



Australian Government

Department of Infrastructure and Regional Development

Bureau of Infrastructure, Transport and Regional Economics

STATISTICAL REPORT



Maritime

Waterline 56

Bureau of Infrastructure, Transport and Regional Economics

Waterline 56

May 2015

Department of Infrastructure and Regional Development
Canberra, Australia

© Commonwealth of Australia 2015

ISSN: 1324-4043

ISBN: 978-1-925216-42-4

May 2015/INFRA2485

Cover photo: Automated stacking cranes at Brisbane Container Terminals. Photo courtesy of Port of Brisbane Pty Ltd.

Ownership of intellectual property rights in this publication

Unless otherwise noted, copyright (and any other intellectual property rights, if any) in this publication is owned by the Commonwealth of Australia (referred to below as the Commonwealth).

Disclaimer

The material contained in this publication is made available on the understanding that the Commonwealth is not providing professional advice, and that users exercise their own skill and care with respect to its use, and seek independent advice if necessary.

The Commonwealth makes no representations or warranties as to the contents or accuracy of the information contained in this publication. To the extent permitted by law, the Commonwealth disclaims liability to any person or organisation in respect of anything done, or omitted to be done, in reliance upon information contained in this publication.

Creative Commons licence

With the exception of (a) the Coat of Arms; and (b) the Department of Infrastructure and Regional Development's photos and graphics, copyright in this publication is licensed under a Creative Commons Attribution 3.0 Australia Licence.

Creative Commons Attribution 3.0 Australia Licence is a standard form licence agreement that allows you to copy, communicate and adapt this publication provided that you attribute the work to the Commonwealth and abide by the other licence terms. A summary of the licence terms is available from <http://creativecommons.org/licenses/by/3.0/au/deed.en>. The full licence terms are available from <http://creativecommons.org/licenses/by/3.0/au/legalcode>.

Use of the Coat of Arms

The Department of the Prime Minister and Cabinet sets the terms under which the Coat of Arms is used. Please refer to the Department's Commonwealth Coat of Arms and Government Branding web page <http://www.dpmc.gov.au/pmc/about-pmc/core-priorities/guidelines-and-procedures-other-agencies> and in particular, the *Commonwealth Coat of Arms Information and Guidelines* publication.

An appropriate citation for this report is:

Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2015, Waterline 56, Statistical Report, BITRE, Canberra ACT.

Contact us

This publication is available in PDF format. All other rights are reserved, including in relation to any Departmental logos or trademarks which may exist. For enquiries regarding the licence and any use of this publication, please contact:

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

Website: www.bitre.gov.au

Foreword

Waterline is published by the Bureau of Infrastructure, Transport and Regional Economics (BITRE) and provides information on container movements on both the wharf-side and the landside of five Australian major port terminals: Brisbane, Sydney, Melbourne, Adelaide and Fremantle. This Waterline covers port terminal activity up to the December quarter 2014.

Waterline reports on trends in container handling productivity on the waterfront in Australia as well as the cost of importing and exporting containers. It covers both the unloading of container ships and the transport of containers from container terminals. This Waterline provides the latest data available on stevedoring productivity and landside performance.

This issue of Waterline was prepared in the Infrastructure and Surface Transport Statistics Section by Adam Malarz and Thomas Rutherford with contributions from Peter Kain. For further information on this report please phone Adam Malarz on (02) 6274 7168, Thomas Rutherford on (02) 6274 6818 or maritime_stats@infrastructure.gov.au.

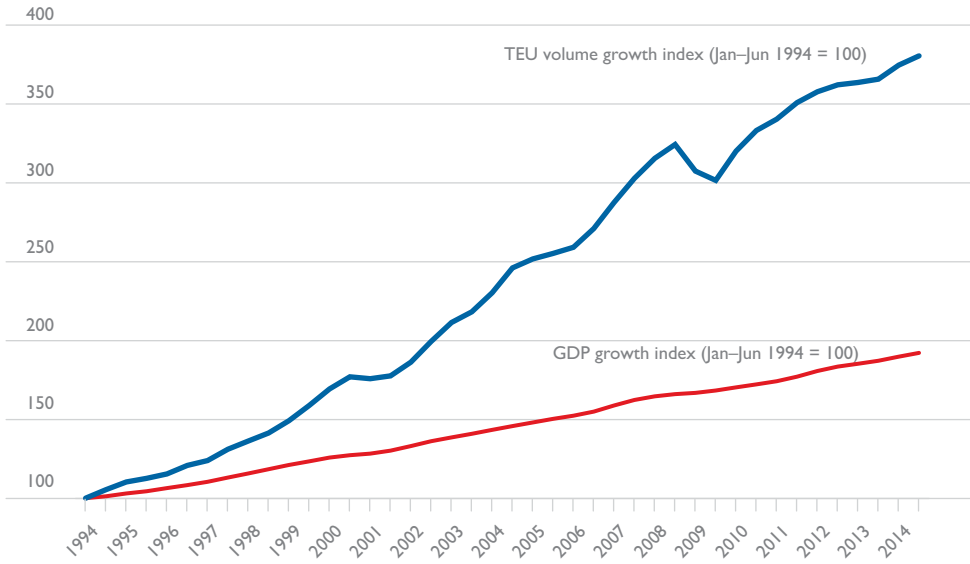
Gary Dolman
Head of Bureau
Bureau of Infrastructure, Transport and Regional Economics
Canberra
May 2015

At a glance

Throughput

- “Whole of port” *Twenty-foot equivalent units (TEUs)* exchanged at Australia’s five major container ports increased to a total of 3.7 million TEUs for the period July to December 2014, an increase of 3.0 per cent compared to the same period in 2013. The per cent increase varied by container port: Fremantle increased by 11.3 per cent, Sydney by 3.5 per cent, Brisbane by 2.0 per cent, and Melbourne by 1.7 per cent, while Adelaide declined by 2.6 per cent.
- The “whole of container terminal” measure of the *number of ship visits* to the five ports declined to 1 998 ship calls to berth in the period July to December 2014, a decrease of 4.4 per cent compared to the corresponding period in the previous year.
- There was a substantial increase in the number of larger-capacity ships visiting Australia’s container ports in the second half of 2014 compared to the same period in 2013. While the total number of ship calls to ports declined by 3.4 per cent, and the number of ships in the range 5 000 to 20 000 gross tonnes declined by 38.2 per cent, ships in the range 20 001 to 35 000 gross tonnes increased by 43.5 per cent. Port visits by container vessels greater than 50 000 gross tonnes increased by 3.8 per cent, and such vessels now account for 36.6 per cent of the total ship visits to the five major container ports.
- The “wharf-side of port” measure of the total number of *containers handled* increased by an average of 4.3 per cent across the five ports. Just over half of these containers were larger, 40-foot containers. This measure counts only containers transported in specialised container ships as reported by the three main stevedoring companies.
- Throughput at Australia’s container ports has returned to a long-term trend of throughput growth (4.0 per cent) exceeding non-farm GDP growth (2.7 per cent). Figure A.1 illustrates this trend. Over the period from 1994 to 2014, GDP increased by more than 90 per cent while container throughput grew by more than 270 per cent.

Figure A.1 Growth in container traffic compared to GDP growth (Jan–Jun 1994=100)



Sources: BITRE estimates (2015), ABS (2015).

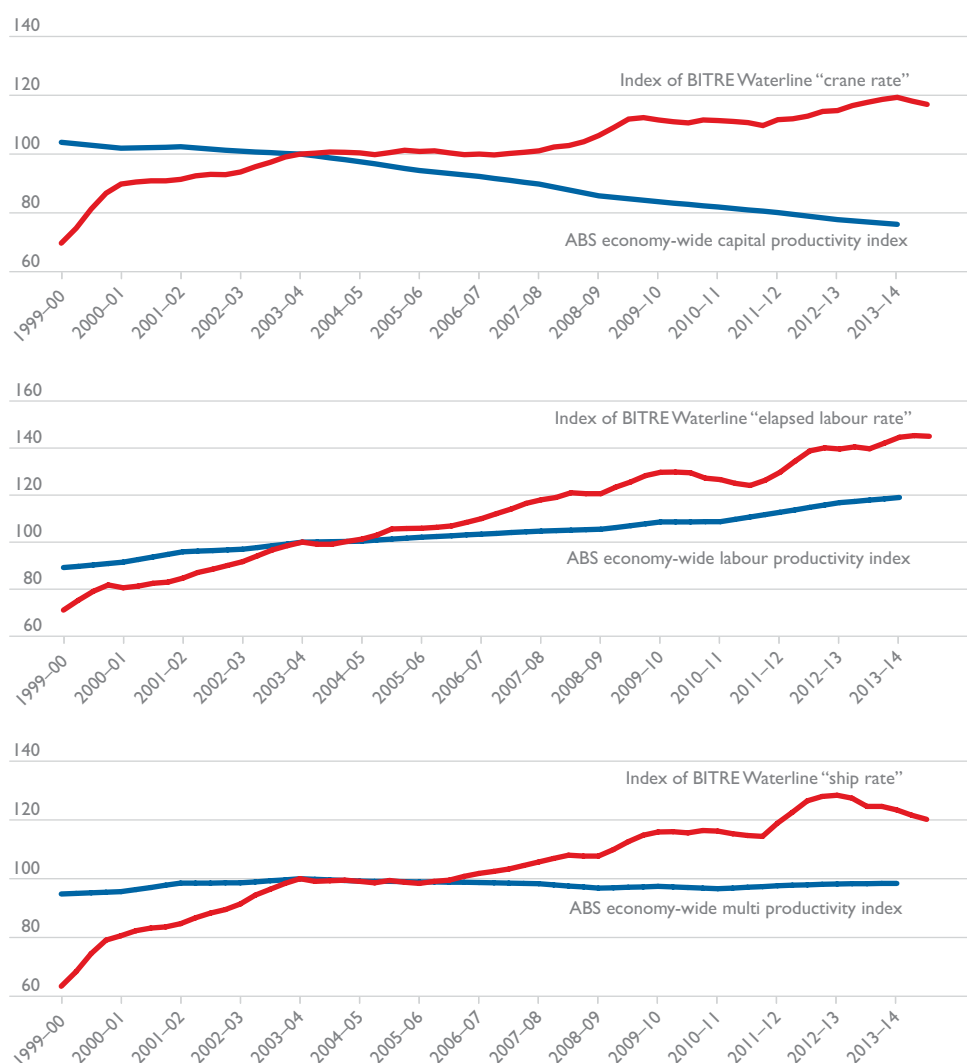


Port of Brisbane. Photo courtesy of Port of Brisbane Pty Ltd.

Productivity

Average measures of “Wharf-side of port” *elapsed labour rate* improved by 0.9 per cent across the five ports in the period July–December 2014 (compared to the same period in 2013), but *crane rate* and *ship rate* declined by 3.3 per cent and 4.7 per cent respectively. Figure A.2 illustrates the trend in port productivity (in Jul–Jun financial years) relative to economy-wide productivity figures from the Australian Bureau of Statistics (ABS 2014).

Figure A.2 Productivity: Container ports and the rest of the Australian economy



Note: Financial year 2003–04 is used as base year for indexing the time series data.

ABS economy-wide productivity measures relate to 16 selected market sector industries. They are indexes of gross value added per hour worked.

ABS productivity measures are produced for financial years, so are not yet available for the most recent period.

Sources: BITRE estimates (2015), ABS (2014).

Of note was a decline in wharf-side productivity (containers per hour) at the Port of Brisbane. The *crane rate*, *elapsed labour rate* and *ship rate* declined by 7.4 per cent, 12.3 per cent and 14.5 per cent, respectively, for July to December 2014 compared to the same period in 2013. A notable improvement was at the Port of Fremantle, with *crane rate*, *elapsed labour rate* and *ship rate* improving by 10.9 per cent, 39.4 and 32.8 per cent respectively.

“Land-side of port” productivity declined on average across the five ports. Average *Truck* and *container turnaround times* increased by 5.7 per cent and 4.7 per cent respectively in the period July to December 2014 compared to the same period in 2013. The only container port which experienced an improvement in these measures was Adelaide, where *truck* and *container turnaround times* declined by 17.4 per cent and 14.4 per cent respectively.

The *median ship turnaround time* worsened in Brisbane, Sydney and Melbourne but improved in Fremantle and Adelaide. The largest improvement was in Fremantle where the *median ship turnaround time* declined by 16.2 per cent, followed by Adelaide where it declined by 8.7 per cent in July to December 2014 compared to the same period in 2013.

Whole of Container Terminal productivity indicators

Between July to December quarters of 2014:

- *Average lifts per hour ships spent in berth* declined from 39.4 in September quarter to 38.6 in December quarter 2014;
- *Average lifts per stevedore’s hour* declined from 43.4 in September quarter to 41.3 in December quarter 2014.

The *average number of lifts per hour of stevedoring operation* is estimated as the number of TEUs exchanged divided by the total number of gross hours a ship was available to stevedores for loading and unloading operations.

Waiting times for entering container terminals shortened at all ports. The measure of the *per cent of ships waiting in anchorage for more than 2 hours* declined by 52.6 per cent in July to December 2014 compared with the corresponding period of 2013. The average waiting time also declined by 10.9 per cent in this period and averaged 14.7 hours at the five ports.

Daily and weekly truck movements at container terminals

The total number of used truck timeslots in five ports increased by 4.4 per cent in the September quarter and by 3.1 per cent in the December quarter, as compared with the corresponding period of 2013. Similarly, the number of truck slots available in September and December quarters 2014 was 3.3 per cent and 2.4 per cent higher than a year ago. Usage of off-peak truck timeslots declined by 4.3 per cent across the five ports to 49.0 per cent in the September quarter of 2014, and by 0.4 per cent to 51.5 per cent in the December quarter of 2014, as compared with the corresponding periods of 2013.

