



**Australian Government**

**Department of Infrastructure and Regional Development**

Bureau of Infrastructure, Transport and Regional Economics

RESEARCH REPORT

138



bitre

Maritime

**Containerised and non-containerised  
trade through Australian ports to 2032–33**



Bureau of Infrastructure, Transport and Regional Economics

# Containerised and non-containerised trade through Australian ports to 2032–33

Report 138

Department of Infrastructure and Regional Development  
Canberra, Australia

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ISSN: 1440-9569

ISBN: 978-1-925216-14-1

December 2014/INFRA2336

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Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2014, *Containerised and non-containerised trade through Australian ports to 2032–33*, Report 138, Canberra ACT.

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Bureau of Infrastructure, Transport and Regional Economics (BITRE)  
Department of Infrastructure and Regional Development  
GPO Box 501, Canberra ACT 2601, Australia

Telephone: (international) +61 2 6274 7210

Fax: (international) +61 2 6274 6855

Email: [bitre@infrastructure.gov.au](mailto:bitre@infrastructure.gov.au)

Website: [www.bitre.gov.au](http://www.bitre.gov.au)

# Foreword

This report presents national- and port-level forecasts of exports and imports of containerised and non-containerised freight and sea passengers movements through Australia's five largest capital city ports and, in aggregation, all 'Other Ports' (outside of the five main capital city ports) over the next 20 years. They have been developed on the basis of the estimated econometric models of export and import demand and the most recent economic outlook and population growth forecasts for Australia and its major trading partners. The forecasts update BITRE's previous 2006 and 2010 forecasts.

The study was undertaken by Dr Krishna Hamal (Team Leader) and Ilia Chibaev with data support from Mano Manoranjan and Adam Malarz. David Mitchell and Dr Gary Dolman provided comments on the draft report.

BITRE acknowledges the cooperation provided by the relevant port authorities and Ports Australia in developing the sea freight movement forecasts presented in this study.

Gary Dolman  
Head of Bureau  
Bureau of Infrastructure, Transport and Regional Economics  
December 2014



# At a glance

This report presents forecasts of exports and imports of containerised and non-containerised freight and sea passengers movements through Australia's five largest capital city ports and, in aggregation, all 'Other Ports' (outside of the five main capital city ports) over the next 20 years. The forecasts are based on econometric models of containerised and non-containerised export and import demand, combined with the most recent economic outlook and population growth forecasts for Australia and its major trading partners. The forecasts presented in this report update those previously published by the Bureau of Infrastructure, Transport and Regional Economics in BITRE (2006 and 2010).

The forecasts imply that Australia's sea trade will double over the next 20 years, largely due to the continuing positive economic outlook for Australia and its major trading partners. Total containerised trade through Australian ports, which is evenly distributed between exports (49.5 per cent by mass) and imports (50.5 per cent), is projected to increase by 5.1 per cent a year over the next 20 years, from 7.2 million twenty-foot equivalent units (TEUs) in 2012–13 to 19.4 million TEUs in 2032–33. It is forecast to increase annually by 6.2 per cent per year in Brisbane, 4.5 per cent in Sydney, 4.8 per cent in Melbourne, 5.4 per cent in Adelaide, 5.8 per cent in Fremantle and 5.1 per cent across all Other Ports. By 2032–33, the total volume of containerised trade is projected to reach to 3.6 million TEUs in Brisbane, 5.2 million TEUs in Sydney, 6.4 million TEUs in Melbourne, around 1.0 million TEUs in Adelaide, 2.1 million TEUs in Fremantle and 1.2 million TEUs across all Other Ports.

Australia's non-containerised trade is dominated by exports, which accounted for 89.6 per cent of total non-containerised trade volumes in 2012–13. Imports accounted for only 10.4 per cent of total non-containerised trade. Total non-containerised trade through Australian ports is projected to increase by 3.9 per cent a year over the next 20 years, from 1.1 billion tonnes in 2012–13 to 2.3 billion tonnes in 2032–33. It is forecast to increase annually by 2.8 per cent in Brisbane, 0.7 per cent in Sydney, 0.6 per cent in Melbourne, 4.6 per cent in Adelaide, 1.1 per cent in Fremantle and 4.0 per cent across all Other Ports. The total volume of non-containerised trade is forecast to increase to 48.9 million tonnes in Brisbane, 15.7 million tonnes in Sydney, 13.2 million tonnes in Melbourne, around 27.3 million tonnes in Adelaide, 31.9 million tonnes in Fremantle and 2,136.7 million (or 2.1 billion) tonnes across all Other Ports, by 2032–33.

The long-term outlook for the cruise shipping industry is also positive, largely due to the projected economic growth in source countries of cruise passengers, particularly the USA. The total (inbound plus outbound) number of cruise ship passengers through Australian ports is projected to increase by 1.8 per cent a year over the next 20 years, from 41 000 in 2012–13 to 59 100 in 2032–33.





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# Executive summary

## Background

Shipping is the main mode of transport for Australia's exports and imports. In 2012–13, total trade in commodities through Australian ports was 1.1 billion tonnes, comprising 992.7 million tonnes of exports and 140.2 million tonnes of imports. Sea freight accounted for 99.7 and 98.4 per cent of Australia's total merchandise exports and imports, by mass, respectively, in 2012–13, with the remainder by air. Over the past decade trade volumes through Australian ports have grown by 83.8 per cent (equivalent to average annual growth of 6.3 per cent per annum). Over the same period container movements through Australian ports have grown by 64.9 per cent (equivalent to average annual growth of 5.1 per cent per annum).

Forecasts of likely future containerised and non-containerised trade through ports are essential to informed planning and management of Australian port infrastructure and associated public policy. This study presents the updated forecasts of containerised and non-containerised through Australian ports over the next 20 years.

The forecasts presented in this report update previous forecasts published by the Bureau of Infrastructure, Transport and Regional Economics in BITRE (2002, 2006 and 2010). The updated forecasts are based on re-estimated econometric models of containerised and non-containerised export and import demand, incorporating the latest available port trade data, and the most recent economic outlook and population growth for Australia and its major trading partners.

## Freight forecasting models

Econometric models of containerised export and import demand have been used to forecast the volume of containerised and non-containerised exports and imports at the port level. The models, which are specified in terms of real income, population and exchange rates, are estimated using annual historical data. Port-level forecasts are presented for Australia's five main capital city ports—Brisbane, Sydney, Melbourne, Adelaide and Fremantle—and, in aggregation, all other ports, hereafter referred to as 'Other Ports' (that is, all Australian ports excluding these five main capital city ports). In 2012–13, the five main capital city ports accounted for about 93.8 per cent of Australia's total containerised trade, whereas Other Ports accounted 91.7 per cent of Australia's total non-containerised trade.

Similarly, forecasts of non-containerised export and import volumes are derived at the national and port level on the basis of econometric models which are specified in terms of real gross domestic product (GDP), population, export prices, import prices and exchange rates.

These estimates are also broadly consistent with BITRE's commodity-specific based export and import forecasts reported separately in BITRE (forthcoming).

## *Data sources*

In this study, historical data were used to estimate the econometric models of containerised and non-containerised export and import demand. Historical data on exports and imports of full and empty containers were obtained from Ports Australia (2014), Port of Brisbane (2013a & 2013b), Sydney Ports (2013), Port of Melbourne (2013 & 2014), Flinders Ports (2014) and Fremantle Ports (2013). Sea passenger movement data was sourced from ABS (2013b). Historical GDP growth, exchange rates, export prices and import prices were sourced from Deloitte Access Economics (2014). Australian population estimates were sourced from ABS (2014), while overseas population estimates for the United States of America (USA), Japan and the broader OECD have been sourced from OECD (2014a & 2014b) and IMF (2014).

## *Port exports and imports*

Importantly, the port export and import estimates presented in this report are based on Ports Australia's definition, which records all outgoing cargoes as 'exports' and all incoming cargoes as 'imports'. This definition includes outgoing and incoming domestic cargoes, shipped by coastal shipping services between Australian ports, and hence differs from the usual national accounting convention that restricts exports and imports purely to overseas trade-related movements. Coastal shipping volumes comprise around 9 per cent of total port cargo volumes, across all Australian ports, and between 16 and 25 per cent of major capital city port volumes, and so the main drivers of total cargo volumes through these ports are predominantly international trade related. Nonetheless, the 'export' and 'import' trade volumes reported here will differ slightly from official trade statistics.

## *Forecast Assumptions*

Long-run assumptions about future population growth, economic growth, exchange rates, export prices and import prices are used to develop the long-run forecasts of containerised and non-containerised trade and sea passenger numbers through Australian ports. Assumptions about future Australian population and real GDP growth were sourced from ABS (2013a) and the Treasury (2010 and 2014), respectively, assumptions about likely future population and real GDP growth for the USA, Japan and the broader OECD were sourced from OECD (2014b) and IMF (2014). All other macroeconomic assumptions were sourced from Deloitte Access Economics (2014).

Over the next twenty years, real GDP is forecast to increase by an annual average of 2.7 per cent a year for Australia, 2.5 per cent a year across the OECD, 1.3 per cent a year in Japan, 2.3 per cent a year for the USA and 6.7 per cent a year for China. This is below average trend growth experienced in Australia, USA and China and slightly above average trend growth experienced across all OECD countries and Japan over the past two decades. Consequently, these assumptions will broadly act to lower containerised and non-containerised import volume growth through Australian ports compared to the historical trend.



With regard to exchange rates, the value of the Australian dollar is assumed to decrease against the US dollar over the forecast period, from around US\$1.04 per Australian dollar in 2012–13 back to a value closer to the long-term average of US\$0.75 per Australian dollar in 2029–30 and onwards. A lower Australian dollar, against the US dollar, dampens Australia's import demand and improves the competitiveness of Australia's exports.

The population of Australia, USA and all OECD countries are projected to increase by an average of 1.5, 0.8 and 0.5 per cent a year, respectively, over the next 20 years. The population of Japan is forecast to decline by 0.4 per cent a year over the forecast period.

## Freight shipping forecasts

Importantly, the forecasts of containerised and non-containerised exports and imports presented in this report are 'unconstrained', in that they are based solely on demand-side parameters and do not factor in supply-side factors, which could constrain demand. Supply-side factors are not included because of the lack of long time-series data on variables influencing supply of port activities. Port-level trade forecasts are summarised in Tables ES.1 and ES.2.

The forecasts inherently assume that the historical relationship between port activity and GDP and other economic factors will hold into the future. If this is not the case, the forecasts presented in this report may over- or under-state future growth.

### Port of Brisbane

The Port of Brisbane is the third largest container port in Australia, by volume (after Melbourne and Sydney), accounting for 14.9 per cent of Australia's total containerised trade, measured in TEUs. Total containerised trade through the Port of Brisbane increased by 8.1 per cent a year over the last 14 years to 1.1 million TEUs in 2012–13. It is projected to increase by 6.2 per cent a year over the next 20 years to 3.6 million TEUs in 2032–33, including annual growth of 5.0 per cent in full container exports and 6.6 per cent in full container imports over the forecast period. Asia is projected to remain Brisbane's main regional export market in terms of tonnage.

**Table ES.1** Containerised trade by port

Port	Annual average growth rate		Trade volume	
	Actual 1998–99 to 2012–13	Forecast 2012–13 to 2032–33	Actual 2012–13	Forecast 2032–33
	per cent per annum		000 TEUs	
Brisbane	8.1	6.2	1 070	3 563
Sydney	6.5	4.5	2 126	5 155
Melbourne	5.9	4.8	2 512	6 415
Adelaide	7.7	5.4	339	972
Fremantle	6.6	5.8	670	2 055
Other Ports	5.7	5.1	447	1 218
All Ports	6.5	5.1	7 165	19 377

Source: BITRE estimates.

Total non-containerised trade through the Port of Brisbane increased by 3.7 per cent a year over the last 14 years, to 28.4 million tonnes in 2012–13, comprising 14.5 million tonnes of exports and 13.9 million tonnes of imports. It is projected to increase by 2.8 per cent a year over the next twenty years to 48.9 million tonnes in 2032–33. Non-containerised exports and imports are forecast to increase by 3.8 and 1.4 per cent a year, respectively, over the forecast period.

**Table ES.2** Non-containerised trade by port

Port	Annual average growth rate		Trade volume	
	Actual 1998–99 to 2012–13	Forecast 2012–13 to 2032–33	Actual 2012–13	Forecast 2032–33
	per cent per annum		million tonnes	
Brisbane	3.7	2.8	28.4	48.9
Sydney	-0.2	0.7	13.7	15.7
Melbourne	1.5	0.6	11.8	13.2
Adelaide	6.6	4.6	11.2	27.3
Fremantle	1.7	1.1	25.7	31.9
Other Ports	5.9	4.0	978.7	2 136.7
All Ports	5.5	3.9	1 069.4	2 277.5

Source: BITRE estimates.

## Sydney region ports

Sydney region ports are here defined to include Port Botany and the bulk and general cargo and cruise facilities within Sydney Harbour, which include Glebe Island and White Bay. Port Botany is Australia's second largest container port, accounting for 29.7 per cent of Australia's total containerised trade measured in TEUs. Total containerised trade through Sydney region ports increased by 6.5 per cent per year over the last 14 years to 2.1 million TEUs in 2012–13, and it is projected to increase by 4.5 per cent a year over the next 20 years to 5.2 million TEUs in 2032–33. Full container exports and imports through Sydney region ports are forecast to increase by 3.4 and 4.6 per cent a year, respectively, over the forecast period.

The significantly slower projected growth in total containerised trade through Sydney region ports (4.5 per cent per annum), in comparison with recent historical trends (6.5 per cent per annum), is driven primarily by projected slower domestic GDP growth and the assumed fall in the exchange rate, in combination with the relatively high estimated income and exchange rate elasticities for Sydney region ports' full containerised imports. In comparison, projected future containerised trade growth through the Port of Melbourne (4.8 per cent per annum), discussed further below, while projected to be slower than historical growth (5.9 per cent per annum), does not decline as sharply as that of Sydney, principally for two reasons. Firstly, Victorian population growth, a factor in containerised import demand through the Port of Melbourne, is projected to grow relatively faster than New South Wales' population, a factor in Sydney region ports import demand model. Secondly, full containerised import demand is more elastic to changes in income and exchange rates in Sydney than in Melbourne, meaning reductions in GDP, population and the exchange rate result in a larger drop in full containerised imports in Sydney than in Melbourne. Also, imports of empty containers are projected to grow

at a higher rate in Melbourne than in Sydney to service full containerised exports, which is forecast to grow at a relatively higher rate in Melbourne than in Sydney.

Non-containerised trade through Sydney region ports is limited to crude and refined petroleum products, liquids and gas, cement, gypsum and sugar, and accounted for approximately 1.3 per cent of Australia's total non-containerised trade in 2012–13. The volume of total non-containerised trade through Sydney region ports has declined slightly over the last 14 years, from 13.9 million tonnes in 1998–99 to 13.7 million tonnes in 2012–13. While the closure of the Shell oil refinery at Clyde in September 2012 and foreshadowed closure of the Caltex oil refinery at Kurnell, scheduled for mid-2014, will reduce the demand for crude imports, it is anticipated that this trade will be replaced by increased refined petroleum product imports, with little overall impact on import volumes.

The volume of non-containerised exports through Sydney region ports is expected to remain at its current level—0.9 million tonnes—over next 20 years, whereas the combined volume of imports through these ports is projected to increase by 0.7 per cent a year over the same period, to 14.8 million tonnes in 2032–33. As a result, total non-containerised trade through Sydney region ports is projected to increase by 0.7 per cent a year over the next twenty years to 15.7 million tonnes in 2032–33.

### *Port of Melbourne*

The Port of Melbourne is the largest container port in Australia, accounting for 35.1 per cent of Australia's total containerised trade. In 2012–13, total containerised trade through the Port of Melbourne was 2.5 million TEUs.

Total containerised trade through the Port of Melbourne, which has increased by 5.9 per cent a year over the last 14 years, is projected to increase by 4.8 per cent a year over the next 20 years to 6.4 million TEUs in 2032–33. The slightly lower rate of growth projected over the forecast period is due to the lower import growth forecast resulting from projected lower future economic growth in Australia and the assumed depreciation of the Australian dollar against the US dollar. Full container exports and imports are forecast to grow annually by 4.3 and 5.0 per cent over the next 20 years to around 2.0 and 3.0 million TEUs in 2032–33, respectively.

Total non-containerised trade through the Port of Melbourne increased by 1.5 per cent a year over the last 14 years, to 11.8 million tonnes in 2012–13. It is projected to increase by 0.6 per cent a year over the next 20 years, to 13.2 million tonnes in 2032–33. Non-containerised exports and imports through the Port of Melbourne are projected to rise by 0.4 and 0.7 per cent a year over the forecast period to 3.0 and 10.3 million tonnes, respectively.

### *Port Adelaide*

Port Adelaide's total containerised trade, which has increased by 7.7 per cent a year over the last 14 years to 339 000 TEUs in 2012–13, is projected to increase by 5.4 per cent a year over the next 20 years to 972 000 TEUs in 2032–33. The lower projected growth rate over the forecast period is largely due to expected slower economic growth in Australia and its major trading partners. Full container exports and imports are forecast to increase by 5.3 and

5.8 per cent a year over the forecast period, to 400 000 and 395 000 TEUs in 2032–33, respectively.

Total non-containerised trade through Port Adelaide increased by 6.6 per cent a year over the last 14 years to 11.2 million tonnes in 2012–13, and it is projected to increase by 4.6 per cent a year over the next 20 years to 27.3 million tonnes in 2032–33. Non-containerised exports and imports through Port Adelaide are forecast to increase by 4.4 and 4.8 per cent a year over the same period to 14.1 and 13.2 million tonnes in 2032–33, respectively.

## Port of Fremantle

Total containerised trade through the Port of Fremantle, which has increased by 6.6 per cent a year over the last 14 years to 670 000 TEUs in 2012–13, is projected to increase by 5.8 per cent a year over the next 20 years, to 2.1 million TEUs in 2032–33. The projected slower economic growth in Australia and its major trading partners is the main factor influencing the slower growth over the forecast period, compared with the historical growth rate over the last 14 years. Full containerised exports are forecast to increase by 3.3 per cent a year over the forecast period to 337 000 TEUs in 2032–33, whereas full containerised imports are projected to increase by 5.9 per cent a year over the same period to 1.0 million TEUs in 2032–33.

Total non-containerised trade through the Port of Fremantle increased by 1.7 per cent a year over the last 14 years, to 25.7 million tonnes in 2012–13. It is projected to increase by 1.1 per cent a year over the next 20 years to 31.9 million tonnes in 2032–33. Non-containerised exports are forecast to increase by 0.9 per cent a year over the forecast period to 17.9 million tonnes in 2032–33; whereas non-containerised imports are projected to increase by 1.4 per cent a year over the same period to 14.0 million tonnes in 2032–33.

## Other Ports

'Other Ports' in this study includes all other Australian ports, excluding the five major city ports—Brisbane, Sydney, Melbourne, Adelaide and Fremantle. Among the larger ports that are included in Other Ports are the major iron ore and coal export ports: Port Hedland, Dampier, Port Walcott, Newcastle, Gladstone and Hay Point; and regional ports at: Cairns, Devonport, Burnie, Launceston, Townsville, Hobart, Rockhampton and Darwin.

Total containerised trade through Other Ports increased by 5.7 per cent a year over the last 14 years to 447 000 TEUs in 2012–13. It is projected to increase by 5.1 per cent a year over the next 20 years to 1.2 million TEUs in 2032–33. Full containerised exports are forecast to increase by 2.8 per cent a year during the forecast period to 287 000 TEUs in 2032–33, whereas full containerised imports are projected to increase by 6.0 per cent a year to 436 000 TEUs in 2032–33.

Total non-containerised trade through Other Ports, which increased by 5.9 per cent a year over the last 14 years to around 1.0 billion tonnes in 2012–13, is projected to increase by 4.0 per cent a year over the next 20 years to 2.1 billion tonnes in 2032–33. Non-containerised exports, which account for 93.9 per cent of the total non-containerised trade through Other Ports—predominated by iron ore and coal—are forecast to increase by 4.1 per cent a year over the next 20 years to 2.1 billion tonnes in 2032–33. In contrast, non-containerised imports

through Other Ports are projected to increase by 0.5 per cent a year over the forecast period to 65.4 million tonnes in 2032–33.

## All Ports

Across all Australian ports, total containerised trade increased by 6.5 per cent a year over the last 14 years to 7.2 million TEUs in 2012–13, and it is projected to increase by 5.1 per cent a year over the next 20 years to 19.4 million TEUs in 2032–33. The forecast slowing of growth in total containerised trade is largely due to the maturing of Australia's export and import markets, expected slower economic growth in Australia and its major trading partners and the assumed depreciation of the Australian dollar against the US dollar. Full containerised exports and imports are forecast to increase by 4.2 and 5.3 per cent a year over the forecast period to 4.8 and 9.2 million TEUs in 2032–33, respectively.

Australia's non-containerised trade, which includes dry bulk—including coal and iron ore—liquid bulk—primarily oil and gas—bunker fuels and other non-containerised commodities, increased by 5.5 per cent a year over the last 14 years to 1.1 billion tonnes in 2012–13. It is projected to increase by 3.9 per cent a year over the next 20 years to 2.3 billion tonnes in 2032–33. Total non-containerised exports, which account for 89.6 per cent of the total non-containerised trade through all Australian ports, are forecast to increase by 4.1 per cent a year over the next 20 years to 2.1 billion tonnes in 2032–33; whereas non-containerised imports are expected to increase by 1.1 per cent a year over the same period to 138.5 million tonnes in 2032–33.

## Cruise shipping forecasts

In this study, econometric models of inbound and outbound sea passenger numbers were used to forecast the number of sea passengers passing through Australian ports. The models, which are specified in terms of population, real income and exchange rates, were estimated using historical data covering the 29-year period from 1983–84 to 2012–13.

The total number of international sea passengers passing through Australian ports has increased by 2.5 per cent a year over the last 29 years to 41 000 passengers in 2012–13. It is projected to increase by 1.8 per cent a year over the next 20 years to 59 100 passengers in 2032–33. Projected slower economic growth in Australia and the USA, and the lower value of the Australian dollar against the US dollar are expected to slow growth in outbound sea passengers but boost growth in inbound sea passengers, compared with the historical growth experienced over the last 29 years. The number of inbound sea passengers, which increased by 1.9 per cent a year over the last 29 years to 15 500 in 2012–13, is projected to increase annually by 2.9 per cent over the forecast period to 27 300 in 2032–33. On the other hand, the number of outbound sea passengers, which increased by 3.0 per cent a year over the last 14 years to 25 500 in 2012–13, is forecast to increase by 1.1 per cent a year over the next 20 years to 31 800 in 2032–33.



## CHAPTER I

# Introduction

Australia is an island nation and many of its principal export and import commodities are relatively dense, low-value commodities. Hence, shipping accounts for over 98 per cent of Australia's total trade, by weight. In 2012–13, total trade in commodities through Australian ports was 1.1 billion tonnes, comprising 992.7 million tonnes of exports and 140.2 million tonnes of imports. Sea freight accounted for 99.7 and 98.4 per cent of Australia's total merchandise exports and imports, by mass, respectively, in the same year. Over the past decade trade volumes through Australia's ports have grown by 83.8 per cent. Over the same period container movements through Australia's ports have grown by 64.9 per cent.

Non-containerised cargoes, which include coal, iron ore and the majority of grain exports, currently account for 94.4 per cent of Australia's total sea cargo by mass, whereas containerised cargoes account for 5.6 per cent by mass.

Long-term forecasts of containerised and non-containerised trade are useful to governments and port authorities to inform planning and development of capacity and infrastructure at Australian ports, as well as for assessment and implementation of appropriate security measures at those ports. For these reasons, BITRE has been publishing port-trade forecasts since 2002.

Ports Australia (2013) has also advocated adoption of long-term master planning processes across Australian ports to help improve land use planning and corridor protection in and around ports and, thereby, improve productivity outcomes, increase investment confidence and protect nearby environments. Such plans would typically be informed by current and projected future trade patterns and volumes.

This report presents separate long term forecasts of containerised and non-containerised trade for Australia's five largest capital city ports and, in aggregation, all Other Ports, to 2032–33. The five capital city ports included in this report are the Port of Brisbane, 'Sydney region ports'—comprising Port Botany and Sydney Harbour terminals—the Port of Melbourne, Port Adelaide and the Port of Fremantle. 'Other Ports' refers to all Australian ports excluding the five capital city ports and the term 'All Ports' refers to the total trade across all Australian ports.

The forecasts presented in this report update those previously published by the Bureau of Infrastructure, Transport and Regional Economics in BITRE (2002, 2006 and 2010). The forecasts have been updated on the basis of re-estimated econometric models of containerised and non-containerised export and import demand and the most recent economic outlook and population growth for Australia and its major trading partners. The econometric models were re-estimated by adding recently available data on port-specific trade activity to the historical data series that were used to estimate the models in previous BITRE studies.

This study also updates national-level forecasts of Australia's inbound and outbound sea passenger numbers. However, port-level forecasts of sea passenger numbers could not be developed due to a lack of recent time series data covering port-specific sea passenger movements.

Forecasts of freight and cruise ship movements, last published in BITRE (2006 and 2010), also could not be updated due to lack of recent historical data on ship movements by the size and type of ship (bulk, container or general cargo ship) at the time of preparing the shipping forecasts presented in this report.

## Objectives

The main objectives of this study are:

- to forecast the volume of containerised and non-containerised trade at both the port- and national-level, and
- to forecast international sea passenger movements at the national-level.

## Outline of the report

The remainder of the report is structured as follows. Chapter 2 presents the econometric models of containerised and non-containerised trade demand, including model specification and parameter estimates, and briefly discusses the implications of the empirical results. Historical time series data on trade, and their sources, as well as assumptions about macroeconomic and population variables, are discussed in Chapter 3.

In Chapter 4, the national and port level forecasts of containerised and non-containerised trade are presented in detail. Forecasts of sea passenger movements are provided in Chapter 5. Chapter 6 discusses the sensitivity of the forecasts to variations in future GDP growth and exchange rate assumptions. Some concluding remarks are presented in Chapter 7.



## CHAPTER 2

# Freight forecasting models

### Introduction

In this study, econometric models were used to forecast containerised and non-containerised trade and sea passenger numbers over the next 20 years. Separate port-specific models were used to forecast containerised and non-containerised trade, developed for each of the five main capital city ports and, in aggregation, all Other Ports in Australia. Forecasts of sea passenger numbers were only produced at the national level, not at the port level, due to the lack of reliable long time-series data on sea passenger numbers through each port. The specification of the forecasting models, and their parameter estimates, are discussed in detail in the later sections of this chapter.

As mentioned in BITRE (2006), econometric models have been preferred over time trend or univariate time-series models to forecast containerised and non-containerised trade at the port level for the reasons that they can accommodate several economic and non-economic explanatory variables, they are easy to estimate, provide superior fit and the estimated parameters can be directly interpreted as elasticities. Econometric models have been widely used in many tourism and transport demand forecasting studies in the past.

In these models, population, income, exchange rates and export and import prices are included as drivers of export and import demand of containerised and non-containerised trade. Separate forecasts for exports and imports of both containerised and non-containerised trade are presented in this report. The models were estimated using annual data and the forecasts are also annual. Importantly, the data used here to forecast port cargo 'exports' and 'imports' also includes domestic cargo movements through ports. Domestic coastal movements comprise only a small share of total movements through ports, and so don't invalidate the port movement forecasts. However, the port 'export' and 'import' estimates presented here will differ from official trade statistics (See Box 1.1).

Unlike in previous BITRE studies, forecasts of ship movements could not be developed due to the unavailability of recent historical data on ship movements, by size and type of ship (bulk, container or general cargo ship) at the time of preparing the shipping forecasts presented in this report.

Australia is also a major exporter of agricultural commodities, particularly grains, meat and livestock, sugar and dairy products. Agricultural export volumes can fluctuate significantly from year-to-year depending on actual climatic conditions, world commodity prices and, most significantly, domestic production volumes. For these commodities, crop planting, weather

conditions and domestic demand are likely to be more relevant indicators of agricultural export volumes than overseas demand. Consequently, the accuracy of export forecasts could arguably be improved by segmenting trade by port and commodity and estimating each component separately. However, this was beyond the scope of this study due principally to the lack of readily available long time-series commodity-level export and import volumes by port. A separate BITRE-study is investigating expected future export and import volumes for major traded commodities through Australian ports (BITRE forthcoming).

### Box 1.1 Definition – exports and imports

The port export and import estimates presented in this report are based on Ports Australia's trade statistics, which defines all outgoing cargoes loaded at Australian ports as 'exports' and all incoming cargoes discharged at Australian ports as 'imports'. This includes outgoing and incoming domestic cargoes, shipped by coastal shipping services between Australian ports. This definition differs from the usual national accounting convention that restricts exports and imports purely to overseas trade-related movements, and differs from the treatment in BITRE (2006). Accordingly, this report, as much as possible, distinguishes 'port exports' and 'port imports'—i.e. all port outgoing and incoming cargo—from trade 'exports' and trade 'imports'.

