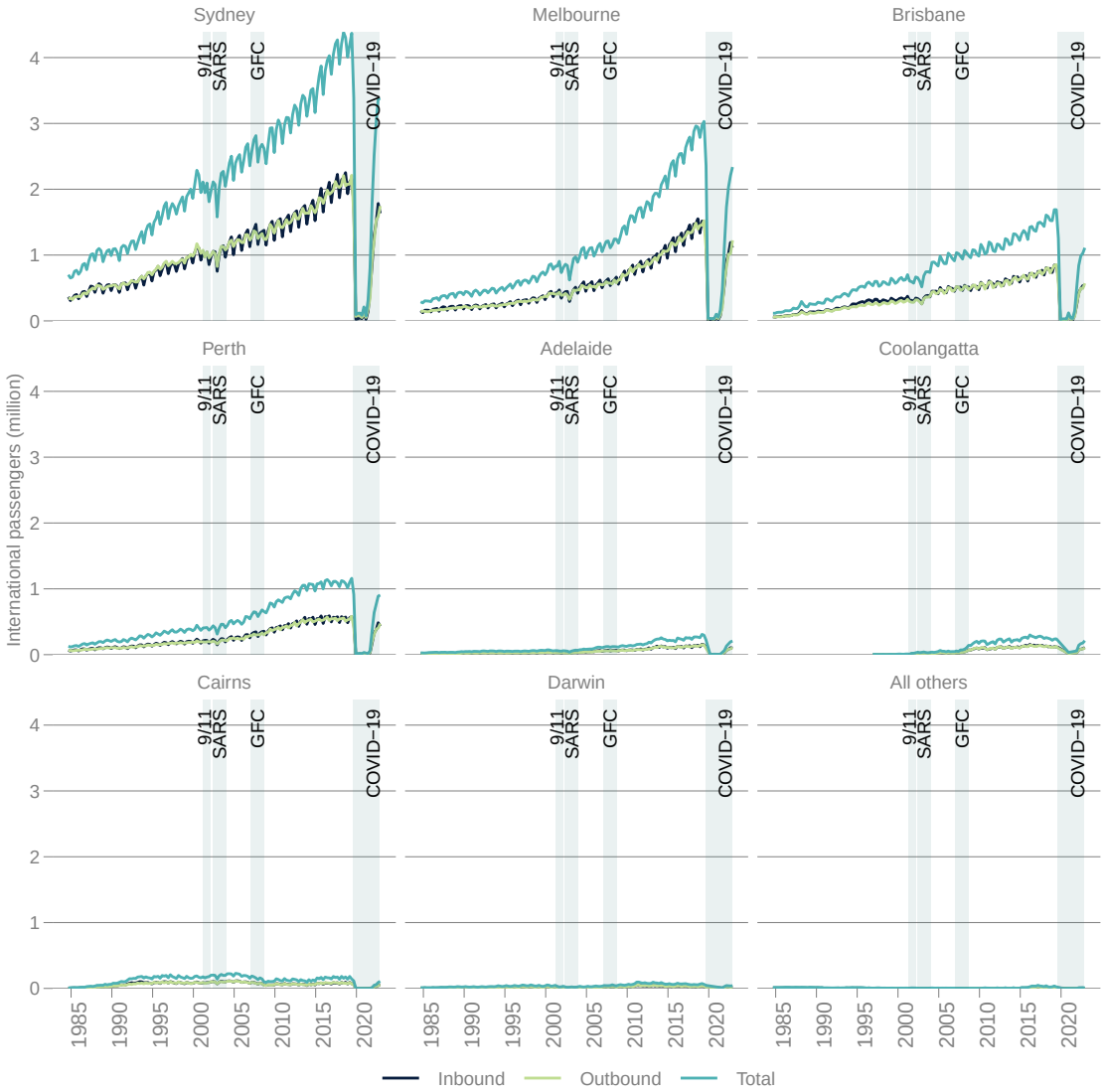


Sources: ABS (2023c) and BITRE estimates.

International passengers through Australian airports

Figure 3.7 shows total international passenger movements through Australian airports – Sydney (Kingsford Smith) Airport is Australia's largest international aviation gateway with around 16.9 million passengers in 2018–19, and accounted for around 40 per cent of all international passenger movements through Australian airports in 2018–19.

Figure 3.7 Total international passenger movements through Australian airports, by direction, 1985–2023



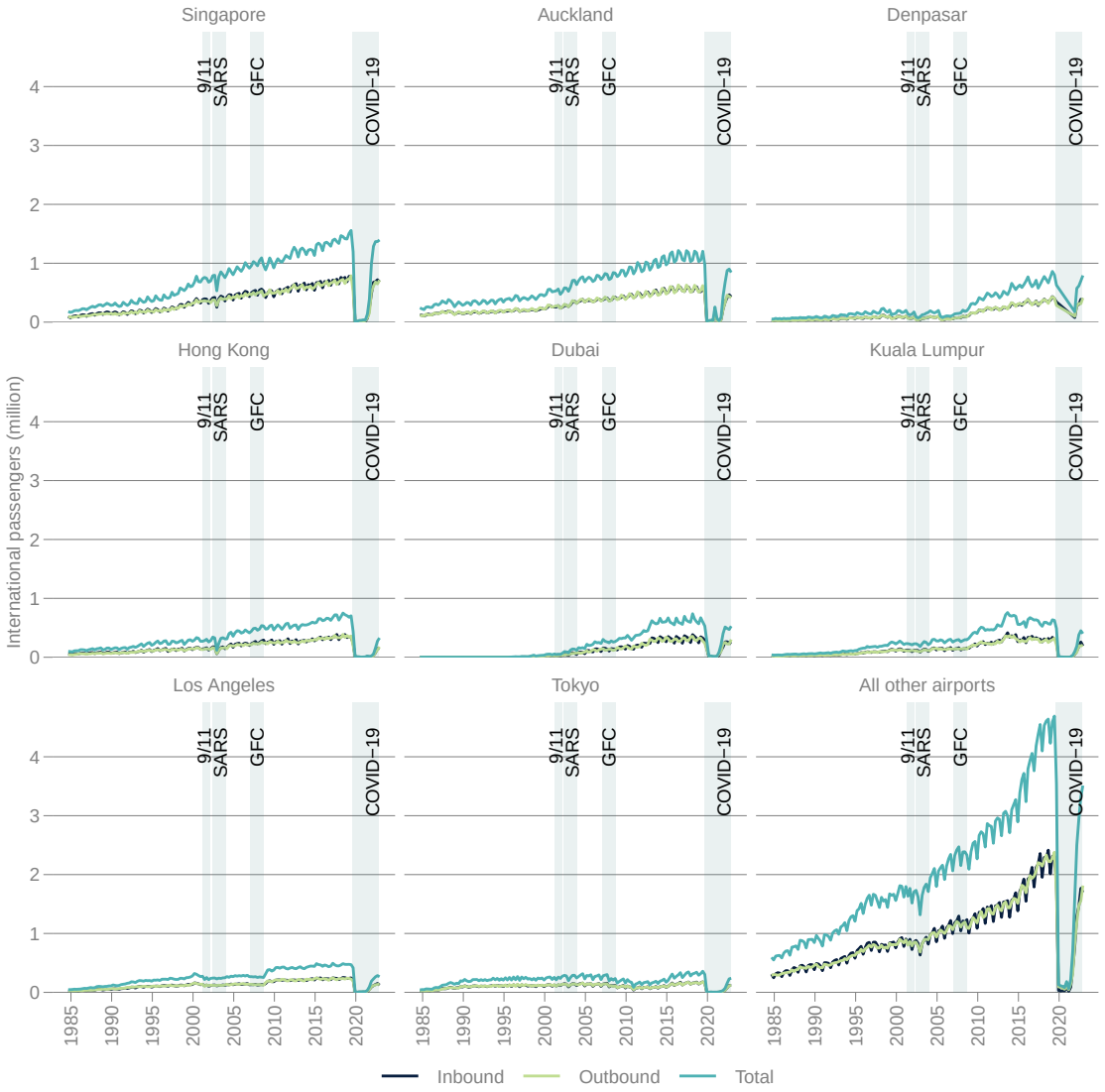
Sources: BITRE (2023e) and BITRE estimates.

Melbourne (Tullamarine) Airport was Australia's second-largest international aviation gateway accounting for around 28 per cent of total international air passenger movements in 2018–19 (11.6 million international passengers in 2018–19). Brisbane Airport accounted for around 15 per cent of total international air passenger movements (6.2 million international passengers) in 2018–19. Perth Airport accounted for around 10 per cent of total international air passengers in 2018–19 (4.3 million international passengers). All other international gateway airports – including Adelaide, Coolangatta, Cairns and Darwin – accounted for the remaining 7.1 per cent (approximately 3 million) of total international passenger movements through Australian airports in 2018–19.

International air passenger overseas port trends

Figure 3.8 shows international passengers to and from Australia by overseas origin/destination city, for the top eight overseas cities (by number of passengers), and all other cities combined. The largest overseas origin/destination cities for Australian aviation in 2018–19 were: Singapore, Auckland, Denpasar (Bali), Hong

Figure 3.8 Australian international air passengers, by overseas origin/destination city, 1985–2023



Sources: BITRE (2023e) and BITRE estimates.

Kong, Dubai, Kuala Lumpur, Los Angeles, and Wellington. Of these, Singapore, Kuala Lumpur, Hong Kong and Dubai are all major international aviation hubs, providing connections to other major cities and regions.

Singapore accounted for 13.7 per cent of total international passengers (5.7 million passengers) to and from Australia in 2018–19. Auckland accounted for 10.6 per cent of total international passengers (4.5 million passengers) to/from Australia in 2018–19.

Of the other major overseas origin/destination locations for Australian international air passenger trips:

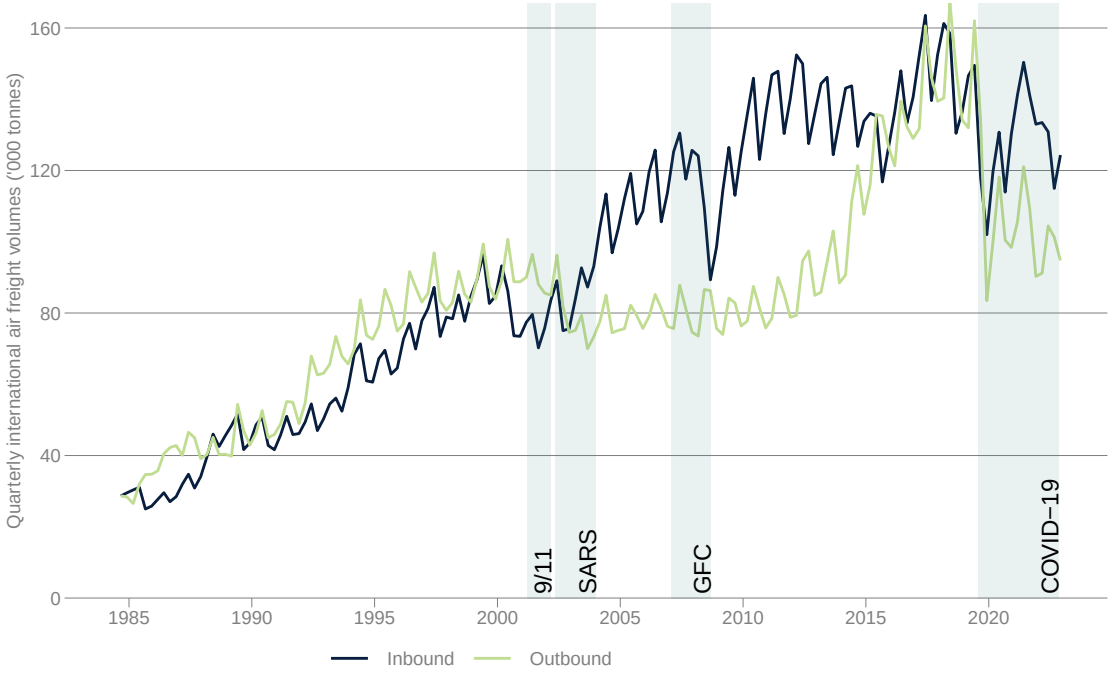
- Denpasar accounted for 7 per cent of all passenger movements in 2018–19
- Hong Kong: 6.8 per cent
- Dubai: 6.1 per cent
- Kuala Lumpur: 5.5 per cent, and
- Los Angeles: 4.5 per cent.

International passengers through all other airports comprised 43 per cent of all international passenger trips to and from Australia in 2018–19.

3.2 International air freight trends

This section briefly outlines long-term trends in domestic air freight movements in Australia. All data is sourced from BITRE (2023e).

Figure 3.9 Quarterly international air freight, by direction, 1985 to 2023



Source: BITRE (2023e) and BITRE estimates.

Total international air freight

International air freight, like domestic air freight, is predominantly carried in the cargo holds of scheduled passenger services, and by a smaller number of dedicated freight-only services.

International air freight accounts for a small share of total merchandise trade by volume (typically less than 1 per cent), but accounts for around 21 per cent of total trade by value. Figure 3.9 shows total quarterly international air freight, by direction, since 1984–85. It highlights that inbound air freight (air cargo imports) has grown almost continuously since 1984–85, with temporary disruptions around 2001 to 2004, coinciding with both 9/11 and SARS, in 2008–09, around the GFC, and of course in 2020–2022 due to COVID-19. Growth in air freight exports has been less consistent than growth in air freight imports, with robust growth up to 2000–01, little growth between 2003–04 and 2011-12, and a sharp increase in air freight export volumes between 2015 and 2019. Outbound air freight volumes were significantly impacted by COVID and are yet to return to pre-COVID levels.

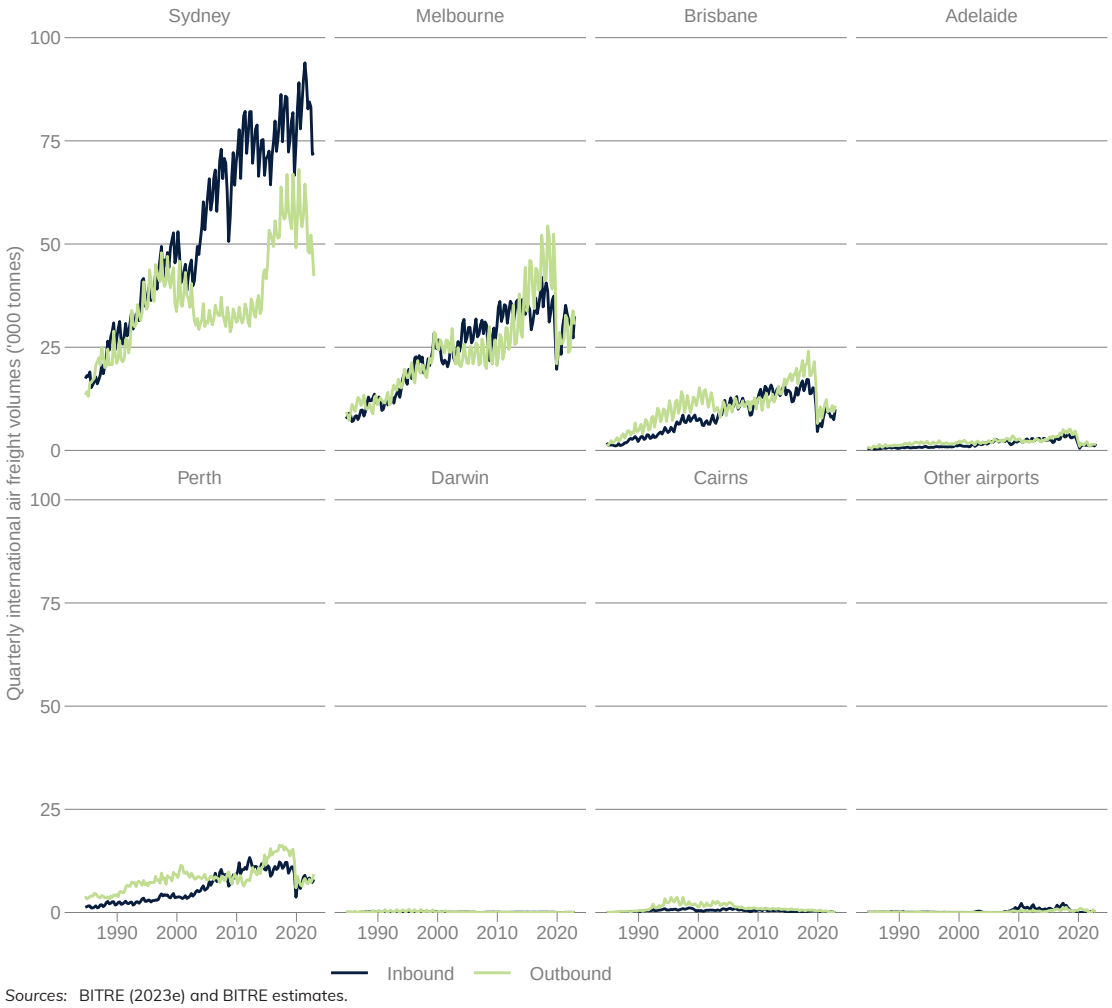
Table 3.3 reports total annual domestic air freight across five-year intervals from 1988–89 to 2018–19 and 2022–23. Total international air freight to and from Australia has increased from approximately 339.8 thousand tonnes in 1998–89 to around 1.18 million tonnes in 2018–19, an average annual rate of growth of 4.2 per cent per annum over that period. In 2022–23, total international air freight was 895 thousand tonnes.

Table 3.3 Annual total international air freight, by direction, 1988–89 to 2022–23

	Freight by direction ('000 tonnes)		
Year	Inbound	Outbound	Total
1989	173.7	166.1	339.8
1994	222.1	272.6	494.7
1999	325.8	343.0	668.8
2004	356.9	297.8	654.7
2009	421.4	322.1	743.5
2014	548.8	371.8	920.6
2019	586.6	590.3	1,176.9
2023	503.6	391.6	895.4

Sources: BITRE (2023e) and BITRE estimates.

Figure 3.10 Quarterly international air freight, by domestic airport, 2010 to 2023



Sources: BITRE (2023e) and BITRE estimates.

International air freight by major airport

Figure 3.10 shows trends in quarterly international air freight through Australia's major airports since 1984–85, and Table 3.4 shows total annual international air freight volumes by airport over the same period.

Sydney is the largest domestic airport for international air freight imports and exports. Melbourne, Brisbane and Perth also accommodate significant international air freight movements. International air freight through Sydney Airport increased from around 187.2 thousand tonnes in 1988–89 to around 556.1 thousand tonnes in 2018–19, and remained fairly robust during the COVID-19 pandemic, but dropped to around 501.9 thousand tonnes in 2022–23. International air freight volumes through Melbourne Airport have also increased since 1988–89, from around 89.4 thousand tonnes in 2010–11 to around 332.6 thousand tonnes in 2018–19. Air freight was approximately 240.6 thousand tonnes in 2022–23. Total international air freight though Brisbane and Perth airports also increased between 1988–89 and 2018–19, but also dropped during COVID. Total international air freight volumes through Brisbane and Perth airports were around 74.4 thousand tonnes and 64.1 thousand tonnes, respectively, in 2022–23.

Table 3.4 Annual total international air freight, by airport and direction, 1988–89 to 2022–23

		Financial year ending (thousand tonnes)							
Airport	Direction	1989	1994	1999	2004	2009	2014	2019	2023
Sydney	Inbound	100.7	133.3	186.2	192.7	239.2	294.9	318.9	311.4
	Outbound	86.5	130.6	168.8	122.3	126.3	139.0	237.3	190.3
	Total	187.2	264.0	355.1	315.0	365.5	434.0	556.1	501.9
Melbourne	Inbound	48.3	56.4	85.3	100.1	101.5	138.1	143.6	120.4
	Outbound	41.1	63.6	81.6	86.8	98.7	122.5	189.0	120.3
	Total	89.4	120.1	166.8	186.9	200.2	260.6	332.6	240.6
Brisbane	Inbound	10.4	16.3	30.5	33.8	39.2	57.2	61.9	33.8
	Outbound	17.6	34.8	44.0	37.9	45.1	57.0	81.5	40.6
	Total	28.0	51.1	74.5	71.7	84.4	114.2	143.3	74.4
Adelaide	Inbound	2.7	3.0	3.4	5.9	7.1	10.2	13.9	5.3
	Outbound	4.4	7.4	6.4	7.8	11.4	9.6	18.3	5.9
	Total	7.1	10.4	9.9	13.7	18.6	19.8	32.2	11.2
Perth	Inbound	9.4	10.1	15.6	20.6	31.0	42.6	44.1	31.4
	Outbound	14.6	28.3	32.6	33.9	35.4	39.0	59.7	32.6
	Total	24.1	38.4	48.3	54.5	66.4	81.7	103.8	64.1
Darwin	Inbound	0.7	0.3	0.4	0.4	0.3	0.4	0.3	0.2
	Outbound	0.5	1.3	1.0	0.5	0.1	0.0	0.2	0.1
	Total	1.2	1.6	1.4	0.8	0.4	0.4	0.5	0.3
Cairns	Inbound	0.9	2.4	4.2	2.4	1.5	1.9	1.3	0.5
	Outbound	1.1	6.0	8.5	8.7	4.1	3.4	2.3	0.4
	Total	2.0	8.3	12.7	11.1	5.5	5.3	3.6	0.9
Other airports	Inbound	0.5	0.3	0.1	0.9	1.6	3.4	2.7	0.7
	Outbound	0.3	0.4	0.0	0.0	0.9	1.1	2.0	1.3
	Total	0.8	0.7	0.2	1.0	2.5	4.6	4.8	2.0
All airports	Inbound	173.7	222.1	325.8	356.9	421.4	548.8	586.6	503.6
	Outbound	166.1	272.6	343.0	297.8	322.1	371.8	590.3	391.6
	Total	339.8	494.7	668.8	654.7	743.5	920.6	1,176.9	895.4

Sources: BITRE (2023e) and BITRE estimates.

This chapter has provided an outline of historical trends in international aviation activity in Australia, providing some context for the forecasts presented later in the report. The next chapter (Chapter 4) provides a discussion of trends in total air passenger and freight movements through Australia's busiest airports.

4. Aviation activity at major Australian airports

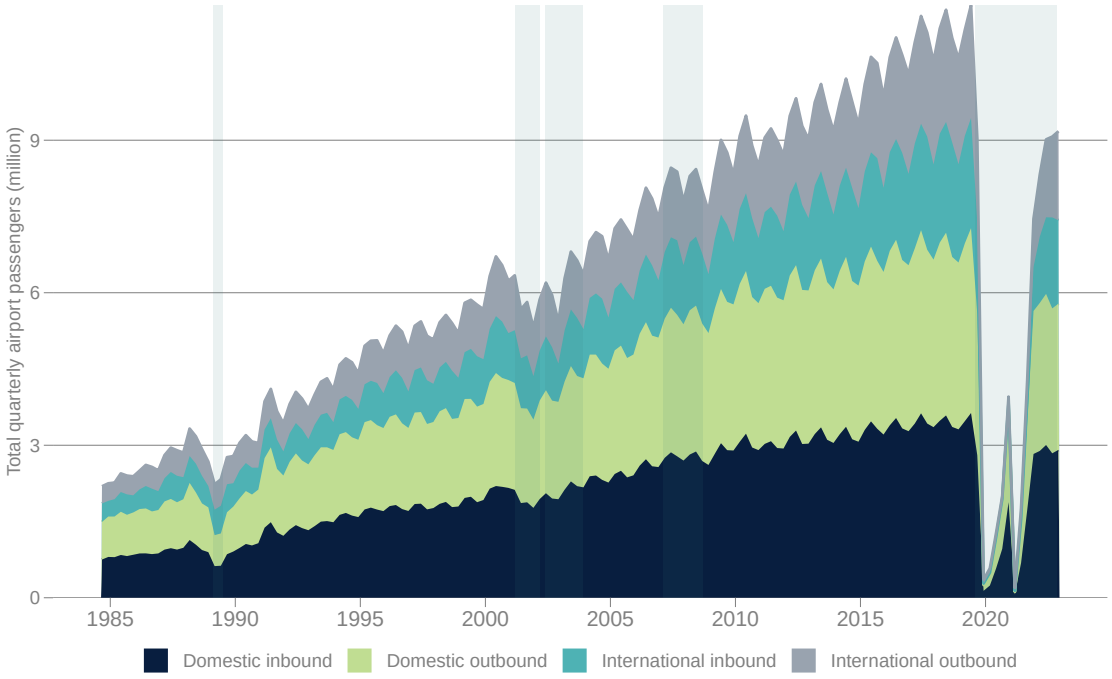
This chapter provides an overview of historical trends in total air passengers and freight through Australia's 14 busiest airports / air catchments. While the previous two chapters briefly highlighted trends in domestic and international air passenger and freight activity at major airports, this chapter focuses on total aviation activity across each airport / air catchment. The discussion provides context for the airport / air catchment-level forecasts presented in Chapter 7.

4.1 Capital city airport trends

Sydney (Kingsford Smith) Airport

Sydney (Kingsford Smith) Airport is Australia's busiest airport in terms of both total passengers and freight. In 2018–19, prior to COVID-19, all air passengers through Sydney Airport totalled 44.4 million passengers – 27.5 million domestic passengers and 16.9 million international passengers. (Figure 4.1 shows quarterly domestic, international and total passengers through Sydney Airport since 1985 and Table 4.1 provides a summary of annual passenger numbers since 1988–89.)

Figure 4.1 Quarterly air passengers, by market, Sydney Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Sydney airport grew by approximately 4.4 per cent per annum. In the June quarter of 2020, passenger numbers through Sydney Airport fell to around 4 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 9.07 million passengers, approximately 82.4 per cent of pre-pandemic (March 2019) levels.

Table 4.1 Annual total air passengers, Sydney Airport, 1989 to 2019

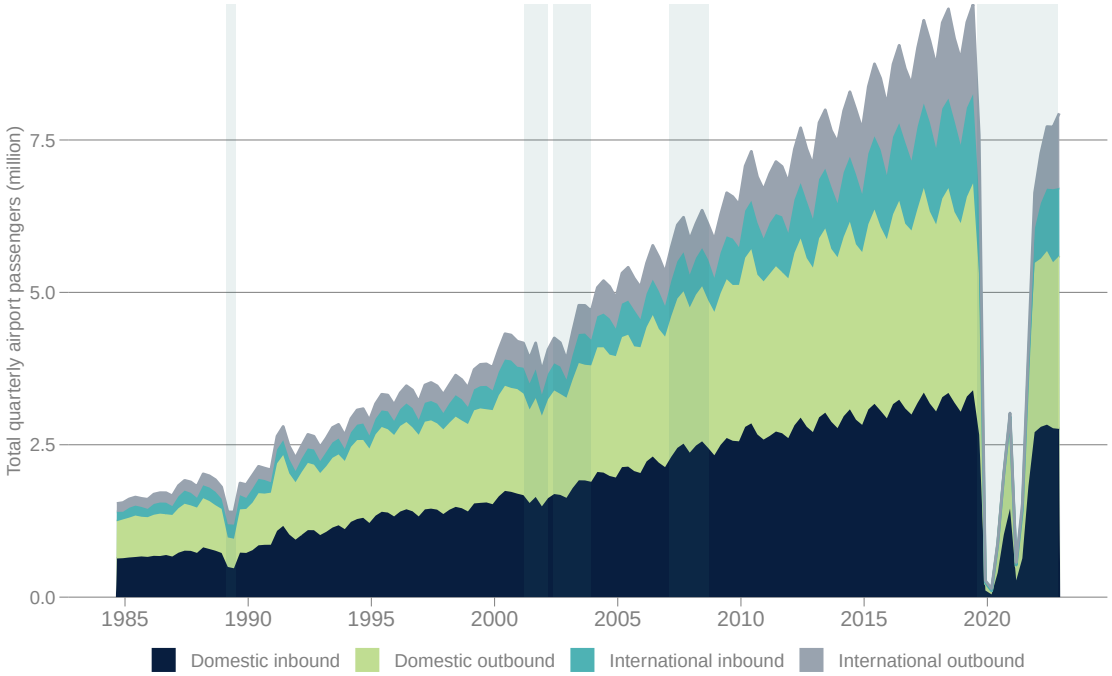
	Passengers, by market (million)		
Year	Domestic	International	Total
1989	7.96	4.14	12.10
1999	14.45	7.13	21.58
2009	22.01	10.34	32.35
2019	27.47	16.91	44.38
Avg. ann. growth (% p.a.)	4.21	4.81	4.43

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Melbourne Airport

Melbourne (Tullamarine) Airport is Australia's second busiest airport both for passengers and freight. In 2018–19, prior to the pandemic, air passengers through Melbourne Airport totalled 37.1 million passengers – 25.7 million domestic passengers and 11.3 million international passengers. (Figure 4.2 shows quarterly domestic, international and total passengers through Melbourne Airport since 1985 and Table 4.2 provides a summary of annual passenger numbers since 1988–89.)

Figure 4.2 Quarterly air passengers, by source and direction, Melbourne Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.2 Annual total air passengers, Melbourne Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	6.16	1.59	7.74
1999	11.56	2.57	14.13
2009	19.62	4.83	24.45
2019	25.71	11.35	37.06
Avg. ann. growth (% p.a.)	4.88	6.78	5.36

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

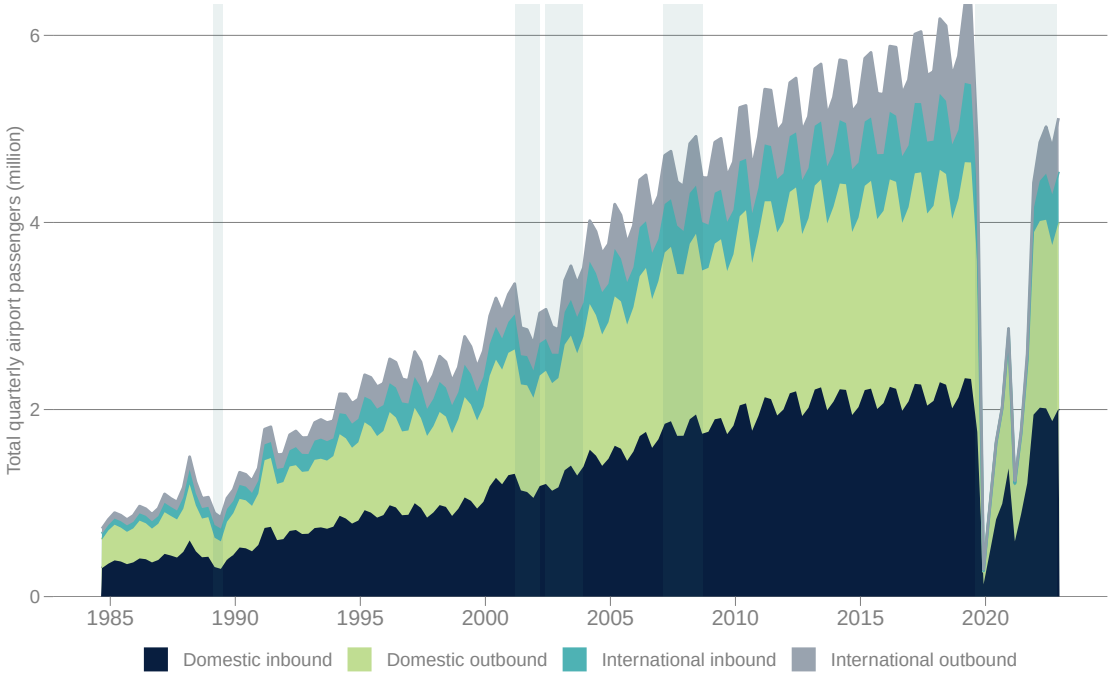
Between 1988–89 and 2018–19, total passengers through Melbourne airport grew by approximately 5.4 per cent per annum. In the June quarter of 2020, passenger numbers through Melbourne Airport fell to around

4 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 7.71 million passengers, approximately 84.2 per cent of pre-pandemic (March 2019) levels.

Brisbane Airport

Brisbane Airport is Australia's third busiest airport in terms of total passengers and freight. In 2018–19, air passengers through Brisbane Airport totalled 23.6 million passengers – 17.4 million domestic passengers and 6.2 million international passengers. (Figure 4.3 shows trends in quarterly domestic, international and total passengers through Brisbane Airport since 1985 and Table 4.3 provides a summary of annual passenger numbers at ten-year intervals since 1988–89.)

Figure 4.3 Quarterly air passengers, by source and direction, Brisbane Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.3 Annual total air passengers, Brisbane Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	3.86	0.97	4.83
1999	7.54	2.29	9.83
2009	14.65	4.07	18.72
2019	17.38	6.25	23.62
Avg. ann. growth (% p.a.)	5.14	6.39	5.43

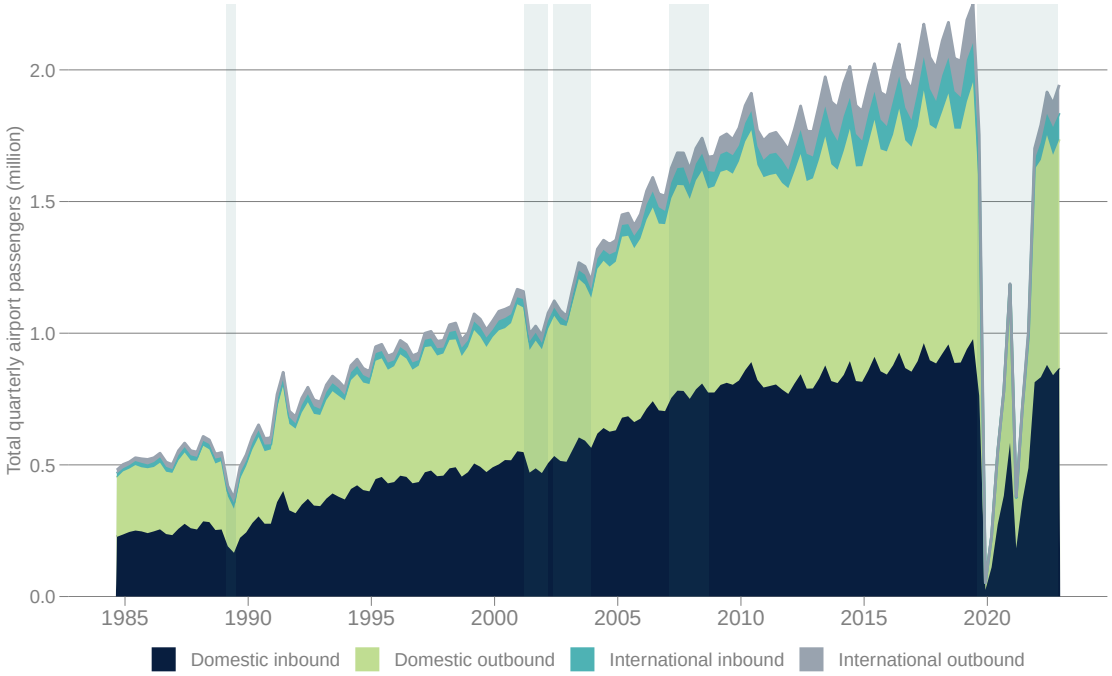
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Brisbane Airport grew by approximately 5.4 per cent per annum. In the June quarter of 2020, passenger numbers through Brisbane Airport fell to around 6 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 4.8 million passengers, approximately 86.3 per cent of pre-pandemic (March 2019) levels.

Adelaide Airport

In 2018–19, prior to COVID-19, air passengers through Adelaide Airport totalled 8.4 million passengers – 7.3 million domestic passengers and 1.1 million international passengers. (Figure 4.4 shows trends in quarterly domestic, international and total passengers through Adelaide Airport since 1985 and Table 4.4 provides a periodic summary of annual passenger numbers since 1988–89.)

Figure 4.4 Quarterly air passengers, by source and direction, Adelaide Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.4 Annual total air passengers, Adelaide Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	2.15	0.14	2.29
1999	3.81	0.23	4.05
2009	6.31	0.48	6.78
2019	7.31	1.06	8.37
Avg. ann. growth (% p.a.)	4.16	7.03	4.41

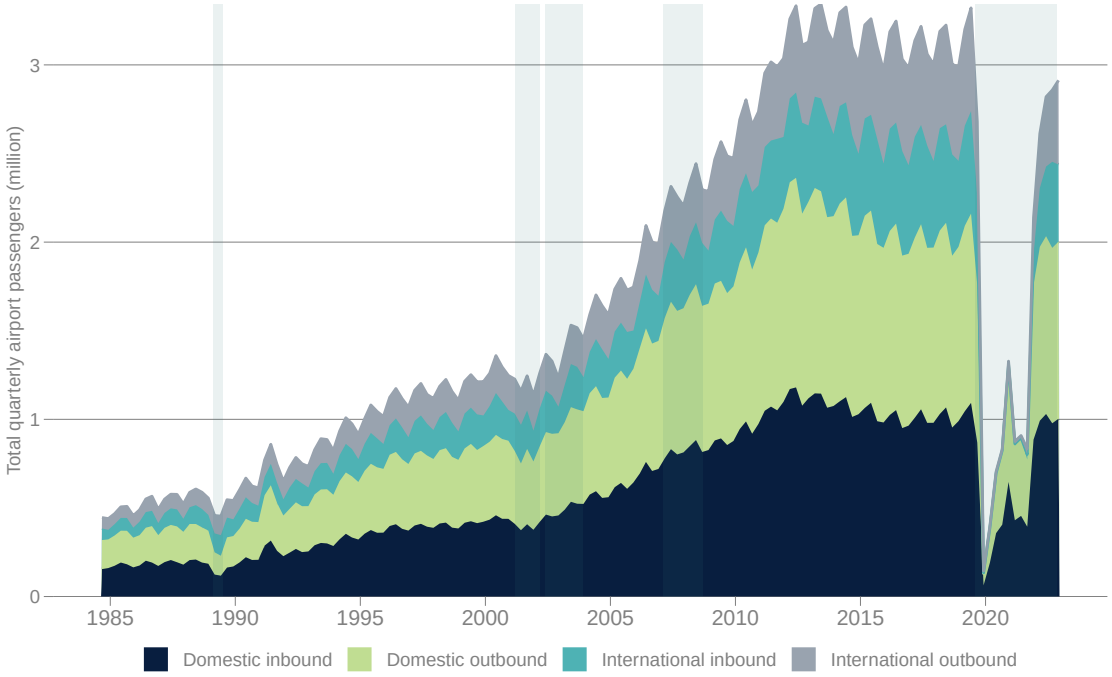
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Adelaide Airport grew by approximately 4.4 per cent per annum. In the June quarter of 2020, passenger numbers through Adelaide Airport fell to around 3 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 1.87 million passengers, approximately 91.6 per cent of pre-pandemic (March 2019) levels.

Perth Airport

In 2018–19, air passengers through Perth Airport totalled 12.4 million passengers – comprising 8.1 million domestic passengers and 4.3 million international passengers. (Figure 4.5 shows quarterly domestic, international and total passengers through Perth Airport since 1985 and Table 4.5 provides a summary of annual air passenger numbers since 1988–89.)

Figure 4.5 Quarterly air passengers, by source and direction, Perth Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.5 Annual total air passengers, Perth Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	1.58	0.76	2.34
1999	3.22	1.45	4.68
2009	6.76	2.60	9.36
2019	8.07	4.33	12.41
Avg. ann. growth (% p.a.)	5.58	5.99	5.72

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

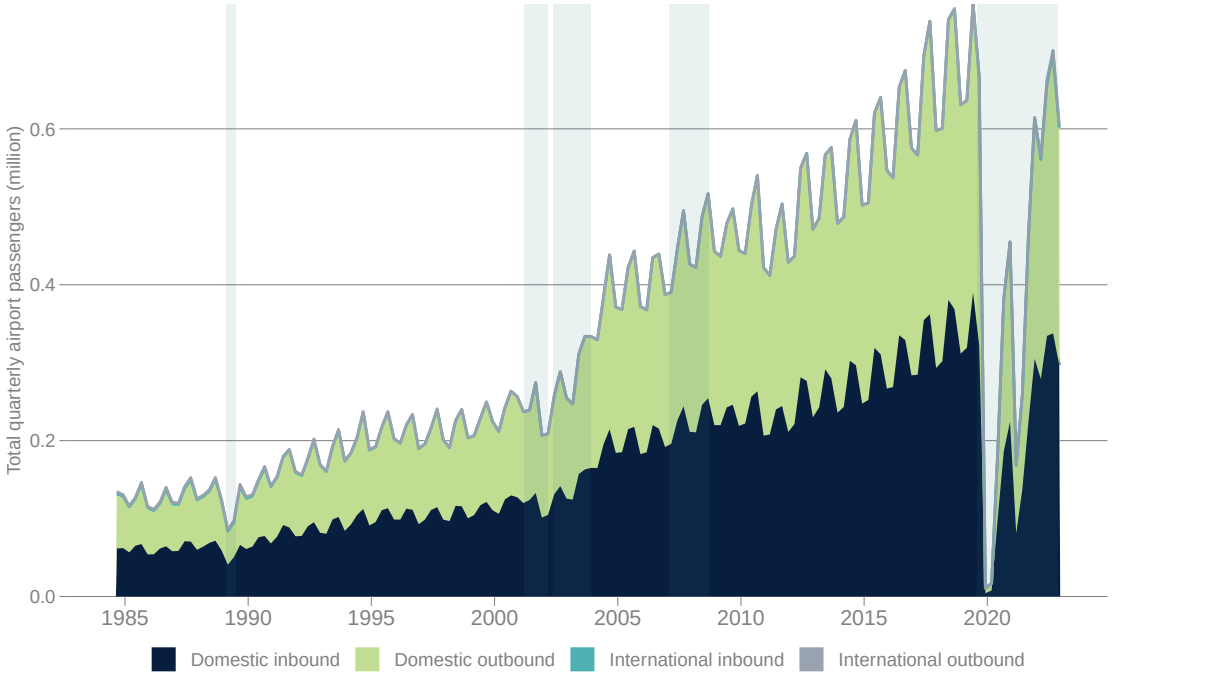
Between 1988–89 and 2018–19, total passengers through Perth Airport grew by approximately 5.7 per cent per annum. Total passenger numbers through Perth Airport increased significantly between 2002–03 and 2012–13, principally as a result of growth in fly-in/fly-out movements related to the mining construction boom. Between 2002–03 and 2012–13 total passenger movements increased from around 5.19 million passengers in 2002–03 to around 12.83 million passengers by 2012–13, an average rate of growth of 9.5 per cent per annum. Since 2012–13, however, total passengers through Perth Airport have grown very little, and domestic passenger numbers declined between 2012–13 and 2018–19.

COVID-19 saw passenger numbers through Perth Airport fall to around 5 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 2.86 million passengers, approximately 95.1 per cent of pre-pandemic (March 2019) levels.

Hobart Airport

In 2018–19, air passengers through Hobart Airport totalled 2.7 million passengers – domestic movements accounted for nearly 100 per cent of all passengers movements through Hobart Airport. (Figure 4.6 shows quarterly domestic, international and total passengers through Hobart Airport since 1985 and Table 4.6 provides a summary of annual passenger movements and growth since 1988–89.)

Figure 4.6 Quarterly air passengers, by source and direction, Hobart Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.6 Annual total air passengers, Hobart Airport, 1989 to 2019

	Passengers (million)	
Year	Domestic	Total
1989	0.53	0.54
1999	0.86	0.86
2009	1.87	1.87
2019	2.73	2.73
Avg. ann. growth (% p.a.)	5.62	5.52

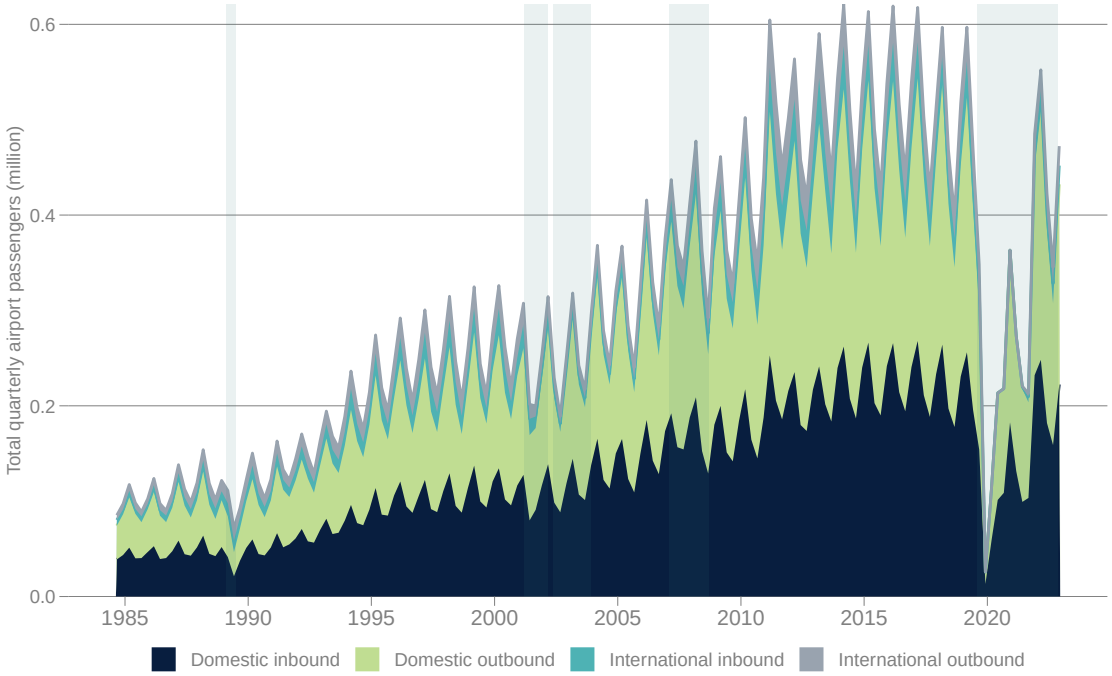
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Hobart Airport grew by approximately 5.5 per cent per annum. In the June quarter of 2020, passenger numbers through Hobart Airport fell to around 2 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 701 thousand passengers, approximately 92.9 per cent of pre-pandemic (March 2019) levels.

Darwin Airport

In 2018–19, prior to COVID-19, total air passengers through Darwin Airport were 2 million passengers – approximately 1.7 million domestic passengers and 235 thousand international passengers. (Figure 4.7 shows quarterly trends in domestic, international and total passengers through Darwin Airport since 1985 and Table 4.7 provides a summary of annual passenger movements and growth in passenger movements since since 1988–89.)

Figure 4.7 Quarterly air passengers, by source and direction, Darwin Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.7 Annual total air passengers, Darwin Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	0.41	0.09	0.50
1999	0.86	0.17	1.03
2009	1.35	0.19	1.54
2019	1.75	0.24	1.98
Avg. ann. growth (% p.a.)	4.95	3.42	4.73

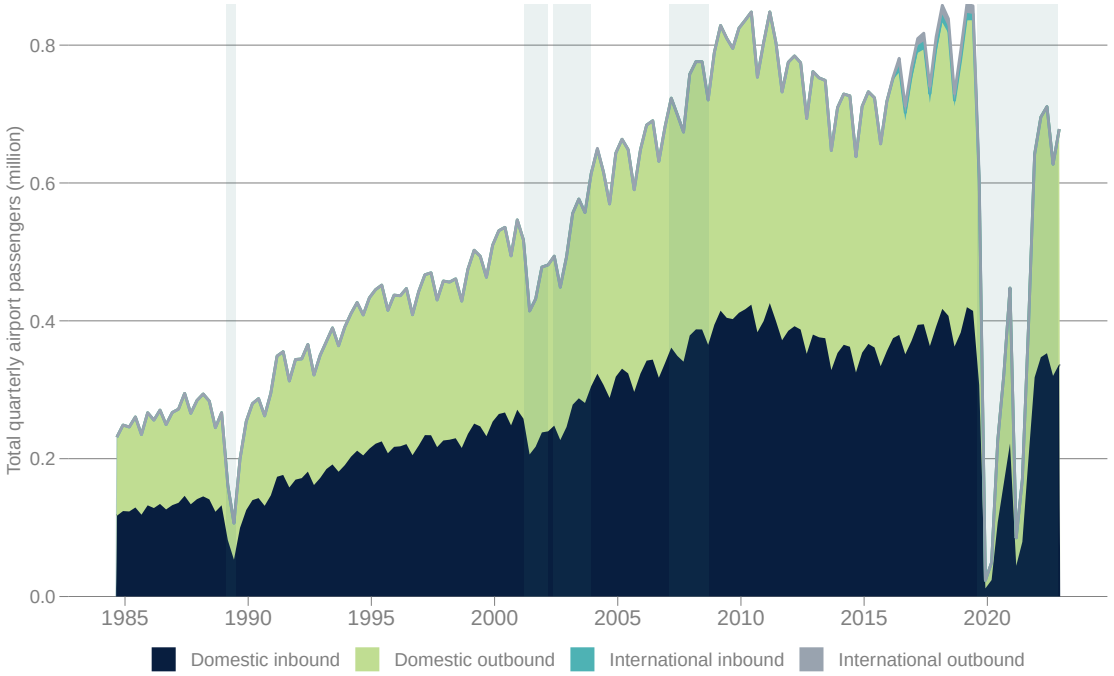
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Darwin Airport grew by approximately 4.7 per cent per annum. In the June quarter of 2020, passenger numbers through Darwin Airport fell to around 5 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 345 thousand passengers, approximately 86.3 per cent of pre-pandemic (March 2019) levels.

Canberra Airport

In 2018–19, air passengers through Canberra Airport totalled 3.2 million passengers – comprising 3.1 million domestic passengers and approximately 86,900 international passengers. (Figure 4.8 shows quarterly domestic, international and total passengers through Canberra Airport since 1985 and Table 4.8 provides a summary of annual passenger numbers since 1988–89.)

Figure 4.8 Quarterly air passengers, by source and direction, Canberra Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.8 Annual total air passengers, Canberra Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	1.09	0.00	1.09
1999	1.82	0.00	1.82
2009	3.06	0.00	3.06
2019	3.13	0.09	3.22
Avg. ann. growth (% p.a.)	3.58	..	3.68

.. not applicable.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Canberra Airport grew by approximately 3.7 per cent per annum. However, much of this increase occurred between 1988–89 and 2009–10 – between 2009–10 and 2018–19, total passenger numbers first declined by around 13.9 per cent to 2014–15, and then increased by an equivalent amount between 2014–15 and 2018–19. The reduction in passengers through Canberra Airport between 2010 and 2015, appears near coincident with reductions in public sector employment and expenditure.

At the height of the COVID-19 pandemic, in the June quarter of 2020, passenger numbers through Canberra Airport fell to around 3 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 627 thousand passengers, approximately 86 per cent of pre-pandemic (March 2019) levels.

4.2 Non-capital city airport passenger trends

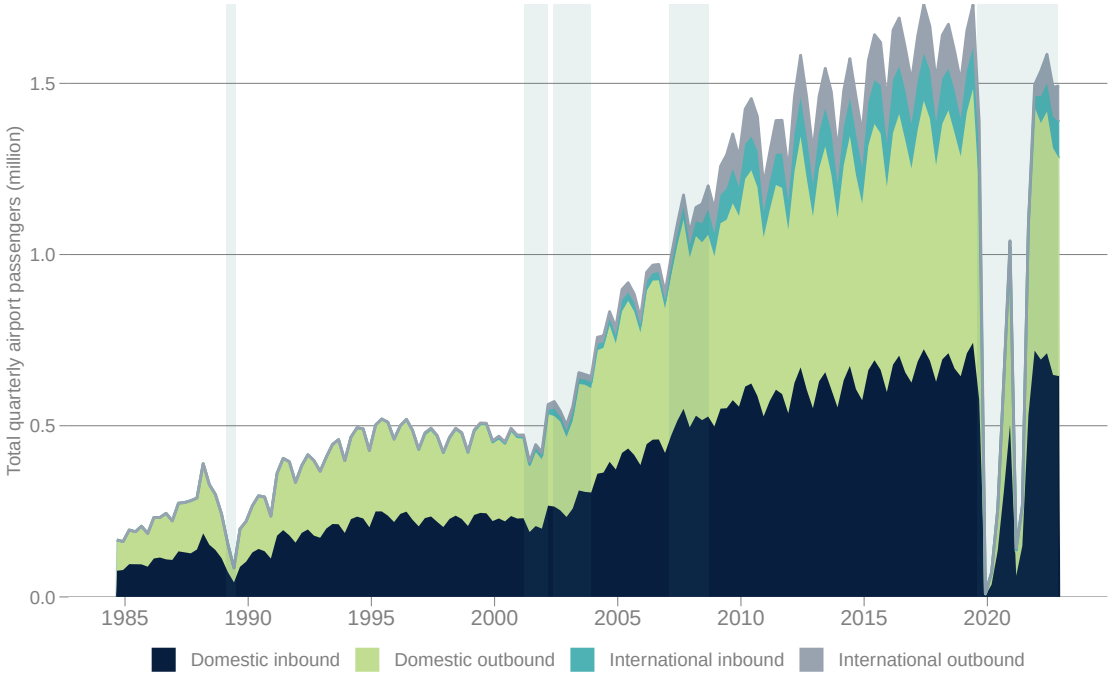
The next six busiest Australian airports, by total passenger numbers in 2018–19, were:

- Gold Coast (Coolangatta)
- Cairns
- Townsville
- Launceston
- Sunshine Coast (Maroochydore)
- Newcastle

Gold Coast Airport

In 2018–19, prior to COVID-19, air passengers through Gold Coast (Coolangatta) Airport totalled 6.4 million passengers – comprising 5.4 million domestic passengers and 1 million international passengers. (Figure 4.9 shows quarterly domestic, international and total passengers through Gold Coast Airport since 1985 and Table 4.9 provides a summary of annual passenger numbers since 1988–89.)

Figure 4.9 Quarterly air passengers, by source and direction, Gold Coast Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.9 Annual total air passengers, Coolangatta Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	1.26	0.00	1.26
1999	1.85	0.02	1.86
2009	4.14	0.48	4.62
2019	5.45	0.97	6.41
Avg. ann. growth (% p.a.)	5.00	..	5.58

.. not applicable.

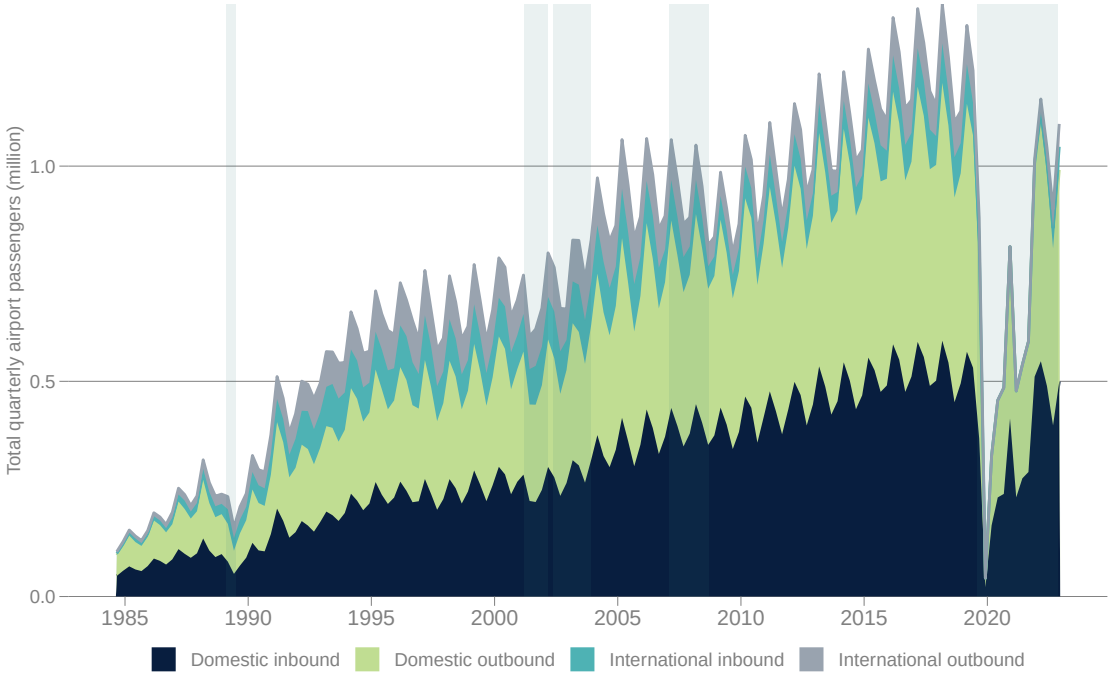
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Gold Coast Airport grew by approximately 5.6 per cent per annum. In the June quarter of 2020, passenger numbers through Coolangatta Airport fell to around 1 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 1.49 million passengers, approximately 93.3 per cent of pre-pandemic (March 2019) levels.

Cairns Airport

In 2018–19, air passengers through Cairns Airport totalled 4.9 million passengers – 4.2 million domestic passengers and around 661 thousand international passengers. (Figure 4.10 shows quarterly trends in domestic, international and total passengers through Cairns Airport since 1985 and Table 4.10 provides a summary of annual passenger numbers and average annual growth since 1988–89.)

Figure 4.10 Quarterly air passengers, by source and direction, Cairns Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.10 Annual total air passengers, Cairns Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	0.86	0.19	1.05
1999	1.97	0.68	2.66
2009	3.16	0.50	3.65
2019	4.20	0.66	4.86
Avg. ann. growth (% p.a.)	5.41	4.25	5.23

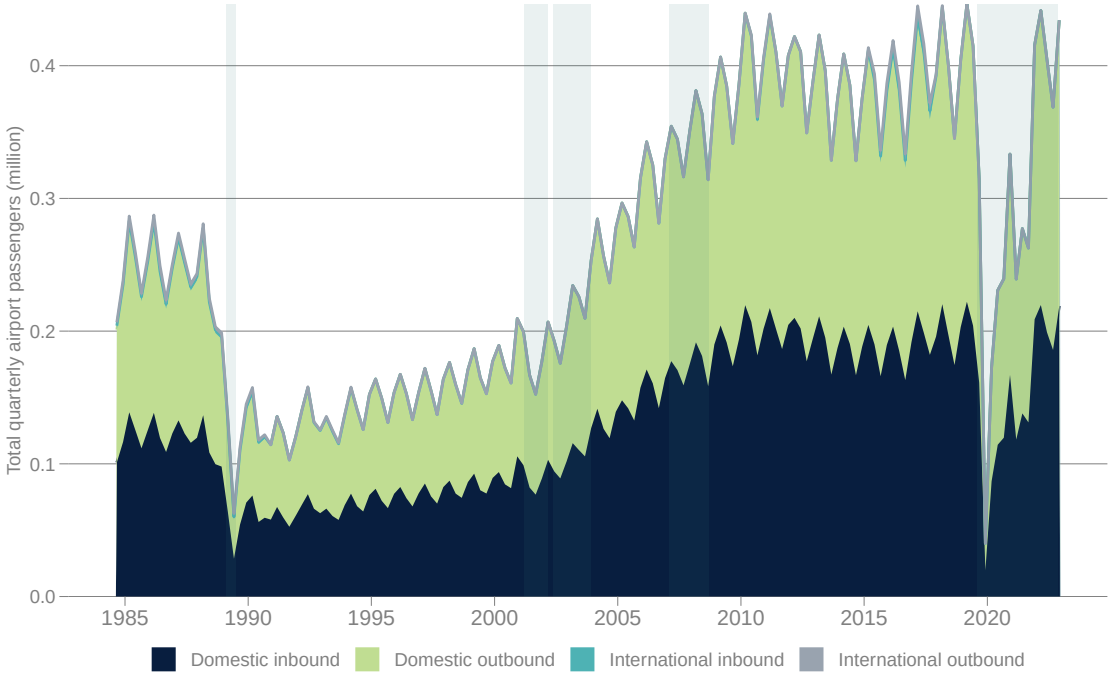
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Cairns Airport grew by approximately 5.2 per cent per annum. In the June quarter of 2020, passenger numbers through Cairns Airport fell to around 4 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 900 thousand passengers, approximately 81.6 per cent of pre-pandemic (March 2019) levels.