Port-interface cost

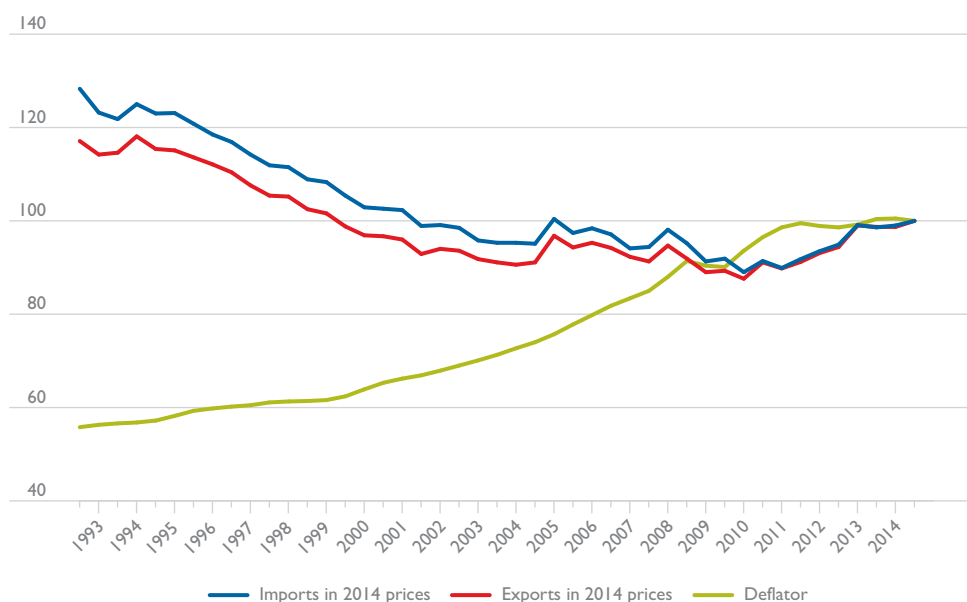
Historically, Australian container handling costs have been declining while the general price level across the economy (measured by the GDP deflator) has been increasing (Figure A.3).

The port interface cost index increased during the period July – December 2014 for all ship categories, as compared with that of January – June 2014. The movement in costs in constant 2014 prices varied by ship size¹:

- For small ships (5 000 to 20 000 GT) port interface costs increased by \$12/TEU for imports and by \$14/TEU for exports;
- For medium size ships (35 000 to 40 000 GT) port interface costs increased by \$10/TEU for imports and \$12/TEU for exports;
- For large size ships (50 000 to 55 000 GT) port interface costs increased by \$10/TEU for imports and by \$13/TEU for exports.

With the latest cost increases for the large ships, the cost per TEU of large- and medium-size ships is at parity.

Figure A.3 Port interface cost indices compared to the GDP deflator



Note 1: PICI data presented in this figure are for 35 000 to 40 000 GT ship category.

Note 2: Data plotted in this figure are constant 2014 prices; June–December 2014 is the base period for both the GDP deflator and PICI.

Sources: BITRE estimates (2015).

¹ Note that these figures may differ from those presented in Table 4.6 due to rounding.



Brisbane Container Terminals Automated Stacking Crane, Port of Brisbane. Photo courtesy of Port of Brisbane Pty Ltd.

Abbreviations and terms

ABS	Australian Bureau of Statistics
ACCC	Australian Competition and Consumer Commission
BITRE	Bureau of Infrastructure, Transport and Regional Economics
DP World	Dubai Ports World
Five ports	Refers to the aggregation of the following major container terminals at the five mainland capital city ports: <ul style="list-style-type: none">• Fisherman Island (Brisbane),• Brotherson Dock, at Port Botany (Sydney),• Swanson Dock (Melbourne),• Flinders Adelaide Terminal at Outer Harbor/Pelican Point (Adelaide); and• North Quay in the “Inner Harbour” on the Swan River (Fremantle)
GT	Gross Tonnage, also known as Gross Registered Tonnage (GRT)
Infrastructure	Department of Infrastructure and Regional Development
n.a.	Not applicable
Mins	minutes
Pbm	Per berth metre
PICI	Port Interface Cost Index
Qtr	Quarter
TAS	Trucks appointments system (used by Hutchison Ports Australia to schedule trucks at a container terminal). Similar to the VBS system which is used by DP World and Patrick
TEU	Twenty-foot equivalent unit
TTT	Truck turnaround time
UCC	Unitized Cellular Container ship; a type of specialised container ship
VBS	Vehicle Booking System (used by DP World and Patrick to schedule trucks at a container terminal). Similar to the TAS system which is used by Hutchison Ports Australia

Acknowledgements

BITRE is particularly grateful for the assistance of the following in the provision of data used to prepare Waterline:

- stevedoring companies: DP World, Flinders Adelaide Container Company, Hutchison Ports Australia, and Patrick
- individual port authorities and corporations: Port of Brisbane Pty Ltd, Port Authority of New South Wales, NSW Ports, Port of Melbourne Corporation, Port of Adelaide, and Fremantle Port Authority
- Ports Australia
- shipping lines
- customs brokers
- road transport operators
- pilot, tug and mooring operators.

Contents

Foreword	iii
At a glance	v
Abbreviations and terms	xi
Acknowledgements.....	xii
Chapter 1 Measures of container terminal throughput.....	1
Chapter 2 Measures of container terminal productivity.....	19
Chapter 3 Timeslots for trucks at container terminals.....	41
Chapter 4 Port interface cost index	55
Appendix A Maps of five major Australian container ports.....	73
References	89

List of tables

Table 1.1	Container terminal throughput: Brisbane	12
Table 1.2	Container terminal throughput: Sydney	13
Table 1.3	Container terminal throughput: Melbourne.....	14
Table 1.4	Container terminal throughput: Adelaide.....	15
Table 1.5	Container terminal throughput: Fremantle.....	16
Table 1.6	Container terminal throughput: Five ports.....	17
Table 1.7	Container terminal throughput: Container Ship Visits by Port, July–December 2014.....	18
Table 2.1	Container terminal productivity: Brisbane.....	34
Table 2.2	Container terminal productivity: Sydney.....	35
Table 2.3	Container terminal productivity: Melbourne	36
Table 2.4	Container terminal productivity: Adelaide	37
Table 2.5	Container terminal productivity: Fremantle.....	38
Table 2.6	Container terminal productivity: Five ports	39
Table 3.1	Timeslots available and actually used by trucks: Brisbane.....	48
Table 3.2	Timeslots available and actually used by trucks: Sydney.....	49
Table 3.3	Timeslots available and actually used by trucks: Melbourne.....	50
Table 3.4	Timeslots available and actually used by trucks: Adelaide	51
Table 3.5	Timeslots available and actually used by trucks: Fremantle	52
Table 3.6	Timeslots available and actually used by trucks: Five ports	53
Table 4.1	Port interface costs by ship type – parameters and estimates: Brisbane	62
Table 4.2	Port interface costs by ship type – parameters and estimates: Sydney	64
Table 4.3	Port interface costs by ship type – parameters and estimates: Melbourne... ..	66
Table 4.4	Port interface costs by ship type – parameters and estimates: Adelaide.....	68
Table 4.5	Port interface costs by ship type – parameters and estimates: Fremantle.. ..	70
Table 4.6	The national port interface cost indices, by size of ship.....	72

List of figures

Figure A.1	Growth in container traffic compared to GDP growth (Jan–Jun 1994=100)vi
Figure A.2	Productivity: Container ports and the rest of the Australian economyvii
Figure A.3	Port interface cost indices compared to the GDP deflatorix
Figure I.1	TEU throughput by container port: Wharf-side of port.....6
Figure I.2	TEU throughput by container port: Landside of port.....7
Figure I.3	TEU throughput by container port: Whole of port.....8
Figure I.4	Container terminal traffic: Number of UCC ships handled.....9
Figure I.5	Container terminal traffic: Number of trucks used in VBS/TAS operations... 10
Figure I.6	Containers by rail as per cent of containers on the landside..... 11
Figure 2.1	Wharf-side crane rate25
Figure 2.2	Wharf-side elapsed labour rate26
Figure 2.3	Wharf-side ship rate.....27
Figure 2.4	Productivity in five ports: Comparison of wharf-side rates.....28
Figure 2.5	Average TEUs per truck on landside of container terminals.....29
Figure 2.6	Average container turnaround time on landside of container terminals30
Figure 2.7	Longest and shortest truck turnaround time in five ports31
Figure 2.8	Longest and shortest container turnaround time in five ports31
Figure 2.9	Average number of lifts per hour a ship spent at berth.....32
Figure 2.10	Average number of lifts per berth visit.....33
Figure 3.1	Timeslots used by trucks in all off-peak periods44
Figure 3.2	Timeslots used by trucks in off-peak periods Monday to Friday45
Figure 3.3	Timeslots used by trucks on Saturday and Sunday.....46
Figure 3.4	TEUs processed per VBS truck at container terminals.....47
Figure 4.1	Port Interface Cost Index for container imports and exports, by ship size60

CHAPTER I

Measures of container terminal throughput

Overview

Chapter I of Waterline presents in a consolidated format all container port throughput indicators. The indicators are in four groups—wharf-side, landside, whole of container terminal and whole of port.

There are four wharf-side quarterly throughput indicators (previously reported in Chapter 2 of Waterline):

- I.1 UCC ships handled, as reported by stevedores
- I.2 Total containers handled by stevedores
- I.3 Total TEUs handled by stevedores
- I.4 40-foot containers as per cent of all containers handled.

There are eleven landside quarterly throughput indicators (previously reported in Chapter I of Waterline):

- I.5 Number of trucks used in VBS/TAS operations
- I.6 Total number of containers transported by trucks and rail
- I.7 Total number of containers transported by trucks
- I.8 Number of containers by rail
- I.9 Total number of TEUs transported by trucks and rail
- I.10 Total number of TEUs transported by trucks
- I.11 Number of TEUs by rail.

At the whole of container terminal level, using data from port authorities, there are two quarterly throughput indicators:

- I.12 Total number of container ship visits, as reported by Port Authorities
- I.13 Total number of containers (lifts) exchanged

At the whole of port level, using data from port authorities, there are seven six-monthly throughput indicators:

- I.14 Total cargo throughput
- I.15 Non-containerised general cargo throughput
- I.16 Total number of TEUs exchanged
- I.17 Number of TEUs: Full import
- I.18 Number of TEUs: Empty import
- I.19 Number of TEUs: Full export
- I.20 Number of TEUs: Empty export.

Indicators of these four groups are presented separately for Brisbane, Sydney, Melbourne, Adelaide and Fremantle, as well as for the five ports as a whole.

Container terminal

The movement of containers from/to the container ship takes place on a wharf or pier known as a container terminal. Unlike a traditional wharf, a container terminal needs a large area adjoining the wharf for storing containers. The containers are placed in stacks of two or more and are kept there until they are moved away by truck or train for unloaded containers, or loaded onto a ship, from the container terminal. While in the terminal, the containers are at the disposal of a stevedoring company.

Stevedoring

The term stevedore can refer to a company which manages the operation of loading or unloading a ship. In Australia the people who work on the waterfront are referred to as waterside workers or stevedores. A stevedoring company typically owns equipment used in the loading or discharging operation and hires labour for that purpose. A stevedoring company also may contract with a terminal owner to manage all terminal operations. In Australia, there are three major stevedoring companies which handle containers: Toll/Patrick, Dubai Ports World and Hutchison Ports Australia.

Wharf-side throughput measures

Measures of throughput at the wharf-side relate only to containers moved by stevedoring companies from/to UCC ships at the container terminals.

Indicator I.1 UCC ships handled, as reported by stevedores

Only fully cellular ships, or Unitized Cellular Container (UCC) ships, are included in this indicator. Normally these purpose built container ships are equipped with 40-foot cell guides below deck as a minimum requirement.

Indicator 1.2 Total containers handled

This is the total number of containers lifted on/off UCC ships. These counts are not standardised to account for different container sizes. Thus one 20-foot container and one 40-foot container are counted as two containers.

Indicator 1.3 Total TEUs handled

This indicator is derived from the total containers handled, taking into account different sizes of containers.

TEU stands for “Twenty-foot equivalent unit”, a universally recognised measure of containers which converts containers of different sizes into standardised twenty-foot units. For example, a 20-foot container equals one TEU, and a 40-foot container is converted to two TEUs.

Indicator 1.4 40-foot container as per cent of all containers handled

This is the number of 40-foot containers as a percentage of all containers handled.

Landside throughput measures

Indicator 1.5 Number of trucks used in VBS/TAS operations

This is the count of trucks processed through either the vehicle booking system (VBS) or the truck appointments system (TAS). This count excludes trucks that perform bulk runs of empty containers between the container parks and container terminals. This indicator counts trucks on a round trip. That is, a truck entering a container terminal and the same truck exiting the container terminal is counted as one truck.

Indicator 1.6 Total number of containers transported by trucks and rail

This indicator includes the total number of containers transported in all modes on the landside, either by trucks or by rail. Counts of containers in this indicator are further broken down into Indicator 1.7 (containers moved by trucks) and Indicator 1.8 (containers moved by rail).

Indicator 1.7 Total number of containers transported by trucks

This indicator includes the total number of containers transported by VBS/TAS trucks. This indicator is computed using data provided by stevedores. In previous editions of *Waterline*, this indicator included the trucks undertaking bulk runs; this has been discontinued due to inconsistent data.

Indicator 1.8 Number of containers by rail

This indicator counts the total number of containers carried by rail in or out of a container terminal is based on data provided by each container port authority. This indicator includes containers processed at “on dock” and those handled through “near dock” rail sidings. “On dock” refers to situations where the rail siding is on dock in a container terminal. In contrast, “near dock” rail sidings are in the neighbourhood of the container terminal but not on the dock. Only “on dock” rail data is reported for Sydney as port precinct rail data is not available.

Indicator I.9 Total number of TEUs transported by trucks and rail

This indicator includes the total number of TEUs transported by VBS/TAS trucks and by rail. In previous editions of Waterline, this indicator included the number of TEUs transported by trucks undertaking bulk runs; this has been discontinued due to inconsistent data. Counts of TEUs in this indicator are further broken down into Indicator I.10 (TEUs moved by trucks) and Indicator I.11 (TEUs moved by rail).

Indicator I.10 Total number of TEUs transported by trucks

This indicator includes the total number of TEUs transported by VBS/TAS trucks. In previous editions of Waterline, this indicator included the number of TEUs transported by trucks undertaking bulk runs; this has been discontinued due to inconsistent data.

Indicator I.11 Number of TEUs by rail

This is a count of the total number of TEUs carried by rail in or out of a container terminal based on data provided by each container port authority. This indicator includes TEUs processed at “on dock” and those handled through “near dock” rail sidings. “On dock” refers to situations where the rail siding is on dock in a container terminal. In contrast, “near dock” rail sidings are in the neighbourhood of the container terminal but not on the dock. Only “on dock” rail data is reported for Sydney as port precinct rail data is not available.

Whole of container terminal throughput

Indicator I.12 Total number of container ship visits

This is a count of all port calls by UCC ships where the vessel visited and exchanged containers at the container terminal. Table 1.7 summarises ship visits by size of ship and by container port.

Indicator I.13 Total number of containers (lifts) exchanged

This indicator is estimated using Indicator I.4 (percentage of 40-foot containers) and total number of TEUs exchanged reported by ports.

Whole of port throughput

Indicator I.14 Total cargo throughput

This is the weight, measured in tonnes, of all container and non-container general cargoes that passed through the port.

Indicator I.15 Non-containerised general cargo throughput

This is the weight of non-container general cargoes processed through a port. Non-container general cargo refers to break bulk commodities including machinery, iron and steel products, timber, paper and timber products and other general cargoes. It does not include bulk cargoes.