Coastal shipping volumes are around 9 per cent of total port trade volumes, across all Australian ports, and between 16 and 25 per cent of major capital city port volumes, and so the main drivers of total cargo volumes through these ports are predominantly international trade related. Consequently, the main drivers of overall port cargo volumes are predominantly international trade related.

## Containerised and non-containerised trade forecasting models

As in previous BITRE port container trade forecasting studies, single equation port-specific models are used in this study to forecast the volume of containerised and non-containerised trade at the port level.

In this study, separate models of full containerised export and import volumes and empty import containers, all measured in twenty-foot equivalent units (TEUs), are estimated separately for each port. Empty export containers are derived as the residual of full and empty imports less full exports. The volumes of full and empty containerised exports and imports are then added to derive total containerised trade in TEUs.

Similarly, separate models of non-containerised exports and imports are derived, to account for the different factors influencing each. The models are then used to forecast volumes of non-containerised exports and imports, which are then combined to derive forecasts of total non-containerised trade at port and national levels.

The econometric models of containerised and non-containerised exports and imports are discussed in the following sections.

## Full container exports

The model of full container exports is specified in terms of population, real income, exchange rates and the number of full container imports. The model is presented in equation (2.1).

$$\ln PFUX_{it} = \alpha_0 + \alpha_{i1} \ln PGDP_{jt} + \alpha_{i2} \ln EXUSAU_t + \alpha_{i3} \ln FUM_{it} + u_{it} \quad (2.1)$$

where,

$PFUX_{it}$  = per capita full container exports from the  $i$ -th port of Australia in year  $t$  in TEUs;

$PGDP_{jt}$  = per capita real Gross Domestic Product (GDP) in the  $j$ -th export destination country in year  $t$  in billion US dollars;

$EXUSAU_t$  = exchange rate of the US dollar per Australian dollar in year  $t$ ;

$FUM_{it}$  = full container imports to the  $i$ -th port in year  $t$  in TEUs;

$u$  = error term;

$\alpha$ 's = regression coefficients;

$i$  =  $i$ -th port (1 = Port of Brisbane, 2 = Sydney region ports, 3 = Port of Melbourne, 4 = Port of Adelaide and 5 = Port of Fremantle and 6 = Other Ports);

$j$  =  $j$ -th export destination country; and

$t$  = time subscript.

Since OECD countries currently account for approximately 43.0 per cent of the total value of Australia's goods and services exports, the population and real income of all OECD countries combined are used as a proxy for the population and real income of export destinations for goods shipped from Brisbane, Sydney, Melbourne, Adelaide and Other Ports. In the case of the Port of Fremantle, Japan was the main export destination for goods shipped from Fremantle over most years of the model estimation period, although China has overtaken Japan more recently. Hence, the population and real income of Japan are used as a proxy for the population and real income of all export markets for modelling exports through Fremantle. In 2011–12, around 29 800 full container export TEUs were destined for China and around 22 000 full container export TEUs for Japan.

Furthermore, most OECD countries are relatively mature export markets. Hence, the use of total OECD population and income to represent Australia's container export destinations is expected to provide more stable long-run elasticities of container export demand.

In Australia, two sizes of containers are most commonly used to transport exports and imports—twenty-foot and forty-foot containers. Although twenty-foot containers are mostly preferred for Australian exports and forty-foot containers for Australian imports, they are to some degree interchangeable, and Australian shippers use a proportion of empty import containers to load their export cargo. Hence, the full container export model also includes the number of import containers (i.e. containers emptied after unloading imported cargo) as one of the explanatory variables. In this study, full container imports are used as a proxy variable for the number of empty import containers available for servicing exports.

In the model, full container exports and real GDP were transformed to per capita equivalent measures to avoid the consequences of a possible collinearity between population and real GDP. The model is empirically estimated using historical data from 1993–94 to 2012–13 and the main estimated regression results are presented in Table 2.1. The results show that the estimated models are a good fit with adjusted R-square values ranging from 0.67 to 0.99, implying that the predictive power of the models is reasonably high.

According to the estimated elasticities, per capita real income is the main driver of full container exports. The estimates imply that a one per cent increase (decrease) in per capita real income in Australia's main export markets will result in an increase (decrease) in per capita full container exports of 3.4 per cent in Brisbane, 2.2 per cent in Sydney, 1.3 per cent in Melbourne, 3.6 per cent in Adelaide, 2.5 per cent in Fremantle and 1.2 per cent across Other Ports. The elasticities also show that full container exports are negatively influenced by the exchange rate in all individual ports and generally positively by the number of import containers for Melbourne, Adelaide, Fremantle and across all Other Ports. The number of import containers is not statistically significant for Brisbane and Sydney.

**Table 2.1** Estimated regression statistics of per capita full container export demand

Port	Elasticity			Adjusted-R2 value
	Income	Exchange rate	Import containers	
Brisbane	3.404*	-0.232*	NS	0.98
Sydney	2.230*	-0.108	NS	0.99
Melbourne	1.258*	-0.075*	0.373*	0.99
Adelaide	3.622*	-0.037	0.178	0.97
Fremantle	2.486*	-0.476*	0.620*	0.99
Other Ports	1.194	-0.827*	0.763	0.67

\*Statistically highly significant. NS = Statistically not significant.

Source: BITRE estimates.

## Full container imports

The econometric model of full container imports presented in equation (2.2) is specified in terms of population, real GDP and exchange rates.

$$\ln PFUM_{it} = \beta_{i0} + \beta_{i1} \ln PGDPAU_t + \beta_{i2} \ln EXUSAU_t + e_{it} \quad (2.2)$$

where,

$PFUM_{it}$  = per capita full container imports to the  $i$ -th port in year  $t$  in TEUs;

$PGDPAU_t$  = per capita real Gross Domestic Product (GDP) of Australia in year  $t$  in million dollars;

$EXUSAU_t$  = exchange rate of the US dollar per Australian dollar in year  $t$ ;

$e$  = error term;

$\beta$ 's = regression parameters;

$i$  =  $i$ -th port (1 = Port of Brisbane, 2 = Sydney region ports, 3 = Port of Melbourne, 4 = Port of Adelaide and 5 = Port of Fremantle and 6 = Other Ports); and

$t$  = time subscript.

In the model, Australian GDP is used as a proxy for the income of local residents, because long-term forecasts are readily available. While Gross State Product (GSP) might provide a more representative measure of local incomes, long-term forecasts of GSP are generally not available, limiting its suitability for long-term forecasting.

Historical time-series data from 1993–94 to 2012–13 were used to estimate the full container import model. The estimated regression statistics of the model presented in Table 2.2 suggest that the model has good predictive power, with adjusted R-square values ranging from 0.90 to 0.99, and the estimated income elasticities are highly statistically significant for all ports. The exchange rate elasticities are significant for all capital city ports, except Fremantle and all Other Ports. While not statistically significant, the exchange rate variable is included in the containerised import model of the Port of Fremantle as it increases the predictive power of the model and the estimated elasticity is of the expected (positive) sign.

**Table 2.2** Estimated regression statistics of per capita full container import demand

Port	Elasticity		Adjusted-R2 value
	Income	Exchange rate	
Brisbane	4.485*	0.107**	0.99
Sydney	2.830*	0.238*	0.99
Melbourne	2.596*	0.185*	0.99
Adelaide	4.043*	0.263**	0.96
Fremantle	3.240*	0.040	0.98
Other Ports	4.502*	NS	0.90

\*Statistically significant at or below 0.10 level of significance. \*\*Statistically significant at or below 0.30 level of significance.

NS = Statistically not significant.

Source: BITRE estimates.

Real per capita income is observed to be the main driver of full container imports. A one per cent increase (decrease) in per capita real GDP leads per capita full container imports to increase (decrease) by 4.5 per cent in Brisbane, 2.8 per cent in Sydney, 2.6 per cent in Melbourne, 4.0 per cent in Adelaide and 3.2 per cent in Fremantle and 4.5 per cent in Other Ports. Similarly, the estimated exchange rate elasticity implies that the volume of full container imports increases (decreases) with the appreciation (depreciation) of the Australian dollar against the US dollar; although the estimated elasticities are fairly small, implying that changes in the exchange rate have only a small impact on container import volumes.

### Empty container imports

Australia's exports generally comprise a larger share of higher density, bulk raw materials and primary products. By contrast, a large proportion of Australia's imports are final manufactures, such as pharmaceuticals and other high value, low density commodities. Forty-foot containers are generally more cost effective for lower density manufactures, where volume constraints are more pressing than mass limits. Conversely, twenty-foot containers are preferred for higher density cargoes, where total container mass is generally the limitation. Consequently, forty-foot containers are generally a higher share of total import containers than of total export containers. Therefore, a proportion of containers used to import commodities are exported empty, and some additional twenty-foot containers imported empty to help service the export task.

Import of empty containers to export Australian commodities depends largely on the volume of full containerised exports and the number of import containers available to transport Australian exports. Hence, the model of empty container imports is specified in terms of the volume of full containerised exports and imports—the latter being used to reflect the number of import containers available to transport Australian exports—as shown in equation (2.3).

$$\ln EMM_{it} = \lambda_{i0} + \lambda_{i1} \ln FUX_{it} + \lambda_{i2} \ln FUM_{it} + \lambda_{i3} \ln D_{it} + w_{it} \quad (2.3)$$

where,

$EMM_{it}$  = empty container imports to the  $i$ -th port in year  $t$  in TEUs;

$FUX_{it}$  = full containerised exports through the  $i$ -th port in year  $t$  in TEUs;

$FUM_{it}$  = full containerised imports through the  $i$ -th port in year  $t$  in TEUs;

$D_{it}$  = dummy variable to capture a large variation in empty container imports to the  $i$ -th port in year  $t$ ;

$w_{it}$  = error term;

$\lambda$ 's = regression parameters;

$i$  =  $i$ -th port (1 = Port of Brisbane, 2 = Sydney region ports, 3 = Port of Melbourne, 4 = Port of Adelaide and 5 = Port of Fremantle and 6 = Other Ports); and

$t$  = time subscript.

Historical data from 1993–94 to 2012–13 were used to estimate the model. The estimated regression statistics presented in Table 2.3 suggest that the model is a good fit for all ports

with adjusted R-square values ranging from 0.73 to 0.95. The elasticity of full containerised export volume is highly significant and positive, implying that empty container imports increase (decrease) with an increase (decrease) of the volume of full containerised exports. A one per cent increase (decrease) in the volume of full containerised exports leads empty container imports to increase (decrease) by 1.3 per cent in Brisbane, 2.0 per cent in Sydney, 2.4 per cent in Melbourne, 0.6 per cent in Adelaide, 3.0 per cent in Fremantle and 1.1 per cent in Other Ports.

Similarly, the elasticity of full containerised imports is highly significant and negative for Brisbane, Sydney, Melbourne and Fremantle but not for Adelaide and Other Ports, implying that the volume of empty container imports increases (decreases) with a decrease (increase) of the volume of full containerised imports through Brisbane, Sydney, Melbourne and Fremantle. A one per cent increase (decrease) in the volume of full containerised imports will lead empty container imports to decrease (increase) by 0.5 per cent in Brisbane, 1.2 per cent in Sydney, 1.3 per cent in Melbourne and 1.9 per cent in Fremantle. The volume of full containerised imports does not appear to influence empty container imports in Port of Adelaide and Other Ports.

**Table 2.3** Estimated regression statistics of empty container import demand

Port	Elasticity		Adjusted-R2 value
	FC Exports	FC Imports	
Brisbane	1.344*	-0.548*	0.78
Sydney	1.978*	-1.241*	0.74
Melbourne	2.373*	-1.269*	0.93
Adelaide	0.640*	NS	0.95
Fremantle	3.030*	-1.889*	0.86
Other Ports	1.072*	NS	0.73

FC = Full Containerised. \*Statistically highly significant at or below 0.10 level of significance.

NS = Statistically not significant.

Source: BITRE estimates.

## Empty container exports

As already mentioned, there are significantly more full import containers than full export containers through Australian ports, and greater use of forty-foot containers for imports than for exports. Consequently, a large volume of containers are exported empty.

Empty export containers have been derived as the residual of full and empty container imports less full container exports and the estimated number of containers that are damaged and/or used for local purposes (equation 2.4). Some containers are damaged during shipment and some are retained in Australia for local transportation and/or non-transportation uses, such as storage, accommodation, etc.

$$EMX_{it} = FUM_{it} + EMM_{it} - FUX_{it} + DLU_{it} \quad (2.4)$$

where,

$EMX_{it}$  = empty container exports from the  $i$ -th port in year  $t$  in TEUs;

$FUM_{it}$  = full container imports to the  $i$ -th port in year  $t$  in TEUs;

$EMM_{it}$  = empty container imports to the  $i$ -th port in year  $t$  in TEUs;

$FUX_{it}$  = full container exports from the  $i$ -th port in year  $t$  in TEUs;

$DLU_{it}$  = containers that are damaged and/or retained in Australia for local usages in year  $t$  in TEUs;

$i$  =  $i$ -th port (1 = Port of Brisbane, 2 = Sydney region ports, 3 = Port of Melbourne, 4 = Port of Adelaide and 5 = Port of Fremantle and 6 = Other Ports); and

$t$  = time subscript.

## Non-containerised exports

The model of non-containerised exports, which is specified in terms of population, real income, exchange rates and real export prices, is presented in equation (2.5).

$$\ln PBX_{it} = \delta_{i0} + \delta_{i1} \ln PGDP_{jt} + \delta_{i2} \ln EXUSAU_t + \delta_{i3} \ln XPR_t + m_{it} \quad (2.5)$$

where,

$PBX_{it}$  = per capita non-containerised exports from the  $i$ -th port in year  $t$  in thousand tonnes;

$PGDP_{jt}$  = per capita real Gross Domestic Product (GDP) in the  $j$ -th export destination country in year  $t$  in billion US dollars;

$EXUSAU_t$  = exchange rate of the US dollar per Australian dollar in year  $t$ ;

$XPR_t$  = real export prices at the national level in year  $t$ ;

$m_{it}$  = error term;

$\delta$ 's = regression parameters;

$i$  =  $i$ -th port (1 = Port of Brisbane, 2 = Sydney region ports, 3 = Port of Melbourne, 4 = Port of Adelaide and 5 = Port of Fremantle and 6 = Other Ports);

$j$  =  $j$ -th export destination country; and

$t$  = time subscript.



China is Australia's largest export destination accounting for 29.4 per cent of Australia's total exports by value (\$249.2 billion) in 2012. Iron ore and concentrates dominated Australia's exports to China, accounting for 52.8 per cent of the total exports to China, followed by coal 9.3 per cent, gold 7.5 per cent and crude petroleum 3.3 per cent. Accordingly, real Chinese GDP was used as the proxy for the real income of people living in Australia's export destination countries in the model of non-containerised exports.

The model of non-containerised exports is estimated using historical data, from 1993–94 to 2011–12. According to the estimated regression results presented in Table 2.4, the model is a relatively good fit for non-containerised exports through Brisbane, Melbourne, Adelaide and Other Ports, but fit non-containerised exports through Sydney and Port of Fremantle less well, mainly due to significant annual fluctuations in historical export volumes through these ports.

**Table 2.4** Estimated regression statistics of non-containerised export demand

Port	Elasticity			Adjusted-R2 value
	Income	Exchange rate	Export price	
Brisbane	0.493*	-0.219**	NS	0.93
Sydney	NS	NS	-0.130	0.19
Melbourne	NS	NS	-0.954**	0.72
Adelaide	1.296**	-0.957*	NS	0.86
Fremantle	NS	NS	-0.087**	0.34
Other Ports	0.707*	NS	-0.217*	0.98

\*Statistically significant at or below 0.10 level of significance. \*\*Statistically significant at or below 0.30 level of significance.

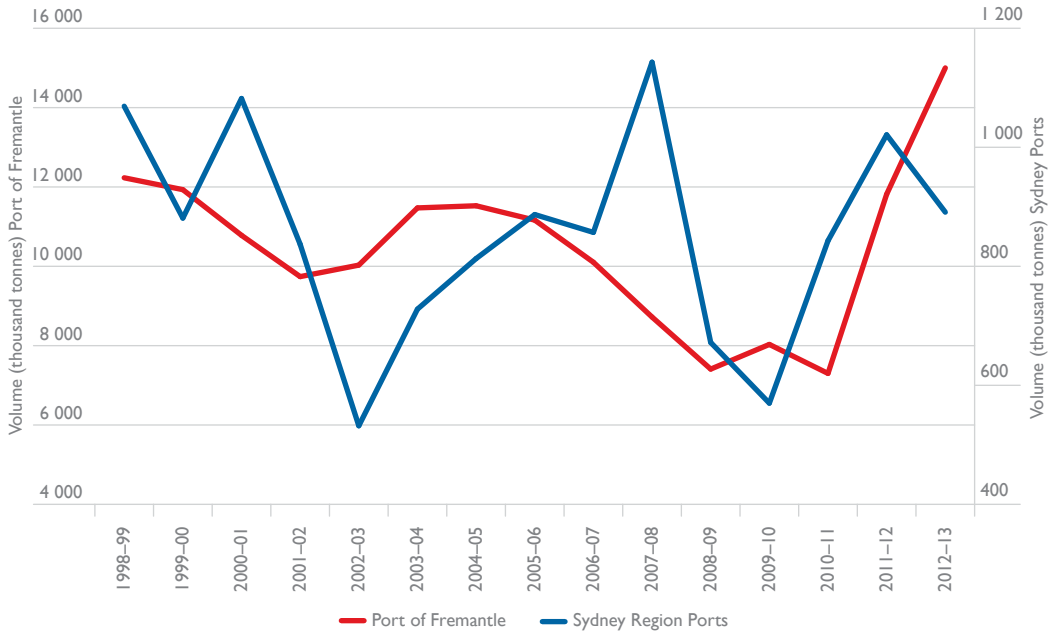
NS = Statistically not significant.

Source: BITRE estimates.

The volume of non-containerised exports through Sydney region ports has fluctuated by as much as 47.9 per cent, from year-to-year over the period 1998–99 and 2012–13, while the volume of non-containerised exports through the Port of Fremantle has fluctuated by as much as 61.9 per cent, from year-to-year over the same period (see Figure 2.1).

The regression results indicate that the foreign real income (proxied by real Chinese GDP) was a statistically significant driver of non-containerised exports from the Port of Brisbane, Port Adelaide and Other Ports, but not from Sydney, Melbourne and the Port of Fremantle. Real Chinese GDP was observed as being significantly correlated with non-containerised exports through the Port of Brisbane and Other Ports, but not with non-containerised exports through Port Adelaide. Real GDP of the OECD region was found to have a significant correlation with non-containerised exports through Port Adelaide. One possible reason for not observing a significant relationship between Chinese real income and Port Adelaide's non-containerised exports could be that grain is the largest non-containerised export commodity passing through Port Adelaide and that China is not a dominant export destination of Australian grain—it was ranked as the fourth largest grain export destination after Indonesia, Vietnam and South Korea, between October 2011 and 31 March 2012.

**Figure 2.1** Non-containerised exports through the Port of Fremantle and Sydney region ports, 1998–99 to 2012–13



Sources: Ports Australia (2013b).

The estimated income elasticities imply that a one per cent increase (decrease) in overseas per capita real income will result in a 0.5 per cent increase (decrease) in the volume of non-containerised exports from the Port of Brisbane, 1.3 per cent for Port Adelaide and 0.7 per cent for Other Ports.

Similarly, the estimated regression results suggest that exchange rates are statistically significant drivers of non-containerised exports through the Port of Brisbane and Port Adelaide; whereas real export prices are statistically significant drivers of non-containerised exports through the Port of Melbourne, the Port of Fremantle and Other Ports. The estimated exchange rates and export price elasticities imply that a one per cent depreciation (appreciation) of the Australian dollar against the US dollar will lead to an increase (decrease) in non-containerised exports by 0.2 per cent in Brisbane and 1.0 per cent in Adelaide; whereas a one per cent decrease (increase) in real export prices will result in a 0.1 per cent increase (decrease) in the volume of non-containerised exports from Sydney and Fremantle, 1.0 per cent from Melbourne and 0.2 per cent from all Other Ports.

## Non-containerised imports

The model of non-containerised imports is specified in terms of population, real GDP, real import prices and a time trend term, which is included as a proxy for variables that affect the volume of non-containerised imports but are not directly observable. It is likely to capture the influence of changes in consumer preferences for non-containerised import goods.

The model of non-containerised imports is presented in equation (2.6).

$$\ln PBM_{it} = \theta_{i0} + \theta_{i1} \ln PGDPAU_t + \theta_{i2} MPR_t + \theta_{i3} T_t + n_{it} \quad (2.6)$$

where,

$PBM_{it}$  = per capita non-containerised imports to the  $i$ -th port in year  $t$  in thousand tonnes;

$PGDPAU_t$  = per capita real Gross Domestic Product (GDP) of Australia in year  $t$  in million dollars;

$MPR_t$  = real import prices at the national level in year  $t$ ;

$T$  = time trend variable;

$n$  = error term;

$\theta$ 's = regression parameters;

$i$  =  $i$ -th port (1 = Port of Brisbane, 2 = Sydney region ports, 3 = Port of Melbourne, 4 = Port of Adelaide and 5 = Port of Fremantle and 6 = Other Ports);

$j$  =  $j$ -th export destination country; and

$t$  = time subscript.

The model is estimated using historical data, from 1998–99 to 2011–12, and the estimated regression results are presented in Table 2.5. The results show that the model is a relatively good fit for non-containerised imports through Sydney, Adelaide, Fremantle and Other Ports, with the adjusted R-square values ranging from 0.61 to 0.92, but does not fit the cases of Brisbane and Melbourne nearly as well.

Real per capita income is observed to be the main driver of non-containerised imports in all five capital city ports and Other Ports. A one per cent increase (decrease) in per capita real income will increase (decrease) the per capita volume of non-containerised imports by 0.4 per cent in Brisbane, 2.2 per cent in Sydney, 2.9 per cent in Melbourne, 4.0 per cent in Adelaide, 0.9 per cent in Fremantle and 1.8 per cent in Other Ports. Similarly, a one per cent increase (decrease) in real import prices will lead to a decrease (increase) in the volume of non-containerised imports by 0.1 per cent for Brisbane and Adelaide, 1.3 per cent for Melbourne, 0.6 per cent for Fremantle and 0.3 per cent for Other Ports.

The estimated coefficient of the time trend variable is found to be negative and statistically significant for all ports bar Port Adelaide, implying that there has been a sustained trend decline in the volume of non-containerised imports across most ports over the last 14 years.

**Table 2.5** Estimated regression statistics of non-containerised import demand

Port	Elasticity			Adjusted-R2 value
	Income	Import price	Time trend	
Brisbane	0.380*	-0.058	-0.008*	0.31
Sydney	2.181*	NS	-0.040*	0.77
Melbourne	2.905*	-1.342	-0.052*	0.52
Adelaide	3.982*	-0.077	NS	0.92
Fremantle	0.854*	-0.569*	-0.024*	0.77
Other Ports	1.757*	-0.314*	-0.040*	0.61

\*Statistically significant at or below 0.10 level of significance. NS = Statistically not significant.

Source: BITRE estimates.

## Sea passenger forecasting models

As in the previous BITRE port forecasting studies (BITRE 2002 and 2006), econometric models of inbound and outbound sea passengers were estimated and used to forecast Australia’s inbound and outbound sea passenger numbers at the national level. Port-level models could not be estimated due to the lack of long historical time-series data on sea passenger numbers at the port level. Outbound and inbound sea passengers are recorded by port of first arrival and last departure, respectively, and do count multiple port visits by individuals.

The econometric inbound and outbound sea passenger models are discussed below.

### Inbound sea passengers

The econometric model of inbound sea passenger demand is specified in terms of population, real income, exchange rates and a dummy variable, to capture the impact of SARS on passenger numbers in 2002–03, in equation (2.7).

$$\ln PISP_t = \psi_1 + \psi_2 \ln PGDPUS_t + \psi_3 \ln EXUSAU_t + \psi_4 DSARS_t + \omega_t \tag{2.7}$$

where,

$PISP_t$  = per capita inbound sea passenger numbers in year  $t$ ;

$PGDPUS_t$  = per capita real GDP of the USA in year  $t$ ;

$EXUSAU_t$  = exchange rate of the US dollar per Australian dollar in year  $t$ ;

$DSARS_t$  = dummy variable used to capture the influence of Severe Acute Respiratory Syndrome (SARS) on Australia’s inbound sea passenger numbers in 2002–03;

$\omega_t$  = error term;

$\psi$ 's = regression parameters; and

$t$  = time subscript.

The USA dominates Australia's inbound sea passenger movements; hence, USA real GDP is used as a proxy for the income of sea passengers visiting Australia. Since long time-series data on sea travel costs are not available, the influence of travel prices on inbound sea passengers could not be included in the inbound sea passenger forecasting model. The exchange rate variable is included in the model to incorporate its influence on the number of inbound sea passengers. A lower value of the Australian dollar against the US dollar will tend to attract more sea passengers to Australia.

The model was estimated using 30 years of historical data, covering the period 1983–84 to 2012–13. The estimated regression statistics, which are presented in Table 2.6, indicate that the model is a reasonably good fit with an adjusted R-square value of 0.58. The estimated coefficients are highly significant and have expected signs. They show that inbound sea passenger demand is positively influenced by the per capita real income of passengers and negatively by the exchange rate of the Australian dollar measured in terms of the US dollar.

The estimated income elasticity implies that a one per cent increase (decrease) in real income will increase (decrease) the number of inbound sea passengers by 1.2 per cent. Similarly, the estimated exchange rate elasticity suggests that a one per cent depreciation (appreciation) of the Australian dollar against the US dollar will lead to a 1.0 per cent increase (decrease) in the number of inbound sea passengers.

**Table 2.6** Estimated regression statistics of sea passenger demand

Passenger type	Elasticity		Adjusted-R2 value
	Income	Exchange rate	
Inbound	1.197*	-0.983*	0.58
Outbound	1.284*	1.353*	0.61

\*Statistically significant at or below 0.10 level of significance.

Source: BITRE estimates.

## Outbound sea passengers

The econometric model of outbound sea passenger demand is specified in terms of population, real income and exchange rates. A dummy variable is also included to capture the impact of SARS on outbound sea passenger numbers in 2002–03, in equation (2.8).

$$\ln POSP_t = \mu_1 + \mu_2 \ln PGDPAU_t + \mu_3 \ln EXUSAU_t + \mu_4 DSARS_t + k_t \quad (2.8)$$

where,

$POSP_t$  = per capita outbound sea passenger numbers in year  $t$ ;

$PGDPAU_t$  = per capita real Gross Domestic Product (GDP) of Australia in year  $t$  in million dollars;

$EXUSAU_t$  = exchange rate of the US dollar per Australian dollar;

$DSARS_t$  = Dummy variable used to capture the influence of Severe Acute Respiratory Syndrome (SARS) on Australia's outbound sea passenger numbers in 2002–03;

$k$  = error term;

$\mu$ 's = regression parameters; and

$t$  = time subscript.

The model was estimated using 30 years of historical data, from 1983–84 to 2012–13, and the estimated regression results are shown in Table 2.6. According to the results, the model is a good fit with an adjusted R-square value of 0.61, and the estimated income and exchange rate elasticities are highly significant, implying that outbound sea passenger demand is positively influenced by per capital real income and exchange rates. A one per cent increase (decrease) in per capita real income will lead to a 1.3 per cent increase (decrease) in the number of outbound sea passengers; whereas a one per cent appreciation (depreciation) of the Australian dollar against the US dollar will lead to a 1.4 per cent increase (decrease) in the number of outbound sea passengers.

## CHAPTER 3

# Freight modelling data and assumptions

### Data

The econometric models of containerised and non-containerised trade were estimated using historical data on containerised and non-containerised exports and imports, empty containers, population, GDP, exchange rates, export prices and import prices. Historical data on exports and imports of full and empty containers were obtained from Ports Australia (2014), Port of Brisbane (2013a & 2013b), Sydney Ports (2013), Port of Melbourne (2013 & 2014), Flinders Ports (2014) and Fremantle Ports (2013). Sea passenger movement estimates were obtained from ABS (2013b). GDP, exchange rates, export prices and import prices were sourced from Deloitte Access Economics (2014), Australian population estimates from ABS (2014), and OECD region, USA and Japanese population estimates from OECD (2014a & 2014b) and IMF (2014).

### Assumptions

Long-run assumptions about likely future population, GDP, exchange rates, export and import prices and model parameters are required to develop the long-run forecasts of containerised and non-containerised trade and sea passenger numbers. These assumptions are presented in the following sections.

#### *Macroeconomic and population*

Assumptions about future Australian population and real GDP growth are based on ABS (2013a) and the Treasury (2010 and 2014), respectively. Assumptions about future population and real GDP growth for Japan, USA and the OECD region were obtained from OECD (2014b) and IMF (2014). All other macroeconomic assumptions are based on Deloitte Access Economics (2014).

ABS and OECD projections of population growth and Treasury projections of long-term Australian GDP growth cover the entire forecast horizon considered in this report. Projections of likely future overseas GDP growth, export and import prices and exchange rates, however, are generally only available for a ten-year horizon (i.e. out to 2023–24). For these variables, the forecast growth rates are generally assumed to be the same or marginally lower than those in year 2023–24. The forecast assumptions are shown in Tables 3.1 to 3.4. For simplicity, Australian average import and export prices are assumed to remain broadly unchanged beyond 2023–24.