Townsville Airport

In 2018–19, prior to COVID-19, air passengers through Townsville Airport totalled 1.6 million passengers – domestic passengers account for almost all passenger throughput. (Figure 4.11 shows quarterly domestic, international and total passengers through Townsville Airport since 1985 and Table 4.11 provides a summary of total annual passengers through the airport and average annual growth since 1988–89.)

Figure 4.11 Quarterly air passengers, by source and direction, Townsville Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.11 Annual total air passengers, Townsville Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	0.89	0.02	0.91
1999	0.65	0.00	0.65
2009	1.44	0.00	1.44
2019	1.59	0.00	1.59
Avg. ann. growth (% p.a.)	1.97	..	1.90

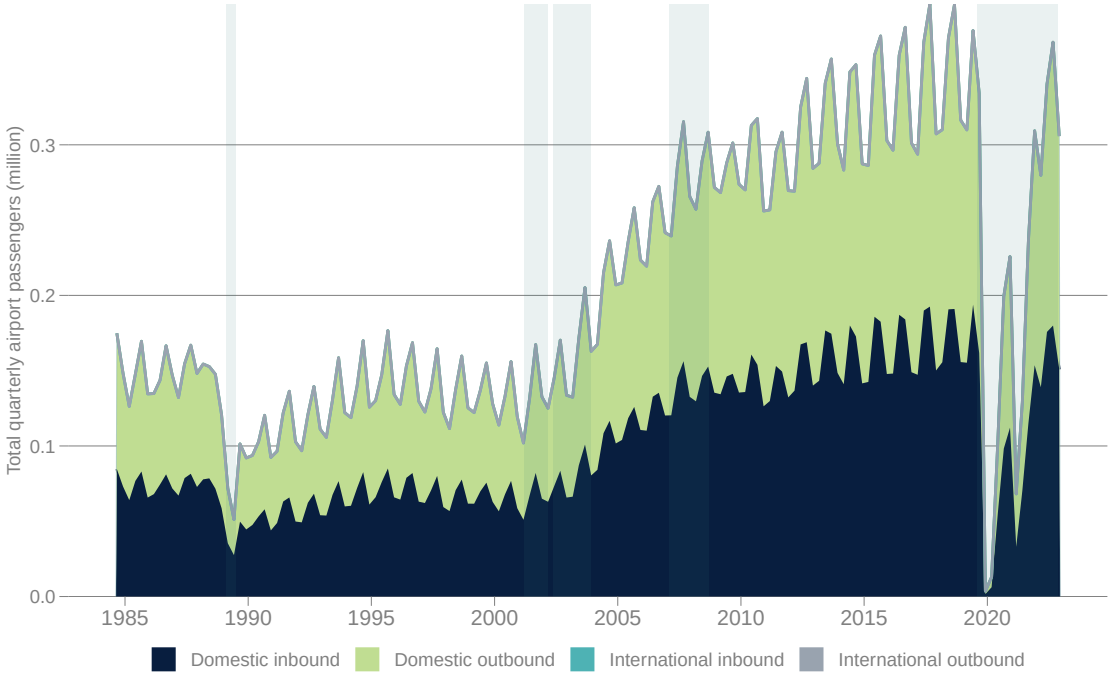
.. not applicable.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Townsville Airport grew by approximately 1.9 per cent per annum. In the June quarter of 2020, passenger numbers through Townsville Airport fell to around 10 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 369 thousand passengers, approximately 106.8 per cent of pre-pandemic (March 2019) levels.

Launceston Airport

In 2018–19, prior to COVID-19, air passengers through Launceston Airport totalled 1.4 million passengers – Launceston Airport does not cater to international air services. (Figure 4.12 shows quarterly trends in domestic passengers through Launceston Airport since 1985 and Table 4.12 provides a summary of annual passenger numbers and average annual growth since 1988–89.)

Figure 4.12 Quarterly air passengers, by source and direction, Launceston Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.12 Annual total air passengers, Launceston Airport, 1989 to 2019

	Passengers (million)	
Year	Domestic	Total
1989	0.58	0.58
1999	0.53	0.53
2009	1.13	1.13
2019	1.39	1.39
Avg. ann. growth (% p.a.)	2.99	2.99

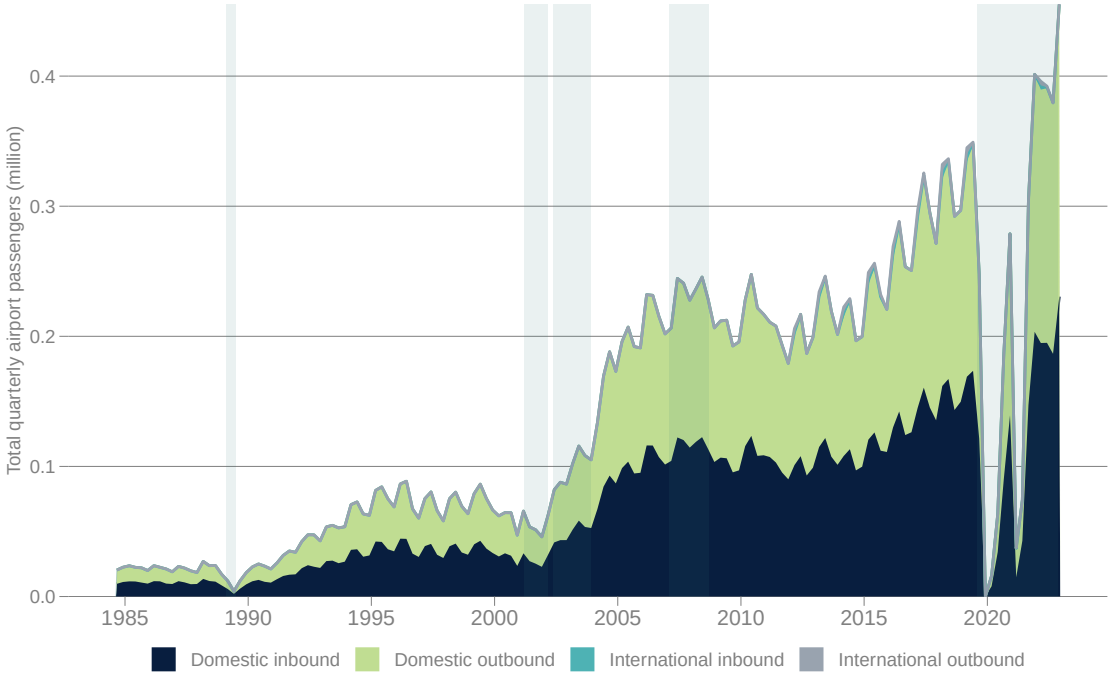
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Launceston Airport grew by approximately 3 per cent per annum. In the June quarter of 2020, passenger numbers through Launceston Airport fell to around 2 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 368 thousand passengers, approximately 93.6 per cent of pre-pandemic (March 2019) levels.

Sunshine Coast Airport

In 2018–19, prior to the pandemic, air passengers through Sunshine Coast (Maroochydore) Airport totalled 1.3 million passengers – domestic passengers comprised nearly 100 per cent of all passengers, with around 1.2 million passengers in 2018–19, and international passenger throughput was around 14 thousand passengers in 2018–19. (Figure 4.13 shows quarterly domestic, international and total passengers through Sunshine Coast Airport since 1985 and Table 4.13 provides a summary of total annual passenger numbers and average annual growth in passengers since 1988–89.)

Figure 4.13 Quarterly air passengers, by source and direction, Sunshine Coast Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.13 Annual total air passengers, Sunshine Coast Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	0.09	0.00	0.09
1999	0.29	0.00	0.29
2009	0.92	0.00	0.92
2019	1.24	0.01	1.26
Avg. ann. growth (% p.a.)	9.08	..	9.12

.. not applicable.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

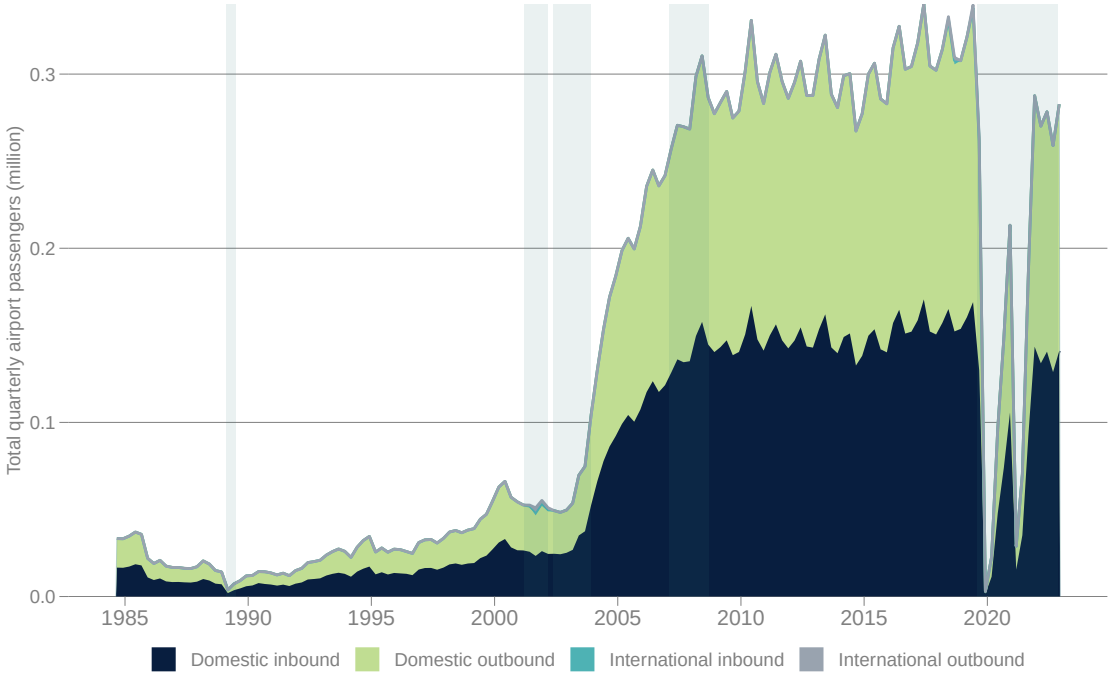
Between 1988–89 and 2018–19, total passengers through Sunshine Coast Airport grew by approximately 9.1 per cent per annum. A significant proportion of that growth occurred between 2003–04 and 2005–06, with passenger numbers increasing from around 430 thousand passengers in 2003–04 to around 790 thousand passengers by 2005–06. Between 2005–06 and 2018–19, passenger numbers grew by around 3.7 per cent per annum.

COVID-19 resulted in passenger numbers through Sunshine Coast Airport in the June quarter of 2020 falling to near zero. By March 2023, total passenger numbers had 'recovered' to around 379 thousand passengers, approximately 129.9 per cent of pre-pandemic (March 2019) levels.

Newcastle Airport

In 2018–19, prior to the arrival of COVID-19, air passengers through Newcastle Airport totalled 1.3 million passengers – domestic passengers comprise nearly 100 per cent of all passengers through Newcastle Airport, with around 6,700 international passengers in 2018–19. (Figure 4.14 shows the profile of quarterly domestic, international and total passengers numbers through Newcastle Airport since 1985 and Table 4.14 provides a summary of total annual passenger numbers and average annual growth since 1988–89.)

Figure 4.14 Quarterly air passengers, by source and direction, Newcastle Airport, 1985 to 2023



Note: Shaded vertical regions highlight, in order, the Pilot's dispute (1989), 9/11 and Ansett collapse (2001), SARS (2003–2004), GFC (2007–2009) and COVID-19.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 4.14 Annual total air passengers, Newcastle Airport, 1989 to 2019

	Passengers, by market (million)		
Year	Domestic	International	Total
1989	0.07	0.00	0.07
1999	0.15	0.00	0.15
2009	1.17	0.00	1.17
2019	1.26	0.01	1.26
Avg. ann. growth (% p.a.)	10.20	..	10.22

.. not applicable.
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Between 1988–89 and 2018–19, total passengers through Newcastle Airport grew by approximately 10.2 per cent per annum. However, most of the growth in total passengers occurred between 2003 and expansion of the terminal facilities in 2006 – with passenger numbers increasing from around 221 thousand passenger in 2003 to around 1.01 million passengers by 2007. Between 2006–07 and 2018–19, total passenger numbers grew by 2.3 per cent per annum. The quarterly passenger profile also suggests the period prior to 2006–07 is not relevant for the purposes of the long-term forecasting model.

The impact of COVID-19 saw passenger numbers through Newcastle Airport in the June quarter of 2020, fall to around 1 per cent of the previous year. By March 2023, total passenger numbers had recovered to around 259 thousand passengers, approximately 83.6 per cent of pre-pandemic (March 2019) levels.

The next chapter outlines the forecast methodology, model results and key forecast assumptions.

5. Forecast methodology, results and key assumptions

This chapter provides an overview of the forecast methodology, data sources, model results and key assumptions used to generate the long-term air passenger and freight forecasts reported in Chapters 6 and 7.

5.1 Aviation forecast models & methodology

BITRE's aviation forecasts are based on a suite of separate statistical models covering the following market segments:

- domestic (scheduled) air passenger movements
- domestic air freight
- international air passenger movements, comprising separate models for:
  - international visitor arrivals and departures
  - domestic resident departures and arrivals
- international air freight, comprising separate models for:
  - air freight imports
  - air freight exports
- domestic general aviation (GA) activity (see Appendix F).

All domestic and international passenger forecast model specifications are dynamic, allowing for differing short- and long-run responses of air travel to changes in socio-economic factors. All domestic and international freight models, by contrast, are static specifications, with no allowance for time-varying responses to changes in modelled factors.

All air passenger and freight forecast models, with the exception of domestic GA activity, are modelled and forecast using quarterly frequency data. (GA activity data is only available annually.) All long-term forecasts are reported on an annual (financial year) basis only.

The following sections provide a brief outline of the forecasting model specification for each modelled aviation market segment – more detailed functional specifications for each forecasting model are presented in Appendix A.

Domestic aviation forecast models

Domestic air passenger forecast models

Domestic air passenger activity is separately modelled at the national level and for each of the 14 busiest domestic airports / air catchments (by passenger throughput).

The national-level model relates total domestic passenger numbers and domestic passenger kilometres to domestic economic activity (GDP), domestic airfares, and event-specific dummy variables to capture the impact of significant events, including the pilot's dispute (1989), 9/11 and Ansett collapse (2000–2001) and COVID-19.

The airport-level models related total domestic passenger numbers through each of the 14 busiest airports / air catchments to local catchment regional product, domestic airfares, other regional factors and economy-wide event-specific dummy variables.

All domestic air passenger models were estimated using quarterly passenger activity data extending back to 1985.

Domestic air freight forecast models

Domestic air freight activity is also modelled at both national and at airport level for each of the five-largest capital city airports – Sydney, Melbourne, Brisbane, Adelaide and Perth. Air freight volumes through other airports are relatively small and not separately available in published statistics (BITRE 2023c), and hence are not separately modelled or forecast here.

Total domestic air freight is modelled as a function of domestic GDP, domestic air transport costs (proxied by aviation fuel costs),[11] and event-specific dummy variables.

Airport-level domestic air freight is modelled as a function of local airport catchment regional product, domestic air transport costs and event-specific dummy variables.

All domestic air freight models are estimated using quarterly freight activity data from 2011 onwards.[12]

International aviation forecast models

Domestic resident international departures and arrivals

Domestic resident international departures are also modelled at both national- and airport / air catchment-level for each of the eight major international aviation gateways – Sydney, Melbourne, Brisbane, Adelaide, Perth, Darwin, Gold Coast and Cairns. Other airports that currently, or have previously, recorded small numbers of international passenger movements include Canberra, Hobart, Sunshine Coast, Townsville and Newcastle airports. However, international passenger volumes through these airports are relatively minor and insufficiently regular to support the long-term forecasting approach applied here.

The national- and airport-level domestic resident departure models relate total quarterly domestic resident departures to domestic (national- or air catchment-level) economic activity, international airfares (proxied by aviation fuel costs), effective (real) exchange rates, and event-specific dummy variables to capture the impact of periodic market shocks (including COVID-19).

The number of residents returning from overseas appear to lag total departures by several quarters, and are modelled (and forecast) as a distributed lag of total resident departures.

International domestic resident departures were estimated using quarterly data covering the period 1989 to 2023.

Foreign visitor international arrivals and departures

Foreign visitor arrivals are modelled separately for each of nine major world regions:

- Americas
- North Africa and Middle East
- North-East Asia
- North-West Europe
- Oceania and Antarctica
- South-East Asia
- Southern and Central Asia
- Southern and Eastern Europe
- Sub-Saharan Africa.

For each region, total international visitor arrivals are modelled as a function of regional GDP,[13] international airfares (proxied by aviation fuel costs), effective (real) exchange rates, and event-specific dummy variables to capture the impact of significant events, including COVID-19. International visitors from each region are subsequently allocated to Australian international airports, based on recent world region–Australian airport visitor arrival shares.

For each major world region, the number of foreign visitors departing are also modelled (and forecast) as a distributed lag of actual visitor arrivals, and allocated to domestic airports based on recent world region–Australian airport visitor departure shares.

International foreign visitor arrivals were estimated using quarterly data from 1995 to 2023.

11 Aviation fuel costs are used as a proxy for trends in air freight costs, as aviation fuel is a significant operating cost. In practice. air freight rates may be influenced by passenger flight numbers and frequency, and available cargo-hold capacity on passenger flights, and so actual air freight rates charged by airlines may not vary in line with aviation fuel costs.

12 As noted in Chapter 2, prior to January 2010, BITRE's air freight statistics provide only partial coverage of total domestic air freight, capturing only freight carried by commercial passenger services operated by major carriers, but not freight carried by dedicated air freight services.

13 Regional GDP is estimated as the sum of GDP across all *major* countries in each world region.

International air freight exports and import forecast models

International air freight exports are modelled at national level and at airport level for each of the seven major international airports – Sydney, Melbourne, Brisbane, Adelaide, Perth, Darwin, Cairns. Total and airport-level air freight exports are modelled as a function of total Australian GDP, international air freight costs (proxied by aviation fuel costs), effective (real) exchange rates, and, again, event-specific dummy variables.

International air freight imports are also modelled at national- and airport-level across each of the seven major international airports. Like exports, total- and airport-level air freight imports are also modelled as a function of Australian GDP, international air freight costs (proxied by aviation fuel costs), effective (real) exchange rates, and event-specific dummy variables.

Both the international air freight exports and imports models are estimated using quarterly data covering the period 1995 to 2023.

5.2 Historical data sources

The historical data used to estimate the domestic and international air passenger and freight forecasting models are drawn from a wide range of sources, which are briefly outlined here.

Australian domestic and international air passenger and freight activity and domestic airfares were sourced from BITRE's aviation statistics collection:

- Australian domestic air passenger and freight activity: BITRE (2023c)
- Australian international air passenger and freight activity: BITRE (2023e)
- Australian general aviation activity: BITRE (2023a)
- Australian domestic air fares: BITRE (2023b)

Domestic economic indicators (and sources) used in the forecast models include:

- Australian economic indicators:
  - GDP: Australian National Accounts (ABS 2023a)
  - CPI: Australian Consumer Price Index (ABS 2023b)
- National and regional estimated resident population (ERP): ABS (2023e), ABS (2022) and ABS (2019).

International economic indicators (and sources) used in the forecast models include:

- World country economic indicators:
  - OECD Quarterly National Accounts, Consumer Prices, and Monetary and Financial Statistics (OECD 2023a, OECD 2023c, OECD 2023b)
  - IMF International Financial Statistics (IMF 2023)
  - World Bank statistics (World Bank 2023)
- Country population estimates: UN World Population Prospects 2022 (UN 2022)
- Exchange rates: (OECD 2023b, IMF 2023, World Bank 2023, RBA 2023).

5.3 Aviation forecast model results

This section presents a summary of the implied aviation forecast model elasticities – the elasticities indicate the degree of responsiveness of air passenger and air freight activity to changes in income, fares and exchange rates. Results are presented for each of the different aviation market forecast models. More detailed empirical results for all forecast models are listed in Appendix B.

Domestic air passenger model results

Table 5.1 shows the estimated short- and long-run air passenger elasticities for total domestic air passenger activity (passenger kilometres) in Australia. The implied long-run *income* elasticity is relatively *elastic* at around +1.1, but the airfare elasticity is quite *inelastic*, around –0.24 – both are statistically significant. The implications of these results is that changes in income can have a significant impact on domestic aviation activity, but that changes in airfares have to be quite large to induce significant changes in domestic air passenger activity. Domestic air passenger demand is relatively insensitive to both income and airfares in the short run – both terms are not statistically significant in the short-run. The error-correction term (ECM term) coefficient (or dynamic adjustment term) is significant, and provides a measure of the rate of dynamic adjustment in the aviation market – the ECM term parameter estimate (–0.20) implies approximately 20 per cent of the divergence from the current market equilibrium occurs each period.

Table 5.1 Total domestic passenger activity model short- and long-run elasticities

	Variable		
Period	Income	Fares	ECM term
Long-run	1.08***	-0.241***	..
Short-run	ns	ns	-0.203**

.. not applicable.
Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.
Source: BITRE estimates.

Table 5.2 shows the estimated short- and long-run air passenger elasticities for domestic air passengers through each of Australia's 14 busiest airports. The implied long-run *income* elasticities are statistically significant across all major airports, generally ranging between +0.5 and +1.5, with the elasticity around +0.8 to +1.0 across the five mainland capital city airports – Sydney, Melbourne, Brisbane, Adelaide and Perth. The income elasticity for air travel to/from Canberra is relatively lower (+0.58), which appears consistent with activity being heavily influenced by public-sector related travel and less to economic activity. The income elasticity for Hobart and Sunshine Coast (Maroochydore) airports are significantly higher than for other airports.

The implied *long-run* airfare elasticities are generally around –0.18 to –0.20, for the larger airports, but slightly higher for Perth at around –0.36, implying that domestic air travel is relatively inelastic (insensitive) to movements in domestic airfares – again, the implication of these findings is that changes in airfares have to be large to induce significant changes in domestic air passenger movements. The airfare elasticities for Gold Coast, Launceston and Townsville airports, are slightly higher than for other airports. The airfare elasticities are not statistically significant for Darwin and Newcastle airports.

The *short-run* income and airfare elasticities for airport passengers are either not significant or marginally statistically significant. Where the elasticities are marginally significant, they are generally the expected sign, though not always consistent with economic theory – the short-run income elasticity is higher than the long-run elasticity for some airports. The airfare elasticities are either very small or not statistically significant for most airports (and smaller than the long-run equivalent). The error correction terms are either strongly or marginally significant across most airports, and have the correct sign – they broadly imply the size of the dis-equilibrium adjustment is about 20–25 per cent of the divergence from equilibrium.

Table 5.2 Domestic air passenger elasticities

	Long-run		Short-run		
Airport	Income	Fares	Income	Fares	ECM term
Sydney	0.811***	-0.182***	0.594.	-0.0916*	-0.163.
Melbourne	0.904***	-0.192***	0.606.	-0.101*	-0.228*
Brisbane	0.901***	-0.197***	ns	ns	ns
Adelaide	0.994***	-0.172***	0.816*	-0.117**	-0.221**
Perth	0.979***	ns	ns	ns	-0.164*
Hobart	1.48***	-0.283***	ns	ns	-0.178**
Darwin	1.01***	ns	1.58**	ns	-0.245**
Canberra	0.566***	-0.245*	0.891.	ns	ns
Coolangatta	0.771***	-0.617***	1.36**	-0.14*	-0.249***
Cairns	0.887***	-0.12*	ns	ns	-0.226***
Launceston	1.08***	-0.525***	ns	ns	-0.235***
Williamtown	0.267*	ns	ns	ns	-0.351*
Townsville	0.944***	-0.367***	1.17**	-0.111*	-0.156**
Maroochydore	1.41***	0.558***	ns	ns	ns
All airports	0.901***	-0.27***	0.63*	-0.0851*	-0.181*

Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.
Source: BITRE estimates.

Domestic air freight model results

Table 5.3 shows the estimated elasticities for all domestic air freight in Australia, with separate estimates for total freight tonne kilometres and total freight tonnes (uplift-discharge basis). The implied *income* elasticity is marginally statistically significant for freight tonne kilometres, and highly significant for total tonnes. Domestic air freight movements were insensitive to aviation costs. The estimated income elasticities are negative, which suggests that domestic air freight activity is inversely correlated with total domestic economic activity. This is

not expected and presumably reflects trends in air freight across the estimation period (June 2011 – June 2023), a period in which there was a general decline in total air freight across Australia and a significant drop in air freight between 2013 and 2015.

The estimated income elasticity, combined with projected growth in domestic economic activity, would imply significant reductions in future domestic air freight. For the long-term domestic freight forecasts (presented in Chapters 6 and 7), BITRE has moderated the estimated income elasticities to moderate the impact on the air freight forecasts.

Table 5.3 Domestic air freight elasticities – all freight

Freight task	Income	Av. fuel costs
Freight TKM (TOB)	-0.302.	ns
Freight tonnes (UD)	-0.563***	ns

Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.
Source: BITRE estimates.

Table 5.4 shows the estimated elasticities for domestic air freight movements to/from Australia's major capital city airports. Again, the implied income elasticities are statistically significant, for all but Melbourne and Perth airports, but not of the expected sign. Air freight costs are not strongly statistically significant for any airport. Again, these elasticities would imply significant reductions in future domestic air freight through almost all major airports, and for the long-term domestic freight forecasts BITRE has moderated the income elasticity values.

Table 5.4 Domestic air freight elasticities, major airports

Airport	Income	Av. fuel costs
Sydney	-1.78***	ns
Melbourne	ns	-0.32.
Brisbane	-0.7***	ns
Adelaide	-1.38***	ns
Perth	ns	ns
All airports	-0.621**	ns

Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.
Source: BITRE estimates.

International air passenger model results

Foreign visitor international arrivals and departures

Table 5.5 shows the estimated short- and long-run air passenger elasticities for foreign visitor arrivals, by major world region. The implied long-run *income* elasticities are statistically significant across all major regions – international visitor arrivals are *income elastic* (i.e. ≥ 1.0) for visitors from the Americas, North West Europe, other Oceania (predominantly New Zealand) and Southern and Central Asia, but income inelastic (i.e. ≤ 1.0) for other major regions. (The long-run elasticity for Sub-Saharan African visitor arrivals is strongly negative, which is counter *a priori* expectations.)

Aviation fuel cost elasticities are statistically significant for seven of the nine world regions, but not of the expected sign (i.e. negative) for five of the nine major regions.

The effective (real) exchange rate term enters the specification as foreign prices divided by Australian prices, hence, the sign of this elasticity is expected to be positive. The effective exchange rate term is relatively elastic and statistically significant across most regions, with the exception of visitor arrivals from North West Europe.

The short-run income, aviation cost and exchange rate elasticities are generally either marginally or not statistically significant. However, the error correction term is generally strongly significant, and of the expected sign (i.e. negative), across almost all major regions, and generally imply a relatively rapid adjustment to long-run changes across all markets except Sub-Saharan Africa and, to a lesser extent, Southern and Central Asia.

Table 5.5 International visitor arrival elasticities, by major world region

Major region	Long-run			Short-run			
	OS income	Real aviation costs	Effective exchange rate	OS income	Real aviation costs	Effective exchange rate	ECM term
Americas	2.42***	-0.655***	ns	ns	ns	ns	-0.399***
North Africa and Middle East	1.78***	ns	-1.92*	ns	0.499.	ns	-0.498***
North-East Asia	0.978***	-0.45**	1.63**	ns	ns	ns	-0.358***
North-West Europe	3.08***	ns	5.89***	ns	ns	ns	-0.254***
Oceania and Antarctica	1.04***	0.224***	2.31***	-0.805*	0.233.	-1.51.	-0.358***
South-East Asia	1.01***	-0.854***	ns	ns	ns	ns	-0.491***
Southern and Central Asia	1.26***	0.719***	3.39***	ns	0.266.	ns	-0.173***
Southern and Eastern Europe	0.589***	0.591**	3.39***	ns	0.543*	ns	-0.309***
Sub-Saharan Africa	-1.1***	1.42***	1.38***	ns	ns	ns	-0.0718*

Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Source: BITRE estimates.

Domestic resident international departures and arrivals

Table 5.6 shows estimated short- and long-run air passenger elasticities for domestic resident international departures, by departure airport. The implied long-run *income* elasticities are all statistically significant and of the expected sign (i.e. positive) – resident departures through Sydney, Melbourne, Brisbane, Adelaide and Perth airports are all *income elastic* (i.e. ≥ 1.0), but relatively income inelastic for Darwin and Cairns airports. The short-run income elasticity is not significant across any airport.

Long-run aviation fuel cost elasticities for domestic resident departures are also statistically significant across all major departure airports, but not the expected sign (i.e. negative) for three of the seven airports – Brisbane, Perth and Darwin. The short-run aviation fuel cost elasticity is also not significant across any airport.

The effective (real) exchange rate term is not statistically significant, in either the long- or short-run, for domestic residents travelling overseas.

The error correction term is generally strongly significant across almost all airports, and of the expected sign (i.e. negative), and generally implies a relatively rapid adjustment to long-run market changes.

Table 5.6 International resident departure elasticities, by departure airport

Airport	Long-run			Short-run			
	Income	Real aviation costs	Effective exchange rate	Income	Real aviation costs	Effective exchange rate	ECM term
Sydney	1.49***	-0.152***	ns	ns	ns	ns	-0.498***
Melbourne	1.61***	-0.225***	ns	ns	ns	ns	-0.224***
Brisbane	1.5***	ns	0.349*	ns	ns	ns	-0.246***
Adelaide	1.47***	-0.417**	ns	ns	ns	ns	-0.156**
Perth	1.36***	-0.218**	0.386*	ns	ns	ns	-0.398***
Darwin	0.594***	ns	1.04**	ns	ns	ns	-0.363***
Cairns	0.643***	-0.57***	ns	ns	ns	ns	-0.295***
All airports	1.55***	-0.197***	ns	ns	ns	ns	-0.269***

Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Source: BITRE estimates.

International air freight exports and import forecast model results

Table 5.7 shows the estimated elasticities for domestic air freight imports through Australia's major international gateway airports. The implied income elasticities are statistically significant across all airports, but not of the expected sign (i.e. positive) for Darwin and Cairns airports, which is likely due to the small and highly variable levels of air freight imports through these airports. The model results also imply statistically significant aviation fuel cost elasticities across all airports, however all elasticities (except 'Other airports') are not of the expected sign (i.e. negative).

Finally, Table 5.8 shows the estimated elasticities for domestic air freight exports through Australia's major

Table 5.7 International air freight import elasticities, major airports

Airport	Income	Av. fuel costs
Sydney	0.489***	0.201***
Melbourne	0.303***	0.261***
Brisbane	0.998***	0.326***
Adelaide	0.84***	0.286**
Perth	1.34***	ns
Darwin	-0.675***	1.11***
Cairns	-0.618***	0.385.
All airports	0.572***	0.199***
Other airports	1.48***	-1.26*

Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.
Source: BITRE estimates.

international gateway airports. Again, the implied income elasticities are statistically significant across all airports, but not of the expected sign (i.e. positive) for Darwin and Cairns airports, which again may be due to the variability in air freight imports through these airports. The model results also imply statistically significant aviation fuel cost elasticities across all airports, except Darwin, Cairns and 'Other airports'. All aviation fuel cost elasticities are generally of the expected sign (i.e. negative).

Table 5.8 International air freight export elasticities, major airports

Airport	Income	Av. fuel costs
Sydney	0.377**	-1.07***
Melbourne	0.886***	-0.73***
Brisbane	0.761***	-0.572***
Adelaide	1.22***	-0.866***
Perth	0.581***	-0.473***
Darwin	-3.66***	ns
Cairns	-1.23***	0.316*
All airports	0.659***	-0.757***
Other airports	1.64*	ns

Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.
Source: BITRE estimates.

5.4 Forecast assumptions and data sources

The main forecast inputs include:

- Australian total and regional population growth
- Australian economic productivity and income growth
- Domestic and international airfares/air travel costs
- World and overseas country population growth
- World and overseas country economic productivity and income growth
- International currency exchanges rates.

Australian population growth forecast assumptions

Australian population projections used to generate the aviation forecasts presented in this report are based on the population projections input to the latest (2023) Intergenerational Report (IGR) (Treasury 2023, Centre for Population 2023). The baseline 2023 IGR projected the Australian population will increase from around 26.6 million persons in June 2023 to around 36.4 million persons by June 2050, an average growth rate of 1.17 per cent per annum (Treasury 2023, p. 252).

The 2023 IGR (Treasury 2023) includes two population sensitivity analysis scenarios (see Appendix C for details) which are used in deriving the sensitivity analysis results reported in Appendix E.

Australian productivity growth forecast assumptions

Australian economic growth projections are also based on the 2023 IGR (Treasury 2023) productivity, participation and population growth assumptions. The base case IGR economic growth projections assume a long-run labour force participation rate (15 years and older) of 63.8 per cent and long-run labour productivity growth of around 1.2 per cent per annum between 2022–23 and 2062–63. Under these assumptions, real GDP per capita is projected to increase from around $83,900 per person in 2022–23 to around $114,600 per person by 2049–50, an average growth rate of 1.16 per cent per annum (Treasury 2023, p. 252).

Treasury (2023) also includes two alternative productivity growth sensitivity analysis scenarios (see Appendix C for details) which are used in deriving the sensitivity analysis results reported in Appendix E.

Airfares and air transport cost forecast assumptions

Projected future growth in domestic and international airfares (air transport costs) are based on projected growth in world oil prices and other air transport input costs.

Oil price scenarios used in developing airfare / air transport costs forecasts are based on the United States' EIA (2021a) world oil price outlook scenarios. The EIA reference case, projects that world oil prices (West Texas Intermediate) will increase from around $US71 per barrel in 2021 to around $US178 per barrel by 2050. EIA also provides alternative 'high' and 'low' oil price scenarios (see Appendix C), which are used in deriving the sensitivity analysis results reported in Appendix E.

The Australian Government has committed to reduce greenhouse emissions by 43 per cent below 2005 levels by 2030, and to net zero by 2050. Reaching the target will require reductions in emissions across all sectors of the economy, including transport. Opportunities to reduce aviation emissions from regular scheduled air passenger and air freight are most likely to come from continuing improvements in aircraft efficiency, increasing uptake of zero- and low-emission aviation fuels – e.g. sustainable aviation fuels (SAF) – and emissions offsets (under the Australian Government's Safeguard Mechanism).

Uptake of SAF and emissions offsets are likely to increase the future cost of aviation fuels. Under the baseline assumptions (outlined in Appendix C), the projected uptake of SAF and application of emissions offsets, are projected to increase domestic aviation fuel *above* fossil-based fuel cost assumptions projected by EIA (2021a).

World population growth forecast assumptions

International country population projections are based on the United Nations' 2022 World Population Prospects (WPP) (UN 2022). The WPP provides population projections out to 2100 for 237 separate countries and world regions, based on analyses of historical country- and region-specific demographic trends.

The 2022 WPP includes ten different projection scenarios, based on varying fertility, mortality and migration assumptions. The *medium* (WPP baseline) scenario projection is used for the baseline air passenger and freight forecasts presented in this report. Under the 2022 WPP medium scenario, the total world population is projected to increase from around 7.96 billion persons in 2022 to around 9.7 billion persons by 2050, an average growth rate of 0.71 per cent per annum (UN 2022, and BITRE estimates).

The WPP projections imply significant population and demographic change for some countries over the forecast horizon, that significantly impact the international visitor projections – in particular, UN (2022) projects that China's population will decline, under the medium scenario, from around 1.43 billion persons in 2022 to around 1.31 billion persons by 2050, an average annual growth rate of -0.29. The UN (2022) medium scenario also projects the populations of Japan, South Korea, Hong Kong, Thailand and Germany will also decline between 2022 and 2050, and slowing population growth across many other developed countries. All else equal, slowing population growth and absolute reductions in overseas country populations will tend to slow future growth in international visitor arrivals to Australia.

Further details about the UN WPP population forecasts are provided in Appendix C.

World productivity growth forecast assumptions

International country economic growth projections are based on the latest OECD Economic Outlook Long-term baseline (LTB) projections (OECD 2021b, OECD 2021a). The OECD LTB projections provide long-term outlooks (to 2060) of GDP (nominal and real), consumer prices, exchange rates and population for OECD members, a number of the larger non-OECD member countries (including China, Brazil, India, Indonesia, Russia and South Africa), and the world.

The projections imply total world economic activity will increase from an average of $US22,600 per person in 2022 to around $US38,500 per person by 2050, an average growth rate of 1.93 per cent per annum (OECD (2021a) and BITRE estimates). Further details about the OECD LTB GDP growth projections are provided in Appendix C.

The next two chapters present the baseline scenario air passenger and air freight forecasts, for all Australia (Chapter 6) and for every major airport (Chapter 7).

6. National forecasts

6.1 Introduction

This chapter presents the *baseline* total domestic and international aviation forecasts to 2050. All forecast results are presented on an annual (financial year) basis.

Forecasts and COVID-19 recovery

The forecasts implicitly assume that both domestic and international air passenger travel will return to pre-pandemic trend levels within the next several years. As previously noted, while both domestic and international air passenger numbers and, to a lesser extent, air freight volumes have rebounded significantly since the height of the pandemic, they are still below pre-pandemic levels – domestic air passenger activity as at June quarter 2023 was approximately 95 per cent of pre-pandemic (June quarter 2019) and international air passenger numbers in the June 2023 quarter had recovered to around 80 per cent of pre-pandemic (June 2019 quarter) levels. Whether this assumption is reasonable will only become clear with time.

Forecast variability and sensitivity analysis

BITRE also estimated the impact of several sensitivity analysis scenarios on the forecasts, including high and low domestic and international productivity growth, high and low domestic and international population growth, and high and low aviation fuel costs – see Appendix E for sensitivity analysis results. BITRE also used the empirical statistical models to derive estimates of the potential range of uncertainty in the forecasts (*prediction intervals*) – all forecast plots shown in this chapter include the 95 per cent forecast prediction intervals.[14]

6.2 Total domestic air passenger forecasts

Total domestic air passenger travel is projected to increase by around 2.59 per cent per annum between 2018–19 and 2049–50, to around 157.1 billion passenger kilometres by 2049–50, and total passenger numbers (on an uplift–discharge (UD) basis) are projected to increase by around 2.19 per cent per annum over the same period, to around 237.5 million passenger movements by 2049–50.

Figure 6.1 shows projected total annual domestic air passenger activity (revenue passenger kilometres) and Figure 6.2 shows projected total revenue passengers (uplift–discharge basis) out to 2050. The shaded areas show the 95 per cent prediction intervals are between −13.3 and +13.6 per cent of the baseline total RPK forecasts, and between −13.6 and +11.1 per cent of the baseline total passenger forecasts. Table 6.1 provides a summary of the baseline annual domestic passenger forecasts, at five-year intervals. (Annual total domestic passenger activity baseline forecasts are listed in Appendix D.)

6.3 Total domestic air freight forecasts

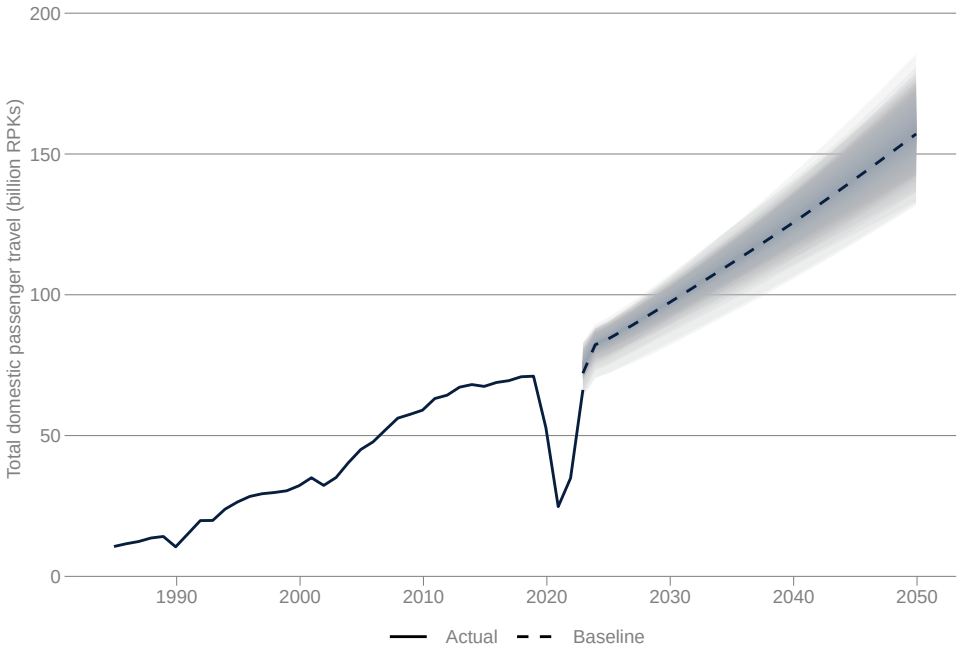
Forecasts of total domestic air freight are based on BITRE's freight forecast model results outlined in Chapter 5 and assumptions in Appendix C, moderated by BITRE where the unconstrained model-based forecasts would result in unrealistically rapid growth or decline in total air freight.

Total domestic air freight tonne kilometres is projected to decrease slightly over the long-term forecast horizon, from around 330.1 million tonne kilometres in 2018–19 to around 250.1 million tonne kilometres by 2049–50, an average annual reduction of around 0.89 per cent per annum. On an uplift-discharge basis, total air freight is projected to decline from around 213.6 thousand tonnes in 2018–19 to around 174.2 thousand tonnes by 2049–50, an average annual reduction of around 0.66 per cent per annum.

Figures 6.3 and 6.4 show projected annual domestic air freight activity out to 2050, in total tonne kilometres and total tonnes uplifted/discharged, respectively. The shaded areas show the 95 per cent prediction intervals and are quite wide, indicating the high degree of uncertainty inherent in the domestic freight task projections. The 95 per cent prediction interval for total tonne kilometres ranges between −36.4 and +70 per cent of the

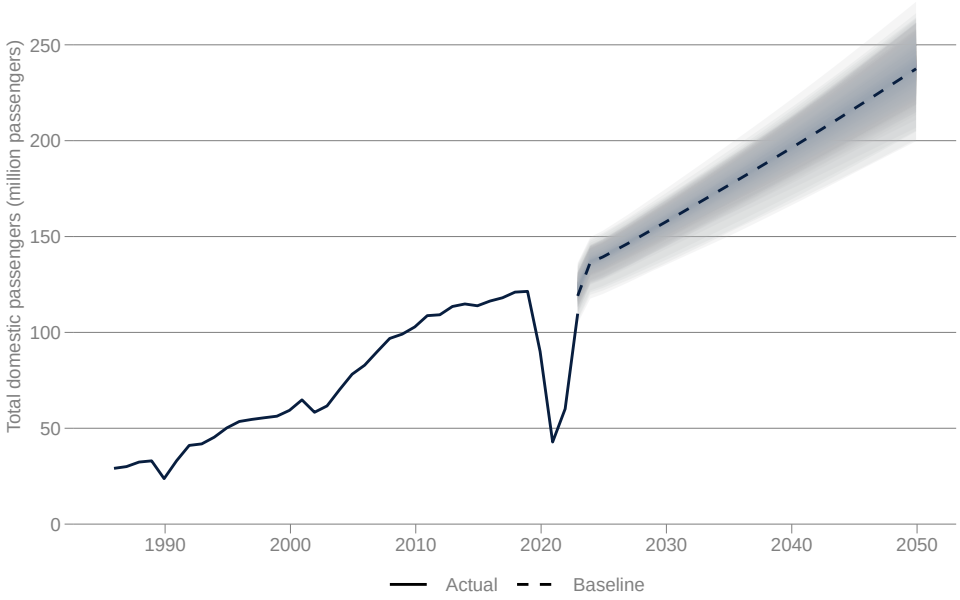
14 The 95 per cent prediction interval shows the region in which 95 per cent of repeated forecast samples are likely to occur.

Figure 6.1 Actual and forecast domestic air passenger kilometres, 1985–2050



Note: The shaded area shows the 95 per cent forecast prediction interval.
Sources: BITRE (2023c) and BITRE estimates.

Figure 6.2 Actual and forecast domestic air passengers (UD-basis), 1985–2050



Note: The shaded area shows the 95 per cent forecast prediction interval.
Sources: BITRE (2023c) and BITRE estimates.

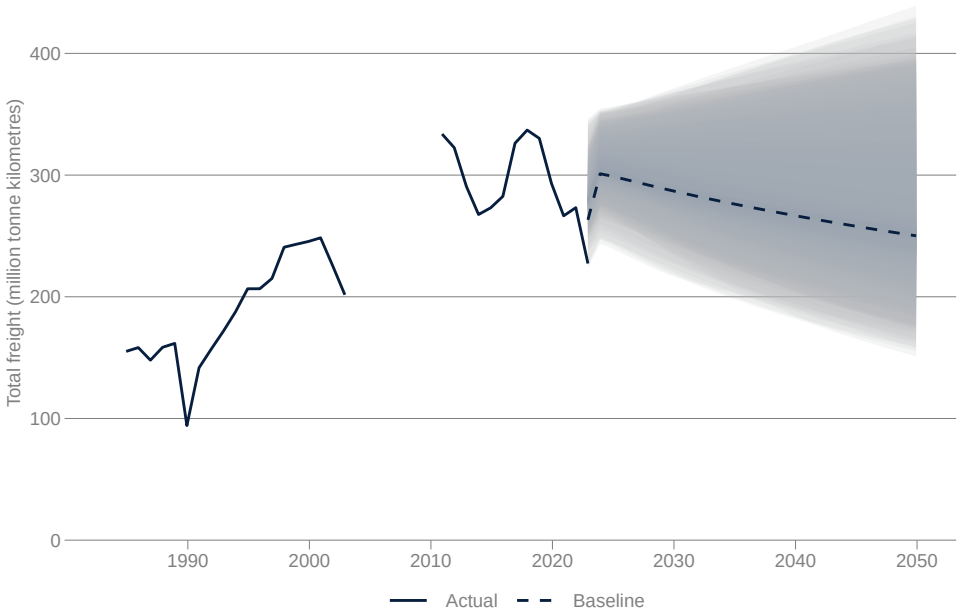
baseline forecasts, and the prediction interval for total freight tonnes lies between –31.7 and +62.9 per cent of the baseline total forecasts. Table 6.2 lists the annual forecasts at five-year intervals.

Table 6.1 Actual and forecast domestic air passengers, 1990–2050

Year	Passengers (million)	Revenue passenger kilometres (billion)
1990	23.72	10.49
1995	50.18	26.39
2000	59.33	32.20
2005	78.17	45.05
2010	102.85	59.02
2015	113.88	67.46
2020	90.07	52.80
2025	139.34	84.19
2030	157.52	97.20
2035	176.57	111.06
2040	196.03	125.52
2045	216.46	140.94
2050	237.51	157.12

Sources: BITRE (2023c) and BITRE estimates.

Figure 6.3 Actual and forecast total Australian domestic freight task, 1985–2050



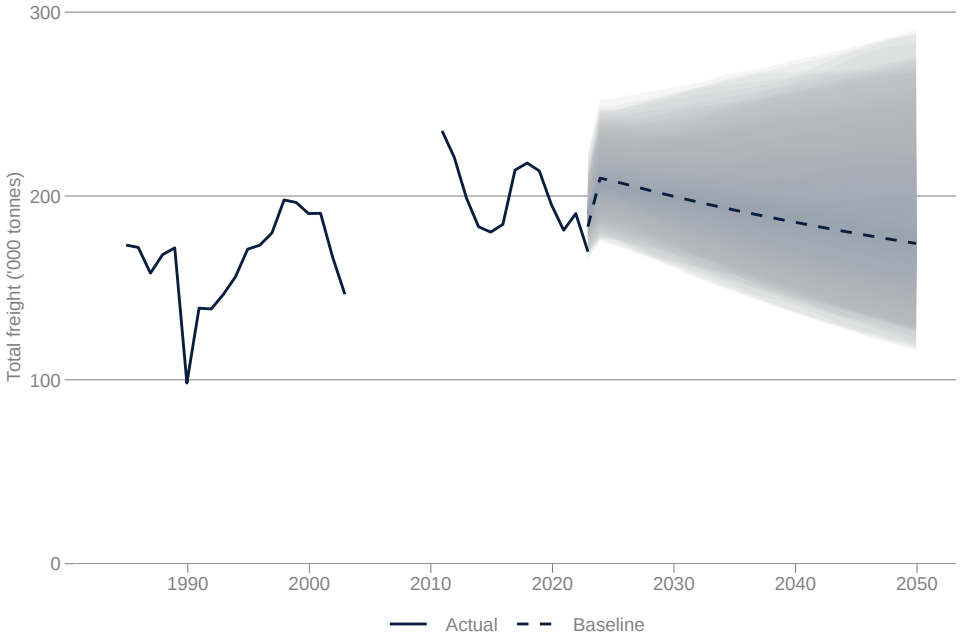
Note: Shaded areas show the 95 per cent forecast prediction interval.
Source: BITRE (2023c) and BITRE estimates.

Table 6.2 Actual and forecast domestic air freight, 1990–2050

	Air freight	
Year	(million tkm)	(tonnes)
1990	94.17	98,250
1995	206.57	171,077
2000	245.46	190,429
2005	..	..
2010	..	..
2015	273.12	180,334
2020	293.13	195,200
2025	299.10	208,300
2030	287.02	199,889
2035	276.30	192,418
2040	266.75	185,770
2045	258.05	179,711
2050	250.11	174,181

.. not available.
Sources: BITRE (2023c) and BITRE estimates.

Figure 6.4 Actual and forecast total Australian domestic freight tonnes, 1985–2050



Note: Shaded areas show the 95 per cent forecast prediction interval.
Source: BITRE (2023c) and BITRE estimates.

6.4 Total international air passenger forecasts

Total international air passenger numbers are projected to increase by around 2.7 per cent per annum between 2019 and 2050, to around 94.7 million passengers by 2049–50. Total inbound passenger numbers are projected to increase by around 2.7 per cent per annum between 2018–19 and 2049–50, to around 47.6 million passengers by 2049–50, and total outbound international passenger numbers are projected to increase at a similar rate (around 2.7 per cent per annum), to around 47.1 million passengers by 2049–50.

Total international passenger kilometres are projected to increase at broadly similar rates, from around 306.2 billion passenger kilometres in 2018–19, to around 689.6 billion passenger kilometres in 2049–50. Inbound international passenger movements are projected to increase to around 346 billion passenger kilometres in 2049–50 and outbound international passenger movements are projected to increase to around 343.6 billion passenger kilometres in 2049–50.

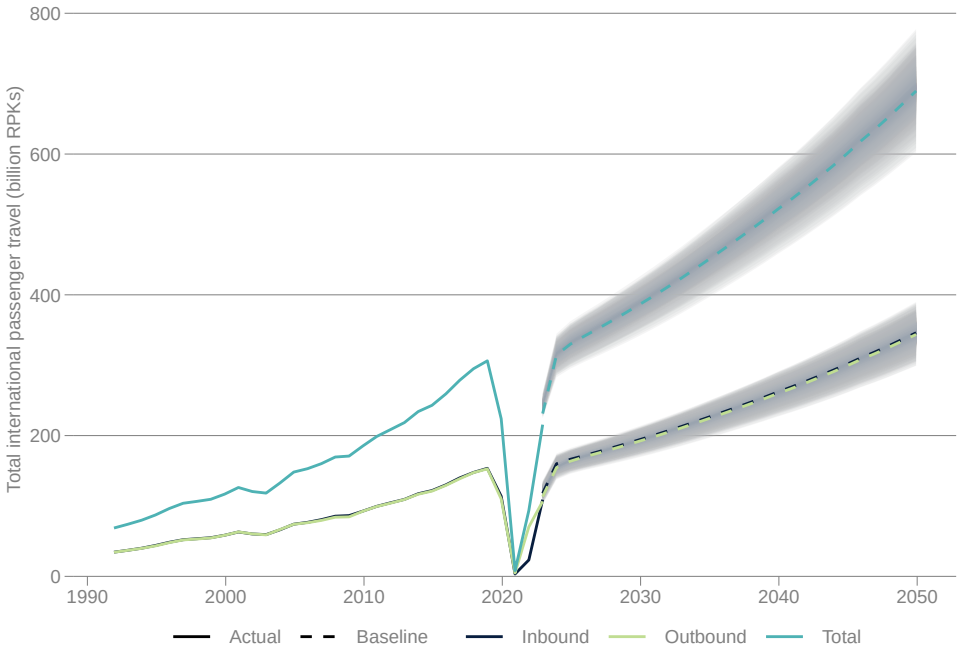
Figures 6.5 and 6.6 illustrate projected total international passenger movements (passenger kilometres) and total passenger numbers, by direction, out to 2049–50. Again, the shaded areas show the 95 per cent prediction intervals, which range between −10.8 and +10.9 per cent of the baseline forecasts for total passenger kilometres, and between −10.8 and +10.9 per cent of the total baseline passenger forecasts. Table 6.3 provides a summary of the annual international air passenger forecasts at five-year intervals.

Table 6.3 Actual and forecast international air passengers, 1995–2050 (billion rpks)

	Passengers (million)			RPKs (billion)		
Year	Inbound	Outbound	Total	Inbound	Outbound	Total
1995	6.04	5.94	11.98	43.87	43.33	87.21
2000	8.04	8.01	16.05	58.46	58.37	116.83
2005	10.20	10.16	20.36	74.13	74.04	148.17
2010	12.75	12.70	25.45	92.70	92.57	185.26
2015	16.77	16.61	33.39	121.92	121.12	243.04
2020	15.65	15.10	30.75	113.78	110.06	223.84
2025	22.88	22.45	45.32	166.29	163.63	329.91
2030	26.70	26.36	53.06	194.09	192.14	386.23
2035	31.11	30.73	61.84	226.10	224.05	450.15
2040	36.03	35.63	71.66	261.87	259.74	521.61
2045	41.45	41.03	82.48	301.29	299.10	600.40
2050	47.61	47.13	94.74	346.01	343.61	689.61

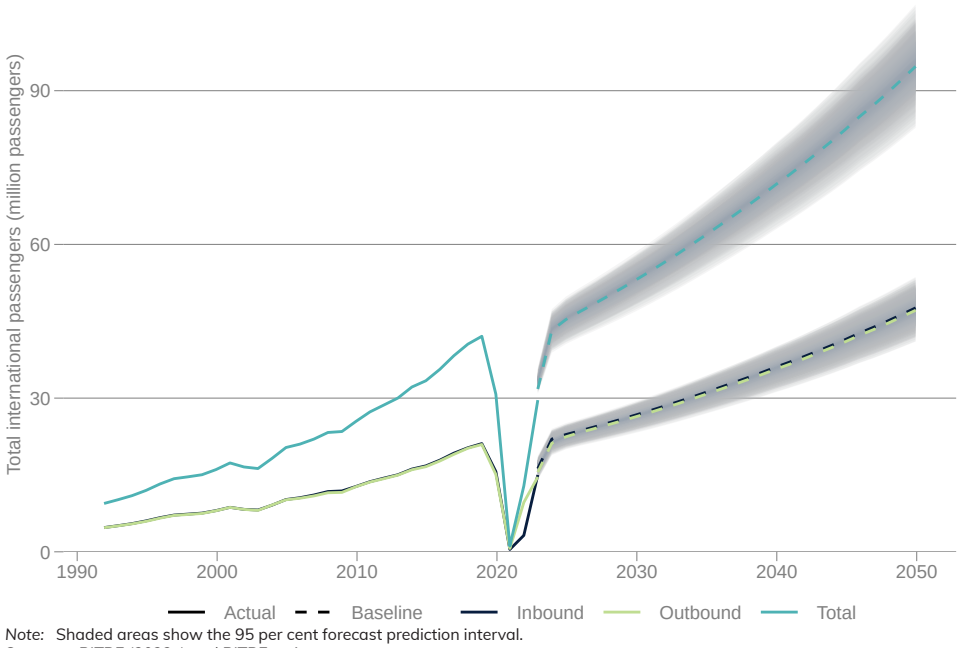
Sources: BITRE (2023e) and BITRE estimates.

Figure 6.5 Actual and forecast total international passenger kilometres, 1992–2050



Note: Shaded areas show the 95 per cent forecast prediction interval.
Sources: BITRE (2023e) and BITRE estimates.

Figure 6.6 Actual and forecast total international passengers, 1992–2050



Note: Shaded areas show the 95 per cent forecast prediction interval.
Sources: BITRE (2023e) and BITRE estimates.

International visitor arrival and resident departure forecasts

BITRE's forecasting approach also provides separate forecasts of international overseas visitor arrivals (and departures) and domestic resident overseas departures (and arrivals).

Total international foreign visitors arriving by air are projected to increase by around 2.23 per cent per annum between 2018–19 and 2049–50, to around 19.7 million passengers by 2049–50. Total visitor departures are projected to increase at a similar rate, 2.04 per cent per annum, to around 17.2 million passengers by 2049–50.

Total domestic resident air departures are projected to increase by around 3.06 per cent per annum between 2018–19 and 2049–50, to around 29.9 million passengers by 2049–50. Total domestic resident arrivals are projected to increase at a similar rate, 3 per cent per annum, to around 27.9 million passengers by 2049–50.

Table 6.4 provides a summary of the annual visitor arrival and resident departure forecasts at five-year intervals.

Table 6.4 Actual and forecast international air passengers, 1995–2050 (million passengers)

	Passengers (million)				
	Residents		Visitors		Total
Year	Inbound	Outbound	Inbound	Outbound	Total
1995	2.39	2.46	3.65	3.49	11.98
2000	3.23	3.36	4.81	4.64	16.05
2005	4.52	4.66	5.68	5.50	20.36
2010	6.64	7.12	6.11	5.58	25.45
2015	9.16	9.65	7.62	6.96	33.39
2020	8.50	8.22	7.16	6.88	30.75
2025	12.01	12.70	10.87	9.74	45.32
2030	14.44	15.29	12.27	11.06	53.06
2035	17.27	18.34	13.84	12.39	61.84
2040	20.46	21.79	15.57	13.84	71.66
2045	23.96	25.59	17.49	15.44	82.48
2050	27.93	29.89	19.67	17.24	94.74

Sources: BITRE (2023e) and BITRE estimates.