Indicator I.16 Total number of TEUs exchanged

This is a count of TEUs, exchanged through the port. This count is further broken down into Indicators I.17 to I.20.

Indicator I.17 Full import TEUs

This is a count of full containers in TEUs imported (unloaded) at the port.

Indicator I.18 Empty import TEUs

This is a count of empty containers in TEUs imported (unloaded) at the port.

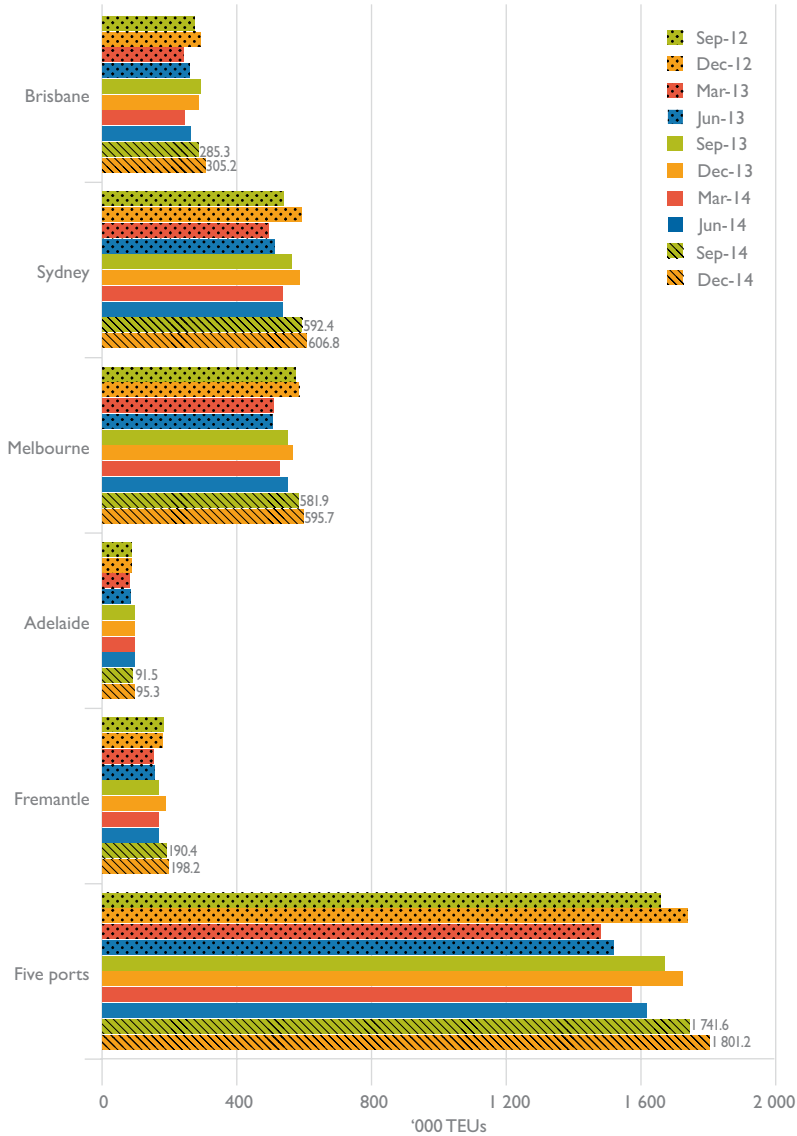
Indicator I.19 Full export TEUs

This is a count of full containers in TEUs exported (loaded) at the port.

Indicator I.20 Empty export TEUs

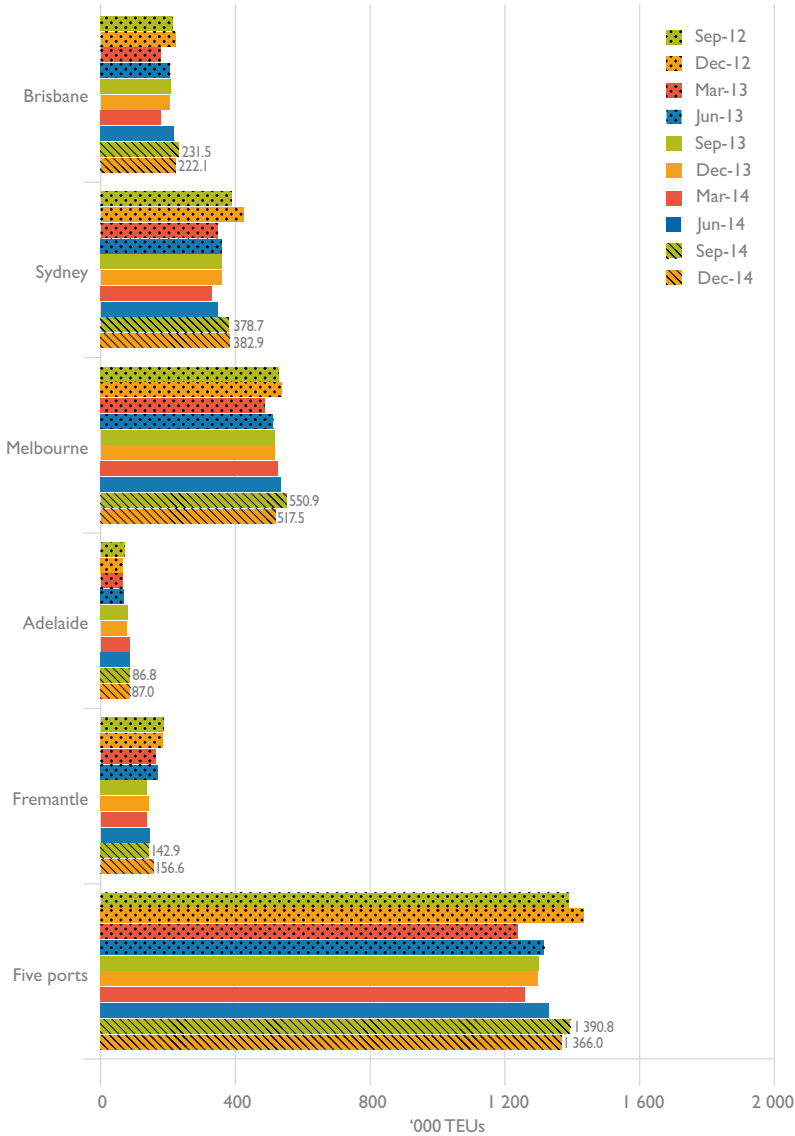
This is a count of empty containers in TEUs exported (loaded) at the port.

Figure I.1 TEU throughput by container port: Wharf-side of port



Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

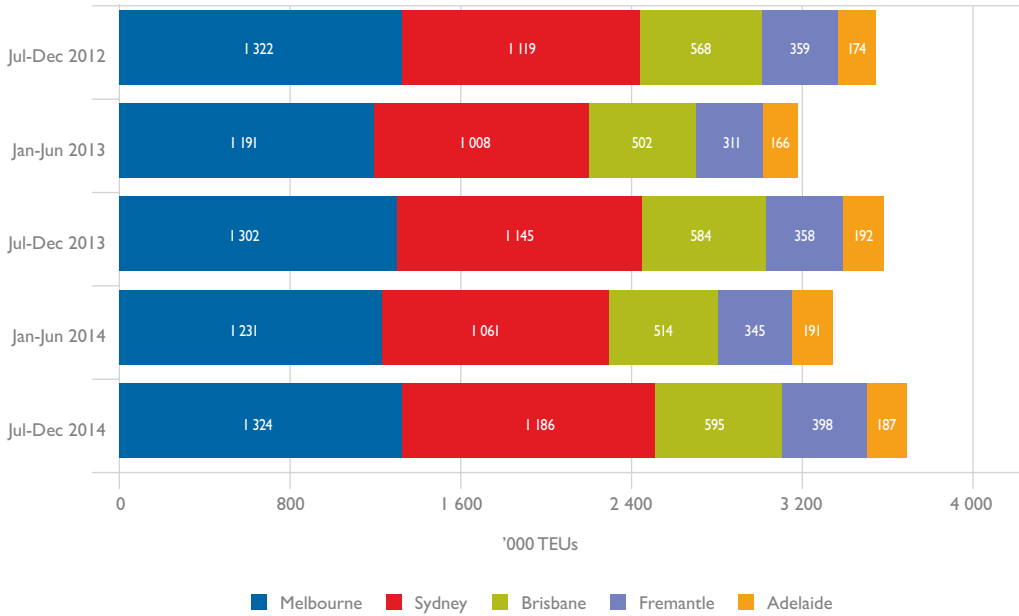
Figure I.2 TEU throughput by container port: Landside of port



Notes: The data in this figure shows the total TEUs moved on the landside by rail and by VBS/TAS trucks where data are available.

Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015), Patrick (2015), Port of Adelaide (2015), Port of Brisbane Pty Ltd (2015), Port of Melbourne Corporation (2015) and Fremantle Port Authority (2015).

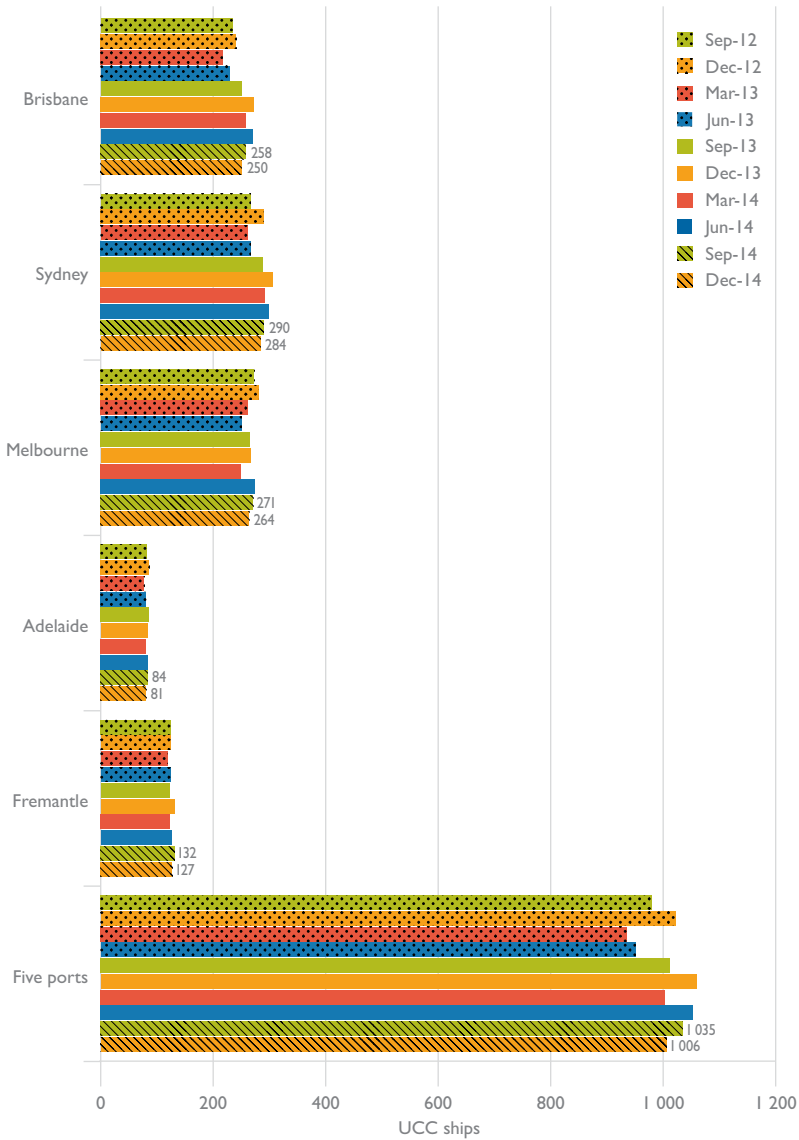
Figure I.3 TEU throughput by container port: Whole of port



Notes: The data relate to terminals at Fisherman Islands (Brisbane), Brotherson Dock at Port Botany (Sydney), Swanson Dock (Melbourne), Flinders Adelaide Terminal at Outer Harbor/Pelican Point (Adelaide), and North Quay in the Inner Harbour (Fremantle).

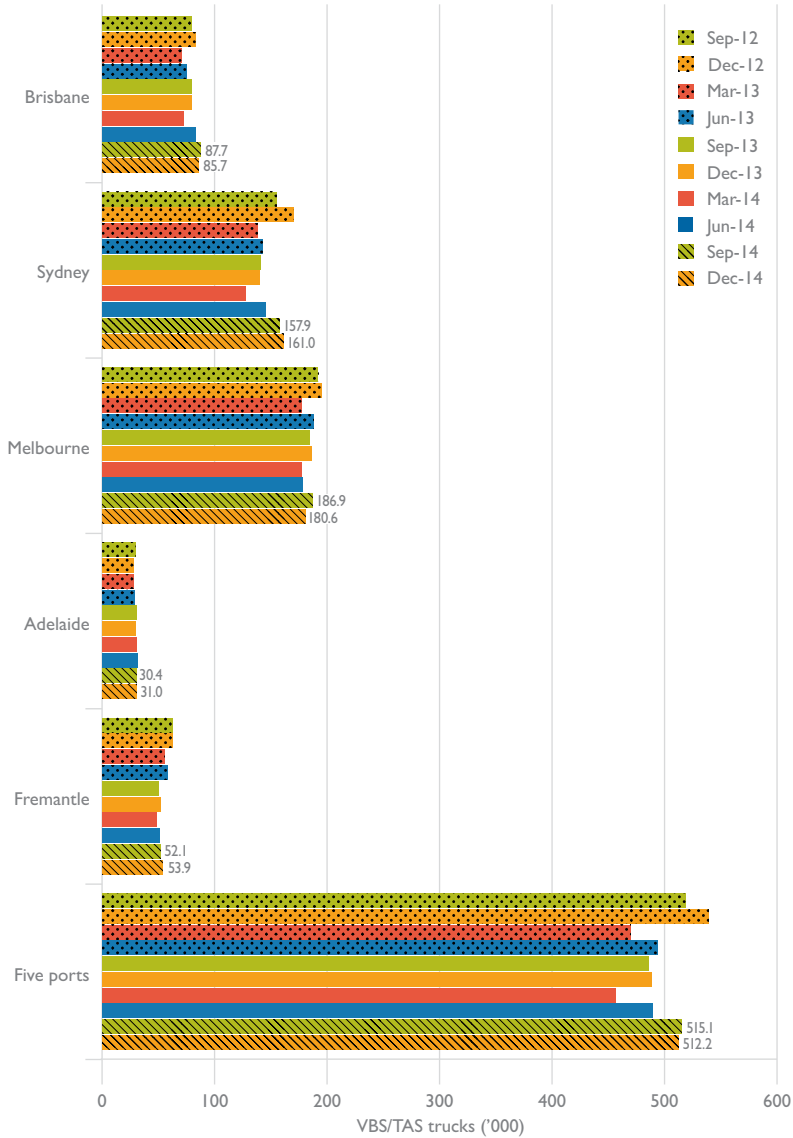
Sources: Port of Brisbane Pty Ltd (2015), Port Authority of New South Wales (2015), Port of Melbourne Corporation (2015), Port of Adelaide (2015) and Fremantle Port Authority (2015).