**Table 3.1** Economic growth rates

Year	Real GDP					Export prices	Import prices	Exchange rate (US\$/AU\$)
	Australia	OECD	Japan	USA	China			
	(per cent)							
2008–09	1.7	-2.8	-5.3	-3.6	9.4	19.7	11.1	0.79
2009–10	2.0	0.3	0.7	-0.2	9.8	-15.5	-11.6	0.88
2010–11	2.2	2.6	1.9	2.7	9.8	17.2	-3.0	0.97
2011–12	3.6	1.9	1.5	2.2	8.5	1.1	0.8	1.03
2012–13	2.7	1.0	0.2	1.8	7.8	-9.5	0.1	1.04
2013–14	<b>2.4</b>	<b>2.2</b>	<b>1.9</b>	<b>2.4</b>	<b>7.5</b>	<b>4.6</b>	<b>9.0</b>	<b>0.92</b>
2014–15	<b>2.6</b>	<b>2.8</b>	<b>1.3</b>	<b>3.0</b>	<b>7.3</b>	<b>-4.2</b>	<b>1.2</b>	<b>0.93</b>
2015–16	<b>3.0</b>	<b>2.8</b>	<b>1.4</b>	<b>2.7</b>	<b>7.2</b>	<b>-0.3</b>	<b>2.6</b>	<b>0.90</b>
2016–17	<b>3.0</b>	<b>2.8</b>	<b>1.4</b>	<b>2.3</b>	<b>7.1</b>	<b>1.7</b>	<b>3.0</b>	<b>0.88</b>
2017–18	<b>3.0</b>	<b>2.8</b>	<b>1.4</b>	<b>2.3</b>	<b>7.0</b>	<b>1.2</b>	<b>3.3</b>	<b>0.85</b>
2018–19	<b>3.2</b>	<b>2.8</b>	<b>1.4</b>	<b>2.3</b>	<b>6.9</b>	<b>0.7</b>	<b>2.2</b>	<b>0.84</b>
2019–20	<b>3.2</b>	<b>2.8</b>	<b>1.4</b>	<b>2.3</b>	<b>6.8</b>	<b>0.6</b>	<b>1.5</b>	<b>0.83</b>
2020–21	<b>3.2</b>	<b>2.7</b>	<b>1.4</b>	<b>2.3</b>	<b>6.7</b>	<b>0.7</b>	<b>1.2</b>	<b>0.82</b>
2021–22	<b>3.1</b>	<b>1.3</b>	<b>0.7</b>	<b>1.1</b>	<b>3.2</b>	<b>0.3</b>	<b>0.5</b>	<b>0.82</b>
2022–23	<b>3.1</b>	<b>2.7</b>	<b>1.4</b>	<b>2.3</b>	<b>6.5</b>	<b>0.4</b>	<b>0.5</b>	<b>0.82</b>
2023–24	<b>3.1</b>	<b>2.7</b>	<b>1.5</b>	<b>2.2</b>	<b>7.0</b>	<b>0.0</b>	<b>0.0</b>	<b>0.82</b>
2024–25	<b>2.9</b>	<b>2.5</b>	<b>1.3</b>	<b>2.2</b>	<b>6.8</b>	<b>0.0</b>	<b>0.0</b>	<b>0.80</b>
2025–26	<b>2.7</b>	<b>2.4</b>	<b>1.3</b>	<b>2.2</b>	<b>6.8</b>	<b>0.0</b>	<b>0.0</b>	<b>0.79</b>
2026–07	<b>2.5</b>	<b>2.3</b>	<b>1.3</b>	<b>2.2</b>	<b>6.8</b>	<b>0.0</b>	<b>0.0</b>	<b>0.78</b>
2027–28	<b>2.3</b>	<b>2.3</b>	<b>1.2</b>	<b>2.2</b>	<b>6.6</b>	<b>0.0</b>	<b>0.0</b>	<b>0.77</b>
2028–29	<b>2.3</b>	<b>2.3</b>	<b>1.2</b>	<b>2.2</b>	<b>6.6</b>	<b>0.0</b>	<b>0.0</b>	<b>0.76</b>
2029–30	<b>2.2</b>	<b>2.3</b>	<b>1.2</b>	<b>2.2</b>	<b>6.6</b>	<b>0.0</b>	<b>0.0</b>	<b>0.75</b>
2030–31	<b>2.2</b>	<b>2.3</b>	<b>1.1</b>	<b>2.2</b>	<b>6.5</b>	<b>0.0</b>	<b>0.0</b>	<b>0.75</b>
2031–32	<b>2.2</b>	<b>2.2</b>	<b>1.1</b>	<b>2.2</b>	<b>6.5</b>	<b>0.0</b>	<b>0.0</b>	<b>0.75</b>
2032–33	<b>2.2</b>	<b>2.2</b>	<b>1.1</b>	<b>2.2</b>	<b>6.5</b>	<b>0.0</b>	<b>0.0</b>	<b>0.75</b>
Annual average								
1992–93 to 2012–13	3.4	2.2	0.8	2.7	9.8	2.4	-0.7	0.75
<b>2012–13 to 2032–33</b>	<b>2.7</b>	<b>2.5</b>	<b>1.3</b>	<b>2.3</b>	<b>6.7</b>	<b>0.3</b>	<b>1.2</b>	<b>0.82</b>

\* Numbers in bold are forecasts.

Sources: Treasury (2010 & 2014), OECD (2014b), IMF (2014) and Deloitte Access Economics (2014).

Australia's real GDP grew by an average of 3.4 per cent a year over the last 20 years (Table 3.1). Treasury projects it will increase by an annual average of 2.7 per cent a year over the forecast period (Treasury 2010 & 2014).

With regard to exchange rates, the value of the Australian dollar is assumed to decrease against the US dollar over the forecast period, from US\$1.04 per Australian dollar in 2012–13 to US\$0.75 per Australian dollar in 2032–33, similar to the long-term average exchange rate between 1992–93 and 2012–13 (Table 3.1). A lower Australian dollar, against the US dollar,



increases the cost to Australians of imports and improves the competitiveness of Australia's exports.

Australia's population grew by an average annual rate of 1.3 per cent a year over the last 20 years (Table 3.2). It is projected to grow by an average of 1.5 per cent a year over the next 20 years to 2032–33. The population of Australia's major trading partner countries are projected to increase relatively slowly, by an average of 0.5 per cent across all OECD countries, albeit declining in absolute terms in some countries (e.g. the population of Japan is projected to decline by, an average, 0.4 per cent per annum over the next 20 years).

**Table 3.2** Population growth rates

Year	Australia	OECD (per cent)	Japan	USA
2008–09	2.1	0.7	0.0	0.9
2009–10	1.6	0.6	0.0	0.8
2010–11	1.4	0.6	-0.1	0.7
2011–12	1.7	0.6	-0.2	0.7
2012–13	1.8	0.6	-0.1	0.3
<b>2013–14</b>	<b>1.7</b>	<b>0.6</b>	<b>-0.2</b>	<b>0.7</b>
<b>2014–15</b>	<b>1.8</b>	<b>0.6</b>	<b>-0.2</b>	<b>0.8</b>
2015–16	1.8	0.6	-0.3	0.8
2016–17	1.7	0.6	-0.3	0.8
2017–18	1.7	0.5	-0.3	0.8
2018–19	1.7	0.5	-0.4	0.8
2019–20	1.6	0.5	-0.4	0.8
2020–21	1.6	0.5	-0.4	0.8
2021–22	1.6	0.5	-0.4	0.8
2022–23	1.5	0.5	-0.4	0.8
2023–24	1.5	0.5	-0.4	0.8
2024–25	1.5	0.4	-0.4	0.8
2025–26	1.4	0.4	-0.4	0.8
2026–07	1.4	0.4	-0.4	0.8
2027–28	1.4	0.4	-0.4	0.8
2028–29	1.4	0.4	-0.4	0.8
2029–30	1.3	0.4	-0.4	0.8
2030–31	1.3	0.4	-0.4	0.8
2031–32	1.3	0.3	-0.4	0.8
2032–33	1.3	0.3	-0.4	0.8
Annual average				
1992–93 to 2012–13	1.3	0.7	0.1	1.0
<b>2012–13 to 2032–33</b>	<b>1.5</b>	<b>0.5</b>	<b>-0.4</b>	<b>0.8</b>

\* Numbers in bold are forecasts.

Sources: ABS (2013a), OECD (2014b), IMF (2014) and Deloitte Access Economics (2014).

Of the five mainland States, with capital city ports included in this study, Western Australia and Queensland are forecast to experience relatively stronger population growth than New South Wales, Victoria and South Australia. The populations of Western Australia and Queensland are projected to increase by 2.5 and 1.8 per cent per annum, respectively, over the next 20 years, while the population of Victoria is projected to grow by 1.5 per cent a year on average, New South Wales by 1.1 per cent per annum and South Australia by 0.9 per cent per annum (Table 3.3).

**Table 3.3 State population growth rates in Australia**

Year	Qld	NSW	Vic	SA	WA
(per cent)					
1998–99	2.6	1.6	2.2	1.3	3.2
2007–08	1.8	1.3	1.7	1.1	2.3
2008–09	1.6	1.0	1.4	0.8	2.7
2009–10	2.0	1.2	1.7	1.0	3.6
2010–11	1.9	1.4	1.9	0.9	3.4
2011–12	2.3	1.1	1.6	1.2	3.0
2012–13	2.1	1.3	1.8	1.0	3.1
<b>2013–14</b>	<b>2.0</b>	<b>1.3</b>	<b>1.8</b>	<b>1.1</b>	<b>3.0</b>
<b>2014–15</b>	<b>2.0</b>	<b>1.3</b>	<b>1.8</b>	<b>1.0</b>	<b>2.9</b>
<b>2015–16</b>	<b>2.0</b>	<b>1.3</b>	<b>1.7</b>	<b>1.0</b>	<b>2.8</b>
<b>2016–17</b>	<b>1.9</b>	<b>1.3</b>	<b>1.7</b>	<b>1.0</b>	<b>2.8</b>
<b>2017–18</b>	<b>1.9</b>	<b>1.2</b>	<b>1.7</b>	<b>1.0</b>	<b>2.7</b>
<b>2018–19</b>	<b>1.9</b>	<b>1.2</b>	<b>1.6</b>	<b>1.0</b>	<b>2.6</b>
<b>2019–20</b>	<b>1.8</b>	<b>1.2</b>	<b>1.6</b>	<b>0.9</b>	<b>2.6</b>
<b>2020–21</b>	<b>1.8</b>	<b>1.2</b>	<b>1.6</b>	<b>0.9</b>	<b>2.5</b>
<b>2021–22</b>	<b>1.8</b>	<b>1.1</b>	<b>1.5</b>	<b>0.9</b>	<b>2.4</b>
<b>2022–23</b>	<b>1.7</b>	<b>1.1</b>	<b>1.5</b>	<b>0.9</b>	<b>2.4</b>
<b>2023–24</b>	<b>1.7</b>	<b>1.1</b>	<b>1.5</b>	<b>0.8</b>	<b>2.3</b>
<b>2024–25</b>	<b>1.7</b>	<b>1.1</b>	<b>1.4</b>	<b>0.8</b>	<b>2.3</b>
<b>2025–26</b>	<b>1.6</b>	<b>1.1</b>	<b>1.4</b>	<b>0.8</b>	<b>2.2</b>
<b>2026–07</b>	<b>1.6</b>	<b>1.0</b>	<b>1.4</b>	<b>0.8</b>	<b>2.2</b>
<b>2027–28</b>	<b>1.6</b>	<b>1.0</b>	<b>1.3</b>	<b>0.8</b>	<b>2.1</b>
<b>2028–29</b>	<b>1.5</b>	<b>1.0</b>	<b>1.3</b>	<b>0.7</b>	<b>2.1</b>
<b>2029–30</b>	<b>1.5</b>	<b>1.0</b>	<b>1.3</b>	<b>0.7</b>	<b>2.0</b>
<b>2030–31</b>	<b>1.5</b>	<b>0.9</b>	<b>1.3</b>	<b>0.7</b>	<b>2.0</b>
<b>2031–32</b>	<b>1.9</b>	<b>1.1</b>	<b>1.3</b>	<b>0.8</b>	<b>1.9</b>
<b>2032–33</b>	<b>1.9</b>	<b>1.1</b>	<b>1.3</b>	<b>0.8</b>	<b>1.9</b>
Annual average					
1992–93 to 2012–13	2.1	1.0	1.2	0.7	2.0
<b>2012–13 to 2032–33</b>	<b>1.8</b>	<b>1.1</b>	<b>1.5</b>	<b>0.9</b>	<b>2.5</b>

\* Numbers in bold are forecasts.

Sources: ABS (2013a).

## CHAPTER 4

# Forecasts of containerised and non-containerised trade through Australia's major ports

### Introduction

This chapter outlines the forecasts of containerised and non-containerised trade through Australia's major ports. As previously discussed, the forecasts are based purely on the econometric demand models outlined in Chapter 2. The potential influence of supply-side factors, such as port capacity and shipping service supply, has not been taken into account in the development of the forecasts due to the lack of long time-series data on supply-side variables influencing port activities. Hence, these forecasts are unconstrained forecasts.

### Port of Brisbane

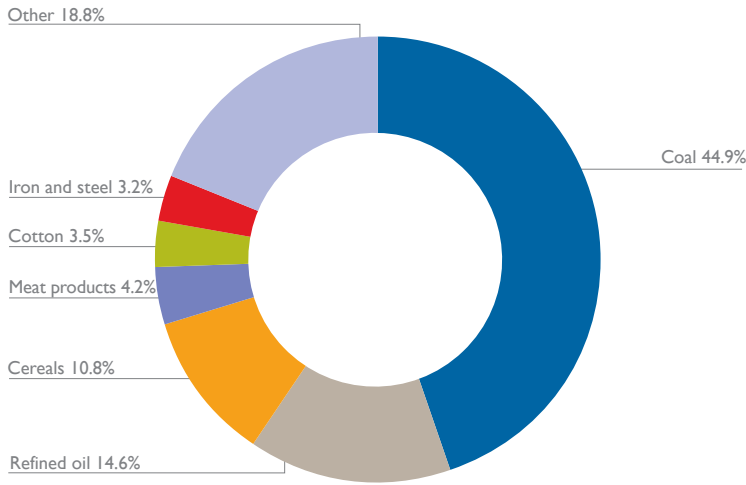
The Port of Brisbane, which is managed by the Port of Brisbane Pty Ltd, is the third largest container port in Australia, after Melbourne and Sydney, accounting for 14.9 per cent of Australia's total containerised trade, measured in TEUs, in 2012–13.

Total trade through the Port of Brisbane increased by 11.9 per cent to 37.2 million tonnes in 2011–12—containerised trade increasing by 2.8 per cent to 1.0 million TEUs and non-containerised trade increasing by 14.0 per cent to 28.5 million tonnes over this period. Although total trade growth slowed in 2012–13, due principally to the slowing of growth in bulk exports and refined oil imports in that year—total trade increased by 1.0 per cent in 2012–13—containerised trade increased more strongly in 2012–13, increasing by 6.4 per cent to 1.1 million TEUs over the same period.

In 2012–13, 51.7 per cent of total trade (by mass) through the Port of Brisbane were exports and the remaining 48.3 per cent were imports. The main commodities exported through the Port of Brisbane in 2012–13 were coal, refined oil, cereals, meat products, cotton, and iron and steel (Figure 4.1). Similarly, the main commodities imported through the Port of Brisbane in 2012–13 were crude oil, refined oil, cement, and iron and steel (Figure 4.2).

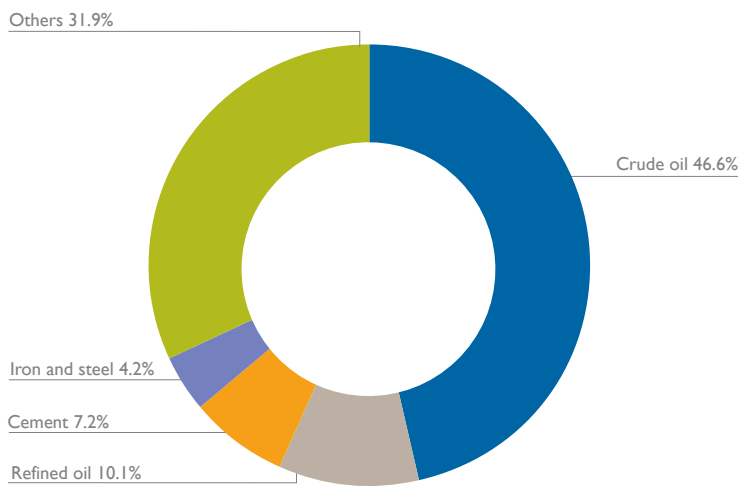
Goods such as meat products, cotton, paper and wood pulp, timber and cereals are exported in containers, whereas household items, building products, electric equipment, paper and wood pulp and iron and steel are imported in containers.

**Figure 4.1** Main export commodities exported through the Port of Brisbane, 2012–13



Source: Port of Brisbane (2013a).

**Figure 4.2** Main import commodities through the Port of Brisbane, 2012–13

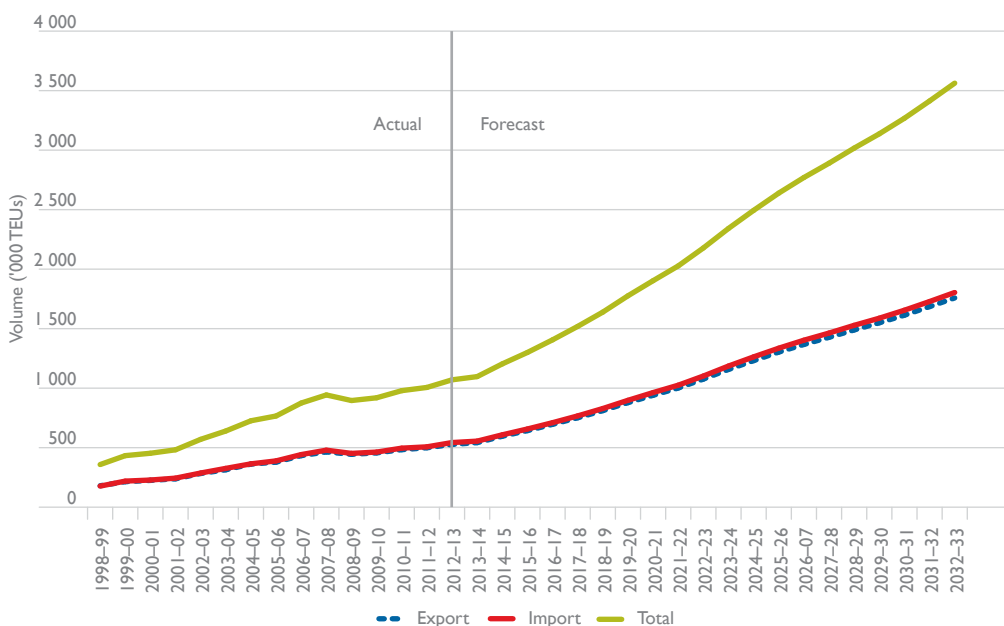


Source: Port of Brisbane (2013a).

### Containerised trade

The total containerised trade of Port of Brisbane has increased by an average of 8.1 per cent per annum over the last 14 years, from 358 000 TEUs in 1998–99 to 1.1 million TEUs in 2012–13, largely due to high import growth, resulting from high population growth and improved economic conditions in South East Queensland, and high export growth, resulting from the continuation of the strong economic performance in Brisbane’s major export destinations. Containerised exports and imports increased annually by 8.0 and 8.3 per cent, respectively, over the same period, to 527 000 and 543 000 TEUs in 2012–13 (Figure 4.3 and Table 4.1).

Figure 4.3 Containerised trade: Port of Brisbane



Sources: Ports Australia (2014) and BITRE estimates.

In 2012–13, full and empty containers accounted for 63.6 and 36.4 per cent of the total containerised exports through the Port of Brisbane. Full containerised exports, which increased by an average of 5.8 per cent a year over the last 14 years, are projected to increase by 5.0 per cent a year over the next 20 years, from 335 000 TEUs in 2012–13 to 890 000 TEUs in 2032–33, mainly due to a positive economic outlook for the major export destination countries of Brisbane. OECD region GDP, which increased by 2.2 per cent a year over the last 14 years, is forecast to increase by 2.5 per cent a year over the next 20 years.

Moreover, expected strong economic growth in China and India is likely to have a positive influence on the volume of containerised exports through the Port of Brisbane.

Of total containerised imports to the Port of Brisbane, about 88.4 per cent are full containers and the remaining 11.6 per cent are empty containers. Full containerised imports, which increased by an average of 10.1 per cent a year over the last 14 years, are forecast to increase by 6.6 per cent a year over the next 20 years, from 480 000 TEUs in 2012–13 to 1.7 million TEUs in 2032–33. The projected strong growth in full containerised imports is the result of the positive long-term economic outlook for Australia, the expected depreciation of the Australian dollar against the US dollar and projected strong population growth in South East Queensland over the forecast period. Real Australian GDP is projected to increase by 2.7 per cent a year over the forecast period. The value of the Australian dollar has been assumed to decrease from US\$1.04 (per Australian dollar) in 2012–13 to US\$0.75 in 2029–30 and onwards. The population of Queensland is projected to increase by 1.8 per cent a year over the forecast period.

**Table 4.1** Containerised trade: Port of Brisbane

Year	Exports			Imports			Total trade
	Full	Empty	Total	Full	Empty	Total	
	('000 TEUs)						
1998–99	153	27	180	124	53	177	358
2008–09	271	173	444	378	75	452	896
2009–10	258	198	456	405	58	463	919
2010–11	283	199	483	434	62	496	979
2011–12	314	186	499	450	57	507	1006
2012–13	335	192	527	480	63	543	1070
<b>2013–14</b>	<b>323</b>	<b>219</b>	<b>542</b>	<b>488</b>	<b>67</b>	<b>555</b>	<b>1097</b>
2014–15	358	238	596	547	62	608	1204
2015–16	386	257	643	593	64	657	1300
2016–17	421	275	696	643	67	710	1406
2017–18	449	302	751	698	69	767	1519
2018–19	474	337	811	759	69	829	1639
2019–20	504	374	878	826	72	898	1776
2020–21	506	434	940	895	68	963	1903
2021–22	538	463	1001	956	70	1025	2027
2022–23	572	504	1076	1031	71	1102	2178
2023–24	604	553	1157	1114	72	1186	2342
2024–25	637	594	1231	1190	73	1263	2494
2025–26	669	633	1303	1262	74	1336	2639
2026–07	696	671	1367	1328	74	1403	2770
2027–28	732	695	1427	1387	76	1463	2890
2028–29	766	723	1489	1450	77	1528	3017
2029–30	794	755	1549	1511	78	1588	3137
2030–31	823	790	1613	1577	78	1655	3268
2031–32	862	823	1685	1648	80	1728	3413
2032–33	890	868	1758	1723	81	1804	3563
Annual average growth rate (per cent)							
1998–99 to 2012–13	5.8	14.9	8.0	10.1	1.3	8.3	8.1
<b>2012–13 to 2032–33</b>	<b>5.0</b>	<b>7.8</b>	<b>6.2</b>	<b>6.6</b>	<b>1.3</b>	<b>6.2</b>	<b>6.2</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.

The projected growth in full containerised imports also results in an increase in the number of empty containers to be exported from Australia for reuse. Full container exports are not projected to grow as strongly, and from a lower base, contributing to an imbalance between full import and export containers. Exports of empty containers, which increased by an average of 14.9 per cent a year over the last 14 years, are projected to increase by 7.8 per cent a year over the next 20 years, from 192 000 TEUs in 2012–13 to 868 000 TEUs in 2032–33.

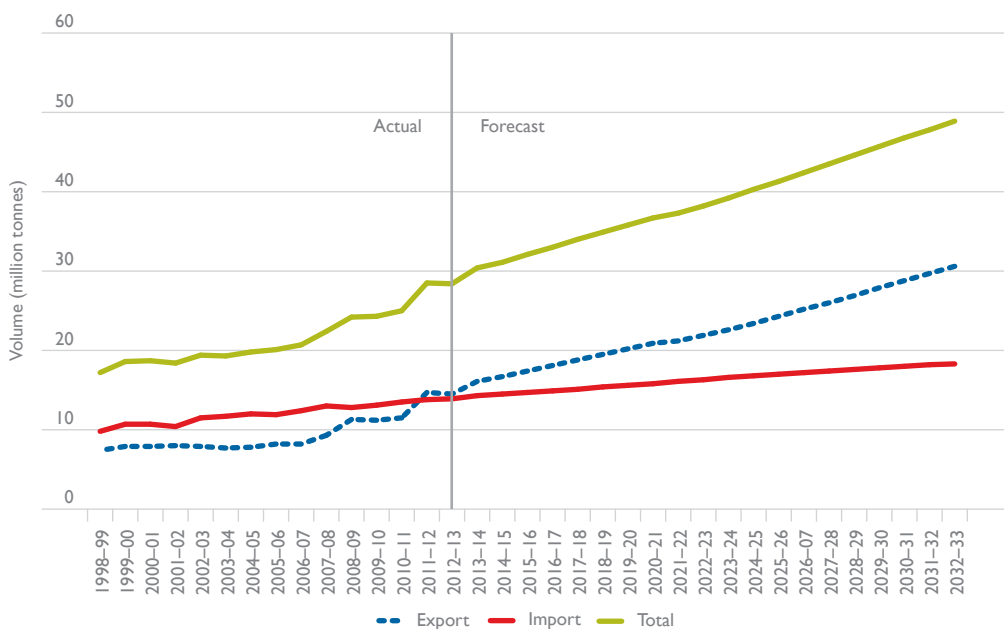
Despite the increase in the number of empty export containers, the demand for empty import containers is projected to continue to grow to service the growing demand for containerised exports. The volume of empty import containers, which increased by 1.3 per cent a year over the last 14 years, is projected to rise by 1.3 per cent a year over the forecast period, from 63 000 TEUs in 2012–13 to 81 000 in 2032–33.

Overall, BITRE projects an increase of 6.2 per cent a year in total containerised trade through the Port of Brisbane over the next 20 years to 3.6 million TEUs in 2032–33.

### Non-containerised trade

In 2012–13, 28.4 million tonnes of non-containerised commodities were shipped through the Port of Brisbane, including 14.5 million tonnes of exports and 13.9 million tonnes of imports (Figure 4.4 and Table 4.2). Major export commodities include coal and refined oil, which account for 60.1 and 19.5 per cent, respectively, of Brisbane's total non-containerised exports. Major import commodities also include crude oil and refined oil, which account for 60.7 and 13.2 per cent, respectively, of Brisbane's total non-containerised imports.

Figure 4.4 Non-containerised trade: Port of Brisbane



Sources: Ports Australia (2014) and BITRE estimates.

The volume of total non-containerised trade through the Port of Brisbane in 2011–12 increased by 14.0 per cent over the previous year, largely due to an increase of 28.1 per cent in non-containerised exports and 2.0 per cent in non-containerised imports, principally increased exports of refined oil (up 12.6 per cent), cereals (up 15.0 per cent) and cotton (up 22.6 per cent) and increased imports of break bulk motor vehicles (up 11.8 per cent), crude oil (up 6.2 per cent) and paper and wood chips (up 60 per cent) (Port of Brisbane 2013a). However, the performance of the export and import sectors was not as strong in 2012–13. The volume of non-containerised exports through the Port of Brisbane decreased

by 6.7 per cent in 2012–13; whereas the volume of non-containerised imports through the port increased by 1.0 per cent in that year, resulting in the volume of total non-containerised trade through the Port of Brisbane declining by 0.4 per cent in the year.

**Table 4.2** Non-containerised trade: Port of Brisbane

Year	Export	Import	Total
	(million tonnes)		
1998–99	7.4	9.8	17.2
2008–09	11.3	12.8	24.2
2009–10	11.2	13.1	24.3
2010–11	11.5	13.5	25.0
2011–12	14.7	13.8	28.5
2012–13	14.5	13.9	28.4
<b>2013–14</b>	<b>16.1</b>	<b>14.3</b>	<b>30.4</b>
<b>2014–15</b>	<b>16.7</b>	<b>14.5</b>	<b>31.1</b>
<b>2015–16</b>	<b>17.4</b>	<b>14.7</b>	<b>32.1</b>
<b>2016–17</b>	<b>18.1</b>	<b>14.9</b>	<b>33.0</b>
<b>2017–18</b>	<b>18.8</b>	<b>15.1</b>	<b>34.0</b>
<b>2018–19</b>	<b>19.5</b>	<b>15.4</b>	<b>34.9</b>
<b>2019–20</b>	<b>20.2</b>	<b>15.6</b>	<b>35.8</b>
<b>2020–21</b>	<b>20.9</b>	<b>15.8</b>	<b>36.7</b>
<b>2021–22</b>	<b>21.2</b>	<b>16.1</b>	<b>37.3</b>
<b>2022–23</b>	<b>21.9</b>	<b>16.3</b>	<b>38.2</b>
<b>2023–24</b>	<b>22.6</b>	<b>16.6</b>	<b>39.2</b>
<b>2024–25</b>	<b>23.4</b>	<b>16.8</b>	<b>40.3</b>
<b>2025–26</b>	<b>24.3</b>	<b>17.0</b>	<b>41.3</b>
<b>2026–07</b>	<b>25.2</b>	<b>17.2</b>	<b>42.4</b>
<b>2027–28</b>	<b>26.0</b>	<b>17.4</b>	<b>43.5</b>
<b>2028–29</b>	<b>26.9</b>	<b>17.6</b>	<b>44.6</b>
<b>2029–30</b>	<b>27.9</b>	<b>17.8</b>	<b>45.7</b>
<b>2030–31</b>	<b>28.8</b>	<b>18.0</b>	<b>46.8</b>
<b>2031–32</b>	<b>29.7</b>	<b>18.2</b>	<b>47.8</b>
<b>2032–33</b>	<b>30.6</b>	<b>18.3</b>	<b>48.9</b>
Annual average growth rate (per cent)			
1998–99 to 2012–13	4.9	2.6	3.7
<b>2012–13 to 2032–33</b>	<b>3.8</b>	<b>1.4</b>	<b>2.8</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.