6.5 Total international air freight forecasts

Based on the models and assumptions outlined in Chapter 5 and Appendixes B and C, total international air freight into and out of Australia is projected to increase by around 0.5 per cent per annum between 2018–19 and 2049–50, from around 966 thousand tonnes in 2018–19 to around 1,136 thousand tonnes in 2049–50.

Total air imports are projected to increase by around 1.78 per cent per annum over that period, to around 772 thousand tonnes in 2049–50, and total air exports are projected to grow from 2022–23 levels, but decline relative to 2018–19 by around 1.1 per cent per annum, to around 364 thousand tonnes in 2049–50.

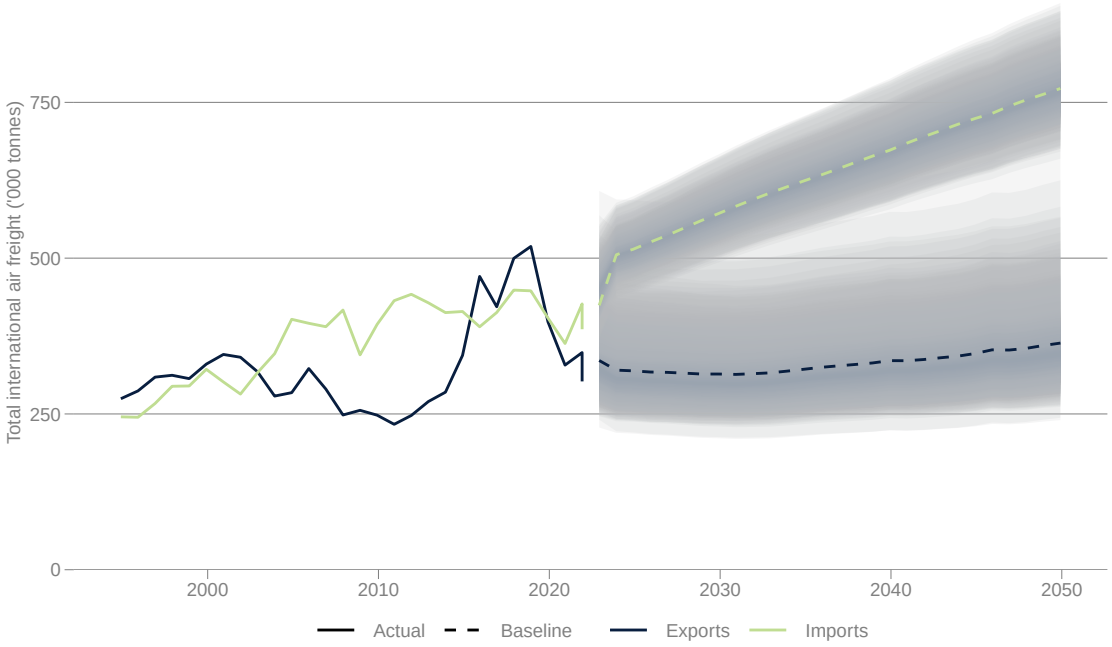
Figure 6.7 shows projected total annual international air freight forecasts, by direction, out to 2049–50. The shaded areas show the 95 per cent prediction intervals, which range between −27.6 and +55.7 per cent of the baseline forecast for total air exports in 2049–50, and between −12.5 and +16 per cent of the total baseline air freight imports in 2049–50. Table 6.5 provides a summary of the annual air freight import and export forecasts at five-year intervals.

Table 6.5 Actual and forecast international air freight, 1995–2050 (thousand tonnes)

	Freight (kt)		
year	Exports	Imports	Total
1995	274.4	245.3	519.7
2000	330.0	321.6	651.5
2005	284.2	401.8	686.0
2010	248.0	393.7	641.7
2015	343.9	414.4	758.3
2020	397.8	403.9	801.7
2025	319.1	514.4	833.5
2030	314.0	571.7	885.8
2035	321.7	624.1	945.9
2040	335.5	673.1	1,008.6
2045	346.9	724.1	1,071.0
2050	363.7	772.3	1,136.0

Sources: BITRE (2023e) and BITRE estimates.

Figure 6.7 Actual and forecast total international freight, 1995–2050



Note: Shaded areas show the 95 per cent forecast prediction interval.
Sources: BITRE (2023e) and BITRE estimates.

Chapter 7 (next) presents air passenger and freight forecasts separately for each of the 14 busiest (according to total passengers) airports in Australia.

7. Airport / air catchment forecasts

7.1 Introduction

This chapter presents commercial air passenger forecasts for the eight capital city air catchments, and the next six busiest regional airports across Australia – Gold Coast, Cairns, Townsville, Launceston, Newcastle, Sunshine Coast – and air freight forecasts for the following mainland capital city airports – Sydney, Melbourne, Brisbane, Adelaide, Perth and Darwin. The forecasts are based on the airport-specific air passenger and freight demand models and the domestic and international socio-economic outlooks outlined in Chapter 5.

Forecast scope – air catchment versus airport-specific forecasts

Previous BITRE aviation forecasts (BITRE 2012, BITRE 2010, BITRE 2008) have provided forecasts for capital city and major non-capital city *airports*, focused on the major commercial airport serving each urban area (e.g. Sydney (Kingsford Smith) Airport (KSA), Melbourne Airport (Tullamarine), etc.).

While the majority of commercial aviation activity in each urban area has historically been concentrated at one airport, most of Australia's larger cities also have one or more smaller airports (e.g. Bankstown Airport, Essendon Airport, Jandakot Airport) that service other aviation market segments (e.g. general aviation, charter, private flying, freight, flying schools, recreational aviation, aircraft maintenance, etc.).

With the opening of Western Sydney International (Nancy Bird Walton) Airport (WSIA), scheduled to commence operations in 2026, there will be two major airports servicing commercial air passenger and freight in the Sydney aviation catchment. While BITRE's forecast models have been developed using historical airport-level data, the forecast approach, and forecasts, more appropriately relate to air passenger and freight movements into and out of the broader air catchment (e.g. Sydney air catchment). Hence, all forecasts presented in this chapter relate to commercial air passenger and freight activity in the broader regional catchments served by major airports.

Capacity constraints and COVID-19 recovery

The passenger movement forecasts presented in this study are solely driven by demand-side parameters, based on the econometric models outlined in Chapter 5. Supply-side effects, such as airport capacity and available air route capacity, have not been explicitly considered in the development of the forecasts – in effect, the forecasts implicitly assume sufficient airport and aviation market capacity to accommodate projected future growth in aviation activity.

Again, as previously noted, the airport (air catchment) forecasts presented here assume that both domestic and international air passenger travel return to pre-pandemic trend levels within the next several years, and that the estimated forecast relationships persist into the future.

7.2 Capital city air catchment forecasts

Sydney air catchment forecasts

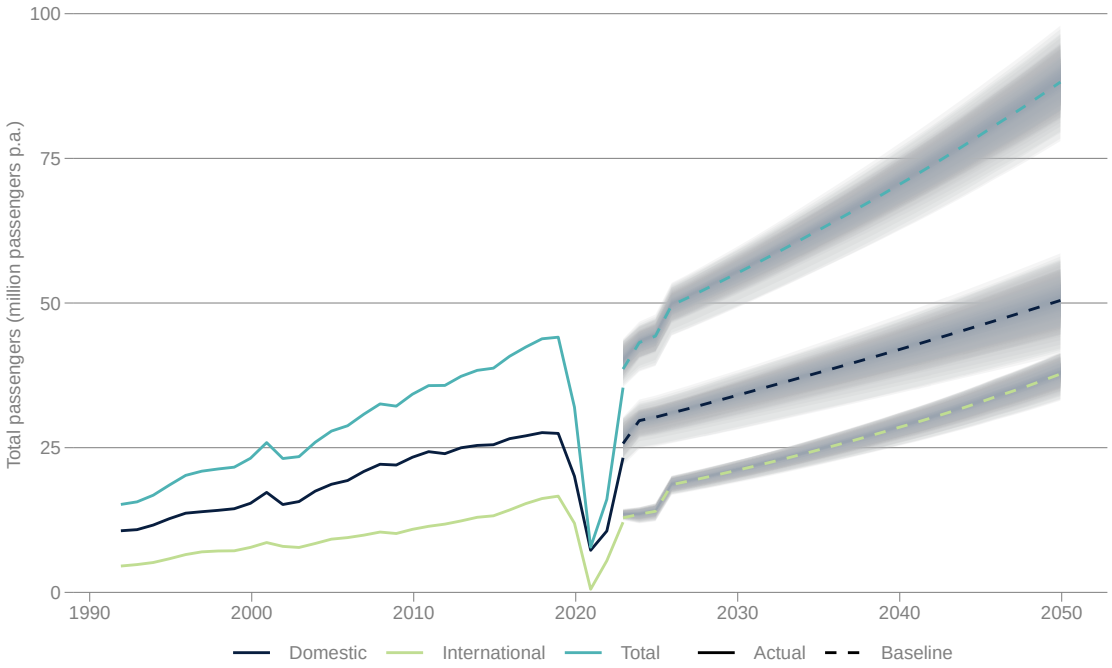
The Sydney air catchment is currently served primarily by Sydney (Kingsford Smith) Airport. Western Sydney International Airport (WSIA) is scheduled to open in 2026, and being designed to accommodate up to 10 million passengers annually upon commencement. The forecasts presented here relate to the Sydney urban aviation catchment – BITRE has not attempted to separately forecast passenger and freight volumes through KSA and WSIA.

Passenger forecasts

Figure 7.1 shows actual and forecast domestic, international and total air passengers through the Sydney area to 2049–50, and Table 7.1 provides a summary of total forecast passengers.

Total (domestic and international) passenger numbers through the Sydney air catchment are projected to increase from around 44.1 million passengers in 2018–19 to around 88.2 million passengers in 2050, an average annual growth rate of 2.26 per cent per annum between 2018–19 and 2049–50.

Figure 7.1 Actual and forecast passengers, Sydney air catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.1 Actual and forecast passengers, Sydney air catchment, 1992–2050

	Total passengers (million)		
Year	Domestic	International	Total
1992	10.65	4.55	15.20
2000	15.40	7.77	23.17
2010	23.35	10.90	34.25
2020	20.07	11.94	32.01
2030	34.02	21.07	55.09
2040	41.92	28.48	70.40
2050	50.45	37.74	88.19

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Total domestic passengers are projected to increase from around 27.5 million passengers in 2018–19 to around 50.5 million passengers by 2049–50, an average annual growth rate of 1.98 per cent per annum between 2018–19 and 2049–50. Total international passengers are forecast to increase from around 16.6 million passengers in 2018–19 to around 37.7 by 2050, an average annual growth rate of 2.68 per cent per annum between 2018–19 and 2049–50.

Air freight forecasts

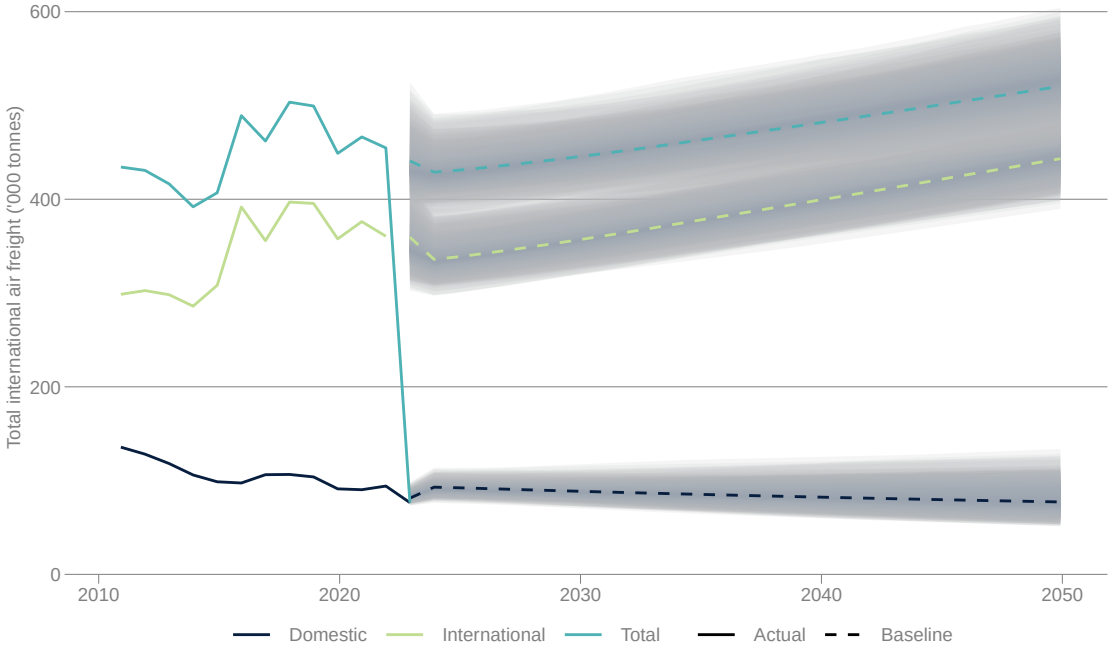
Figure 7.2 shows actual (since 2010–11)[15] forecast domestic, international and total air freight through the Sydney air catchment and Table 7.2 provides a summary of total forecast freight to 2050.

BITRE forecasts that total air freight through the Sydney aviation basin will decline slightly between 2019 and 2050, from around 499.4 thousand tonnes in 2018–19 to around 520.5 thousand tonnes in 2050, although this implies some growth over total air freight volumes in 2022–23.

Domestic air freight through the Sydney metropolitan area is projected to decline from around 103.9 thousand tonnes in 2018–19 to around 77.2 thousand tonnes by 2050. Total international air freight through the Sydney catchment is projected to grow from around 395.5 thousand tonnes in 2018–19 to around 443.3 thousand tonnes by 2050.

15 City-level estimates of total air freight volumes are not available prior to 2010–11.

Figure 7.2 Actual and forecast air freight, Sydney air catchment, 2011–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.2 Actual and forecast air freight, Sydney air catchment, 2011–2050

	Total freight ('000 tonnes)		
Year	Domestic	International	Total
2011	135.65	298.66	434.31
2020	91.17	357.77	448.94
2030	88.62	356.75	445.36
2040	82.36	399.19	481.55
2050	77.22	443.25	520.47

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Melbourne air catchment forecasts

Passenger forecasts

Figure 7.3 shows domestic, international and total forecast air passengers through the Melbourne metropolitan area, and Table 7.3 provides a summary of total forecast passengers, to 2050.

Total (domestic and international) passengers are forecast to increase from around 37.2 million passengers in 2018–19 to around 82.3 in 2050, an average annual growth rate of 2.59 per cent per annum between 2018–19 and 2049–50.

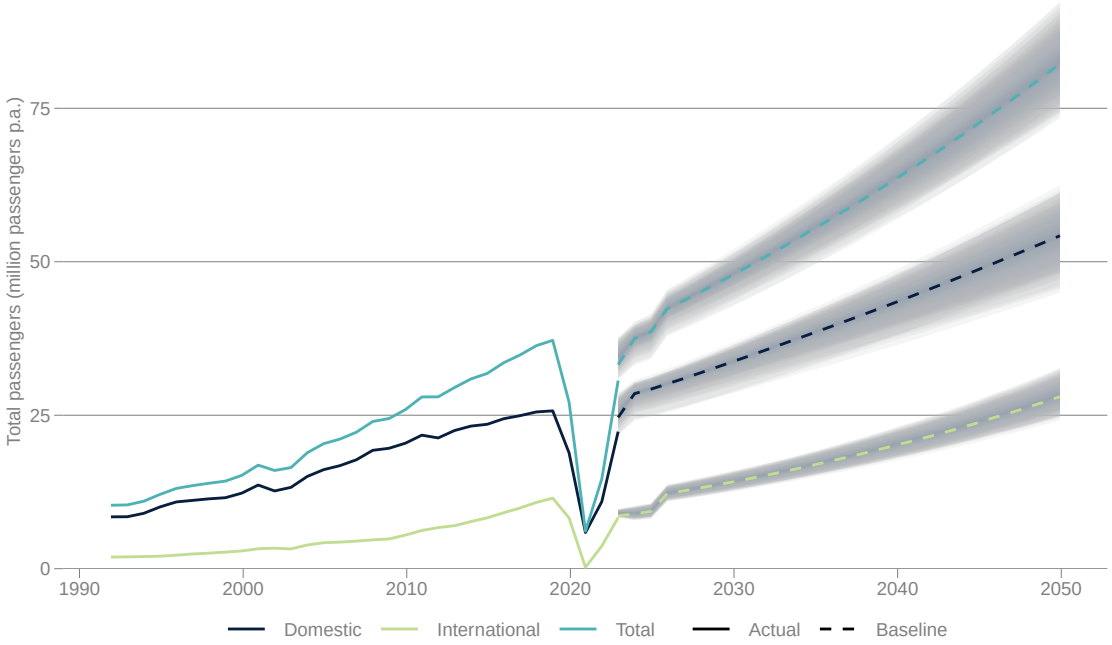
Domestic passengers through the Melbourne air catchment are projected to increase from around 25.7 million passengers in 2018–19 to around 54.2 million passengers in 2050, an average annual growth rate of 2.44 per cent per annum between 2018–19 and 2049–50. Total international passengers are forecast to increase from around 11.5 million passengers in 2018–19 to around 28 million passengers in 2050, an average annual growth rate of 2.92 per cent per annum between 2018–19 and 2049–50.

Air freight forecasts

Figure 7.4 shows actual (since 2010–11) and forecast domestic, international and total air freight through the Melbourne metropolitan area out to 2050, and Table 7.4 provides a summary of total forecast air freight.

Total air freight through Melbourne is projected to increase between 2019 and 2050, from around 453.4 thousand tonnes in 2018–19 to around 462 thousand tonnes in 2050. Domestic air freight through the Melbourne metropolitan area is projected to decline very slightly, from around 127.7 thousand tonnes in 2018–19 to around

Figure 7.3 Actual and forecast passengers, Melbourne air catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.3 Actual and forecast passengers, Melbourne air catchment, 1992–2050

	Total passengers (million)		
Year	Domestic	International	Total
1992	8.44	1.89	10.33
2000	12.31	2.90	15.21
2010	20.45	5.48	25.92
2020	18.85	8.26	27.11
2030	33.72	14.14	47.86
2040	43.43	20.14	63.57
2050	54.24	28.03	82.27

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

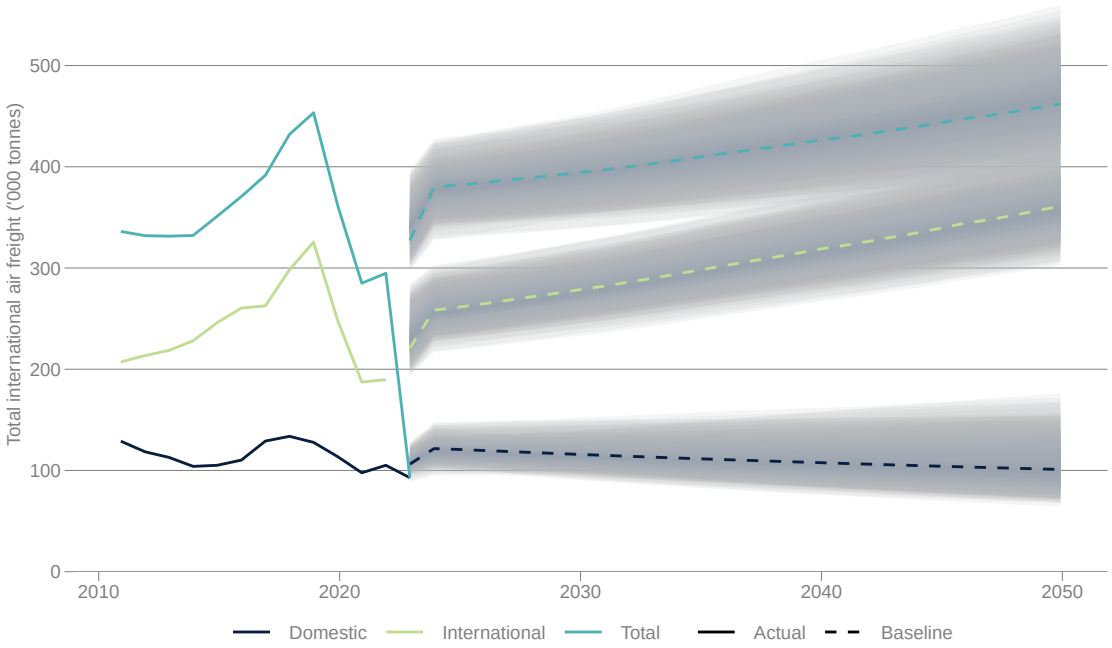
101 thousand tonnes by 2050. Total international air freight through Melbourne is projected to grow from around 325.6 thousand tonnes in 2018–19 to around 361 thousand tonnes by 2050.

Table 7.4 Actual and forecast air freight, Melbourne air catchment, 2011–2050

	Total freight ('000 tonnes)		
Year	Domestic	International	Total
2011	128.91	207.22	336.13
2020	113.61	248.06	361.67
2030	115.89	278.39	394.27
2040	107.70	318.66	426.37
2050	100.98	361.03	462.01

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Figure 7.4 Actual and forecast air freight, Melbourne airport, 2011–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Brisbane air catchment forecasts

Passenger forecasts

Figure 7.5 shows domestic, international and total forecast air passengers to/from the Brisbane air catchment to 2049–50, and Table 7.5 provides a summary of total forecast passengers.

Total (domestic and international) passengers are projected to increase from around 23.6 million passengers in 2018–19 to around 55.4 million passengers in 2049–50, an average annual growth rate of 2.79 per cent per annum between 2018–19 and 2049–50.

Domestic passengers through the Brisbane air catchment are projected to increase from around 17.4 million passengers in 2018–19 to around 39 million passengers in 2049–50, an average annual growth rate of 2.64 per cent per annum between 2018–19 and 2049–50. Total international passengers through Brisbane are forecast to increase from around 6.2 million passengers in 2018–19 to around 16.4 million passengers in 2049–50, an average annual growth rate of 3.16 per cent per annum between 2018–19 and 2049–50.

Table 7.5 Actual and forecast passengers, Brisbane air catchment, 1992–2050

	Total passengers (million)		
Year	Domestic	International	Total
1992	5.37	1.35	6.72
2000	8.10	2.55	10.65
2010	14.73	4.06	18.79
2020	13.10	4.70	17.80
2030	24.51	8.48	32.99
2040	31.35	11.96	43.31
2050	38.95	16.40	55.36

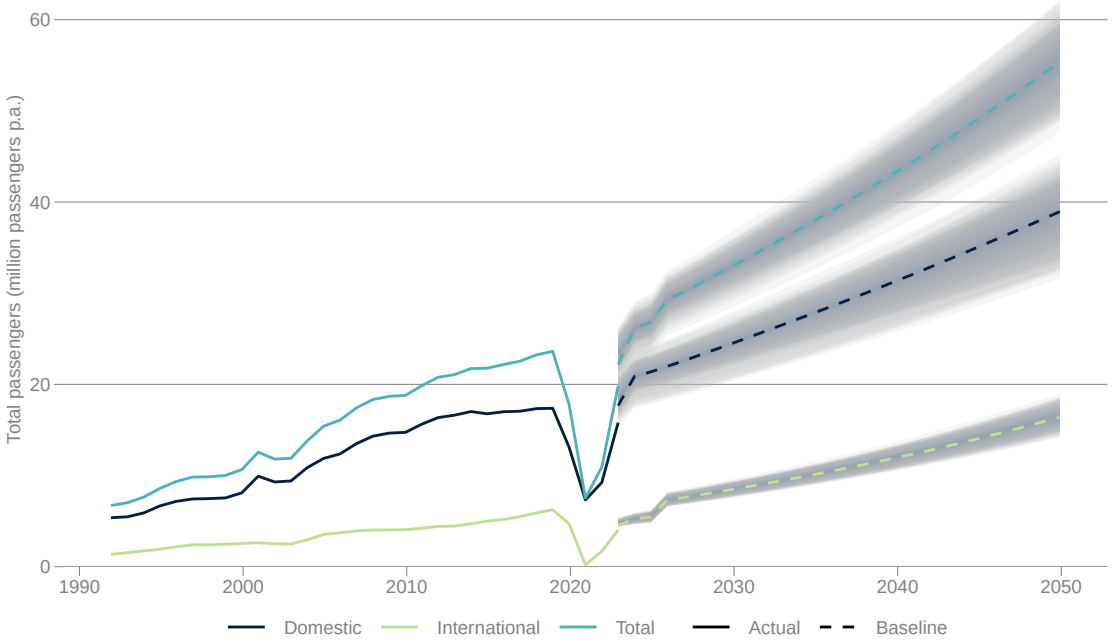
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Air freight forecasts

Figure 7.6 shows actual (since 2010–11) and forecast domestic, international and total air freight through the Brisbane metropolitan area out to 2049–50, and Table 7.6 provides a summary of total forecast air freight.

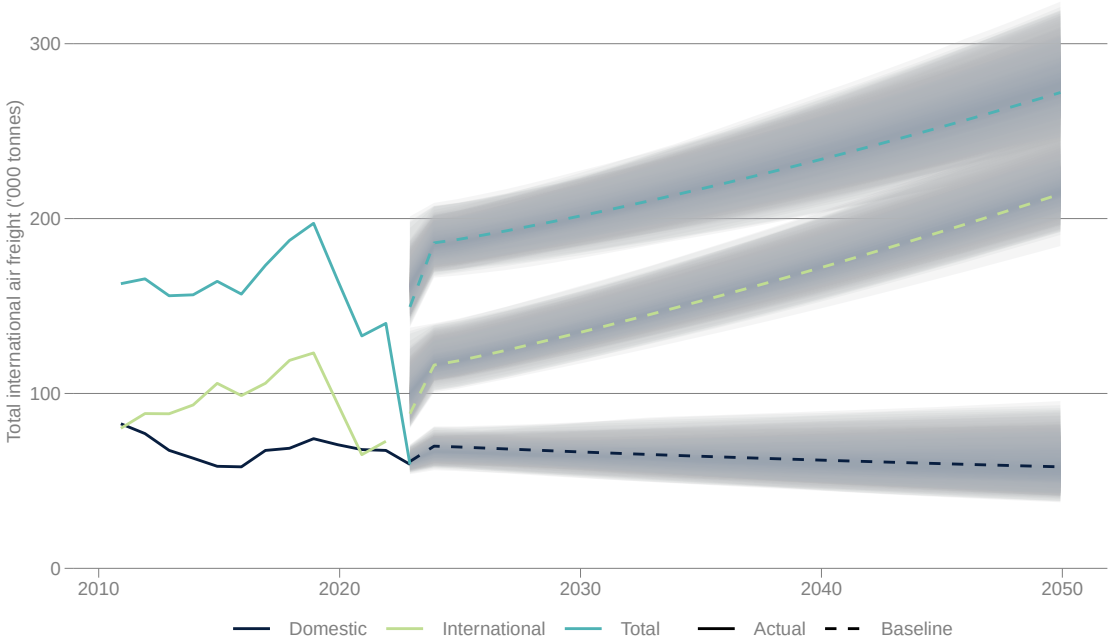
Total air freight through Brisbane is forecast to increase between 2018–19 and 2049–50, from around 197.3 thousand tonnes in 2018–19 to around 272.1 thousand tonnes in 2049–50. Domestic air freight through the

Figure 7.5 Actual and forecast passengers, Brisbane air catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Figure 7.6 Actual and forecast air freight, Brisbane airport, 2011–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Brisbane air catchment is projected to decline from around 74.1 thousand tonnes in 2018–19 to around 58 thousand tonnes by 2049–50. Total international air freight through the Brisbane air catchment is projected to increase from around 123.2 thousand tonnes in 2018–19 to around 214 thousand tonnes by 2049–50.

Table 7.6 Actual and forecast air freight, Brisbane air catchment, 2011–2050

	Total freight ('000 tonnes)		
Year	Domestic	International	Total
2011	82.66	80.11	162.77
2020	70.68	93.95	164.64
2030	66.61	134.70	201.30
2040	61.90	171.73	233.63
2050	58.04	214.04	272.08

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Adelaide air catchment forecasts

Passenger forecasts

Figure 7.7 shows domestic, international and total forecast air passengers through the Adelaide metropolitan area to 2049–50, and Table 7.7 provides a summary of total forecast passengers.

Total (domestic and international) passengers through Adelaide are projected to increase from around 8.4 million passengers in 2018–19 to around 15.1 million passengers in 2049–50, an average annual growth rate of 1.94 per cent per annum between 2018–19 and 2049–50.

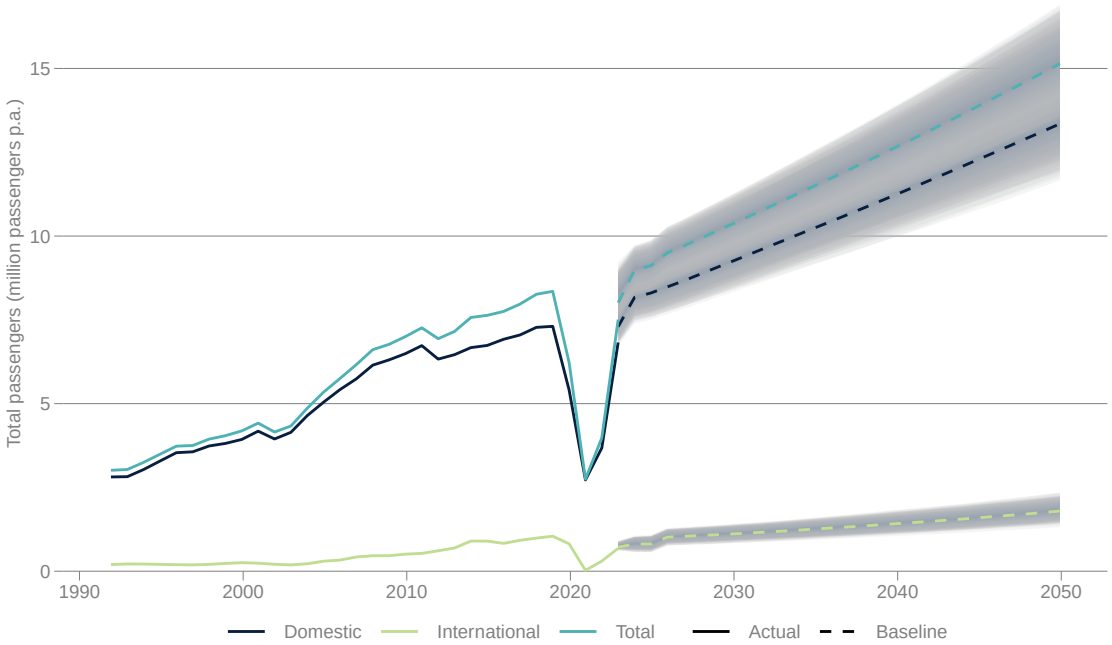
Total domestic passengers through the Adelaide air catchment are forecast to increase from around 7.3 million passengers in 2018–19 to around 13.3 million passengers in 2049–50, an average annual growth rate of 1.96 per cent per annum between 2018–19 and 2049–50. Total international passengers are forecast to increase from around 1 million passengers in 2018–19 to around 1.8 million passengers in 2049–50, an average annual growth rate of 1.76 per cent per annum between 2018–19 and 2049–50.

Air freight forecasts

Figure 7.8 shows actual (since 2010–11) and forecast domestic, international and total air freight through the Adelaide air catchment out to 2049–50, and Table 7.8 provides a summary of total forecast air freight.

Total air freight through the Adelaide air catchment is projected to decline slightly between 2018–19 and 2049–50, from around 55.3 thousand tonnes in 2018–19 to around 54.1 thousand tonnes in 2049–50. However, the forecast 95 per cent prediction interval for total air freight is quite wide, ranging between –21 and +36.7 per cent of the baseline forecast of total air freight through Adelaide by 2049–50.

Figure 7.7 Actual and forecast passengers, Adelaide air catchment, 1992–2050



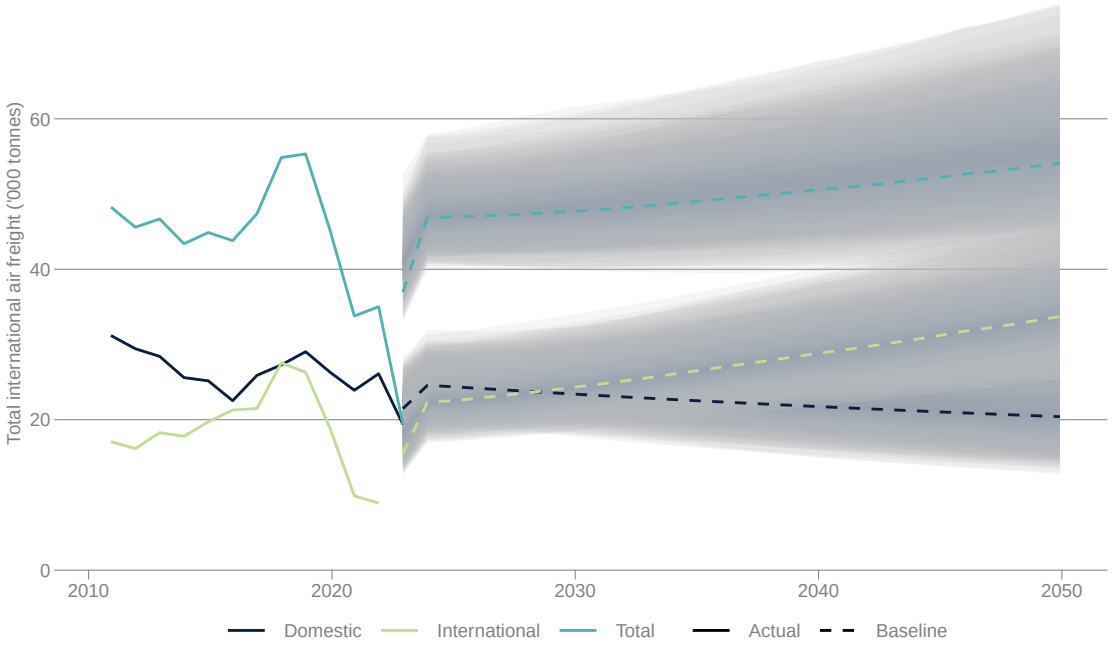
Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.7 Actual and forecast passengers, Adelaide air catchment, 1992–2050

	Total passengers (million)		
Year	Domestic	International	Total
1992	2.81	0.20	3.01
2000	3.93	0.25	4.19
2010	6.49	0.51	7.00
2020	5.41	0.82	6.23
2030	9.25	1.11	10.36
2040	11.24	1.42	12.66
2050	13.35	1.79	15.14

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Figure 7.8 Actual and forecast air freight, Adelaide airport, 2011–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Domestic air freight through Adelaide is projected to decline from around 29 thousand tonnes in 2018–19 to around 20.4 thousand tonnes by 2049–50. Total international air freight through the Adelaide air catchment is projected to increase from around 26.3 thousand tonnes in 2018–19 to around 33.7 thousand tonnes by 2049–50.

Table 7.8 Actual and forecast air freight, Adelaide air catchment, 2011–2050

	Total freight ('000 tonnes)		
Year	Domestic	International	Total
2011	31.19	17.08	48.27
2020	26.32	18.89	45.21
2030	23.41	24.30	47.72
2040	21.76	28.81	50.57
2050	20.40	33.71	54.11

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Perth air catchment forecasts

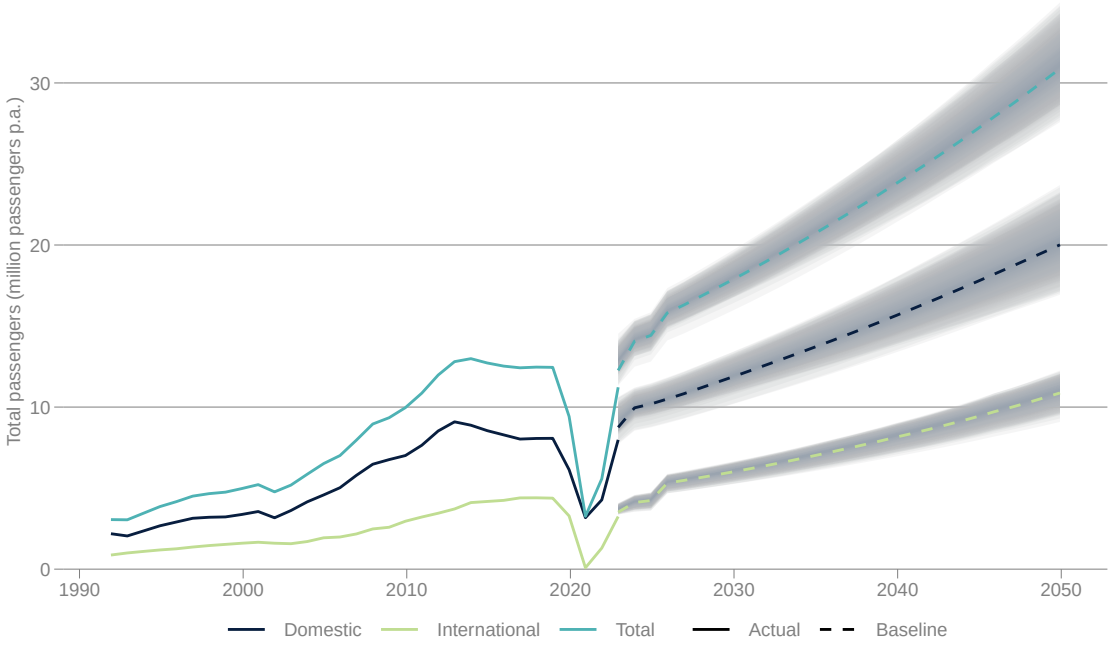
Passenger forecasts

Figure 7.9 shows domestic, international and total forecast air passengers to/from the Perth air catchment to 2049–50, and Table 7.9 provides a summary of total forecast passengers.

Total (domestic and international) passengers through the Perth air catchment are projected to increase from around 12.5 million passengers in 2018–19 to around 30.9 million passengers in 2049–50, an average annual growth rate of 2.97 per cent per annum between 2018–19 and 2049–50.

Total domestic passengers through Perth are projected to increase from around 8.1 million passengers in 2018–19 to around 20 million passengers in 2049–50, an average annual growth rate of 2.97 per cent per annum between 2018–19 and 2049–50. Total international passengers are forecast to increase from around 4.4 million passengers in 2018–19 to around 10.9 million passengers in 2049–50, an average annual growth rate of 2.98 per cent per annum between 2018–19 and 2049–50.

Figure 7.9 Actual and forecast passengers, Perth air catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.9 Actual and forecast passengers, Perth air catchment, 1992–2050

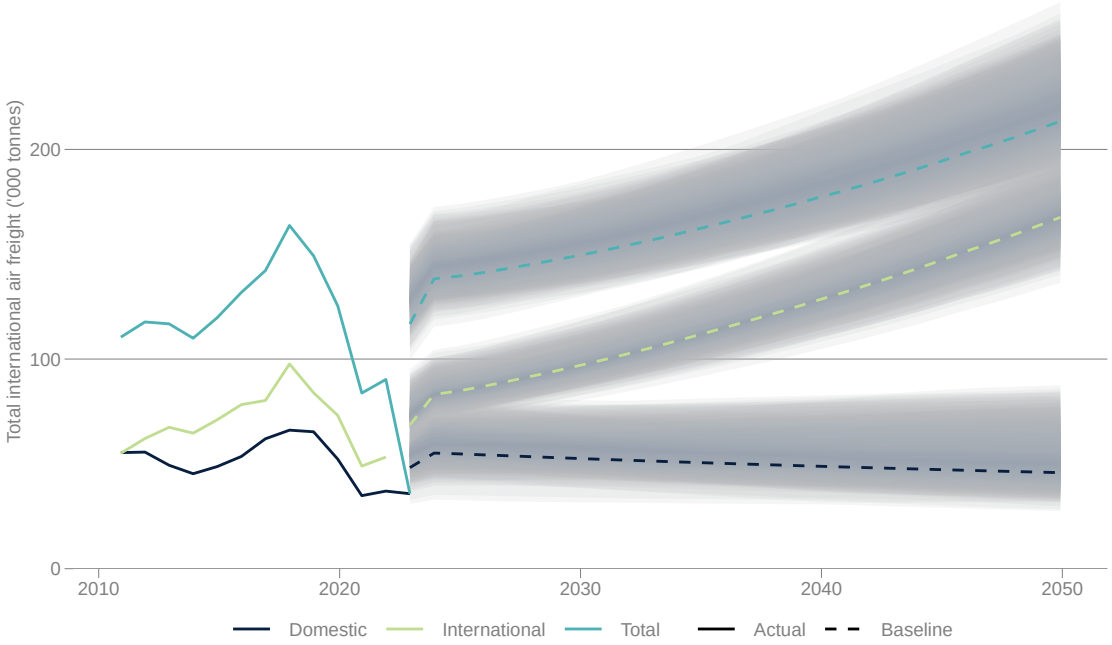
	Total passengers (million)		
Year	Domestic	International	Total
1992	2.19	0.87	3.06
2000	3.37	1.60	4.97
2010	7.01	2.96	9.97
2020	6.14	3.28	9.42
2030	11.86	6.00	17.86
2040	15.66	8.15	23.80
2050	20.01	10.87	30.88

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Air freight forecasts

Figure 7.10 shows actual (since 2010–11) and forecast domestic, international and total air freight movements through the Perth air catchment out to 2049–50, and Table 7.10 provides a summary of total forecast air freight.

Figure 7.10 Actual and forecast air freight, Perth air catchment, 2011–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Total air freight through the Perth aviation basin is forecast to increase between 2019 and 2049–50, from around 149.2 thousand tonnes in 2018–19 to around 213.4 thousand tonnes in 2049–50. Domestic air freight through the Perth metropolitan area is projected to increase from around 65.3 thousand tonnes in 2018–19 to around 45.8 thousand tonnes by 2049–50. Total international air freight through the Perth catchment is projected to grow from around 83.9 thousand tonnes in 2018–19 to around 167.6 thousand tonnes by 2049–50.

Table 7.10 Actual and forecast air freight, Perth air catchment, 2011–2050

	Total freight ('000 tonnes)		
Year	Domestic	International	Total
2011	55.38	55.08	110.46
2020	52.26	73.12	125.39
2030	52.57	96.84	149.42
2040	48.86	128.34	177.20
2050	45.81	167.61	213.42

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

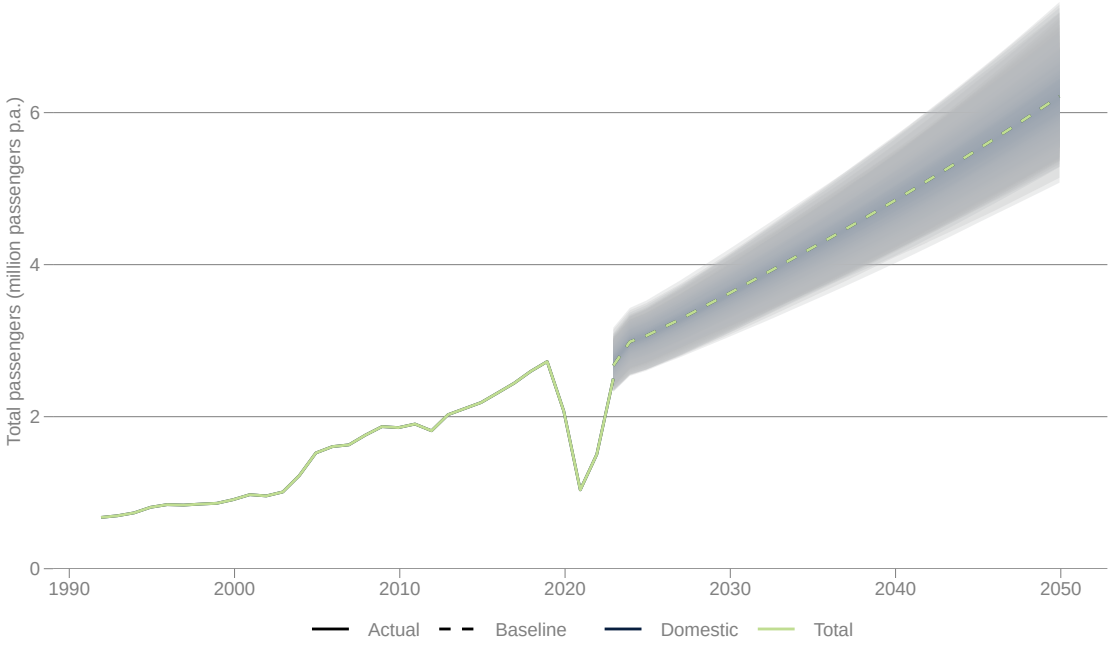
Hobart air catchment forecasts

Figure 7.11 shows total domestic forecast air passengers through Hobart to 2049–50, and Table 7.11 provides a summary of total forecast passengers.

Total domestic passengers through Hobart are forecast to increase from around 2.7 million passengers in 2018–19 to around 6.2 million passengers in 2049–50, an average annual growth rate of 2.7 per cent per annum between 2018–19 and 2049–50.

Total international passengers through Hobart are a small fraction of total air passengers through Hobart Airport and not separately forecast. Similarly, air freight forecasts were not produced for Hobart Airport.

Figure 7.11 Actual and forecast passengers, Hobart airport catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.11 Actual and forecast passengers, Hobart airport catchment, 1992–2050

	Total passengers (million)	
Year	Domestic	Total
1992	0.67	0.67
2000	0.91	0.91
2010	1.86	1.86
2020	2.07	2.07
2030	3.62	3.62
2040	4.84	4.84
2050	6.22	6.22

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Darwin air catchment forecasts

Passenger forecasts

Figure 7.12 shows domestic, international and total forecast air passengers through the Darwin air catchment to 2049–50, and Table 7.12 provides a summary of total forecast passengers.

Total (domestic and international) passengers are forecast to increase from around 2 million passengers in 2018–19 to around 4.8 million passengers in 2049–50, an average annual growth rate of 2.86 per cent per annum between 2018–19 and 2049–50.

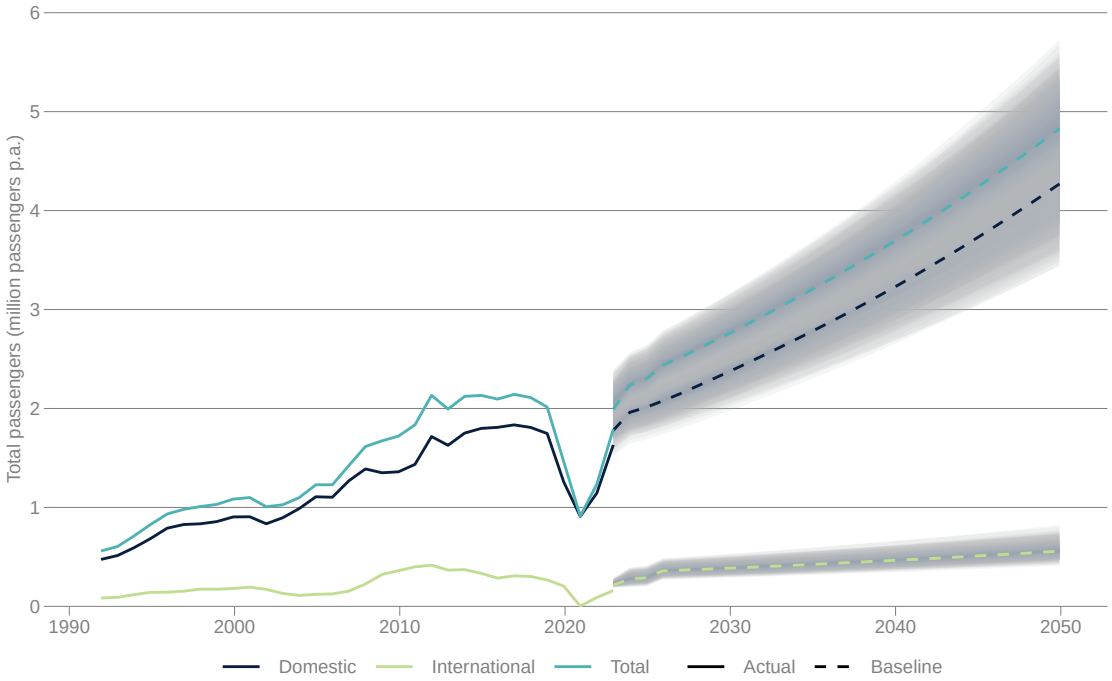
Domestic passengers through the Darwin air catchment are projected to increase from around 1.7 million passengers in 2018–19 to around 4.3 million passengers in 2049–50, an average annual growth rate of 2.92 per cent per annum between 2018–19 and 2049–50. Total international passengers are forecast to increase from around 267 thousand passengers in 2018–19 to around 558 thousand passengers in 2049–50, an average annual growth rate of 2.4 per cent per annum between 2018–19 and 2049–50.

Air freight forecasts

Figure 7.13 shows actual (since 2010–11) and forecast total international air freight through Darwin Airport and Table 7.13 provides a summary of forecast total international air freight to 2050. Domestic freight volumes are not available and hence domestic air freight forecasts not produced for Darwin Airport.

Total international air freight to and from the Darwin air catchment is projected to decline slightly between

Figure 7.12 Actual and forecast passengers, Darwin airport catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.12 Actual and forecast passengers, Darwin airport catchment, 1992–2050

	Total passengers (million)		
Year	Domestic	International	Total
1992	0.47	0.09	0.56
2000	0.90	0.18	1.08
2010	1.36	0.36	1.72
2020	1.26	0.20	1.46
2030	2.37	0.39	2.76
2040	3.22	0.47	3.69
2050	4.27	0.56	4.83

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

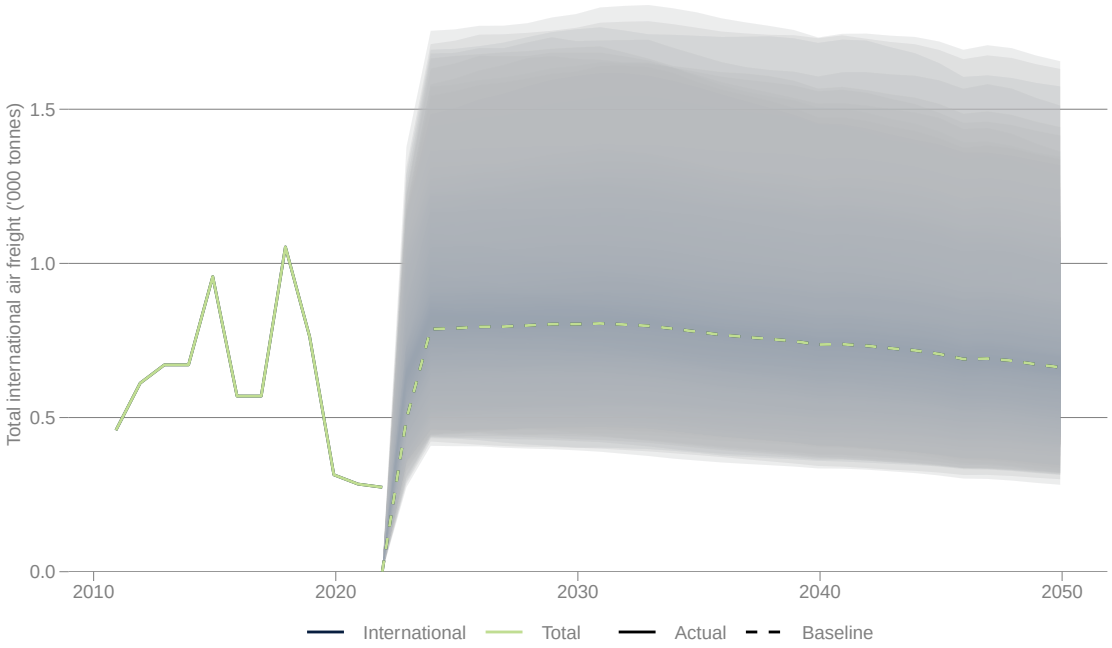
2018–19 and 2049–50, from around 760 tonnes in 2018–19 to around 660 tonnes by 2049–50. Air freight volumes through Darwin are forecast to remain relatively small, with very wide prediction intervals, ranging between –52.4 and +128.1 per cent of the baseline forecast of total air freight through Darwin by 2049–50, reflecting the high variation in historical air freight volumes.

Table 7.13 Actual and forecast air freight, Darwin air catchment, 2011–2050

	Total freight ('000 tonnes)	
Year	International	Total
2011	0.46	0.46
2020	0.31	0.31
2030	0.80	0.80
2040	0.74	0.74
2050	0.66	0.66

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Figure 7.13 Actual and forecast air freight, Darwin air catchment, 2011–2050



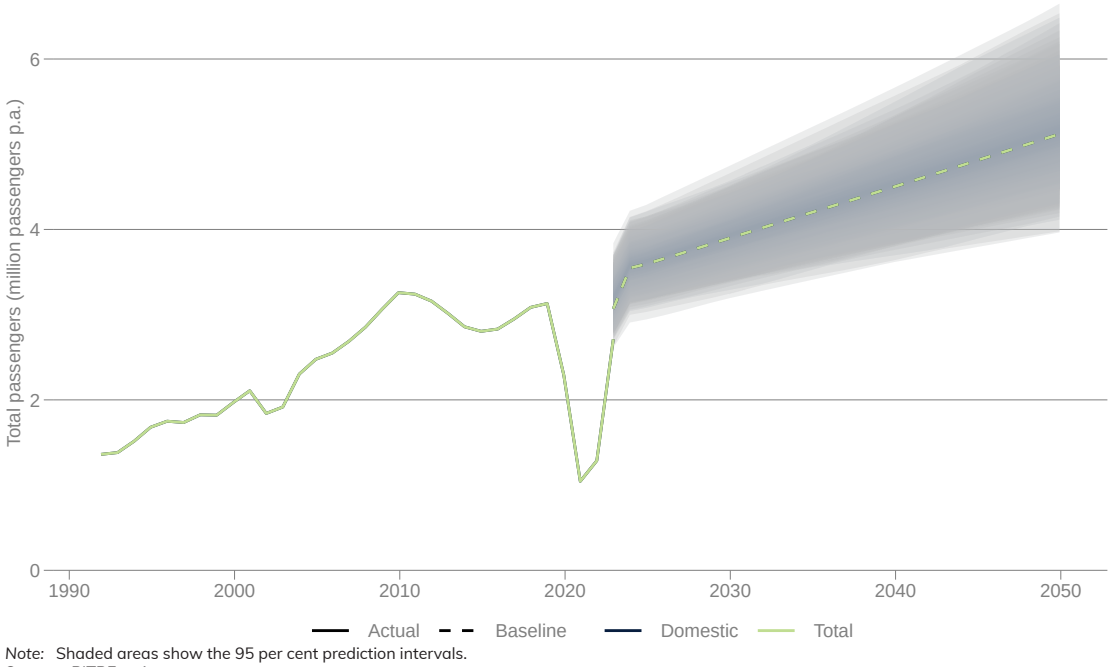
Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Canberra air catchment forecasts

Figure 7.14 shows total domestic forecast air passengers through Canberra to 2049–50, and Table 7.14 provides a summary of total forecast passengers.

Total domestic passengers through Canberra Airport are projected to increase from around 3.1 million passengers in 2018–19 to around 5.1 million passengers in 2049–50, an average annual growth rate of 1.6 per cent per annum over that period. Total international passengers through Canberra are a small fraction of total air passengers and are not separately forecast.

Figure 7.14 Actual and forecast passengers, Canberra airport catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.14 Actual and forecast passengers, Canberra airport catchment, 1992–2050

	Total passengers (million)	
Year	Domestic	Total
1992	1.36	1.36
2000	1.97	1.97
2010	3.26	3.26
2020	2.29	2.29
2030	3.90	3.90
2040	4.50	4.50
2050	5.12	5.12

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

7.3 Non-capital city airport forecasts

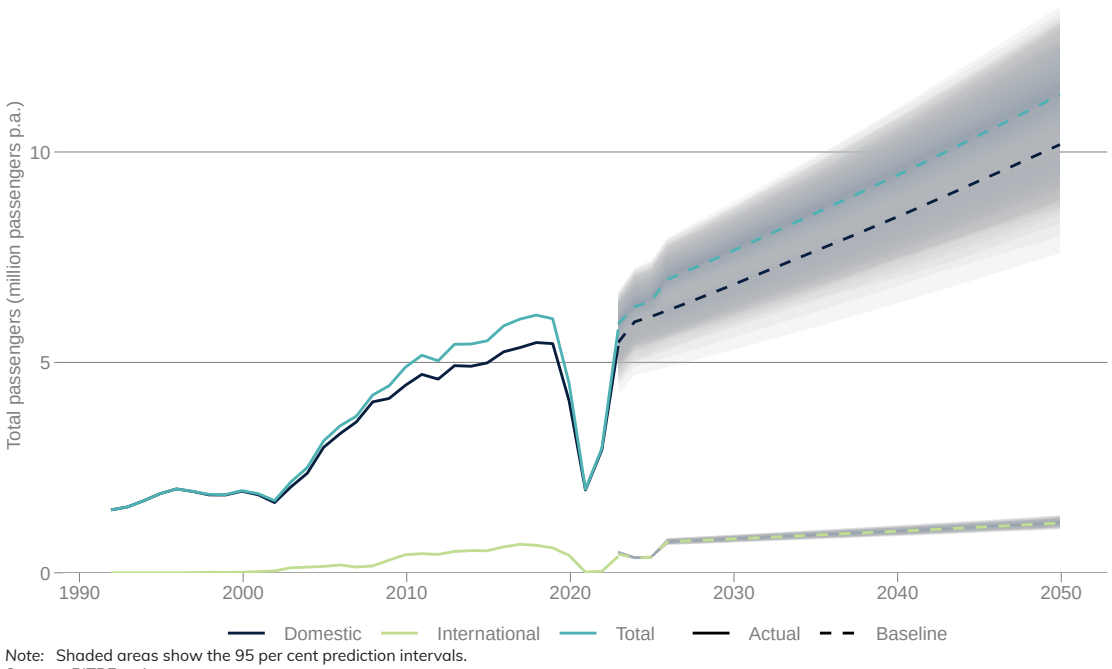
Gold Coast airport forecasts

Figure 7.15 shows forecast domestic, international and total forecast air passengers through Gold Coast airport to 2049–50, and Table 7.15 provides a summary of total forecast passengers through Gold Coast.

Total (domestic and international) passenger numbers are projected to increase from around 6 million passengers in 2018–19 to around 11.4 million passengers in 2049–50, an average annual growth rate of 2.06 per cent per annum between 2018–19 and 2049–50.

Domestic passengers through Gold Coast Airport are forecast to increase from around 5.4 million passengers in 2018–19 to around 10.2 million passengers in 2049–50, an average annual growth rate of 2.04 per cent per annum between 2018–19 and 2049–50. Total international passengers are forecast to increase from around 0.6 million passengers in 2018–19 to around 1.2 million passengers in 2049–50, an average annual growth rate of 2.27 per cent per annum between 2018–19 and 2049–50.