Figure I.4 Container terminal traffic: Number of UCC ships handled



Notes: The data contained in this figure relates to Indicator 1.1 as defined in the explanatory notes and Table 1.1 to 1.6.
 Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

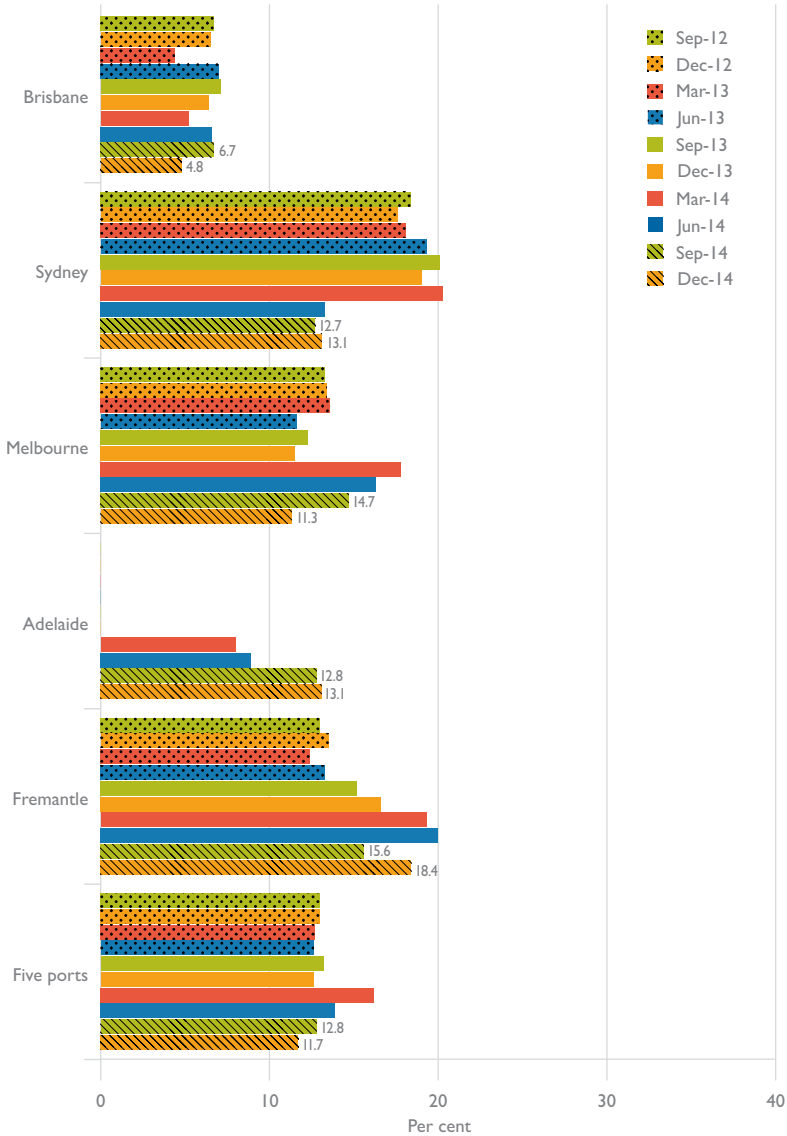
Figure I.5 Container terminal traffic: Number of trucks used in VBS/TAS operations



Notes: Data on number of trucks used in bulk runs are not available.

Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Figure I.6 Containers by rail as per cent of containers on the landside



Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015), Patrick (2015), Port of Adelaide (2015), Port of Brisbane Pty Ltd (2015), Port of Melbourne Corporation (2015) and Fremantle Port Authority (2015).

Table 1.1 Container terminal throughput: Brisbane

	2012			2013			2014							
	Sep Qtr	Dec Qtr	Jul-Dec	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	
Wharfside														
UCC ship handled, as reported by stevedores	234	241	475	217	229	446	250	273	523	258	270	528	258	508
Total containers handled ('000)	182.1	193.7	375.8	159.5	175.1	334.6	197.2	190.7	387.9	167.3	179.5	346.8	191.0	394.2
Total TEUs handled ('000)	273.6	291.7	565.4	240.4	259.6	500.0	292.3	286.2	578.5	245.9	262.6	508.6	285.3	590.5
40-foot container as per cent of all containers handled (%)	50.2	50.6	50.4	50.7	48.3	49.4	48.2	50.1	49.2	47.0	46.3	46.6	49.4	49.8
Landside														
Number of trucks used in VB5/TAS operations ('000)	79.4	83.0	162.4	70.6	75.0	145.6	79.9	79.7	159.6	72.1	83.2	155.3	87.7	173.4
Total containers transported by trucks and rail ('000)	140.0	149.4	289.4	123.5	143.9	267.4	144.8	142.3	287.1	125.2	149.3	274.4	157.8	311.1
Containers by trucks ('000)	128.9	138.3	267.2	117.0	132.6	249.7	133.4	131.9	265.3	117.2	137.9	255.1	145.5	289.3
Containers by rail ('000)	11.1	11.1	22.2	6.5	11.3	17.8	11.3	10.5	21.8	8.0	11.4	19.3	12.3	21.8
Total TEUs transported by trucks and rail ('000)	213.9	222.2	436.2	177.1	205.7	382.8	208.3	203.7	412.0	178.4	217.7	396.0	231.5	453.5
TEUs by trucks ('000)	199.6	207.7	407.4	169.4	191.3	360.6	193.4	190.7	384.1	169.1	203.3	372.4	215.9	427.3
TEUs by rail ('000)	14.3	14.5	28.8	7.7	14.4	22.1	14.9	13.0	27.8	9.3	14.4	23.6	15.6	26.2
Whole of Container Terminal														
Total number of container ship visits	240	244	484	220	223	443	253	266	519	248	263	511	252	486
Total containers (lifts) exchanged ('000)	196.2	211.0	407.2	157.1	166.2	323.4	196.8	186.5	383.3	167.5	174.2	341.7	190.6	387.3
Whole of port														
Total cargo throughput (million tonnes)	19.8		19.8		17.7				18.8			19.9		33.6
Non-containerised general cargo throughput (million tonnes)	0.9		0.9		0.6				0.5			0.5		0.4
Total TEUs exchanged ('000)	567.6		567.6		502.3				583.7			513.6		595.2
Full import ('000)	255.5		255.5		224.3				259.5			228.0		264.9
Empty import ('000)	34.0		34.0		29.1				36.4			31.0		35.0
Full export ('000)	187.6		187.6		147.8				178.0			145.4		167.3
Empty export ('000)	90.5		90.5		101.1				109.8			109.2		128.1

Note: Blank cells mean no data was reported for the categories (data for these indicators were reported at six-monthly intervals only).

Sources: DPWorld (2015), Hutchison Ports Australia (2015), Patrick (2015) and Port of Brisbane Pty Ltd (2015).

Table 1.2 Container terminal throughput: Sydney

	2012			2013			2014								
	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec		
Wharfside															
UCC ship handled, as reported by stevedores	266	290	556	261	267	528	289	306	595	292	299	591	290	284	574
Total containers handled ('000)	355.2	387.7	742.9	325.6	340.8	666.4	366.7	387.0	753.7	352.6	355.2	707.9	387.6	393.5	781.2
Total TEUs handled ('000)	539.0	592.5	1 131.5	493.6	511.2	1 004.7	561.0	584.5	1 145.5	535.9	536.2	1 072.1	592.4	606.8	1 199.2
40-foot container as per cent of all containers handled (%)	51.7	52.8	52.3	51.6	50.0	50.8	53.0	51.1	52.0	52.0	50.9	51.5	52.8	54.2	53.5
Landside															
Number of trucks used in VBS/TAS operations ('000)	154.8	169.8	324.6	138.5	143.1	281.7	141.1	140.3	281.4	127.8	145.3	273.1	157.9	161.0	318.9
Total containers transported by trucks and rail ('000)	263.5	286.8	550.3	236.9	244.7	481.6	243.4	241.6	485.0	223.0	229.7	452.7	249.3	252.4	501.7
Containers by trucks ('000)	211.9	232.4	444.4	189.3	193.8	383.0	191.4	192.6	383.9	174.1	197.8	371.9	217.0	218.2	435.2
Containers by rail ('000)	51.5	54.4	105.9	47.7	51.0	98.6	52.0	49.1	101.1	48.8	31.9	80.8	32.3	34.2	66.5
Total TEUs transported by trucks and rail ('000)	388.0	422.8	810.8	345.9	359.3	705.2	359.1	357.7	716.8	329.9	346.3	676.2	378.7	382.9	761.6
TEUs by trucks ('000)	316.5	348.3	664.8	283.4	289.8	573.2	286.8	289.8	576.6	262.9	300.1	563.1	330.6	332.8	663.4
TEUs by rail ('000)	71.5	74.5	146.0	62.5	69.5	132.0	72.3	68.0	140.2	66.9	46.2	113.1	48.1	50.1	98.2
Whole of Container Terminal															
Total number of container ship visits	267	289	556	262	270	532	286	297	583	284	293	577	288	275	563
Total containers (lifts) exchanged ('000)	324.2	355.7	679.9	301.5	308.7	610.3	337.0	358.3	695.3	319.4	322.1	641.5	361.5	362.9	724.4
Whole of port															
Total cargo throughput (million tonnes)			15.8		14.3			9.8				9.3			10.3
Non-containerised general cargo throughput (million tonnes)			0.0		0.0			0.0				0.0			1.7
Total TEUs exchanged ('000)			1 118.5		1 007.8			1 145.3				1 061.1			1 185.9
Full import ('000)			564.1		499.9			576.6				524.6			597.8
Empty import ('000)			2.9		7.4			3.4				5.5			6.3
Full export ('000)			234.4		208.5			227.5				208.5			233.8
Empty export ('000)			317.2		292.0			337.8				322.6			581.8

Note: Blank cells mean no data was reported for the categories (data for these indicators were reported at six-monthly intervals only).

Cells with an entry of "0.0" mean that data were reported but rounded to zero.

Sources: DP World (2015), Patrick (2015) and NSW Ports (2015).

Table 1.3 Container terminal throughput: Melbourne

	2012				2013				2014						
	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec
Wharfside															
UCC ship handled, as reported by stevedores	273	281	554	262	250	512	265	266	531	249	274	523	271	264	535
Total containers handled ('000)	382.2	387.1	769.3	340.0	337.3	677.3	364.6	377.4	742.1	355.3	370.8	726.2	388.6	395.5	784.2
Total TEUs handled ('000)	572.7	583.5	1 156.2	508.0	505.7	1 013.6	550.1	565.9	1 116.0	525.2	548.4	1 073.6	581.9	595.7	1 177.7
40-foot container as per cent of all containers handled (%)	49.8	50.7	50.3	49.4	49.9	49.7	50.9	49.9	50.4	47.8	47.9	47.9	49.7	50.6	50.2
Landside															
Number of trucks used in VBS/ITAS operations ('000)	192.0	194.8	386.8	177.2	188.2	365.5	184.2	185.8	370.0	177.3	178.4	355.7	186.9	180.6	367.6
Total containers transported by trucks and rail ('000)	359.9	367.9	727.8	329.1	343.6	672.7	344.3	348.7	693.0	362.1	362.2	724.3	371.3	349.8	721.0
Containers by trucks ('000)	313.1	320.2	633.2	284.8	304.2	589.0	302.4	309.3	611.7	298.7	303.4	602.1	317.3	311.0	628.3
Containers by rail ('000)	46.8	47.7	94.6	44.4	39.4	83.7	41.9	39.4	81.2	63.5	58.8	122.2	54.0	38.8	92.8
Total TEUs transported by trucks and rail ('000)	527.6	537.9	1 065.5	486.5	510.9	997.5	514.7	515.2	1 029.9	526.1	533.8	1 059.9	550.9	517.5	1 068.4
TEUs by trucks ('000)	457.4	466.0	923.4	420.2	451.9	872.1	451.6	456.2	907.7	432.3	446.9	879.2	470.1	459.2	929.2
TEUs by rail ('000)	70.1	72.0	142.1	66.3	59.0	125.3	63.2	59.0	122.2	93.8	86.9	180.7	80.9	58.4	139.2
Whole of Container Terminal															
Total number of container ship visits	297	303	600	284	270	554	281	284	565	261	266	527	266	259	525
Total containers (lifts) exchanged ('000)	380.2	384.6	764.9	346.2	344.3	690.5	368.9	380.0	748.9	359.2	361.6	720.9	384.4	389.2	773.6
Whole of port															
Total cargo throughput (million tonnes)	17.8					17.2			17.6			17.4			17.2
Non-containerised general cargo throughput (million tonnes)	1.2					1.1			1.1			1.0			1.1
Total TEUs exchanged ('000)	1 322.4					1 190.6			1 302.2			1 230.5			1 323.8
Full import ('000)	605.4					529.2			593.6			538.7			608.8
Empty import ('000)	64.1					68.9			59.4			75.6			57.6
Full export ('000)	435.6					428.5			438.3			441.0			429.3
Empty export ('000)	217.2					164.0			210.9			175.2			228.0

Note: Blank cells mean no data were reported for the categories (data for these indicators were reported at six-monthly intervals only).

The counts of containers by rail include those handled by Qube Logistics

Whole of container terminal refers to East and West Swanson Docks and Webb Dock East 3, 4 and 5.

Sources: DP World (2015), Patrick (2015) and Port of Melbourne Corporation (2015).