Total non-containerised trade through the Port of Brisbane, which increased by an average of 3.7 per cent a year over the last 14 years, is forecast to increase by 2.8 per cent a year over the next 20 years to 48.9 million tonnes in 2032–33 (Figure 4.2 and Table 4.2). The main reason for the lower growth forecast is the slowing of growth in non-containerised exports



and imports. The volume of non-containerised exports, which increased by 4.9 per cent a year over the last 14 years, is forecast to increase by 3.8 per cent a year over the next 20 years, from 14.5 million tonnes in 2012–13 to 30.6 million tonnes in 2032–33, with the projected rise in export prices and a relatively strong Australian dollar being the main factors dampening projected future growth over the forecast period. The growth in exports will be driven by export of coal, refined oil, meat products, iron and steel, timber and woodchips. Average real export prices are projected to increase by 0.3 per cent a year over the forecast period, whereas the exchange rate is expected to remain around or above US 80 cents per Australian dollar over the next 15 years and around US 75 cents per Australian dollar over the last five years of the forecast period.

The volume of non-containerised imports, which increased by 2.6 per cent a year over the last 14 years, is projected to rise by 1.4 per cent a year over the forecast period, from 13.9 million tonnes in 2012–13 to 18.3 million tonnes in 2032–33, largely due to the expected lower growth in real GDP and higher growth in import prices in Australia over the forecast period, compared with the corresponding growth rates over the last 14 years.

## Sydney Region Ports

In April 2013, operation of Port Botany (and Port Kembla) was privatised—under a 99-year operating lease awarded to the NSW Ports Consortium. Sydney Ports Corporation—the previous owner and operator of Port Botany—retained ownership and operation of Sydney Harbour, and White Bay and Glebe Island terminals. The trade volumes and forecasts presented in this section include all containerised and non-containerised freight through Port Botany, Sydney Harbour, and Glebe Island and White Bay terminals.

Port Botany is Australia's second largest container port, accounting for 29.7 per cent of Australia's total container trade measured in TEUs. Sydney region ports' non-containerised trade is limited to crude and refined oil, liquid and gas, cement, gypsum, salt and sugar and accounts for only 1.2 per cent of Australia's total non-containerised trade.

In 2012–13, total trade through Sydney region ports declined by 1.6 per cent to 29.6 million mass tonnes, including 2.1 million TEUs of containerised trade and 13.6 million tonnes of non-containerised trade. Containerised and non-containerised trade account for 53.9 and 46.1 per cent of total trade in total tonnes through Sydney region ports, respectively.

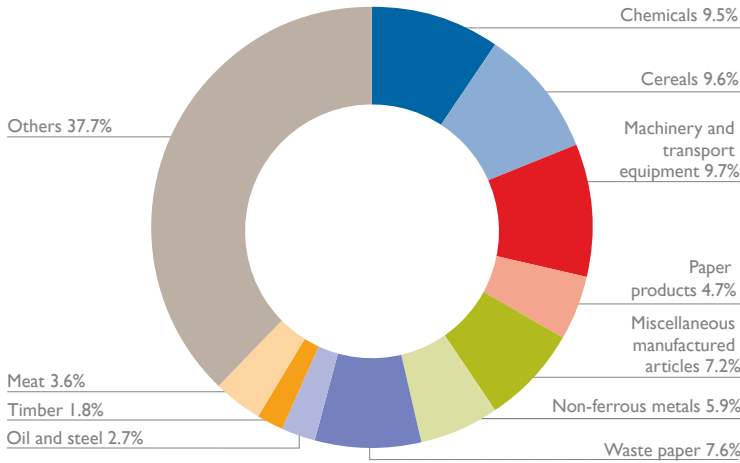
Containerised trade is evenly distributed between exports (49.5 per cent) and imports (50.5 per cent), but non-containerised trade is largely dominated by imports, which account for 93.5 per cent of Sydney region ports' total non-containerised trade.

### Containerised trade

The volume of total containerised trade through Port Botany in 2012–13 included 1.0 million TEUs of exports and 1.1 million TEUs of imports (Ports Australia 2013). The main containerised export commodities (by mass) through Port Botany in 2012–13 were machinery and transport equipment, cereals, chemicals, waste paper, miscellaneous manufactured articles, non-ferrous metals, paper products, meat, iron & steel and timber (Figure 4.5). Similarly, the main containerised import commodities through Sydney region ports in 2012–13 were

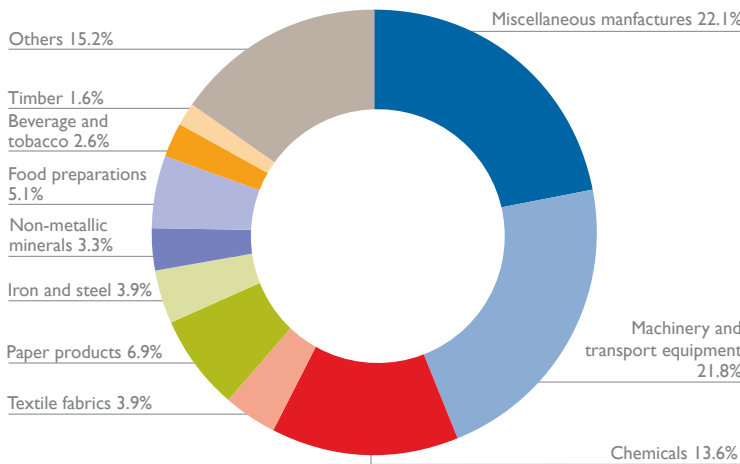
miscellaneous manufactures, machinery and transport equipment, chemicals, paper products, food preparations, textile fabrics, iron and steel, non-metallic minerals, beverages and tobacco and timber (Figure 4.6).

**Figure 4.5** Main containerised export commodities through Sydney region ports, 2012–13



Source: Sydney Ports (2013).

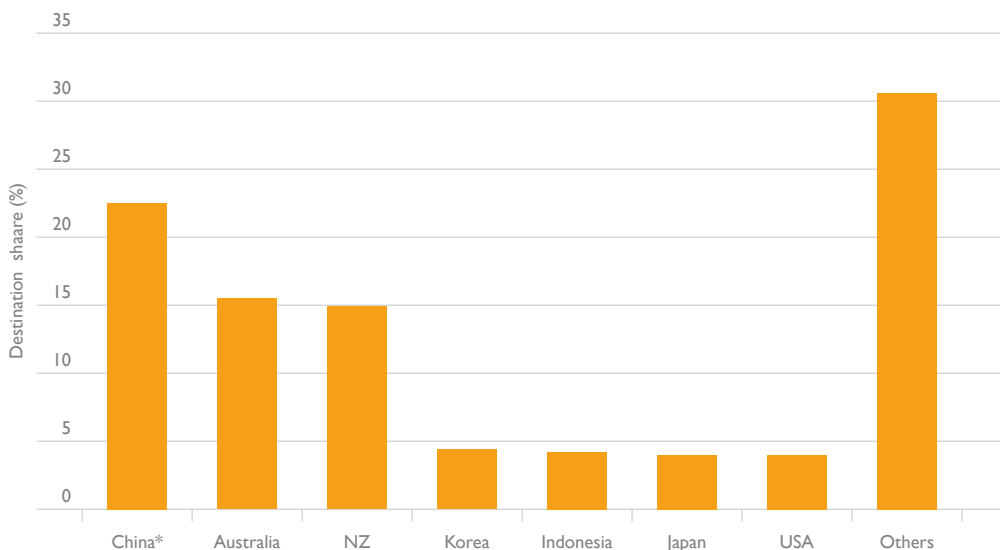
**Figure 4.6** Main containerised import commodities through Sydney region ports, 2012–13



Source: Sydney Ports (2013).

The main destinations of containerised exports from Sydney region ports in 2012–13 were New Zealand, Vietnam, the USA, Taiwan, China and Singapore (Figure 4.7), whereas the main origins of containerised imports were China, the USA, Thailand, Japan, Hong Kong, Malaysia, Germany and New Zealand (Figure 4.8).

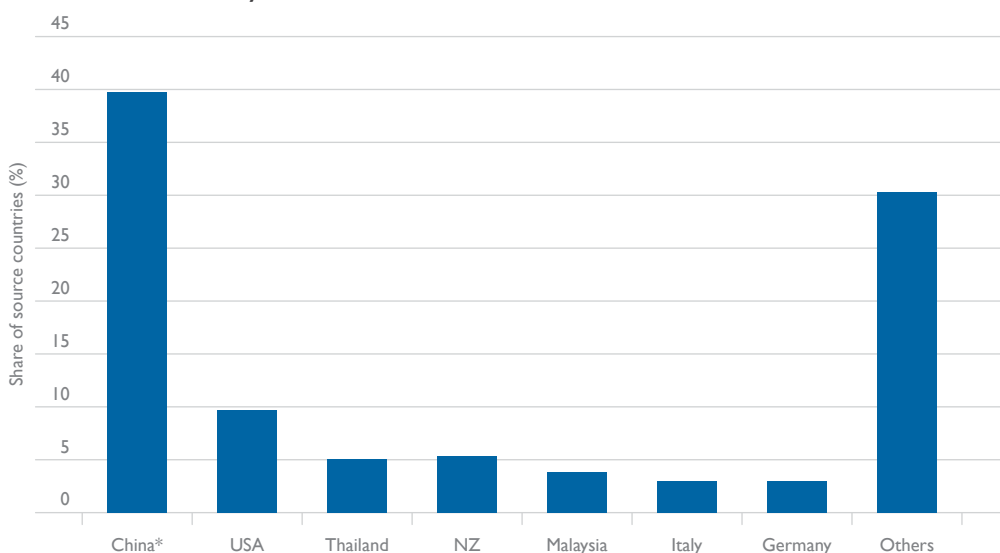
**Figure 4.7** Sydney region ports' full containerised export share, by destination country, 2012–13



\*Includes Hong Kong.

Source: Sydney Ports (2013).

**Figure 4.8** Sydney region ports' full containerised import share by originating country, 2012–13



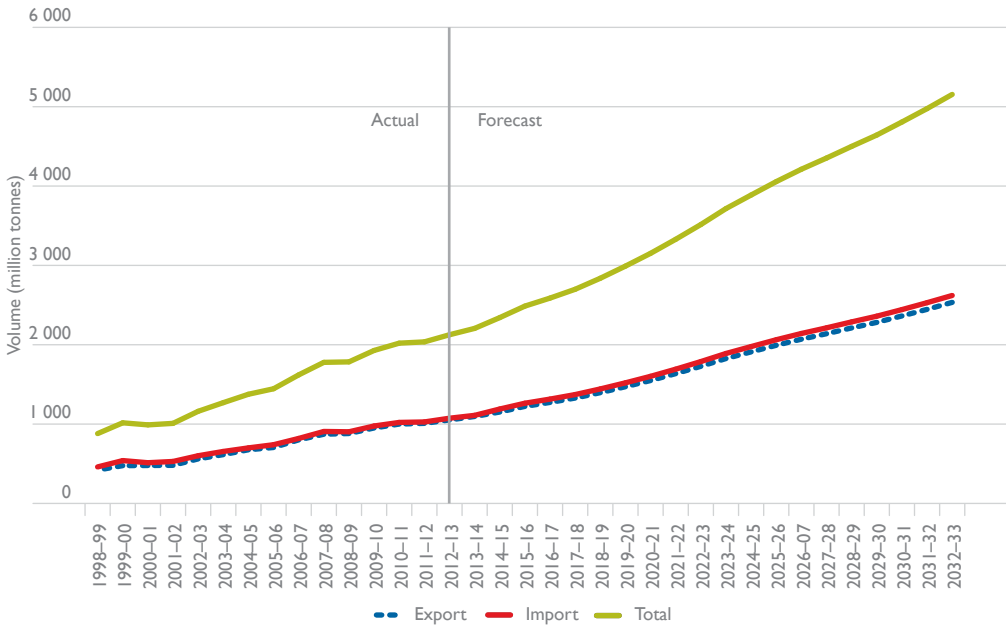
\*Includes Hong Kong.

Source: Sydney Ports (2013).

Sydney region ports' full containerised exports, which account for 42.1 per cent of the total containerised exports through Sydney region ports, have increased by an average of 3.8 per cent a year over the last 14 years, from 263 000 TEUs in 1998–99 to 443 000 TEUs in 2012–13 (Figure 4.9 and Table 4.3). However, growth is forecast to be slightly slower—

3.4 per cent a year—over the forecast period, due to assumed slower average growth in Australia’s main export markets and a slightly higher exchange rate—average of US\$0.82 per Australian dollar—over the forecast period, compared with the average exchange rate of US\$0.75 per Australian dollar over the last 20 years. The volume of full containerised exports is projected to increase to 869 000 TEUs in 2032–33.

**Figure 4.9** Containerised trade: Sydney region ports



Sources: Ports Australia (2014) and BITRE estimates.

On the other hand, empty export containers, which account for 57.9 per cent of total containerised exports, are projected to increase by 5.2 per cent a year over the next 20 years, from 609 000 TEUs in 2012–13 to 1.7 million TEUs in 2032–33, driven principally by growth in import container volumes.

On the basis of the forecast growth of full and empty export containers, Sydney region ports’ total (full plus empty) export containers, which have increased by an average of 6.8 per cent a year over the last 14 years, from 420 000 TEUs in 1998–99 to 1.1 million TEUs in 2012–13, are projected to increase by 4.5 per cent a year over the next 20 years to 2.5 million TEUs in 2032–33.

Based on the assumed growth in real income and the slightly lower value of the Australian dollar, the volume of full containerised imports is projected to increase by 4.6 per cent per year over the next 20 years, from 1.1 million TEUs in 2012–13 to 2.6 million TEUs in 2032–33.

As mentioned in Chapter 2, a small volume of empty containers are imported to Australia to service Australia’s commodity exports. Empty container imports to Sydney region ports declined by an average of 4.8 per cent a year over the last 14 years. However, it is projected to increase slightly (an average of 1.3 per cent per a year) over the next 20 years, from 10 000 TEUs in 2012–13 to 13 000 TEUs in 2032–33.

Full containerised imports account for 99.0 per cent of the total (full plus empty) containerised imports through Sydney region ports. Hence, growth in total containerised imports is dictated by growth in full containerised imports. The volume of total containerised imports to Sydney region ports increased by an average of 6.2 per cent a year over the last 14 years, from 460 000 TEUs in 1998–99 to 1.1 million TEUs in 2012–13, and is forecast to increase by 4.6 per cent a year over the forecast period to 2.6 million TEUs in 2032–33. The significantly slower projected growth in total containerised trade through Sydney region ports (4.5 per cent per annum), in comparison with recent historical trends (6.5 per cent per annum), is driven primarily by projected slower domestic GDP growth and the assumed fall in the exchange rate, in combination with the relatively high estimated income and exchange rate elasticities for Sydney region ports' full containerised imports.

**Table 4.3** Containerised trade: Sydney region ports

Year	Exports			Imports			Total
	Full	Empty	Total	Full	Empty	Total	trade
	('000 TEUs)						
1998–99	263	157	420	440	21	460	880
2008–09	442	439	881	876	26	903	1784
2009–10	443	509	951	951	25	976	1928
2010–11	459	541	1000	1000	20	1021	2020
2011–12	455	553	1009	1017	10	1027	2036
2012–13	443	609	1052	1064	10	1074	2126
2013–14	<b>436</b>	<b>660</b>	<b>1096</b>	<b>1101</b>	<b>9</b>	<b>1110</b>	<b>2206</b>
2014–15	447	706	1152	1180	10	1190	2342
2015–16	464	759	1223	1254	10	1263	2487
2016–17	477	796	1273	1305	10	1315	2588
2017–18	496	832	1328	1362	10	1372	2699
2018–19	504	892	1396	1433	10	1443	2838
2019–20	532	939	1471	1510	10	1520	2991
2020–21	545	1004	1549	1593	10	1602	3152
2021–22	576	1061	1636	1682	10	1692	3329
2022–23	596	1132	1728	1777	10	1788	3515
2023–24	613	1213	1826	1880	10	1890	3716
2024–25	632	1278	1910	1967	10	1977	3887
2025–26	662	1331	1993	2052	10	2063	4056
2026–07	694	1376	2070	2131	11	2142	4212
2027–28	727	1412	2139	2202	12	2213	4353
2028–29	762	1450	2212	2276	12	2288	4500
2029–30	799	1483	2282	2348	13	2360	4643
2030–31	835	1528	2363	2430	13	2443	4807
2031–32	847	1599	2446	2517	13	2530	4976
2032–33	869	1664	2534	2608	13	2621	5155
Annual average growth rate (per cent)							
1998–99 to 2012–13	3.8	10.2	6.8	6.5	-4.8	6.2	6.5
2012–13 to 2032–33	<b>3.4</b>	<b>5.2</b>	<b>4.5</b>	<b>4.6</b>	<b>1.3</b>	<b>4.6</b>	<b>4.5</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.

The projected positive growth in containerised exports and imports will result in average growth of 4.5 per cent a year in the volume of total (exports plus imports) containerised trade through Sydney region ports over the next 20 years to 5.2 million TEUs in 2032–33.

## *Non-containerised trade*

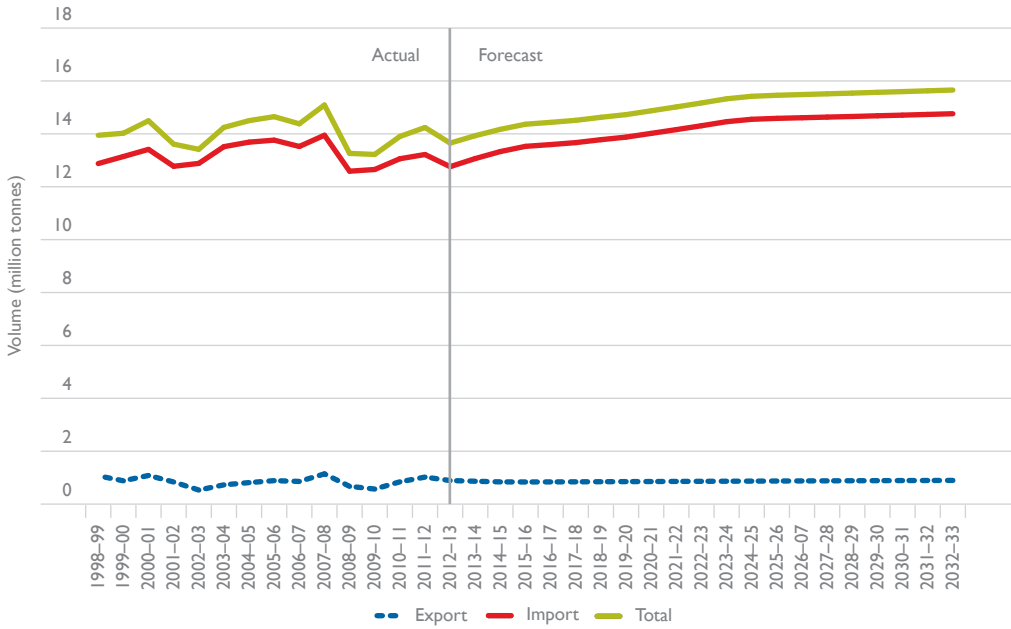
Sydney region ports' non-containerised trade is also dominated by imports, which account for 93.5 per cent of total non-containerised trade. Non-containerised exports comprise the other 6.5 per cent. Oil dominates the non-containerised trade of Sydney region ports, accounting for 86.9 per cent of the total non-containerised exports and 88.4 per cent of the total non-containerised imports (Sydney Ports 2013). In 2012–13, Sydney region ports imported 5.7 million tonnes of crude oil and 5.5 million tonnes of refined oil, and it exported 146 000 tonnes of crude oil and 628 000 tonnes of refined oil. Other major non-containerised commodities traded through Sydney region ports are cement, gypsum, salt, sugar, bulk liquids and gas.

The volume of non-containerised exports through Sydney region ports has declined by an average of 1.3 per cent a year over the last 14 years, from 1.1 million tonnes in 1998–99 to 0.9 million tonnes in 2012–13 (Figure 4.10 and Table 4.4). Although the expected higher economic growth in Australia's export destinations and lower growth in Australia's export prices over the forecast period, compared with the corresponding growth rates over the last 14 years, is expected to have a positive influence on non-containerised exports through Sydney region ports, the closure of the Shell oil refinery at Clyde in September 2012 and foreshadowed closure of the Caltex oil refinery at Kurnell, scheduled for mid-2014, will reduce both the demand for crude imports and potentially also crude and refined petroleum product exports. This could significantly reduce the total volume of non-containerised exports over the forecast horizon, given that refined exports comprised approximately 70 per cent of total non-containerised exports. The volume of non-containerised exports through Sydney region ports is projected to remain at its current level—0.9 million tonnes—over the next 20 years.

The volume of non-containerised imports, which declined by 0.1 per cent a year over the last 14 years, is projected to rise by 0.7 per cent, from 12.8 million tonnes in 2012–13 to 14.8 million tonnes in 2032–33, largely due to continuing positive economic growth in Australia and an expected increase in refined petroleum product import demand following the closure of the Shell oil refinery at Clyde in September 2012 and scheduled 2014 closure of the Caltex oil refinery at Kurnell.

Overall, total non-containerised trade through Sydney region ports is projected to increase slightly, from 13.7 million tonnes in 2012–13 to 15.7 million tonnes by 2032–33, implied average annual growth of 0.7 per cent a year over that period.

Figure 4.10 Non-containerised trade: Sydney region ports



Sources: Ports Australia (2014) and BITRE estimates.

**Table 4.4** Non-containerised trade: Sydney region ports

Year	Export	Import	Total
	(million tonnes)		
1998–99	1.1	12.9	13.9
2008–09	0.7	12.6	13.3
2009–10	0.6	12.7	13.2
2010–11	0.8	13.1	13.9
2011–12	1.0	13.2	14.2
2012–13	0.9	12.8	13.7
<b>2013–14</b>	<b>0.9</b>	<b>13.1</b>	<b>13.9</b>
<b>2014–15</b>	<b>0.8</b>	<b>13.3</b>	<b>14.2</b>
<b>2015–16</b>	<b>0.8</b>	<b>13.5</b>	<b>14.4</b>
<b>2016–17</b>	<b>0.8</b>	<b>13.6</b>	<b>14.4</b>
<b>2017–18</b>	<b>0.8</b>	<b>13.7</b>	<b>14.5</b>
<b>2018–19</b>	<b>0.8</b>	<b>13.8</b>	<b>14.6</b>
<b>2019–20</b>	<b>0.9</b>	<b>13.9</b>	<b>14.7</b>
<b>2020–21</b>	<b>0.9</b>	<b>14.0</b>	<b>14.9</b>
<b>2021–22</b>	<b>0.9</b>	<b>14.2</b>	<b>15.0</b>
<b>2022–23</b>	<b>0.9</b>	<b>14.3</b>	<b>15.2</b>
<b>2023–24</b>	<b>0.9</b>	<b>14.5</b>	<b>15.3</b>
<b>2024–25</b>	<b>0.9</b>	<b>14.6</b>	<b>15.4</b>
<b>2025–26</b>	<b>0.9</b>	<b>14.6</b>	<b>15.5</b>
<b>2026–07</b>	<b>0.9</b>	<b>14.6</b>	<b>15.5</b>
<b>2027–28</b>	<b>0.9</b>	<b>14.6</b>	<b>15.5</b>
<b>2028–29</b>	<b>0.9</b>	<b>14.7</b>	<b>15.5</b>
<b>2029–30</b>	<b>0.9</b>	<b>14.7</b>	<b>15.6</b>
<b>2030–31</b>	<b>0.9</b>	<b>14.7</b>	<b>15.6</b>
<b>2031–32</b>	<b>0.9</b>	<b>14.7</b>	<b>15.6</b>
<b>2032–33</b>	<b>0.9</b>	<b>14.8</b>	<b>15.7</b>
Annual average growth rate (per cent)			
1998–99 to 2012–13	-1.3	-0.1	-0.2
<b>2012–13 to 2032–33</b>	<b>0.0</b>	<b>0.7</b>	<b>0.7</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.



## Port of Melbourne

The Port of Melbourne, which is managed by the Port of Melbourne Corporation, is the largest container port in Australia in terms of trade volume. It accounts for 35.1 per cent of Australia's total containerised trade. In 2012–13, total containerised trade through the Port of Melbourne was 2.5 million TEUs.

In 2012–13, total (i.e. containerised plus non-containerised) trade through the Port of Melbourne declined by 2.3 per cent over 2011–12 to 35.1 million tonnes. This included a drop in total containerised trade of 2.6 per cent to 2.5 million TEUs. Both containerised exports and imports through the port declined by 2.8 and 2.4 per cent, to 1.2 and 1.3 million TEUs, respectively.

### Containerised trade

Port of Melbourne (2014) reports the main containerised export commodities shipped through the Port of Melbourne in 2012–13 were (by mass):

- cereal grains, paperboards and fibreboards
- dairy products, fruit and vegetables
- pulp and wastepaper
- miscellaneous manufactures
- beverages
- paper and newsprint
- stockfeed and meat

The main containerised import commodities (by mass) were (Port of Melbourne 2014):

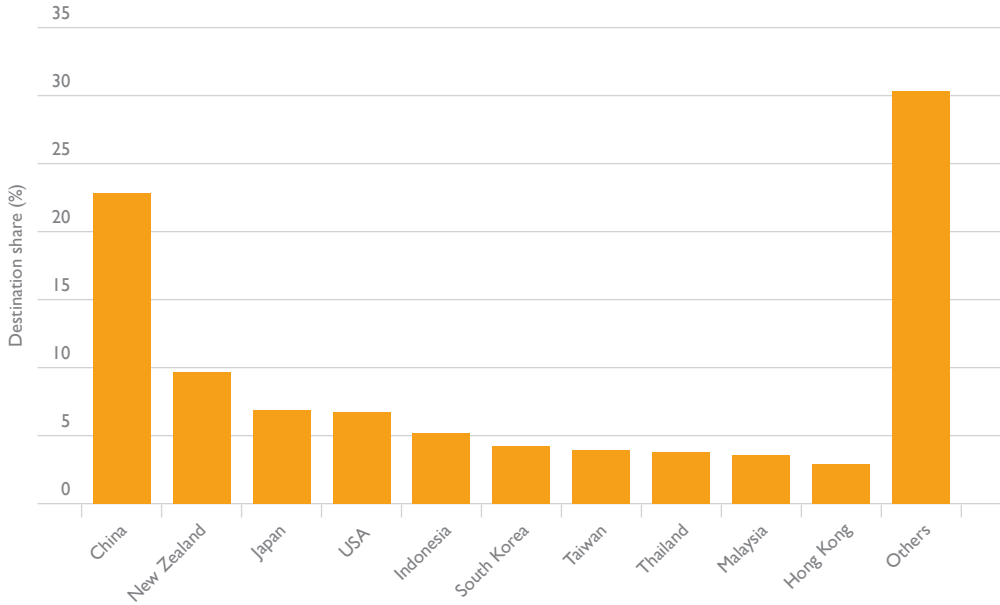
- miscellaneous manufactures
- furniture
- electrical equipment
- fruit and vegetables
- paper and newsprint
- clothing
- machinery
- metal manufactures
- motor vehicle parts
- toys and sporting goods

The top five export destinations for commodities exported from the Port of Melbourne are China, New Zealand, Japan, the USA and Indonesia (Figure 4.11), whereas the top five origins of commodities imported through the Port of Melbourne are China, the USA, New Zealand, Thailand and Germany (Figure 4.12).

Notwithstanding the drop in trade volumes in 2012–13, the volume of containerised trade through the Port of Melbourne has increased over the last 14 years by an average of 5.9 per cent a year, from 1.1 million TEUs in 1998–99 to 2.5 million TEUs in 2012–13 (Figure 4.13 and Table 4.5). It is projected to increase by 4.8 per cent a year over the next 20 years to 6.4 million TEUs in 2032–33. The volume of total containerised exports and imports are projected to grow at the same rate—4.8 per cent a year—over the forecast period to around 3.2 million TEUs each by 2032–33.