Figure 7.15 Actual and forecast passengers, Gold Coast air catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.15 Actual and forecast passengers, Gold Coast airport, 1992–2050

	Total passengers (million)		
Year	Domestic	International	Total
1992	1.49	0.00	1.49
2000	1.94	0.01	1.95
2010	4.46	0.43	4.89
2020	4.09	0.41	4.50
2030	6.84	0.81	7.65
2040	8.45	0.99	9.44
2050	10.18	1.18	11.36

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

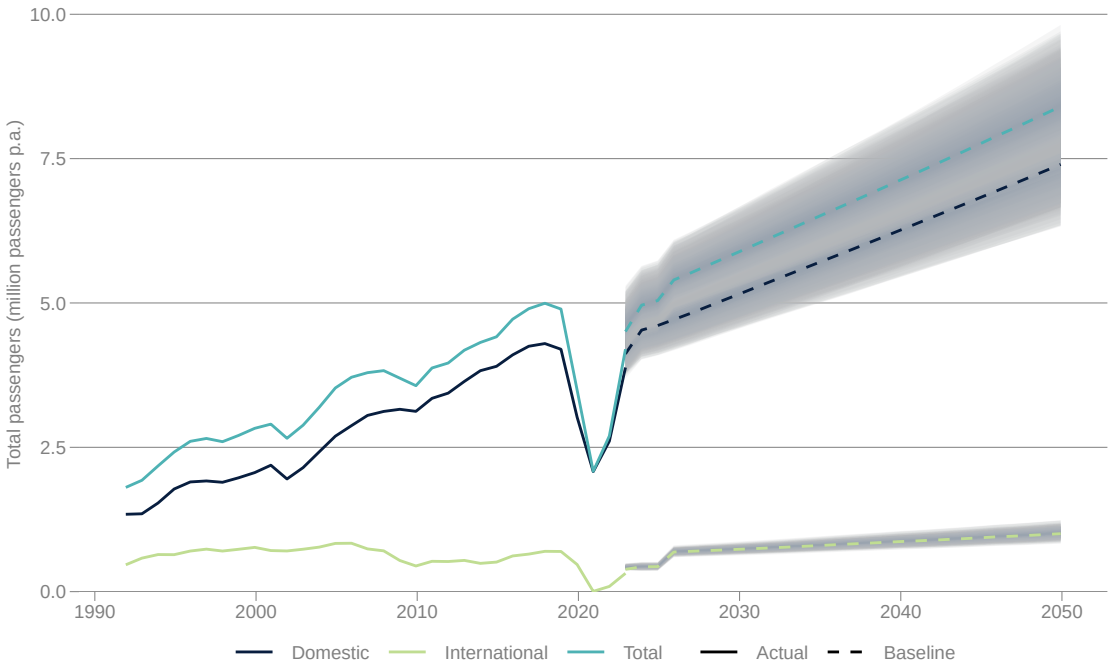
Cairns air catchment forecasts

Figure 7.16 shows domestic, international and total forecast air passengers through the Cairns metropolitan area to 2049–50, and Table 7.16 provides a summary of total forecast passengers through Cairns.

Total (domestic and international) passengers are projected to increase from around 4.9 million passengers in 2018–19 to around 8.4 million passengers in 2049–50, an average annual growth rate of 1.76 per cent per annum between 2018–19 and 2049–50.

Total domestic passengers through the Cairns air catchment are forecast to increase from around 4.2 million passengers in 2018–19 to around 7.4 million passengers in 2049–50, an average annual growth rate of 1.84 per cent per annum between 2018–19 and 2049–50. Total international passengers through Cairns are forecast to increase from around 0.7 million passengers in 2018–19 to around 1 million passengers in 2049–50, an average annual growth rate of 1.19 per cent per annum between 2018–19 and 2049–50.

Figure 7.16 Actual and forecast passengers, Cairns air catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.16 Actual and forecast passengers, Cairns air catchment, 1992–2050

	Total passengers (million)		
Year	Domestic	International	Total
1992	1.34	0.47	1.81
2000	2.06	0.77	2.83
2010	3.12	0.44	3.57
2020	3.02	0.47	3.49
2030	5.15	0.73	5.88
2040	6.26	0.87	7.12
2050	7.40	1.00	8.40

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

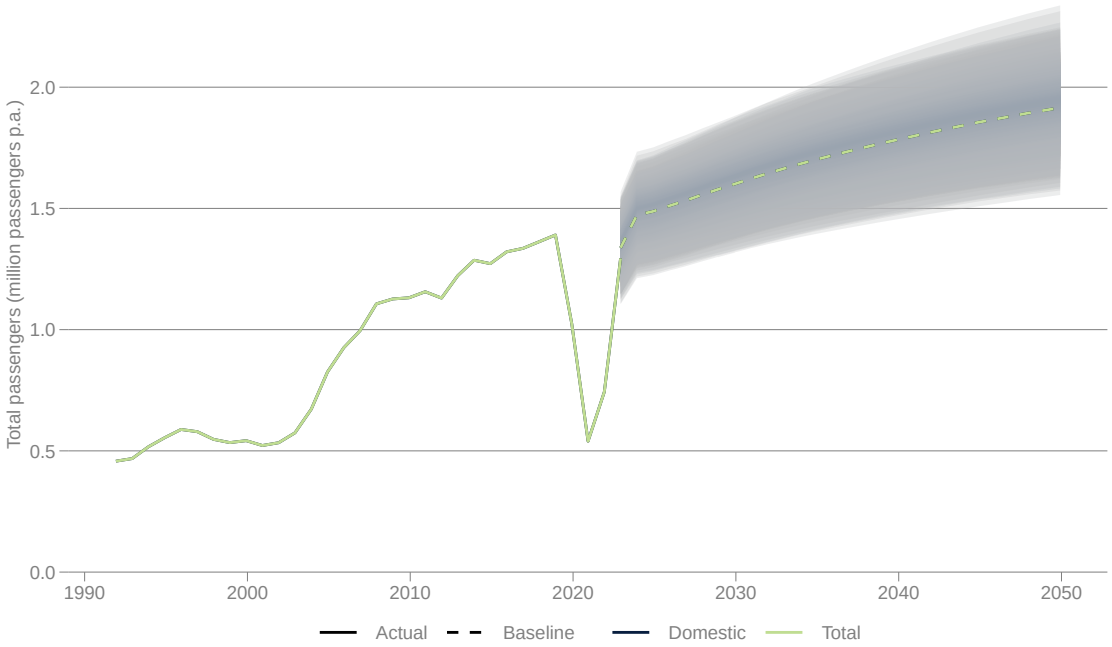
Launceston air catchment forecasts

Figure 7.17 shows total domestic forecast air passengers through Launceston Airport to 2049–50, and Table 7.17 provides a summary of total forecast passengers.

Total domestic passengers through Launceston are projected to increase from around 1.4 million passengers in 2018–19 to around 1.9 million passengers in 2049–50, an average annual growth rate of 1.04 per cent per annum between 2018–19 and 2049–50.

Total international passengers through Launceston are a minor fraction of total passenger movements through the airport and are not forecast in this report.

Figure 7.17 Actual and forecast passengers, Launceston airport catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.17 Actual and forecast passengers, Launceston airport catchment, 1992–2050

	Total passengers (million)	
Year	Domestic	Total
1992	0.46	0.46
2000	0.54	0.54
2010	1.13	1.13
2020	1.02	1.02
2030	1.60	1.60
2040	1.78	1.78
2050	1.92	1.92

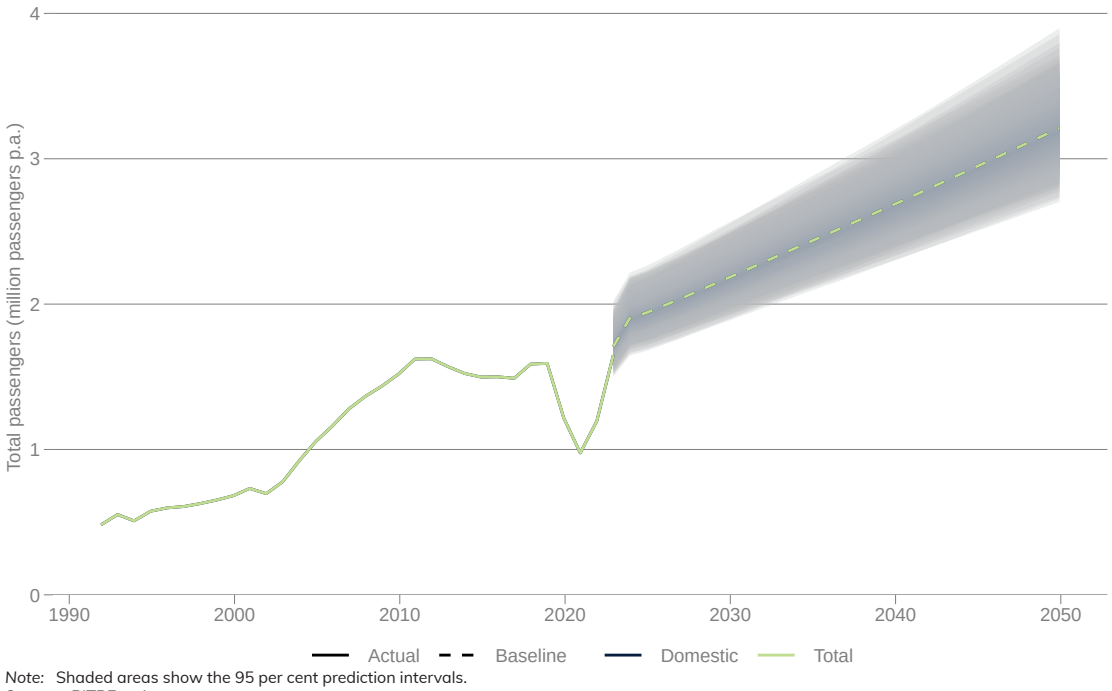
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Townsville air catchment forecasts

Figure 7.18 shows total domestic forecast air passengers through Townsville to 2049–50, and Table 7.18 provides a summary of total forecast passengers. Total domestic passengers through the Townsville air catchment are projected to increase from around 1.6 million passengers in 2018–19 to around 3.2 million passengers in 2049–50, an average annual growth rate of 2.29 per cent per annum between 2018–19 and 2049–50.

International passengers through Townsville are a minor share of total air passengers through Townsville Airport and not forecast here.

Figure 7.18 Actual and forecast passengers, Townsville airport catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.18 Actual and forecast passengers, Townsville airport catchment, 1992–2050

	Total passengers (million)	
Year	Domestic	Total
1992	0.48	0.48
2000	0.68	0.68
2010	1.52	1.52
2020	1.22	1.22
2030	2.18	2.18
2040	2.69	2.69
2050	3.21	3.21

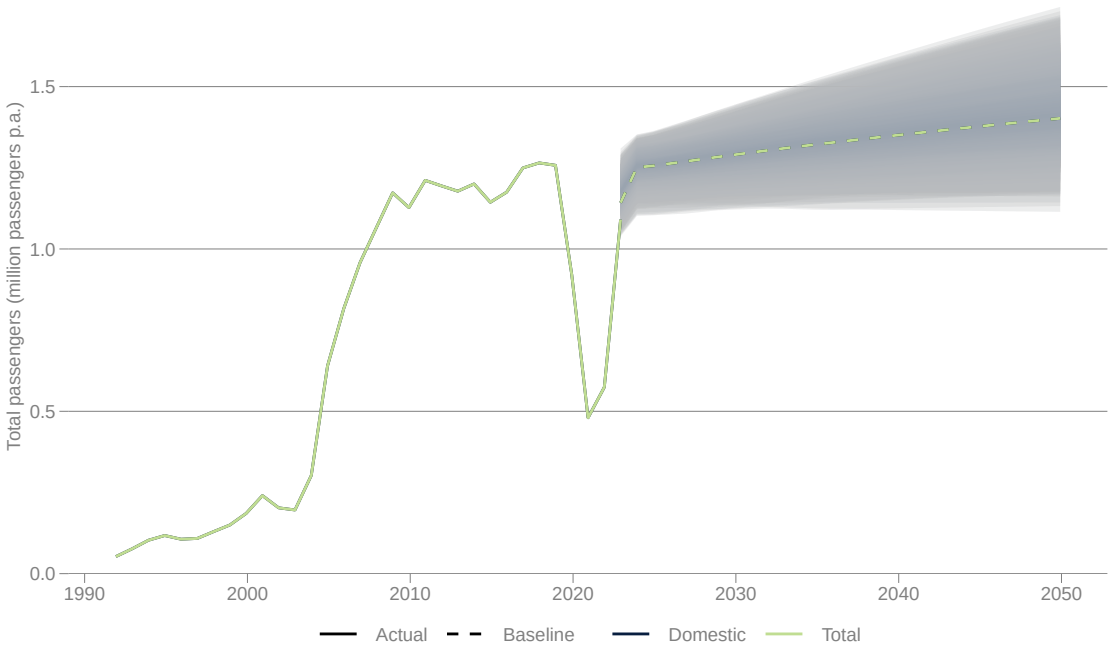
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Newcastle air catchment forecasts

Figure 7.19 shows total annual domestic forecast air passengers through the Newcastle air catchment to 2049–50, and Table 7.19 provides a summary of total forecast passenger numbers.

Total domestic passengers through the Newcastle region are projected to increase from around 1.3 million passengers in 2018–19 to around 1.4 million passengers in 2049–50, an average annual growth rate of just 0.35 per cent per annum between 2018–19 and 2049–50. Newcastle region growth is based on modelled trends between 2009 and 2023, a period in which there has been little growth, hence the projected slow rate of growth in passenger numbers over the forecast horizon.

Figure 7.19 Actual and forecast passengers, Newcastle airport catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.19 Actual and forecast passengers, Newcastle airport catchment, 1992–2050

	Total passengers (million)	
Year	Domestic	Total
1992	0.05	0.05
2000	0.19	0.19
2010	1.13	1.13
2020	0.92	0.92
2030	1.29	1.29
2040	1.35	1.35
2050	1.40	1.40

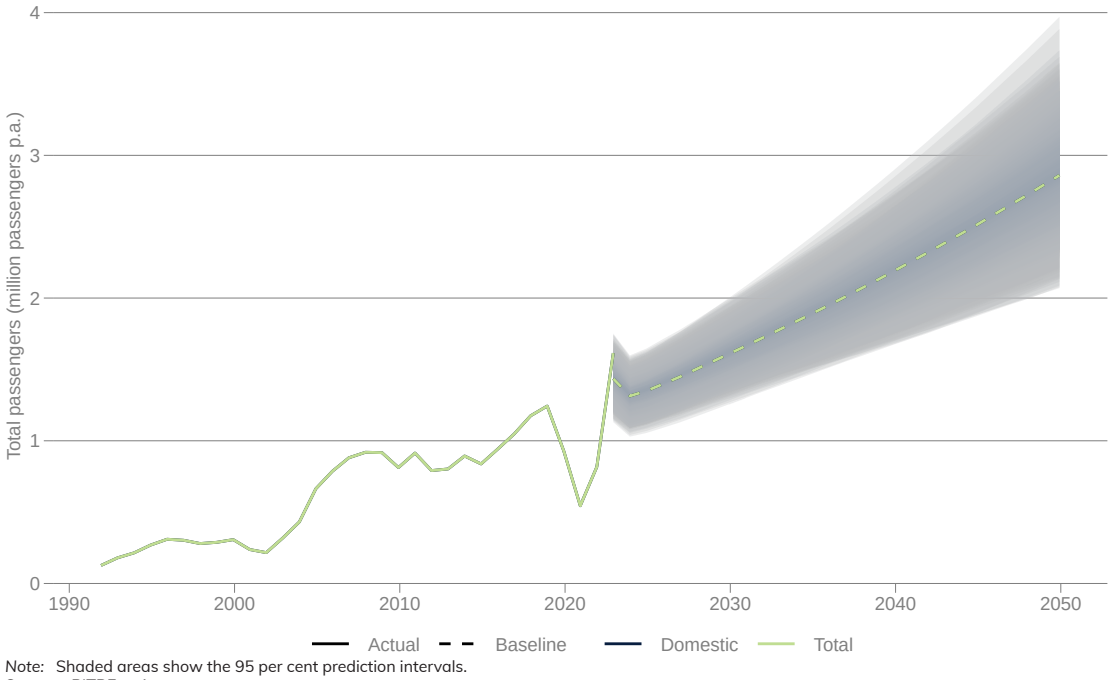
Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Sunshine Coast Airport forecasts

Figure 7.20 shows total domestic forecast air passengers through Sunshine Coast Airport to 2049–50, and Table 7.20 provides a summary of total forecast passengers through Sunshine Coast.

Total domestic passengers through Sunshine Coast Airport are forecast to increase from around 1.2 million passengers in 2018–19 to around 2.9 million passengers in 2049–50, an average annual growth rate of 2.72 per cent per annum between 2018–19 and 2049–50.

Figure 7.20 Actual and forecast passengers, Sunshine Coast airport catchment, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Table 7.20 Actual and forecast passengers, Sunshine Coast airport catchment, 1992–2050

	Total passengers (million)	
Year	Domestic	Total
1992	0.13	0.13
2000	0.31	0.31
2010	0.81	0.81
2020	0.93	0.93
2030	1.61	1.61
2040	2.19	2.19
2050	2.86	2.86

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table 7.21 Actual and forecast air passengers, all capital city air catchments, 1992–2050

	Total passengers (million)		
Year	Domestic	International	Total
1992	31.97	8.95	40.91
2000	46.90	15.26	62.16
2010	78.51	24.26	102.77
2020	69.19	29.21	98.40
2030	123.25	51.20	174.44
2040	156.16	70.62	226.78
2050	192.61	95.39	288.00

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

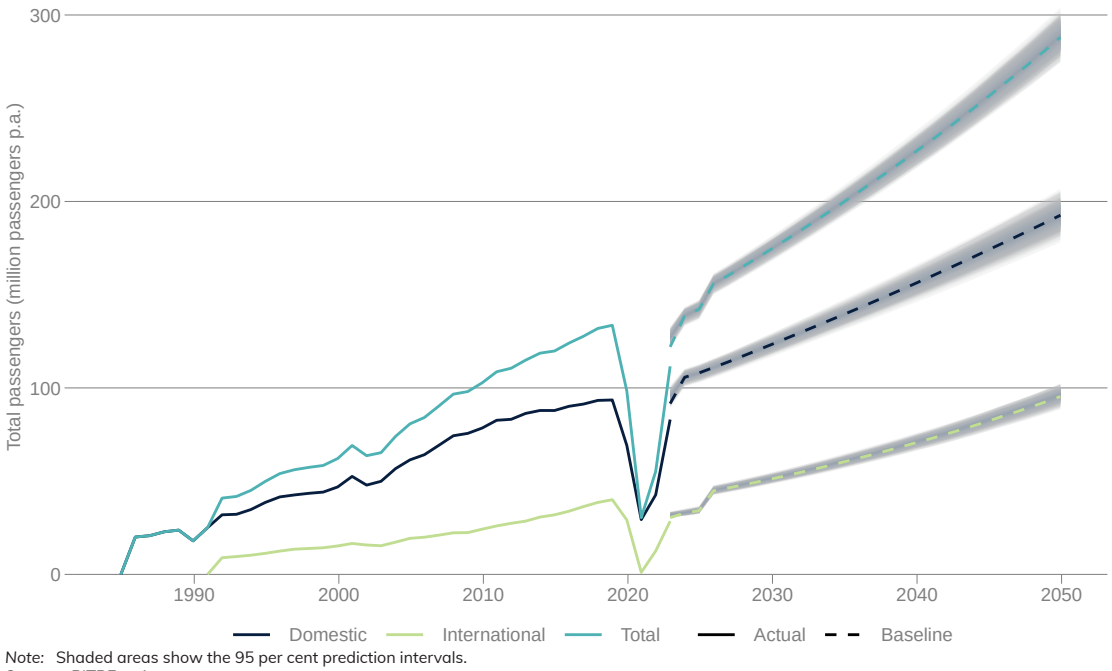
7.4 Total capital city and non-capital city air catchment passenger forecasts

Lastly, Figures 7.21 and 7.22 show forecast domestic, international and total air passenger numbers aggregated across all capital city and non-capital city airports / air catchments, and the 95 per cent prediction intervals, and Tables 7.21 and 7.22 provide annual summaries of the same.

Across all capital city airports, total (domestic and international) passengers are projected to increase from around 133.6 million passengers in 2018–19 to around 288 million passengers in 2049–50, an average annual growth rate of 2.51 per cent per annum between 2018–19 and 2049–50.

Total domestic passengers through all capital city air catchments are projected to increase from around 93.5 million passengers in 2018–19 to around 192.6 million passenger in 2049–50, an average annual growth rate of 2.36 per cent per annum between 2018–19 and 2049–50. Total international passengers through all capital city airports are forecast to increase from around 40.1 million passengers in 2018–19 to around 95.4 million passengers in 2049–50, an average annual growth rate of 2.84 per cent per annum between 2018–19 and 2049–50.

Figure 7.21 Actual and forecast air passengers, all capital city air catchments, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

Across the six major (non-capital city) airports, total (domestic and international) passengers are projected to increase from around 16.4 million passengers in 2018–19 to around 29.2 million passengers in 2049–50, an average annual growth rate of 1.87 per cent per annum between 2018–19 and 2049–50.

Total domestic passengers through all regional city air catchments are projected to increase from around

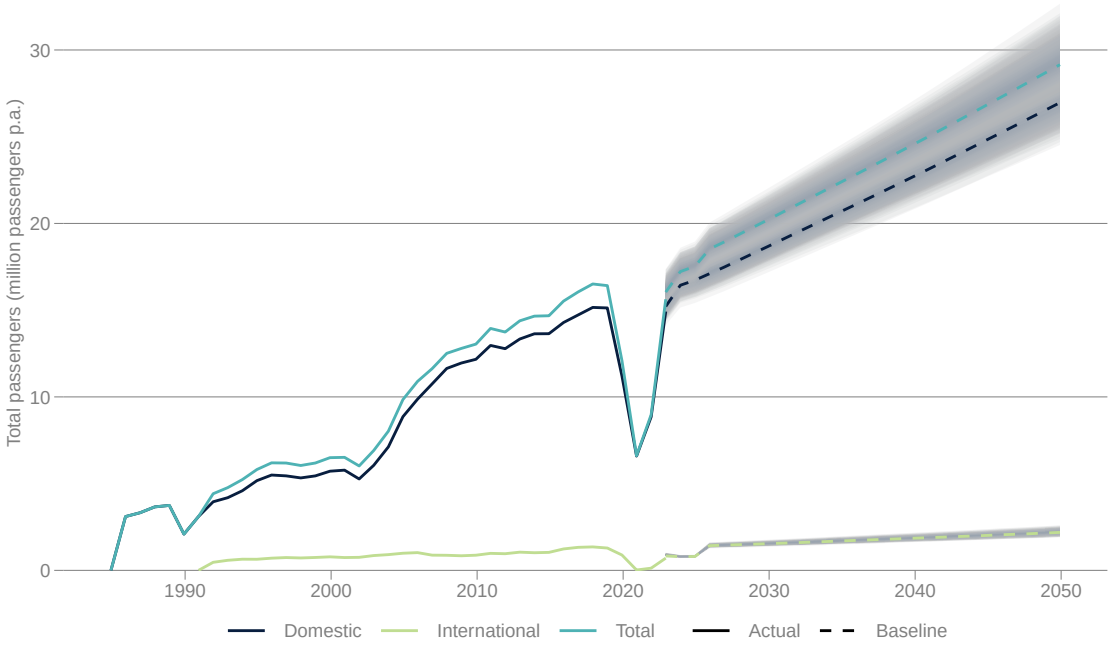
Table 7.22 Actual and forecast air passengers, non-capital city air catchments, 1992–2050

	Total passengers (million)		
Year	Domestic	International	Total
1992	3.95	0.47	4.42
2000	5.72	0.78	6.50
2010	12.17	0.87	13.04
2020	11.20	0.88	12.08
2030	18.67	1.54	20.21
2040	22.72	1.85	24.57
2050	26.96	2.19	29.15

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

15.1 million passengers in 2018–19 to around 27 million passenger in 2049–50, an average annual growth rate of 1.88 per cent per annum between 2018–19 and 2049–50. Total international passengers are forecast to increase from around 1.3 million passengers in 2018–19 to around 2.2 million passengers in 2049–50, an average annual growth rate of 1.73 per cent per annum between 2018–19 and 2049–50.

Figure 7.22 Actual and forecast air passengers, non-capital city air catchments, 1992–2050



Note: Shaded areas show the 95 per cent prediction intervals.
Source: BITRE estimates.

8. Forecast comparison and concluding remarks

This final chapter provides a comparison of BITRE's long-term air passenger movement forecasts with recently released airport Master Plans outlooks and finishes with some concluding remarks.

8.1 Forecast comparison

Table 8.1 provides a comparison of the long-term air passenger forecasts presented in this report, with previous BITRE forecasts (BITRE 2012) and the latest available airport Master Plan forecasts.

Table 8.1 Comparison of forecast air passenger growth rates, by airport / air catchment

	BITRE forecasts				Airport forecasts		
Airport / air catchment	BITRE (2008)	BITRE (2010)	BITRE (2012)	Present	Forecast	Period	Source
Sydney	4.0	4.0	3.6	2.3	1.9	2017-2039	Sydney Airport (2019)
Melbourne	4.0	4.2	3.9	2.6	3.2	2019-2042	Melbourne Airport (2022)
Brisbane	4.5	4.9	4.2	2.8	3.8	2018-2040	Brisbane Airport (2020)
Adelaide	3.6	3.5	3.1	1.9	4.1	2018-2039	Adelaide Airport (2019)
Perth	4.7	4.7	4.4	3.0	3.2	2018-2040	Adelaide Airport (2019)
Hobart	3.2	3.5	3.0	2.7	3.4	2023-2042	Hobart Airport (2022)
Darwin	4.3	4.4	4.2	2.9	3.5	2019-2043	Darwin Airport (2023)
Canberra	3.5	3.5	3.3	1.6	4.8	2019-2040	Canberra Airport (2020)
All capital cities	4.1	4.2	3.8	2.1	3.1	na	na
Gold Coast	..	..	4.4	2.1	4.8	2022-2037	Canberra Airport (2020)
Cairns	..	..	3.7	1.8	3.6	2019-2040	Cairns Airport (2022)
Launceston	..	..	2.7	1.0	2.8	2018-2040	Launceston Airport (2020)
Townsville	..	..	3.7	2.3	4.1	2022-2043	Townsville Airport (2023)
Newcastle	..	..	3.1	0.4	4.0	2016-2036	Newcastle Airport (2016)
Sunshine Coast	..	..	..	2.7	4.3	2020-2040	Sunshine Coast Airport (2020)
Non-capital cities	3.3	..	3.2	..	3.4	na	na
All airports	4.0	..	3.7	2.3	3.1	na	na

na not applicable .. not available

Sources: Airport Master Plans, BITRE (2008), BITRE (2010), BITRE (2012) and BITRE estimates.

Comparison with previous BITRE forecasts

BITRE's latest forecasts are based on a broadly similar methodology to that used to produce previous BITRE forecasts, but updated to incorporate both short- and long-run responses of domestic and international passenger aviation movements. These forecasts imply slower future growth in domestic and international air passenger numbers, than previous BITRE forecasts (see Table 8.1). Part of the difference in the forecast growth rates is due to changes in the estimated travel demand parameters, which reflect slower observed recent growth in domestic aviation activity, while part is due to changes in forecast assumptions – i.e. slower and slowing growth over the later (and longer) forecast horizon.

The most significant model differences include:

- the long-run real income-related travel demand parameters for domestic passengers are lower across all airports (except Hobart) than previously estimated (BITRE 2012, Table 2.3, p. 18), presumably reflecting slower growth in domestic air passenger travel observed between 2012 and 2019
  - for example, the real income parameter estimate for domestic passenger movements through Canberra Airport is about half the equivalent parameter estimate reported in BITRE (2012, Table 2.3, p. 18)
- the long-run real income travel demand parameters for international travel by domestic residents are also lower across all airports (except Adelaide and Cairns) than previous estimates (BITRE 2012), also reflecting slower observed growth in international travel by residents since 2012
- the long-run real income parameter estimates for foreign visitor arrivals, though not directly comparable due to changes in model specification, are also generally below the equivalent BITRE (2012) estimates.

The estimated airfare and exchange rate parameter estimates do not appear to be significantly different to the equivalent BITRE (2012) estimates, noting that these parameters are generally relatively small (inelastic), and accordingly changes in airfares and exchange rates have a smaller impact on passenger movements.

The latest forecasts assume similar rates of domestic population growth, but slower domestic productivity growth relative to the forecast assumptions used in BITRE (2012).

Comparison with Master Plan forecasts

The most recent published airport Master Plans include:

- Sydney (Kingsford Smith) Airport Master Plan 2019 (Sydney Airport 2019)
- Melbourne Airport Master Plan 2022 (Melbourne Airport 2022)
- Brisbane Airport Master Plan 2020 (Brisbane Airport 2020)
- Adelaide Airport Master Plan 2019 (Adelaide Airport 2019)
- Perth Airport Master Plan 2020 (Perth Airport 2020)
- Hobart Airport Master Plan 2022 (Hobart Airport 2022)
- Darwin Airport Draft Master Plan 2023 (Darwin Airport 2023)
- Canberra Airport Master Plan 2020 (Canberra Airport 2020)
- Gold Coast Airport Master Plan 2017 (Gold Coast Airport 2017)
- Launceston Airport Master Plan 2020 (Launceston Airport 2020)
- Townsville Airport Preliminary Draft Master Plan 2023 (Townsville Airport 2023)
- Newcastle Airport Master Plan 2016 (Newcastle Airport 2016)
- Sunshine Coast Airport Master Plan 2020 (Sunshine Coast Airport 2020).

Cairns Airport is not a federally-leased airport, and hence not required to release regular Master Plans under that program, however, Cairns Airport corporation issued a Statement of Intent in 2022 (Cairns Airport 2022) that provides broad long-term passenger throughput forecasts to 2040.

When comparing BITRE and airport Master Plan air passenger forecasts, note that the majority of published airport Master Plans were developed and published prior to the onset of the COVID-19 pandemic – only the latest Master Plans for Melbourne, Hobart, Darwin and Townsville Airports, have been produced since the onset of the pandemic. In most of these recent plans, aviation activity is assumed to recover from the pandemic, albeit with some lag.

It should also be noted that BITRE's current forecast horizon (2050) extends out 27 years, whereas airport Master Plans typically provide 20-year outlooks. Most long-term socio-economic variable projections, including those used in this report, assume slowing future growth, particularly slowing population and productivity growth. Hence, the longer the forecast horizon, the slower the projected future annual rate of growth (all else equal).

Across all airports, BITRE's latest air passenger growth rates are generally below those of most of the recent airport Master Plans (see Table 8.1), and in some cases BITRE's forecasts are well below recent Master Plan forecasts. The major exception is Sydney (Kingsford Smith) Airport – the latest airport Master Plan (Sydney Airport 2019) implies slower growth than BITRE's latest estimates.

In the case of Sydney (Kingsford Smith) Airport, it should be noted that BITRE's forecasts relate to the broader Sydney aviation catchment, and so will include future passenger growth that will be accommodated by the new Western Sydney (Nancy Bird Walton) Airport, from 2026 onwards. The major area of difference between these forecast and those of Sydney Airport (2019) is in domestic passenger growth – Sydney Airport (2019) projected growth in domestic passenger numbers of 1.0 per cent per annum between 2017 and 2039 through Kingsford Smith Airport, where BITRE projects domestic passenger growth of around 2.0 per cent per annum between 2019 and 2050 *through the Sydney aviation catchment*. Total international passenger numbers are projected to grow at similar rates, allowing for the difference in forecast horizons (outlined above) – BITRE: 2.7 per cent per annum 2019 to 2050; Sydney Airport (2019): 3.1 per cent per annum 2017 to 2039.

Of the other airports, the most significant differences between the latest Master Plan passenger forecasts and these forecasts are for: Adelaide, Canberra, Gold Coast, Cairns, Launceston, Townsville, Newcastle and the Sunshine Coast airports / air catchments.

8.2 Concluding remarks

This report provides long-term forecasts, to 2050, of passenger and freight movements through Australia's 14 busiest airports / air catchments. The forecasts have been derived using updated air passenger and air freight demand models, and the latest long-term outlooks of domestic and international population and economic

growth, world oil prices and the potential impact of future responses to climate impacts. The air passenger and freight forecasts presented in the report are intended to help inform policy makers and planners about likely future growth in airport throughput and future airport capacity requirements.

The baseline scenario forecasts presented in the report represent BITRE's best estimates of likely future growth in Australian aviation activity, subject to the long-term forecast assumptions. However, forecasting future activity is an inherently uncertain undertaking, and the forecast prediction intervals and sensitivity analysis results provide estimate of the range of uncertainty in the forecasts.

All passenger and freight movement forecasts presented in this report are 'unconstrained' in the sense that they are primarily driven only by demand-side factors. The influence of supply-side factors are limited to fuel costs – and no account has been taken of the impact of future airport and air-route capacity, due to the high collinearity of these factors to airport demand and the difficulty in reliably forecasting these factors.

The air passenger forecast model parameter estimates and forecast growth rates imply that Australian passenger air travel has further matured since the BITRE's previous forecasts (BITRE 2012), with future growth projected to be more in line with economic growth rates, than the higher growth rates experienced in the 1990s and early 2000s. Nonetheless, passenger movements and, to a lesser extent, freight movements through Australian airports will continue to grow over the next 20–30 years, with consequent implications for supporting supply-side infrastructure capacity.

COVID-19 recovery

The forecasts presented in this report implicitly assume *full recovery* of both domestic and international aviation activity to pre-COVID-19 pandemic trend levels.

Whether aviation activity will return to pre-pandemic trend levels or whether the pandemic will have a persistent effect will only become clear in time. Previous aviation shocks, while not as large as the impact of COVID-19, have not had a significant persistent impact on aviation activity. As of the June 2023 quarter, domestic passenger activity had recovered to around 95 per cent of pre-pandemic (June 2019 quarter) levels and international air passenger numbers had recovered to around 80 per cent of pre-pandemic (June quarter 2019) levels.

In view of the recovery to date, to the extent the pandemic does have a persistent impact on aviation activity, it is likely to be a small fraction of total activity.

Response to climate change

The Australian Government has committed to reduce emissions by 43 per cent below 2005 levels by 2030, and to net zero by 2050. Reaching the target will require reductions in emissions across all sectors of the economy, including transport. The forecasts incorporate the potential future impact of government policies and industry actions to reduce aviation sector emissions, principally through the impact on aviation fuel costs.

The forecasts presented here do not, however, incorporate the potential impact of changes in global temperatures on future domestic and international passenger activity. While the issue is important and could significantly impact future air travel activity, the direct impact of potential climate change on air travel was beyond the scope of this study.

Appendix A – Aviation forecasting models – empirical specifications

Introduction

BITRE's aviation forecasts are based on a suite of empirical models:

- domestic regular scheduled air passenger movement models
- domestic air freight models
- international air passenger movement models
- international air freight models
- domestic general aviation activity.

This appendix describes each of the model components and lists the model specifications.

Domestic air passenger movement models

Domestic air passenger movements are modelled and forecast using two sets of models:

1) National domestic passenger movement models
2) Air catchment-specific domestic passenger movement models

The air catchment models overlap with the national model in the aggregate, with the results from the national model used as control totals for the disaggregate model results.

National domestic passenger movement model(s)

National domestic passenger movements are modelled in two dimensions:

- Total passengers
- Total passenger kilometres

The general form of the model is an unrestricted error correction mechanism (UECM) model to account for differences in short- and long-run market responses. Available domestic air passenger movement data does not distinguish between business and leisure travel, hence a single model is used to model total domestic commercial air passenger movements.

The UECM features separate long-run and short-run specifications, and is estimated in two stages, the long-run specification is estimated first and the residuals from the long-run specification enter the short-run specification, capturing the dynamic market disequilibrium adjustment process. The long-run UECM specification is listed in equation (A.1).

$$\ln y_t = A + \sum_i B_i \ln X_{it} + \sum_k \Gamma_k Z_{kt} + u_t \quad \text{where } u_t \sim iid(0, \sigma_u^2) \tag{A.1}$$

where:

y_t – denotes domestic air passenger kilometres or passengers uplifted in time period t.

X_{it} – denotes the set of i air passenger demand drivers at time t. Relevant demand drivers include: income (e.g. GDP), real domestic air fares, and other relevant factors.

Z_{kt} – denotes the set of k event-specific dummy variables, to capture changes in air passenger demand that cannot be explained by other factors. Examples of event-specific dummy variables include periods affected by the 1989 pilot's dispute, Ansett Airlines closure and, more recently, COVID-19.

A, B_i, Γ_i – are long-run model parameter estimates.

The short-run UECM specification is listed in equation (A.2).

$$\Delta \ln y_t = \alpha + \sum_i \beta_i \ln X_{it} + \gamma(\hat{A} + \sum_i \hat{B}_i \ln X_{it}) + \sum_k \delta_k Z_{kt} + \varepsilon_t \quad \text{where } \varepsilon_t \sim iid(0, \sigma_\varepsilon^2) \tag{A.2}$$

where:

Δy_t – denotes the change in domestic air passenger kilometres or passengers uplifted in time period t

ΔX_{it} – denotes the change in air passenger demand drivers at time t

X_{it}, Z_{kt} – have the same meaning as in equation (A.1)

$\hat{A}$, $\hat{B}_i$ – are empirical estimates of A and B_i from equation (A.1)

α, β_i, γ, δ_i – are the short-run model parameter estimates. The parameter γ reflects the speed of market adjustment in response to disequilibrium.

Airport / air catchment domestic air passenger movement models

Total domestic passenger movements to and from each of Australia's eight state/territory capital cities and the six next busiest regional domestic airports are also modelled using separate, independent UECM's, to account for variation in short- and long-run market responsiveness. Like the national domestic model, the airport / air catchment UECM model are estimated in two stages, the long-run specification is estimated first and the residuals from the long-run specification used in estimating the short-run specification.

The long- and short-run UECM specifications are broadly similar to the national model specifications (Equations (A.1) and (A.2)), albeit with air catchment-specific activity and airfares. Air catchment-specific economic activity is derived as the product of gross domestic product per capita and airport catchment populations – i.e. GCCSAs for capital city airports and local regional population for regional airports.

Domestic air freight aviation model

BITRE collects and reports domestic air freight volumes carried in the cargo-hold of passenger aircraft and, since 2010, air freight to/from capital city airports carried by dedicated domestic air freight services.

National domestic air freight model

Total domestic air freight is modelled in a static econometric specification as a function of domestic economic activity, domestic air transport costs (proxied by aviation fuel costs),[16] and some aviation event-specific dummy variables.

The estimating model specification is listed in equation (A.3).

$$\ln f_t = \beta_0 + \beta_y \ln y_{it} + \beta_p p_t + u_t \quad \text{where } u_t \sim iid(0, \sigma_u^2) \tag{A.3}$$

where:

f_t – denotes total freight tonne kilometres in time period t

y_t – denotes real GDP at time t

p_t – denotes real domestic aviation fuel costs at time t

β_0, β_y, β_p – are model parameters.

Air catchment-specific air freight movement models

Total domestic air freight to and from Australia's major capital cities are also modelled using separate, independent airport-specific static econometric models. The city-based air freight specifications have a similar structure to the national domestic air freight model, albeit with region-specific activity variables in place of national GDP. Air freight costs are again proxied by trends in aviation fuel costs. Air catchment-specific economic activity is derived as GDP per capita multiplied by airport catchment populations.

16 BITRE does not collect air freight rate series. Aviation fuel costs are used as a proxy for trends in air freight costs, as aviation fuel is a significant operating cost. In practice, air freight rates may be influenced by passenger flight numbers and frequency, and available cargo-hold capacity on passenger flights, and so air freight rates may bear no relation to aviation fuel costs.

International air passenger movement forecast models

International air passenger movement forecasts are derived as the sum of:

1) Australian resident departures
2) Australian resident arrivals
3) Overseas visitor arrivals
4) Overseas visitor departures

Each of these four components are modelled separately and then aggregated to derive total forecast international passenger arrivals and departures:

- Total arrivals = Resident arrivals + Visitor arrivals
- Total departures = Resident departures + Visitor departures

The following sections outline the empirical model specifications for each of the four international passenger movement segments.

Domestic resident departures and arrivals

Domestic resident departures

Domestic resident departures are influenced by a number quantitative and qualitative factors. These factors include:

- income
- airfares
- relative prices (between Australia and overseas destinations)
- qualitative factors, such as tastes and preferences, service offerings and travel risks (e.g. terrorism threat, political risk, natural disasters, etc.)

Domestic resident departures are modelled using a UECM, to account for variation in the short- and long-run market responses, taking into account all of the above factors. Again, the UECM model is estimated in two stages, the long-run specification is first estimated and the residuals from the long-run specification enter the short-run specification. The long-run model specification is listed in equation (A.4).

$$\ln y_t^{\mathrm{RD}} = A + \sum_i B_i \ln X_{it} + \sum_k \Gamma_k Z_{kt} + u_t \quad \text{where } u_t \sim iid(0, \sigma_u^2) \tag{A.4}$$

where:

y_t^{RD} – denotes domestic resident departures (passengers) in time period t.

X_{it} – denotes the set of i domestic resident departures demand drivers at time t. The principal demand drivers include: income (proxied by Australian real GDP); airfares (proxied by a combination of historical fares and world aviation fuel prices, in Australian dollars); and relative prices – defined as the product of the exchange rate and changes in general prices in Australia and overseas, i.e.

$$e_t^{\mathrm{A}} \times \frac{P_t^{\mathrm{A}}}{P_t^{\mathrm{O}}}$$

.

Z_{kt} – denotes k event-specific dummy variables, to capture changes in air passenger demand that cannot be explained by other factors. Examples of event-specific dummy variables include periods affected by SARS, September 11, the GFC and, more recently, COVID-19.

A, B_i, Γ_i – denote the long-run UECM model parameter estimates.

The short-run specification is listed in (A.5).

$$\Delta \ln y_t^{\mathrm{RD}} = \alpha + \sum_i \beta_i \ln X_{it} + \gamma(\hat{A} + \sum_i \hat{B}_i \ln X_{it}) + \sum_k \delta_k Z_{kt} + \varepsilon_t \quad \text{where } \varepsilon_t \sim iid(0, \sigma_\varepsilon^2) \tag{A.5}$$

where:

Δy_t^{RD} – denotes differenced domestic resident departures (passengers) in time period t

ΔX_{it} – is differenced air passenger demand drivers (specified above) at time t

X_{it}, Z_{kt} – have the same meaning in equation (A.1)

$\hat{A}$, $\hat{B}_i$ – denote the empirical estimates of A and B_i from equation (A.1)

α, β_i, γ, δ_i – denote the short-run model parameters. The parameter γ reflects the speed of market adjustment in response to disequilibrium.

Australian international visitor and arrivals data (BITRE 2023e) includes:

- travel purpose – leisure or business
- trip duration – short-term or long-term/permanent
- arriving/departing Australian airport
- overseas destination country (for departing residents) and country of residence (for arriving visitors).

The domestic resident departure forecasting models were estimated separately by trip duration and departure airport, but did not differentiate between business and leisure passengers nor the destination country of overseas trips. As short-term departures comprise more than 95 per cent of all domestic resident departures, the forecasting models are based only on total domestic resident departures.

Domestic resident arrivals

Domestic resident arrivals appear highly correlated with the number of resident departures, albeit with some lag. BITRE modelled international resident arrivals as a distributed-lag of total domestic resident departures. The total resident arrivals specification is listed in equation (A.6), with lag terms lagged up to 4 and 8 periods to cover both short- and long-term returning residents.

$$\ln y_t^{\text{RA}} = \alpha + \sum_{i \in (1,2,3,4,8)} \beta_i \ln X_{t-i}^{\text{RD}} + \varepsilon_t \quad \text{where } \varepsilon_t \sim iid(0, \sigma_\varepsilon^2) \tag{A.6}$$

where:

y_t^{RA} – denotes domestic resident arrivals (passengers) in time period t

X_{t-i}^{RD} – denotes domestic resident departures $t-i$ periods prior to return.

Foreign visitor arrivals and departures

Foreign visitor arrivals

Foreign visitor arrivals are influenced by similar factors to domestic resident departures:

- income
- airfares
- real (effective) exchange rate (between Australia and overseas destinations)
- qualitative factors, such as tastes and preferences, service offerings and travel risks (e.g. terrorism threat, political risk, natural disasters, etc.)

Foreign visitor arrivals were also modelled using a UECM model specification, with separate long- and short-run specifications, for each major overseas aviation market. Each market is modelled independently of all other markets, which implicitly assumes that changes in foreign visitor arrivals from any single country/market will not impact the number of visitor arrivals from other markets.

As short-term visitor arrivals comprise well over 95 per cent of all foreign visitor arrivals, the forecasting models are based only on total visitor arrivals from each market region. The 'all-periods' long-run model specification is listed in equation (A.7).

$$\ln y_{mt}^{\text{VA}} = A_m + \sum_i B_{mi} \ln X_{mit} + \sum_k \Gamma_{mk} Z_{mkt} + u_{mt} \quad \text{where } u_{mt} \sim iid(0, \sigma_{u_m}^2) \tag{A.7}$$

where:

y_{mt}^{VA} – denotes foreign visitor arrivals from market m in time period t

X_{mit} – denotes the set of i foreign visitor arrival demand drivers for market m at time t

Z_{mkt} – denotes event-specific dummy variables for market m, to capture changes in air passenger demand that cannot be explained by other factors. Examples of event-specific dummy variables include periods affected by by SARS, September 11, the GFC and, more recently, COVID-19

A, B_i, Γ_i – denote the long-run UECM model parameters.

The principal demand drivers are:

- Origin-market incomes – proxied by real GDP of each overseas market (m)
- Airfares – a combination of historical fares and world aviation fuel prices (in foreign currency units)
- Real (effective) exchange rate (index)) – defined as the product of the exchange rate and changes in general prices in Australia and overseas:[17]

$$e_t^{\mathsf{F}} \times \frac{P_t^{\mathsf{F}}}{P_t^{\mathsf{A}}}$$

Estimated total visitor arrivals are equal to the sum of individual market predicted visitor arrivals (Equation (A.8)).

$$y_t^{\mathsf{VA}} = \sum_m y_{mt}^{\mathsf{VA}} \tag{A.8}$$

The short-run specification is listed in equation (A.9).

$$\Delta \ln y_{mt}^{\mathsf{VA}} = \alpha_m + \sum_i \beta_{mi} \ln X_{mit} + \gamma m(\hat{A_m} + \sum_i \hat{B}_{mi} \ln X_{mit}) + \sum_k \delta_{mk} Z_{mkt} + \varepsilon_t \quad \text{where } \varepsilon_{mt} \sim iid(0, \sigma_{\varepsilon_m}^2) \tag{A.9}$$

where:

$\Delta y_{mt}^{\mathsf{VA}}$ – denotes differenced foreign visitor arrivals (passengers) from market m in time period t

ΔX_{mit} – denotes differenced foreign visitor arrival demand drivers (specified above) for market m at time t

X_{mit}, Z_{mkt} – have the same meaning in equation (A.7)

$\hat{A_m}$, $\hat{B_{mi}}$ – denotes empirical estimates of A_m and B_{mi} from (A.7)

α_m, β_{mi}, γ_m, δ_{mk} – denote the short-run model parameter estimates. The parameter γ_m reflects the speed of market adjustment for each international market.

Foreign visitor departures

Foreign visitor departures are also highly correlated with the number of visitors arriving, albeit with a lag. BITRE modelled international visitor departures as a distributed lag of total visitor arrivals. Separate model specifications were estimated for short- and long-term visitor departures, reflecting the difference in average trip duration between short- and long-stay trips. However, again because short-term visitor arrivals predominate total visitor arrivals, the foreign visitor departure forecasts are based only on models of total visitor departures.

The total visitor departures specification is listed in Equation (A.10), and models visitor departures resident arrivals as a distributed lag of all domestic resident departures, with lag terms up to 4 and 8 periods to cover both short- and long-term returning residents.

$$\ln y_t^{\mathsf{VD}} = \alpha + \sum_{i \in (1,2,3,4,8)} \beta_i \ln X_{t-i}^{\mathsf{VA}} + \varepsilon_t \quad \text{where } \varepsilon_t \sim iid(0, \sigma_\varepsilon^2) \tag{A.10}$$

where:

y_t^{VD} – denotes foreign visitor departures (passengers) in time period t

X_{t-i}^{VA} – denotes foreign visitor arrivals $t-i$ periods prior to return.

17 The expected sign of this variable specification is positive, i.e. a decrease in Australian prices, relative to overseas prices, would result in this variable increasing, and would be expected to result in an increase in overseas passenger arrivals.

International air freight models

International air freight imports

International air freight imports are modelled at national- and air catchment-level for each of the seven major international gateway airports / air catchments – Sydney, Melbourne, Brisbane, Adelaide, Perth, Darwin, and Cairns. Separate static model specifications, relating total air freight imports as a function of domestic economic activity, air transport costs (proxied by aviation fuel costs), effective (real) exchange rates, and aviation event-specific dummy variables, is used for each air catchment. Economic activity is proxied by estimates of Australian gross regional product and international air freight costs (proxied by aviation fuel costs).

The model specification is shown in Equation (A.11).

$$\ln f_t^M = \beta_0 + \beta_y \ln y_{it} + \beta_p p_t + \sum_k \gamma_{ik} Z_{ikt} + u_t \quad \text{where } u_t \sim iid(0, \sigma_u^2) \tag{A.11}$$

where:

f_{it}^M – denotes are freight imports (tonnes) through air catchment i in time period t

y_{it} – denotes real regional gross product (region i) at time t

p_t} – denotes real aviation fuel costs at time t

Z_{ikt} – denotes event-specific dummy variables

β_0, β_y, β_p, γ_{ik} – are model parameters.

International air freight exports

International air freight exports are also modelled at national- and air catchment-level for each of the seven major international gateway airport regions. Total and airport-level air freight exports are modelled as separate functions of overseas economic activity, proxied by global GDP, international air freight costs (proxied by aviation fuel costs), effective (real) exchange rates, and, again, event-specific dummy variables. The model specification, shown in Equation (A.12) is very similar in functional form to the international air imports specification.

$$\ln f_t^X = \beta_0 + \beta_y \ln y_{it} + \beta_p p_t + \sum_k \gamma_{ik} Z_{ikt} + u_t \quad \text{where } u_t \sim iid(0, \sigma_u^2) \tag{A.12}$$

where:

f_{it}^X – denotes air freight exports (tonnes) through air catchment i in time period t

y_{it} – denotes real global gross product (region i) at time t

p_t – denotes real international aviation fuel costs at time t

Z_{ikt} – denotes event-specific dummy variables

β_0, β_y, β_p, γ_{ik} – are model parameters.

Appendix B – Aviation forecasting models – empirical results

Appendix A outlined the aviation forecasting model suite forecast components. This appendix lists and discusses the empirical results.

The appendix is structured similarly to Appendix A, with empirical results presented in the following order:

- Domestic aviation air passenger movement models
- Domestic aviation air freight models
- International air passenger movement models
  - International domestic resident departures
  - International foreign visitor arrivals
- International air freight models
  - International air freight exports
  - International air freight imports.

Domestic aviation forecast model empirical results

Domestic total air passenger empirical results

Table B.1 lists the total domestic passenger UECM long- and short-run model results, and Figure B.1 shows the long-run actual and model predictions.

All variables are statistically significant in the long-run specification. The implied long-run *income* elasticity is around +1.1 and long-run fare elasticity is around –0.24. The seasonal dummy variables are significant and there are several one-off and COVID-19 dummy variables (not listed in Table B.1) that are also statistically significant. The short-run specification results suggest that income and airfares are not statistically significant in the short run. However, the error-correction term coefficient (or dynamic adjustment term) is significant, and implies approximately 20 per cent of the adjustment towards equilibrium occurs each period (quarter).

Table B.1 Domestic air passenger activity – short- and long-run model results

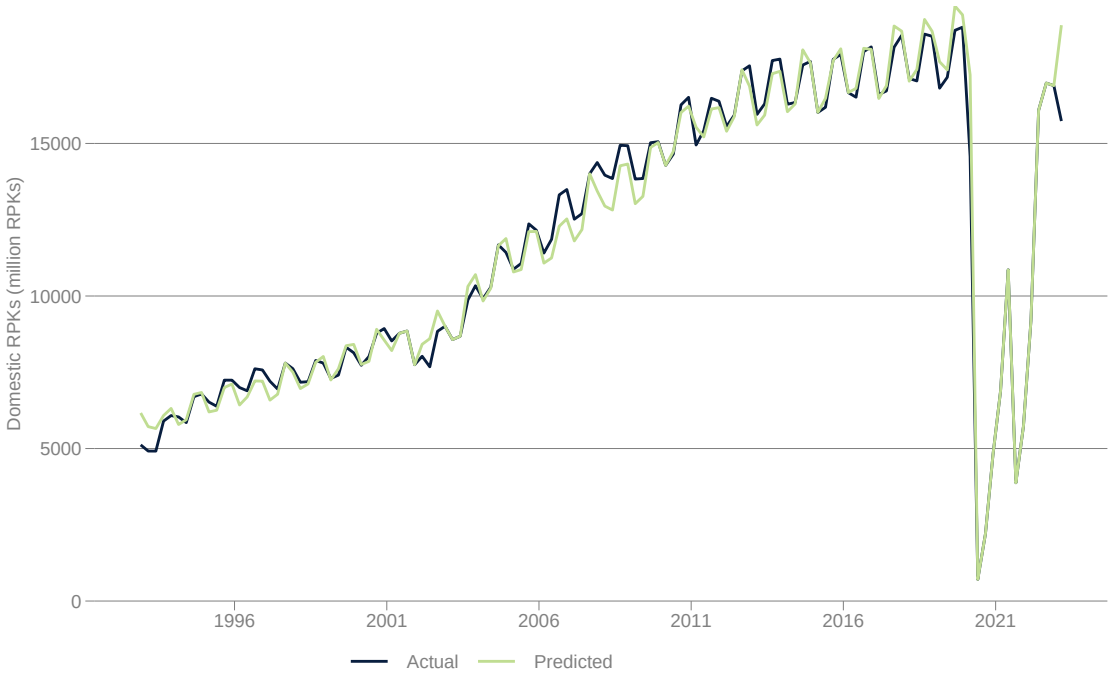
	Short-run	Long-run
Intercept	-0.077***	10.400***
	(0.008)	(0.705)
Income	0.489	1.084***
	(0.355)	(0.042)
Airfares	-0.063	-0.241***
	(0.043)	(0.042)
LR adj. term	-0.203**	
	(0.072)	
Seasonal Dummy Q2	0.080***	0.005
	(0.009)	(0.014)
Seasonal Dummy Q3	0.176***	0.099***
	(0.010)	(0.015)
Seasonal Dummy Q4	0.082***	0.112***
	(0.011)	(0.015)
Num.Obs.	121	122
R2	0.994	0.991
R2 Adj.	0.992	0.989
AIC	-476.5	-349.3
BIC	-401.0	-276.4
Log.Lik.	265.259	200.661
RMSE	0.03	0.05

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variables not listed.

Source: BITRE estimates.

Figure B.1 Domestic passenger long-run actual and predictions, 1985–2023



Source: BITRE estimates.

Domestic airport passenger movement empirical results

Tables B.2 and B.3 list the long-run domestic passenger model results for capital city airport / air catchment and non-capital city airports, respectively, and Tables B.4 and B.5 list the short-run model results. Figure B.2 shows the actual and long-run model predictions of total passengers through each of the 14 busiest domestic airport / air catchment markets.

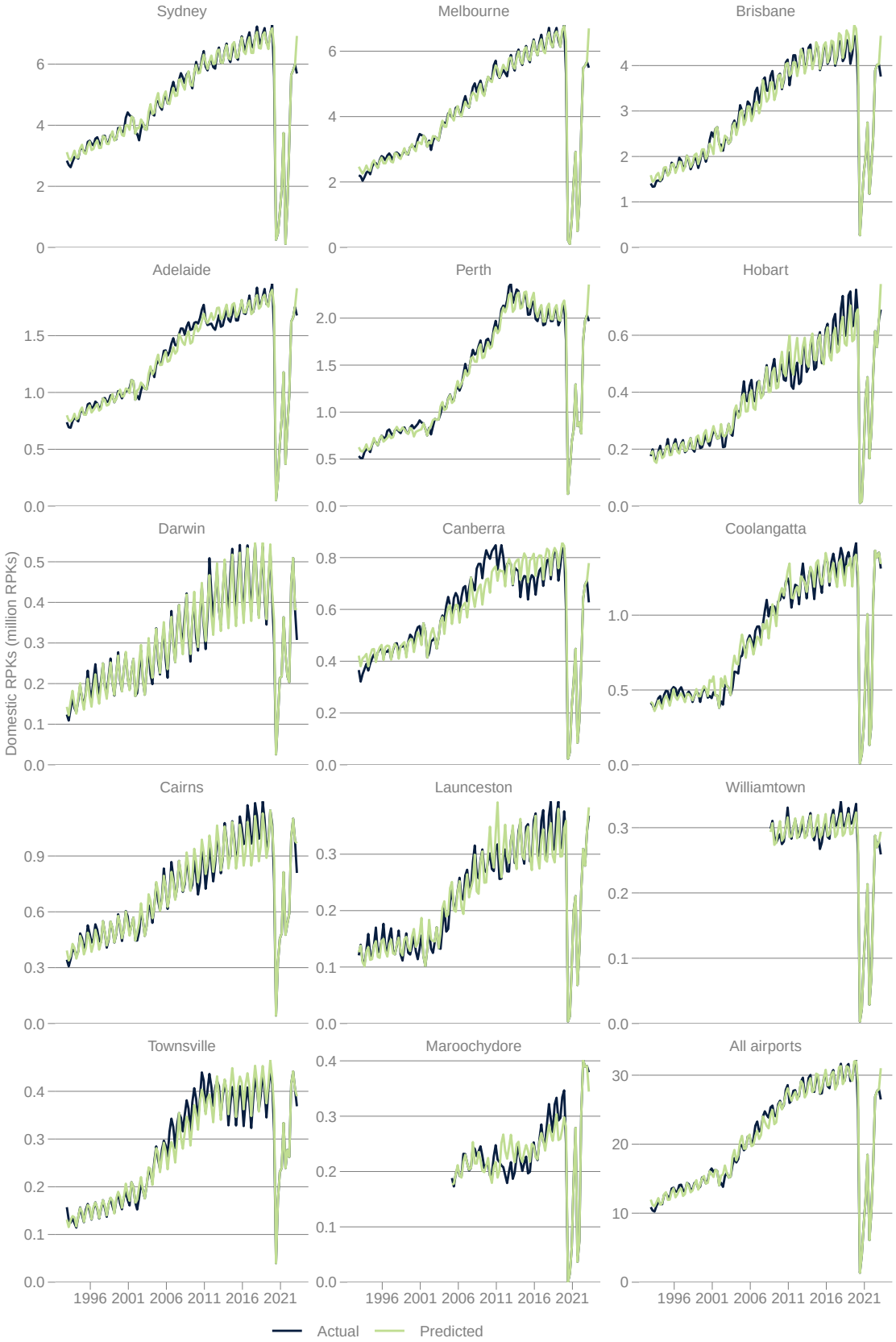
The income and airfare variables are statistically significant in the long-run specification for nearly every air catchment. The implied long-run *income* elasticities generally range between +0.5 and +1.5, with the elasticity around +0.8 to +1.0 for the largest five airports. The implied income elasticities for Hobart and Sunshine Coast airport passengers are significantly higher than for other airports. The long-run income elasticities for Gold Coast (Coolangatta), Canberra and Newcastle (Williamtown) airports are below average, which appears to reflect the slower passenger growth through these airports between 2012 and 2019.