Table 1.4 Container terminal throughput: Adelaide

	2012			2013			2014							
	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	
Wharfside														
UCC ship handled, as reported by stevedores	82	86	168	77	81	158	86	83	169	81	84	165	84	165
Total containers handled ('000)	63.0	62.4	125.4	58.5	61.1	119.6	68.1	69.4	137.5	69.6	70.8	140.4	65.1	67.7
Total TEUs handled ('000)	88.0	87.9	175.9	81.6	84.4	166.0	96.5	96.2	192.7	95.3	97.3	192.6	91.5	95.3
40-foot container as per cent of all containers handled (%)	39.7	41.0	40.3	39.4	38.1	38.7	41.7	38.6	40.2	37.0	37.5	37.2	40.5	40.7
Landside														
Number of trucks used in VBS/TAS operations ('000)	29.6	28.4	58.0	28.0	28.6	56.6	30.7	29.8	60.5	31.0	31.9	62.9	30.4	31.0
Total containers transported by trucks and rail ('000)	49.6	45.9	95.5	45.8	48.8	94.7	55.2	53.6	108.8	61.7	62.1	123.8	62.4	62.1
Containers by trucks ('000)	49.6	45.9	95.5	45.8	48.8	94.7	55.2	53.6	108.8	56.7	56.4	113.1	53.3	52.9
Containers by rail ('000)										5.0	5.6	10.7	9.1	9.2
Total TEUs transported by trucks and rail ('000)	70.3	65.6	135.9	64.4	68.9	133.3	80.3	76.3	156.6	85.9	86.8	172.7	86.8	87.0
TEUs by trucks ('000)	70.3	65.6	135.9	64.4	68.9	133.3	80.3	76.3	156.6	79.0	79.1	158.1	75.7	75.5
TEUs by rail ('000)										6.9	7.7	14.6	11.1	11.4
Whole of Container Terminal														
Total number of container ship visits	83	85	168	77	82	159	86	86	172	81	82	163	85	81
Total containers (lifts) exchanged ('000)	63.0	60.8	123.7	59.0	61.6	120.6	67.1	69.7	136.7	69.2	69.7	139.0	65.5	67.5
Whole of port														
Total cargo throughput (million tonnes)			7.2			7.9			8.0			8.1		7.0
Non-containerised general cargo throughput (million tonnes)			0.2			0.1			0.2			0.2		0.1
Total TEUs exchanged ('000)			173.6			165.5			191.9			190.8		187.0
Full import ('000)			66.5			60.5			72.9			67.0		70.6
Empty import ('000)			19.5			22.2			24.3			27.4		22.6
Full export ('000)			69.2			72.3			76.9			81.1		77.6
Empty export ('000)			18.4			10.4			17.8			15.3		16.2

Note: Blank cells mean no data was reported for the categories (data for these indicators were reported at six-monthly intervals only).

Sources: Flinders Adelaide Container Company (2015) and Port of Adelaide (2015).

Table 1.5 Container terminal throughput: Fremantle

	2012				2013				2014						
	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec
		125	124	249	119	124	243	122	131	253	123	126	249	132	127
Wharveside															
UCC ship handled, as reported by stevedores	121.2	119.0	240.2	104.5	106.2	210.7	112.2	125.2	237.4	114.1	117.5	231.6	129.8	132.8	262.7
Total containers handled ('000)	181.3	178.3	359.6	153.1	155.5	308.6	167.0	186.8	353.8	166.6	168.3	334.8	190.4	198.2	388.7
Total TEUs handled ('000)	49.6	49.8	49.7	46.5	46.5	46.5	48.8	49.2	49.0	46.0	43.2	44.6	46.7	49.2	48.0
40-foot container as per cent of all containers handled (%)															
Landside															
Number of trucks used in VBS/TTAS operations ('000)	62.9	62.9	125.9	55.5	58.5	114.1	50.3	52.4	102.7	48.4	50.8	99.2	52.1	53.9	106.0
Total containers transported by trucks and rail ('000)	125.7	126.4	252.1	112.5	118.1	230.6	97.2	101.7	198.9	99.9	107.0	206.8	103.5	111.2	214.7
Containers by trucks ('000)	108.2	108.4	216.5	97.2	100.8	198.0	81.1	83.5	164.6	78.7	83.5	162.2	85.6	88.9	174.6
Containers by rail ('000)	17.5	18.1	35.6	15.2	17.4	32.6	16.1	18.2	34.3	21.2	23.5	44.6	17.9	22.3	40.2
Total TEUs transported by trucks and rail ('000)	185.7	184.0	369.7	162.5	169.5	331.9	136.8	143.0	279.7	136.3	144.4	280.7	142.9	156.6	299.4
TEUs by trucks ('000)	161.7	159.1	320.8	142.3	146.9	289.2	116.0	119.2	235.2	110.0	115.5	225.5	120.5	127.7	248.3
TEUs by rail ('000)	24.1	24.8	48.9	20.2	22.6	42.8	20.8	23.8	44.5	26.3	28.9	55.2	22.3	28.8	51.2
Whole of Container Terminal															
Total number of container ship visits	123	125	248	120	123	243	123	129	252	129	125	254	132	126	258
Total containers (lifts) exchanged ('000)	119.1	116.2	235.3	104.8	106.3	211.1	112.6	121.8	234.4	115.8	116.2	232.0	129.1	131.0	260.1
Whole of port															
Total cargo throughput (million tonnes)	15.6		15.6			16.3			15.6			17.8			17.4
Non-containerised general cargo throughput (million tonnes)	0.6		0.6			0.5			0.5			0.5			0.5
Total TEUs exchanged ('000)	359.2		359.2			311.1			357.7			345.4			398.1
Full import ('000)	176.2		176.2			153.7			176.5			164.1			189.8
Empty import ('000)	7.2		7.2			6.7			9.0			14.0			17.1
Full export ('000)	86.9		86.9			87.6			96.6			109.4			118.2
Empty export ('000)	88.9		88.9			63.0			75.6			57.9			72.9

Note: Blank cells mean no data was reported for the categories (data for these indicators were reported at six-monthly intervals only).

Sources: DP World (2015), Patrick (2015) and Fremantle Port Authority (2015).

Table 1.6 Container terminal throughput: Five ports

	2012					2013					2014				
	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec
Wharfside															
UCC ship handled, as reported by stevedores	980	1 022	2 002	936	951	1 887	1 012	1 059	2 071	1 003	1 053	2 056	1 035	1 006	2 041
Total containers handled ('000)	1 103.8	1 149.9	2 253.6	988.2	1 020.4	2 008.6	1 08.9	1 49.6	2 258.5	1 059.0	1 093.9	2 152.9	1 162.2	1 192.9	2 355.1
Total TEUs handled ('000)	1 654.6	1 734.0	3 388.6	1 476.6	1 516.3	2 992.9	1 666.9	1 719.6	3 386.5	1 568.9	1 612.8	3 181.7	1 741.6	1 801.2	3 542.8
40-foot container as per cent of all containers handled (%)	49.9	50.8	50.4	49.4	48.6	49.0	50.3	49.6	49.9	48.2	47.4	47.8	49.9	51.0	50.4
Landside															
Number of trucks used in VBS/TAS operations ('000)	5 18.7	538.9	1 057.6	470.0	493.4	963.4	486.2	488.1	974.3	456.6	489.6	946.2	515.1	512.2	1 027.3
Total containers transported by trucks and rail ('000)	938.6	976.4	1 915.0	847.9	899.2	1 747.1	884.9	887.9	1 772.8	871.8	910.2	1 782.1	944.3	928.7	1 873.0
Containers by trucks ('000)	811.7	845.1	1 656.8	734.1	780.2	1 514.3	763.5	770.8	1 534.3	725.4	779.1	1 504.4	818.7	814.9	1 633.6
Containers by rail ('000)	127.0	131.3	258.2	113.8	119.0	232.8	121.4	117.1	238.5	146.5	131.2	277.6	125.6	113.9	239.4
Total TEUs transported by trucks and rail ('000)	1 385.6	1 432.5	2 818.1	1 236.4	1 314.3	2 550.6	1 299.2	1 295.9	2 595.1	1 256.5	1 329.1	2 585.6	1 390.8	1 366.0	2 756.8
TEUs by trucks ('000)	1 205.6	1 246.7	2 452.3	1 079.7	1 148.7	2 228.4	1 128.1	1 132.2	2 260.3	1 053.3	1 144.9	2 198.2	1 212.8	1 206.6	2 419.4
TEUs by rail ('000)	180.0	185.8	365.9	156.7	165.5	322.2	171.1	163.7	334.8	203.2	184.1	387.3	178.0	159.4	337.4
Whole of Container Terminal															
Total number of container ship visits	1 010	1 046	2 056	963	968	1 931	1 029	1 062	2 091	1 003	1 029	2 032	1 023	975	1 998
Total containers (lifts) exchanged ('000)	1 082.6	1 282.2	2 210.9	968.5	987.2	1 955.9	1 082.4	1 163.2	2 198.6	1 031.3	1 043.7	2 075.1	1 310.1	1 475.2	2 278.5
Whole of port															
Total cargo throughput (million tonnes)			76.2			73.4			69.8			72.5			85.5
Non-containerised general cargo throughput (million tonnes)			2.9			2.3			2.3			2.2			3.8
Total TEUs exchanged ('000)			3 541.3			3 177.3			3 580.8			3 341.4			3 690.0
Full import ('000)			1 667.7			1 467.6			1 679.1			1 522.4			1 731.9
Empty import ('000)			127.7			134.3			132.5			153.5			138.6
Full export ('000)			1 013.7			944.7			1 017.3			985.4			1 026.2
Empty export ('000)			732.2			630.5			751.9			680.2			1 027.0

Note: Blank cells mean no data was reported for the categories (data for these indicators were reported at six-monthly intervals only).

Sources: As for Tables 1.1 to 1.5.

Table I.7 Container terminal throughput: Container Ship Visits by Port, July–December 2014

	Brisbane	Sydney	Melbourne	Adelaide	Fremantle	Total
<i>Gross Tonnage</i>						
5 000–20 000 GT	63	50	29	0	26	168
20 001–35 000 GT	54	108	66	20	6	254
35 001–40 000 GT	65	89	89	41	43	327
40 001–50 000 GT	137	129	148	49	54	517
50 001 and above GT	167	187	191	56	129	730
All ship sizes	486	563	523	166	258	1996

Sources: Port of Brisbane Pty Ltd (2015), NSW Ports (2015), Port of Melbourne Corporation (2015), Port of Adelaide (2015) and Fremantle Port Authority (2015).

CHAPTER 2

Measures of container terminal productivity

Overview

Chapter 2 of Waterline presents in a consolidated format all container terminal productivity measures. These indicators are in three groups—wharf-side, landside and whole of container terminal.

Seven quarterly wharf-side productivity indicators are covered:

- 2.1 Crane rate – containers per hour
- 2.2 Elapsed labour rate – containers per hour
- 2.3 Ship rate – containers per hour
- 2.4 Crane rate – TEUs per hour
- 2.5 Elapsed labour rate – TEUs per hour
- 2.6 Ship rate – TEUs per hour
- 2.7 Throughput pbm (containers per berth metre).

The following four quarterly landside productivity indicators are reported for trucks involved in VBS/TAS operations. Bulk runs trucks are not included in calculating these indicators:

- 2.8 Containers per truck
- 2.9 TEUs per truck
- 2.10 Average truck turnaround time
- 2.11 Average container turnaround time.

Eleven indicators are reported for whole of container terminal productivity:

- 2.12 Median of ship turnaround time
- 2.13 95th percentile of ship turnaround time
- 2.14 Number of ships waited in anchorage for more than 2 hours
- 2.15 Per cent of ships waited in anchorage for more than 2 hour
- 2.16 Average waiting time in anchorage
- 2.17 Median of waiting time in anchorage
- 2.18 Total time ships spent in berth
- 2.19 Average TEUs per hour ship spent in berth
- 2.20 Average lifts per hour ship spent in berth
- 2.21 Total time ships available to stevedores
- 2.22 Average lifts per hour of stevedoring operation
- 2.23 Average lifts per berth visit.

The chapter presents these indicators for Brisbane, Sydney, Melbourne, Adelaide, Fremantle and Five ports, where Five ports are aggregations of data for the five capital city container terminals.

Wharf-side productivity measures

Measures of productivity on the wharf-side of a container terminal relate only to containers moved by stevedoring companies from/to UCC ships at that container terminal.

Indicator 2.1 Crane rate – containers per hour

This is computed as the total number of containers handled divided by the total elapsed crane time (see details in Box 1). This indicator is interpreted as a proxy measure for the productivity of capital at a container terminal.

Box 1: Elapsed Crane Time

This is the crane time allocated by the stevedore to work on a container ship, assuming the container ship is ready for loading or unloading. It is computed as the total allocated crane hours, less operational and non-operational delays:

- No labour allocated
- Closed-port holiday
- Port-wide industrial stoppage
- Total crane time spent handling break-bulk cargo and containers that require manual intervention, e.g. use of wires, chains, non-rigid spreaders or other handling gear
- Award or enterprise agreement breaks as applicable
- Adverse weather
- Delays caused by the ship or its agent
- All breakdowns, including spreader changes
- Other equipment breakdowns which stop crane operations
- Booming up for passing ships
- Handling hatch covers
- Cage work and lashing/unlashing where crane operations are affected
- Crane long-travelling between hatches and crossing accommodation
- Labour withdrawn without operator's agreement including enterprise agreement related industrial stoppages
- Over-dimensional containers requiring additional (rigid) spreader
- Spreader changes
- Waiting for export cargo
- Defective ship's gear (e.g. jammed twist-locks, broken cell guides, ballast pumps unable to maintain list/trim).

Indicator 2.2 Elapsed labour rate – containers per hour

This indicator measures labour productivity at a container terminal and is computed as the number of containers handled divided by the total elapsed labour time (see details in Box 2). Sometimes this measure is reported as the “ship working rate”.

Indicator 2.3 Ship rate – containers per hour

This is the average number of containers moved on or off a ship in an hour. Generally, this indicator measures the combined stevedoring productivity of capital and labour.

Indicator 2.4 Crane rate – TEUs per hour

This is similar to Indicator 2.1 after converting containers to TEUs.

Indicator 2.5 Elapsed labour rate – TEUs per hour

This is similar to Indicator 2.2 after converting containers to TEUs.

Indicator 2.6 Ship rate – TEUs per hour

This is similar to Indicator 2.3 after converting containers to TEUs.

Indicator 2.7 Throughput pbm (containers per berth metre)

This is the number of containers through a container terminal divided by the length (in metres) of berths. At a container terminal it measures the intensity of use of the terminal container handling facility. The six month figure is a weighted average of the corresponding quarterly throughput.

Box 2: Elapsed Labour Time

This is the time elapsed between labour first boarding a container ship and labour last leaving the ship, less any time when the labour has not worked for whatever reasons including non-operational delays such as:

- No labour allocated to ship
- Closed-port holiday
- Port-wide industrial stoppage
- Break bulk and containers that require manual interventions, e.g. use of wires, chains, non-rigid spreaders or other handling gear.

Landside productivity measures

These indicators relate to the performance in processing containers through the 1-Stop Connections Pty Ltd Vehicle Booking System (VBS) by Patrick and DP World, or through the Truck Appointment System (TAS) by Hutchison Ports Australia. They do not include the performance of bulk runs trucks.

Indicator 2.8 Containers per truck

Count of containers processed through the VBS/TAS systems divided by the total number of VBS/TAS trucks used.

Indicator 2.9 TEUs per truck

Count of TEUs through the VBS/TAS systems divided by the total number of VBS/TAS trucks used. In contrast to Indicator 2.8, this indicator measures the truck efficiency in a standard unit, a TEU, and thus takes into account the different sizes of containers.