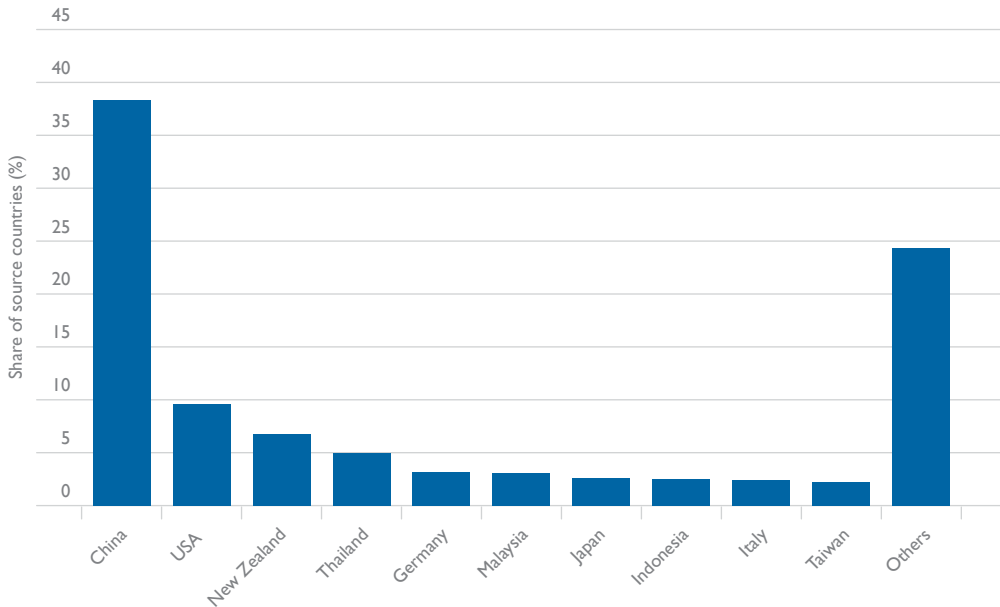
Full and empty containers account for 69.4 and 30.6 per cent of total containerised exports through the Port of Melbourne, respectively. Full containerised exports, which increased by 5.0 per cent a year over the last 14 years, are projected to grow by 4.3 per cent a year over the next 20 years, from 863 000 TEUs in 2012–13 to around 2.0 million TEUs in 2032–33, driven by the continuing positive economic outlook for Australia's export destination countries, mainly China and the OECD.

**Figure 4.11** Port of Melbourne full containerised export share, by destination country, 2012–13



Source: Port of Melbourne (2014).

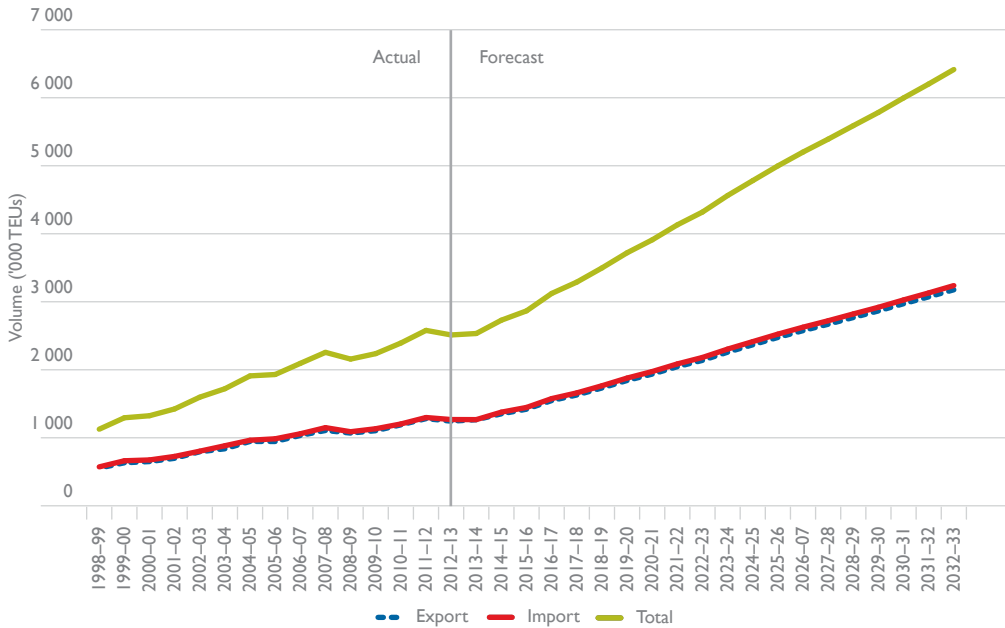
**Figure 4.12** Port of Melbourne full containerised import share, by originating country, 2012–13



Source: Port of Melbourne (2014).

About 90.0 per cent of total containerised imports to the Port of Melbourne are full containers, and the remaining 10 per cent are empty containers. Full containerised imports increased by 6.1 per cent a year over the last 14 years, and are projected to increase by 5.0 per cent a year over the next 20 years, from 1.1 million TEUs in 2012–13 to around 3.0 million TEUs in 2032–33. Continuing economic growth in Australia, at a slightly slower rate than the historical average, is the main reason for slightly slower projected growth in full containerised imports over the forecast period.

**Figure 4.13** Containerised trade: Port of Melbourne



Sources: Ports Australia (2014) and BITRE estimates.

Imports of empty containers are projected to increase by 3.1 per cent a year over the forecast period, from 133 000 TEUs in 2012–13 to 243 000 TEUs in 2032–33. On the other hand, exports of empty containers, the residual of full and empty import containers less full export containers, are forecast to increase by 5.8 per cent a year over the forecast period, from 381 000 TEUs in 2012–13 to 1.2 million TEUs in 2032–33.

## *Non-containerised trade*

In 2012–13, the volume of non-containerised trade through the Port of Melbourne was 11.8 million tonnes, largely dominated by imports. Imports accounted for 76.4 per cent and exports 23.6 per cent of the total non-containerised trade, respectively.

The main non-containerised export commodities, by volume, through the Port of Melbourne in 2012–13 were (Ports Australia 2014):

- grains
- oil and petroleum
- steel
- motor vehicles
- wool

The main non-containerised import commodities, by volume, through the Port of Melbourne in 2012–13 were (PMC 2013):

- crude oil,
- motor vehicles,
- petroleum products,
- cement and
- transport equipment

**Table 4.5** Containerised trade: Port of Melbourne

Year	Exports			Imports			Total trade
	Full	Empty	Total	Full	Empty	Total	
	('000 EUs)						
1998–99	437	117	554	497	75	572	1126
2008–09	713	356	1069	980	108	1089	2157
2009–10	767	337	1104	1035	98	1133	2237
2010–11	806	384	1190	1090	113	1203	2393
2011–12	885	395	1281	1167	131	1298	2579
2012–13	863	381	1244	1135	133	1268	2512
<b>2013–14</b>	<b>879</b>	<b>386</b>	<b>1265</b>	<b>1132</b>	<b>135</b>	<b>1267</b>	<b>2533</b>
<b>2014–15</b>	<b>892</b>	<b>461</b>	<b>1352</b>	<b>1241</b>	<b>135</b>	<b>1377</b>	<b>2729</b>
<b>2015–16</b>	<b>934</b>	<b>486</b>	<b>1420</b>	<b>1310</b>	<b>136</b>	<b>1446</b>	<b>2866</b>
<b>2016–17</b>	<b>990</b>	<b>557</b>	<b>1547</b>	<b>1439</b>	<b>137</b>	<b>1576</b>	<b>3122</b>
<b>2017–18</b>	<b>1036</b>	<b>593</b>	<b>1629</b>	<b>1521</b>	<b>140</b>	<b>1660</b>	<b>3289</b>
<b>2018–19</b>	<b>1097</b>	<b>635</b>	<b>1732</b>	<b>1619</b>	<b>146</b>	<b>1765</b>	<b>3497</b>
<b>2019–20</b>	<b>1161</b>	<b>681</b>	<b>1842</b>	<b>1725</b>	<b>153</b>	<b>1878</b>	<b>3720</b>
<b>2020–21</b>	<b>1200</b>	<b>735</b>	<b>1936</b>	<b>1822</b>	<b>153</b>	<b>1974</b>	<b>3910</b>
<b>2021–22</b>	<b>1266</b>	<b>779</b>	<b>2045</b>	<b>1925</b>	<b>161</b>	<b>2086</b>	<b>4131</b>
<b>2022–23</b>	<b>1331</b>	<b>807</b>	<b>2138</b>	<b>2012</b>	<b>169</b>	<b>2181</b>	<b>4319</b>
<b>2023–24</b>	<b>1400</b>	<b>858</b>	<b>2258</b>	<b>2129</b>	<b>175</b>	<b>2304</b>	<b>4562</b>
<b>2024–25</b>	<b>1469</b>	<b>898</b>	<b>2367</b>	<b>2231</b>	<b>183</b>	<b>2414</b>	<b>4781</b>
<b>2025–26</b>	<b>1537</b>	<b>938</b>	<b>2475</b>	<b>2331</b>	<b>193</b>	<b>2524</b>	<b>4998</b>
<b>2026–07</b>	<b>1606</b>	<b>970</b>	<b>2575</b>	<b>2425</b>	<b>201</b>	<b>2626</b>	<b>5201</b>
<b>2027–28</b>	<b>1675</b>	<b>994</b>	<b>2669</b>	<b>2510</b>	<b>211</b>	<b>2721</b>	<b>5391</b>
<b>2028–29</b>	<b>1749</b>	<b>1019</b>	<b>2768</b>	<b>2600</b>	<b>221</b>	<b>2821</b>	<b>5589</b>
<b>2029–30</b>	<b>1824</b>	<b>1040</b>	<b>2865</b>	<b>2687</b>	<b>232</b>	<b>2919</b>	<b>5784</b>
<b>2030–31</b>	<b>1900</b>	<b>1071</b>	<b>2971</b>	<b>2785</b>	<b>242</b>	<b>3027</b>	<b>5997</b>
<b>2031–32</b>	<b>1979</b>	<b>1093</b>	<b>3072</b>	<b>2888</b>	<b>242</b>	<b>3130</b>	<b>6202</b>
<b>2032–33</b>	<b>1996</b>	<b>1180</b>	<b>3176</b>	<b>2995</b>	<b>243</b>	<b>3238</b>	<b>6415</b>
Annual average growth rate (per cent)							
1998–99 to 2012–13	5.0	8.8	6.0	6.1	4.2	5.8	5.9
<b>2012–13 to 2032–33</b>	<b>4.3</b>	<b>5.8</b>	<b>4.8</b>	<b>5.0</b>	<b>3.1</b>	<b>4.8</b>	<b>4.8</b>

\*Numbers in bold are forecasts.

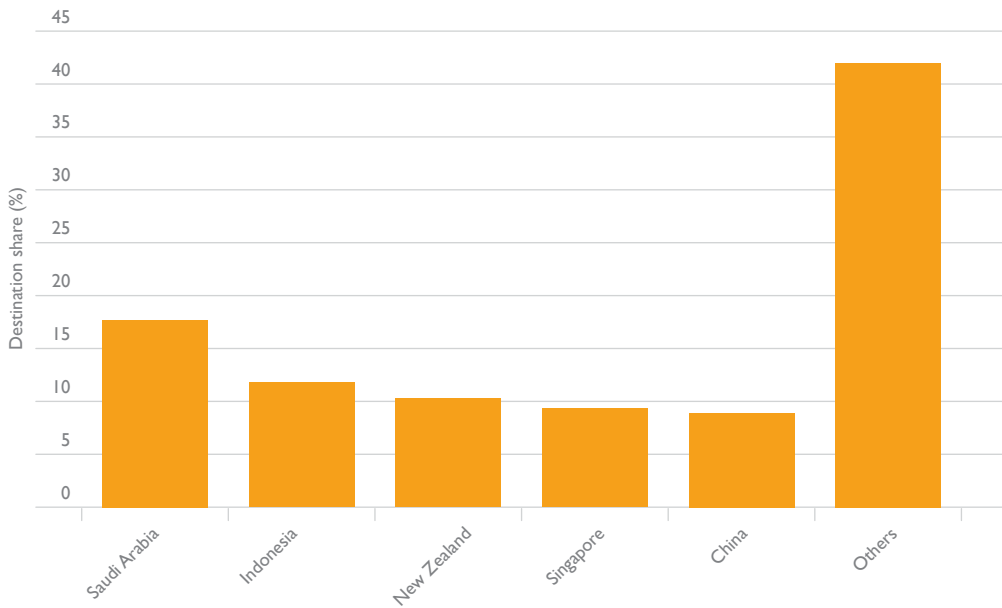
Sources: Ports Australia (2014) and BITRE estimates.

The main destinations of non-containerised exports through the Port of Melbourne in 2011–12 were Saudi Arabia, Indonesia, New Zealand, Singapore and China (Figure 4.14), while the main origins of non-containerised imports through the Port of Melbourne in 2011–12 were Japan, Gabon, Singapore, Thailand and Indonesia (Figure 4.15).

Total non-containerised trade (exports plus imports) through the Port of Melbourne, which increased by 1.5 per cent a year over the last 14 years to 11.8 million tonnes in 2012–13, is forecast to increase by 0.6 per cent a year over the next 20 years to 13.2 million tonnes in 2032–33 (Figure 4.16 and Table 4.6).

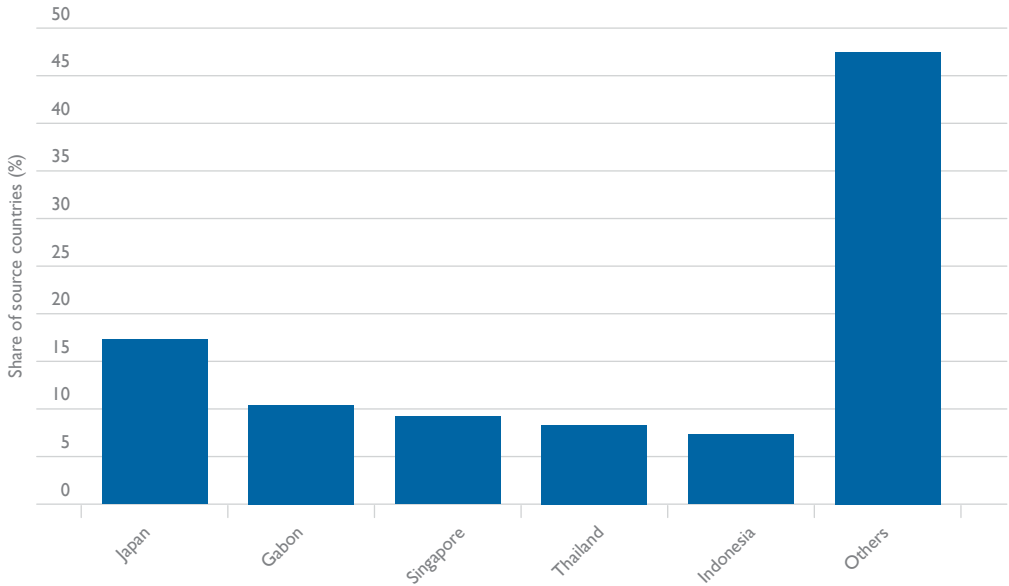
Non-containerised exports through the Port of Melbourne, which increased by 1.3 per cent a year over the last 14 years to 2.8 million tonnes in 2012–13, are predicted to increase by 0.4 per cent a year over the next 20 years to 3.0 million tonnes in 2032–33, mainly due to the positive economic outlook for Australia’s export destinations. Scheduled closure of domestic car manufacturing plants in Melbourne and Adelaide over the next three years is expected to curtail motor vehicle exports through the Port of Melbourne and Port Adelaide. However, its effect on total non-containerised exports through the Port of Melbourne, while not insignificant, will be relatively small as motor vehicles exports currently account for 8.5 per cent of total non-containerised exports (by mass) through the Port of Melbourne. Exports of other non-containerised commodities—e.g. wheat, canola and barley—are expected to increase to compensate the loss of shipment of car exports.

**Figure 4.14** Port of Melbourne non-containerised export share, by destination country, 2012–13



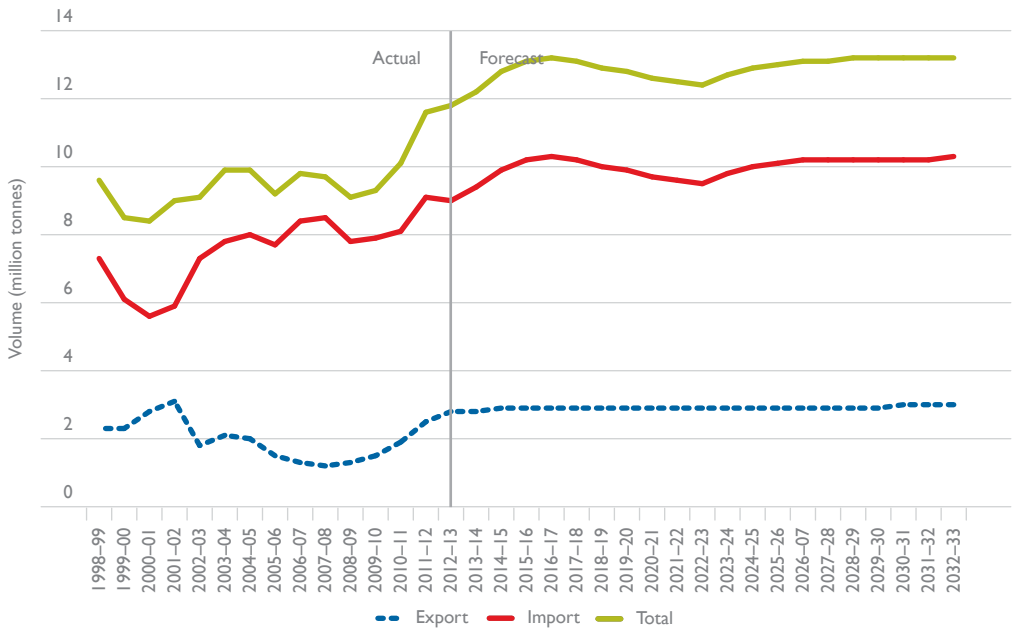
Source: Port of Melbourne (2014).

**Figure 4.15** Port of Melbourne non-containerised import share, by originating country, 2012–13



Source: Port of Melbourne (2014).

**Figure 4.16** Non-containerised trade: Port of Melbourne



Sources: Ports Australia (2014) and BITRE estimates.

**Table 4.6** Non-containerised trade: Port of Melbourne

Year	Export	Import	Total
	(million tonnes)		
1998–99	2.3	7.3	9.6
2008–09	1.3	7.8	9.1
2009–10	1.5	7.9	9.3
2010–11	1.9	8.1	10.1
2011–12	2.5	9.1	11.6
2012–13	2.8	9.0	11.8
<b>2013–14</b>	<b>2.8</b>	<b>9.4</b>	<b>12.2</b>
<b>2014–15</b>	<b>2.9</b>	<b>9.9</b>	<b>12.8</b>
<b>2015–16</b>	<b>2.9</b>	<b>10.2</b>	<b>13.1</b>
<b>2016–17</b>	<b>2.9</b>	<b>10.3</b>	<b>13.2</b>
<b>2017–18</b>	<b>2.9</b>	<b>10.2</b>	<b>13.1</b>
<b>2018–19</b>	<b>2.9</b>	<b>10.0</b>	<b>12.9</b>
<b>2019–20</b>	<b>2.9</b>	<b>9.9</b>	<b>12.8</b>
<b>2020–21</b>	<b>2.9</b>	<b>9.7</b>	<b>12.6</b>
<b>2021–22</b>	<b>2.9</b>	<b>9.6</b>	<b>12.5</b>
<b>2022–23</b>	<b>2.9</b>	<b>9.5</b>	<b>12.4</b>
<b>2023–24</b>	<b>2.9</b>	<b>9.8</b>	<b>12.7</b>
<b>2024–25</b>	<b>2.9</b>	<b>10.0</b>	<b>12.9</b>
<b>2025–26</b>	<b>2.9</b>	<b>10.1</b>	<b>13.0</b>
<b>2026–07</b>	<b>2.9</b>	<b>10.2</b>	<b>13.1</b>
<b>2027–28</b>	<b>2.9</b>	<b>10.2</b>	<b>13.1</b>
<b>2028–29</b>	<b>2.9</b>	<b>10.2</b>	<b>13.2</b>
<b>2029–30</b>	<b>2.9</b>	<b>10.2</b>	<b>13.2</b>
<b>2030–31</b>	<b>3.0</b>	<b>10.2</b>	<b>13.2</b>
<b>2031–32</b>	<b>3.0</b>	<b>10.2</b>	<b>13.2</b>
<b>2032–33</b>	<b>3.0</b>	<b>10.3</b>	<b>13.2</b>
Annual average growth rate (per cent)			
1998–99 to 2012–13	1.3	1.5	1.5
<b>2012–13 to 2032–33</b>	<b>0.4</b>	<b>0.7</b>	<b>0.6</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.

Similarly, non-containerised imports, which increased by 1.5 per cent a year over the last 14 years to 9.0 million tonnes in 2012–13, are projected to increase by 0.7 per cent a year to 10.3 million tonnes in 2032–33. The slowing of the Australian economy over the forecast period is the main reason for the projected slower growth in non-containerised imports over the forecast period.



## Port Adelaide

Port Adelaide, which is managed by Flinders Ports Pty Ltd (FPPL), is the major gateway for exports and imports of containerised and non-containerised cargoes to and from South Australia. Port Adelaide's major trading regions are Northern Europe, the United Kingdom (UK), the Mediterranean, Africa, the USA, Japan, South Korea, South East Asia and the Middle East.

In 2012–13, Port Adelaide's total trade was 15.2 million tonnes, comprising exports of 8.6 million tonnes (56.6 per cent by mass) and imports of 6.6 million tonnes (43.4 per cent by mass). Although total containerised trade through Port Adelaide increased by 4.7 per cent in 2012–13, over 2011–12, total trade volumes through Port Adelaide declined by 3.2 per cent to 15.2 million tonnes in the same year due to a decline of 5.5 per cent in its non-containerised trade.

The main export commodities through Port Adelaide in 2012–13 were:

- grain
- general cargo
- gypsum
- vegetables
- legumes
- oilseeds
- scrap metal
- concentrates
- lead zinc
- copper
- uranium
- salt
- fruit
- cars
- stock feed
- timber
- soda ash and
- iron and steel

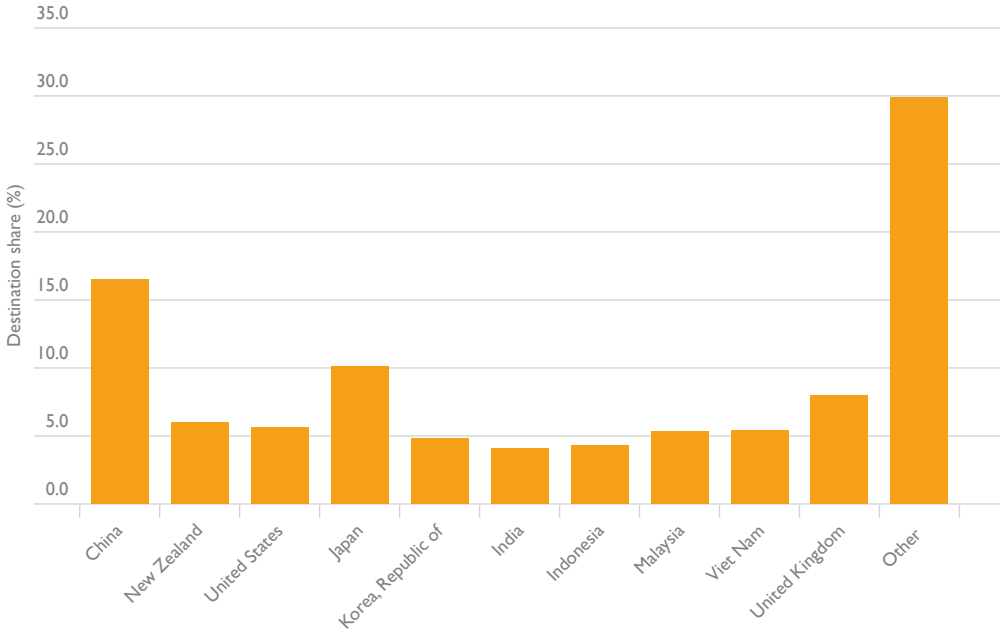
The main import commodities through Port Adelaide in 2012–13 were:

- petroleum
- gas
- general cargo
- fertilisers
- limestone
- iron and steel
- sulphur
- chemicals and
- cars

### *Containerised trade*

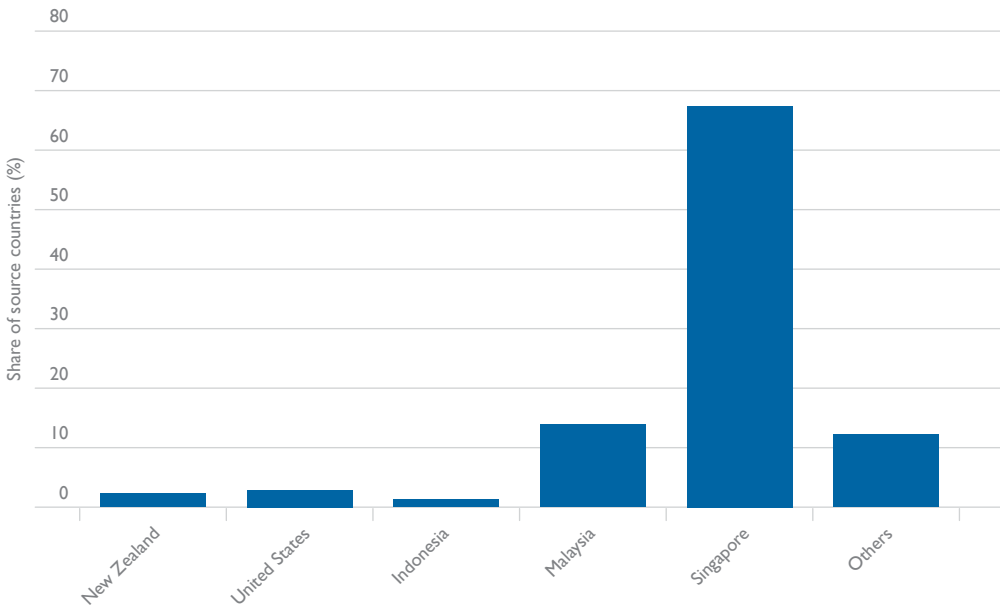
The main destinations of commodities exported from Port Adelaide are China, New Zealand, the USA, Japan, South Korea, India, Indonesia, Malaysia, Vietnam and the United Kingdom (Figure 4.17), whereas the main origins of commodities imported through the Port Adelaide are New Zealand, the USA, Indonesia, Malaysia and Singapore (Figure 4.18).

**Figure 4.17** Port Adelaide full containerised export share, by destination country, 2012–13



Source: Flinders Ports (2014).

**Figure 4.18** Port Adelaide full containerised import share, by originating country, 2012–13

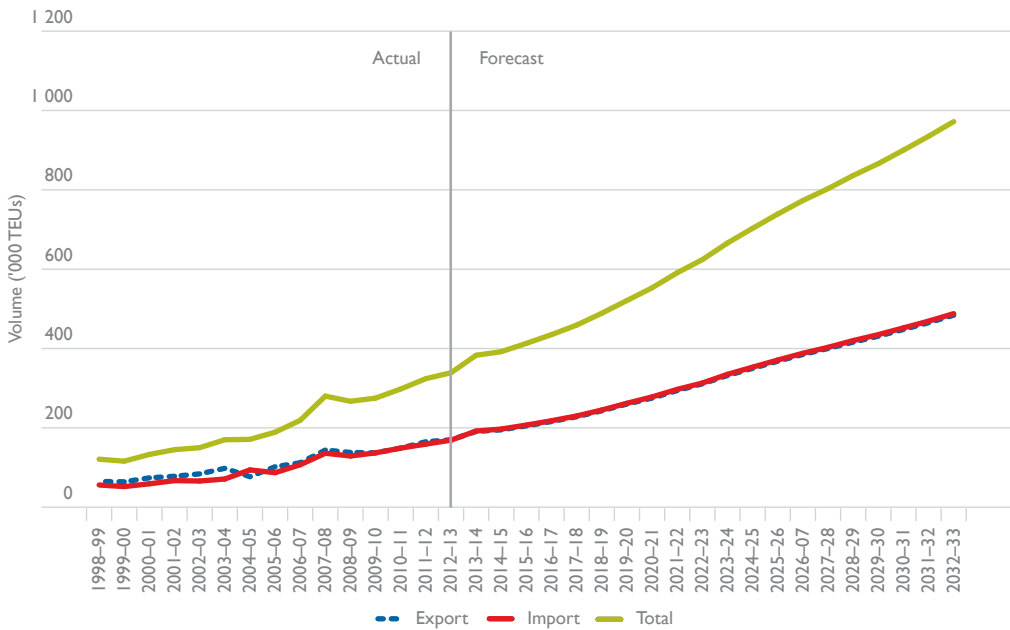


Source: Flinders Ports (2014).