The implied *long-run* airfare elasticities are generally around –0.18 to –0.20, for the larger airports, but slightly higher for Perth at around –0.36. All long-run fare elasticities are relatively inelastic, suggesting that domestic air travel is relatively insensitive to domestic airfares. The airfare elasticities for Gold Coast, Launceston, Townsville and Newcastle (Williamtown) airports, are slightly higher than for other airports. The fare elasticities for Darwin and Sunshine Coast (Maroochydore) airports are of the expected sign, but not statistically significant. The seasonal dummy variables are significant and there are several one-off and COVID-19 related dummy variables (not listed in Tables B.2 and B.3) that are also statistically significant.

The mining construction expenditure term ('WA FIFO') in the Perth Airport model results imply the mining construction boom between 2003–04 and 2011–12 has a statistically significant impact on total passenger numbers through Perth Airport. The public sector employment term ('ACT PSE') term in the Canberra Airport model is not statistically significant.

The *short-run* specification results show the dynamic adjustment term is of the expected sign and statistically significant for most airports. The short-run income elasticity is also of the expected sign for all airports, and smaller than the long-run elasticity for most airports – although higher than the long-run elasticity for Darwin, Canberra, Gold Coast and Townsville airports. The short-run airfare elasticities are either very small or not statistically significant for most airports (and smaller than their long-run equivalent).

Figure B.2 Domestic passenger long-run actual and predictions, 1985–2023



Source: BITRE estimates.

Table B.2 Domestic airport passengers long-run model results, capital city airports

	Sydney	Melbourne	Brisbane	Adelaide	Perth	Hobart	Darwin	Canberra
Intercept	7.117***	6.092***	6.373***	4.985***	3.321***	2.125*	4.966***	9.168***
	(0.549)	(0.519)	(0.593)	(0.571)	(0.609)	(0.831)	(0.586)	(1.160)
Income	0.811***	0.904***	0.901***	0.994***	0.979***	1.481***	1.010***	0.566***
	(0.036)	(0.033)	(0.038)	(0.042)	(0.039)	(0.072)	(0.047)	(0.073)
Airfares	-0.182***	-0.192***	-0.197***	-0.172***	-0.069	-0.283***	-0.049	-0.245*
	(0.035)	(0.036)	(0.046)	(0.036)	(0.054)	(0.060)	(0.055)	(0.095)
WA FIFO					0.129***			
					(0.013)			
ACT PSE								0.062
								(0.164)
Seasonal Dummy Q2	-0.016	-0.030*	0.034*	-0.001	-0.019	-0.176***	0.252***	0.090***
	(0.012)	(0.012)	(0.016)	(0.013)	(0.015)	(0.021)	(0.019)	(0.024)
Seasonal Dummy Q3	0.052***	0.034**	0.123***	0.046***	0.049**	-0.189***	0.415***	0.123***
	(0.012)	(0.012)	(0.016)	(0.013)	(0.015)	(0.021)	(0.019)	(0.024)
Seasonal Dummy Q4	0.092***	0.074***	0.129***	0.083***	0.064***	-0.015	0.177***	0.138***
	(0.013)	(0.013)	(0.016)	(0.013)	(0.016)	(0.021)	(0.019)	(0.025)
Num.Obs.	122	122	122	122	122	122	122	122
R2	0.995	0.995	0.987	0.992	0.991	0.988	0.982	0.976
R2 Adj.	0.994	0.994	0.984	0.990	0.988	0.985	0.977	0.970
AIC	-387.4	-387.0	-328.8	-383.5	-335.9	-260.2	-284.8	-225.7
BIC	-314.5	-314.1	-255.9	-310.6	-260.2	-187.3	-211.9	-150.0
Log.Lik.	219.716	219.479	190.379	217.753	194.944	156.092	168.405	139.862
RMSE	0.04	0.04	0.05	0.04	0.05	0.07	0.06	0.08

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variable parameters not listed.

Source: BITRE estimates.

Table B.3 Domestic airport passenger long-run model results, non-capital city and all airports

	Coolangatta	Cairns	Launceston	Williamtown	Townsville	Maroochydore	All airports
Intercept	8.374***	4.597***	5.642***	9.943***	4.140***	-5.095*	6.531***
	(0.929)	(0.705)	(1.136)	(1.257)	(0.808)	(2.202)	(0.593)
Income	0.771***	0.887***	1.080***	0.267*	0.944***	1.411***	0.901***
	(0.060)	(0.046)	(0.099)	(0.115)	(0.053)	(0.168)	(0.035)
Airfares	-0.617***	-0.120*	-0.525***	-0.068	-0.367***	0.558***	-0.270***
	(0.073)	(0.052)	(0.072)	(0.075)	(0.060)	(0.129)	(0.035)
Seasonal Dummy Q2	-0.100***	0.078***	-0.209***	0.010	0.135***	-0.035	0.001
	(0.025)	(0.018)	(0.025)	(0.019)	(0.020)	(0.041)	(0.012)
Seasonal Dummy Q3	0.013	0.251***	-0.240***	0.072***	0.222***	0.046	0.074***
	(0.025)	(0.018)	(0.026)	(0.018)	(0.021)	(0.041)	(0.012)
Seasonal Dummy Q4	0.105***	0.174***	-0.025	0.119***	0.182***	0.045	0.107***
	(0.025)	(0.018)	(0.026)	(0.020)	(0.021)	(0.042)	(0.012)
Num.Obs.	122	122	122	59	122	73	122
R2	0.986	0.982	0.982	0.998	0.978	0.996	0.993
R2 Adj.	0.983	0.977	0.977	0.997	0.973	0.994	0.991
AIC	-219.0	-297.7	-212.2	-183.3	-264.5	-92.4	-391.6
BIC	-146.1	-224.8	-139.3	-145.9	-191.5	-48.9	-318.7
Log.Lik.	135.482	174.874	132.112	109.656	158.226	65.216	221.795
RMSE	0.08	0.06	0.08	0.04	0.07	0.10	0.04

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variable parameters not listed.

Source: BITRE estimates.

Table B.4 Domestic airport passengers short-run model results, capital city airports

	Sydney	Melbourne	Brisbane	Adelaide	Perth	Hobart	Darwin	Canberra
Intercept	-0.070***	-0.051***	-0.100***	-0.066***	-0.057***	0.053***	-0.155***	-0.108***
	(0.007)	(0.008)	(0.009)	(0.008)	(0.010)	(0.011)	(0.012)	(0.011)
Income	0.594+	0.606+	0.226	0.816*	0.638	0.234	1.579**	0.891+
	(0.325)	(0.360)	(0.385)	(0.356)	(0.389)	(0.512)	(0.500)	(0.453)
Airfares	-0.092*	-0.101*	-0.069	-0.117**	-0.034	-0.076	0.054	-0.053
	(0.039)	(0.043)	(0.048)	(0.042)	(0.047)	(0.060)	(0.062)	(0.055)
WA FIFO					0.034			
					(0.021)			
ACT PSE								0.327
								(0.419)
LR adj. term	-0.163+	-0.228*	-0.103	-0.221**	-0.164*	-0.178**	-0.245**	-0.053
	(0.087)	(0.095)	(0.080)	(0.080)	(0.076)	(0.063)	(0.076)	(0.056)
Seasonal Dummy Q2	0.049***	0.017+	0.135***	0.060***	0.046***	-0.225***	0.393***	0.185***
	(0.009)	(0.009)	(0.010)	(0.009)	(0.012)	(0.013)	(0.014)	(0.012)
Seasonal Dummy Q3	0.142***	0.117***	0.197***	0.119***	0.124***	-0.060***	0.317***	0.139***
	(0.009)	(0.010)	(0.011)	(0.010)	(0.011)	(0.015)	(0.015)	(0.013)
Seasonal Dummy Q4	0.102***	0.088***	0.102***	0.096***	0.083***	0.107***	-0.092***	0.103***
	(0.010)	(0.011)	(0.012)	(0.011)	(0.013)	(0.016)	(0.016)	(0.014)
Num.Obs.	121	121	121	121	121	121	121	121
R2	0.998	0.996	0.990	0.995	0.989	0.993	0.987	0.992
R2 Adj.	0.997	0.995	0.987	0.993	0.985	0.991	0.983	0.990
AIC	-497.5	-474.6	-449.7	-474.4	-446.4	-386.3	-378.5	-416.4
BIC	-422.0	-399.1	-374.2	-398.9	-368.1	-310.8	-303.0	-338.2
Log.Lik.	275.728	264.313	251.837	264.212	251.180	220.159	216.261	236.217
RMSE	0.02	0.03	0.03	0.03	0.03	0.04	0.04	0.03

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variable parameters not listed.

Source: BITRE estimates.

Table B.5 Domestic airport passenger short-run model results, non-capital city and all airports

	Coolangatta	Cairns	Launceston	Williamtown	Townsville	Maroochydore	All airports
Intercept	-0.049***	-0.141***	0.093***	-0.114***	-0.150***	-0.128***	-0.074***
	(0.012)	(0.010)	(0.013)	(0.013)	(0.010)	(0.022)	(0.007)
Income	1.364**	0.648	0.870	0.944	1.169**	0.247	0.630*
	(0.487)	(0.421)	(0.583)	(0.726)	(0.408)	(1.038)	(0.311)
Airfares	-0.140*	0.049	0.041	-0.099	-0.111*	-0.139	-0.085*
	(0.060)	(0.052)	(0.072)	(0.065)	(0.052)	(0.111)	(0.038)
LR adj. term	-0.249***	-0.226***	-0.235***	-0.351*	-0.156**	-0.084	-0.181*
	(0.052)	(0.066)	(0.061)	(0.143)	(0.055)	(0.074)	(0.079)
Seasonal Dummy Q2	-0.056***	0.215***	-0.299***	0.109***	0.280***	0.090***	0.073***
	(0.013)	(0.012)	(0.016)	(0.016)	(0.011)	(0.025)	(0.008)
Seasonal Dummy Q3	0.155***	0.316***	-0.124***	0.171***	0.235***	0.245***	0.150***
	(0.014)	(0.013)	(0.017)	(0.017)	(0.012)	(0.029)	(0.009)
Seasonal Dummy Q4	0.093***	0.055***	0.074***	0.163***	0.076***	0.196***	0.092***
	(0.016)	(0.014)	(0.019)	(0.019)	(0.013)	(0.031)	(0.010)
Num.Obs.	121	121	121	58	121	72	121
R2	0.995	0.991	0.992	0.999	0.985	0.999	0.995
R2 Adj.	0.994	0.988	0.990	0.998	0.981	0.999	0.993
AIC	-390.4	-419.6	-346.4	-215.5	-429.3	-186.1	-505.9
BIC	-314.9	-344.1	-270.9	-176.3	-353.8	-140.6	-430.4
Log.Lik.	222.179	236.775	200.187	126.730	241.632	113.059	279.946
RMSE	0.04	0.03	0.05	0.03	0.03	0.05	0.02

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variable parameters not listed.

Source: BITRE estimates.

Domestic air freight model results

Total domestic air freight empirical results

Table B.6 lists the regression results for the aggregate domestic air freight forecasting model specification, both specified in mass (tonnes) and mass-distance (tonne kilometres) terms. Figure B.3 shows the actual and model-predicted total domestic freight.

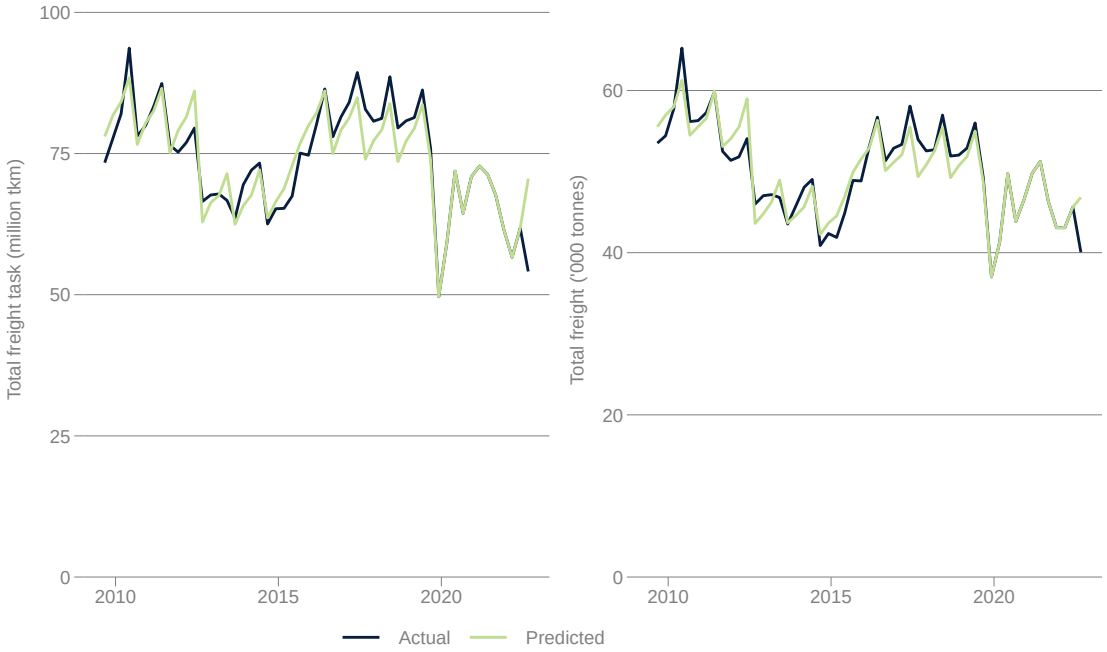
The empirical results are based on data covering the March quarter 2010 to June quarter 2023, the period for which BITRE data provide comprehensive estimates of total domestic air freight – i.e. carried on both passenger services and by dedicated freight operators. The best model fit implies that total domestic air freight has a negative correlation with economic activity over the estimation period, but no significant correlation with airfares/fuel costs. There is a strong downturn in air freight between 2013 and 2015 – captured by a period-specific dummy variable. The results also imply statistically significant seasonality in air freight movements. BITRE also tested the significance of passenger service availability and capacity utilisation on domestic air freight movements, but neither variable significantly improved model predictive performance.

Table B.6 Domestic air freight activity model results

	Freight (TKM)	Freight (tonnes)
Intercept	15.238***	18.095***
	(2.217)	(1.656)
Income	-0.302+	-0.563***
	(0.168)	(0.126)
Fuel costs	-0.070	0.081
	(0.087)	(0.065)
Seasonal Dummy Q2	0.052+	0.025
	(0.029)	(0.022)
Seasonal Dummy Q3	0.080**	0.054*
	(0.029)	(0.022)
Seasonal Dummy Q4	0.133***	0.114***
	(0.029)	(0.022)
Dummy - 2013-2015	-0.179***	-0.190***
	(0.024)	(0.018)
Num.Obs.	53	53
R2	0.830	0.874
R2 Adj.	0.747	0.813
AIC	-119.3	-150.3
BIC	-81.9	-112.8
Log.Lik.	78.668	94.126
RMSE	0.05	0.04

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.
Note: COVID-19 and other event-specific dummy variables not listed.
Source: BITRE estimates.

Figure B.3 Domestic air freight, actual and model predictions, 2010 to 2023



Source: BITRE estimates

Airport-specific domestic freight movements empirical results

Table B.7 lists the forecasting model results for domestic air freight (on an uplift-discharge basis) through Australia's five mainland capital city airports, and all airports in aggregate, and Figure B.4 shows the actual historical air freight volumes and model predictions.

Again, the empirical results are based on data from March 2010 to June 2023. The airport-specific model results imply that domestic air freight movements either have no significant correlation or a statistically significant, *negative* correlation with regional economic activity, but no significant correlation with airfares/fuel costs. The drop in air freight between 2013 and 2015 is also statistically significant across all airports.

Table B.7 Domestic air freight activity by major airport model results

	Sydney	Melbourne	Brisbane	Adelaide	Perth	All airports
Intercept	29.850***	11.787***	16.833***	21.731***	6.559*	19.839***
	(1.795)	(1.559)	(1.773)	(3.031)	(2.663)	(2.066)
Income	-1.779***	-0.015	-0.700***	-1.381***	0.398	-0.621**
	(0.179)	(0.157)	(0.194)	(0.344)	(0.299)	(0.180)
Fuel costs	0.169	-0.320+	0.099	0.255	-0.300	-0.037
	(0.153)	(0.173)	(0.191)	(0.221)	(0.290)	(0.152)
Seasonal Dummy Q2	0.042	0.025	0.025	0.029	0.068	0.030
	(0.028)	(0.032)	(0.034)	(0.038)	(0.051)	(0.027)
Seasonal Dummy Q3	0.066*	0.072*	0.065+	0.065+	0.107*	0.067*
	(0.027)	(0.031)	(0.034)	(0.038)	(0.050)	(0.027)
Seasonal Dummy Q4	0.122***	0.153***	0.104*	0.093*	0.188**	0.124***
	(0.032)	(0.036)	(0.039)	(0.045)	(0.059)	(0.031)
Dummy - 2013-2015	-0.133***	-0.185***	-0.203***	-0.128***	-0.224***	-0.189***
	(0.023)	(0.026)	(0.028)	(0.031)	(0.042)	(0.022)
Num.Obs.	53	53	53	53	53	53
R2	0.905	0.783	0.721	0.726	0.829	0.826
R2 Adj.	0.858	0.678	0.585	0.593	0.746	0.741
AIC	-125.5	-110.9	-103.3	-92.1	-61.0	-128.3
BIC	-88.0	-73.5	-65.9	-54.6	-23.6	-90.9
Log.Lik.	81.730	74.461	70.651	65.041	49.522	83.147
RMSE	0.05	0.06	0.06	0.07	0.10	0.05

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.
Note: COVID-19 and other event-specific dummy variables not listed.
Source: BITRE estimates.

Figure B.4 Domestic air freight, actual and model predictions, 2010 to 2023

Source: BITRE estimates

International aviation forecast model empirical results

Domestic resident international passenger departure model empirical results

Tables B.8 and B.9 list the long- and short-run model estimation results, respectively, for all domestic resident departures, for Australia's major international airport regions, and all of Australia. Figure B.5 plots observed resident departures and the long-run model predictions.

Table B.8 Domestic resident departures long-run model results, %s departures

	Sydney	Melbourne	Brisbane	Adelaide	Perth	Darwin	Cairns	All airports
Intercept	-3.381***	-4.951***	-3.594***	-3.772*	-1.908**	4.888***	3.653**	-5.596***
	(0.513)	(0.717)	(0.590)	(1.887)	(0.623)	(1.116)	(1.210)	(0.702)
Income	1.491***	1.610***	1.497***	1.470***	1.361***	0.594***	0.643***	1.555***
	(0.045)	(0.064)	(0.056)	(0.190)	(0.060)	(0.142)	(0.115)	(0.055)
Airfares	-0.152***	-0.225***	-0.019	-0.417**	-0.218**	-0.158	-0.570***	-0.197***
	(0.043)	(0.064)	(0.065)	(0.159)	(0.066)	(0.159)	(0.130)	(0.053)
Real Ex. Rate	0.103	-0.026	0.349*	0.186	0.386*	1.043**	-0.038	0.085
	(0.102)	(0.154)	(0.152)	(0.364)	(0.156)	(0.381)	(0.297)	(0.124)
Seasonal dummy Q2	0.203***	0.244***	0.145***	0.356***	0.214***	0.178**	0.073	0.205***
	(0.016)	(0.025)	(0.025)	(0.060)	(0.026)	(0.062)	(0.049)	(0.020)
Seasonal dummy Q3	0.230***	0.285***	0.177***	0.417***	0.307***	0.193**	0.032	0.244***
	(0.017)	(0.025)	(0.025)	(0.060)	(0.026)	(0.062)	(0.049)	(0.020)
Seasonal dummy Q4	0.216***	0.201***	0.230***	0.211***	0.228***	0.286***	0.147**	0.215***
	(0.016)	(0.025)	(0.025)	(0.059)	(0.025)	(0.062)	(0.048)	(0.020)
Num.Obs.	129	129	129	129	129	129	129	129
R2	0.995	0.991	0.992	0.976	0.993	0.955	0.977	0.994
R2 Adj.	0.994	0.989	0.990	0.971	0.991	0.946	0.972	0.992
AIC	-326.6	-218.4	-220.2	5.5	-213.5	14.4	-47.0	-272.9
BIC	-255.1	-147.0	-148.7	77.0	-142.0	85.9	24.5	-201.4
Log.Lik.	188.286	134.225	135.102	22.261	131.735	17.822	48.480	161.450
RMSE	0.06	0.09	0.08	0.20	0.09	0.21	0.17	0.07

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variables not listed.

Source: BITRE estimates.

Across Australia's five busiest international airports, the implied *income* elasticity of domestic resident departures is around +1.4 to +1.6 and the implied price elasticity (proxied by oil prices) is around –0.15 to –0.23. The real exchange rate variable is significant for Sydney, Brisbane and Perth, but not for Melbourne and Adelaide. The seasonal dummy variables are statistically significant and several one-off and COVID-19 related dummy variables (not listed in Table B.8) are also statistically significant.

The short-run specification results suggest that income and price (airfares) are not statistically significant in the short run. However, the error-correction term coefficient (or dynamic adjustment term) is significant, and implies approximately 20 per cent of the adjustment towards equilibrium occurs each quarter.

International visitor arrival model empirical results

Tables B.10 and B.11 list the long- and short-run model estimation results, respectively, for foreign visitor arrivals for the nine modelled major overseas regions. Figure B.6 shows observed visitor arrivals and the long-run model predictions.

The empirical results imply that the international visitor arrivals are income elastic for visitors from the Americas, North West Europe, Oceania and Southern and Central Asia, but income inelastic for every other major region. The real aviation cost variable is relatively inelastic in every major region, however, it is not of the expected sign (i.e. negative) for five of the nine major regions.

The real exchange rate term enters the specification as foreign prices divided by Australian prices, hence, the sign of this term is expected to be positive. The empirical results show that the response is positive and statistically significant across all regions, except for visitor arrivals from North West Europe.

Table B.9 Domestic resident departures – short-run model results

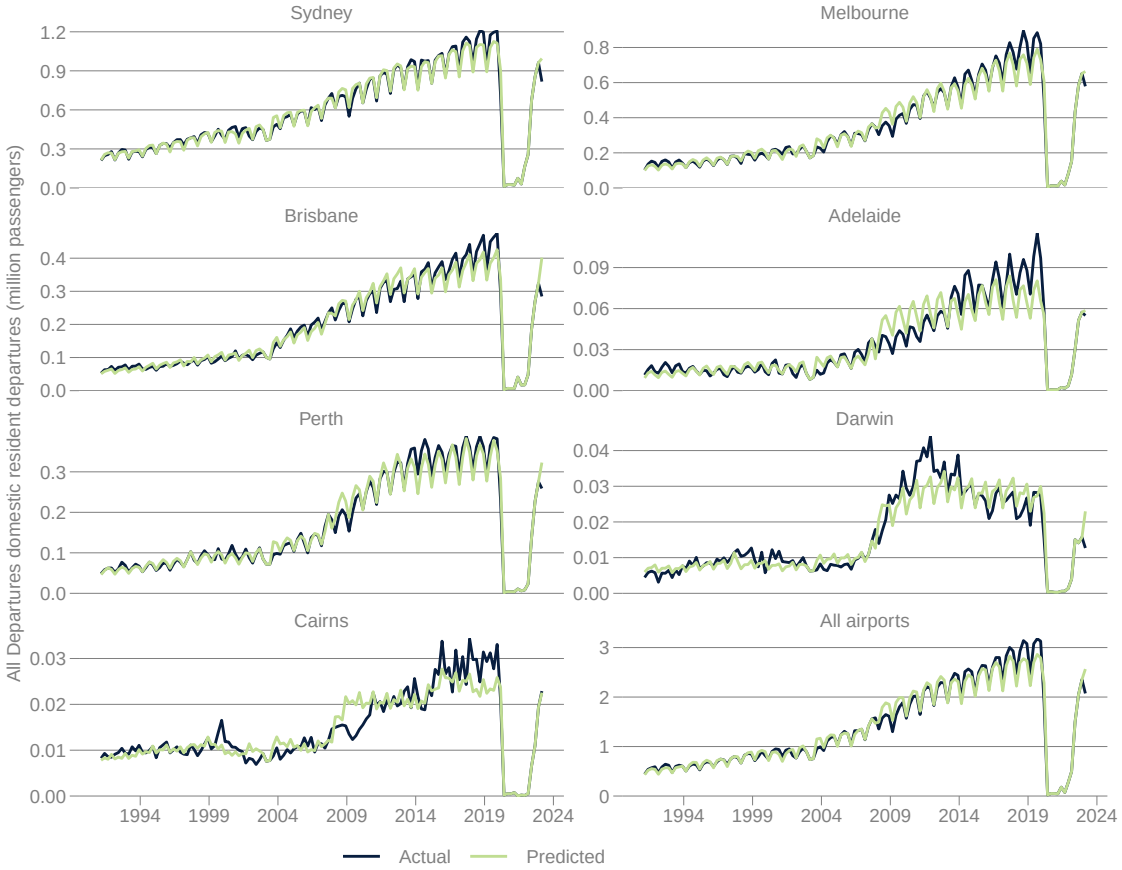
	Sydney	Melbourne	Brisbane	Adelaide	Perth	Darwin	Cairns	All airports
Intercept	-0.167***	-0.145***	-0.165***	-0.150***	-0.164***	-0.232***	-0.069*	-0.157***
	(0.011)	(0.013)	(0.013)	(0.024)	(0.015)	(0.034)	(0.027)	(0.010)
Income	0.929	0.427	0.305	1.403	0.212	2.826	-0.176	0.508
	(0.629)	(0.698)	(0.710)	(1.381)	(0.811)	(1.785)	(1.410)	(0.590)
Airfares	0.079	0.019	0.109	-0.107	-0.051	-0.187	0.169	0.045
	(0.079)	(0.088)	(0.094)	(0.176)	(0.106)	(0.247)	(0.191)	(0.075)
Real Ex. Rate	0.100	0.222	0.225	0.551	0.553	0.521	-0.532	0.272
	(0.275)	(0.300)	(0.313)	(0.601)	(0.366)	(0.809)	(0.650)	(0.259)
LR adj. term	-0.498***	-0.224***	-0.246***	-0.156**	-0.398***	-0.363***	-0.295***	-0.269***
	(0.098)	(0.062)	(0.070)	(0.051)	(0.077)	(0.071)	(0.069)	(0.069)
Seasonal Dummy Q2	0.403***	0.426***	0.353***	0.552***	0.414***	0.391***	0.161***	0.395***
	(0.015)	(0.016)	(0.017)	(0.032)	(0.020)	(0.045)	(0.035)	(0.014)
Seasonal Dummy Q3	0.239***	0.239***	0.254***	0.274***	0.317***	0.255***	0.073*	0.248***
	(0.014)	(0.015)	(0.016)	(0.031)	(0.019)	(0.043)	(0.033)	(0.013)
Seasonal Dummy Q4	0.193***	0.108***	0.263***	-0.031	0.116***	0.310***	0.235***	0.169***
	(0.014)	(0.015)	(0.016)	(0.030)	(0.018)	(0.042)	(0.033)	(0.013)
Num.Obs.	128	128	128	128	128	128	128	128
R2	0.990	0.990	0.989	0.992	0.987	0.900	0.979	0.992
R2 Adj.	0.988	0.988	0.987	0.991	0.984	0.878	0.975	0.991
AIC	-373.7	-348.2	-333.5	-170.2	-298.7	-85.4	-149.3	-388.0
BIC	-302.4	-276.9	-262.2	-98.9	-227.4	-14.1	-78.0	-316.7
Log.Lik.	211.845	199.085	191.735	110.077	174.346	67.708	99.673	218.982
RMSE	0.05	0.05	0.05	0.10	0.06	0.14	0.11	0.04

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variables not listed.

Source: BITRE estimates.

Figure B.5 Domestic resident departures long-run actual and model predictions, by departure airport, 1991–2023



Source: BITRE estimates.

Table B.10 Foreign visitor arrivals by world region, long-run model results

	Americas	North Africa and Middle East	North-East Asia	North-West Europe	Oceania and Antarctica	South-East Asia	Southern and Central Asia	Southern and Eastern Europe	Sub-Saharan Africa
Intercept	-58.515***	-35.979***	-16.017***	-79.227***	-14.509***	-14.337***	-24.961***	-7.919+	37.204***
	(3.199)	(4.480)	(3.504)	(6.533)	(0.825)	(1.570)	(5.196)	(4.142)	(7.157)
Real income	2.418***	1.778***	0.978***	3.081***	1.043***	1.007***	1.255***	0.589***	-1.096***
	(0.121)	(0.192)	(0.108)	(0.220)	(0.033)	(0.062)	(0.199)	(0.151)	(0.278)
Real aviation costs	-0.655***	0.219	-0.450**	0.116	0.224***	-0.854***	0.719***	0.591**	1.424***
	(0.088)	(0.153)	(0.151)	(0.095)	(0.064)	(0.081)	(0.165)	(0.183)	(0.305)
Effective exchange rate	0.708	-1.920*	1.628**	5.891***	2.307***	0.171	3.389***	3.390***	1.380***
	(0.797)	(0.895)	(0.571)	(0.459)	(0.137)	(0.143)	(0.282)	(0.186)	(0.145)
Seasonal dummy Q2	-0.260***	-0.288***	-0.341***	-0.645***	0.171***	0.093**	-0.113*	-0.538***	-0.215*
	(0.028)	(0.044)	(0.043)	(0.026)	(0.021)	(0.030)	(0.053)	(0.040)	(0.092)
Seasonal dummy Q3	-0.196***	0.257***	-0.113*	-0.391***	0.333***	0.013	-0.197***	-0.008	-0.113
	(0.028)	(0.045)	(0.044)	(0.026)	(0.022)	(0.031)	(0.054)	(0.041)	(0.094)
Seasonal dummy Q4	-0.020	-0.052	-0.194***	-0.008	0.227***	0.180***	-0.105*	0.199***	0.299**
	(0.028)	(0.044)	(0.043)	(0.027)	(0.021)	(0.030)	(0.053)	(0.043)	(0.093)
Num.Obs.	110	114	118	114	130	114	118	110	130
R2	0.993	0.979	0.988	0.994	0.993	0.992	0.980	0.985	0.899
R2 Adj.	0.991	0.974	0.985	0.993	0.992	0.990	0.976	0.982	0.878
AIC	-179.4	-77.4	-82.6	-197.4	-262.2	-163.3	-33.8	-98.6	120.5
BIC	-114.6	-11.8	-16.1	-131.8	-193.3	-97.6	32.7	-33.8	189.4
Log.Lik.	113.707	62.712	65.286	122.718	155.082	105.648	40.895	73.323	-36.268
RMSE	0.09	0.14	0.14	0.08	0.07	0.10	0.17	0.12	0.32

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variables not listed.

Source: BITRE estimates.

Table B.11 Foreign visitor arrivals by region, short-run model results

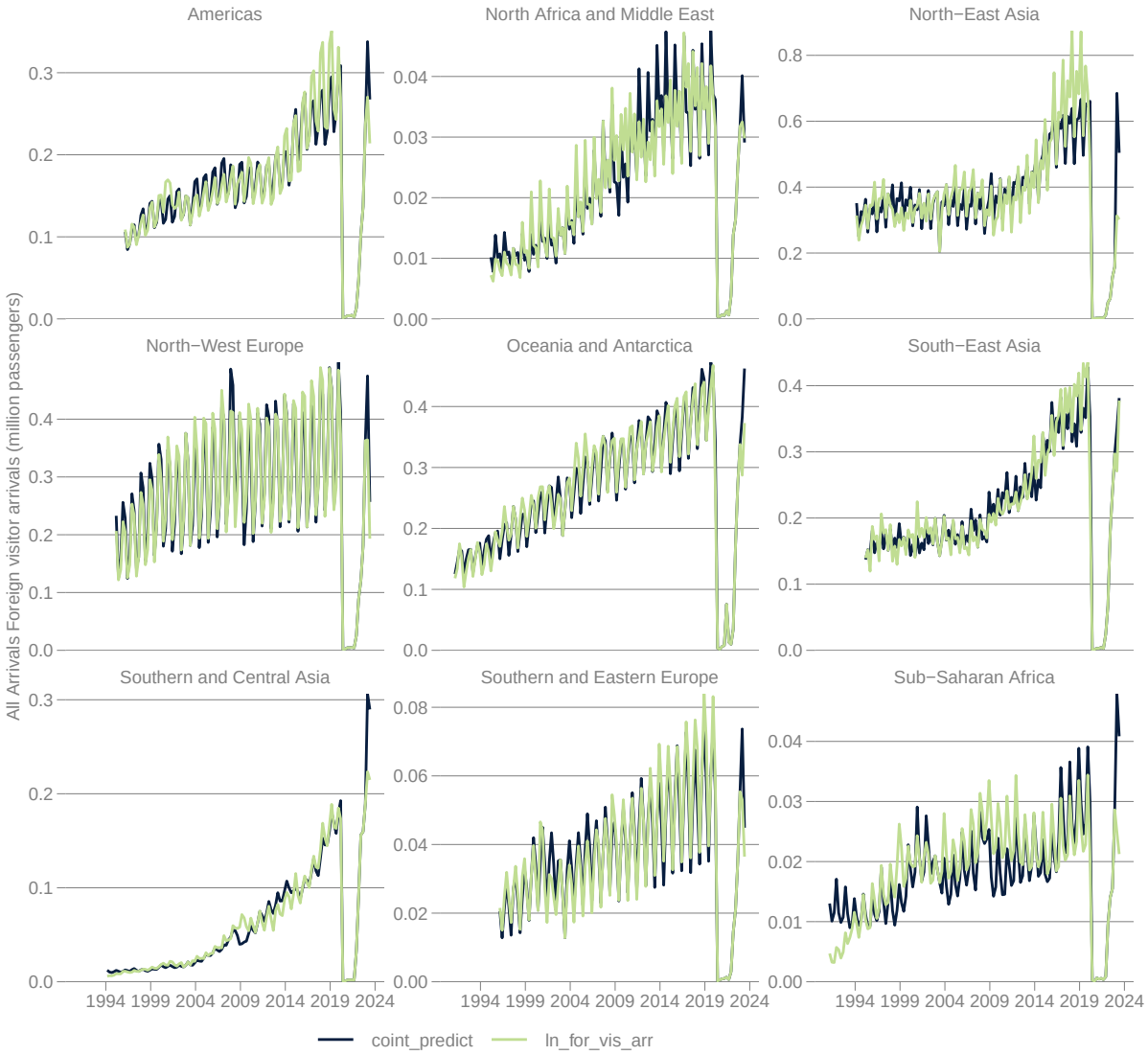
	Americas	North Africa and Middle East	North-East Asia	North-West Europe	Oceania and Antarctica	South-East Asia	Southern and Central Asia	Southern and Eastern Europe	Sub-Saharan Africa
Intercept	0.043**	0.077**	0.190***	-0.049*	-0.272***	-0.166***	0.167***	-0.266***	-0.196***
	(0.015)	(0.026)	(0.031)	(0.024)	(0.017)	(0.020)	(0.018)	(0.046)	(0.020)
Real income	0.312	0.212	-0.010	0.711	-0.805*	0.908	-0.531	-0.679	0.311
	(1.181)	(1.094)	(0.355)	(0.675)	(0.375)	(0.694)	(0.549)	(0.541)	(0.352)
Real aviation costs	0.079	0.499+	-0.072	0.049	0.233+	-0.299	0.266+	0.543*	0.197
	(0.201)	(0.268)	(0.211)	(0.117)	(0.127)	(0.222)	(0.146)	(0.218)	(0.194)
Effective exchange rate	-1.964	-0.383	-0.408	0.797	-1.513+	0.107	-1.365	-0.642	1.032
	(2.192)	(2.230)	(1.026)	(1.465)	(0.827)	(0.779)	(1.620)	(1.438)	(0.953)
LR adj. term	-0.399***	-0.498***	-0.358***	-0.254***	-0.358***	-0.491***	-0.173***	-0.309***	-0.072*
	(0.084)	(0.087)	(0.081)	(0.068)	(0.079)	(0.101)	(0.049)	(0.085)	(0.027)
Seasonal Dummy Q2	-0.299***	-0.368***	-0.532***	-0.565***	0.438***	0.242***	-0.232***	-0.198*	-0.019
	(0.023)	(0.036)	(0.043)	(0.033)	(0.020)	(0.037)	(0.025)	(0.075)	(0.031)
Seasonal Dummy Q3	0.020	0.482***	0.060	0.278***	0.388***	0.093**	-0.208***	0.805***	0.280***
	(0.022)	(0.038)	(0.044)	(0.025)	(0.016)	(0.030)	(0.028)	(0.049)	(0.030)
Seasonal Dummy Q4	0.160***	-0.356***	-0.220***	0.510***	0.331***	0.356***	-0.048+	0.538***	0.559***
	(0.023)	(0.039)	(0.051)	(0.044)	(0.050)	(0.036)	(0.025)	(0.078)	(0.029)
Num.Obs.	109	113	117	113	129	113	117	109	129
R2	0.989	0.966	0.979	0.995	0.990	0.981	0.985	0.984	0.976
R2 Adj.	0.986	0.957	0.974	0.994	0.988	0.976	0.982	0.980	0.971
AIC	-243.8	-125.3	-162.2	-315.3	-342.8	-190.4	-223.8	-165.2	-216.0
BIC	-176.6	-57.1	-93.1	-247.1	-271.3	-122.2	-154.7	-97.9	-144.5
Log.Lik.	146.918	87.637	106.082	182.639	196.388	120.216	136.877	107.612	132.988
RMSE	0.06	0.11	0.10	0.05	0.05	0.08	0.08	0.09	0.09

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variables not listed.

Source: BITRE estimates.

Figure B.6 Foreign visitor arrivals, by major market, long-run actual and model predictions, 1991–2023



Source: BITRE estimates.

International air freight model empirical results

International air freight import model empirical results

Table B.12 lists the model estimation results for air freight imports across the seven largest gateway airports, 'Other airports' and 'All airports'. Figure B.7 provides a comparison of observed and model-predicted air freight imports for each gateway airport region.

The empirical results imply that international air freight imports are positively correlated with real domestic incomes, except for Darwin and Cairns airports – the latter results may be due to the relatively low volumes and high variability in air freight imports through those two airports / regions. The model results also imply that air freight imports are *positively* correlated (and significantly so) with real aviation costs.

Table B.12 International air freight imports, by major airport, model results

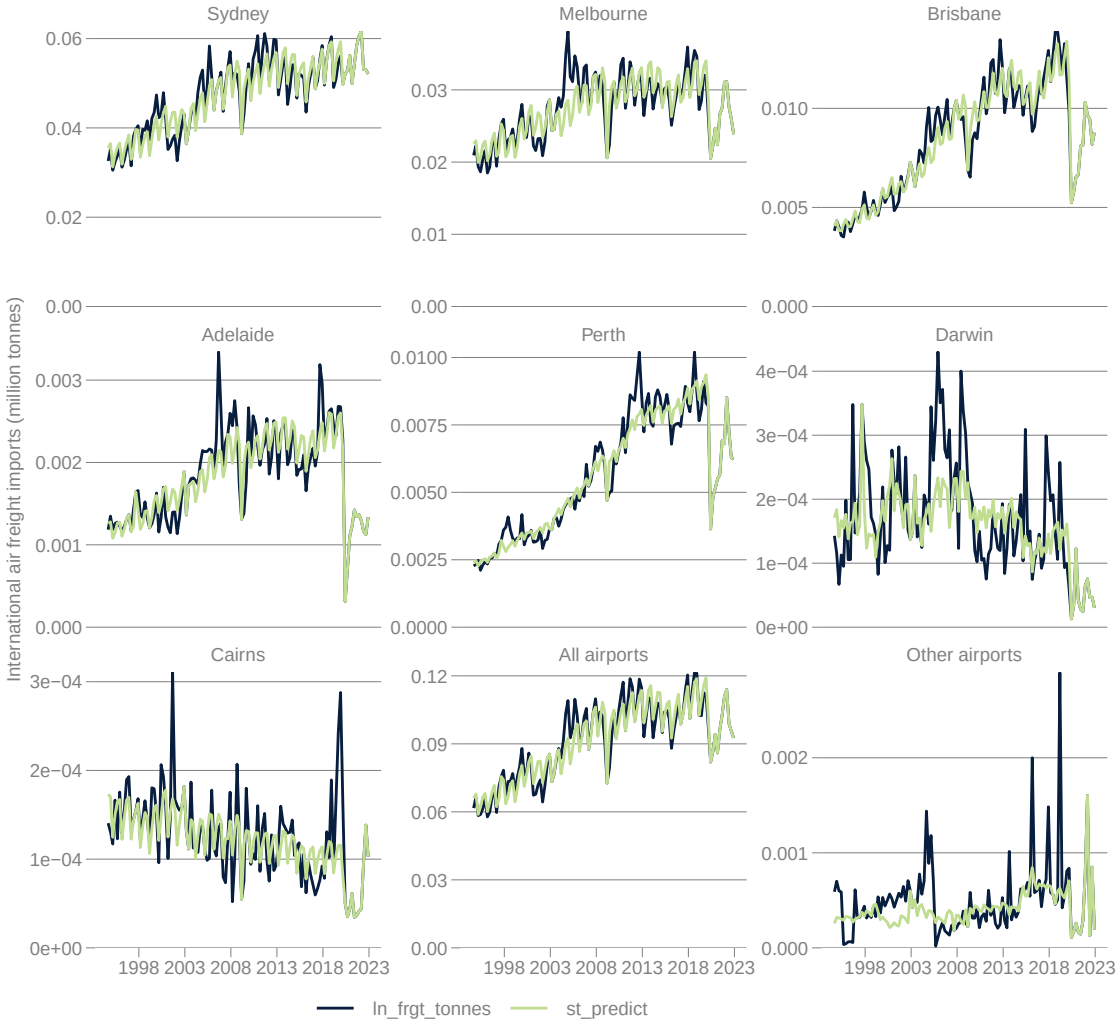
	Sydney	Melbourne	Brisbane	Adelaide	Perth	Darwin	Cairns	All airports	Other airports
Intercept	4.990***	6.551***	-1.716***	-1.149	-5.265***	9.047***	10.732***	3.850***	-11.742*
	(0.395)	(0.417)	(0.393)	(0.789)	(0.416)	(1.223)	(1.315)	(0.426)	(4.645)
Income	0.489***	0.303***	0.998***	0.840***	1.342***	-0.675***	-0.618***	0.572***	1.485***
	(0.038)	(0.041)	(0.041)	(0.085)	(0.045)	(0.180)	(0.137)	(0.035)	(0.387)
Fuel costs	0.201***	0.261***	0.326***	0.286**	0.067	1.111***	0.385+	0.199***	-1.262*
	(0.047)	(0.057)	(0.064)	(0.093)	(0.068)	(0.265)	(0.196)	(0.046)	(0.499)
Seasonal Dummy Q2	0.077***	0.032	-0.015	0.055	0.052+	0.166	0.189*	0.052*	-0.041
	(0.020)	(0.026)	(0.028)	(0.040)	(0.030)	(0.117)	(0.083)	(0.020)	(0.217)
Seasonal Dummy Q3	0.125***	0.117***	0.062*	0.153***	0.059*	0.152	0.310***	0.115***	-0.166
	(0.020)	(0.026)	(0.028)	(0.040)	(0.030)	(0.117)	(0.083)	(0.020)	(0.217)
Seasonal Dummy Q4	0.153***	0.140***	0.118***	0.165***	0.083**	0.268*	0.314***	0.141***	-0.002
	(0.020)	(0.025)	(0.027)	(0.039)	(0.029)	(0.115)	(0.082)	(0.020)	(0.214)
Dummy - 2009 Q1	-0.129+	-0.240**	-0.221*	-0.320*	-0.189+	0.528	-0.544+	-0.187**	-0.746
	(0.072)	(0.090)	(0.097)	(0.140)	(0.105)	(0.412)	(0.292)	(0.070)	(0.763)
Num.Obs.	114	114	114	114	114	114	114	114	114
R2	0.879	0.771	0.946	0.869	0.954	0.660	0.643	0.902	0.275
R2 Adj.	0.850	0.715	0.933	0.838	0.943	0.578	0.557	0.879	0.099
AIC	-259.0	-207.2	-190.5	-107.7	-173.2	138.7	60.4	-265.6	279.4
BIC	-193.4	-141.6	-124.8	-42.1	-107.5	204.3	126.0	-199.9	345.0
Log.Lik.	153.511	127.611	119.257	77.863	110.585	-45.334	-6.182	156.796	-115.678
RMSE	0.06	0.08	0.09	0.12	0.09	0.36	0.26	0.06	0.67

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variables not listed.

Source: BITRE estimates.

Figure B.7 International air freight imports, actual and model predictions, by major airport, 1995–2023



Source: BITRE estimates

International air freight export model empirical results

Table B.13 lists the model estimation results for air freight exports across the seven largest gateway airports, 'Other airports' and 'All airports'. Figure B.8 shows observed and model-predicted air freight exports for each gateway airport region.

The empirical results imply that international air freight exports are significantly positively correlated with real domestic incomes, again except for Darwin and Cairns airports. The model results imply that air freight exports are statistically significantly and negatively correlated with real aviation costs.

Table B.13 International air freight movement exports, by major airport, model results

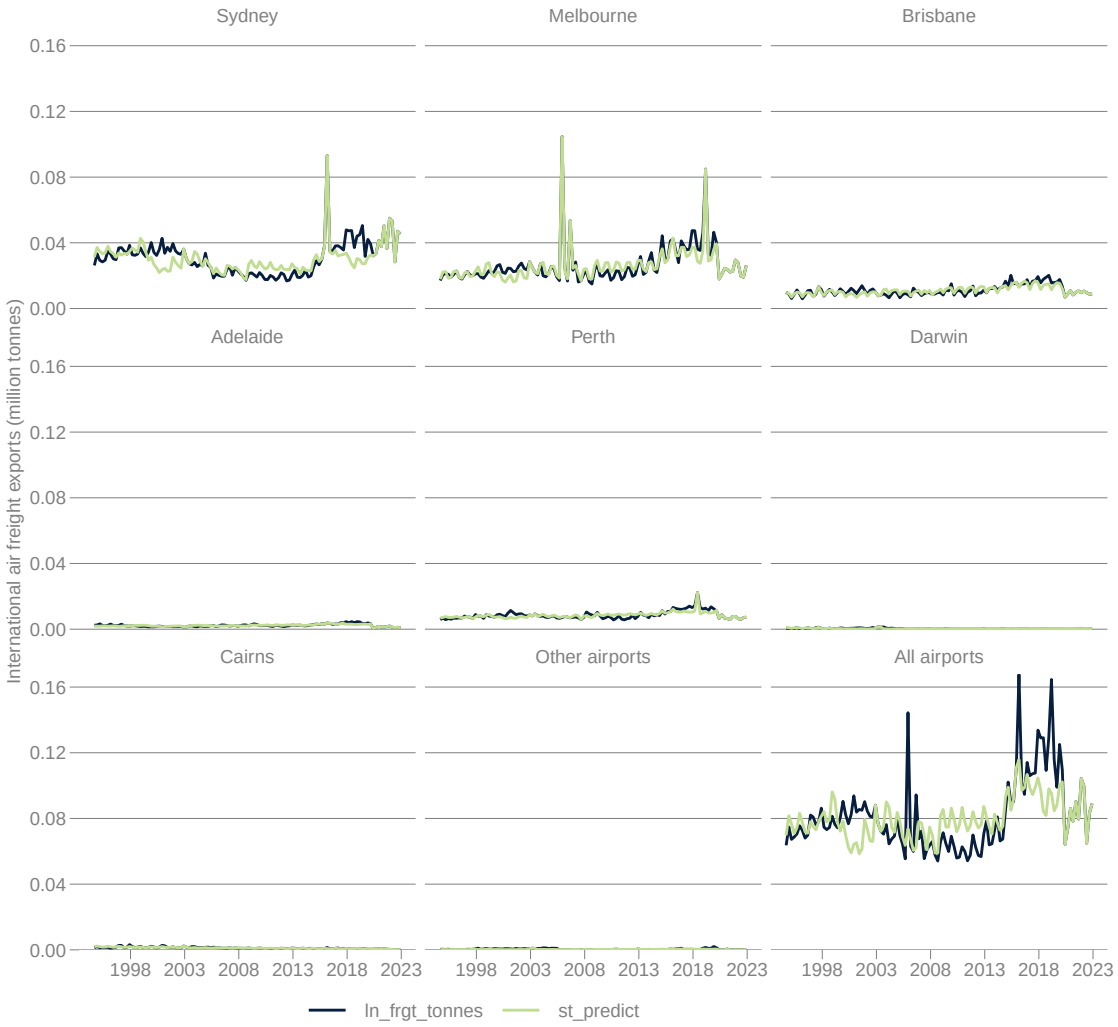
	Sydney	Melbourne	Brisbane	Adelaide	Perth	Darwin	Cairns	All airports	Other airports
Intercept	7.031***	1.072	1.709*	-3.565**	3.607***	32.235***	19.565***	3.599**	-14.269+
	(1.386)	(0.786)	(0.750)	(1.327)	(0.775)	(2.682)	(1.050)	(1.308)	(8.133)
Income	0.377**	0.886***	0.761***	1.221***	0.581***	-3.657***	-1.225***	0.659***	1.645*
	(0.133)	(0.077)	(0.079)	(0.143)	(0.083)	(0.395)	(0.109)	(0.109)	(0.678)
Fuel costs	-1.070***	-0.730***	-0.572***	-0.866***	-0.473***	-0.690	0.316*	-0.757***	-1.214
	(0.165)	(0.108)	(0.121)	(0.157)	(0.125)	(0.582)	(0.157)	(0.140)	(0.873)
Seasonal Dummy Q2	-0.031	-0.199***	0.252***	0.076	-0.072	0.619*	-0.186**	-0.078	-0.051
	(0.070)	(0.048)	(0.052)	(0.066)	(0.055)	(0.254)	(0.066)	(0.061)	(0.376)
Seasonal Dummy Q3	-0.070	-0.207***	0.322***	0.055	-0.111*	0.855**	-0.055	-0.071	-0.181
	(0.070)	(0.048)	(0.052)	(0.066)	(0.055)	(0.254)	(0.066)	(0.061)	(0.376)
Seasonal Dummy Q4	0.062	-0.018	0.296***	-0.029	-0.071	0.588*	0.129*	0.056	0.105
	(0.069)	(0.047)	(0.051)	(0.065)	(0.054)	(0.250)	(0.065)	(0.060)	(0.370)
Num.Obs.	114	114	114	114	114	114	114	114	114
R2	0.552	0.800	0.637	0.702	0.538	0.758	0.854	0.385	0.393
R2 Adj.	0.443	0.746	0.555	0.634	0.427	0.703	0.821	0.245	0.255
AIC	21.4	-65.2	-44.0	10.2	-33.2	317.0	8.4	-10.3	406.4
BIC	87.1	5.9	19.0	73.1	32.4	379.9	71.4	52.7	469.3
Log.Lik.	13.285	58.624	44.987	17.894	40.620	-135.483	18.787	28.128	-180.185
RMSE	0.22	0.14	0.16	0.21	0.17	0.79	0.21	0.19	1.18

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.

Note: COVID-19 and other event-specific dummy variables not listed.

Source: BITRE estimates.

Figure B.8 International air freight exports, by major airport, actual and model predictions, 1995–2023



Source: BITRE estimates

Appendix C – Key forecast inputs and assumptions

This appendix outlines the key forecast assumptions used in producing the air passenger and freight forecasts, and sensitivity analysis, presented in this report.

Domestic forecast assumptions

Australian population projections

The Australian population projections used to generate the aviation forecasts presented in this report are based on the population projections input to the latest (2023) Intergenerational Report (IGR) (Treasury 2023, Centre for Population 2023). The base case IGR population projections assume a long-run fertility rate of around 1.62 (live births per female) and a long-run net overseas migration (NOM) rate of 235,000 persons per year. Under these assumptions, the total population is projected to increase from around 26.6 million persons in June 2023 to around 36.4 million persons by June 2050, an average annual growth rate of 1.17 per cent per annum (Treasury 2023, p. 252).[18]

Treasury (2023) included two sensitivity analysis population growth scenarios:

- The higher population growth scenario assumes a fertility rate of 1.72 births per female and NOM rate of 285,000 persons per year, resulting in a projected population of around 38.2 million persons by 2050 (1.35 per cent per annum).
- The lower population growth scenario assumes a fertility rate of 1.52 births per female and NOM rate of 185,000 persons per year, resulting in a projected population of around 34.7 million persons by 2050 (0.99 per cent per annum).

By way of comparison, the ABS (2018) population projections:

- ABS Series B (medium series) assumed a fertility rate of 1.80 births per female and NOM rate of 225,000 persons per year, resulting in a projected population of around 37.1 million persons by 2050.
- ABS Series A (high series) assumed a fertility rate of 1.95 births per female and NOM rate of 275,000 persons per year, resulting in a projected population of around 40.6 million persons by 2050.
- ABS Series C (low series) assumed a fertility rate of 1.65 births per female and NOM rate of 175,000 persons per year, resulting in a projected population of around 34.2 million persons by 2050.

Figure C.1 shows projected Australian population under the Treasury (2023) baseline, and high and low projected population growth scenarios, and Figure C.2 and Table C.1 show the implied growth rates.

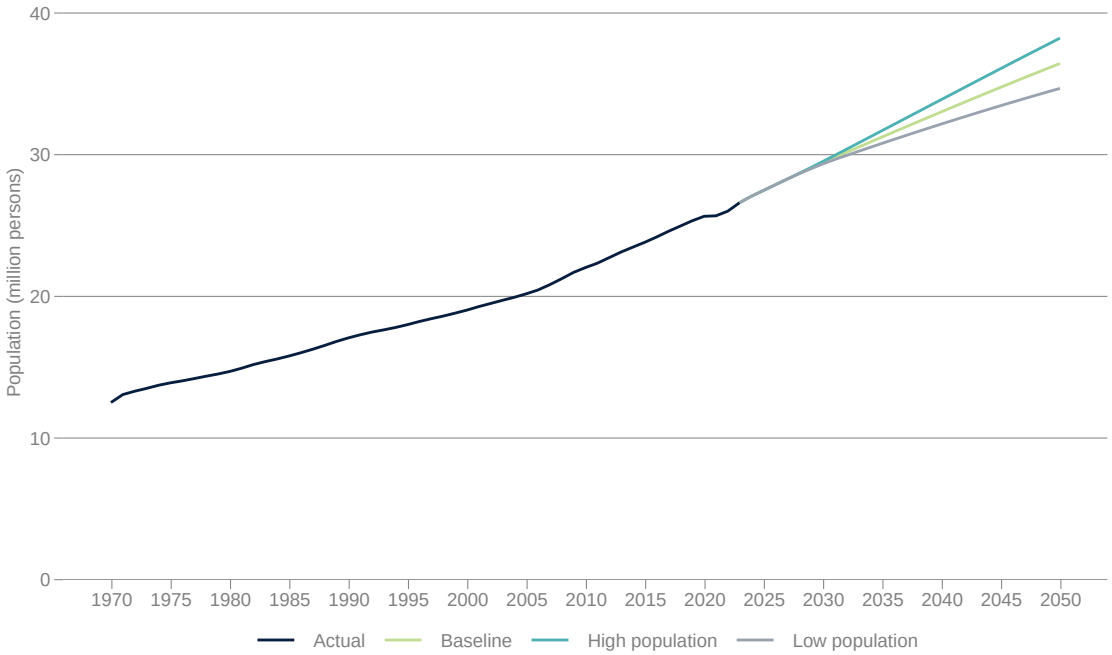
Table C.1 Projected population levels, by scenario, 2020 to 2050

	Scenario		
Year	Baseline	High population	Low population
2023	26.62	26.62	26.62
2030	29.43	29.51	29.34
2040	33.02	33.89	32.16
2050	36.44	38.23	34.68
Avg. ann. growth (% p.a.)	1.17	1.35	0.99

Sources: Centre for Population (2023), ABS (2018) and BITRE estimates.

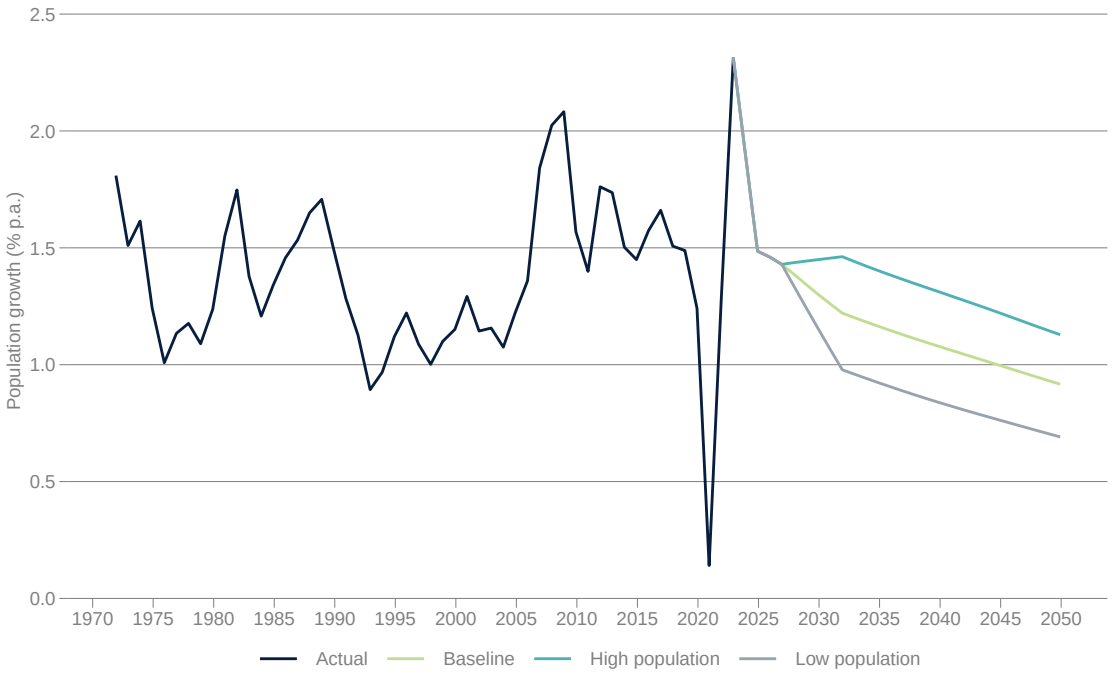
18 The CfP is due to release an updated Population Statement in early 2024 and the ABS is scheduled to release updated population projections ABS (2023d) in November 2023, both of which post-date the inclusion of the forecast assumptions used in this report.