Indicator 2.10 Average truck turnaround time

The indicator measures the time elapsed from when the truck enters the gate of a container terminal to the time when the truck exits the gate. This measure does not include the time the truck waits outside the gate of a container terminal. This is a measure of stevedoring efficiency and shows how fast (expressed in minutes) a stevedoring company processes a truck at a container terminal.

Indicator 2.11 Average container turnaround time

This is as the “average truck turnaround time” (Indicator 2.10) divided by “average containers per truck” (Indicator 2.8). It is a measure of the stevedoring efficiency in handling containers at a container terminal.

Container turnaround time improves (that is, it goes down) if either the truck utilisation rates improve, implying that the number of containers per truck increases, or the container terminal is faster in processing each truck.

Whole of container terminal measures

Indicator 2.12 Median of ship turnaround time

This is the median of the time (in hours) a container ship is in a port. It is the time that elapses from the time a ship enters a port to the time a ship leaves the port.

Indicator 2.13 95th percentile of ship turnaround time

The 95th percentile indicates that for 95 per cent of the ships, the turnaround time is below the value of the indicator. Conversely, for 5 per cent of the ships, the turnaround time is above the value of the indicator.

Indicator 2.14 Number of ships waited in anchorage for more than 2 hours

This indicator provides the number of container ships, as reported by port authorities, that waited for longer than 2 hours for port entry clearance at the time of the ship’s first entry. Delay before entering a port usually results from the geography-specific situation of a port and may also be caused by operational reasons, both at the terminal or ship or both.

Indicator 2.15 Per cent of ships waited in anchorage for more than 2 hours

This is the number of container ships in Indicator 2.14 as a per cent of the total number of container ships that visited the container terminal in the period.

Indicator 2.16 Average waiting time in anchorage

This is the average time (hours) ships have waited in anchorage. Only ships that waited for port entry clearance for two hours or more are included in the calculation.

Indicator 2.17 Median of waiting time in anchorage

This is the median of time (hours) ships have waited in anchorage. Only ships that waited for port entry clearance for two hours or more are included in the calculation.

Indicator 2.18 Total time ships spent in berth

This is the total hours spent in berth by all dedicated container ships (UCC) that exchanged containers at that port. The time a ship spends in berth is the elapsed time between the time a ship arrives at berth and the time of its departure from berth. Port authorities report the berth time as a “gross value” including all times spent by a ship at berth such as time for loading/unloading containers, for maintenance and supply operations, or waiting for labour or suitable weather.

Indicator 2.19 Average TEUs per hour ship spent in berth

This is the total TEUs lifted on/off dedicated container ships (UCC) divided by the total time ship spent in berth (Indicator 2.18). The indicator is strongly influenced by changes in the average number of TEUs exchanged per visiting ship and by the mix of ship sizes during the period.

Indicator 2.20 Average lifts per hour ship spent in berth

This indicator is similar to Indicator 2.19 whereas the total crane lifts (containers handled) is used in calculating the indicator rather than the number of TEUs.

Indicator 2.21 Total time ships available to stevedores

This is the total time (in hours) when ships can be loaded or unloaded.

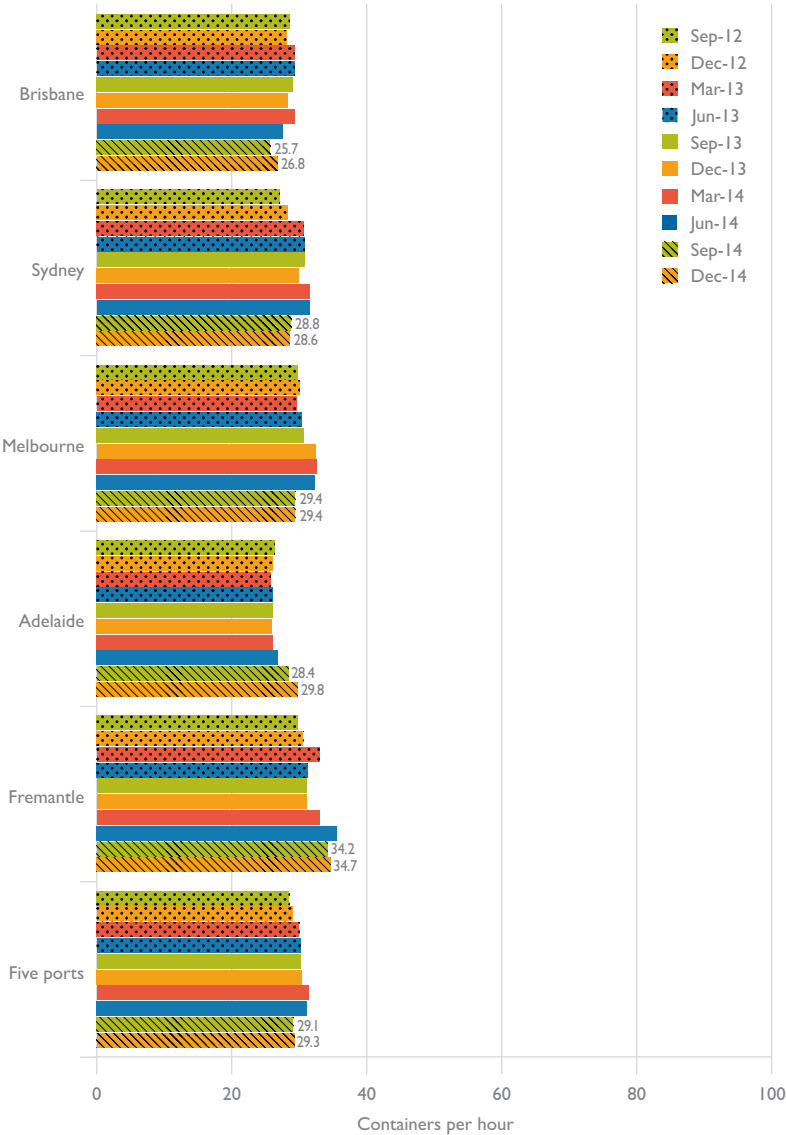
Indicator 2.22 Average lifts per hour of stevedoring operation

This is the total number of crane lifts (containers handled) divided by the total time actually spent by stevedores in loading and unloading containers.

Indicator 2.23 Average lifts per berth visit

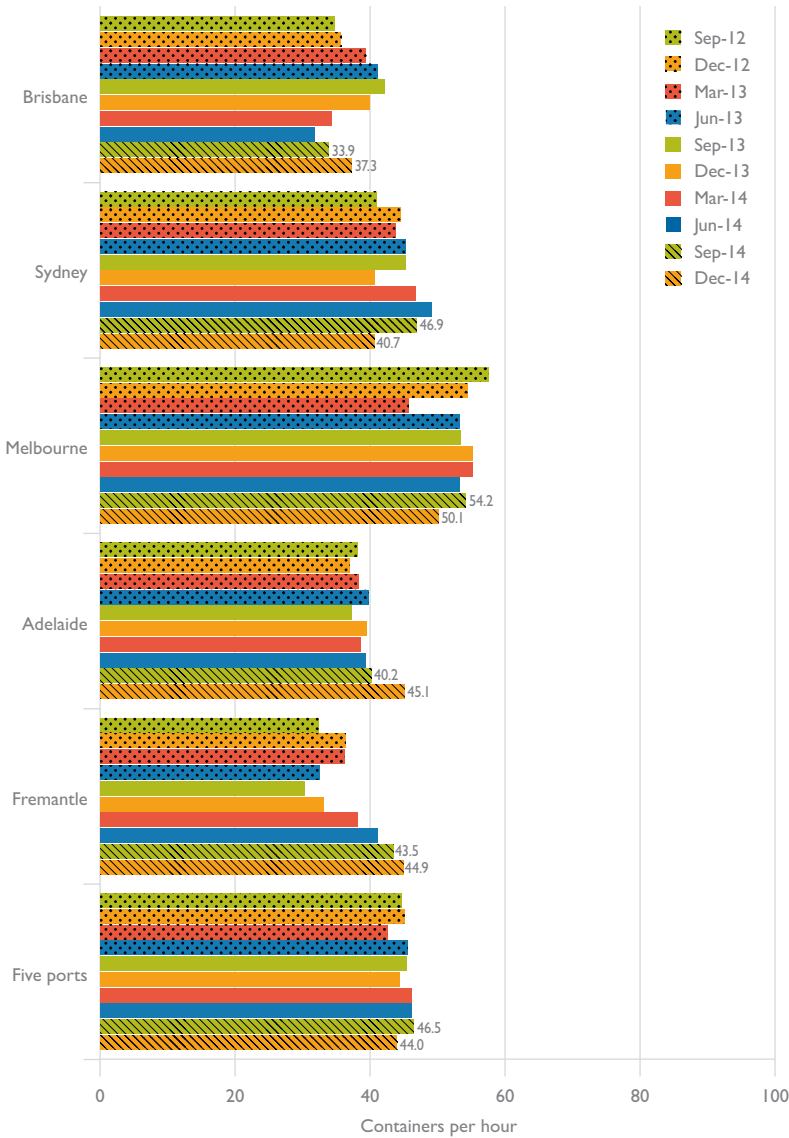
This is the number of crane lifts (containers handled) divided by the number of berth visits of dedicated container ships (UCC).

Figure 2.1 Wharf-side crane rate



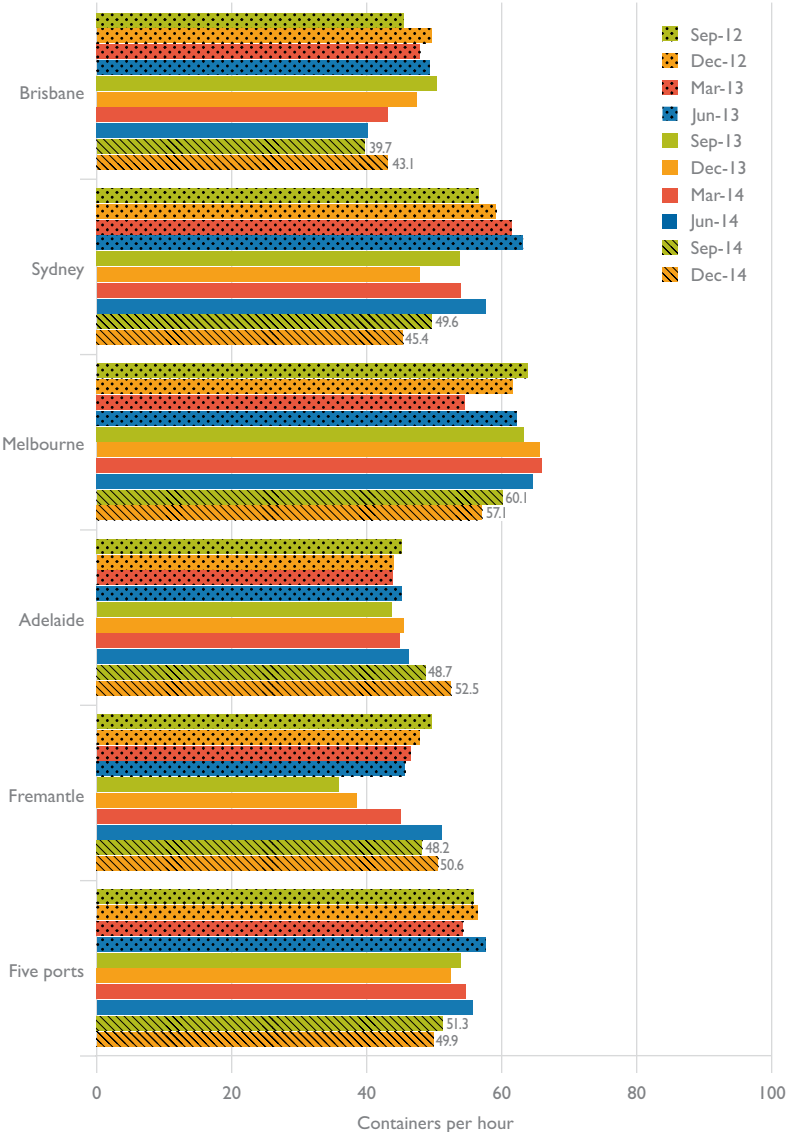
Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Figure 2.2 Wharf-side elapsed labour rate



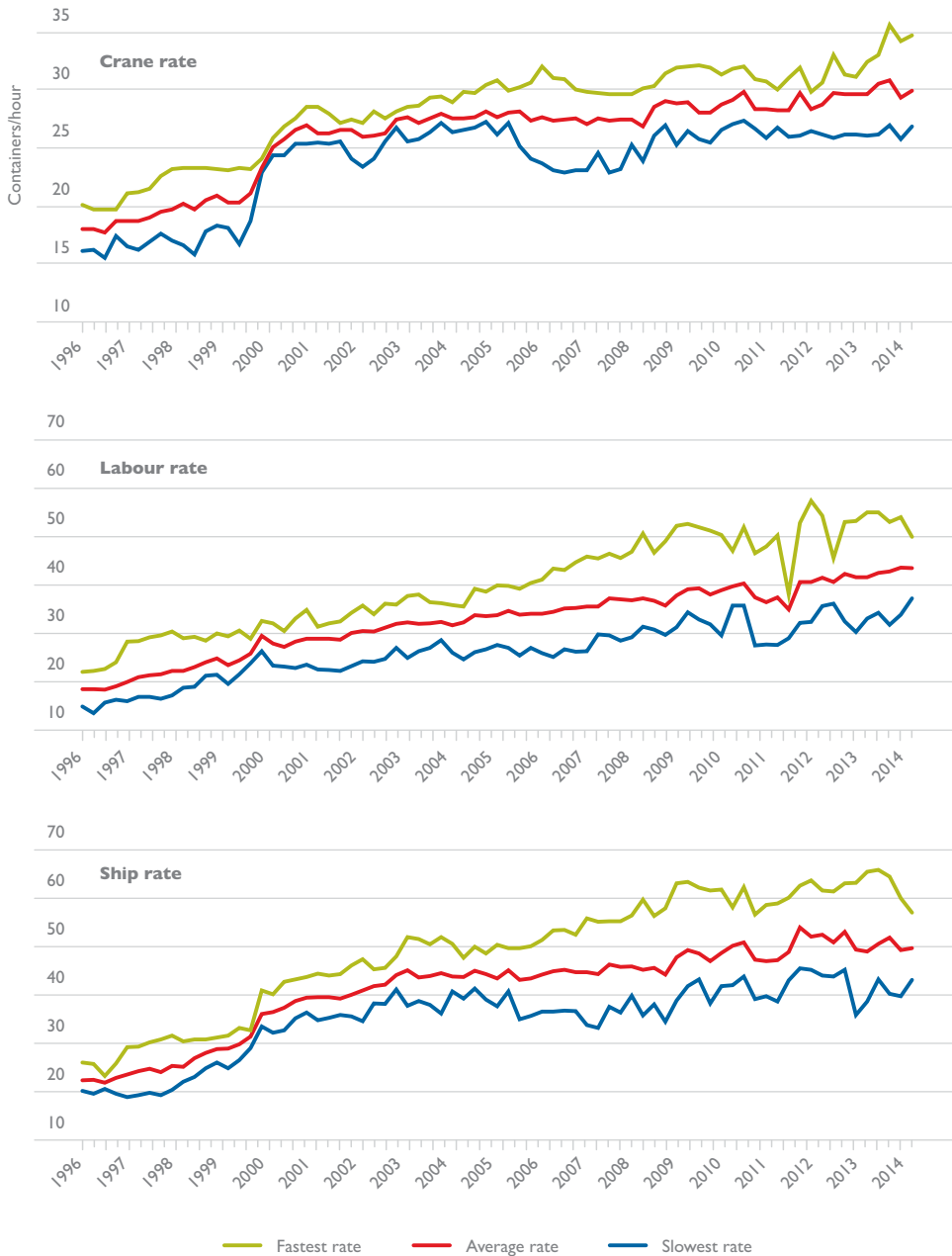
Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Figure 2.3 Wharf-side ship rate



Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Figure 2.4 Productivity in five ports: Comparison of wharf-side rates

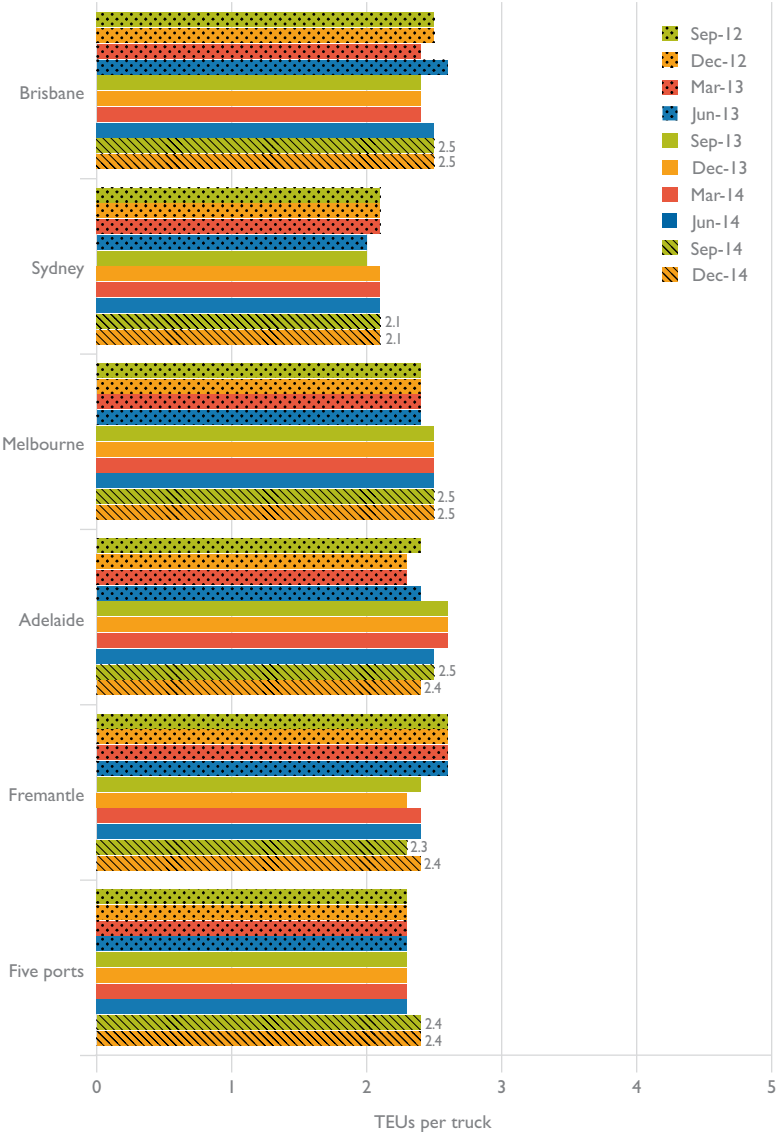


Notes: The wharf-side crane rate, labour rate and ship rate are compared among all five ports and the fastest, average and slowest rates are illustrated. The fastest and slowest rate may correspond to different ports in different periods.

Crane rate, labour rate and ship rate are measured in containers per crane hour; elapsed labour hour and berth hour respectively.

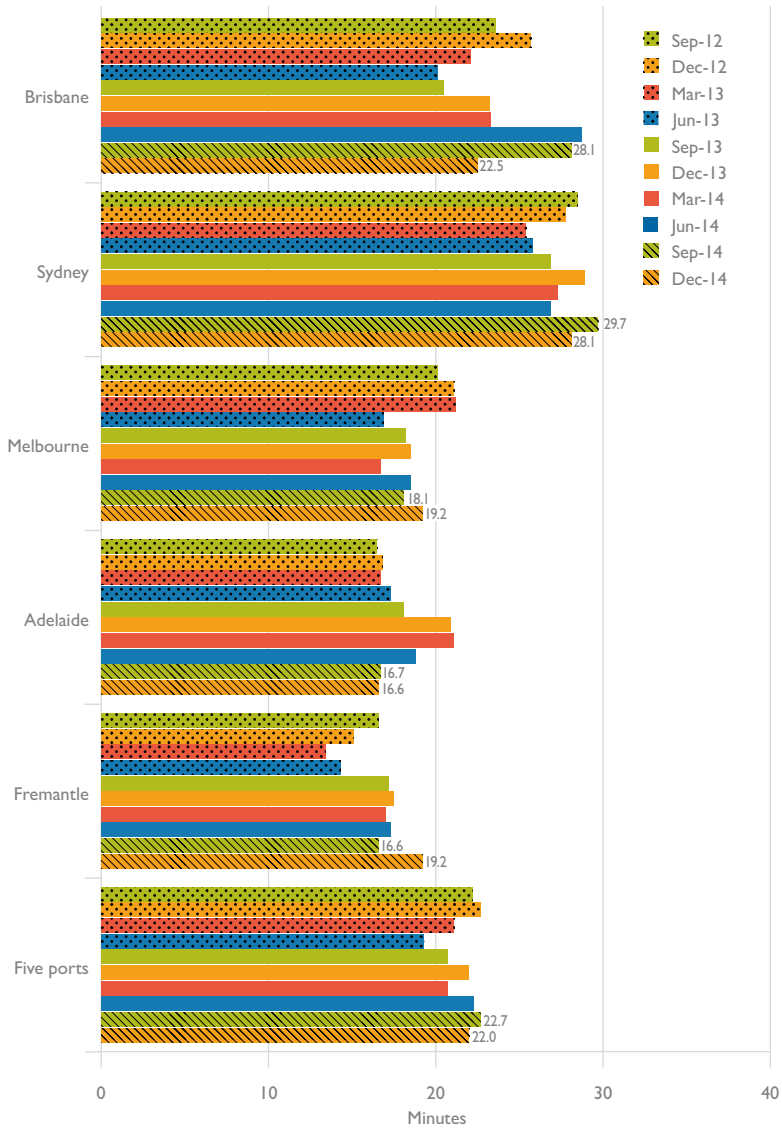
Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Figure 2.5 Average TEUs per truck on landside of container terminals



Notes: This indicator is based on only the trucks that are processed through the VBS/TAS system.
 Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

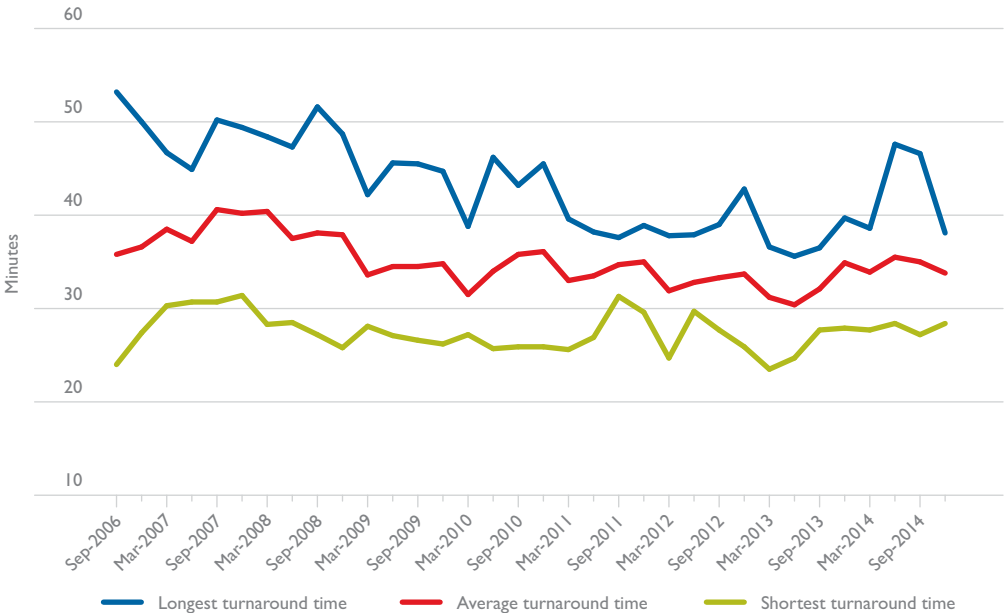
Figure 2.6 Average container turnaround time on landside of container terminals



Notes: This indicator is based on only the containers that are processed through the VBS/TAS system.

Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

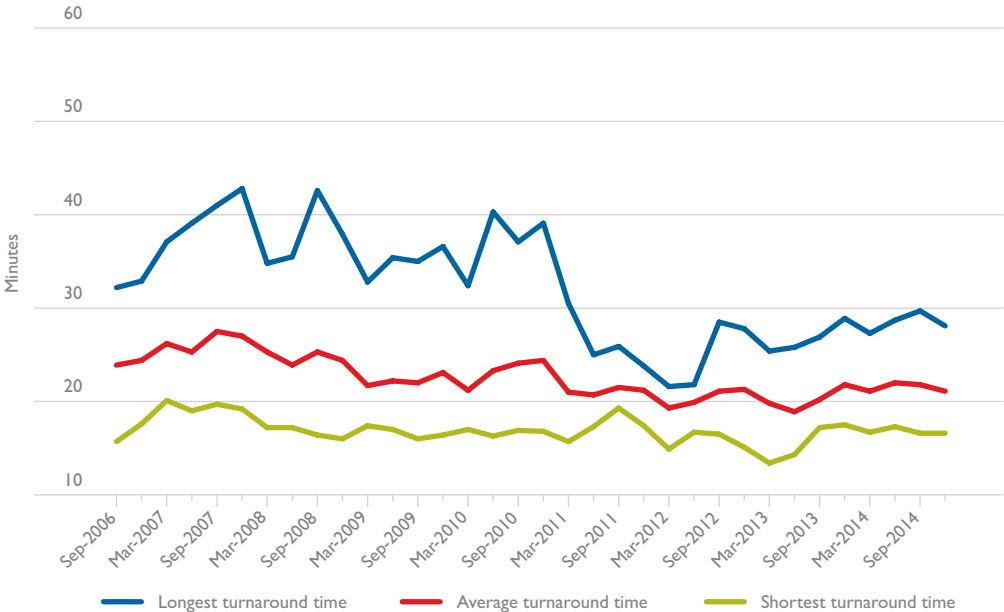
Figure 2.7 Longest and shortest truck turnaround time in five ports



Notes: The truck turnaround time is compared among all five ports in each quarter. The longest and shortest truck turnaround time may correspond to different ports in different periods.

Sources: DPWorld (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015), Patrick (2015).

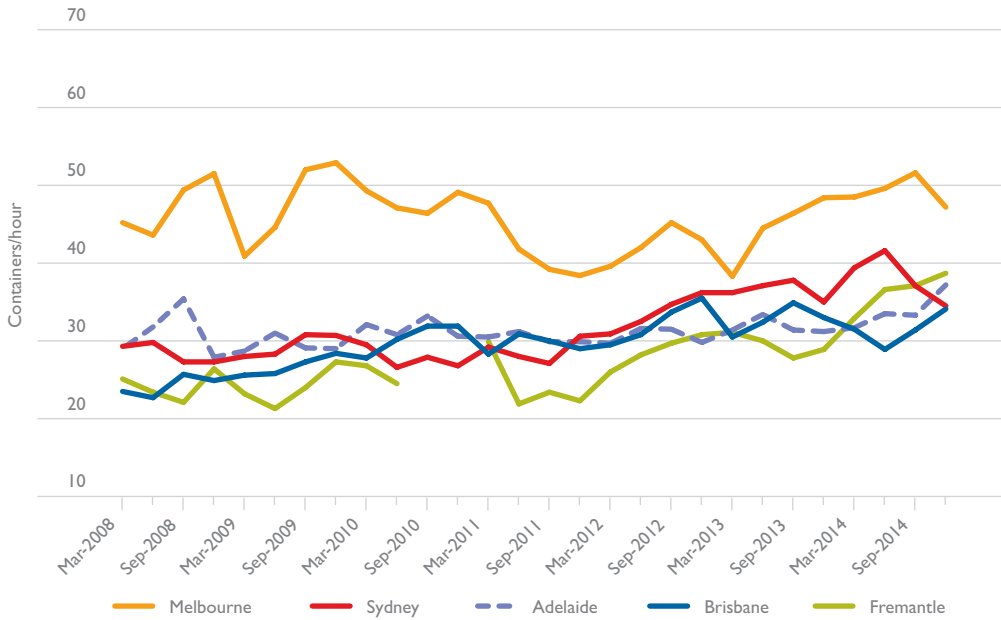
Figure 2.8 Longest and shortest container turnaround time in five ports



Notes: The container turnaround time is compared among all five ports in each quarter. The longest and shortest container turnaround time may correspond to different ports in different periods.