Growth in total containerised trade through Port Adelaide has been strong, approximately 7.7 per cent a year over the last 14 years. However, such strong growth is not projected to continue over the forecast period. Total containerised trade is forecast to increase by 5.4 per cent a year over the next 20 years, from 339 000 TEUs in 2012–13 to around 1.0 million TEUs in 2032–33 (Figure 4.19 and Table 4.7).

Total containerised exports through Port Adelaide increased by 7.1 per cent a year over the last 14 years, from 65 000 TEUs in 1998–99 to 170 000 TEUs in 2012–13, and are projected to increase by 5.4 per cent a year over the next 20 years to 484 000 TEUs in 2032–33.

**Figure 4.19** Containerised trade: Port Adelaide



Sources: Ports Australia (2014) and BITRE estimates.

**Table 4.7** Containerised trade: Port Adelaide

Year	Exports			Imports			Total trade
	Full	Empty	Total	Full	Empty	Total	
	('000 TEUs)						
1998–99	54	11	65	39	17	56	121
2008–09	116	23	138	75	54	129	267
2009–10	119	19	137	90	48	137	275
2010–11	125	23	149	105	44	149	298
2011–12	137	27	165	118	41	159	324
2012–13	142	29	170	127	42	169	339
<b>2013–14</b>	<b>158</b>	<b>33</b>	<b>191</b>	<b>140</b>	<b>52</b>	<b>192</b>	<b>383</b>
2014–15	159	36	195	148	49	197	392
2015–16	169	37	205	156	51	207	413
2016–17	180	37	216	165	54	218	435
2017–18	191	37	228	174	57	230	459
2018–19	205	39	243	186	60	245	489
2019–20	219	41	260	199	63	262	521
2020–21	226	49	275	213	65	278	553
2021–22	244	50	294	229	68	297	591
2022–23	257	53	311	243	70	313	624
2023–24	274	57	332	261	73	335	666
2024–25	290	60	350	277	76	353	703
2025–26	305	63	368	293	79	371	739
2026–07	320	64	385	307	81	388	773
2027–28	336	64	400	320	84	403	803
2028–29	352	64	416	333	86	420	836
2029–30	365	66	431	346	88	435	866
2030–31	379	70	448	362	90	452	900
2031–32	388	77	465	378	92	469	935
2032–33	400	84	484	395	93	488	972
Annual average growth rate (per cent)							
1998–99 to 2012–13	7.2	7.0	7.1	8.8	6.7	8.2	7.7
<b>2012–13 to 2032–33</b>	<b>5.3</b>	<b>5.5</b>	<b>5.4</b>	<b>5.8</b>	<b>4.1</b>	<b>5.5</b>	<b>5.4</b>

\* Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.

Presently, full and empty containers account for 83.1 and 16.9 per cent of total containerised exports through Port Adelaide, respectively. Full container exports, which increased by 7.2 per cent a year over the last 14 years, are forecast to increase by 5.3 per cent a year over the next 20 years to 400 000 TEUs in 2032–33. The slower projected growth over the forecast period is due to slower economic growth in Australia's main export destination countries and an assumed high value of Australian dollar, against the US dollar, over the forecast period.

In 2012–13, around 29 000 empty TEUs were exported from Port Adelaide. The number is projected to increase by 5.5 per cent a year over the next 20 years to 84 000 in 2032–33.

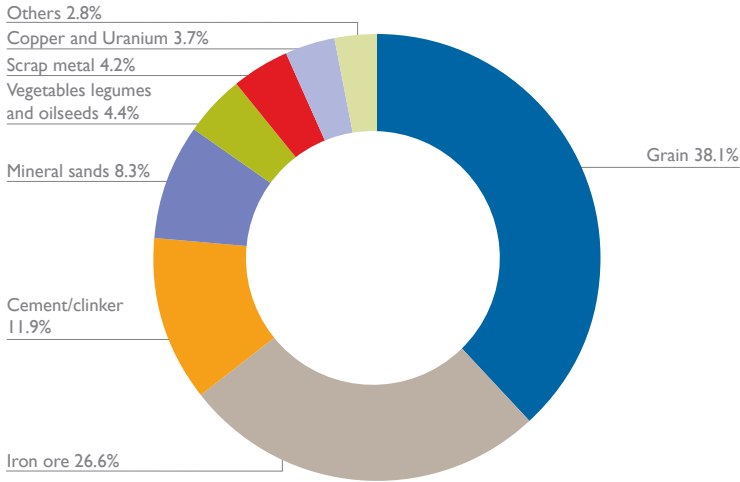
Port Adelaide's total containerised imports, which increased by 8.2 per cent a year over the last 14 years, from 56 000 TEUs in 1998–99 to 169 000 TEUs in 2012–13, are projected to increase by 5.5 per cent per annum over the forecast period to 488 000 TEUs in 2032–33. Full and empty container imports account for 75.3 and 24.7 per cent of the total containerised imports, respectively. They are projected to increase by 5.8 and 4.1 per cent a year, respectively, over the next 20 years to 395 000 and 93 000 TEUs in 2032–33.

### *Non-containerised trade*

Exports accounted for 53.6 per cent (by volume) and imports 46.4 per cent of Port Adelaide's total non-containerised trade in 2012–13. The main non-containerised commodities exported through Port Adelaide in 2013 were grain, limestone, iron ore, cement/clinker, mineral sands, vegetables, legumes, oilseeds, scrap metal, copper and uranium (Figure 4.20). The main non-containerised commodities imported through Port Adelaide in 2013 were petroleum and gas, limestone, fertilisers, general cargo, iron and steel (Figure 4.21).

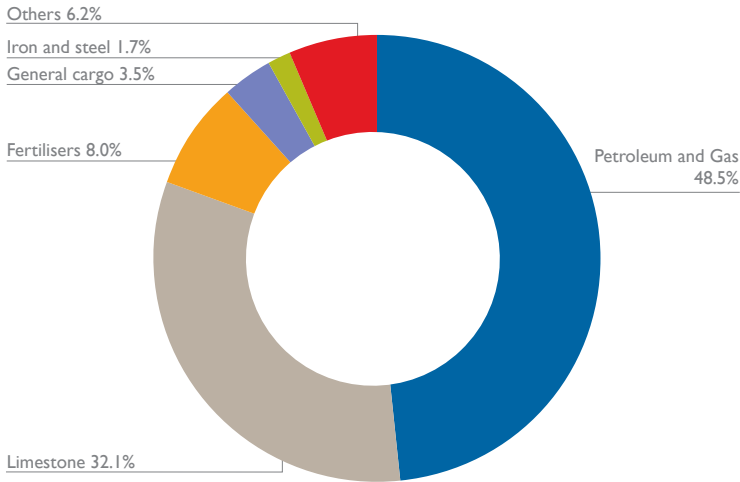
Total non-containerised trade through Port Adelaide grew by 6.6 per cent per annum over the last 14 years, from 4.6 million tonnes in 1998–99 to 11.2 million tonnes in 2012–13 (Figure 4.22 and Table 4.8). This strong growth is the result of a surge in non-containerised exports in 2009–10, 2010–11 and 2011–12, which grew by 52.3, 27.7 and 48.1 per cent in those three years, mainly due to strong domestic grain growing conditions, driving increased grain exports in these three years, and exceptionally strong exports of iron ore, cement/clinker, copper, uranium and livestock. Total non-containerised exports have increased by 6.5 per cent a year over the last 14 years to 6.0 million tonnes in 2012–13. However, such high growth in non-containerised exports through Port Adelaide is not expected to continue over the forecast period due to the expected slowing of many Asian economies, including China, and the recent high grain export volumes, reflecting exceptional growing conditions experienced in South Australia in that period. Port Adelaide's total non-containerised exports are projected to increase by 4.4 per cent a year over the next 20 years to 14.1 million tonnes in 2032–33.

**Figure 4.20** Main non-containerised export commodities through Port Adelaide, 2012–13



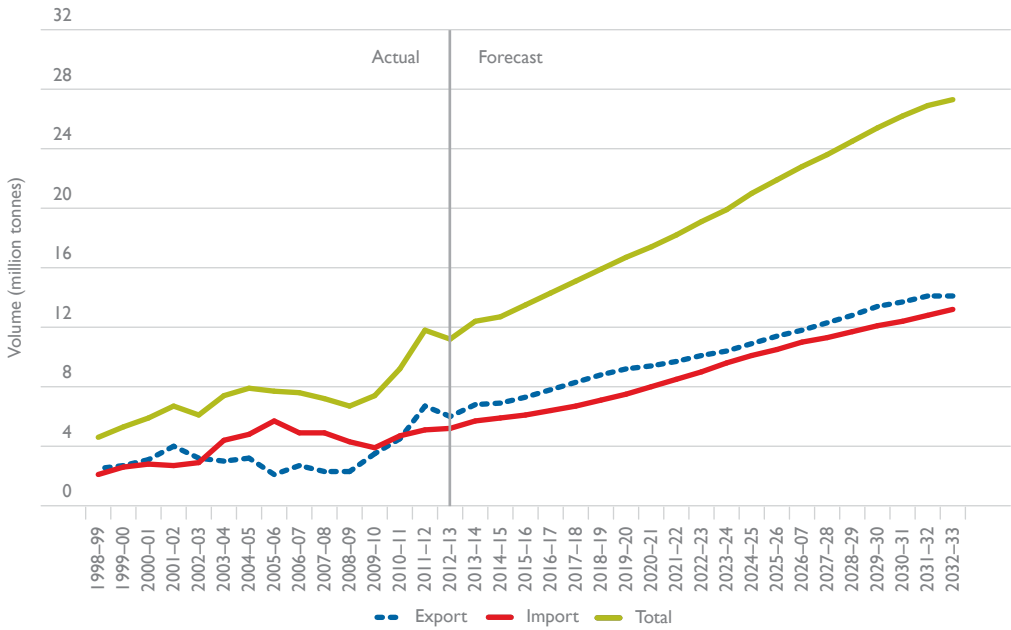
Source: Flinders Port (2014).

**Figure 4.21** Main non-containerised import commodities through Port Adelaide, 2012–13



Source: Flinders Port (2014).

Figure 4.22 Non-containerised trade: Port Adelaide



Sources: Ports Australia (2014) and BITRE estimates.

**Table 4.8** Non-containerised trade: Port Adelaide

Year	Export	Import	Total
	(million tonnes)		
1998–99	2.5	2.1	4.6
2008–09	2.3	4.3	6.7
2009–10	3.5	3.9	7.4
2010–11	4.5	4.7	9.2
2011–12	6.7	5.1	11.8
2012–13	6.0	5.2	11.2
<b>2013–14</b>	<b>6.8</b>	<b>5.7</b>	<b>12.4</b>
<b>2014–15</b>	<b>6.9</b>	<b>5.9</b>	<b>12.7</b>
<b>2015–16</b>	<b>7.3</b>	<b>6.1</b>	<b>13.5</b>
<b>2016–17</b>	<b>7.8</b>	<b>6.4</b>	<b>14.3</b>
<b>2017–18</b>	<b>8.3</b>	<b>6.7</b>	<b>15.1</b>
<b>2018–19</b>	<b>8.8</b>	<b>7.1</b>	<b>15.9</b>
<b>2019–20</b>	<b>9.2</b>	<b>7.5</b>	<b>16.7</b>
<b>2020–21</b>	<b>9.4</b>	<b>8.0</b>	<b>17.4</b>
<b>2021–22</b>	<b>9.7</b>	<b>8.5</b>	<b>18.2</b>
<b>2022–23</b>	<b>10.1</b>	<b>9.0</b>	<b>19.1</b>
<b>2023–24</b>	<b>10.4</b>	<b>9.6</b>	<b>19.9</b>
<b>2024–25</b>	<b>10.9</b>	<b>10.1</b>	<b>21.0</b>
<b>2025–26</b>	<b>11.4</b>	<b>10.5</b>	<b>21.9</b>
<b>2026–07</b>	<b>11.8</b>	<b>11.0</b>	<b>22.8</b>
<b>2027–28</b>	<b>12.3</b>	<b>11.3</b>	<b>23.6</b>
<b>2028–29</b>	<b>12.8</b>	<b>11.7</b>	<b>24.5</b>
<b>2029–30</b>	<b>13.4</b>	<b>12.1</b>	<b>25.4</b>
<b>2030–31</b>	<b>13.7</b>	<b>12.4</b>	<b>26.2</b>
<b>2031–32</b>	<b>14.1</b>	<b>12.8</b>	<b>26.9</b>
<b>2032–33</b>	<b>14.1</b>	<b>13.2</b>	<b>27.3</b>
Annual average growth rate (per cent)			
1998–99 to 2012–13	6.5	6.7	6.6
<b>2012–13 to 2032–33</b>	<b>4.4</b>	<b>4.8</b>	<b>4.6</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.



The volume of non-containerised imports through Port Adelaide increased by 6.7 per cent a year over the last 14 years to 5.2 million tonnes in 2012–13, and is projected to increase by 4.8 per cent a year over the next 20 years to 13.2 million tonnes in 2032–33. The expected lower growth forecast is largely due to the slowing of the Australian economy and an expected rise in average import prices over the forecast period. Real average import prices, which declined by 0.7 per cent a year over the last 14 years, are assumed to rise by 1.2 per cent a year over the forecast period.

As in the case of the Port of Melbourne, scheduled closure of domestic car manufacturing plants in Adelaide over the next three years would be expected to impact motor vehicle exports through Port Adelaide. However, it is likely to have only a minimal effect on total non-containerised exports through Port Adelaide as motor vehicle exports account for only 0.5 per cent of total non-containerised exports (by mass) through Port Adelaide—most motor vehicles exports are shipped through the Port of Melbourne. Export of other non-containerised commodities—grain, iron ore, limestone, cement/clinker and mineral sands—is expected to increase to compensate the loss of shipment of car exports through Port Adelaide.

Total non-containerised trade through Port Adelaide is forecast to increase by 4.6 per cent per annum over the next 20 years, from 11.2 million tonnes in 2012–13 to 27.3 million tonnes in 2032–33.

## Port of Fremantle

The Port of Fremantle, which is managed by Fremantle Port Authority (trading as Fremantle Ports), is the main general cargo port of Western Australia. In 2012–13, total trade through the port was around 32.0 million tonnes, comprising around 18 million tonnes of exports and 14.0 million tonnes of imports.

The main commodities (containerised plus non-containerised) exported through the Port of Fremantle in 2012–13 were grain, iron ore, alumina, refined petroleum and coal. Combined, they account for 80.8 per cent of the total volume all commodities exported through the Port of Fremantle (Fremantle Ports 2013).

The main commodities (containerised plus non-containerised) imported through the Port of Fremantle in 2012–13 were:

- crude petroleum
- refined petroleum
- caustic soda
- cement clinker
- phosphates
- sulphur
- iron and steel products
- chemicals and related products
- manufactures of metal
- slag residue

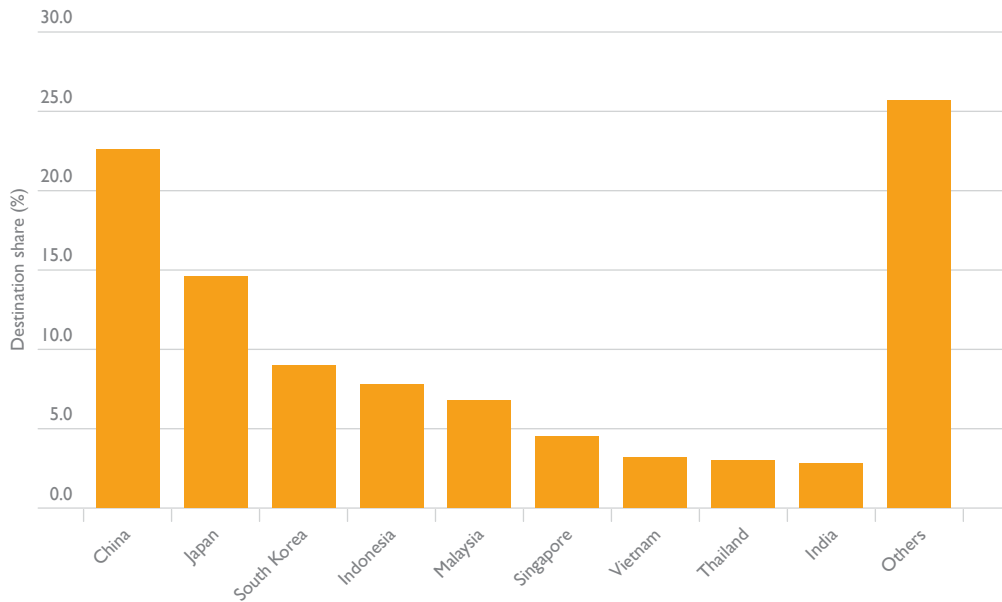
The main trading regions and trade share (i.e. containerised and non-containerised trade combined) of the Port of Fremantle in 2012–13 were:

- East Asia (34.0 per cent)
- South-East Asia (23.0 per cent)
- Middle East (16.0 per cent)
- Australia (12.0 per cent)
- Southern Asia (4.0 per cent)
- UK and Europe (4.0 per cent)
- North America (3.0 per cent)
- Africa (2.0 per cent)
- Others (2.0 per cent)

### Containerised trade

The main destinations of containerised commodities exported from the Port of Fremantle are China, Singapore, Malaysia, Japan, South Korea, Indonesia, Thailand, Vietnam and India (Figure 4.23). The main origins of commodities imported through the Port of Fremantle are China, the USA, Thailand, Malaysia, South Korea, Indonesia, Singapore, Germany and other Australian ports (Figure 4.24).

**Figure 4.23** Port of Fremantle full containerised export share, by destination country, 2012–13

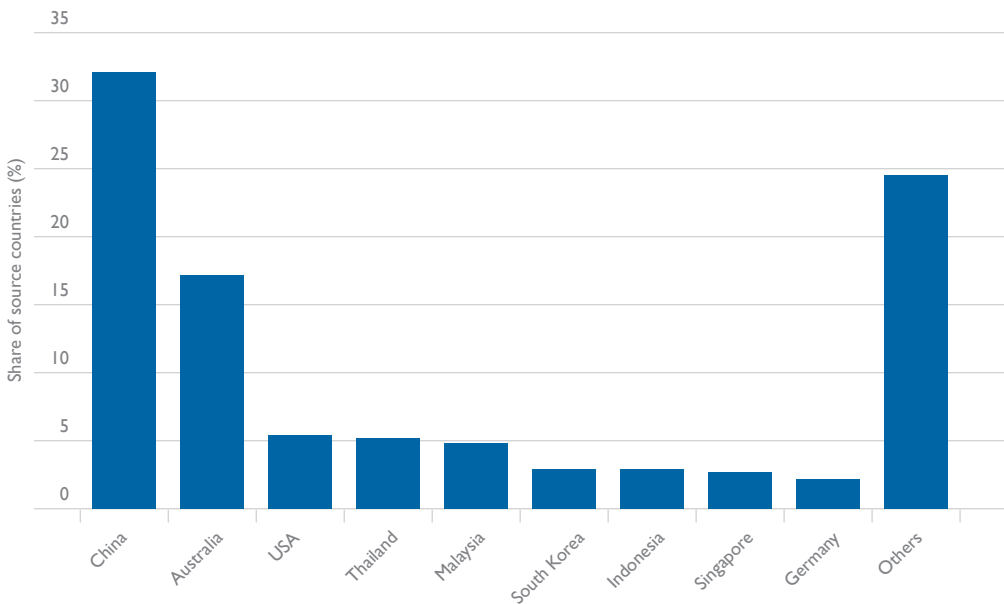


Source: Fremantle Ports (2013).

Total containerised trade through the Port of Fremantle increased by 6.6 per cent a year over the last 14 years, from 276 000 TEUs in 1998–99 to 670 000 TEUs in 2012–13. It is forecast to increase by 5.8 per cent a year over the next 20 years to 2.1 million TEUs in 2032–33 (Figure 4.25 and Table 4.9).

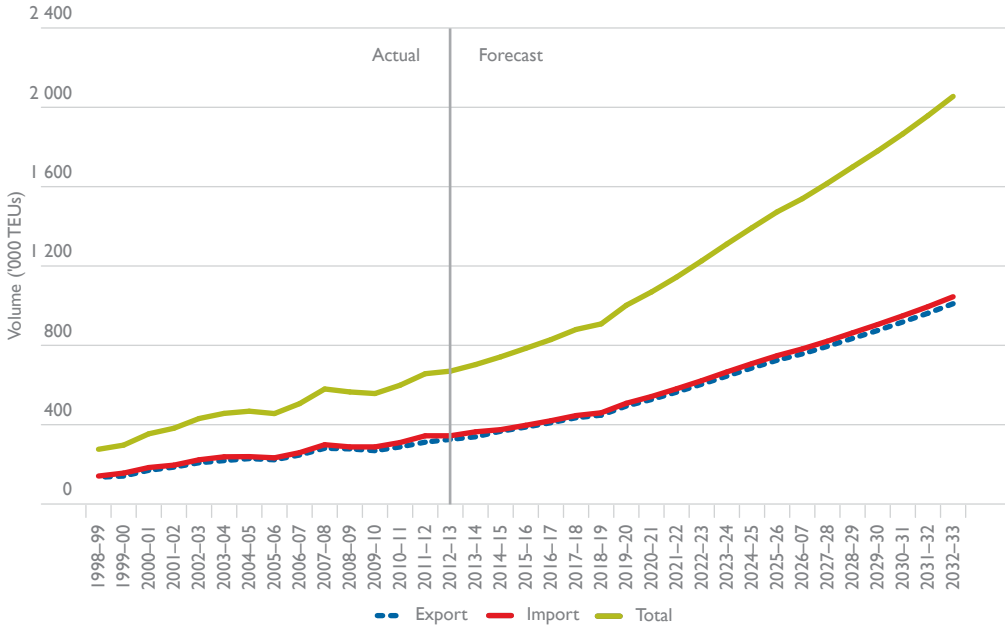
Total containerised exports, which increased by 6.5 per cent a year over the last 14 years, are forecast to increase by 5.8 per cent a year over the next 20 years, from 326 000 TEUs in 2012–13 to 1.0 million TEUs in 2032–33. Full export containers accounted for 53.5 per cent and empty export containers 46.5 per cent of total containerised exports through the Port of Fremantle in 2012–13. Full and empty container exports are projected to increase by 3.3 and 7.7 per cent a year, to 337 000 and 672 000 TEUs, respectively, by 2032–33.

**Figure 4.24** Port of Fremantle full containerised import share, by originating country, 2012–13



Source: Fremantle Ports (2013).

Figure 4.25 Containerised trade: Port of Fremantle



Sources: Ports Australia (2014) and BITRE estimates.

Total containerised imports through the Port of Fremantle, which increased by 6.6 per cent a year over the last 14 years to 344 000 TEUs in 2012–13, are forecast to increase by 5.7 per cent per annum during the forecast period to 1.0 million TEUs in 2032–33. Full containerised imports increased by 8.1 per cent a year over the last 14 years to 330 000 TEUs in 2012–13 and are forecast to increase by 5.9 per cent a year over the forecast period to 1.0 million TEUs in 2032–33. Empty container imports through the Port of Fremantle are projected to increase by 0.5 per cent a year over the next 20 years to 15 000 TEUs in 2032–33.

### Non-containerised trade

In 2012–13, the Port of Fremantle handled 25.7 million tonnes of non-containerised trade, which has increased by 1.7 per cent a year over the last 14 years. Total non-containerised trade is forecast to increase by 1.1 per cent over the next 20 years to 31.9 million tonnes in 2032–33 (Figure 4.26 and Table 4.10).

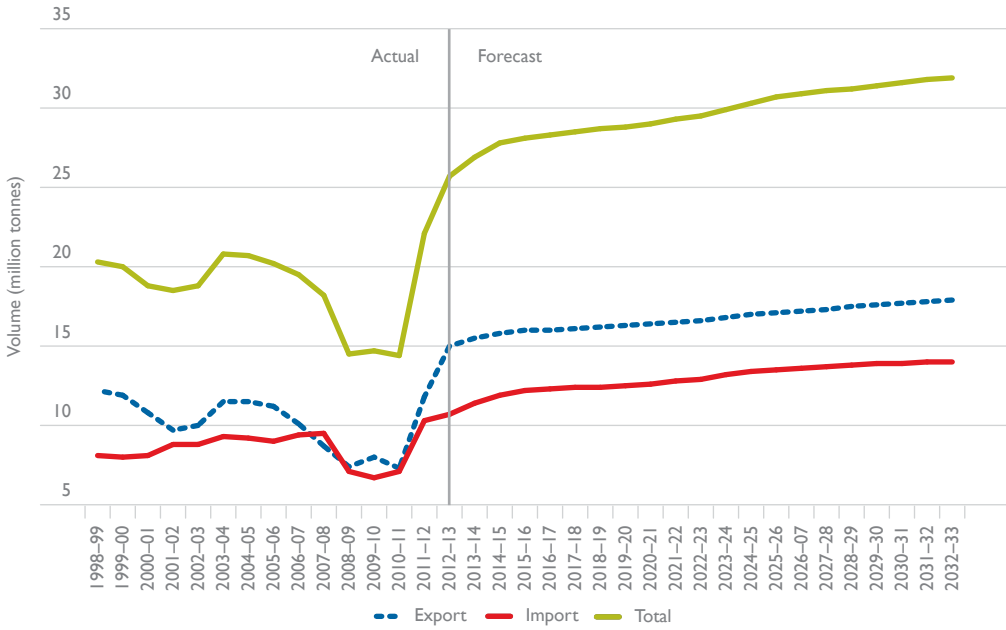
**Table 4.9** Containerised trade: Port of Fremantle

Year	Exports			Imports			Total trade
	Full	Empty	Total	Full	Empty	Total	
	('000 TEUs)						
1998–99	105	30	135	111	30	141	276
2008–09	191	87	278	256	32	288	565
2009–10	179	90	269	264	25	288	557
2010–11	169	120	288	293	17	310	599
2011–12	161	152	312	330	14	344	657
2012–13	175	152	326	330	14	344	670
<b>2013–14</b>	<b>206</b>	<b>133</b>	<b>339</b>	<b>341</b>	<b>23</b>	<b>364</b>	<b>703</b>
2014–15	210	157	367	353	22	375	742
2015–16	212	176	388	376	21	397	785
2016–17	219	191	410	400	20	420	829
2017–18	228	207	435	425	20	446	880
2018–19	228	220	448	441	19	460	908
2019–20	232	262	494	492	16	508	1002
2020–21	234	293	527	527	15	542	1069
2021–22	238	325	564	565	16	581	1144
2022–23	249	354	604	605	17	622	1226
2023–24	259	386	645	649	17	666	1311
2024–25	271	415	686	691	17	708	1393
2025–26	281	444	725	731	17	748	1473
2026–07	290	467	757	765	17	782	1539
2027–28	299	496	795	804	17	821	1617
2028–29	308	527	835	846	17	863	1699
2029–30	318	558	875	888	17	905	1780
2030–31	324	594	918	932	16	949	1866
2031–32	330	632	962	980	16	995	1958
2032–33	337	672	1010	1030	15	1045	2055
Annual average growth rate (per cent)							
1998–99 to 2012–13	3.7	12.3	6.5	8.1	-5.2	6.6	6.6
<b>2012–13 to 2032–33</b>	<b>3.3</b>	<b>7.7</b>	<b>5.8</b>	<b>5.9</b>	<b>0.5</b>	<b>5.7</b>	<b>5.8</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.

Figure 4.26 Non-containerised trade: Port of Fremantle



Sources: Ports Australia (2014) and BITRE estimates.

**Table 4.10** Non-containerised trade: Port of Fremantle

Year	Export	Import	Total
	(million tonnes)		
1998–99	12.2	8.1	20.3
2008–09	7.4	7.1	14.5
2009–10	8.0	6.7	14.7
2010–11	7.3	7.1	14.4
2011–12	11.8	10.3	22.1
2012–13	15.0	10.7	25.7
<b>2013–14</b>	<b>15.5</b>	<b>11.4</b>	<b>26.9</b>
<b>2014–15</b>	<b>15.8</b>	<b>11.9</b>	<b>27.8</b>
<b>2015–16</b>	<b>16.0</b>	<b>12.2</b>	<b>28.1</b>
<b>2016–17</b>	<b>16.0</b>	<b>12.3</b>	<b>28.3</b>
<b>2017–18</b>	<b>16.1</b>	<b>12.4</b>	<b>28.5</b>
<b>2018–19</b>	<b>16.2</b>	<b>12.4</b>	<b>28.7</b>
<b>2019–20</b>	<b>16.3</b>	<b>12.5</b>	<b>28.8</b>
<b>2020–21</b>	<b>16.4</b>	<b>12.6</b>	<b>29.0</b>
<b>2021–22</b>	<b>16.5</b>	<b>12.8</b>	<b>29.3</b>
<b>2022–23</b>	<b>16.6</b>	<b>12.9</b>	<b>29.5</b>
<b>2023–24</b>	<b>16.8</b>	<b>13.2</b>	<b>29.9</b>
<b>2024–25</b>	<b>17.0</b>	<b>13.4</b>	<b>30.3</b>
<b>2025–26</b>	<b>17.1</b>	<b>13.5</b>	<b>30.7</b>
<b>2026–07</b>	<b>17.2</b>	<b>13.6</b>	<b>30.9</b>
<b>2027–28</b>	<b>17.3</b>	<b>13.7</b>	<b>31.1</b>
<b>2028–29</b>	<b>17.5</b>	<b>13.8</b>	<b>31.2</b>
<b>2029–30</b>	<b>17.6</b>	<b>13.9</b>	<b>31.4</b>
<b>2030–31</b>	<b>17.7</b>	<b>13.9</b>	<b>31.6</b>
<b>2031–32</b>	<b>17.8</b>	<b>14.0</b>	<b>31.8</b>
<b>2032–33</b>	<b>17.9</b>	<b>14.0</b>	<b>31.9</b>
Annual average growth rate (per cent)			
1998–99 to 2012–13	1.5	2.0	1.7
<b>2012–13 to 2032–33</b>	<b>0.9</b>	<b>1.4</b>	<b>1.1</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.