Figure C.1 Actual and projected estimated resident population, 1971–2050



Sources: Centre for Population (2021), ABS (2018) and BITRE estimates.

Figure C.2 Actual and projected estimated resident population growth, 1971–2050



Sources: Centre for Population (2021), ABS (2018) and BITRE estimates.

Australian productivity and economic growth projections

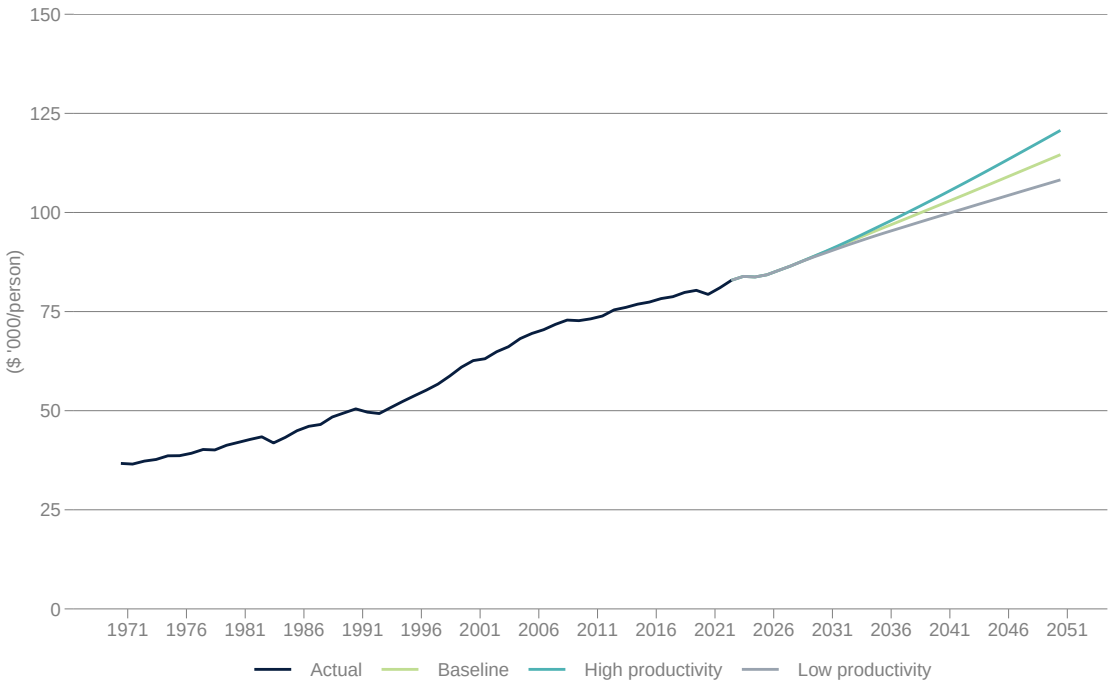
Australian economic growth projections are also based on the 2023 IGR (Treasury 2023) productivity, participation and population growth assumptions. The base case IGR productivity projections assume a long-run labour force participation rate (15 years and older) of 63.8 per cent and long-run labour productivity growth of around 1.2 per cent per annum between 2022–23 and 2062–63. Under these assumptions, real GDP per capita is projected to increase from around $83,900 per person in 2022–23 to around $114,600 per person by 2049–50, an average annual growth rate of 1.16 per cent per annum (Treasury 2023, p. 252).

Treasury (2023) also included two GDP per capita growth sensitivity analysis scenarios:

- The *higher* productivity scenario assumed long-run labour productivity growth of around 1.5 per cent per annum between 2022–23 and 2049–50, resulting in GDP per capita increasing to around $120,700 per person by 2050 (1.36 per cent per annum).
- The *lower* productivity scenario assumed long-run labour productivity growth of around 0.9 per cent per annum between 2022–23 and 2049–50, resulting in GDP per capita increasing to around $108,200 per person by 2050 (0.95 per cent per annum) (Treasury 2023, p. 252).

Figure C.3 shows the projected forecast real per capita GDP between 2023 and 2050 under alternative scenarios. Figure C.4 shows the implied annual forecast growth rates. Table C.2 shows the projected real per capita GDP increase at ten-year intervals between 2030 and 2050.

Figure C.3 Actual and projected GDP per capita forecast scenarios, 1971–2050



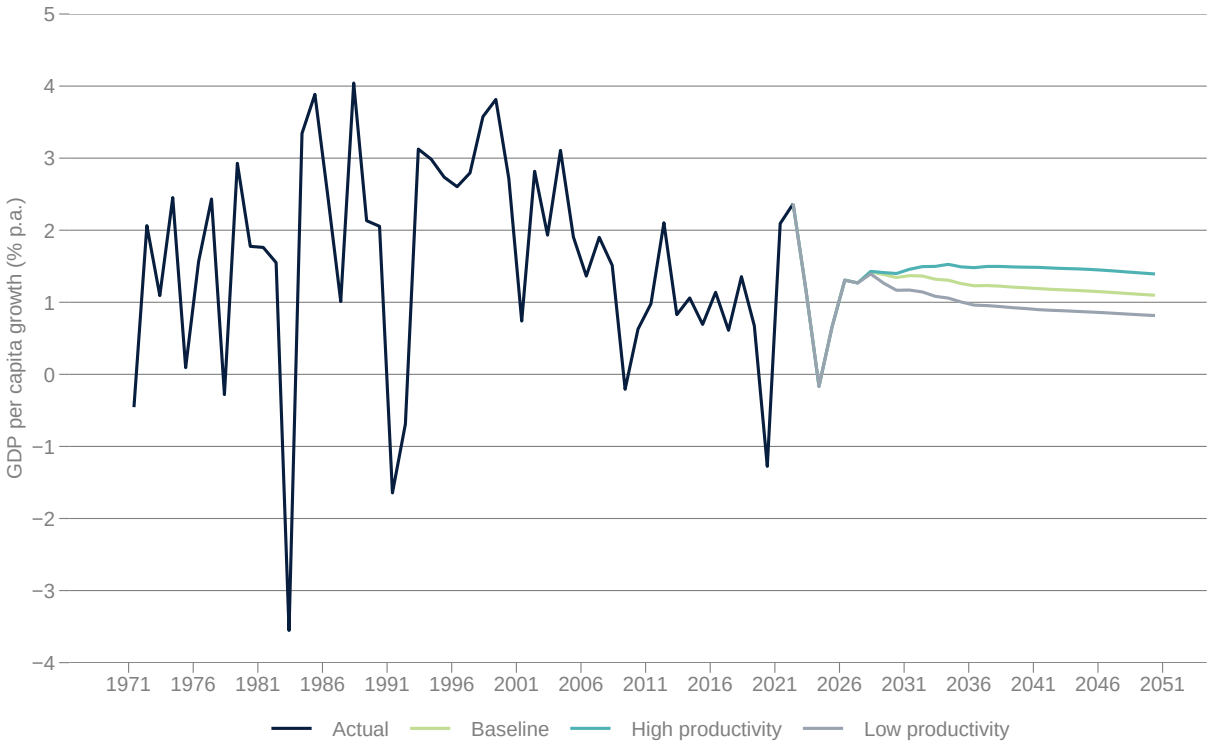
Sources: Treasury (2021) and BITRE estimates.

Table C.2 Projected GDP per capita, by scenario, 2020 to 2050

	Scenario		
Year	Baseline	High productivity	Low productivity
2023	83,900	83,900	83,900
2030	90,100	90,200	89,800
2040	102,200	104,600	99,400
2050	114,600	120,700	108,200
Avg. ann. growth (% p.a.)	1.16	1.36	0.95

Sources: Treasury (2023) and BITRE estimates.

Figure C.4 Actual and projected GDP per capita forecast scenario growth, 1971–2050



Sources: Treasury (2021) and BITRE estimates.

International forecast assumptions

World population projections

International country population projections are based on the United Nations' 2022 World Population Prospects (WPP), prepared by the Population Division of the Department of Economic and Social Affairs of the United Nations Secretariat (UN 2022). The WPP provides historical annual population estimates and projections out to 2100 for 237 separate countries and world regions, based on analyses of historical country- and region-specific demographic trends.

The 2022 WPP included ten different projection scenarios, based on varying fertility, mortality and migration assumptions. The *medium* (WPP baseline) scenario projection is derived using probabilistic methods based on historical demographic trends in each country and uncertainty about future changes based on the experience of other similar countries. UN (2022) reports the *medium* WPP scenario projection '... corresponds to the median of several thousand distinct trajectories of each demographic component derived using the probabilistic model of the variability in changes over time' (UN 2022, see 'Definition of Project Scenarios' page). Other scenarios include:

- Fertility scenarios: Low, High, Constant fertility, Instant replacement
- Mortality scenarios: Constant mortality and 'no change'
- Migration scenarios: Zero migration and 'no change' scenario.

Under the 2022 WPP Medium scenario, the total world population is projected to increase from around 7.96 billion persons in 2022 to around 9.7 billion persons by 2050, an average annual growth rate of 0.71 per cent per annum (UN (2022) and BITRE estimates).

Figure C.5 shows the WPP actual and projected populations (low, medium, and high fertility scenarios), for major international aviation market countries, between 1990 and 2050, and Table C.3 shows the projected population in 2050 for each major country and WPP scenario, and the implied population growth rate.

Major international aviation origin and destination country markets for Australian international aviation, where the population is projected to decline between 2022 and 2050 include: China (including Hong Kong), Japan, South Korea, Thailand and Germany. Major international aviation markets where the population is projected to increase include: India, Indonesia, Malaysia, Philippines, Vietnam, Canada and New Zealand.

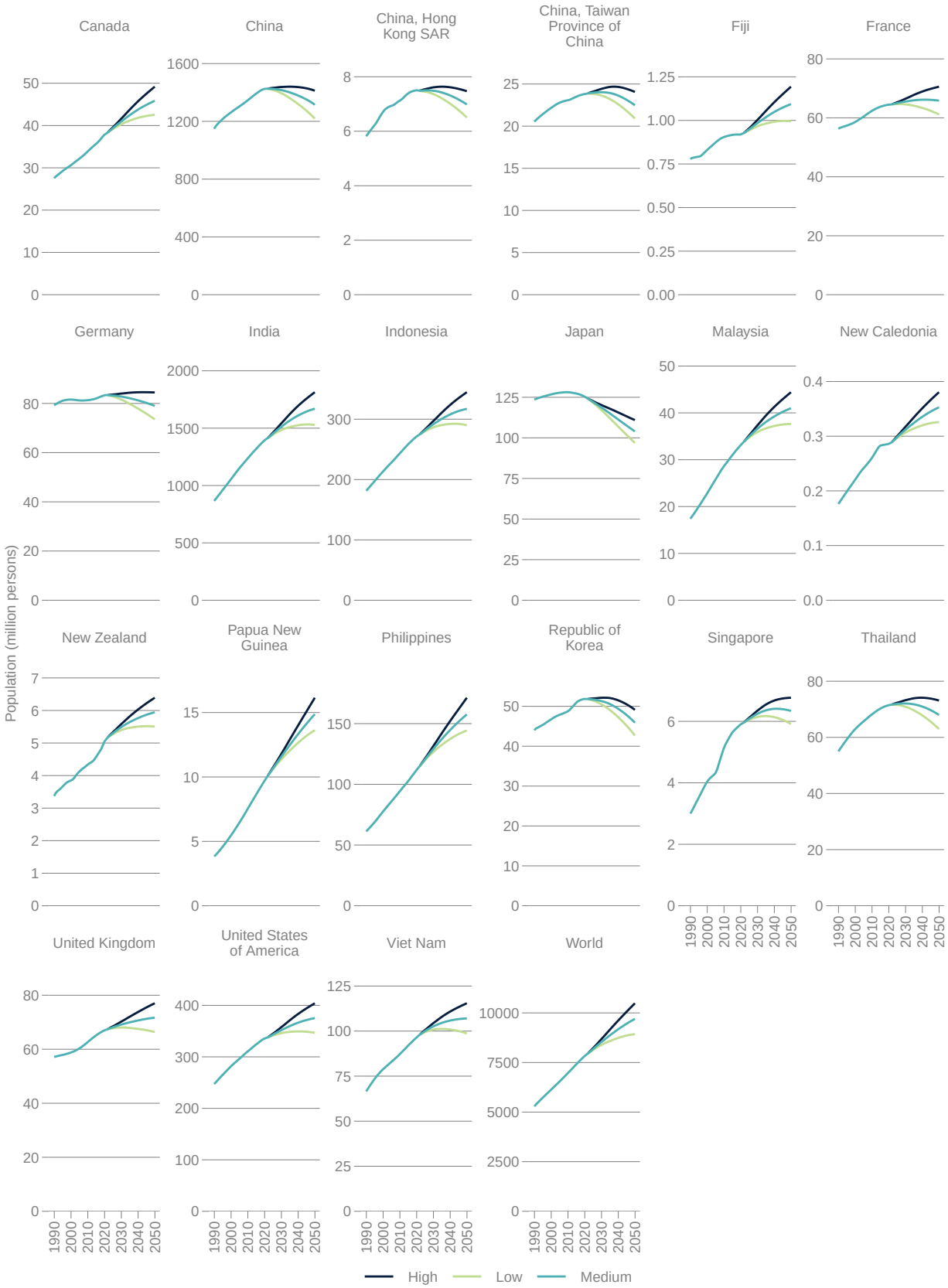
BITRE has used the WPP 2022 Medium scenario for the baseline international aviation forecasts presented in this report, and used the WPP 2022 High and Low fertility scenarios in the sensitivity analysis scenarios.

Table C.3 Actual and projected population and population growth, selected countries and world, by WPP scenario, 1990–2050

	Population 2022	Population - 2050			Avg. annual growth, 2022-2050		
	(million persons)				(per cent p.a.)		
Country	Medium	Medium	High	Low	Medium	High	Low
World	7,958.38	9,698.47	10,485.63	8,926.59	0.71	0.99	0.41
China	1,425.91	1,314.79	1,411.99	1,218.72	-0.29	-0.04	-0.56
China, Hong Kong SAR	7.49	6.99	7.47	6.50	-0.25	-0.01	-0.50
China, Taiwan Province of China	23.89	22.48	24.06	20.91	-0.22	0.03	-0.47
Japan	124.12	103.96	110.95	96.87	-0.63	-0.40	-0.88
Republic of Korea	51.82	45.88	49.10	42.68	-0.43	-0.19	-0.69
India	1,414.75	1,669.48	1,813.45	1,527.89	0.59	0.89	0.28
Indonesia	275.06	317.10	344.76	290.03	0.51	0.81	0.19
Malaysia	33.84	41.00	44.41	37.62	0.69	0.98	0.38
Philippines	115.11	157.60	171.31	144.30	1.13	1.43	0.81
Singapore	5.97	6.34	6.77	5.91	0.22	0.45	-0.03
Thailand	71.67	67.98	73.12	62.96	-0.19	0.07	-0.46
Viet Nam	98.01	107.01	115.43	98.68	0.31	0.59	0.02
United Kingdom	67.45	71.67	77.03	66.37	0.22	0.48	-0.06
France	64.59	65.85	70.58	61.17	0.07	0.32	-0.19
Germany	83.40	79.00	84.46	73.51	-0.19	0.05	-0.45
Canada	38.37	45.85	49.19	42.53	0.64	0.89	0.37
United States of America	337.89	375.24	404.08	346.73	0.38	0.64	0.09
New Zealand	5.17	5.95	6.39	5.50	0.50	0.76	0.22
Fiji	0.93	1.09	1.19	0.99	0.59	0.90	0.25
New Caledonia	0.29	0.35	0.38	0.33	0.71	0.98	0.43
Papua New Guinea	10.10	14.87	16.15	13.63	1.39	1.69	1.08

Sources: UN (2022) and BITRE estimates.

Figure C.5 Actual and projected population, selected countries and world, by WPP scenario, 1990–2050



Sources: UN (2022) and BITRE estimates.

Country economic growth projections

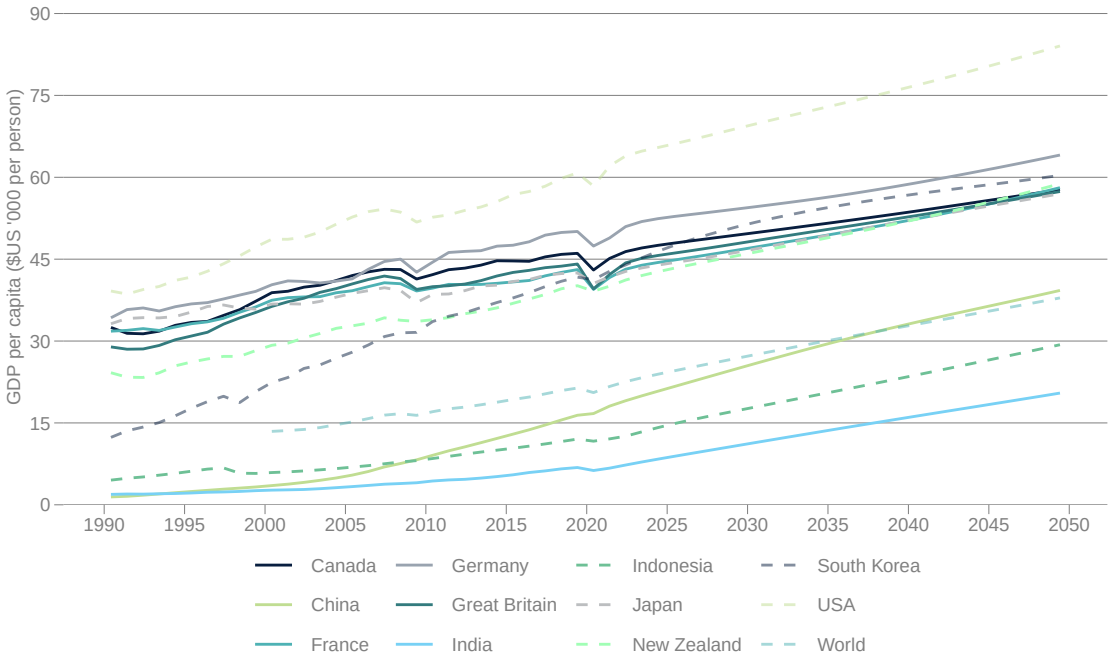
International country economic growth projections are based on the latest OECD Economic Outlook Long-term baseline (LTB) projections (OECD 2021b, OECD 2021a). The OECD LTB projections provide long-term outlooks, to 2060, of GDP (nominal and real), consumer prices, exchange rates and population for OECD members, a limited number of non-member countries – including China, Brazil, India, Indonesia, Russia and South Africa – and the world.

The OECD (2021a) projections imply world economic activity will increase from an average of around $US22,600 per person in 2022 to around $US38,500 per person by 2050, an average annual growth rate of 1.93 per cent per annum (OECD (2021a) and BITRE estimates).

Figure C.6 shows OECD LTB projections of GDP per capita for selected major international aviation market countries, between 1990 and 2050, and Table C.4 shows the projected GDP per capita, and implied average annual growth rate, for each major country between 2022 and 2050.

OECD (2021a) projections imply that between 2022 and 2050, GDP per capita will grow most strongly in China, India and Indonesia. Conversely, per capita GDP is projected to grow by around 1 per cent per annum, or less, in the United States, Germany, Great Britain and Canada.

Figure C.6 Actual and projected GDP per capita, selected countries and world, 1990–2050



Sources: OECD (2021a) and BITRE estimates.

Table C.4 Actual and projected GDP per capita, selected countries and world, 1990–2050

	GDP per capita ($US per person)				Avg. annual growth (per cent p.a.)
Country	2022	2030	2040	2050	2022-2050
Canada	46,400	49,800	53,800	58,200	0.81
China	19,100	25,800	33,400	40,000	2.68
France	43,200	47,200	52,300	58,800	1.11
Germany	51,000	54,600	58,900	64,700	0.86
Great Britain	44,300	48,400	53,000	57,900	0.96
India	7,300	11,400	16,200	21,000	3.84
Indonesia	12,600	17,900	23,700	30,000	3.15
Japan	42,800	46,800	52,300	57,500	1.06
New Zealand	41,200	46,300	52,300	59,600	1.33
South Korea	44,000	51,700	56,900	60,800	1.17
USA	63,900	69,700	76,800	84,900	1.02
World	22,600	27,500	33,000	38,500	1.93

Sources: OECD (2021a) and BITRE estimates.

Aviation fuel cost assumptions

Aviation fuel is a significant input cost to commercial aviation, comprising up to 25 per cent of domestic aviation expenditure, and an even higher share of aviation costs for international aviation to and from Australia. Aviation fuel costs are generally very highly correlated with world crude oil prices – Figure C.7 illustrates the high correlation between daily U.S. jet fuel spot prices and West Texas Intermediate (WTI) crude oil spot prices (EIA 2021a), all converted to 2023 Australian dollar values, between 1990 and 2023. The high correlation between jet fuel prices and crude oil prices implies that projected rates of growth in future crude oil prices can be applied to future jet fuel prices.

Figure C.7 Real daily jet fuel and WTI crude oil spot prices – January 1990 to June 2023

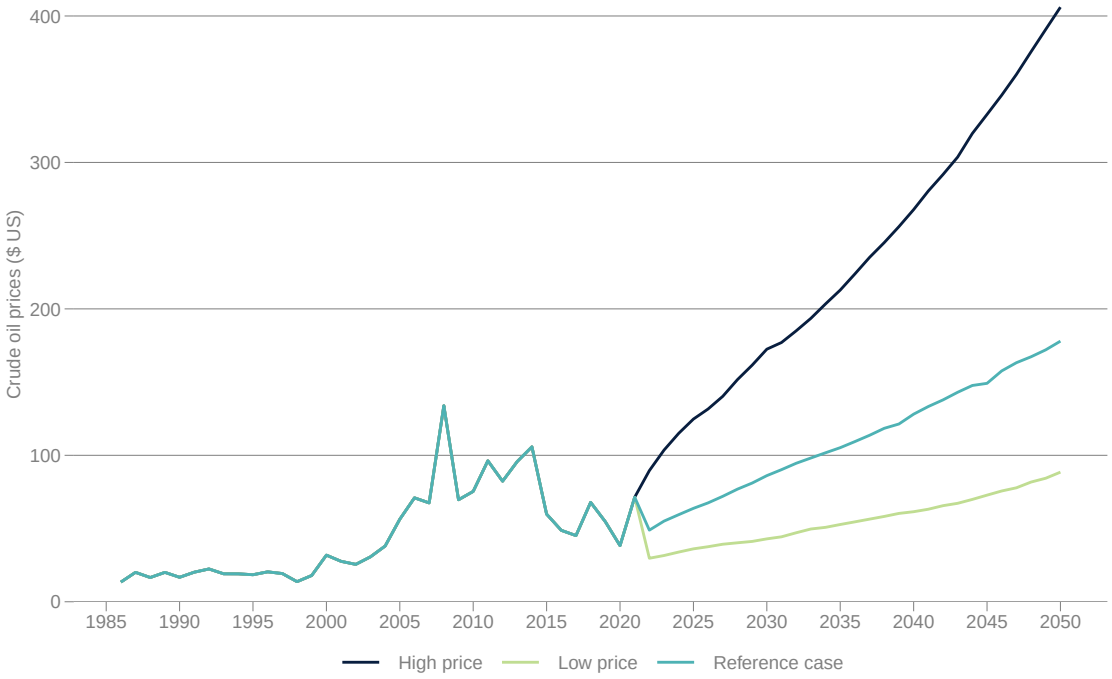
Sources: BITRE estimates based on EIA (2021a), ABS (2023b) and RBA (2023)

World oil price scenario assumptions

The oil price scenarios used in developing the aviation forecasts are based on the United States' EIA (2021a) world oil price outlook scenarios. The EIA reference case, projects that world oil prices (West Texas Intermediate) will increase from around $US71 per barrel in 2021 to around $US178 per barrel by 2050. Under the low price case, world oil prices are projected to decline in the near term, but increase thereafter, to be around $US89 per barrel by 2050. Under the high price case, world oil prices are projected to increase to over $US406 per barrel

by 2050 (see Table C.5).

Figure C.8 EIA oil price scenarios, 2020–2050



Source: EIA (2021a)

Table C.5 U.S. EIA world oil price scenarios, 2020 to 2050

	Scenario		
Year	Reference case	High price	Low price
2020	38.3	38.3	38.3
2030	86.1	172.5	42.9
2040	128.1	267.8	61.5
2050	177.9	406.0	88.5

Note: [a] West Texas Intermediate crude oil prices
Source: EIA (2021a).

Fuel efficiency, climate change and alternative aviation fuel costs

The Australian Government has committed to reduce Australia's greenhouse emissions by 43 per cent below 2005 levels by 2030, and to net zero by 2050. Reaching the target will require reductions in emissions across all sectors of the economy, including transport. Opportunities to reduce emissions in transport broadly fall into the following categories:

- more energy efficient vehicles
- lower carbon fuels
- modal substitution – to less carbon-intensive transport modes, and
- reduced activity.

While increasing uptake of electric vehicles provides opportunities for a viable path to net-zero emissions in road transport over the medium to long-term, there are few similar technically-feasible near-term technology options in aviation. Rather, opportunities to reduce aviation emissions will likely come from:

- accelerated improvement in new aircraft fuel efficiency
- battery electric and hydrogen-powered aircraft, applicable in short-haul, small aircraft operations only
- substitution of fossil-based aviation fuels used in commercial aviation – i.e. aviation turbine fuel (ATF) with sustainable aviation fuels (SAF), i.e. biofuels.

Each of these alternatives has implications for future air transport costs, and hence airfares. For example, SAF is likely to be more expensive than ATF in the short-to-medium term, impacting airline costs (and fares). Development and uptake of more efficient new aircraft, while having higher capital costs, will reduce ongoing operating costs.

Aircraft fuel efficiency trends

According to a 2016 study by the International Council on Clean Transportation (ICCT), new commercial jet aircraft fuel efficiency (measured in fuel per revenue passenger kilometre – L/rpk) improved by around 30 per cent between 1980 and 2016, equivalent to average annual rate of improvement of around 0.9 per cent per annum (Kharina, Rutherford and Zeinali 2016, pp. vi). Assuming a similar rate of improvement over the next 27 years (to 2049–50), would imply a further 26 per cent improvement in new aircraft fuel efficiency.

The ICCT study identified a broad range of cost-effective technology options that, when combined, could increase the rate of aircraft fuel efficiency improvement from under 1 per cent per annum up to around 2.2 per cent per year in the coming decades (Kharina, Rutherford and Zeinali 2016, p. iv). The study modelled the costs and benefits of developing and deploying new fuel-efficiency technologies in aircraft, taking into account development costs, production costs and fuel savings. The average impact on the total cost of ownership (TCO), relative to the baseline scenario is a 0 to 7 per cent increase in 2024, and –4 to +2 per cent in 2034,[19] suggesting the overall capital cost impact is minimal.

SAF uptake and cost impact

Airlines are developing plans to utilise SAF to reduce emissions. For example, Qantas has announced an intention to use 10 per cent SAF in its overall fuel mix by 2030 and to achieve net zero emissions by 2050, and reports it is currently purchasing SAF overseas (Qantas 2023). Qantas has also announced development of a biofuel production facility, in partnership with Jet Zero, to produce up to 100 million litres of SAF per year in Australia, from agricultural by-products (Qantas 2023). Construction of the facility is expected to start in 2024. Virgin Australia are also advocating for the development of an Australian SAF industry (Virgin 2023).

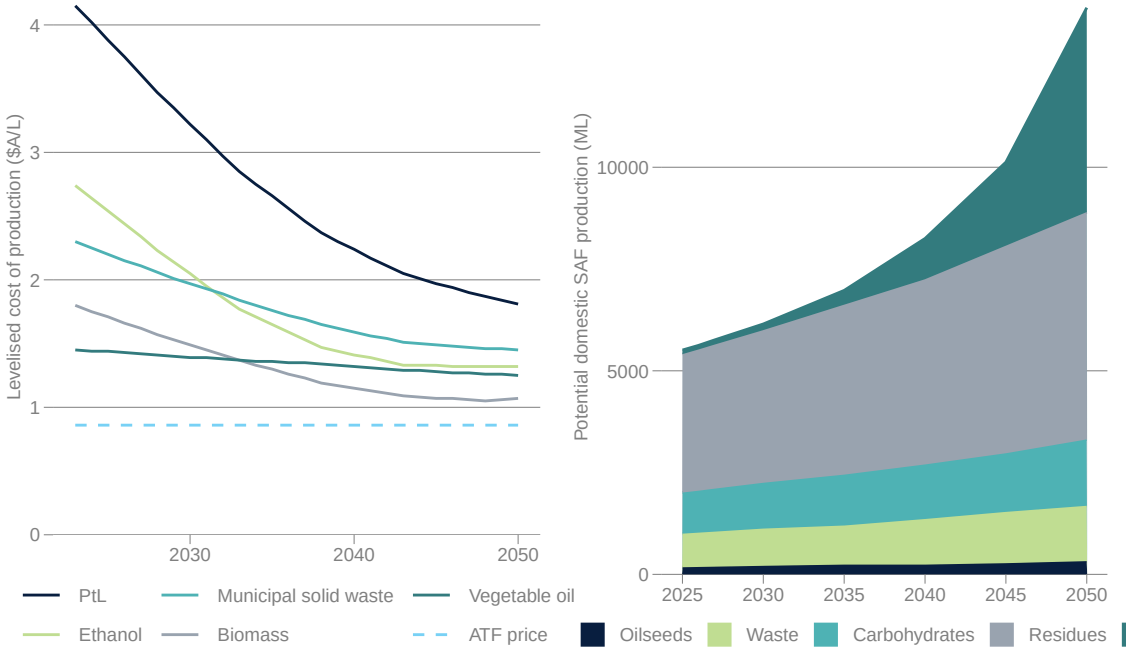
CSIRO (2023) investigated the domestic supply capacity and cost of SAF production from Australian agricultural and other-source by-products, including ethanol, municipal wastes, biomass and vegetable oil. CSIRO (2023) estimated that potential SAF production from domestic feedstock sources could supply around 5.5 billion litres of aviation biofuels by 2025, increasing to around 8.4 billion litres by 2050 (not including power-to-liquids sources.[20] By way of comparison, DCCEEW (2023b) reports total Australian ATF sales were 9.4 billion litres in 2018–19 (pre-COVID-19), with approximately 3.8 billion litres used in domestic aviation and 6.0 billion litres in international sales.

CSIRO estimates, however, the cost premium of SAF could be between 50 and 150 per cent above the cost of ATF. Figure C.9 reproduces CSIRO's projected domestic SAF production capacity and projected average production cost by feedstock source. Figure C.10 shows the implied (minimum) average cost of domestic SAF production, by production year, and provides a comparison with the current average cost of ATF. The average cost of SAF production increases with volume, but is projected to decline over time. (These estimates are used to inform BITRE's fuel cost scenarios, described below.)

19 BITRE estimates based on Kharina, Rutherford and Zeinali (2016), pp. 27-28.

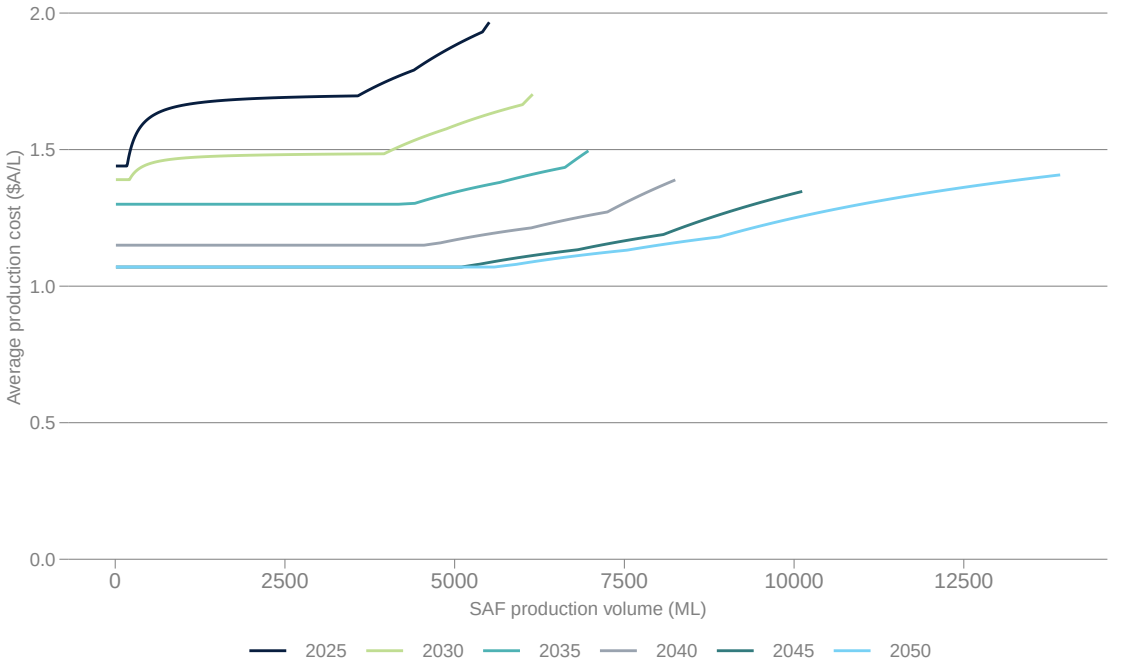
20 Power-to-liquids (PtL) is a process that involves the production of jet fuel using non-biological feedstocks, such as hydrogen and carbon dioxide, and renewable energy CSIRO (2023).

Figure C.9 CSIRO SAF Roadmap estimates cost of projection and production capacity, 2025–2050



Source: CSIRO (2023).

Figure C.10 CSIRO SAF Roadmap-implied average cost of production, 2025–2050



Sources: BITRE estimates and CSIRO (2023).

The Safeguard Mechanism and aviation fuel costs

The Australian Government's Safeguard Mechanism (SGM) applies to facilities that emit more than 100,000 tonnes of carbon dioxide equivalent (CO_2-e) emissions per year. DCCEEW reports there were 215 Safeguard facilities across Australia in 2023, responsible for around 28 per cent of Australia's total greenhouse emissions (DCCEEW 2023c). Aviation sector facilities required to report under the SGM include the major domestic commercial airlines: Qantas and Virgin Australia, which are responsible for the majority of domestic commercial air passenger and freight activity. In order to simplify modelling of the potential impact of the SGM on aviation

input costs, BITRE assumed the SGM would apply to all domestic aviation passenger and freight operations.

Under the reforms to the SGM, which commenced on 1 July 2023, large industry CO2-e emitters are required to reduce net emissions by 4.9 per cent each year to 2030. Beyond 2030, CO2-e emission reduction rates for large emitters are to be set in five-year blocks, determined after updates to Australia's Nationally Determined Contribution (NDC) under the Paris Agreement (DCCEEW 2023c).

Facilities that exceed their baseline target each year will be able to purchase Australian Carbon Credit Units (ACCUs) or Safeguard Mechanism Credits. In addition, there is a cost containment measure that allows facilities that have exceeded their baseline to purchase ACCUs from the Australian Government at a fixed price of $75 per tonne CO2-e in 2023–24, increasing by CPI plus 2 per cent each year. ACCU prices are projected to remain below the cost containment price to 2035 (DCCEEW 2023a, p. 33.) BITRE has assumed the future ACCU price is equal to the median forecast ACCU price to 2035, and beyond 2035 increase at the average annual projected median ACCU price growth between 2030 and 2035 – under these assumptions BITRE estimates ACCU prices would increase to around the ACCU fixed price just prior to 2050. International offsets are not part of the current SGM.

BITRE estimates Australia's total (direct) domestic aviation emissions (including general aviation activity) were around 9.43 million tonnes CO2-e in 2022–23 (BITRE 2023d), and in the absence of significant technological changes, are projected to increase to around 14.06 Mt CO2-e by 2049–50 (BITRE estimates).

The average CO2-e emissions intensity of aviation turbine fuel (ATF) is approximately 2.56 kg CO2-e per litre of ATF.[21] Converted to a price per litre of ATF-equivalent, the cost of an ACCU purchased from the Australian Government would be equivalent to around 19.2 cents per litre of ATF ($A0.192/L) in 2023–24, increasing in real terms to around 32.1 cents per litre by 2049–50.[22] By way of comparison, the current average price of jet fuel in Australia is approximately $A0.86 per litre of ATF (CSIRO 2023),

In practice, the number of ACCUs required to be purchased by the domestic aviation sector will depend on projected emissions growth, emissions reductions from aircraft efficiency improvements, uptake of low carbon fuels and any required offsets.

BITRE aircraft efficiency, emissions response and fuel cost scenarios

In order to incorporate the potential future impact of the SGM and SAF uptake on future aviation input costs, BITRE considered three SAF uptake scenarios (illustrated in Figure C.11:

- Under the baseline scenario, uptake of SAF in domestic aviation is assumed to be about 5 per cent by 2030, increasing to 10 per cent by 2035 and 25 per cent by 2050.
- Under the low SAF uptake scenario, domestic SAF usage is assumed to commence in 2030–31, increasing to 5 per cent by 2035 and 12.5 per cent by 2050.
- Under the high SAF uptake scenario domestic SAF usage is assumed to reach 10 per cent by 2030, 20 per cent by 2035 and 50 per cent by 2050.

SAF costs are assumed to follow the production cost profile shown in Figure C.10 under the baseline and low SAF uptake scenarios, but be 25 per cent higher under the high SAF uptake scenario – under all scenarios, BITRE assumed no supply constraints on SAF availability. Average new aircraft fuel efficiency improvement of around 0.8 per cent per annum between 2023–24 and 2049–50 under all scenarios – fleet average fuel efficiency improvement will be slightly less than this, reflecting aircraft operating life and turnover.

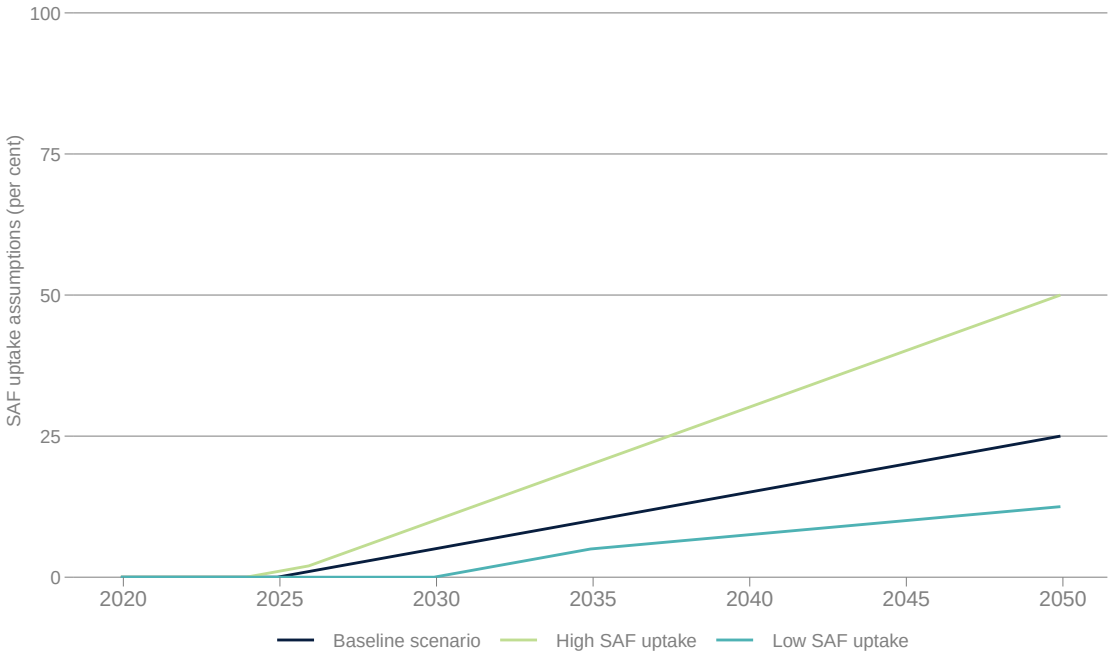
And domestic industry is assumed to purchase SGM credits or ACCUs from the Australian Government required to reduce net domestic aviation emissions to 43 per cent of 2004–05 levels by 2030, and meet net zero by 2049–50.

These assumptions are combined to derive an estimate of the likely impact on aviation fuel costs of assumed SAF uptake and the SGM shown in Figure C.12. The plot shows the likely proportional fuel cost 'uplift factor' of SAF uptake and the Safeguard Mechanism over current ATF costs – the Baseline and low SAF uptake scenarios produce similar outcomes – costs are likely to be 30 per cent higher by 2050 – as the estimated average domestic SAF production cost is similar to the proposed ACCU purchase price (measured as a proportion of current ATF costs). The higher scale factor implied under high SAF uptake scenario is due to assuming SAF production costs are 25 per cent higher than under the Baseline scenario.

21 Based on an ATF energy density of 36.8 MJ/L, CO2-equivalent emissions factor of 69.6 g CO2-e/MJ and oxidation rate of 99 per cent.

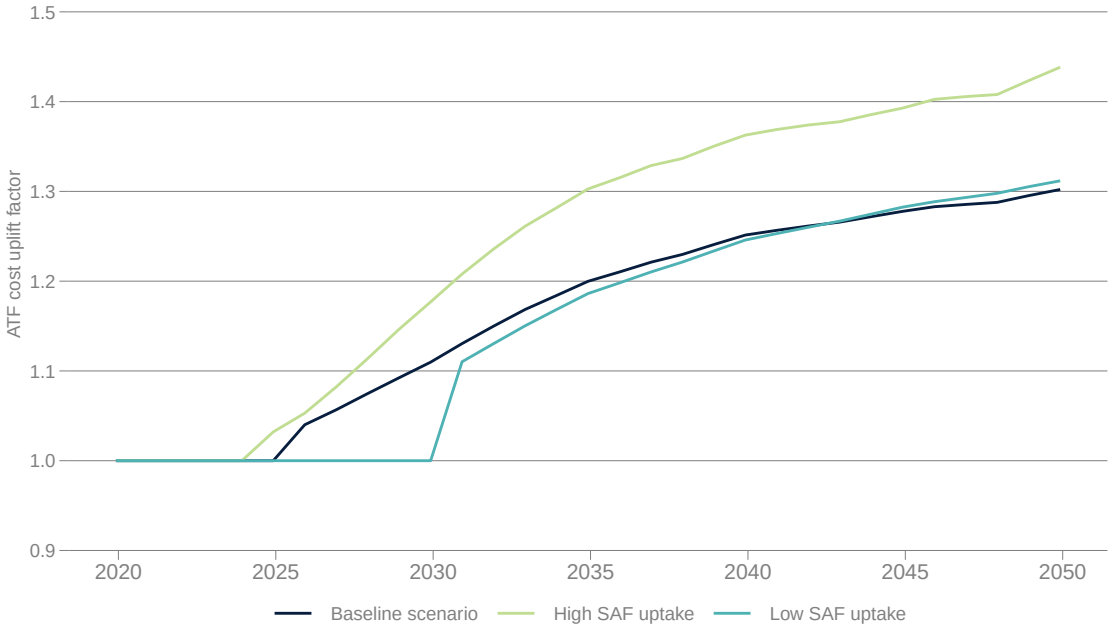
22 In estimating the aviation jet fuel equivalent ACCU cost in 2049–50, the real price of ACCUs is assumed to increase by 2 per cent per annum, to around $A125.50 per tonne CO2-e by 2049–50.

Figure C.11 BITRE-assumed domestic aviation SAF uptake scenarios, 2024–2050



Sources: BITRE assumptions.

Figure C.12 BITRE-estimated SAF-uptake and Safeguard Mechanism impact on domestic aviation fuel costs, 2024 – 2050



Sources: BITRE assumptions.

International aviation scenario assumptions

The 184 member countries of the International Civil Aviation Organization (ICAO) and member airlines of the International Air Transport Association (IATA) have both declared long-term goals of net zero emissions from international aviation by 2050. International aviation fuel input costs are therefore also likely to increase as airlines make greater use of zero- and low-emission fuels or required to offset emissions. For simplicity, BITRE assumed the fuel cost uplift trajectory for international aviation would likely follow that of domestic aviation, but with a 5-10 year lag. (BITRE notes the increase in demand for SAFs and/or offsets, due to inclusion of international aviation, might increase the unit costs for both domestic and international aviation – but did not include such a scenario as part of the forecast production.)

Appendix D – Aviation activity forecasts

This appendix presents annual actual and forecast air passenger and freight movement activity reported in the body of the report.

Air passenger activity forecasts

Table D.1 lists actual and forecast total domestic and international air revenue passenger kilometres to 2050. Table D.2 lists actual and forecast total domestic and international air passengers through all Australian airports (i.e. counting both passenger departures and arrivals) out to 2050.

Table D.1 Actual and forecast total annual domestic and international revenue passenger kilometres, 1992 to 2050

	Domestic	International			Total
	(billion passenger kilometres)				
Year	Total	Inbound	Outbound	Total	Total
1991	15.14	0.00	0.00	0.00	15.14
1992	19.81	34.38	34.28	68.66	88.47
1993	19.85	37.05	36.99	74.04	93.89
1994	23.86	40.00	39.79	79.78	103.64
1995	26.39	43.87	43.33	87.21	113.60
1996	28.37	48.45	47.92	96.37	124.74
1997	29.34	52.10	51.77	103.87	133.21
1998	29.78	53.46	53.09	106.55	136.33
1999	30.39	54.93	54.58	109.51	139.90
2000	32.20	58.46	58.37	116.83	149.03
2001	35.01	63.08	63.19	126.27	161.28
2002	32.30	60.22	60.32	120.55	152.85
2003	35.10	59.32	58.97	118.29	153.39
2004	40.40	66.15	66.53	132.68	173.08
2005	45.05	74.13	74.04	148.17	193.22
2006	47.78	76.76	76.25	153.01	200.80
2007	52.02	80.61	79.53	160.14	212.16
2008	56.19	85.50	84.06	169.56	225.75
2009	57.55	86.34	84.56	170.89	228.44
2010	59.02	92.70	92.57	185.26	244.28
2011	63.15	99.46	99.25	198.71	261.86
2012	64.35	104.54	104.04	208.58	272.93
2013	67.18	109.35	109.15	218.49	285.67
2014	68.11	117.37	116.75	234.13	302.24
2015	67.46	121.92	121.12	243.04	310.50
2016	68.86	130.04	129.25	259.29	328.15
2017	69.50	139.91	138.70	278.61	348.11
2018	70.88	147.65	147.37	295.03	365.91
2019	71.08	153.51	152.72	306.23	377.31
2020	52.80	113.78	110.06	223.84	276.64
2021	24.76	3.37	4.83	8.20	32.96
2022	34.89	23.27	70.32	93.60	128.48
2023	66.22	109.02	106.51	215.52	281.74
2024	82.25	159.99	154.62	314.61	396.86
2025	84.19	166.29	163.63	329.91	414.11
2026	86.68	171.53	169.69	341.22	427.90
2027	89.18	176.90	175.02	351.92	441.10
2028	91.85	182.50	180.62	363.12	454.96
2029	94.52	188.20	186.28	374.48	469.01
2030	97.20	194.09	192.14	386.23	483.43
2031	99.94	200.06	198.08	398.14	498.08
2032	102.70	206.33	204.33	410.66	513.36
2033	105.46	212.68	210.67	423.35	528.81
2034	108.26	219.32	217.30	436.62	544.89
2035	111.06	226.10	224.05	450.15	561.20
2036	113.87	232.98	230.92	463.90	577.76
2037	116.72	239.93	237.85	477.79	594.51
2038	119.62	247.02	244.92	491.94	611.56
2039	122.56	254.26	252.16	506.42	628.97
2040	125.52	261.87	259.74	521.61	647.13
2041	128.52	269.11	266.94	536.06	664.57
2042	131.57	276.74	274.57	551.32	682.89
2043	134.65	284.72	282.53	567.24	701.90
2044	137.77	292.82	290.61	583.42	721.19
2045	140.94	301.29	299.10	600.40	741.33
2046	144.11	310.32	308.07	618.39	762.49
2047	147.31	318.54	316.22	634.75	782.07
2048	150.57	327.32	325.00	652.32	802.89
2049	153.83	336.60	334.26	670.87	824.70
2050	157.12	346.01	343.61	689.61	846.74

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.2 Actual and forecast total annual passenger numbers, all Australian airports, 1992 to 2050

	Domestic	International			Total
	(million passengers)				
Year	Total	Inbound	Outbound	Total	Total
1992	41.05	4.73	4.70	9.43	50.48
1993	41.85	5.10	5.07	10.17	52.02
1994	45.34	5.50	5.46	10.96	56.30
1995	50.18	6.04	5.94	11.98	62.16
1996	53.54	6.67	6.57	13.24	66.78
1997	54.61	7.17	7.10	14.27	68.88
1998	55.47	7.36	7.28	14.64	70.11
1999	56.29	7.56	7.49	15.05	71.34
2000	59.33	8.04	8.01	16.05	75.38
2001	64.80	8.68	8.67	17.35	82.15
2002	58.33	8.29	8.27	16.56	74.89
2003	61.64	8.16	8.09	16.25	77.89
2004	70.15	9.10	9.13	18.23	88.38
2005	78.17	10.20	10.16	20.36	98.53
2006	82.90	10.56	10.46	21.02	103.92
2007	89.95	11.09	10.91	22.00	111.95
2008	96.86	11.76	11.53	23.29	120.15
2009	99.09	11.88	11.60	23.48	122.57
2010	102.85	12.75	12.70	25.45	128.30
2011	108.74	13.68	13.61	27.30	136.03
2012	109.20	14.38	14.27	28.65	137.85
2013	113.50	15.04	14.97	30.02	143.52
2014	114.83	16.15	16.02	32.16	146.99
2015	113.88	16.77	16.61	33.39	147.27
2016	116.35	17.89	17.73	35.62	151.97
2017	118.06	19.25	19.03	38.28	156.34
2018	121.01	20.32	20.22	40.53	161.54
2019	121.40	21.12	20.95	42.07	163.47
2020	90.07	15.65	15.10	30.75	120.82
2021	42.81	0.46	0.66	1.13	43.94
2022	60.10	3.20	9.65	12.85	72.95
2023	109.76	15.00	14.61	29.61	139.37
2024	136.56	22.01	21.21	43.22	179.78
2025	139.34	22.88	22.45	45.32	184.66
2026	142.85	23.60	23.28	46.88	189.73
2027	146.36	24.34	24.01	48.35	194.71
2028	150.09	25.11	24.78	49.89	199.97
2029	153.81	25.89	25.55	51.45	205.26
2030	157.52	26.70	26.36	53.06	210.58
2031	161.32	27.53	27.17	54.70	216.02
2032	165.14	28.39	28.03	56.42	221.55
2033	168.93	29.26	28.90	58.16	227.09
2034	172.76	30.18	29.81	59.98	232.75
2035	176.57	31.11	30.73	61.84	238.41
2036	180.38	32.05	31.68	63.73	244.11
2037	184.24	33.01	32.63	65.64	249.87
2038	188.13	33.99	33.60	67.58	255.71
2039	192.07	34.98	34.59	69.57	261.65
2040	196.03	36.03	35.63	71.66	267.69
2041	200.02	37.03	36.62	73.64	273.66
2042	204.09	38.08	37.66	75.74	279.83
2043	208.16	39.17	38.76	77.93	286.09
2044	212.28	40.29	39.86	80.15	292.43
2045	216.46	41.45	41.03	82.48	298.94
2046	220.58	42.70	42.26	84.95	305.54
2047	224.77	43.83	43.38	87.20	311.97
2048	229.03	45.03	44.58	89.62	318.64
2049	233.24	46.31	45.85	92.16	325.41
2050	237.51	47.61	47.13	94.74	332.25

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Airport passenger forecasts

Tables D.3 to D.10 present actual and baseline scenario forecast domestic and international air passenger numbers through each of the eight state and territory capital city airports / air catchments, and Tables D.11 to D.16 present actual and baseline scenario forecast domestic and international air passenger numbers through the six busiest non-capital city airports / air catchments.

Table D.3 Actual and forecast total annual passenger numbers, Sydney air catchment, 1992 to 2050

	Domestic	International			Total
		(million passengers)			
Year	Total	Inbound	Outbound	Total	Total
1992	10.65	2.24	2.31	4.55	15.20
1993	10.84	2.35	2.45	4.80	15.64
1994	11.63	2.53	2.63	5.16	16.79
1995	12.74	2.83	2.98	5.81	18.55
1996	13.68	3.19	3.34	6.53	20.22
1997	13.94	3.41	3.59	7.00	20.94
1998	14.17	3.47	3.67	7.15	21.32
1999	14.45	3.52	3.66	7.18	21.64
2000	15.40	3.85	3.93	7.77	23.17
2001	17.28	4.26	4.35	8.61	25.88
2002	15.18	3.90	4.05	7.95	23.13
2003	15.69	3.83	3.94	7.76	23.45
2004	17.50	4.18	4.27	8.45	25.95
2005	18.68	4.55	4.65	9.20	27.87
2006	19.33	4.71	4.76	9.47	28.80
2007	20.89	4.95	4.94	9.89	30.78
2008	22.14	5.23	5.19	10.42	32.56
2009	22.01	5.13	5.04	10.17	32.18
2010	23.35	5.45	5.45	10.90	34.25
2011	24.31	5.71	5.71	11.41	35.73
2012	23.97	5.90	5.89	11.79	35.76
2013	24.98	6.15	6.19	12.35	37.33
2014	25.39	6.46	6.51	12.97	38.37
2015	25.51	6.62	6.61	13.23	38.74
2016	26.56	7.13	7.11	14.24	40.80
2017	27.05	7.70	7.65	15.34	42.40
2018	27.60	8.09	8.13	16.22	43.82
2019	27.47	8.28	8.35	16.63	44.10
2020	20.07	5.97	5.97	11.94	32.01
2021	7.27	0.22	0.32	0.54	7.81
2022	10.61	1.50	3.97	5.47	16.08
2023	23.26	6.10	6.02	12.12	35.38
2024	29.68	8.73	4.76	13.49	43.17
2025	30.27	9.10	4.92	14.02	44.29
2026	31.00	9.39	9.22	18.61	49.61
2027	31.72	9.69	9.51	19.19	50.92
2028	32.49	10.00	9.81	19.81	52.30
2029	33.25	10.31	10.12	20.43	53.69
2030	34.02	10.64	10.43	21.07	55.09
2031	34.79	10.98	10.75	21.73	56.52
2032	35.58	11.32	11.09	22.41	57.99
2033	36.35	11.68	11.43	23.11	59.46
2034	37.14	12.05	11.79	23.83	60.97
2035	37.92	12.42	12.15	24.57	62.49
2036	38.70	12.81	12.52	25.32	64.02
2037	39.50	13.19	12.89	26.08	65.58
2038	40.30	13.59	13.27	26.86	67.15
2039	41.11	13.99	13.66	27.65	68.76
2040	41.92	14.42	14.07	28.48	70.40
2041	42.74	14.82	14.46	29.28	72.02
2042	43.57	15.25	14.87	30.12	73.70
2043	44.41	15.70	15.30	31.00	75.41
2044	45.26	16.15	15.74	31.89	77.14
2045	46.11	16.62	16.20	32.82	78.93
2046	46.97	17.13	16.68	33.80	80.77
2047	47.83	17.59	17.12	34.71	82.54
2048	48.70	18.09	17.60	35.68	84.39
2049	49.57	18.61	18.10	36.70	86.28
2050	50.45	19.13	18.60	37.74	88.19

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.4 Actual and forecast total annual passenger numbers, Melbourne air catchment, 1992 to 2050

	Domestic	International			Total
	(million passengers)				
Year	Total	Inbound	Outbound	Total	Total
1992	8.44	0.96	0.93	1.89	10.33
1993	8.47	0.97	0.95	1.92	10.39
1994	9.01	1.00	0.97	1.97	10.98
1995	10.06	1.03	1.01	2.04	12.10
1996	10.88	1.10	1.10	2.20	13.08
1997	11.13	1.20	1.21	2.40	13.54
1998	11.38	1.28	1.25	2.53	13.92
1999	11.56	1.36	1.35	2.70	14.27
2000	12.31	1.44	1.46	2.90	15.21
2001	13.63	1.61	1.63	3.24	16.87
2002	12.66	1.67	1.66	3.34	16.00
2003	13.25	1.64	1.58	3.22	16.46
2004	15.03	1.87	1.99	3.86	18.89
2005	16.13	2.14	2.09	4.23	20.36
2006	16.79	2.20	2.13	4.33	21.12
2007	17.74	2.28	2.21	4.49	22.23
2008	19.28	2.37	2.33	4.70	23.98
2009	19.62	2.44	2.41	4.85	24.46
2010	20.45	2.73	2.74	5.48	25.92
2011	21.75	3.12	3.10	6.22	27.97
2012	21.30	3.34	3.35	6.69	27.99
2013	22.50	3.51	3.50	7.01	29.51
2014	23.23	3.86	3.81	7.67	30.90
2015	23.52	4.16	4.13	8.29	31.81
2016	24.43	4.59	4.53	9.12	33.54
2017	24.93	4.98	4.91	9.89	34.81
2018	25.53	5.41	5.39	10.80	36.33
2019	25.71	5.83	5.66	11.49	37.20
2020	18.85	4.25	4.01	8.26	27.11
2021	5.89	0.06	0.16	0.22	6.11
2022	10.92	0.96	2.73	3.69	14.61
2023	22.33	4.26	4.05	8.31	30.64
2024	28.52	5.69	3.27	8.96	37.48
2025	29.24	5.93	3.40	9.33	38.57
2026	30.11	6.15	6.08	12.24	42.34
2027	30.97	6.38	6.31	12.69	43.65
2028	31.88	6.61	6.55	13.16	45.04
2029	32.80	6.85	6.79	13.64	46.44
2030	33.72	7.10	7.04	14.14	47.86
2031	34.66	7.36	7.30	14.66	49.31
2032	35.60	7.62	7.57	15.20	50.80
2033	36.55	7.90	7.85	15.75	52.30
2034	37.51	8.19	8.14	16.33	53.85
2035	38.47	8.48	8.44	16.93	55.40
2036	39.44	8.79	8.75	17.54	56.98
2037	40.42	9.09	9.07	18.16	58.58
2038	41.41	9.41	9.39	18.80	60.21
2039	42.42	9.73	9.72	19.45	61.87
2040	43.43	10.08	10.07	20.14	63.57
2041	44.46	10.41	10.40	20.81	65.26
2042	45.50	10.75	10.75	21.51	67.01
2043	46.56	11.12	11.13	22.25	68.80
2044	47.62	11.49	11.51	23.00	70.62
2045	48.71	11.88	11.91	23.79	72.50
2046	49.79	12.30	12.33	24.64	74.43
2047	50.89	12.69	12.72	25.41	76.30
2048	52.00	13.10	13.15	26.25	78.25
2049	53.11	13.54	13.59	27.13	80.25
2050	54.24	13.98	14.05	28.03	82.27

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.5 Actual and forecast total annual passenger numbers, Brisbane air catchment, 1992 to 2050

	Domestic	International			Total
	(million passengers)				
Year	Total	Inbound	Outbound	Total	Total
1992	5.37	0.70	0.65	1.35	6.72
1993	5.47	0.81	0.73	1.54	7.01
1994	5.89	0.91	0.82	1.73	7.63
1995	6.67	1.04	0.88	1.92	8.59
1996	7.17	1.20	0.98	2.18	9.35
1997	7.43	1.30	1.10	2.40	9.83
1998	7.47	1.30	1.09	2.40	9.86
1999	7.54	1.31	1.16	2.47	10.01
2000	8.10	1.33	1.22	2.55	10.65
2001	9.93	1.36	1.27	2.63	12.56
2002	9.30	1.30	1.20	2.51	11.81
2003	9.40	1.28	1.21	2.49	11.89
2004	10.87	1.52	1.43	2.94	13.81
2005	11.87	1.80	1.74	3.54	15.42
2006	12.37	1.88	1.83	3.71	16.08
2007	13.49	1.98	1.95	3.93	17.42
2008	14.31	2.02	2.00	4.02	18.33
2009	14.65	2.02	2.02	4.03	18.69
2010	14.73	2.03	2.03	4.06	18.79
2011	15.63	2.11	2.11	4.22	19.85
2012	16.35	2.24	2.19	4.43	20.78
2013	16.62	2.24	2.20	4.45	21.07
2014	17.01	2.38	2.34	4.72	21.73
2015	16.77	2.51	2.49	5.00	21.78
2016	17.00	2.60	2.58	5.18	22.18
2017	17.05	2.74	2.75	5.49	22.54
2018	17.33	2.99	2.90	5.90	23.23
2019	17.38	3.18	3.07	6.25	23.62
2020	13.10	2.44	2.27	4.70	17.80
2021	7.32	0.10	0.10	0.21	7.53
2022	9.24	0.40	1.29	1.69	10.93
2023	15.80	2.04	1.97	4.01	19.82
2024	20.89	3.36	1.88	5.24	26.12
2025	21.37	3.52	1.96	5.48	26.85
2026	21.98	3.64	3.67	7.31	29.29
2027	22.58	3.77	3.81	7.59	30.17
2028	23.22	3.91	3.97	7.88	31.10
2029	23.87	4.05	4.12	8.18	32.04
2030	24.51	4.20	4.28	8.48	32.99
2031	25.17	4.35	4.44	8.79	33.96
2032	25.84	4.50	4.61	9.11	34.95
2033	26.50	4.66	4.78	9.44	35.95
2034	27.18	4.82	4.96	9.78	36.96
2035	27.86	4.98	5.14	10.12	37.97
2036	28.53	5.15	5.32	10.47	39.00
2037	29.22	5.32	5.51	10.83	40.05
2038	29.92	5.50	5.70	11.19	41.12
2039	30.63	5.68	5.90	11.57	42.20
2040	31.35	5.86	6.10	11.96	43.31
2041	32.07	6.05	6.31	12.35	44.42
2042	32.81	6.24	6.52	12.76	45.57
2043	33.55	6.44	6.74	13.18	46.73
2044	34.30	6.64	6.96	13.61	47.91
2045	35.06	6.85	7.19	14.05	49.11
2046	35.83	7.07	7.43	14.50	50.33
2047	36.60	7.28	7.67	14.96	51.55
2048	37.38	7.51	7.92	15.43	52.81
2049	38.16	7.73	8.18	15.91	54.07
2050	38.95	7.97	8.44	16.40	55.36

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.6 Actual and forecast total annual passenger numbers, Adelaide air catchment, 1992 to 2050

	Domestic	International			Total
	(million passengers)				
Year	Total	Inbound	Outbound	Total	Total
1992	2.81	0.10	0.10	0.20	3.01
1993	2.82	0.11	0.10	0.21	3.03
1994	3.03	0.11	0.10	0.21	3.25
1995	3.29	0.10	0.10	0.20	3.49
1996	3.54	0.10	0.09	0.20	3.73
1997	3.56	0.09	0.09	0.19	3.75
1998	3.74	0.10	0.10	0.20	3.94
1999	3.81	0.12	0.11	0.23	4.04
2000	3.93	0.14	0.12	0.25	4.19
2001	4.18	0.13	0.11	0.24	4.42
2002	3.95	0.10	0.10	0.21	4.15
2003	4.14	0.10	0.09	0.19	4.33
2004	4.64	0.12	0.11	0.22	4.86
2005	5.04	0.15	0.15	0.30	5.34
2006	5.42	0.17	0.16	0.33	5.75
2007	5.74	0.22	0.20	0.42	6.16
2008	6.15	0.24	0.22	0.46	6.61
2009	6.31	0.24	0.22	0.46	6.77
2010	6.49	0.26	0.25	0.51	7.00
2011	6.73	0.27	0.26	0.53	7.26
2012	6.33	0.31	0.30	0.61	6.94
2013	6.46	0.35	0.34	0.69	7.15
2014	6.67	0.46	0.44	0.90	7.57
2015	6.74	0.45	0.45	0.90	7.63
2016	6.92	0.41	0.42	0.83	7.75
2017	7.05	0.46	0.46	0.92	7.97
2018	7.28	0.49	0.49	0.99	8.26
2019	7.31	0.52	0.53	1.04	8.35
2020	5.41	0.42	0.40	0.82	6.23
2021	2.72	0.02	0.01	0.02	2.75
2022	3.68	0.06	0.24	0.30	3.98
2023	6.83	0.34	0.34	0.68	7.51
2024	8.17	0.51	0.30	0.81	8.98
2025	8.30	0.51	0.31	0.81	9.12
2026	8.48	0.52	0.50	1.02	9.50
2027	8.66	0.53	0.51	1.04	9.70
2028	8.86	0.54	0.52	1.06	9.92
2029	9.06	0.55	0.53	1.09	10.14
2030	9.25	0.57	0.55	1.11	10.36
2031	9.45	0.58	0.56	1.14	10.59
2032	9.65	0.59	0.57	1.17	10.82
2033	9.84	0.61	0.59	1.20	11.04
2034	10.04	0.62	0.60	1.23	11.27
2035	10.24	0.64	0.62	1.26	11.50
2036	10.44	0.66	0.63	1.29	11.72
2037	10.63	0.67	0.65	1.32	11.95
2038	10.84	0.69	0.66	1.35	12.19
2039	11.04	0.70	0.68	1.38	12.42
2040	11.24	0.72	0.70	1.42	12.66
2041	11.45	0.74	0.71	1.45	12.90
2042	11.65	0.76	0.73	1.48	13.14
2043	11.86	0.77	0.75	1.52	13.38
2044	12.07	0.79	0.76	1.56	13.63
2045	12.28	0.81	0.78	1.59	13.88
2046	12.49	0.83	0.80	1.64	14.13
2047	12.71	0.85	0.82	1.67	14.38
2048	12.92	0.87	0.84	1.71	14.63
2049	13.13	0.89	0.86	1.75	14.89
2050	13.35	0.91	0.88	1.79	15.14

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.7 Actual and forecast total annual passenger numbers, Perth air catchment, 1992 to 2050

	Domestic	International			Total
		(million passengers)			
Year	Total	Inbound	Outbound	Total	Total
1992	2.19	0.44	0.43	0.87	3.06
1993	2.05	0.51	0.49	1.00	3.05
1994	2.36	0.56	0.54	1.09	3.46
1995	2.68	0.60	0.58	1.18	3.86
1996	2.91	0.64	0.62	1.26	4.16
1997	3.14	0.70	0.67	1.37	4.50
1998	3.20	0.74	0.72	1.46	4.66
1999	3.22	0.78	0.75	1.53	4.75
2000	3.37	0.80	0.80	1.60	4.97
2001	3.55	0.84	0.82	1.66	5.21
2002	3.17	0.81	0.79	1.60	4.77
2003	3.62	0.81	0.76	1.57	5.19
2004	4.15	0.87	0.83	1.70	5.86
2005	4.58	0.98	0.95	1.93	6.51
2006	5.03	1.01	0.98	1.98	7.01
2007	5.79	1.11	1.06	2.17	7.96
2008	6.47	1.28	1.20	2.48	8.95
2009	6.76	1.33	1.25	2.58	9.34
2010	7.01	1.48	1.48	2.96	9.97
2011	7.64	1.63	1.59	3.22	10.86
2012	8.53	1.74	1.71	3.45	11.98
2013	9.09	1.88	1.84	3.71	12.80
2014	8.88	2.06	2.05	4.11	12.99
2015	8.55	2.11	2.07	4.18	12.72
2016	8.28	2.13	2.11	4.24	12.53
2017	8.03	2.22	2.18	4.40	12.42
2018	8.06	2.20	2.20	4.40	12.47
2019	8.07	2.19	2.19	4.38	12.45
2020	6.14	1.68	1.60	3.28	9.42
2021	3.17	0.04	0.04	0.09	3.26
2022	4.28	0.22	1.09	1.30	5.58
2023	7.98	1.63	1.61	3.24	11.22
2024	9.95	2.53	1.58	4.11	14.07
2025	10.19	2.61	1.63	4.23	14.42
2026	10.50	2.68	2.63	5.31	15.81
2027	10.82	2.76	2.72	5.47	16.29
2028	11.17	2.84	2.80	5.64	16.81
2029	11.51	2.93	2.89	5.82	17.33
2030	11.86	3.02	2.98	6.00	17.86
2031	12.22	3.11	3.07	6.18	18.41
2032	12.58	3.21	3.17	6.38	18.96
2033	12.95	3.31	3.27	6.58	19.53
2034	13.32	3.41	3.38	6.79	20.11
2035	13.70	3.52	3.49	7.00	20.70
2036	14.07	3.62	3.60	7.22	21.30
2037	14.46	3.73	3.71	7.44	21.90
2038	14.85	3.85	3.82	7.67	22.52
2039	15.25	3.96	3.94	7.90	23.15
2040	15.66	4.08	4.06	8.15	23.80
2041	16.07	4.20	4.18	8.38	24.45
2042	16.48	4.32	4.31	8.63	25.11
2043	16.91	4.45	4.44	8.88	25.79
2044	17.34	4.58	4.57	9.15	26.48
2045	17.77	4.71	4.71	9.42	27.19
2046	18.21	4.86	4.86	9.72	27.93
2047	18.65	4.99	4.99	9.98	28.63
2048	19.10	5.13	5.13	10.26	29.37
2049	19.55	5.28	5.28	10.57	30.12
2050	20.01	5.43	5.44	10.87	30.88

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.8 Actual and forecast total annual passenger numbers, Hobart air catchment, 1992 to 2050

	(million passengers)	
Year	Domestic	Total
1992	0.67	0.67
1993	0.70	0.70
1994	0.73	0.73
1995	0.81	0.81
1996	0.84	0.84
1997	0.84	0.84
1998	0.85	0.85
1999	0.86	0.86
2000	0.91	0.91
2001	0.97	0.97
2002	0.96	0.96
2003	1.01	1.01
2004	1.23	1.23
2005	1.52	1.52
2006	1.61	1.61
2007	1.63	1.63
2008	1.76	1.76
2009	1.87	1.87
2010	1.86	1.86
2011	1.90	1.90
2012	1.81	1.81
2013	2.03	2.03
2014	2.11	2.11
2015	2.19	2.19
2016	2.31	2.31
2017	2.44	2.44
2018	2.60	2.60
2019	2.73	2.73
2020	2.07	2.07
2021	1.04	1.04
2022	1.50	1.50
2023	2.50	2.50
2024	2.99	2.99
2025	3.07	3.07
2026	3.17	3.17
2027	3.28	3.28
2028	3.39	3.39
2029	3.51	3.51
2030	3.62	3.62
2031	3.74	3.74
2032	3.86	3.86
2033	3.98	3.98
2034	4.10	4.10
2035	4.22	4.22
2036	4.34	4.34
2037	4.46	4.46
2038	4.59	4.59
2039	4.71	4.71
2040	4.84	4.84
2041	4.97	4.97
2042	5.10	5.10
2043	5.24	5.24
2044	5.37	5.37
2045	5.51	5.51
2046	5.65	5.65
2047	5.79	5.79
2048	5.93	5.93
2049	6.07	6.07
2050	6.22	6.22

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.9 Actual and forecast total annual passenger numbers, Darwin air catchment, 1992 to 2050

	Domestic	International			Total
		(million passengers)			
Year	Total	Inbound	Outbound	Total	Total
1992	0.47	0.04	0.04	0.09	0.56
1993	0.51	0.05	0.04	0.09	0.60
1994	0.59	0.06	0.06	0.12	0.71
1995	0.69	0.08	0.07	0.14	0.83
1996	0.79	0.07	0.07	0.14	0.93
1997	0.83	0.08	0.07	0.15	0.98
1998	0.83	0.09	0.09	0.17	1.01
1999	0.86	0.09	0.09	0.17	1.03
2000	0.90	0.09	0.09	0.18	1.08
2001	0.91	0.10	0.09	0.19	1.10
2002	0.83	0.09	0.09	0.17	1.01
2003	0.90	0.06	0.07	0.13	1.03
2004	0.99	0.06	0.06	0.11	1.10
2005	1.11	0.06	0.06	0.12	1.23
2006	1.10	0.06	0.06	0.13	1.23
2007	1.27	0.08	0.08	0.15	1.42
2008	1.39	0.12	0.11	0.23	1.62
2009	1.35	0.17	0.15	0.32	1.67
2010	1.36	0.19	0.17	0.36	1.72
2011	1.44	0.20	0.20	0.40	1.83
2012	1.72	0.21	0.20	0.42	2.13
2013	1.63	0.18	0.18	0.37	1.99
2014	1.75	0.19	0.18	0.37	2.12
2015	1.80	0.17	0.16	0.33	2.13
2016	1.81	0.14	0.14	0.29	2.10
2017	1.83	0.15	0.16	0.31	2.14
2018	1.81	0.16	0.14	0.30	2.11
2019	1.75	0.13	0.14	0.27	2.01
2020	1.26	0.10	0.10	0.20	1.46
2021	0.91	0.00	0.00	0.00	0.91
2022	1.14	0.02	0.07	0.09	1.23
2023	1.63	0.08	0.08	0.16	1.79
2024	1.96	0.17	0.11	0.28	2.24
2025	2.01	0.18	0.11	0.29	2.30
2026	2.08	0.18	0.17	0.36	2.44
2027	2.15	0.19	0.18	0.37	2.51
2028	2.22	0.19	0.18	0.37	2.59
2029	2.30	0.20	0.18	0.38	2.67
2030	2.37	0.20	0.19	0.39	2.76
2031	2.45	0.20	0.19	0.39	2.84
2032	2.53	0.21	0.19	0.40	2.93
2033	2.61	0.21	0.20	0.41	3.02
2034	2.69	0.22	0.20	0.42	3.11
2035	2.78	0.22	0.20	0.42	3.20
2036	2.86	0.22	0.21	0.43	3.29
2037	2.95	0.23	0.21	0.44	3.39
2038	3.04	0.23	0.21	0.45	3.49
2039	3.13	0.24	0.22	0.46	3.59
2040	3.22	0.24	0.22	0.47	3.69
2041	3.32	0.25	0.23	0.47	3.79
2042	3.42	0.25	0.23	0.48	3.90
2043	3.52	0.26	0.23	0.49	4.01
2044	3.62	0.26	0.24	0.50	4.12
2045	3.72	0.27	0.24	0.51	4.23
2046	3.83	0.27	0.25	0.52	4.35
2047	3.94	0.28	0.25	0.53	4.46
2048	4.05	0.28	0.25	0.54	4.58
2049	4.16	0.29	0.26	0.55	4.70
2050	4.27	0.30	0.26	0.56	4.83

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.10 Actual and forecast total annual passenger numbers, Canberra air catchment, 1992 to 2050

	(million passengers)	
Year	Domestic	Total
1992	1.36	1.36
1993	1.38	1.38
1994	1.51	1.51
1995	1.68	1.68
1996	1.75	1.75
1997	1.73	1.73
1998	1.82	1.82
1999	1.82	1.82
2000	1.97	1.97
2001	2.11	2.11
2002	1.84	1.84
2003	1.92	1.92
2004	2.30	2.30
2005	2.48	2.48
2006	2.55	2.55
2007	2.69	2.69
2008	2.85	2.85
2009	3.06	3.06
2010	3.26	3.26
2011	3.24	3.24
2012	3.16	3.16
2013	3.01	3.01
2014	2.86	2.86
2015	2.80	2.80
2016	2.83	2.83
2017	2.95	2.95
2018	3.09	3.09
2019	3.13	3.13
2020	2.29	2.29
2021	1.04	1.04
2022	1.29	1.29
2023	2.71	2.71
2024	3.55	3.55
2025	3.59	3.59
2026	3.65	3.65
2027	3.71	3.71
2028	3.77	3.77
2029	3.84	3.84
2030	3.90	3.90
2031	3.96	3.96
2032	4.02	4.02
2033	4.08	4.08
2034	4.14	4.14
2035	4.20	4.20
2036	4.26	4.26
2037	4.32	4.32
2038	4.38	4.38
2039	4.44	4.44
2040	4.50	4.50
2041	4.56	4.56
2042	4.62	4.62
2043	4.69	4.69
2044	4.75	4.75
2045	4.81	4.81
2046	4.87	4.87
2047	4.93	4.93
2048	5.00	5.00
2049	5.06	5.06
2050	5.12	5.12

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.11 Actual and forecast total annual passenger numbers, Gold Coast air catchment, 1992 to 2050

	Domestic	International			Total
	(million passengers)				
Year	Total	Inbound	Outbound	Total	Total
1992	1.49	0.00	0.00	0.00	1.49
1993	1.56	0.00	0.00	0.00	1.56
1994	1.71	0.00	0.00	0.00	1.71
1995	1.88	0.00	0.00	0.00	1.88
1996	1.99	0.00	0.00	0.00	1.99
1997	1.93	0.00	0.00	0.00	1.94
1998	1.85	0.01	0.01	0.01	1.86
1999	1.85	0.01	0.00	0.01	1.86
2000	1.94	0.01	0.01	0.01	1.95
2001	1.85	0.01	0.01	0.03	1.88
2002	1.67	0.03	0.02	0.05	1.72
2003	2.04	0.06	0.06	0.12	2.16
2004	2.37	0.07	0.07	0.14	2.50
2005	2.98	0.07	0.08	0.15	3.13
2006	3.30	0.09	0.09	0.19	3.49
2007	3.59	0.07	0.07	0.14	3.72
2008	4.06	0.08	0.08	0.16	4.23
2009	4.14	0.15	0.15	0.30	4.44
2010	4.46	0.22	0.21	0.43	4.89
2011	4.71	0.22	0.23	0.45	5.17
2012	4.60	0.22	0.22	0.44	5.04
2013	4.92	0.26	0.25	0.51	5.43
2014	4.91	0.27	0.26	0.53	5.44
2015	4.99	0.27	0.26	0.52	5.51
2016	5.25	0.32	0.30	0.62	5.87
2017	5.35	0.35	0.32	0.68	6.03
2018	5.47	0.34	0.31	0.65	6.12
2019	5.45	0.31	0.29	0.59	6.04
2020	4.09	0.22	0.20	0.41	4.50
2021	1.97	0.01	0.01	0.02	1.98
2022	2.91	0.02	0.02	0.04	2.95
2023	5.39	0.21	0.18	0.39	5.78
2024	5.96	0.36	0.00	0.36	6.32
2025	6.09	0.37	0.00	0.37	6.45
2026	6.23	0.38	0.36	0.74	6.97
2027	6.38	0.38	0.37	0.75	7.13
2028	6.53	0.39	0.38	0.77	7.31
2029	6.69	0.40	0.39	0.79	7.48
2030	6.84	0.41	0.40	0.81	7.65
2031	7.00	0.42	0.40	0.82	7.82
2032	7.16	0.43	0.41	0.84	8.00
2033	7.32	0.44	0.42	0.86	8.18
2034	7.48	0.45	0.43	0.88	8.36
2035	7.64	0.46	0.44	0.90	8.53
2036	7.80	0.47	0.45	0.91	8.71
2037	7.96	0.47	0.46	0.93	8.89
2038	8.12	0.48	0.47	0.95	9.07
2039	8.28	0.49	0.48	0.97	9.25
2040	8.45	0.50	0.49	0.99	9.44
2041	8.61	0.51	0.49	1.01	9.62
2042	8.79	0.52	0.50	1.02	9.81
2043	8.96	0.53	0.51	1.04	10.00
2044	9.13	0.54	0.52	1.06	10.19
2045	9.30	0.55	0.53	1.08	10.39
2046	9.47	0.56	0.54	1.10	10.58
2047	9.65	0.57	0.55	1.12	10.77
2048	9.82	0.58	0.56	1.14	10.97
2049	10.00	0.59	0.57	1.16	11.16
2050	10.18	0.60	0.58	1.18	11.36

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.12 Actual and forecast total annual passenger numbers, Cairns air catchment, 1992 to 2050

	Domestic	International			Total
	(million passengers)				
Year	Total	Inbound	Outbound	Total	Total
1992	1.34	0.24	0.23	0.47	1.81
1993	1.35	0.29	0.29	0.58	1.93
1994	1.54	0.33	0.31	0.64	2.18
1995	1.78	0.33	0.32	0.64	2.42
1996	1.90	0.35	0.35	0.70	2.60
1997	1.92	0.38	0.36	0.74	2.65
1998	1.89	0.36	0.35	0.70	2.60
1999	1.97	0.37	0.36	0.73	2.71
2000	2.06	0.38	0.38	0.77	2.83
2001	2.19	0.36	0.35	0.71	2.90
2002	1.95	0.36	0.35	0.70	2.66
2003	2.15	0.36	0.37	0.73	2.88
2004	2.42	0.41	0.37	0.77	3.19
2005	2.69	0.42	0.41	0.84	3.53
2006	2.88	0.42	0.41	0.84	3.71
2007	3.05	0.37	0.37	0.74	3.79
2008	3.12	0.36	0.35	0.71	3.83
2009	3.16	0.27	0.27	0.54	3.70
2010	3.12	0.22	0.22	0.44	3.57
2011	3.35	0.26	0.27	0.53	3.87
2012	3.44	0.26	0.26	0.52	3.96
2013	3.64	0.27	0.27	0.54	4.18
2014	3.83	0.24	0.25	0.49	4.32
2015	3.90	0.25	0.26	0.51	4.41
2016	4.10	0.30	0.32	0.62	4.72
2017	4.25	0.32	0.33	0.65	4.90
2018	4.30	0.34	0.35	0.70	5.00
2019	4.20	0.36	0.34	0.70	4.89
2020	3.02	0.24	0.23	0.47	3.49
2021	2.08	0.00	0.00	0.00	2.08
2022	2.61	0.01	0.08	0.09	2.70
2023	3.88	0.16	0.16	0.32	4.20
2024	4.53	0.34	0.10	0.43	4.96
2025	4.61	0.34	0.10	0.43	5.04
2026	4.71	0.34	0.34	0.69	5.40
2027	4.82	0.35	0.35	0.70	5.51
2028	4.93	0.35	0.36	0.71	5.64
2029	5.04	0.36	0.36	0.72	5.76
2030	5.15	0.37	0.37	0.73	5.88
2031	5.26	0.37	0.37	0.74	6.00
2032	5.37	0.38	0.38	0.76	6.13
2033	5.48	0.39	0.39	0.77	6.25
2034	5.59	0.39	0.39	0.78	6.38
2035	5.70	0.40	0.40	0.80	6.50
2036	5.81	0.41	0.41	0.81	6.62
2037	5.92	0.41	0.41	0.83	6.75
2038	6.03	0.42	0.42	0.84	6.87
2039	6.14	0.43	0.43	0.85	7.00
2040	6.26	0.43	0.43	0.87	7.12
2041	6.37	0.44	0.44	0.88	7.25
2042	6.48	0.45	0.44	0.89	7.37
2043	6.59	0.45	0.45	0.90	7.50
2044	6.71	0.46	0.46	0.92	7.63
2045	6.82	0.47	0.47	0.93	7.76
2046	6.94	0.48	0.47	0.95	7.89
2047	7.05	0.48	0.48	0.96	8.01
2048	7.17	0.49	0.49	0.97	8.14
2049	7.28	0.50	0.49	0.99	8.27
2050	7.40	0.50	0.50	1.00	8.40

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.13 Actual and forecast total annual passenger numbers, Townsville air catchment, 1992 to 2050

	(million passengers)	
Year	Domestic	Total
1992	0.48	0.48
1993	0.55	0.55
1994	0.51	0.51
1995	0.58	0.58
1996	0.60	0.60
1997	0.61	0.61
1998	0.63	0.63
1999	0.65	0.65
2000	0.68	0.68
2001	0.73	0.73
2002	0.70	0.70
2003	0.78	0.78
2004	0.92	0.92
2005	1.06	1.06
2006	1.16	1.16
2007	1.28	1.28
2008	1.37	1.37
2009	1.44	1.44
2010	1.52	1.52
2011	1.62	1.62
2012	1.62	1.62
2013	1.57	1.57
2014	1.52	1.52
2015	1.50	1.50
2016	1.50	1.50
2017	1.49	1.49
2018	1.59	1.59
2019	1.59	1.59
2020	1.22	1.22
2021	0.98	0.98
2022	1.19	1.19
2023	1.65	1.65
2024	1.90	1.90
2025	1.94	1.94
2026	1.99	1.99
2027	2.03	2.03
2028	2.08	2.08
2029	2.13	2.13
2030	2.18	2.18
2031	2.23	2.23
2032	2.28	2.28
2033	2.33	2.33
2034	2.38	2.38
2035	2.43	2.43
2036	2.48	2.48
2037	2.53	2.53
2038	2.58	2.58
2039	2.64	2.64
2040	2.69	2.69
2041	2.74	2.74
2042	2.79	2.79
2043	2.84	2.84
2044	2.89	2.89
2045	2.95	2.95
2046	3.00	3.00
2047	3.05	3.05
2048	3.11	3.11
2049	3.16	3.16
2050	3.21	3.21

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.14 Actual and forecast total annual passenger numbers, Launceston air catchment, 1992 to 2050

	(million passengers)	
Year	Domestic	Total
1992	0.46	0.46
1993	0.47	0.47
1994	0.52	0.52
1995	0.55	0.55
1996	0.59	0.59
1997	0.58	0.58
1998	0.55	0.55
1999	0.53	0.53
2000	0.54	0.54
2001	0.52	0.52
2002	0.53	0.53
2003	0.57	0.57
2004	0.67	0.67
2005	0.83	0.83
2006	0.93	0.93
2007	1.00	1.00
2008	1.11	1.11
2009	1.13	1.13
2010	1.13	1.13
2011	1.16	1.16
2012	1.13	1.13
2013	1.22	1.22
2014	1.29	1.29
2015	1.27	1.27
2016	1.32	1.32
2017	1.34	1.34
2018	1.36	1.36
2019	1.39	1.39
2020	1.02	1.02
2021	0.54	0.54
2022	0.74	0.74
2023	1.29	1.29
2024	1.47	1.47
2025	1.49	1.49
2026	1.51	1.51
2027	1.53	1.53
2028	1.56	1.56
2029	1.58	1.58
2030	1.60	1.60
2031	1.62	1.62
2032	1.64	1.64
2033	1.66	1.66
2034	1.68	1.68
2035	1.70	1.70
2036	1.72	1.72
2037	1.74	1.74
2038	1.75	1.75
2039	1.77	1.77
2040	1.78	1.78
2041	1.80	1.80
2042	1.81	1.81
2043	1.83	1.83
2044	1.84	1.84
2045	1.86	1.86
2046	1.87	1.87
2047	1.88	1.88
2048	1.89	1.89
2049	1.90	1.90
2050	1.92	1.92

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.15 Actual and forecast total annual passenger numbers, Newcastle air catchment, 1992 to 2050

	(million passengers)	
Year	Domestic	Total
1992	0.05	0.05
1993	0.08	0.08
1994	0.10	0.10
1995	0.12	0.12
1996	0.11	0.11
1997	0.11	0.11
1998	0.13	0.13
1999	0.15	0.15
2000	0.19	0.19
2001	0.24	0.24
2002	0.20	0.20
2003	0.20	0.20
2004	0.30	0.30
2005	0.64	0.64
2006	0.82	0.82
2007	0.96	0.96
2008	1.07	1.07
2009	1.17	1.17
2010	1.13	1.13
2011	1.21	1.21
2012	1.19	1.19
2013	1.18	1.18
2014	1.20	1.20
2015	1.14	1.14
2016	1.17	1.17
2017	1.25	1.25
2018	1.27	1.27
2019	1.26	1.26
2020	0.92	0.92
2021	0.48	0.48
2022	0.57	0.57
2023	1.09	1.09
2024	1.25	1.25
2025	1.26	1.26
2026	1.26	1.26
2027	1.27	1.27
2028	1.28	1.28
2029	1.28	1.28
2030	1.29	1.29
2031	1.30	1.30
2032	1.30	1.30
2033	1.31	1.31
2034	1.32	1.32
2035	1.32	1.32
2036	1.33	1.33
2037	1.33	1.33
2038	1.34	1.34
2039	1.34	1.34
2040	1.35	1.35
2041	1.36	1.36
2042	1.36	1.36
2043	1.37	1.37
2044	1.37	1.37
2045	1.38	1.38
2046	1.38	1.38
2047	1.39	1.39
2048	1.39	1.39
2049	1.40	1.40
2050	1.40	1.40

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.16 Actual and forecast total annual passenger numbers, Sunshine Coast air catchment, 1992 to 2050

	(million passengers)	
Year	Domestic	Total
1992	0.13	0.13
1993	0.18	0.18
1994	0.21	0.21
1995	0.27	0.27
1996	0.31	0.31
1997	0.30	0.30
1998	0.28	0.28
1999	0.29	0.29
2000	0.31	0.31
2001	0.24	0.24
2002	0.22	0.22
2003	0.32	0.32
2004	0.43	0.43
2005	0.66	0.66
2006	0.79	0.79
2007	0.88	0.88
2008	0.92	0.92
2009	0.92	0.92
2010	0.81	0.81
2011	0.91	0.91
2012	0.79	0.79
2013	0.80	0.80
2014	0.89	0.89
2015	0.84	0.84
2016	0.94	0.94
2017	1.05	1.05
2018	1.18	1.18
2019	1.24	1.24
2020	0.93	0.93
2021	0.54	0.54
2022	0.82	0.82
2023	1.61	1.61
2024	1.31	1.31
2025	1.35	1.35
2026	1.40	1.40
2027	1.45	1.45
2028	1.50	1.50
2029	1.55	1.55
2030	1.61	1.61
2031	1.66	1.66
2032	1.72	1.72
2033	1.78	1.78
2034	1.83	1.83
2035	1.89	1.89
2036	1.95	1.95
2037	2.01	2.01
2038	2.07	2.07
2039	2.13	2.13
2040	2.19	2.19
2041	2.25	2.25
2042	2.32	2.32
2043	2.38	2.38
2044	2.45	2.45
2045	2.51	2.51
2046	2.58	2.58
2047	2.65	2.65
2048	2.72	2.72
2049	2.79	2.79
2050	2.86	2.86

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Air freight activity forecasts

Table D.17 lists actual and forecast total domestic and international air freight tonnes through all Australian airports (i.e. counting both inbound and outbound air freight) out to 2050.

Table D.17 Actual and forecast total annual air freight, Australia, 2011–2050

	Domestic	International			Total
	(thousand tonnes)				
Year	Total	Exports	Imports	Total	Total
2011	506.74	233.32	431.76	665.09	1,171.82
2012	472.88	247.56	441.98	689.54	1,162.42
2013	430.17	269.90	428.28	698.18	1,128.35
2014	393.98	284.90	412.61	697.52	1,091.50
2015	384.97	343.90	414.39	758.29	1,143.26
2016	390.26	470.66	389.83	860.50	1,250.75
2017	449.97	422.02	412.80	834.82	1,284.79
2018	462.43	499.60	448.72	948.32	1,410.75
2019	472.83	518.76	447.56	966.32	1,439.15
2020	426.38	397.82	403.89	801.71	1,228.09
2021	395.66	328.37	363.05	691.42	1,087.08
2022	409.04	302.23	385.94	688.16	1,097.21
2023	377.66	335.75	424.18	759.93	1,137.59
2024	431.92	320.27	505.55	825.82	1,257.74
2025	429.08	319.13	514.37	833.51	1,262.59
2026	425.52	317.23	525.88	843.10	1,268.63
2027	422.08	316.68	536.77	853.45	1,275.53
2028	418.50	315.40	548.69	864.09	1,282.59
2029	415.06	314.05	560.58	874.63	1,289.69
2030	411.75	314.02	571.75	885.77	1,297.52
2031	408.51	313.43	583.33	896.77	1,305.27
2032	405.33	314.58	594.10	908.68	1,314.02
2033	402.27	315.92	604.65	920.57	1,322.84
2034	399.27	318.69	614.53	933.21	1,332.48
2035	396.36	321.73	624.13	945.86	1,342.22
2036	393.54	324.84	633.63	958.47	1,352.00
2037	390.74	327.19	643.61	970.80	1,361.54
2038	388.00	329.39	653.72	983.11	1,371.10
2039	385.31	331.78	663.74	995.53	1,380.84
2040	382.67	335.50	673.10	1,008.60	1,391.27
2041	380.07	335.40	684.49	1,019.89	1,399.97
2042	377.54	337.30	694.87	1,032.18	1,409.72
2043	375.04	340.20	704.74	1,044.95	1,419.99
2044	372.59	342.75	714.84	1,057.58	1,430.17
2045	370.19	346.89	724.08	1,070.97	1,441.16
2046	367.81	352.86	732.31	1,085.18	1,452.99
2047	365.49	352.49	744.00	1,096.49	1,461.98
2048	363.22	355.26	753.99	1,109.25	1,472.47
2049	360.99	359.80	762.97	1,122.77	1,483.76
2050	358.80	363.68	772.30	1,135.98	1,494.78

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Airport air freight forecasts

Tables D.18 to D.23 present actual and baseline scenario forecast domestic and international air freight tonnes through capital city airports for which air freight data is separately enumerated.

Table D.18 Actual and forecast total annual air freight, Sydney air catchment, 2011–2050

	Domestic	International			Total
	(thousand tonnes)				
Year	Total	Exports	Imports	Total	Total
2011	135.65	74.17	224.49	298.66	434.31
2012	128.18	77.89	224.69	302.58	430.76
2013	118.17	80.51	217.71	298.22	416.39
2014	105.97	81.60	204.40	286.00	391.97
2015	98.71	101.14	207.11	308.25	406.96
2016	97.42	196.16	195.55	391.72	489.14
2017	106.27	148.51	207.27	355.78	462.06
2018	106.53	178.27	218.73	397.00	503.53
2019	103.90	176.57	218.96	395.53	499.43
2020	91.17	145.18	212.59	357.77	448.94
2021	90.27	162.84	213.34	376.18	466.45
2022	94.18	149.22	211.34	360.56	454.74
2023	81.28	138.83	220.74	359.57	440.85
2024	92.96	88.33	247.60	335.92	428.88
2025	92.34	86.88	251.74	338.61	430.96
2026	91.58	84.90	257.02	341.92	433.49
2027	90.84	83.48	261.96	345.44	436.28
2028	90.07	81.77	267.35	349.12	439.19
2029	89.33	80.10	272.74	352.84	442.17
2030	88.62	78.97	277.78	356.75	445.36
2031	87.92	77.67	283.01	360.68	448.59
2032	87.23	77.01	287.84	364.84	452.08
2033	86.57	76.44	292.56	369.00	455.58
2034	85.93	76.38	296.95	373.33	459.26
2035	85.30	76.42	301.21	377.64	462.94
2036	84.69	76.50	305.43	381.93	466.62
2037	84.09	76.32	309.87	386.19	470.29
2038	83.50	76.11	314.37	390.47	473.98
2039	82.93	75.96	318.82	394.78	477.71
2040	82.36	76.24	322.95	399.19	481.55
2041	81.80	75.31	328.06	403.38	485.17
2042	81.25	75.03	332.68	407.72	488.97
2043	80.72	75.07	337.05	412.12	492.84
2044	80.19	75.00	341.53	416.53	496.72
2045	79.67	75.43	345.59	421.02	500.69
2046	79.16	76.41	349.17	425.58	504.74
2047	78.66	75.46	354.41	429.87	508.53
2048	78.17	75.48	358.83	434.31	512.48
2049	77.69	76.03	362.77	438.80	516.49
2050	77.22	76.38	366.88	443.25	520.47

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.19 Actual and forecast total annual air freight, Melbourne air catchment, 2011–2050

	Domestic	International			Total
	(thousand tonnes)				
Year	Total	Exports	Imports	Total	Total
2011	128.91	81.92	125.30	207.22	336.13
2012	118.46	88.76	124.71	213.47	331.92
2013	112.87	99.66	118.93	218.59	331.46
2014	104.05	108.38	119.73	228.11	332.15
2015	105.10	126.61	119.46	246.06	351.17
2016	110.25	148.75	111.62	260.36	370.61
2017	129.05	142.94	119.68	262.62	391.67
2018	133.70	166.91	131.41	298.32	432.02
2019	127.74	199.82	125.80	325.62	453.36
2020	113.61	137.10	110.96	248.06	361.67
2021	97.68	91.35	95.98	187.33	285.01
2022	105.11	84.59	105.07	189.66	294.77
2023	106.29	105.76	115.33	221.09	327.39
2024	121.56	116.90	141.48	258.39	379.95
2025	120.76	117.70	143.54	261.24	382.01
2026	119.76	118.34	146.17	264.51	384.27
2027	118.79	119.40	148.55	267.95	386.74
2028	117.79	120.22	151.17	271.39	389.18
2029	116.82	120.99	153.79	274.78	391.60
2030	115.89	122.23	156.16	278.39	394.27
2031	114.97	123.25	158.64	281.89	396.87
2032	114.08	124.94	160.81	285.75	399.83
2033	113.22	126.68	162.92	289.60	402.82
2034	112.37	128.98	164.78	293.76	406.13
2035	111.56	131.40	166.54	297.94	409.50
2036	110.76	133.85	168.27	302.13	412.89
2037	109.97	136.02	170.15	306.17	416.15
2038	109.20	138.15	172.05	310.20	419.40
2039	108.45	140.37	173.91	314.28	422.72
2040	107.70	143.14	175.53	318.66	426.37
2041	106.97	144.34	177.82	322.17	429.14
2042	106.26	146.39	179.77	326.16	432.42
2043	105.56	148.87	181.52	330.38	435.94
2044	104.87	151.20	183.33	334.54	439.40
2045	104.19	154.25	184.85	339.10	443.29
2046	103.52	158.10	186.02	344.13	447.65
2047	102.87	159.22	188.34	347.56	450.42
2048	102.23	161.71	190.09	351.80	454.03
2049	101.60	165.01	191.49	356.50	458.10
2050	100.98	168.02	193.01	361.03	462.01

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.20 Actual and forecast total annual air freight, Brisbane air catchment, 2011–2050

	Domestic	International			Total
	(thousand tonnes)				
Year	Total	Exports	Imports	Total	Total
2011	82.66	37.96	42.15	80.11	162.77
2012	77.05	41.64	46.85	88.49	165.54
2013	67.47	42.39	46.01	88.39	155.87
2014	62.99	49.31	44.11	93.42	156.41
2015	58.35	63.34	42.45	105.78	164.13
2016	58.04	59.28	39.50	98.78	156.82
2017	67.42	62.13	43.69	105.82	173.24
2018	68.66	69.77	49.12	118.89	187.55
2019	74.14	70.54	52.62	123.16	197.30
2020	70.68	54.12	39.83	93.95	164.64
2021	67.91	37.95	27.05	65.00	132.90
2022	67.43	36.80	35.85	72.65	140.07
2023	61.09	42.65	45.75	88.41	149.50
2024	69.87	53.77	62.47	116.25	186.12
2025	69.41	54.07	64.57	118.65	188.06
2026	68.83	54.35	67.29	121.64	190.47
2027	68.28	54.80	69.91	124.71	192.99
2028	67.70	55.17	72.83	128.00	195.70
2029	67.14	55.52	75.80	131.32	198.46
2030	66.61	56.04	78.66	134.70	201.30
2031	66.08	56.48	81.67	138.15	204.23
2032	65.57	57.15	84.54	141.70	207.27
2033	65.07	57.85	87.41	145.27	210.34
2034	64.59	58.75	90.17	148.92	213.51
2035	64.12	59.69	92.91	152.60	216.72
2036	63.66	60.64	95.66	156.30	219.96
2037	63.21	61.49	98.58	160.07	223.28
2038	62.76	62.33	101.57	163.90	226.66
2039	62.33	63.19	104.59	167.78	230.11
2040	61.90	64.25	107.48	171.73	233.63
2041	61.48	64.77	110.95	175.72	237.20
2042	61.07	65.57	114.21	179.77	240.85
2043	60.67	66.52	117.37	183.89	244.56
2044	60.27	67.43	120.64	188.06	248.34
2045	59.88	68.57	123.71	192.28	252.17
2046	59.50	70.00	126.53	196.54	256.03
2047	59.12	70.49	130.39	200.88	260.00
2048	58.76	71.44	133.80	205.23	263.99
2049	58.39	72.66	136.95	209.61	268.01
2050	58.04	73.79	140.25	214.04	272.08

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.21 Actual and forecast total annual air freight, Adelaide air catchment, 2011–2050

	Domestic	International			Total
	(thousand tonnes)				
Year	Total	Exports	Imports	Total	Total
2011	31.19	8.31	8.77	17.08	48.27
2012	29.43	7.49	8.67	16.16	45.59
2013	28.42	9.24	9.03	18.27	46.69
2014	25.60	8.84	8.95	17.79	43.39
2015	25.16	11.27	8.45	19.72	44.89
2016	22.52	13.68	7.60	21.28	43.81
2017	25.90	13.18	8.32	21.50	47.39
2018	27.28	16.79	10.78	27.57	54.85
2019	29.04	16.24	10.05	26.29	55.33
2020	26.32	10.95	7.94	18.89	45.21
2021	23.91	5.41	4.46	9.87	33.79
2022	26.11	4.13	4.78	8.91	35.02
2023	21.47	7.76	7.74	15.50	36.97
2024	24.56	10.79	11.52	22.31	46.87
2025	24.40	10.77	11.75	22.52	46.92
2026	24.19	10.76	12.08	22.84	47.03
2027	24.00	10.80	12.39	23.18	47.18
2028	23.79	10.82	12.73	23.55	47.35
2029	23.60	10.83	13.08	23.92	47.52
2030	23.41	10.90	13.41	24.30	47.72
2031	23.23	10.94	13.75	24.69	47.92
2032	23.05	11.06	14.06	25.12	48.16
2033	22.87	11.17	14.37	25.54	48.42
2034	22.70	11.35	14.66	26.01	48.71
2035	22.54	11.54	14.93	26.47	49.01
2036	22.38	11.73	15.21	26.94	49.31
2037	22.22	11.89	15.50	27.39	49.61
2038	22.06	12.05	15.80	27.85	49.91
2039	21.91	12.22	16.10	28.31	50.22
2040	21.76	12.44	16.37	28.81	50.57
2041	21.61	12.50	16.72	29.22	50.83
2042	21.47	12.65	17.03	29.68	51.15
2043	21.32	12.84	17.33	30.17	51.49
2044	21.18	13.02	17.63	30.65	51.83
2045	21.05	13.27	17.90	31.17	52.22
2046	20.91	13.59	18.14	31.74	52.65
2047	20.78	13.65	18.51	32.16	52.94
2048	20.65	13.84	18.81	32.65	53.30
2049	20.52	14.11	19.08	33.19	53.71
2050	20.40	14.35	19.36	33.71	54.11

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.22 Actual and forecast total annual air freight, Perth air catchment, 2011–2050

	Domestic	International			Total
	(thousand tonnes)				
Year	Total	Exports	Imports	Total	Total
2011	55.38	26.47	28.61	55.08	110.46
2012	55.61	27.28	34.81	62.09	117.71
2013	49.35	33.07	34.38	67.45	116.80
2014	45.30	32.40	32.24	64.65	109.94
2015	48.71	37.58	33.45	71.03	119.75
2016	53.54	47.30	30.96	78.26	131.80
2017	61.98	49.51	30.73	80.24	142.22
2018	66.09	63.60	34.03	97.63	163.72
2019	65.31	49.26	34.65	83.91	149.23
2020	52.26	43.85	29.27	73.12	125.39
2021	34.85	27.84	21.10	48.94	83.79
2022	37.01	26.24	27.02	53.26	90.27
2023	48.22	34.75	33.78	68.53	116.75
2024	55.15	38.82	44.31	83.14	138.28
2025	54.79	38.92	45.83	84.75	139.54
2026	54.33	39.02	47.84	86.87	141.20
2027	53.89	39.25	49.94	89.19	143.08
2028	53.43	39.43	52.25	91.68	145.11
2029	53.00	39.60	54.60	94.21	147.20
2030	52.57	39.87	56.97	96.84	149.42
2031	52.16	40.10	59.44	99.54	151.70
2032	51.75	40.46	61.95	102.41	154.16
2033	51.36	40.84	64.49	105.33	156.70
2034	50.98	41.34	67.08	108.42	159.40
2035	50.61	41.85	69.71	111.57	162.18
2036	50.25	42.38	72.40	114.78	165.02
2037	49.89	42.84	75.19	118.03	167.92
2038	49.54	43.29	78.06	121.35	170.89
2039	49.20	43.77	81.00	124.77	173.97
2040	48.86	44.34	83.99	128.34	177.20
2041	48.53	44.61	87.15	131.75	180.28
2042	48.21	45.04	90.33	135.37	183.58
2043	47.89	45.55	93.57	139.12	187.01
2044	47.57	46.04	96.90	142.94	190.51
2045	47.27	46.66	100.26	146.92	194.18
2046	46.96	47.43	103.64	151.07	198.03
2047	46.67	47.67	107.26	154.93	201.59
2048	46.38	48.17	110.86	159.04	205.41
2049	46.09	48.83	114.48	163.31	209.40
2050	45.81	49.42	118.18	167.61	213.42

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Table D.23 Actual and forecast total annual air freight, Darwin air catchment, 2011–2050

	Domestic	International			Total
		(thousand tonnes)			
Year	Total	Exports	Imports	Total	Total
2011	..	0.06	0.40	0.46	0.46
2012	..	0.04	0.57	0.61	0.61
2013	..	0.16	0.52	0.67	0.67
2014	..	0.05	0.62	0.67	0.67
2015	..	0.17	0.79	0.96	0.96
2016	..	0.11	0.46	0.57	0.57
2017	..	0.11	0.46	0.57	0.57
2018	..	0.11	0.94	1.05	1.05
2019	..	0.10	0.66	0.76	0.76
2020	..	0.05	0.26	0.31	0.31
2021	..	0.06	0.22	0.28	0.28
2022	..	0.00	0.00	0.00	0.00
2023	..	0.09	0.41	0.50	0.50
2024	..	0.05	0.74	0.79	0.79
2025	..	0.04	0.75	0.79	0.79
2026	..	0.04	0.76	0.79	0.79
2027	..	0.03	0.76	0.80	0.80
2028	..	0.03	0.77	0.80	0.80
2029	..	0.02	0.78	0.80	0.80
2030	..	0.02	0.78	0.80	0.80
2031	..	0.02	0.79	0.81	0.81
2032	..	0.02	0.79	0.80	0.80
2033	..	0.01	0.78	0.80	0.80
2034	..	0.01	0.78	0.79	0.79
2035	..	0.01	0.77	0.78	0.78
2036	..	0.01	0.76	0.77	0.77
2037	..	0.01	0.75	0.76	0.76
2038	..	0.01	0.75	0.75	0.75
2039	..	0.01	0.74	0.75	0.75
2040	..	0.01	0.73	0.74	0.74
2041	..	0.01	0.73	0.74	0.74
2042	..	0.01	0.73	0.73	0.73
2043	..	0.00	0.72	0.72	0.72
2044	..	0.00	0.71	0.72	0.72
2045	..	0.00	0.70	0.71	0.71
2046	..	0.00	0.69	0.69	0.69
2047	..	0.00	0.69	0.69	0.69
2048	..	0.00	0.68	0.68	0.68
2049	..	0.00	0.67	0.67	0.67
2050	..	0.00	0.66	0.66	0.66

.. not available.

Sources: BITRE (2023c), BITRE (2023e) and BITRE estimates.

Appendix E – Sensitivity analysis

The air passenger and freight movement forecasts presented in the body of the report are based on the *baseline* assumptions of Australian and overseas population growth, economic activity and oil prices. Future growth in population, economic activity, aviation fuel prices and exchange rates, is inherently uncertain. Sensitivity analysis was undertaken to assess the impact of variation in future population growth, economic growth, aviation fuel prices and exchange rates on forecast future passenger and freight movements.

This appendix presents sensitivity analysis results for domestic and international passenger movements and international air freight forecasts. Sensitivity analysis results are not provided for domestic air freight movements.

Domestic air passenger movements

Domestic population growth sensitivity analysis

Two alternative domestic population growth scenarios were considered – a high growth scenario and a low growth scenario, as specified in Appendix C. Figure E.1 illustrates the impact of the high and low population growth scenarios on total domestic passenger movements.

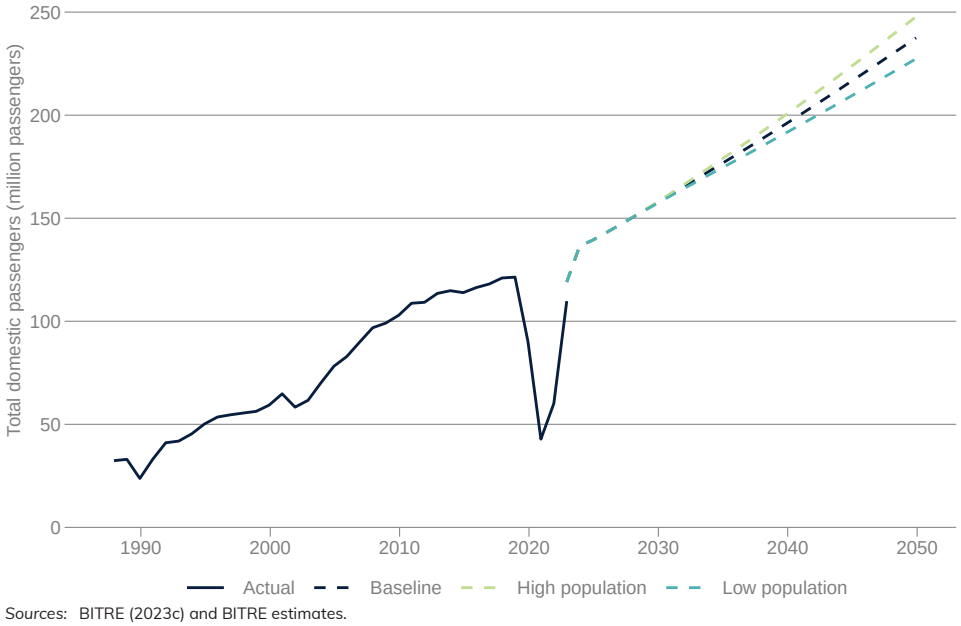
Under the high domestic population growth scenario, forecast total domestic passenger movements would be approximately 247.8 million passengers by 2049–50, approximately 4.3 per cent higher than under the baseline scenario. Under the low domestic population growth scenario, forecast total domestic passenger movements would be approximately 227.3 million passengers by 2049–50, approximately 4.3 per cent lower than under the baseline scenario.

Domestic productivity growth sensitivity analysis

Two alternative domestic productivity growth scenarios were considered – a high productivity growth scenario and a low productivity growth scenario, as specified in Appendix C. Figure E.2 illustrates the impact of the high and low productivity growth scenarios on total domestic passenger movements.

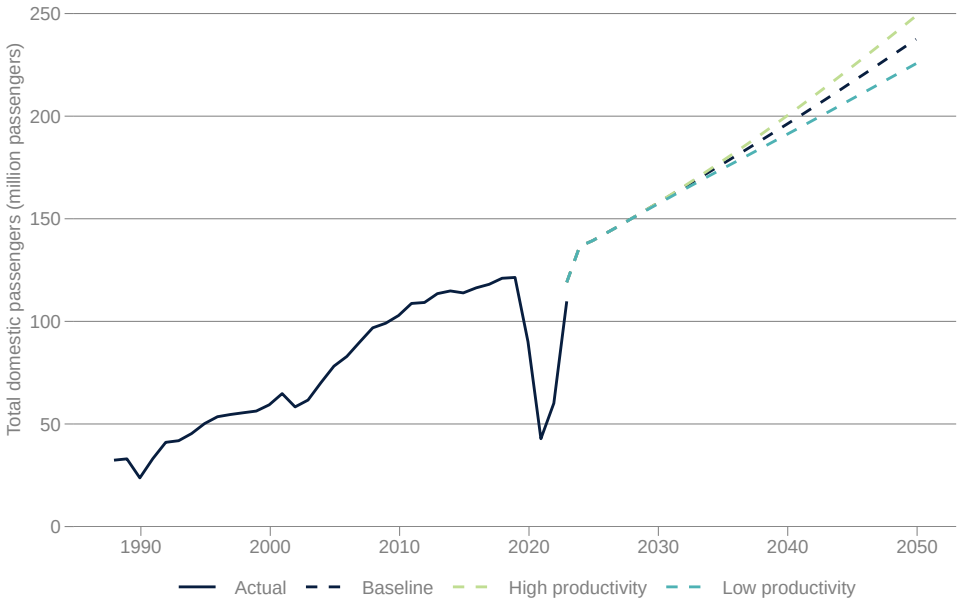
Under the high domestic productivity growth scenario, forecast total domestic passenger movements would be approximately 248.9 million passengers by 2049–50, approximately 4.8 per cent higher than under the baseline

Figure E.1 Actual and forecast total Australian, domestic passengers, alternative domestic population growth scenarios, 1985–2050



Sources: BITRE (2023c) and BITRE estimates.

Figure E.2 Actual and forecast total Australian, domestic passengers, alternative domestic productivity growth scenarios, 1985–2050



Sources: BITRE (2023c) and BITRE estimates.

scenario. Under the low domestic productivity growth scenario, forecast total domestic passenger movements would be approximately 225.6 million passengers by 2049–50, approximately 5 per cent lower than under the baseline scenario.

World oil price sensitivity analysis

Similarly, two alternative aviation fuel cost scenarios were considered – a high future world oil price scenario and a low future world oil price scenario, as specified in Appendix C. Figure E.3 illustrates the impact of the high and low world oil price scenarios on total domestic passenger movements.

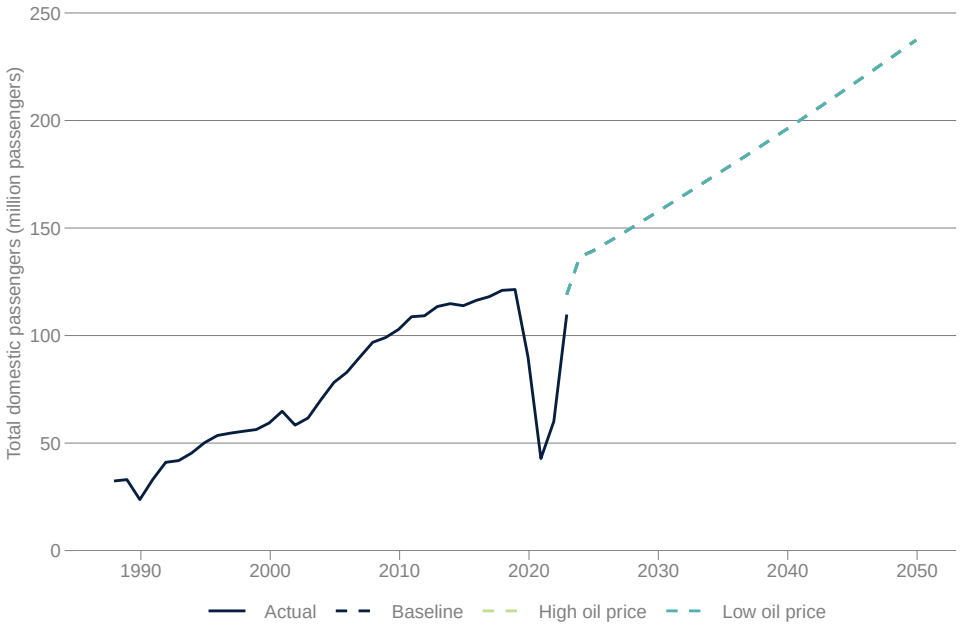
Under the both the high and low world oil price scenarios, forecast total domestic passenger movements would change very little by 2050, due to the low fuel prices elasticities, substitution towards zero and lower-emission fuels and domestic policy to reduce greenhouse emissions.

Domestic air passenger prediction intervals

By way of comparison, Figure E.4 shows the 50, 65, 80 and 95 per cent prediction intervals for the forecast domestic passenger numbers out to 2049–50. As noted in Chapter 6, the 95 per cent prediction intervals are +11.1 and −13.6 per cent of the baseline forecasts. The 80 per cent prediction intervals are +7.9 and −6.9 per cent of the baseline forecasts. The 66 per cent prediction intervals are +5.8 and −5.4 per cent of the baseline forecasts. The 50 per cent prediction intervals are +4.5 and −3.6 per cent of the baseline forecasts.

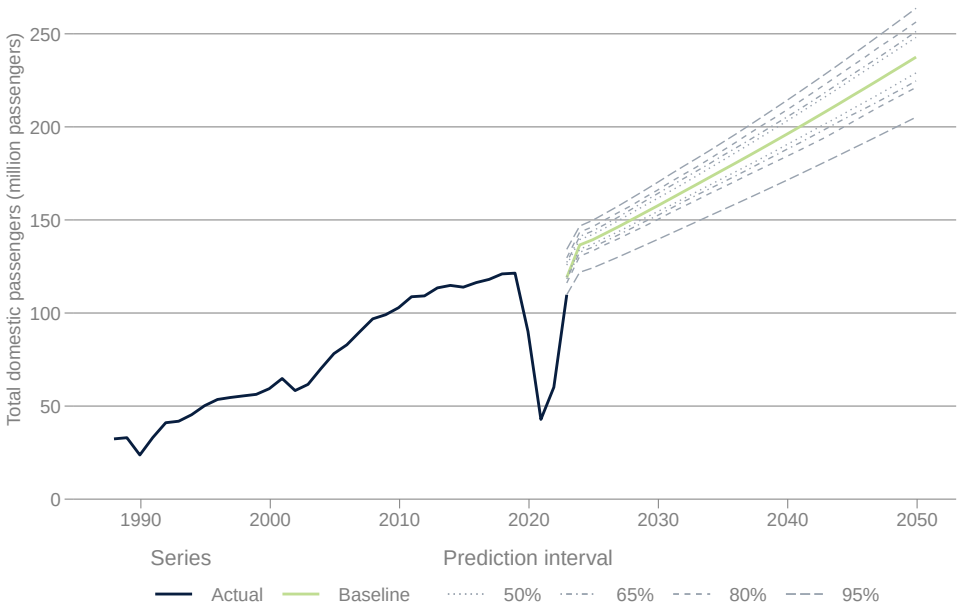
In short, the 50 per cent prediction interval covers the potential range of the various population, productivity and oil price sensitivity analysis scenarios.