Non-containerised export volumes through the Port of Fremantle are heavily influenced by grain export volumes, which are, in turn, subject to grain growing conditions in the south west of Western Australia. Non-containerised exports, which currently account for 58.3 per cent of total non-containerised trade through the Port of Fremantle, increased by 1.5 per cent a year over the last 14 years to 15.0 million tonnes in 2012–13. They are projected to grow by 0.9 per cent a year over the next 20 years to 17.9 million tonnes in 2032–33.

Non-containerised imports, which grew by 2.0 per cent a year over the last 14 years to 10.7 million tonnes in 2012–13, are projected to rise by 1.4 per cent a year to 14.0 million tonnes in 2032–33.

## Other Ports

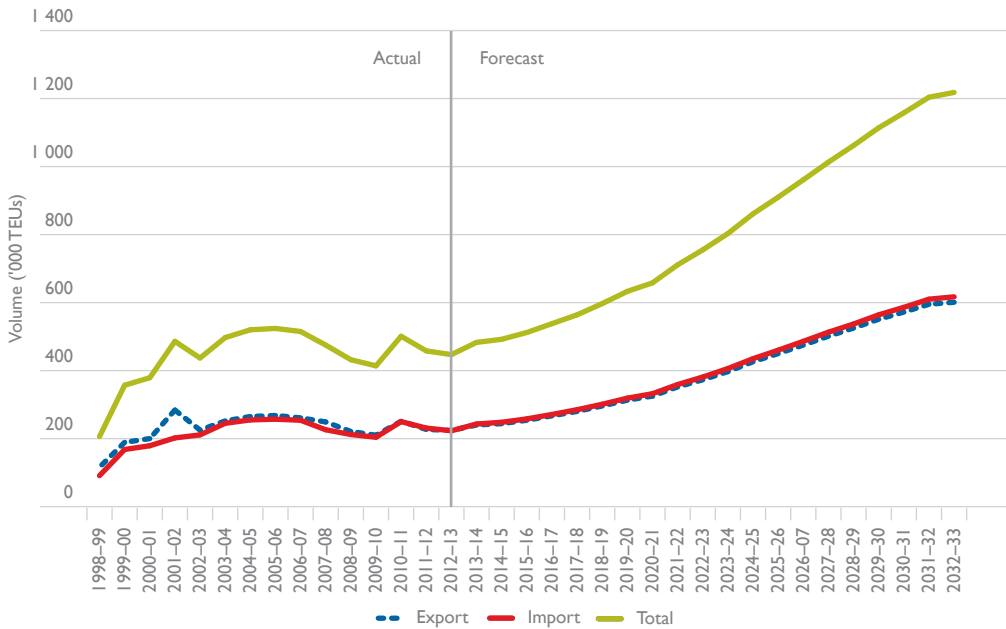
As defined in Chapter 1, 'Other Ports' are defined here to include all other Australian ports, excluding the mainland state capital city ports—Port of Brisbane, Sydney region ports, Port of Melbourne, Port Adelaide and Port of Fremantle. Major ports grouped in Other Ports include: Cairns, Devonport, Burnie, Launceston, Townsville, Hobart, Rockhampton and Darwin and Australia's major coal and iron ore export ports —Port Hedland, Dampier, Port Walcott, Newcastle, Gladstone, Hay Point and Abbot Point. Other Ports currently account for 86.8 per cent of Australia's total sea trade by volume and 88.8 per cent of Australia's total non-containerised trade by volume—dominated by iron ore and coal.

In 2012–13, total trade through Other Ports was 983.6 million tonnes. Exports dominated, accounting for 93.8 per cent of the total trade through Other Ports.

### Containerised trade

Containerised trade through Other Ports accounts for around 6.2 per cent of Australia's total containerised trade, and has increased by 5.7 per cent a year over the last 14 years, from 206 000 TEUs in 1998–99 to 447 000 TEUs in 2012–13 (Figure 4.27 and Table 4.11). Full containerised exports from Other Ports grew by 3.2 per cent a year and full containerised imports by 6.1 per cent a year over the same period, to 167 000 and 136 000 TEUs respectively, in 2012–13.

**Figure 4.27** Containerised trade: Other Ports



Sources: Ports Australia (2014) and BITRE estimates.



**Table 4.11** Containerised trade: Other Ports

Year	Exports			Imports			Total trade
	Full	Empty	Total	Full	Empty	Total	
	('000 TEUs)						
1998–99	107	8	116	59	31	91	206
2008–09	159	61	221	143	69	212	432
2009–10	149	61	210	144	61	204	414
2010–11	174	78	251	166	84	250	501
2011–12	163	64	227	146	86	231	458
2012–13	167	58	224	136	87	223	447
<b>2013–14</b>	<b>171</b>	<b>69</b>	<b>240</b>	<b>139</b>	<b>104</b>	<b>243</b>	<b>483</b>
<b>2014–15</b>	<b>170</b>	<b>74</b>	<b>244</b>	<b>145</b>	<b>103</b>	<b>248</b>	<b>492</b>
<b>2015–16</b>	<b>172</b>	<b>82</b>	<b>254</b>	<b>153</b>	<b>105</b>	<b>258</b>	<b>512</b>
<b>2016–17</b>	<b>178</b>	<b>88</b>	<b>267</b>	<b>163</b>	<b>109</b>	<b>271</b>	<b>538</b>
<b>2017–18</b>	<b>184</b>	<b>96</b>	<b>280</b>	<b>173</b>	<b>112</b>	<b>285</b>	<b>564</b>
<b>2018–19</b>	<b>190</b>	<b>106</b>	<b>296</b>	<b>185</b>	<b>116</b>	<b>301</b>	<b>597</b>
<b>2019–20</b>	<b>197</b>	<b>116</b>	<b>313</b>	<b>198</b>	<b>121</b>	<b>319</b>	<b>633</b>
<b>2020–21</b>	<b>195</b>	<b>131</b>	<b>325</b>	<b>213</b>	<b>120</b>	<b>332</b>	<b>658</b>
<b>2021–22</b>	<b>213</b>	<b>140</b>	<b>352</b>	<b>228</b>	<b>131</b>	<b>359</b>	<b>711</b>
<b>2022–23</b>	<b>220</b>	<b>153</b>	<b>373</b>	<b>245</b>	<b>136</b>	<b>381</b>	<b>755</b>
<b>2023–24</b>	<b>226</b>	<b>171</b>	<b>397</b>	<b>266</b>	<b>140</b>	<b>406</b>	<b>803</b>
<b>2024–25</b>	<b>240</b>	<b>186</b>	<b>426</b>	<b>286</b>	<b>149</b>	<b>435</b>	<b>861</b>
<b>2025–26</b>	<b>248</b>	<b>202</b>	<b>450</b>	<b>305</b>	<b>155</b>	<b>460</b>	<b>910</b>
<b>2026–07</b>	<b>260</b>	<b>215</b>	<b>475</b>	<b>324</b>	<b>162</b>	<b>486</b>	<b>961</b>
<b>2027–28</b>	<b>274</b>	<b>226</b>	<b>501</b>	<b>340</b>	<b>172</b>	<b>513</b>	<b>1013</b>
<b>2028–29</b>	<b>284</b>	<b>240</b>	<b>525</b>	<b>358</b>	<b>179</b>	<b>537</b>	<b>1062</b>
<b>2029–30</b>	<b>298</b>	<b>253</b>	<b>551</b>	<b>376</b>	<b>188</b>	<b>564</b>	<b>1114</b>
<b>2030–31</b>	<b>303</b>	<b>269</b>	<b>572</b>	<b>394</b>	<b>192</b>	<b>586</b>	<b>1158</b>
<b>2031–32</b>	<b>308</b>	<b>286</b>	<b>595</b>	<b>414</b>	<b>195</b>	<b>610</b>	<b>1204</b>
<b>2032–33</b>	<b>287</b>	<b>313</b>	<b>601</b>	<b>436</b>	<b>181</b>	<b>617</b>	<b>1218</b>
Annual average growth rate (per cent)							
1998–99 to 2012–13	3.2	14.8	4.8	6.1	7.6	6.6	5.7
<b>2012–13 to 2032–33</b>	<b>2.8</b>	<b>8.8</b>	<b>5.0</b>	<b>6.0</b>	<b>3.7</b>	<b>5.2</b>	<b>5.1</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.

Since China accounts 31.6 per cent of Australia's exports and the Chinese economy is expected to grow by an annual average of 6.7 per cent over the next 20 years, Australia's exports are projected to grow positively over the forecast period. Full and empty container exports through Other Ports are projected to grow by 2.8 and 8.8 per cent a year over the forecast period, to 287 000 and 313 000 TEUs in 2032–33, respectively. As a result, total container (full plus empty) exports through Other Ports are forecast to increase by 5.0 per cent a year over the next 20 years to 601 000 TEUs in 2032–33.

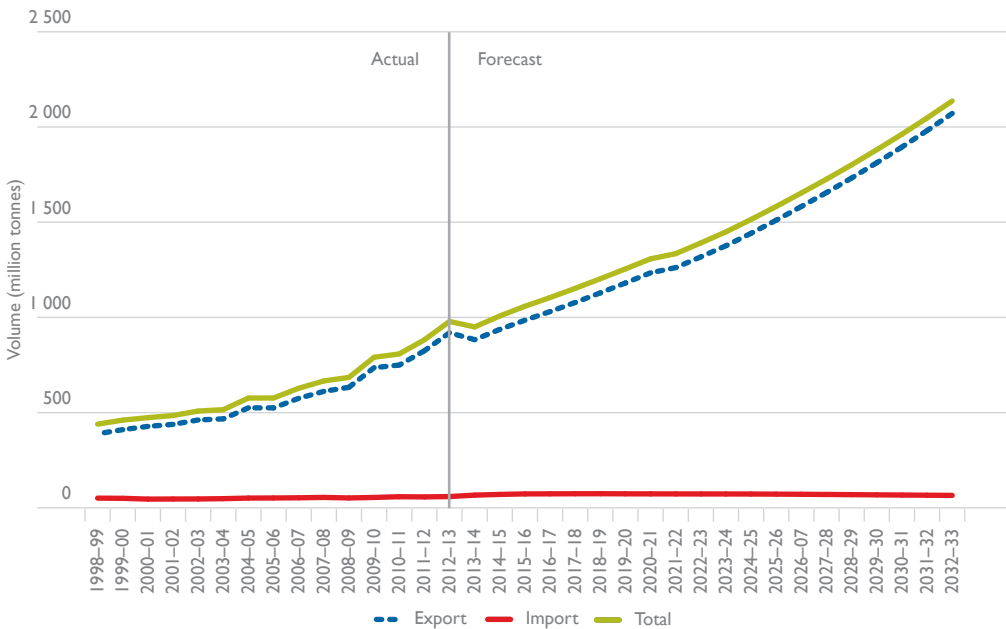
Full containerised imports through Other Ports are projected to grow by 6.0 per cent a year over the next 20 years to 436 000 TEUs in 2032–33, whereas empty container imports are projected to increase by 3.7 per cent a year over the same period to 181 000 TEUs in 2032–33. Total containerised imports through Other Ports are forecast to increase by 5.2 per cent a year over the next 20 years to 617 000 TEUs in 2032–33.

The volume of total containerised trade through Other Ports is projected to increase by 5.1 per cent a year over the next 20 years, from 447 000 TEUs in 2012–13 to 1.2 million TEUs in 2032–33.

### Non-containerised trade

In 2012–13, Other Ports handled a total of 978.7 million tonnes of non-containerised trade, including 919.4 million tonnes of non-containerised exports—dominated by iron ore and coal exports—and 59.3 million tonnes of non-containerised imports (Figure 4.28 and Table 4.12).

**Figure 4.28 Non-containerised trade: Other Ports**



Sources: Ports Australia (2014) and BITRE estimates.

**Table 4.12** Non-containerised trade: Other Ports

Year	Export	Import	Total
	(million tonnes)		
1998–99	388.9	51.0	439.8
2008–09	633.2	51.9	685.1
2009–10	736.2	54.6	790.8
2010–11	749.9	58.4	808.3
2011–12	826.3	56.0	882.3
2012–13	919.4	59.3	978.7
2013–14	<b>883.3</b>	<b>66.8</b>	<b>950.1</b>
2014–15	<b>937.1</b>	<b>70.5</b>	<b>1007.6</b>
2015–16	<b>985.3</b>	<b>73.2</b>	<b>1058.5</b>
2016–17	<b>1030.7</b>	<b>73.6</b>	<b>1104.3</b>
2017–18	<b>1078.5</b>	<b>74.0</b>	<b>1152.5</b>
2018–19	<b>1129.0</b>	<b>74.2</b>	<b>1203.1</b>
2019–20	<b>1181.1</b>	<b>73.7</b>	<b>1254.9</b>
2020–21	<b>1234.4</b>	<b>73.4</b>	<b>1307.8</b>
2021–22	<b>1261.6</b>	<b>73.2</b>	<b>1334.8</b>
2022–23	<b>1318.1</b>	<b>73.0</b>	<b>1391.2</b>
2023–24	<b>1376.5</b>	<b>72.9</b>	<b>1449.4</b>
2024–25	<b>1442.0</b>	<b>72.6</b>	<b>1514.6</b>
2025–26	<b>1510.7</b>	<b>72.0</b>	<b>1582.7</b>
2026–07	<b>1582.6</b>	<b>71.3</b>	<b>1653.9</b>
2027–28	<b>1655.8</b>	<b>70.3</b>	<b>1726.0</b>
2028–29	<b>1732.3</b>	<b>69.3</b>	<b>1801.6</b>
2029–30	<b>1812.4</b>	<b>68.3</b>	<b>1880.7</b>
2030–31	<b>1894.9</b>	<b>67.3</b>	<b>1962.2</b>
2031–32	<b>1981.1</b>	<b>66.3</b>	<b>2047.5</b>
2032–33	<b>2071.3</b>	<b>65.4</b>	<b>2136.7</b>
Annual average growth rate (per cent)			
1998–99 to 2012–13	6.3	1.1	5.9
<b>2012–13 to 2032–33</b>	<b>4.1</b>	<b>0.5</b>	<b>4.0</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.

The volume of total non-containerised trade, which increased by 5.9 per cent a year over the last 14 years, is forecast to increase by 4.0 per cent a year over the next 20 years to 2.1 billion tonnes in 2032–33. Non-containerised exports, which include Australia's iron ore and coal export trades, increased by 6.3 per cent a year over the last 14 years, and are projected to increase by 4.1 per cent a year over the forecast period to 2.1 billion tonnes in 2032–33. Non-containerised imports, which increased by 1.1 per cent a year over the last 14 years, are projected to increase by 0.5 per cent a year over the forecast period to 65.4 million tonnes in 2032–33.

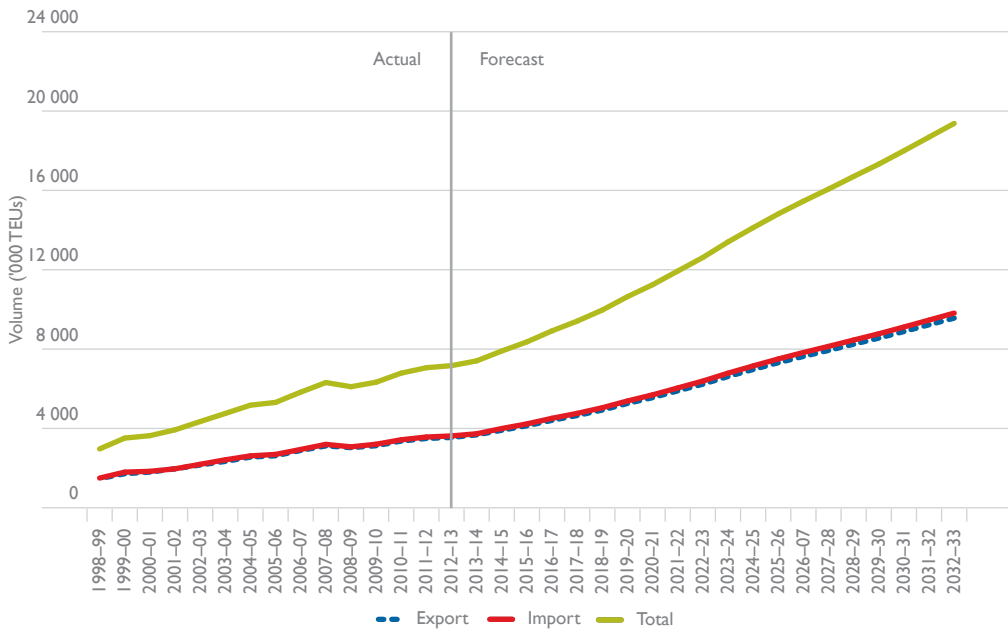
## All ports

Aggregated across All Ports, the total volume of trade through Australian ports increased by 9.5 per cent in 2012–13, over 2011–12, to 1.1 billion tonnes, due to strong growth in exports (Ports Australia 2013). The volume of exports through Australian ports grew 10.9 per cent to 992.7 million tonnes in 2012–13, while the volume of imports increased by 0.8 per cent, to 140.2 million tonnes in 2012–13.

### Containerised trade

Across All Ports, the volume of Australia's total containerised trade has increased by 6.5 per cent a year over the last 14 years to 7.2 million TEUs in 2012–13 (Figure 4.29 and Table 4.13). Full containerised exports grew by 4.7 per cent a year and full containerised imports by 7.0 per cent a year over the same period, to 2.1 and 3.3 million TEUs in 2012–13.

**Figure 4.29** Containerised trade: All Ports



Sources: Ports Australia (2014) and BITRE estimates.

With the positive economic outlook for Australia and its major trading partners, Australia's exports and imports are projected to grow positively over the forecast period. Full and empty container exports through all Australian ports are projected to grow by 4.1 and 6.3 per cent a year, respectively, over the forecast period to 4.8 million TEUs each in 2032–33. As a result, total container (full plus empty) exports through All Ports are forecast to increase by 5.1 per cent a year over the next 20 years to 9.6 million TEUs in 2032–33.

Full containerised imports, which increased by 7.0 per cent a year over the last 14 years, are projected to grow by 5.3 per cent a year over the forecast period, from 3.3 million TEUs in 2012–13 to 9.2 million TEUs in 2032–33. Empty container imports are projected to increase

by 3.0 per cent a year over the next 20 years to 0.6 million TEUs. Total containerised (full plus empty) imports through All Ports are forecast to increase by 5.1 per cent a year over the next 20 years to 9.8 TEUs in 2032–33.

The volume of total containerised trade through All Ports is projected to increase by 5.1 per cent a year over the next 20 years, from 7.2 million TEUs in 2012–13 to 19.4 million TEUs, in 2032–33.

**Table 4.13** Containerised trade: All Ports

Year	Exports			Imports			Total trade
	Full	Empty	Total	Full	Empty	Total	
	('000 TEUs)						
1998–99	1119	350	1469	1271	226	1497	2966
2008–09	1891	1139	3031	2708	365	3072	6103
2009–10	1914	1213	3127	2888	314	3203	6329
2010–11	2016	1345	3361	3088	340	3428	6789
2011–12	2115	1378	3493	3227	340	3567	7060
2012–13	2124	1420	3544	3272	349	3621	7165
2013–14	<b>2174</b>	<b>1500</b>	<b>3674</b>	<b>3341</b>	<b>390</b>	<b>3731</b>	<b>7405</b>
2014–15	<b>2235</b>	<b>1672</b>	<b>3907</b>	<b>3614</b>	<b>381</b>	<b>3995</b>	<b>7902</b>
2015–16	<b>2337</b>	<b>1797</b>	<b>4134</b>	<b>3842</b>	<b>386</b>	<b>4228</b>	<b>8362</b>
2016–17	<b>2465</b>	<b>1943</b>	<b>4408</b>	<b>4114</b>	<b>396</b>	<b>4511</b>	<b>8919</b>
2017–18	<b>2584</b>	<b>2067</b>	<b>4651</b>	<b>4352</b>	<b>407</b>	<b>4759</b>	<b>9410</b>
2018–19	<b>2697</b>	<b>2228</b>	<b>4925</b>	<b>4623</b>	<b>420</b>	<b>5043</b>	<b>9968</b>
2019–20	<b>2845</b>	<b>2413</b>	<b>5257</b>	<b>4950</b>	<b>434</b>	<b>5384</b>	<b>10642</b>
2020–21	<b>2906</b>	<b>2646</b>	<b>5553</b>	<b>5262</b>	<b>430</b>	<b>5692</b>	<b>11244</b>
2021–22	<b>3075</b>	<b>2817</b>	<b>5892</b>	<b>5585</b>	<b>455</b>	<b>6040</b>	<b>11933</b>
2022–23	<b>3227</b>	<b>3003</b>	<b>6230</b>	<b>5914</b>	<b>473</b>	<b>6388</b>	<b>12617</b>
2023–24	<b>3377</b>	<b>3238</b>	<b>6615</b>	<b>6299</b>	<b>487</b>	<b>6786</b>	<b>13401</b>
2024–25	<b>3538</b>	<b>3431</b>	<b>6969</b>	<b>6642</b>	<b>508</b>	<b>7150</b>	<b>14119</b>
2025–26	<b>3702</b>	<b>3610</b>	<b>7312</b>	<b>6975</b>	<b>527</b>	<b>7502</b>	<b>14815</b>
2026–07	<b>3865</b>	<b>3764</b>	<b>7629</b>	<b>7280</b>	<b>547</b>	<b>7827</b>	<b>15456</b>
2027–28	<b>4044</b>	<b>3888</b>	<b>7931</b>	<b>7564</b>	<b>572</b>	<b>8136</b>	<b>16067</b>
2028–29	<b>4222</b>	<b>4023</b>	<b>8245</b>	<b>7864</b>	<b>593</b>	<b>8457</b>	<b>16702</b>
2029–30	<b>4398</b>	<b>4154</b>	<b>8553</b>	<b>8155</b>	<b>616</b>	<b>8771</b>	<b>17324</b>
2030–31	<b>4563</b>	<b>4321</b>	<b>8885</b>	<b>8480</b>	<b>632</b>	<b>9112</b>	<b>17997</b>
2031–32	<b>4715</b>	<b>4510</b>	<b>9225</b>	<b>8824</b>	<b>639</b>	<b>9462</b>	<b>18687</b>
2032–33	<b>4780</b>	<b>4783</b>	<b>9562</b>	<b>9187</b>	<b>627</b>	<b>9814</b>	<b>19377</b>
Annual average growth rate (per cent)							
1998–99 to 2012–13	4.7	10.5	6.5	7.0	3.1	6.5	6.5
2012–13 to 2032–33	<b>4.1</b>	<b>6.3</b>	<b>5.1</b>	<b>5.3</b>	<b>3.0</b>	<b>5.1</b>	<b>5.1</b>

\*Numbers in bold are forecasts.

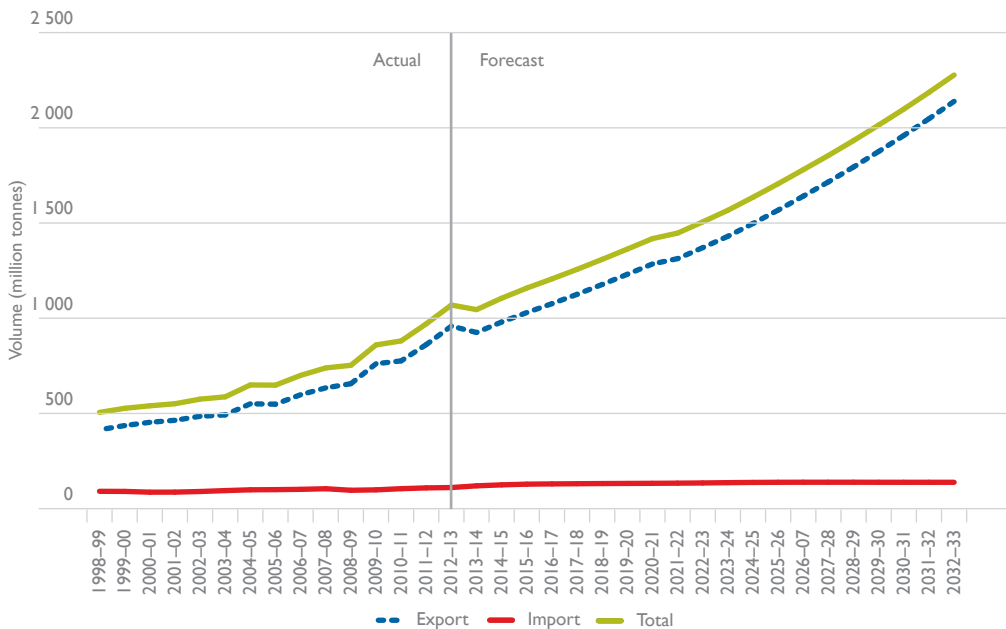
Sources: Ports Australia (2014) and BITRE estimates.

## Non-containerised trade

Australia’s total non-containerised trade stood at 1.1 billion tonnes in 2012–13, which included 958.6 million tonnes of non-containerised exports (89.6 per cent) and 110.9 million tonnes of non-containerised imports (10.4 per cent) (Figure 4.30 and Table 4.14). Exports dominate Australia’s non-containerised trade in volume terms.

Total non-containerised trade, which increased by 5.5 per cent a year over the last 14 years, is projected to increase by 3.9 per cent a year over the next 20 years to 2.3 billion tonnes in 2032–33. Non-containerised exports, which increased by 6.2 per cent a year over the last 14 years, are forecast to grow by 4.1 per cent a year during the forecast period to 2.1 billion tonnes in 2032–33. Non-containerised imports, which increased by 1.4 per cent a year over the last 14 years, are forecast to increase by 1.1 per cent a year over the forecast period to 138.5 million tonnes in 2032–33.

**Figure 4.30** Non-containerised trade, 1993–94 to 2024-25: All Ports



Sources: Ports Australia (2014) and BITRE estimates.

**Table 4.14** Non-containerised trade: All Ports

Year	Export	Import	Total
	(million tonnes)		
1998–99	414.3	91.1	505.5
2008–09	656.2	96.6	752.8
2009–10	761.0	98.8	859.8
2010–11	776.0	104.9	880.9
2011–12	861.6	109.1	970.6
2012–13	958.6	110.9	1069.4
<b>2013–14</b>	<b>925.3</b>	<b>119.9</b>	<b>1045.2</b>
<b>2014–15</b>	<b>980.2</b>	<b>125.0</b>	<b>1105.2</b>
<b>2015–16</b>	<b>1029.8</b>	<b>128.7</b>	<b>1158.4</b>
<b>2016–17</b>	<b>1076.5</b>	<b>130.0</b>	<b>1206.5</b>
<b>2017–18</b>	<b>1125.6</b>	<b>131.0</b>	<b>1256.7</b>
<b>2018–19</b>	<b>1177.4</b>	<b>131.9</b>	<b>1309.3</b>
<b>2019–20</b>	<b>1230.8</b>	<b>132.5</b>	<b>1363.2</b>
<b>2020–21</b>	<b>1285.1</b>	<b>133.1</b>	<b>1418.2</b>
<b>2021–22</b>	<b>1313.1</b>	<b>134.0</b>	<b>1447.1</b>
<b>2022–23</b>	<b>1370.8</b>	<b>135.0</b>	<b>1505.9</b>
<b>2023–24</b>	<b>1430.4</b>	<b>136.6</b>	<b>1567.0</b>
<b>2024–25</b>	<b>1497.6</b>	<b>137.8</b>	<b>1635.4</b>
<b>2025–26</b>	<b>1567.8</b>	<b>138.5</b>	<b>1706.3</b>
<b>2026–07</b>	<b>1641.3</b>	<b>138.8</b>	<b>1780.1</b>
<b>2027–28</b>	<b>1716.0</b>	<b>138.8</b>	<b>1854.8</b>
<b>2028–29</b>	<b>1794.2</b>	<b>138.8</b>	<b>1932.9</b>
<b>2029–30</b>	<b>1875.9</b>	<b>138.6</b>	<b>2014.5</b>
<b>2030–31</b>	<b>1959.9</b>	<b>138.5</b>	<b>2098.4</b>
<b>2031–32</b>	<b>2047.6</b>	<b>138.5</b>	<b>2186.2</b>
<b>2032–33</b>	<b>2139.0</b>	<b>138.5</b>	<b>2277.5</b>
Annual average growth rate (per cent)			
1998–99 to 2011–12	6.2	1.4	5.5
<b>2011–12 to 2032–33</b>	<b>4.1</b>	<b>1.1</b>	<b>3.9</b>

\*Numbers in bold are forecasts.