Figure E.3 Actual and forecast total Australian, domestic passengers, alternative word oil price scenarios, 1985–2050



Sources: BITRE (2023c) and BITRE estimates.

Figure E.4 Actual and forecast total domestic passenger numbers, prediction intervals, 1989–2050



Sources: BITRE (2023c) and BITRE estimates.

International air passenger movement sensitivity analysis

Forecasts of domestic resident departures and overseas visitor arrivals are driven by a different range of factors. Consequently, separate sensitivity analysis results are presented for each market segment.

Domestic resident international departures

Domestic population growth sensitivity analysis

Figure E.5 illustrates the impact of the high and low domestic population growth scenarios on forecast domestic resident international departures.

Under the high domestic population growth scenario, forecast total domestic resident departures would be around 32.2 million passengers by 2049–50, approximately 7.6 per cent higher than under the baseline scenario. Under the low domestic population growth scenario, forecast total domestic passenger movements would be approximately 27.7 million passengers by 2049–50, approximately 7.3 per cent lower than under the baseline scenario.

Domestic productivity growth sensitivity analysis

Figure E.6 illustrates the impact of the high and low productivity growth scenarios on total domestic resident international departures.

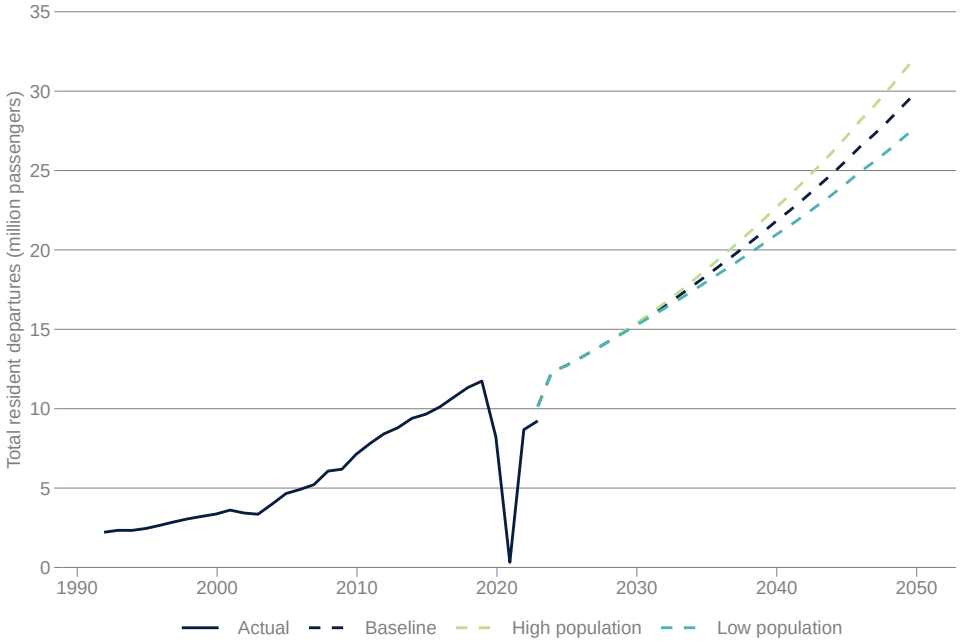
Under the high domestic productivity growth scenario, forecast total domestic resident departures would increase to around 32.4 million passengers by 2049–50, approximately 8.4 per cent higher than under the baseline scenario. Under the low domestic population growth scenario, forecast total domestic passenger movements would be approximately 27.4 million passengers by 2049–50, approximately 8.5 per cent lower than under the baseline scenario.

World oil price sensitivity analysis

Figure E.7 illustrates the impact of the high and low future world oil price scenarios on total domestic resident international departures.

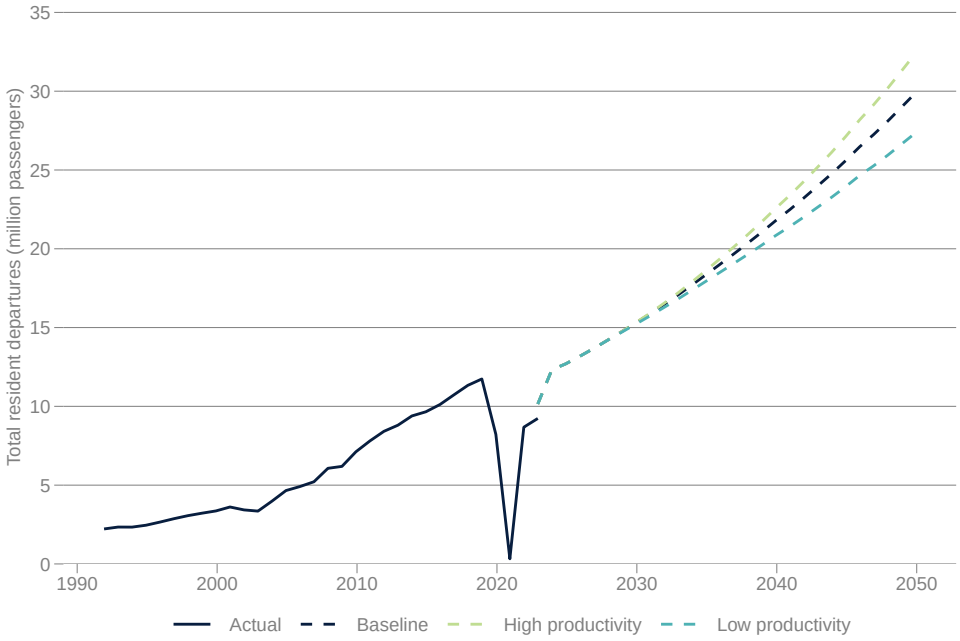
Under the high world oil price scenario, forecast total domestic resident departures would increase to around 29 million passengers by 2049–50, approximately 3.1 per cent lower than under the baseline scenario. Under

Figure E.5 Actual and forecast total domestic resident departures, alternative domestic population growth scenarios, 1985–2050



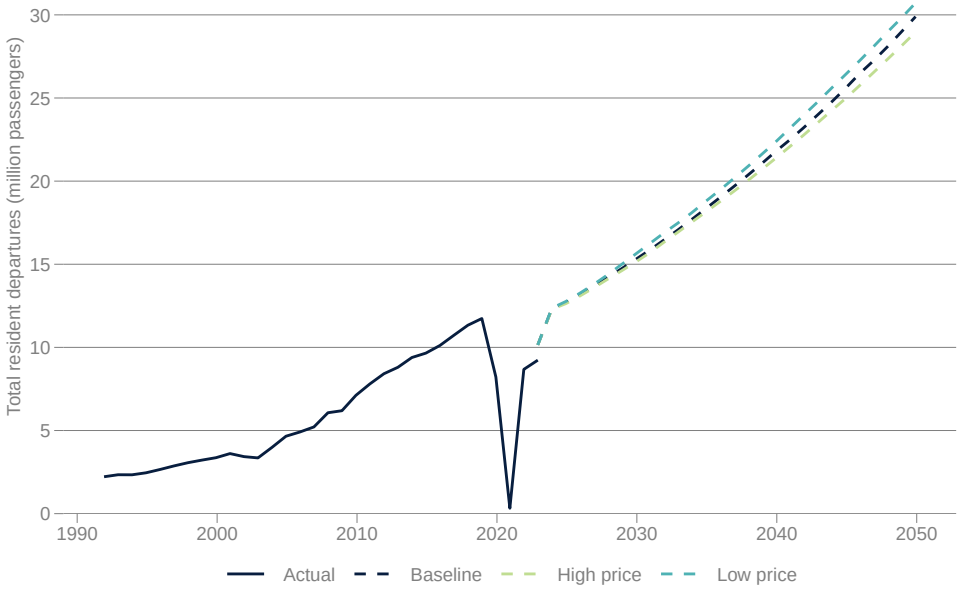
Sources: BITRE (2023c) and BITRE estimates.

Figure E.6 Actual and forecast total domestic resident departures, alternative domestic productivity growth scenarios, 1985–2050



Sources: BITRE (2023c) and BITRE estimates.

Figure E.7 Actual and forecast total domestic resident departures, alternative world oil price scenarios, 1985–2050



Sources: BITRE (2023c) and BITRE estimates.

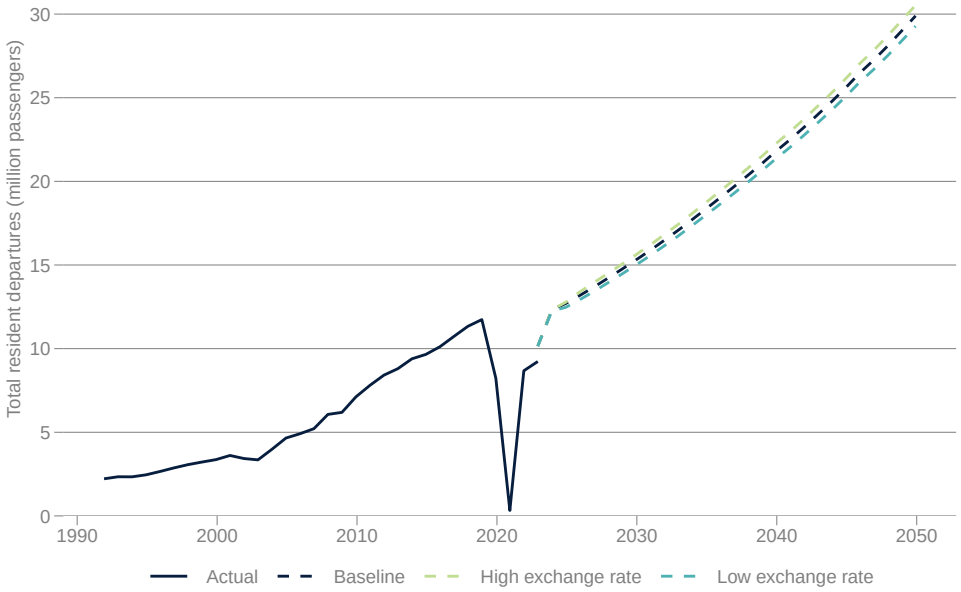
the low world oil price scenario, forecast total domestic passenger movements would be approximately 30.7 million passengers by 2049–50, approximately 2.8 per cent higher than under the baseline scenario.

Exchange rate sensitivity analysis

Figure E.8 illustrates the impact of the high and low exchange rate scenarios on total domestic resident international departures.

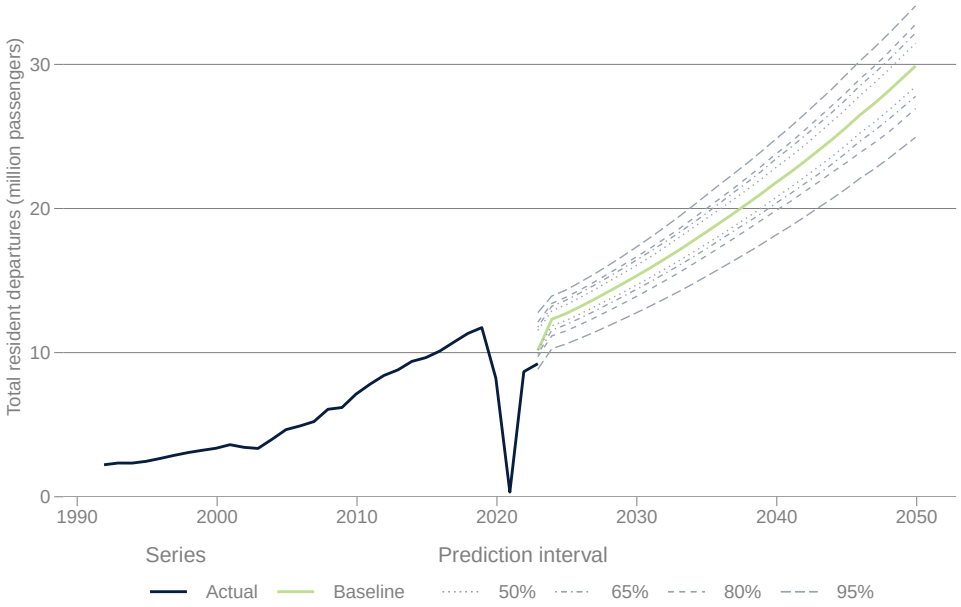
Under the high exchange rate scenario, forecast total domestic resident departures would increase to around 30.5 million passengers by 2049–50, approximately 2.1 per cent higher than under the baseline scenario. Under the low exchange rate scenario, forecast total domestic passenger movements would be approximately 29.3

Figure E.8 Actual and forecast total domestic resident departures, alternative exchange rate scenarios, 1985–2050



Sources: BITRE (2023c) and BITRE estimates.

Figure E.9 Actual and forecast total domestic resident departures, prediction intervals, 1989–2050



Sources: BITRE (2023c) and BITRE estimates.

million passengers by 2049–50, approximately 2.1 per cent lower than under the baseline scenario.

Domestic resident departure prediction intervals

By way of comparison, Figure E.9 shows the 50, 65, 80 and 95 per cent prediction intervals for the forecast domestic passenger numbers out to 2049–50. As noted in Chapter 6, the 95 per cent prediction intervals are between +13.9 and –16.6 per cent of the baseline forecasts. The 80 per cent prediction intervals are between +9.6 and –9.9 per cent of the baseline forecasts. The 66 per cent prediction intervals are between +7.7 and –7 per cent of the baseline forecasts. Finally, the 50 per cent prediction intervals are between +5.3 and –4.8 per cent of the baseline forecasts.

In short, the 50 per cent prediction interval covers the potential range of the various population, productivity, oil price and exchange rate sensitivity analysis scenarios.

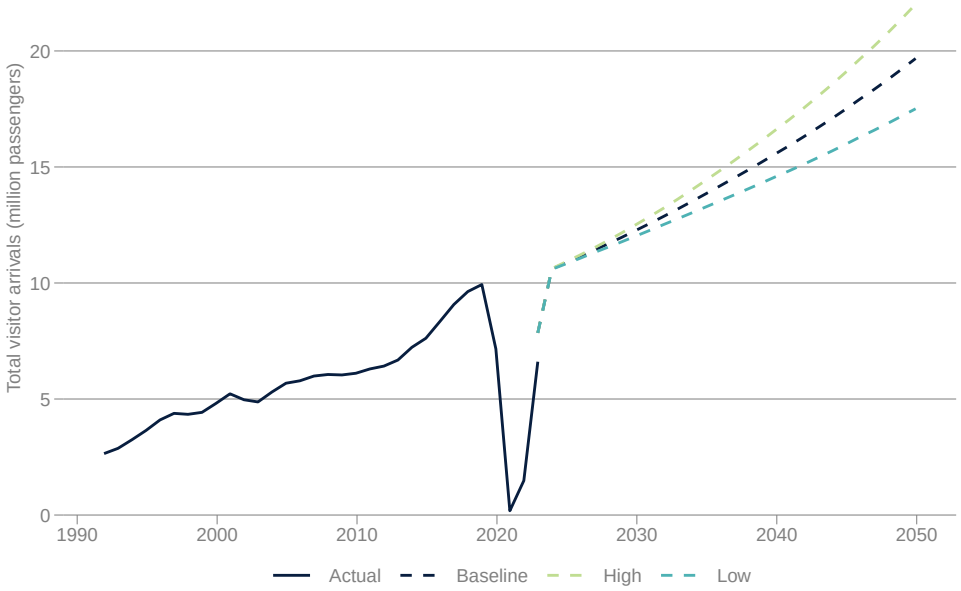
Overseas visitor arrivals

World population growth sensitivity analysis

Figure E.10 illustrates the impact of the high and low world population growth scenarios on forecast international visitor arrivals.

Under the high world population growth scenario, forecast total visitor arrivals would be around 22 million passengers by 2049–50, approximately 11.9 per cent higher than under the baseline scenario. Under the low world population growth scenario, forecast total international visitor arrivals would be approximately 17.5 million passengers by 2049–50, approximately 11 per cent lower than under the baseline scenario.

Figure E.10 Actual and forecast total international visitor arrivals, alternative world population growth scenarios, 1985–2050



Sources: BITRE (2023c) and BITRE estimates.

World oil price sensitivity analysis

Figure E.11 illustrates the impact of the high and low world population growth scenarios on forecast international visitor arrivals.

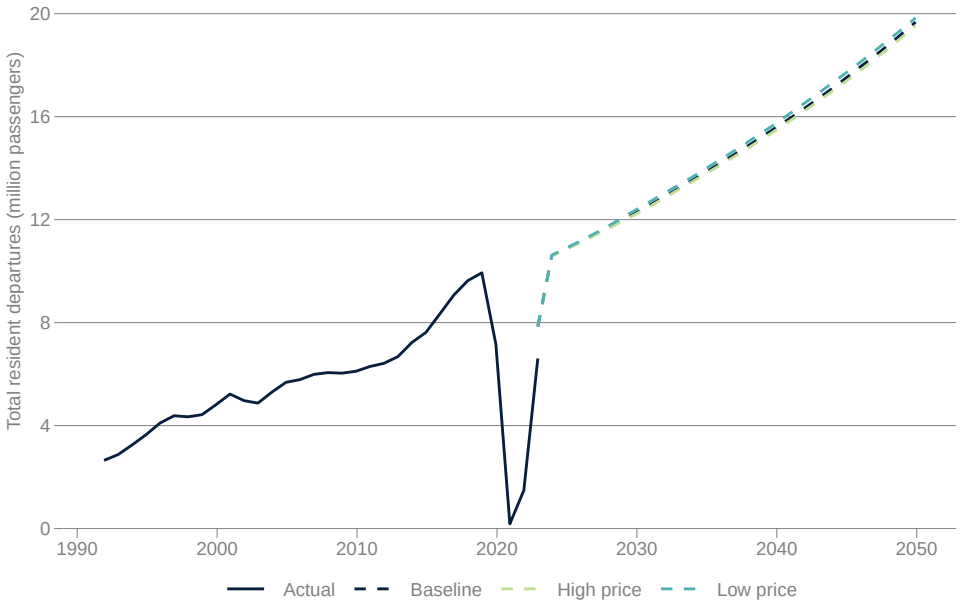
Under the high oil price scenario, forecast total visitor arrivals would be around 19.5 million passengers by 2049–50, approximately 0.7 per cent lower than under the baseline scenario. Under the low world oil price scenario, forecast total international visitor arrivals would be approximately 19.8 million passengers by 2049–50, approximately 0.8 per cent higher than under the baseline scenario.

International visitor arrival prediction intervals

By way of comparison, Figure E.12 shows the 50, 65, 80 and 95 per cent prediction intervals for the forecast domestic passenger numbers out to 2049–50. As noted in Chapter 6, the 95 per cent prediction intervals are between +12.1 and −10 per cent of the baseline forecasts. The 80 per cent prediction intervals are between +8.8 and −6.3 per cent of the baseline forecasts. The 66 per cent prediction intervals are between +7.7 and −4.8 per cent of the baseline forecasts. Finally, the 50 per cent prediction intervals are between +5.9 and −3.1 per cent of the baseline forecasts.

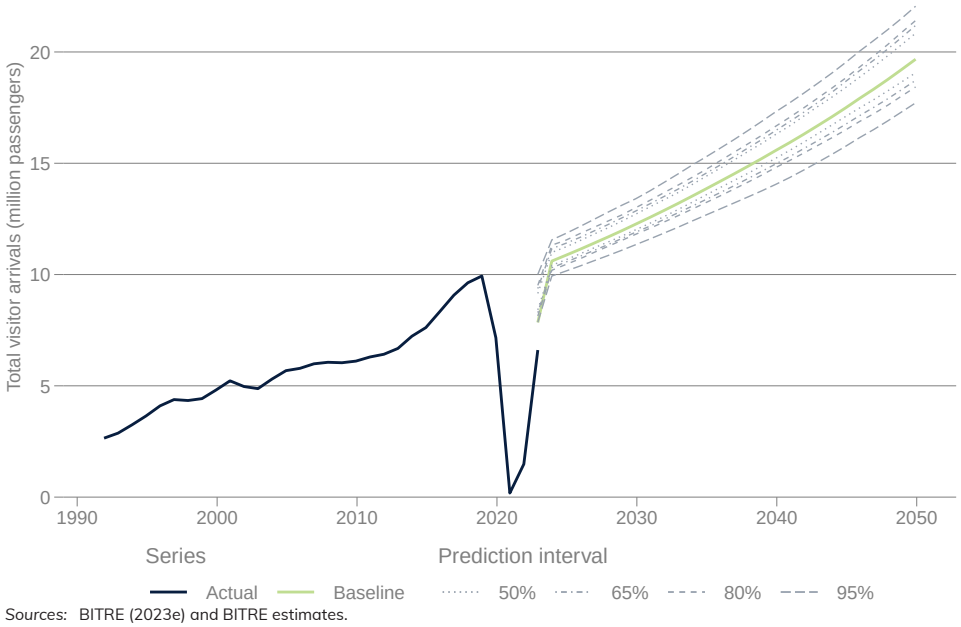
In short, the 50 per cent prediction interval covers the potential range of the various population and oil price sensitivity analysis scenarios.

Figure E.11 Actual and forecast total international visitor arrivals, alternative world oil price scenarios, 1985–2050



Sources: BITRE (2023c) and BITRE estimates.

Figure E.12 Actual and forecast total visitor arrivals, prediction intervals, 1989–2050



Sources: BITRE (2023e) and BITRE estimates.

International air freight sensitivity analysis

Forecasts of international air freight are driven domestic resident departures and overseas visitor arrivals are driven by a different range of factors. Consequently, separate sensitivity analysis results are presented for each market segment.

Air freight exports

Population growth sensitivity analysis

Figure E.13 illustrates the impact of the high and low population growth scenarios on forecast international air freight exports.

Under the high population growth scenario, forecast air freight exports would be around 375.2 thousand tonnes by 2049–50, approximately 3.2 per cent higher than under the baseline scenario. Under the low population growth scenario, forecast total international air freight exports would be around 352.2 million passengers by 2049–50, approximately 3.1 per cent lower than under the baseline scenario.

Productivity growth sensitivity analysis – air freight exports

Figure E.14 illustrates the impact of the high and low productivity growth scenarios on forecast international air freight exports.

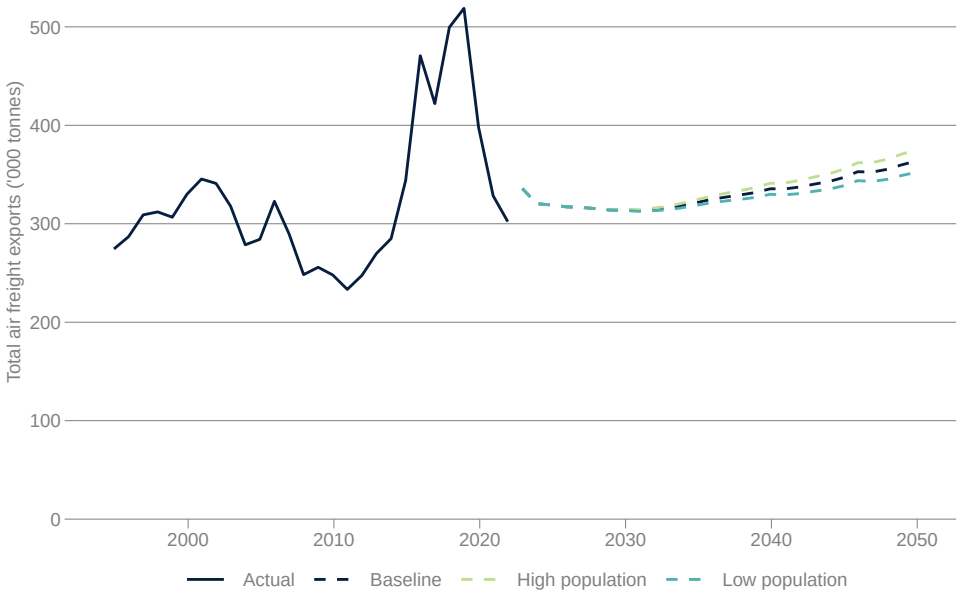
Under the high productivity growth scenario, forecast air freight exports would be around 376.4 thousand tonnes by 2049–50, approximately 3.5 per cent higher than under the baseline scenario. Under the low productivity growth scenario, forecast total international air freight exports would be around 350.3 million passengers by 2049–50, approximately 3.7 per cent lower than under the baseline scenario.

World oil price sensitivity analysis

Figure E.15 illustrates the impact of the high and low oil price scenarios on forecast international air freight exports.

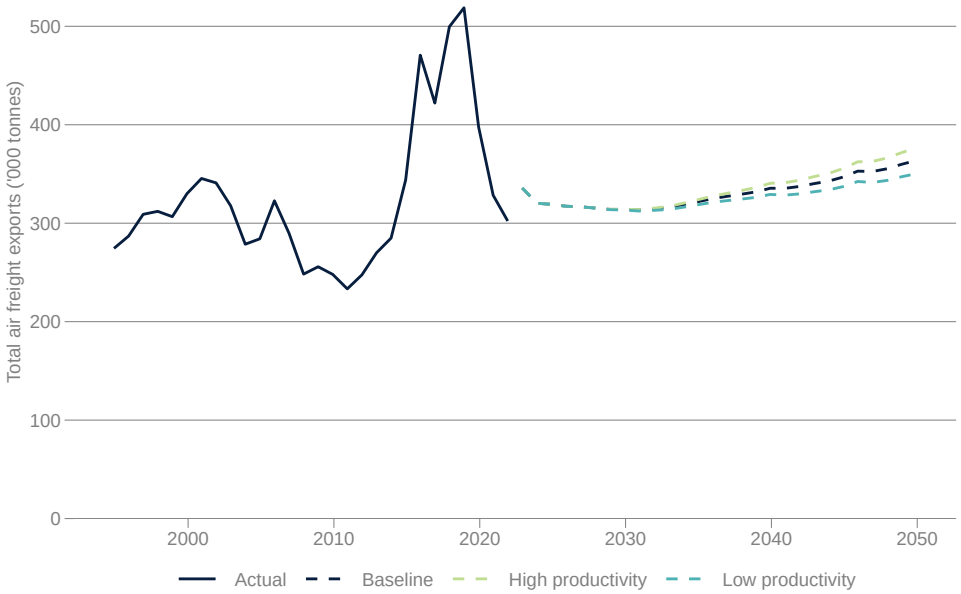
Under the high oil price scenario, forecast air freight exports would be around 317.6 thousand tonnes by 2049–50, approximately 12.7 per cent lower than under the baseline scenario. Under the low oil price scenario, forecast total international air freight exports would be around 413.3 million passengers by 2049–50, approximately 13.6 per cent higher than under the baseline scenario.

Figure E.13 Actual and forecast total air freight forecasts, alternative population growth scenarios, 1985–2050



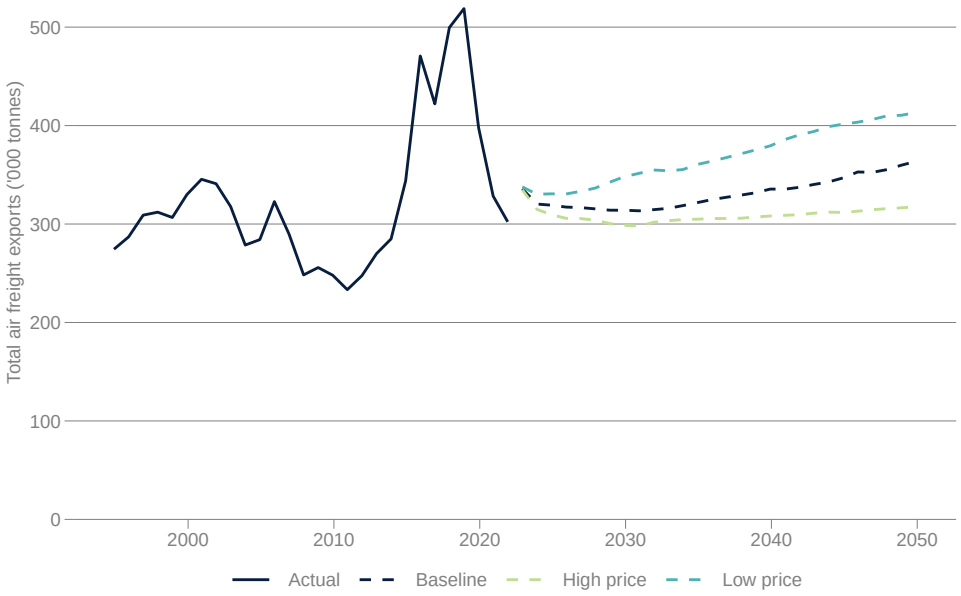
Sources: BITRE (2023e) and BITRE estimates.

Figure E.14 Actual and forecast total air freight forecasts, alternative productivity growth scenarios, 1985–2050



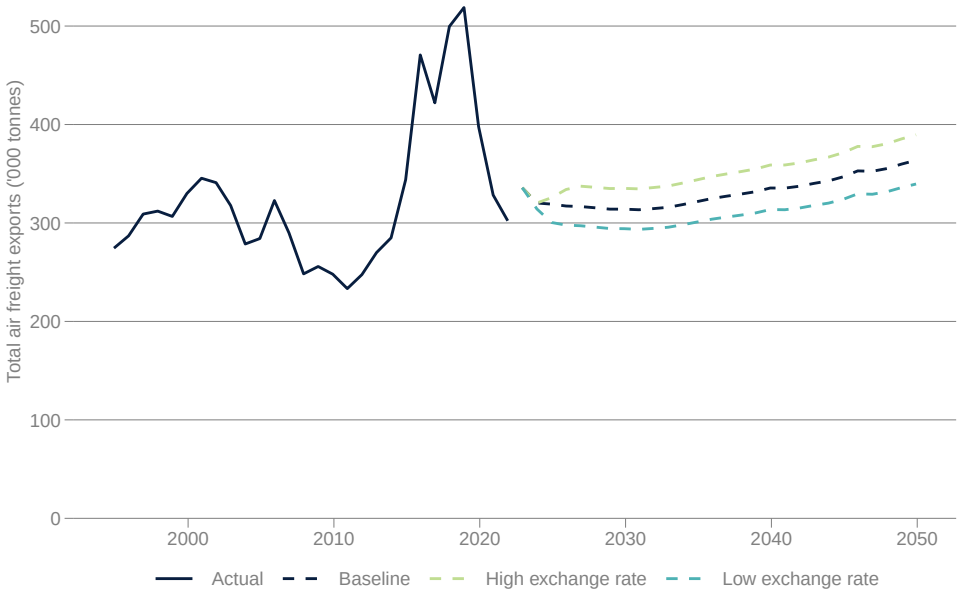
Sources: BITRE (2023e) and BITRE estimates.

Figure E.15 Actual and forecast total air freight forecasts, alternative oil price scenarios, 1985–2050



Sources: BITRE (2023e) and BITRE estimates.

Figure E.16 Actual and forecast total air freight forecasts, alternative exchange rate scenarios, 1985–2050



Sources: BITRE (2023e) and BITRE estimates.

Exchange rate sensitivity analysis

Figure E.16 illustrates the impact of the high and low exchange rate growth scenarios on forecast international air freight exports.

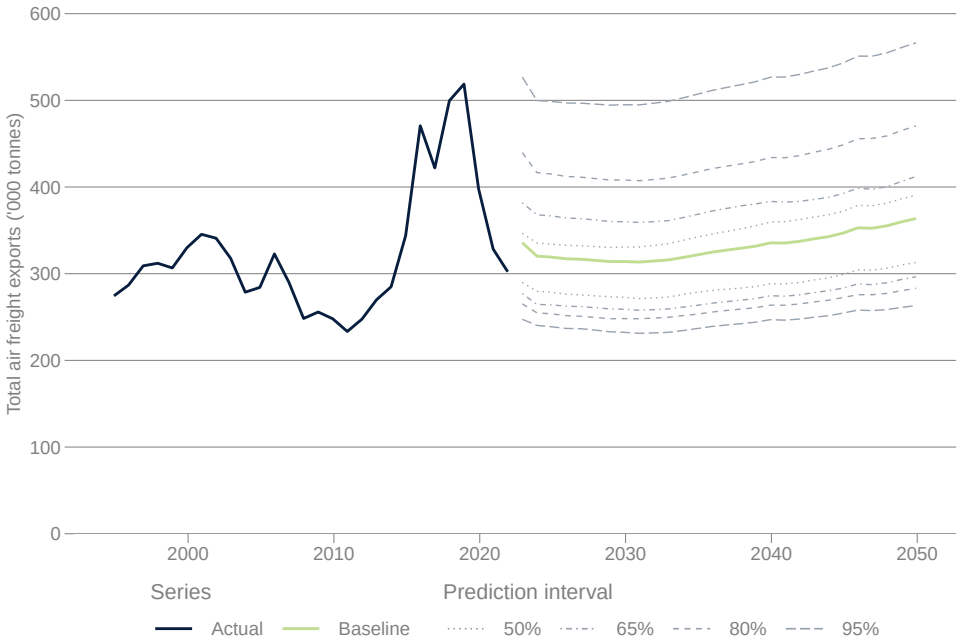
Under the high exchange rate scenario, forecast air freight exports would be around 389.5 thousand tonnes by 2049–50, approximately 7.1 per cent higher than under the baseline scenario. Under the low exchange rate scenario, forecast total international air freight exports would be around 339.6 million passengers by 2049–50, approximately 6.6 per cent lower than under the baseline scenario.

International air export prediction intervals

Finally, for comparison, Figure E.17 shows the 50, 65, 80 and 95 per cent prediction intervals for the forecast air freight exports out to 2049–50. As noted in Chapter 6, the 95 per cent prediction intervals are between +55.7 and −27.6 per cent of the baseline forecasts. The 80 per cent prediction intervals are between +29.4 and −22.1 per cent of the baseline forecasts. The 66 per cent prediction intervals are between +13.4 and −18.5 per cent of the baseline forecasts. Finally, the 50 per cent prediction intervals are between +7.4 and −14 per cent of the baseline forecasts.

In brief, the 50 per cent prediction interval covers the potential range of the various population and oil price sensitivity analysis scenarios.

Figure E.17 Actual and forecast total air freight exports, prediction intervals, 1989–2050



Sources: BITRE (2023e) and BITRE estimates.

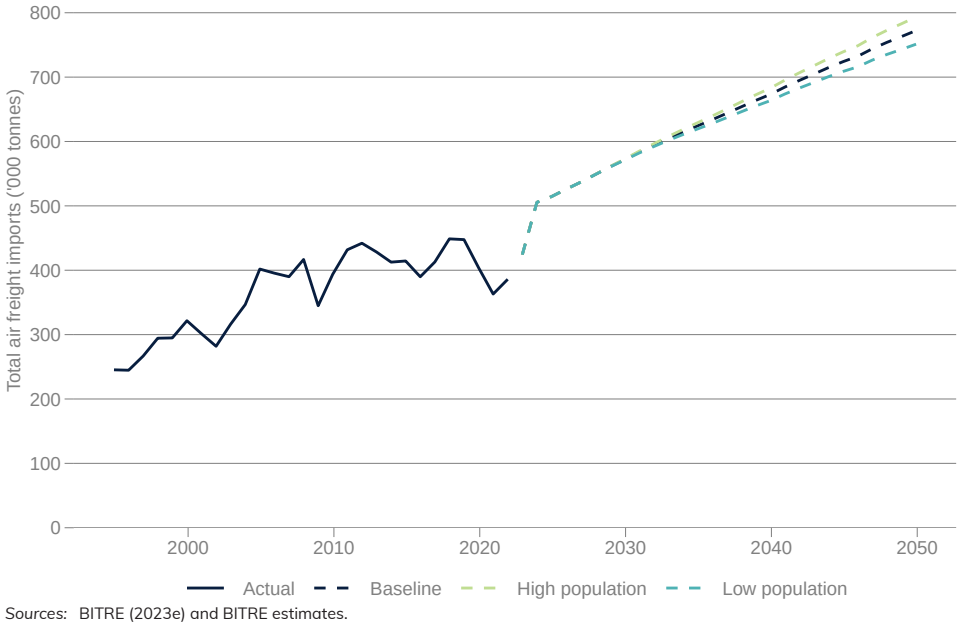
Air freight imports

Population growth sensitivity analysis

Figure E.18 illustrates the impact of the high and low population growth scenarios on forecast international air freight imports.

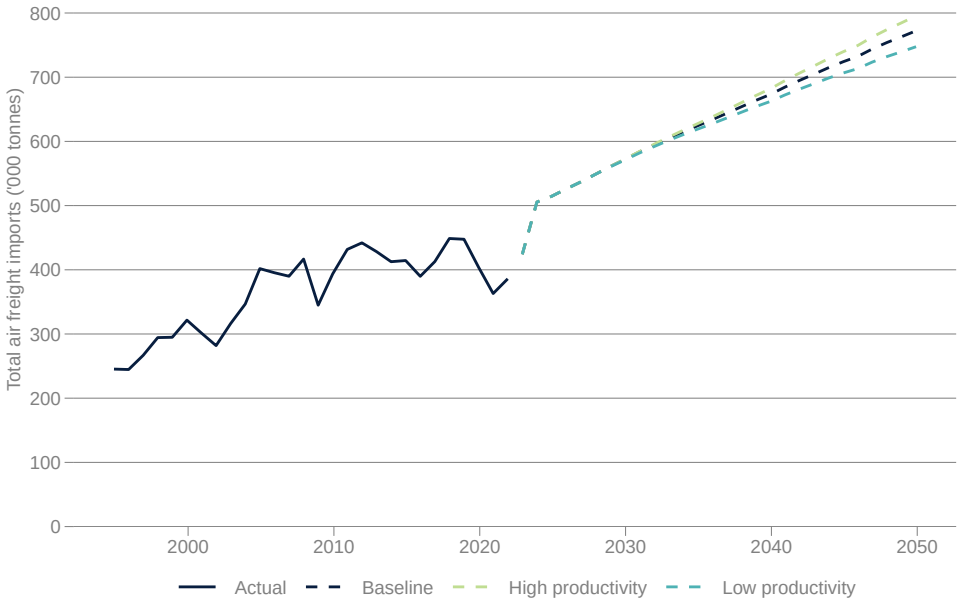
Under the high population growth scenario, forecast air freight imports would be around 793.4 thousand tonnes by 2049–50, approximately 2.7 per cent higher than under the baseline scenario. Under the low population growth scenario, forecast total international air freight imports would be around 751.2 million passengers by 2049–50, approximately 2.7 per cent lower than under the baseline scenario.

Figure E.18 Actual and forecast total air freight forecasts, alternative population growth scenarios, 1985–2050



Sources: BITRE (2023e) and BITRE estimates.

Figure E.19 Actual and forecast total air freight forecasts, alternative productivity growth scenarios, 1985–2050



Sources: BITRE (2023e) and BITRE estimates.

Productivity growth sensitivity analysis

Figure E.19 illustrates the impact of the high and low productivity growth scenarios on forecast international air freight imports.

Under the high productivity growth scenario, forecast air freight imports would be around 795.6 thousand tonnes by 2049–50, approximately 3 per cent higher than under the baseline scenario. Under the low productivity growth scenario, forecast total international air freight imports would be around 747.5 million passengers by 2049–50, approximately 3.2 per cent lower than under the baseline scenario.

World oil price sensitivity analysis

Figure E.20 illustrates the impact of the high and low oil price scenarios on forecast international air freight imports.

Under the high oil price scenario, forecast air freight imports would be around 800.2 thousand tonnes by 2049–50, approximately 3.6 per cent lower than under the baseline scenario. Under the low oil price scenario, forecast total international air freight imports would be around 746.8 million passengers by 2049–50, approximately 3.3 per cent higher than under the baseline scenario.

Exchange rate sensitivity analysis – air freight imports

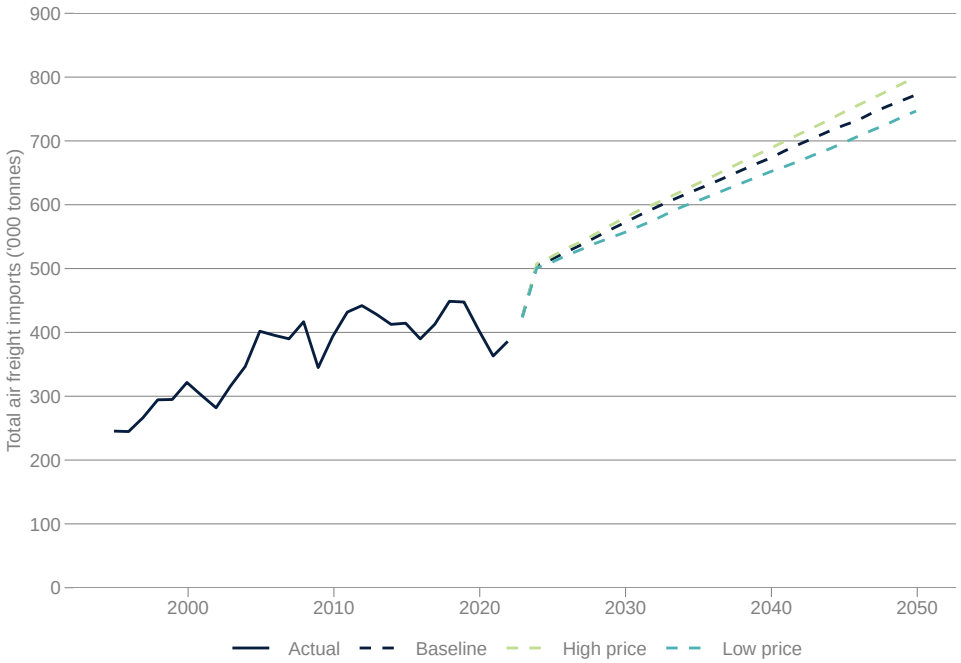
Figure E.21 illustrates the impact of the high and low exchange rate growth scenarios on forecast international air freight imports.

Under the high exchange rate scenario, forecast air freight imports would be around 758.5 thousand tonnes by 2049–50, approximately 1.8 per cent lower than under the baseline scenario. Under the low exchange rate scenario, forecast total international air freight imports would be around 786.3 million passengers by 2049–50, approximately 1.8 per cent higher than under the baseline scenario.

International air import prediction intervals

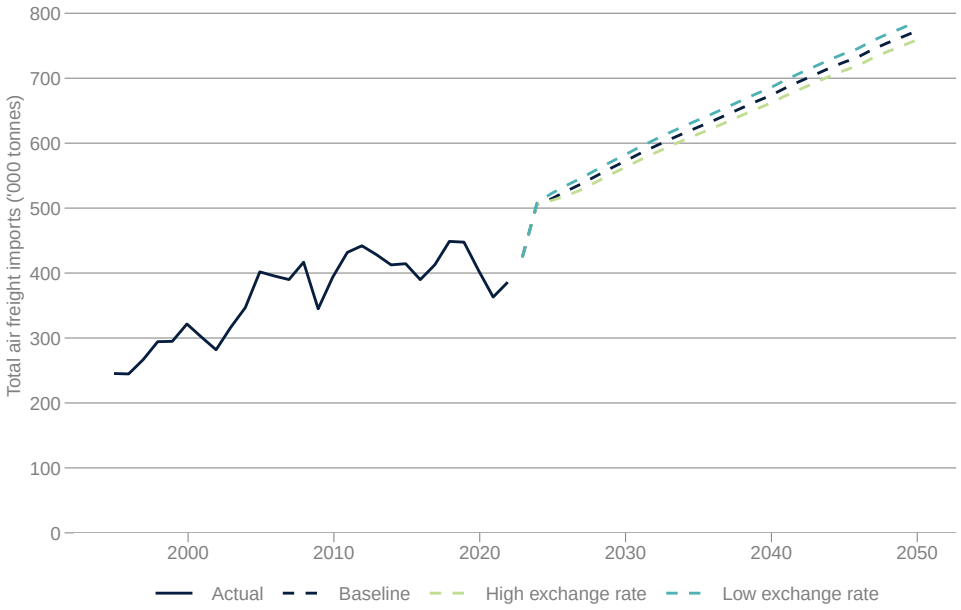
Finally, for comparison, Figure E.22 shows the 50, 65, 80 and 95 per cent prediction intervals for the forecast air freight imports out to 2049–50. As noted in Chapter 6, the 95 per cent prediction intervals are between +16 and −12.5 per cent of the baseline forecasts. The 80 per cent prediction intervals are between +8.8 and −8 per cent of the baseline forecasts. The 66 per cent prediction intervals are between +5.7 and −6.1 per cent of the baseline forecasts. Finally, the 50 per cent prediction intervals are between +3.7 and −4.8 per cent of the baseline forecasts.

Figure E.20 Actual and forecast total air freight forecasts, alternative oil price scenarios, 1985–2050



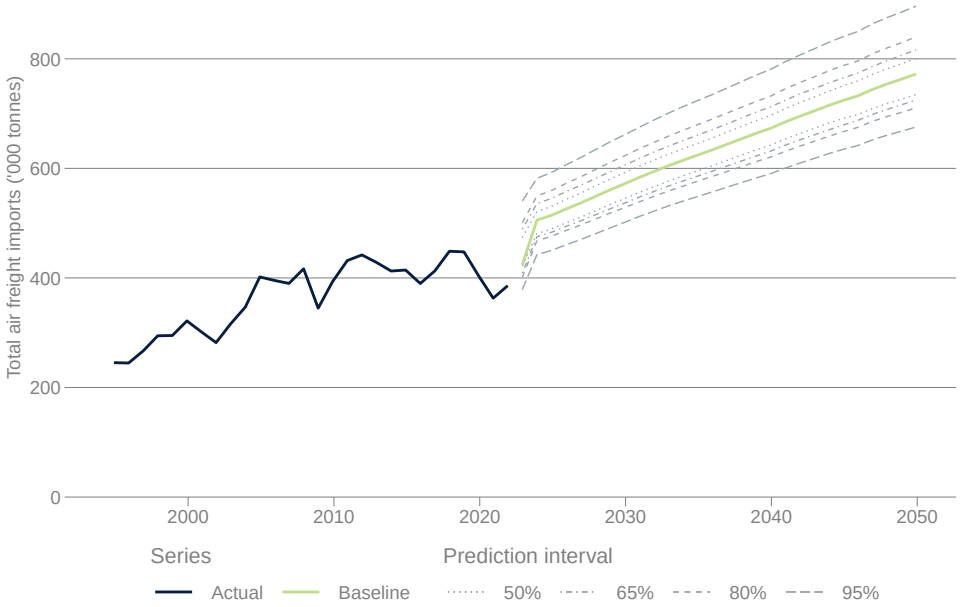
Sources: BITRE (2023e) and BITRE estimates.

Figure E.21 Actual and forecast total air freight forecasts, alternative exchange rate scenarios, 1985–2050



Sources: BITRE (2023e) and BITRE estimates.

Figure E.22 Actual and forecast total air freight imports, prediction intervals, 1989–2050



Sources: BITRE (2023e) and BITRE estimates.

In short, the 50 per cent prediction interval covers the potential range of the various population and oil price sensitivity analysis scenarios.

Appendix F – General aviation activity forecasts

Australian general aviation (GA) activity covers all flying activity in Australian-registered aircraft other than commercial air transport. The major categories of flying include aerial work, own-use business flying, sport and pleasure flying and other flying in registered aircraft (BITRE 2023a).

Statistical information about GA sector activity is based on BITRE's annual survey of the aviation industry (BITRE 2023a, and earlier issues). The survey provides estimates of all registered aircraft, active and inactive aircraft and total aircraft flying hours, for the following broad industry sectors:

- Scheduled (commercial) aviation
- Other VH-registered aircraft – general aviation
- Ultralight aircraft
- Gliding
- Hang Gliding
- Gyroplanes.

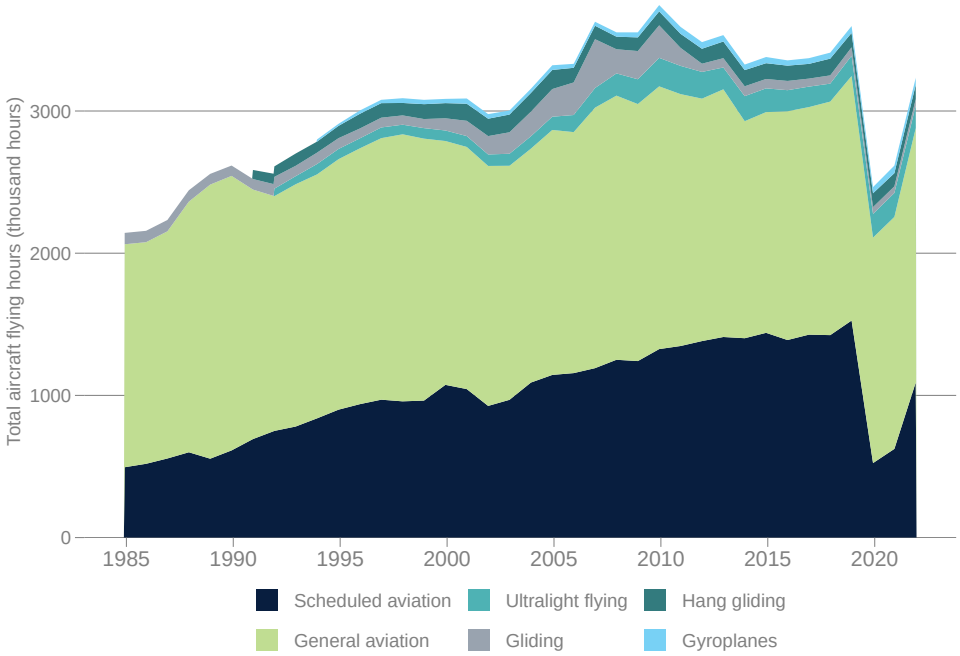
General aviation activity

General aviation activity is not the principal focus of this report. Forecasts of GA activity are presented in this appendix for completeness.

Figure F.1 shows trends in total aircraft flying hours between 1985 and 2022. GA aircraft activity typically accounts for the largest proportion of total domestic aircraft flying hours each year – in 2019 GA aircraft flying hours totalled 1.72 million aircraft hours, accounting for approximately 47.8 per cent of total Australian aircraft flying hours.

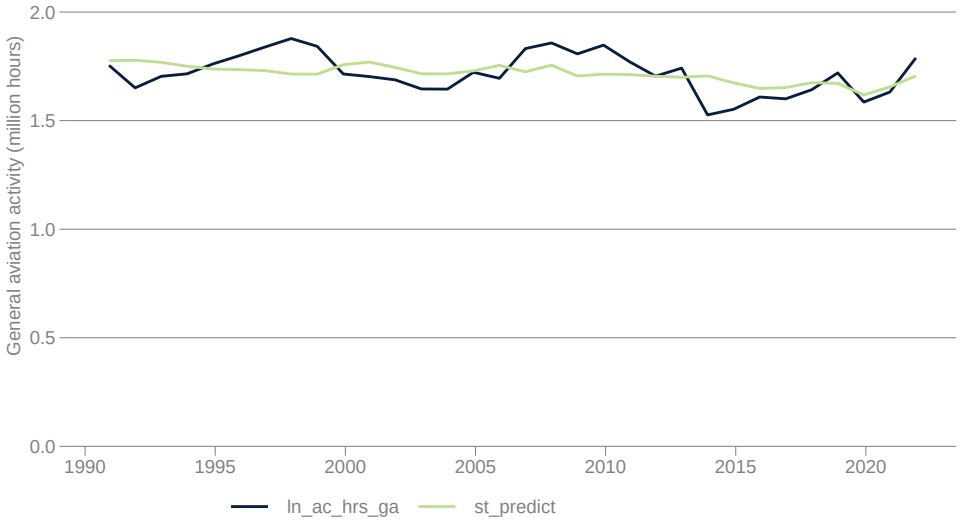
GA sector activity has exhibited little growth over the past three decades, with total GA flying hours generally ranging between 1.53 and 1.93 million hours per year, and averaging around 1.72 million aircraft hours per year between 1985 and 2019. COVID-19 had an impact on GA sector activity, but nowhere near as large as the impact on commercial aviation aircraft activity, and broadly within the typical range of year-to-year variation in GA activity implied by the annual survey data.

Figure F.1 Total aircraft flying hours, by industry sector, 1985 to 2022



Source: BITRE (2023a) and BITRE estimates.

Figure F.2 General aviation activity, actual and model predictions, 1995–2022



Source: BITRE estimates.

General aviation activity forecast model

The GA activity forecasting model is a simple static linear model relating annual GA aircraft flying hours (BITRE 2023a) with annual domestic economic activity and real aviation fuel prices.

Table F.1 presents the empirical results of the GA activity model. The model explains very little of the observed annual variation in GA activity. The domestic economic activity term is marginally significant at the 10 per cent significance level and aviation fuel costs are not statistically significant. Figure F.2 provides a comparison of the actual and predicted model results.

Table F.1 Actual and predicted GA activity

	GA activity
Intercept	15.674***
	(0.517)
GDP	-0.099*
	(0.039)
Fuel costs	0.091
	(0.057)
Num.Obs.	32
R2	0.183
R2 Adj.	0.127
AIC	-94.8
BIC	-89.0
Log.Lik.	51.422
RMSE	0.05

[a] Significance levels: *** < 0.1%, ** < 1%, * < 5%, . < 10%, ns > 10%.
Source: BITRE estimates.

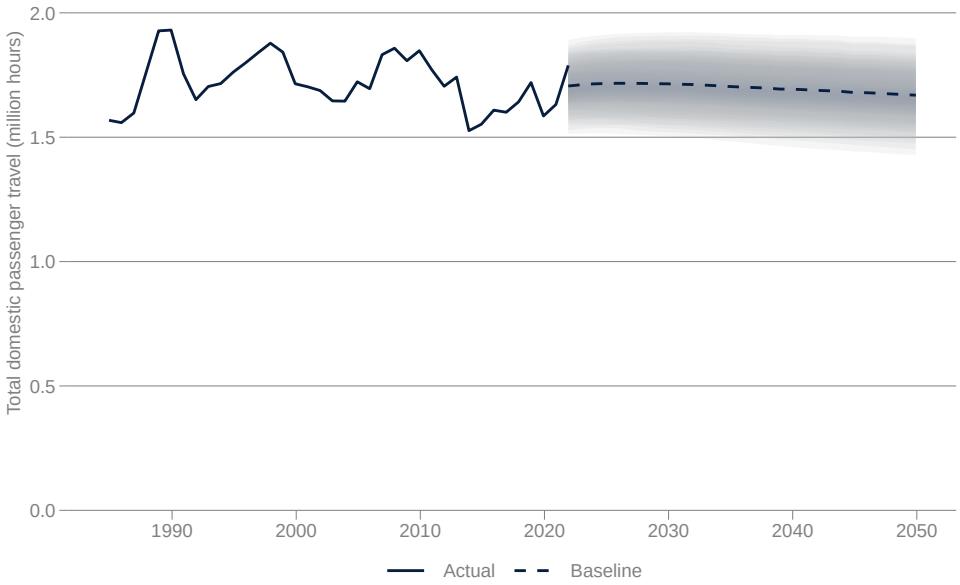
General aviation activity forecasts

The broad forecast assumptions presented in Chapter 5 are applied in the GA activity model to derive long-term GA activity forecasts. Economic activity forecasts are based on IGR projections of GDP growth (Treasury 2023) and aviation fuel cost forecasts are based on world oil price projections (EIA 2021b).

The forecast assumptions imply that GA activity is likely to remain more or less around current levels over the forecast horizon, with the baseline forecast involving a slight decline in overall activity from around 1.72 million flying hours in 2019, to around 1.67 flying hours in 2050 (an average annual rate of growth of –0.1 per cent per annum).

Figure F.3 plots (and Table F.2 lists) the GA activity forecasts and the 95 per cent prediction interval lower

Figure F.3 General aviation activity forecasts, 1995–2050



Source: BITRE estimates.

and upper bounds. The lack of predictive power of the original model results in a relatively wide 95 per cent prediction interval range. Separate sensitivity analysis scenarios considered variations in productivity and future oil prices – all alternative scenario predictions are well within the 95 per cent prediction interval.

Table F.2 Projected GA flying hours and 95 per cent prediction interval bounds, 2022 to 2050

		Prediction interval bounds	
Year	Estimate	Lower	Upper
2022	1,706.0	1,528.4	1,868.6
2023	1,710.7	1,533.1	1,881.5
2024	1,714.4	1,536.7	1,891.0
2025	1,715.9	1,537.3	1,896.7
2026	1,716.9	1,536.0	1,902.1
2027	1,716.5	1,531.0	1,904.4
2028	1,716.2	1,525.3	1,906.2
2029	1,715.3	1,522.2	1,907.2
2030	1,714.6	1,520.3	1,908.5
2031	1,712.9	1,517.8	1,908.5
2032	1,711.8	1,515.8	1,909.3
2033	1,709.4	1,512.9	1,908.4
2034	1,706.9	1,510.0	1,907.5
2035	1,703.8	1,506.4	1,903.9
2036	1,701.6	1,502.8	1,902.3
2037	1,699.6	1,499.4	1,901.2
2038	1,697.5	1,496.0	1,899.9
2039	1,693.6	1,491.5	1,894.3
2040	1,693.1	1,488.6	1,896.3
2041	1,691.1	1,485.0	1,895.0
2042	1,688.3	1,480.9	1,891.9
2043	1,686.6	1,477.4	1,891.1
2044	1,684.2	1,473.6	1,888.8
2045	1,679.6	1,468.7	1,882.1
2046	1,678.8	1,465.8	1,883.2
2047	1,676.7	1,462.3	1,881.7
2048	1,674.0	1,458.5	1,878.7
2049	1,671.5	1,455.5	1,876.0
2050	1,669.0	1,452.8	1,873.5

Sources: BITRE estimates.

Acronyms and abbreviations

9/11 – 11 September 2001 terror event in the United States

ABS – Australian Bureau of Statistics

AGF – Aviation gasoline fuel (also referred to as 'Avgas')

ATF – Aviation turbine fuel (also referred to as 'Avtur')

BITRE – Bureau of Infrastructure and Transport Research Economics

CER – Clean Energy Regulator

CfP – Centre for Population

CO2-e – Carbon dioxide-equivalent emissions

CPI – Consumer Price Index

CSIRO – Commonwealth Scientific and Industrial Research Organisation

DITRDCA – Department of Infrastructure, Transport, Regional Development, Communications and the Arts

EIA – U.S. Energy Information Administration

ERP – Estimated resident population

GFC – Global Financial Crisis

IATA – International Air Transport Association

ICAO – International Civil Aviation Organization

IEA – International Energy Agency

IFAM – International Freight Assistance Mechanism

IFS – International Financial Statistics

IMF - International Monetary Fund

OD – origin–destination

OECD – Organisation for Economic Co-operation and Development

pkm – passenger kilometres (equivalent to one passenger moved one kilometre)

RPK – revenue passenger kilometres (equivalent to one revenue-paying passenger moved one kilometre)

RPT – regular (scheduled) passenger transport

SAF – Sustainable aviation fuel

SARS – Severe acute respiratory syndrome

SGM – Safeguard Mechanism

tkm – tonne kilometres (equivalent to one tonne moved one kilometre)

TOB – Traffic on board (by stage)

UD – uplift–discharge

UN – United Nations

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