Sources: Ports Australia (2014) and BITRE estimates.





## CHAPTER 5

# Forecasts of sea passengers

### Introduction

This chapter presents BITRE forecasts of international sea passenger numbers, which are based on re-estimated demand parameters and the current economic outlook for Australia and overseas sea passenger market. A detailed discussion of the global and the Australian cruise passenger markets was provided in BITRE (2006) and previous BITRE forecasts of sea passengers published in BITRE (2006 and 2010).

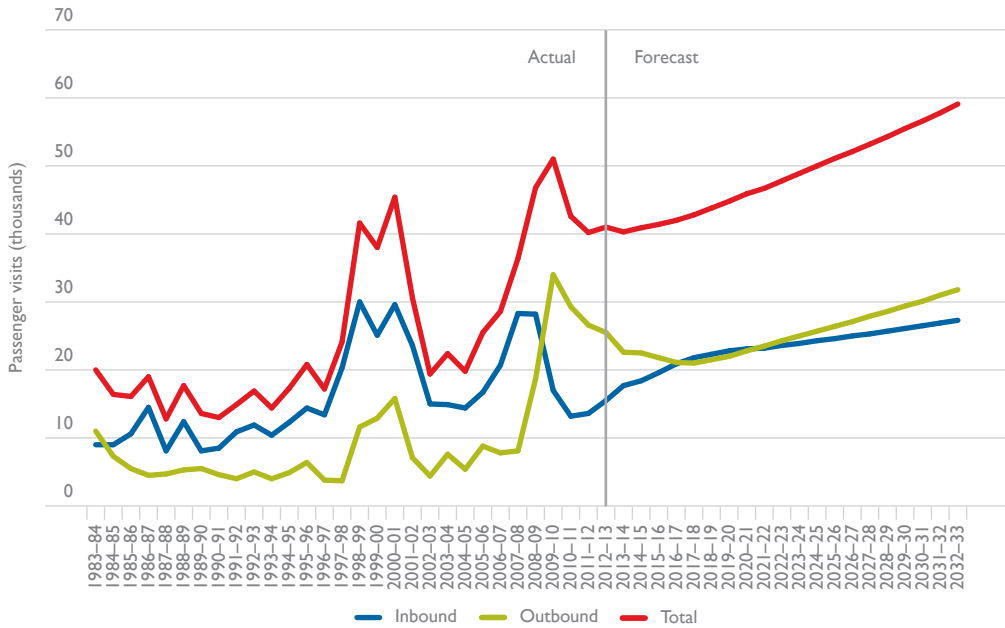
#### **Box 5.1**      **Sea passenger movement estimates**

While inbound and outbound cruise passengers may have more than one port call at Australian ports, as they have to clear Customs at each port visited, outbound and inbound sea passenger numbers are recorded by port of first arrival and last departure, respectively. The estimates of international sea passenger movements through Australian ports presented in Figure 5.1 and Table 5.1 are based purely on the number of passengers arriving in and departing from Australia by first point of entry or last point of exit, respectively.

### Growth in international sea passenger movements

According to historical data available since the early 1980s, the number of inbound and outbound sea passengers passing through Australian ports has fluctuated significantly with no clearly observable trend (Figure 5.1). Total international sea passenger numbers through Australian ports remained relatively flat between 1983–84 and 1996–97, and then increased significantly between 1998–99 and 2000–01. However, passenger numbers declined again, to around pre-1998 levels, in 2001–02 and 2002–03. This period is shortly after the September 11 terrorist attacks in the USA and the Severe Acute Respiratory Syndrome (SARS) epidemic in Asia. As mentioned in BITRE (2006), the operations of several international cruise ships were moved to Australia to avoid the SARS epidemic in Asia, which may account for part of the increase in passenger numbers through Australian ports in 2001–02 and subsequent decline thereafter. However, this only partially offset the adverse impact of the September 11 terrorist attacks and the SARS epidemic on Australia's international sea passenger numbers. The number of total sea passengers again grew strongly between 2004–05 and 2009–10, but declined sharply in 2010–11 and 2011–12, possibly due to the Global Financial Crisis (GFC) which severely reduced inbound sea passenger numbers in 2009–10 and 2010–11 and outbound passenger numbers in 2010–11.

Figure 5.1 Inbound and outbound sea passenger numbers



Sources: ABS (2013b) and BITRE estimates.

## Forecasts of sea passenger and cruise ship visits

Based on the projected positive economic outlook for Australia and the OECD, and continuing economic recovery following the GFC, the outlook for Australia’s inbound and outbound sea travel market appears to be positive.

The number of inbound sea passengers increased annually by 1.9 per cent a year over the last 30 years, from 9 000 passenger arrivals in 1983–84 to 15 500 in 2012–13. It is forecast to increase by 2.9 per cent a year over the next 20 years to 27 300 passenger arrivals in 2032–33 (Figure 5.1 and Table 5.1). On the other hand, the number of outbound sea passengers, which increased by 3.0 per cent a year over the last 30 years, from 11 000 passengers in 1983–84 to 25 500 in 2012–13, is projected to increase by 1.1 per cent a year over the next 20 years to 31 800 passengers in 2032–33.

The total (inbound plus outbound) number of sea passengers increased by an average annual rate of 2.5 per cent a year over the last 30 years, from 20 000 in 1983–84 to 41 000 in 2012–13. It is forecast to increase by 1.8 per cent a year over the forecast period to 59 100 in 2032–33.

**Table 5.1** Short-term international sea passengers: All Ports

Year	Inbound	Outbound	Total
1983–84	9.0	11.0	20.0
2007–08	28.3	8.1	36.4
2008–09	28.2	18.7	46.8
2009–10	17.0	34.0	51.0
2010–11	13.2	29.3	42.6
2011–12	13.6	26.6	40.2
2012–13	15.5	25.5	41.0
<b>2013–14</b>	<b>17.7</b>	<b>22.6</b>	<b>40.3</b>
<b>2014–15</b>	<b>18.4</b>	<b>22.5</b>	<b>40.9</b>
<b>2015–16</b>	<b>19.6</b>	<b>21.8</b>	<b>41.4</b>
<b>2016–17</b>	<b>20.9</b>	<b>21.1</b>	<b>42.0</b>
<b>2017–18</b>	<b>21.8</b>	<b>21.0</b>	<b>42.8</b>
<b>2018–19</b>	<b>22.3</b>	<b>21.5</b>	<b>43.8</b>
<b>2019–20</b>	<b>22.8</b>	<b>22.0</b>	<b>44.8</b>
<b>2020–21</b>	<b>23.1</b>	<b>22.8</b>	<b>45.9</b>
<b>2021–22</b>	<b>23.2</b>	<b>23.5</b>	<b>46.7</b>
<b>2022–23</b>	<b>23.6</b>	<b>24.3</b>	<b>47.8</b>
<b>2023–24</b>	<b>23.9</b>	<b>25.0</b>	<b>48.9</b>
<b>2024–25</b>	<b>24.3</b>	<b>25.7</b>	<b>50.0</b>
<b>2025–26</b>	<b>24.6</b>	<b>26.4</b>	<b>51.1</b>
<b>2026–27</b>	<b>25.0</b>	<b>27.1</b>	<b>52.1</b>
<b>2027–28</b>	<b>25.3</b>	<b>27.9</b>	<b>53.2</b>
<b>2028–29</b>	<b>25.7</b>	<b>28.6</b>	<b>54.3</b>
<b>2029–30</b>	<b>26.1</b>	<b>29.4</b>	<b>55.5</b>
<b>2030–31</b>	<b>26.5</b>	<b>30.1</b>	<b>56.6</b>
<b>2031–32</b>	<b>26.9</b>	<b>31.0</b>	<b>57.8</b>
<b>2032–33</b>	<b>27.3</b>	<b>31.8</b>	<b>59.1</b>
Annual average growth rate (per cent):			
1983–84 to 2012–13	1.9	3.0	2.5
<b>2012–13 to 2032–33</b>	<b>2.9</b>	<b>1.1</b>	<b>1.8</b>

\*Numbers in bold are forecasts.

Sources: ABS (2013b) and BITRE estimates.



## CHAPTER 6

# Sensitivity analysis

### Introduction

The most recent long-term population and macroeconomic projections for Australia and its major trading partners were used to derive the containerised and non-containerised trade forecasts in Chapter 4. However, significant variability in economic growth and exchange rates has been observed over the last two decades, particularly the unexpected shocks of the Asian financial crisis, Global Financial Crisis, the ongoing political uncertainty in the Middle East and recent tensions in Eastern Europe. Hence, sensitivity analysis was carried out to assess the possible impact of variations in likely future economic growth and exchange rates on likely future containerised and non-containerised trade through Australian ports. The sensitivity analysis results are compared here with the base case forecasts presented in Chapter 4.

### Sensitivity analysis on economic growth

Two alternative economic growth scenarios were considered—a high-growth scenario and a low-growth scenario. The scenario assumptions used were:

**High-growth scenario:** Average annual GDP growth in Australia and all OECD countries was assumed to be 0.5 percentage points higher than in the base case—i.e. average growth of 3.2 per cent per annum between 2012–13 and 2032–33 in Australia and 3.0 per cent per annum across all OECD countries.

**Low-growth scenario:** Average annual GDP growth in Australia and all OECD countries was assumed to be 0.5 percentage points lower than in the base case—i.e. average growth of 2.2 per cent per annum between 2012–13 and 2032–33 in Australia and 2.0 per cent per annum across all OECD countries.

Under the high growth scenario, total containerised trade through all Australian ports is projected to increase annually by 6.8 per cent a year; and under the low growth scenario by 3.5 per cent a year over the next 20 years, compared with growth of 5.1 per cent per annum under the base case scenario (Table 6.1). The impact of higher/lower average annual GDP growth on containerised trade varies by port, with the annual average growth rate ranging between 6.0 and 8.5 per cent per year under the high economic growth scenario and, between 3.0 and 4.1 per cent per year under the low economic growth scenario.

**Table 6.1** Total containerised trade through Australian ports, 2012–13 to 2032–33, under alternative GDP growth scenarios

Port	Base case	High growth scenario	Low growth scenario	High growth scenario	Low growth scenario
	Average annual growth rate (per cent per annum)			Difference (percentage points)	
Brisbane	6.2	8.5	4.0	2.3	-2.2
Sydney	4.5	6.0	3.1	1.4	-1.4
Melbourne	4.8	6.1	3.5	1.3	-1.3
Adelaide	5.4	7.4	3.5	2.0	-1.9
Fremantle	5.8	7.5	4.1	1.7	-1.7
Other Ports	5.1	7.6	3.0	2.5	-2.1
All Ports	5.1	6.8	3.5	1.7	-1.6
	Forecast cumulative trade volume (million TEUs)			Difference (per cent)	
Brisbane	45.6	60.0	35.5	31.7	-22.1
Sydney	72.5	85.7	61.8	18.2	-14.7
Melbourne	89.0	104.0	77.1	16.8	-13.4
Adelaide	13.1	16.4	10.5	25.7	-19.7
Fremantle	26.0	31.8	21.3	22.3	-18.1
Other Ports	16.2	21.4	12.5	31.9	-23.3
All Ports	262.3	319.3	218.7	21.7	-16.6

Source: BITRE estimates.

Total non-containerised trade through all Australian ports over the next 20 years would increase annually by 3.92 and 3.80 per cent under the high and low economic growth scenarios, respectively, compared with growth of 3.85 per cent per annum under the base case scenario (Table 6.2).

**Table 6.2** Total non-containerised trade through Australian ports, 2012–13 to 2032–33, under alternative GDP growth scenarios

Port	Base case	High growth scenario	Low growth scenario	High growth scenario	Low growth scenario
	Average annual growth rate (per cent per annum)			Difference (percentage points)	
Brisbane	2.8	2.8	2.7	0.1	-0.1
Sydney	0.7	1.7	-0.3	1.0	-1.0
Melbourne	0.6	1.7	-0.5	1.1	-1.1
Adelaide	4.6	5.7	3.7	1.1	-0.9
Fremantle	1.1	1.3	0.9	0.2	-0.2
Other Ports	4.0	4.0	4.0	0.0	0.0
All Ports	3.85	3.92	3.80	0.1	-0.1
	Forecast cumulative trade volume (million tonnes)			Difference (per cent)	
Brisbane	784.0	790.7	777.4	0.9	-0.8
Sydney	301.0	335.6	271.0	11.5	-10.0
Melbourne	258.3	291.2	231.0	12.8	-10.6
Adelaide	394.9	444.3	357.3	12.5	-9.5
Fremantle	595.8	607.8	584.4	2.0	-1.9
Other Ports	29519.8	29652.9	29400.6	0.5	-0.4
All Ports	31868.9	32141.4	31635.1	0.9	-0.7

Source: BITRE estimates.

## Sensitivity analysis on exchange rates

The Australian dollar reached parity with the US dollar in December 2010 and has remained strong since then, due in part to the resources boom in Australia and very low interest rates in Europe and the US. However, the value of the Australian dollar could vary depending upon world economic conditions, especially in China, Europe and the US. Hence, the impact of a change in the value of the Australian dollar on containerised and non-containerised trade through Australian ports has been analysed with the following two alternative exchange rate scenarios

**High exchange rate scenario:** The Australian dollar remains at par with the US dollar over the forecast period.

**Low exchange rate scenario:** The Australian dollar gradually declines from its current level to US 50 cents per Australian dollar in 2029–30 and remains at that level thereafter.

The sensitivity analysis results suggest that changes in exchange rate assumptions have only a minimal impact on total containerised and non-containerised trade passing through Australian ports, mainly because overall containerised and non-containerised trade volumes are relatively inelastic to changes in exchange rates. However, changes in exchange rates have a more significant effect when considered from the perspective of imports and exports.

Total containerised trade through all Australian ports would increase annually by 5.3 per cent under the high exchange rate scenario and 4.9 per cent under the low exchange rate scenario over the next 20 years, compared with growth of 5.1 per cent per annum under the base case scenario (Table 6.3). Similarly, total non-containerised trade through all Australian ports would increase annually by 3.84 per cent under the high exchange rate scenario and 3.87 per cent under the low exchange rate scenario over the forecast, compared with growth of 3.85 per cent per annum under the base case scenario (Table 6.4).

The impact of variations in exchange rate assumptions on containerised and non-containerised trade varies by port. The annual average growth rate of containerised trade ranges from 4.6 per cent per annum in Other Ports to 6.3 per cent per annum at the Port of Brisbane under the high exchange rate scenario and, from 4.0 per cent per annum for Sydney region ports to 6.2 per cent per annum for Other Ports under the low exchange rate scenario. Similarly, the annual average growth rate of non-containerised trade ranges from 0.6 per cent per annum for the Port of Melbourne to 4.0 per cent per annum for Other Ports under the high exchange rate scenario and, from 0.6 per cent per annum for the Port of Melbourne to 5.7 per cent per annum for Port Adelaide under the low exchange rate scenario.

**Table 6.3** Total containerised trade through Australian ports, 2012–13 to 2032–33, under alternative exchange rate scenarios

Port	Base case	High exchange rate scenario	Low exchange rate scenario	High exchange rate scenario	Low exchange rate scenario
	Average annual growth rate (per cent per annum)			Difference (percentage points)	
Brisbane	6.2	6.3	6.0	0.1	-0.2
Sydney	4.5	4.9	4.0	0.3	-0.5
Melbourne	4.8	5.0	4.5	0.2	-0.3
Adelaide	5.4	5.7	5.0	0.3	-0.5
Fremantle	5.8	5.8	5.8	0.0	0.0
Other Ports	5.1	4.6	6.2	-0.5	1.0
All Ports	5.1	5.3	4.9	0.2	-0.2
	Forecast cumulative trade volume (million TEUs)			Difference (per cent)	
Brisbane	45.6	46.7	44.8	2.6	-1.8
Sydney	72.5	76.4	67.9	5.5	-6.3
Melbourne	89.0	92.3	85.8	3.7	-3.6
Adelaide	13.1	13.7	12.3	4.9	-6.0
Fremantle	26.0	25.9	26.0	-0.3	0.1
Other Ports	16.2	14.8	19.0	-8.9	17.1
All Ports	262.3	269.9	255.7	2.9	-2.5

Source: BITRE estimates.



**Table 6.4** Total non-containerised trade through Australian ports, 2012–13 to 2032–33, under alternative exchange rate scenarios

Port	Base case	High exchange rate scenario	Low exchange rate scenario	High exchange rate scenario	Low exchange rate scenario
	Average annual growth rate (per cent per annum)			Difference (percentage points)	
Brisbane	2.8	2.6	3.1	-0.2	0.3
Sydney	0.7	0.7	0.7	0.0	0.0
Melbourne	0.6	0.6	0.6	0.0	0.0
Adelaide	4.6	3.9	5.7	-0.7	1.2
Fremantle	1.1	1.1	1.1	0.0	0.0
Other Ports	4.0	4.0	4.0	0.0	0.0
All Ports	3.85	3.84	3.87	-0.01	0.02
	Forecast cumulative trade volume (million tonnes)			Difference (per cent)	
Brisbane	784.0	762.8	813.7	-2.7	3.8
Sydney	301.0	301.0	301.0	0.0	0.0
Melbourne	258.3	258.3	258.3	0.0	0.0
Adelaide	394.9	355.4	463.4	-10.0	17.4
Fremantle	595.8	595.8	595.8	0.0	0.0
Other Ports	29519.8	29519.8	29519.8	0.0	0.0
All Ports	31868.9	31808.0	31967.5	-0.2	0.3

Source: BITRE estimates.



## CHAPTER 7

# Forecast performance and concluding remarks

### Forecast performance

In this chapter, BITRE's long-term forecasts of containerised and non-containerised trade through Australian ports presented in this report are compared with previous BITRE (2002, 2006 and 2010) forecasts of containerised and non-containerised trade. Since forecasts of containerised and non-containerised trade for Australian ports prepared by other organisations are not publicly available, the BITRE forecasts could not be compared with forecasts of other organisations.

The current BITRE forecasts are consistent with the BITRE forecasts published in 2002 and 2006 at both the national and individual port level and with 2010 at the national level (Table 7.1, Figure 7.1 and Figure 7.2). The differences in forecast growth rates across the various BITRE studies are due to changes in the estimated demand parameters resulting from the difference in the historical period used to estimate containerised and non-containerised trade models, revisions to actual and differences in forecast growth in GDP, population, exchange rates, prices of exports and imports across the various reports. The port-level forecasts published in BITRE (2010) are slightly lower than the current forecasts, and those published in BITRE (2002 and 2006), largely due to differences in the choice of income variable and the timing of preparation of macroeconomic projections. Real GDP of Australia's export destination countries, which is the key driver of Australian exports, is proxied by real GDP of G7 countries in BITRE (2002), real GDP of OECD countries in this study and BITRE (2006), and aggregated real regional GDP in BITRE (2010). Similarly, Australia's national real GDP has been used as key driver of Australia's imports in this study and BITRE (2002), whereas national real GNE and real state final demand were used as the key driver of Australia's port-level imports in BITRE (2006) and BITRE (2010), respectively. Moreover, long-term projections of real GDP and final demand that were used in BITRE (2010) to derive forecasts were relatively low as they were developed during the period of the Asian financial crisis and the Global Financial Crisis.

Total containerised trade through all Australian ports, which increased by 6.5 per cent a year over the last 14 years, is projected to grow annually by 5.1 per cent per year over the next 20 years. This compares with projected annual growth of 5.0 per cent per year in BITRE (2002), 5.4 per cent per year in BITRE (2006) and 4.2 per cent per year in BITRE (2010). Similarly, total non-containerised trade through all Australian ports grew by 5.5 per cent a year over the last 14 years, and is forecast here to grow annually by 3.9 per cent per year over the

next 20 years. This compares with projected annual growth of 3.8 per cent per year in BITRE (2006) and 3.0 per cent per year in BITRE (2010).

**Table 7.1** Comparison of current and previous BITRE forecast growth of containerised and non-containerised trade, by port

Port	Actual 1998–99 to 2012–13	BITRE (2002) 2001–02 to 2010–11	BITRE (2006) 2004–05 to 2024–25	BITRE (2010) 2007–08 to 2029–30	Present forecast 2012–13 to 2032–33
Containerised trade <sup>a</sup>					
Brisbane	8.1	-	7.4	3.6	6.2
Sydney	6.5	-	5.0	3.2	4.5
Melbourne	5.9	-	4.9	5.0	4.8
Adelaide	7.7	-	5.3	3.0	5.4
Fremantle	6.6	-	5.4	4.8	5.8
Other Ports	5.7	-	5.3	3.8	5.1
All Ports	6.5	5.0 <sup>b</sup>	5.4	4.2	5.1
Non-containerised trade					
Brisbane	3.7	-	2.7	1.4	2.8
Sydney	-0.2 <sup>c</sup>	-	1.3	1.4	0.7
Melbourne	1.5	-	3.5	1.1	0.6
Adelaide	6.6	-	3.5	-0.6	4.6
Fremantle	1.7	-	1.3	2.0	1.1
Other Ports	5.9	-	3.9	3.1	4.0
All Ports	5.5	-	3.8	3.0	3.9

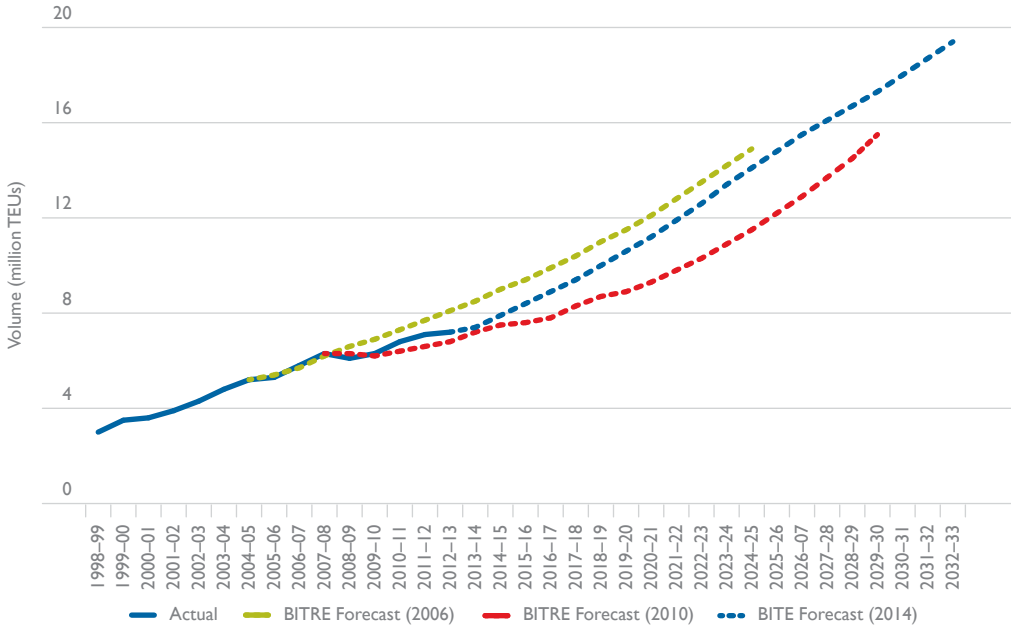
a. Includes export and import of full and empty containers.

b. Growth forecast is based on econometric model specified in terms of income and exchange rate variables. The study also shows a growth of 2.3 per cent over the forecast period based on univariate time series model which is not comparable to the econometric models used in this study and BITRE (2006 and 2010).

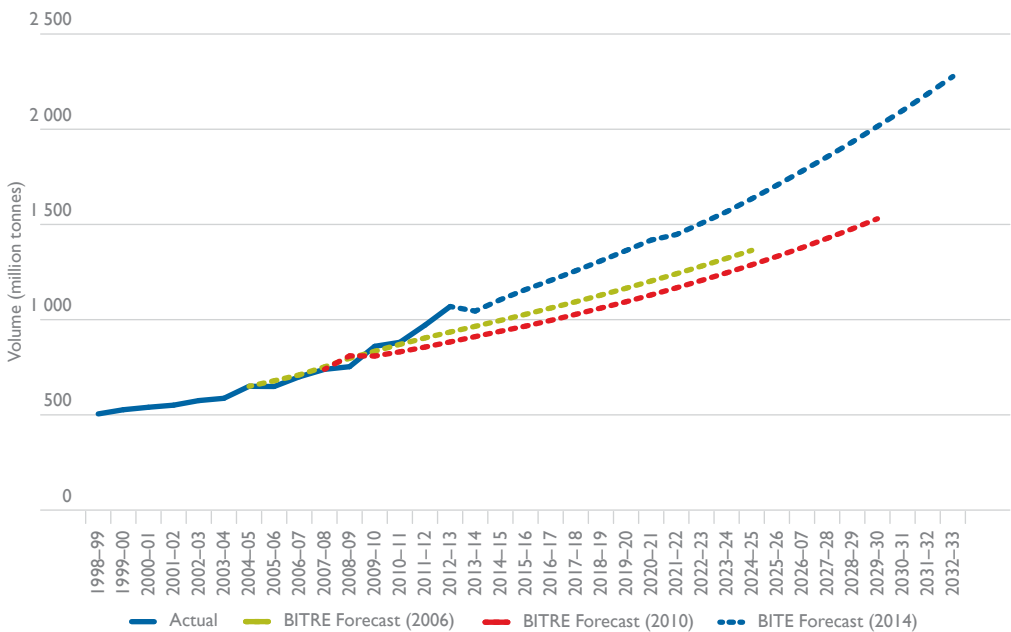
c. Due to the closures of the Shell oil refinery at Clyde in September 2012.

Source: BITRE estimates.

**Figure 7.1** Comparison of current and previous BITRE forecasts of containerised trade:All Ports



**Figure 7.2** Comparison of current and previous BITRE forecasts of non-containerised trade:All Ports



## Concluding remarks

This report updates long-term forecasts of containerised and non-containerised trade for the Australia's five largest capital city ports—Port of Brisbane, Sydney region ports, Port of Melbourne, Port Adelaide and Port of Fremantle—and, in aggregation, all Other Ports, to 2032–33. The forecasts are based on re-estimated export and import models and the most recent information on economic growth, population, exchange rates, and prices of exports and imports.

The report also presents the updated national-level forecasts of Australia's inbound and outbound sea passenger numbers. Port-level forecasts of sea passenger numbers could not be developed due to the lack of recent time series data on port-specific sea passenger movements.

The containerised and non-containerised trade forecasts presented in this report are solely driven by demand-side parameters related to population, income, exchange rates and price variables and do not include the influence of supply-side parameters related to port capacity or commodity availability. Hence, the forecasts are “unconstrained” by any potential future supply constraints.

Containerised and non-containerised trade through Australian ports is projected to increase by 5.1 and 3.9 per cent a year, respectively, over the next 20 years to 2032–33. This compares with annual growth of 6.5 and 5.5 per cent per year, respectively, experienced over the last 14 years. The slightly slower projected growth over the forecast period, relative to historical growth, is largely due to expected slower economic growth in Australia and its major trading partners over the forecast period.

The report also includes sensitivity analysis, which was carried out to assess the possible impact of changes in economic growth and exchange rates on containerised and non-containerised trade through Australian ports. Two alternative scenarios on economic growth—a high-growth scenario and low-growth scenario—and two alternative scenarios on exchange rates—a high exchange rate scenario and low exchange rate scenario—considered for the sensitivity analysis.

Results of the sensitivity analysis suggest that total containerised trade through all Australian ports would increase annually by 6.8 per cent under the high economic growth scenario and 3.5 per cent under the low economic growth scenario over the next twenty years, compared with growth of 5.1 per cent per annum under the base case scenario. Total non-containerised trade through all Australian ports over the next 20 years would increase annually by 3.92 and 3.80 per cent under the high and low economic growth scenarios, compared with growth of 3.85 per cent per annum under the base case scenario.

The exchange rate scenarios imply changes in exchange rate assumptions have a minimal impact on total containerised and non-containerised trade passing through Australian ports, mainly due to the inelastic nature of total containerised and non-containerised trade to exchange rates. Within this total trade envelope, differing exchange rates will have more significant impacts on exports and imports. Total containerised trade through all Australian ports is projected to increase annually by 5.3 per cent under the high exchange rate scenario and 4.9 per cent under the low exchange rate scenario over the next twenty years, compared with growth of 5.1 per cent per annum under the base case scenario. Similarly, total non-containerised trade through all Australian ports would increase annually by 3.84 per cent under the high exchange

rate scenario and 3.87 per cent under the low exchange rate scenario over the forecast, compared with growth of 3.85 per cent per annum under the base case scenario.

The impact of variations in GDP growth and exchange rates on containerised and non-containerised trade varies by port as the magnitude of income and exchange rate elasticities varies by port.

# Abbreviations and acronyms

ABS	Australian Bureau of Statistics
BITRE	Bureau of Infrastructure, Transport and Regional Economics
CDU	Cruise Down Under
DOI	Department of Infrastructure
GDP	Gross Domestic Product
NSW	New South Wales
OECD	The Organisation for Economic Co-operation and Development
SARS	Severe Acute Respiratory Syndrome
TEU	Twenty-foot equivalent unit
UK	United Kingdom
US	United States
USA	The United States of America



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ISBN 978-1-925216-14-1