Sources: DPWorld (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

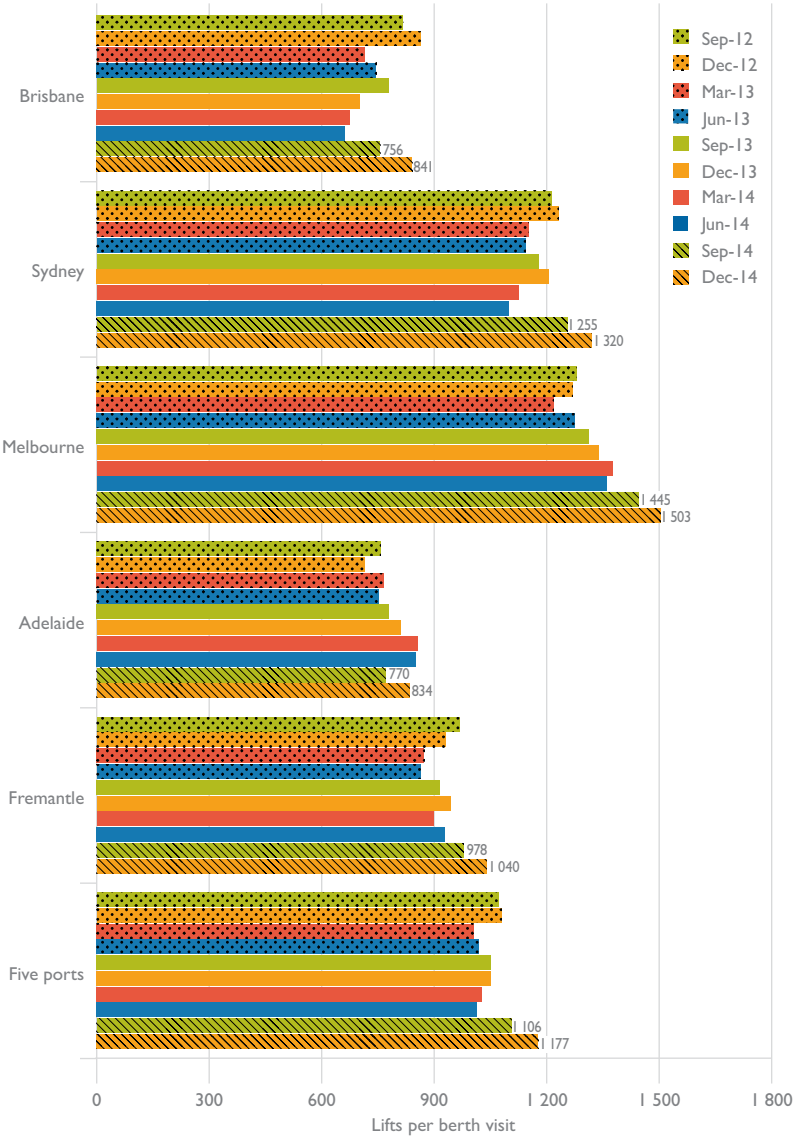
Figure 2.9 Average number of lifts per hour a ship spent at berth



Note: In September and December quarters of 2010 only part of ship movement statistics for Fremantle was available for analysis. These data points are not plotted.

Sources: BITRE estimates based on data from Port of Brisbane Pty Ltd (2015), NSW Ports (2015), Port of Melbourne Corporation (2015), Port of Adelaide (2015) and Fremantle Port Authority (2015).

Figure 2.10 Average number of lifts per berth visit



Sources: BITRE estimates based on data from Port of Brisbane Pty Ltd (2015), NSW Ports (2015), Port of Melbourne Corporation (2015), Port of Adelaide (2015) and Fremantle Port Authority (2015).

Table 2.1 Container terminal productivity: Brisbane

	2012				2013				2014						
	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec
Wharfside															
Containers per hour															
Crane rate	28.6	28.2	28.4	29.3	29.3	29.3	29.1	28.3	28.3	29.3	27.5	28.4	25.7	26.8	26.2
Elapsed labour rate	34.7	35.7	35.2	39.4	41.1	40.3	42.1	39.9	40.6	34.3	31.8	33.0	33.9	37.3	35.6
Ship rate	45.5	49.6	47.6	47.9	49.3	48.6	50.4	47.4	48.4	43.2	40.2	41.6	39.7	43.1	41.4
TEUs per hour															
Crane rate	42.9	42.5	42.7	44.1	43.5	43.8	43.1	42.3	42.2	43.2	40.3	41.6	38.2	40.2	39.2
Elapsed labour rate	52.0	54.0	53.0	59.4	61.1	60.3	62.5	59.9	60.5	50.3	46.6	48.3	50.5	56.2	53.4
Ship rate	68.2	74.9	71.6	72.3	73.3	72.8	75.0	71.3	72.4	63.5	58.9	60.9	59.1	64.8	62.0
Throughput pbm	113.3	120.5	116.9	99.3	108.9	104.1	122.7	118.7	120.7	104.1	111.7	108.0	118.8	126.5	122.8
Landside															
Containers per truck	1.6	1.7	1.6	1.7	1.8	1.7	1.7	1.7	1.7	1.6	1.7	1.6	1.7	1.7	1.7
TEUs per truck	2.5	2.5	2.5	2.4	2.6	2.5	2.4	2.4	2.4	2.4	2.5	2.4	2.5	2.5	2.5
Truck turnaround time (mins)	38.3	42.8	40.6	36.6	35.6	36.1	34.1	38.4	36.3	37.9	47.6	43.1	46.6	37.7	42.2
Average container turnaround time (mins)	23.6	25.7	24.7	22.1	20.1	21.1	20.5	23.2	21.8	23.3	28.7	26.2	28.1	22.5	25.3
Whole of Container Terminal															
Ship turnaround time															
Median (hours)	31.2	31.4	31.4	30.0	30.7	30.5	30.1	28.7	29.5	29.2	29.4	29.2	30.6	30.7	30.7
95th percentile (hours)	53.7	68.5	58.4	97.3	51.5	69.9	51.0	49.3	51.0	51.1	52.0	51.8	51.8	51.6	51.6
Ship waiting time at anchorage				33	36	69	35	39	74	34	15	49	4	0	4
Number of ships waited in anchorage for more than 2 hours				15.0	16.1	15.6	13.8	14.7	14.3	13.7	5.7	9.6	1.6	0.0	0.8
Per cent of ships waited in anchorage for more than 2 hours (%)				30.6	13.4	21.6	13.1	12.6	12.8	12.1	10.7	11.6	10.8	-	10.8
Average waiting time in anchorage (hours)				21.3	10.2	13.6	8.7	9.2	9.1	7.0	9.1	7.0	10.8	-	10.8
Median of waiting time in anchorage (hours)				5.1	5.1	10.3	5.6	5.7	11.3	5.3	6.0	11.3	6.1	5.8	11.8
Total time ships spent in berth ('000 hours)	5.8	5.9	11.8	46.0	48.1	47.1	51.7	49.5	50.6	46.3	42.2	44.1	46.9	51.3	49.0
Average TEUs per hour ship spent in berth (TEUs per hour)	33.7	35.5	34.6	30.5	32.4	31.5	34.9	33.0	33.9	31.5	28.9	30.1	31.4	34.1	32.7
Average lifts per hour ship spent in berth (lifts per hour)	5.4	5.8	11.2	4.1	4.3	8.4	4.8	4.8	9.6	4.9	6.0	10.9	5.9	5.6	11.4
Total time ships are available to stevedores ('000 hours)	36.4	36.5	36.4	38.5	38.6	38.5	41.0	38.8	39.9	33.9	29.1	31.3	32.4	35.3	33.8
Average lifts per stevedores' hour (lifts per hour)	817.4	864.7	841.3	714.3	745.4	730.1	778.0	701.1	738.6	675.5	662.2	668.7	756.3	840.9	797.0
Average lifts per berth visit (lifts)															

Note: Blank cells mean no data was reported for the categories. They relate to new indicators first reported in issue 53 of Waterline.

Half-yearly averages for crane rate, elapsed labour rate and ship rate may not lie between the quarterly averages, due to variations in the weighting scheme across periods. BITRE is currently considering alterations to our methodology to reduce this effect.

Sources: DP World (2015), Hutchison Ports Australia (2015), Patrick (2015), and Port of Brisbane Pty Ltd (2015).

Table 2.2 Container terminal productivity: Sydney

	2012				2013				2014						
	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec
Wharfside															
Containers per hour															
Crane rate	27.1	28.3	27.7	30.7	30.8	30.8	30.8	30.0	30.4	31.6	31.5	31.4	28.8	28.6	28.7
Elapsed labour rate	40.9	44.5	42.7	43.8	45.3	44.6	45.3	40.7	43.0	46.8	49.1	47.6	46.9	40.7	43.8
Ship rate	56.6	59.2	57.9	61.5	63.2	62.4	63.8	47.8	50.8	53.9	57.6	55.5	49.6	45.4	47.5
TEUs per hour															
Crane rate	41.0	43.2	42.1	46.4	46.1	46.3	46.6	45.3	46.0	48.0	47.5	47.5	43.8	43.7	43.7
Elapsed labour rate	62.0	67.8	64.9	66.3	68.1	67.2	69.5	62.0	65.7	71.2	74.4	72.3	71.9	63.0	67.5
Ship rate	85.8	90.6	88.2	93.4	95.2	94.3	82.0	72.2	77.1	82.0	87.3	84.2	75.7	70.0	72.9
Throughput pbm	182.9	199.6	191.3	167.7	175.5	171.6	188.8	199.3	194.2	181.6	182.9	182.3	199.6	202.6	201.1
Landside															
Containers per truck															
TEUs per truck	1.4	1.4	1.4	1.4	1.3	1.4	1.3	1.4	1.3	1.4	1.4	1.4	1.4	1.4	1.4
Truck turnaround time (mins)	2.1	2.1	2.1	2.1	2.0	2.0	2.0	2.1	2.0	2.1	2.1	2.1	2.1	2.1	2.1
Average container turnaround time (mins)	39.0	38.1	38.5	34.7	34.9	34.8	36.5	39.7	38.1	37.2	36.6	36.9	40.9	38.1	39.4
Average container turnaround time (mins)	28.5	27.8	28.1	25.4	25.8	25.6	26.9	28.9	27.9	27.3	26.9	27.1	29.7	28.1	28.9
Whole of Container Terminal															
Ship turnaround time															
Median (hours)	32.9	33.5	33.2	30.3	29.8	30.0	30.0	33.7	31.5	28.1	25.6	26.5	30.4	34.2	32.6
95th percentile (hours)	53.9	53.6	53.9	53.1	50.5	51.5	53.8	58.7	57.0	46.9	44.9	45.5	60.6	68.8	65.4
Ship waiting time at anchorage															
Number of ships waited in anchorage for more than 2 hours	59	68	127	81	122	203	59	54	60	72	132	132	60	72	132
Per cent of ships waited in anchorage for more than 2 hours (%)	22.7	25.0	23.9	22.7	25.0	23.9	27.8	40.0	34.1	20.8	18.4	19.6	20.8	26.2	23.4
Average waiting time in anchorage (hours)	17.3	14.3	15.8	15.3	16.1	15.8	16.1	15.8	15.8	10.1	10.4	10.2	10.3	15.1	12.9
Median of waiting time in anchorage (hours)	12.1	9.9	11.0	12.3	11.1	11.4	11.1	11.4	11.4	6.7	7.0	6.7	5.4	7.2	6.3
Total time ships spent in berth ('000 hours)	9.3	9.8	19.2	8.3	8.3	16.6	8.9	10.2	19.2	8.1	7.7	15.9	9.7	10.5	20.3
Average TEUs per hour ship spent in berth (TEUs per hour)	52.7	55.3	54.0	54.9	55.7	55.3	57.8	52.8	55.1	59.8	62.8	61.2	56.7	53.2	54.9
Average lifts per hour ship spent in berth (lifts per hour)	34.7	36.2	35.5	36.2	37.1	36.7	37.8	35.0	36.3	39.4	41.6	40.4	37.1	34.5	35.7
Total time ships are available to stevedores ('000 hours)	8.7	8.8	17.5	7.5	7.5	15.0	8.3	9.7	18.0	7.6	7.3	14.8	8.3	9.7	18.0
Average lifts per stevedores' hour (lifts per hour)	37.2	40.6	38.9	40.5	41.1	40.8	40.8	36.8	38.6	42.3	44.4	43.3	43.7	37.4	40.3
Average lifts per berth visit (lifts)	1 214.3	1 230.6	1 222.8	1 507	1 435	1 471	1 178.4	1 206.3	1 192.6	1 248	1 099.2	1 111.8	1 255.2	1 319.8	1 286.7

Note: Blank cells mean no data was reported for the categories. They relate to new indicators first reported in issue 53 of Waterline. Half-yearly averages for crane rate, elapsed labour rate and ship rate may not lie between the quarterly averages, due to variations in the weighting scheme across periods. BITRE is currently considering alterations to our methodology to reduce this effect.

Sources: DP World (2015), Patrick (2015), NSW Ports (2015) and Port Authority New South Wales (2015).

Table 2.3 Container terminal productivity: Melbourne

	2012				2013				2014						
	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec
Wharfside															
Containers per hour															
Crane rate	29.8	30.1	29.9	29.6	30.4	30.0	30.7	32.4	31.5	32.6	32.3	32.5	29.4	29.4	29.4
Elapsed labour rate	57.6	54.5	56.0	45.7	53.2	49.5	53.4	55.2	54.3	55.2	53.2	54.3	54.2	50.1	52.1
Ship rate	63.8	61.7	62.8	54.6	62.3	58.4	63.3	65.6	64.4	66.0	64.6	65.3	60.1	57.1	58.6
TEUs per hour															
Crane rate	44.6	45.3	45.0	44.1	45.6	44.9	46.2	48.3	47.2	48.0	47.6	47.8	43.6	43.9	43.7
Elapsed labour rate	86.3	82.1	84.2	68.3	66.9	67.7	80.5	82.7	81.6	81.6	79.0	80.4	81.4	75.3	78.3
Ship rate	95.6	93.1	94.4	81.7	93.6	87.6	95.5	98.5	97.0	97.7	96.2	97.0	90.3	85.9	88.1
Throughput pbm	209.3	212.0	210.7	186.2	184.7	185.5	199.7	206.7	203.3	194.6	203.1	198.9	212.8	216.6	214.7
Landside															
Containers per truck															
Median (hours)	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.7	1.7	1.7	1.7	1.7	1.7	1.7	1.7
95th percentile (hours)	2.4	2.4	2.4	2.4	2.4	2.4	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5	2.5
Truck turnaround time (mins)	32.8	34.6	33.7	34.1	27.3	30.6	29.9	30.8	30.3	28.1	31.4	29.8	30.8	33	31.9
Average container turnaround time (mins)	20.1	21.1	20.6	21.2	16.9	19.0	18.2	18.5	18.4	16.7	18.5	17.6	18.1	19.2	18.6
Whole of Container Terminal															
Ship turnaround time															
Median (hours)	35.4	36.7	36.0	38.1	35.6	36.6	36.4	34.9	35.7	34.5	34.8	34.6	34.6	38.6	36.3
95th percentile (hours)	70.9	68.2	70.4	65.0	62.6	65.0	57.5	55.8	56.7	54.8	52.7	53.8	55.2	65.9	62.6
Ship waiting time at anchorage															
Number of ships waited in anchorage for more than 2 hours				21	10	31	18	10	28	3	10	13	9	4	13
Per cent of ships waited in anchorage for more than 2 hours (%)				7.4	3.7	5.6	6.4	3.5	5.0	1.1	3.8	2.5	3.4	1.5	2.5
Ship waiting time in anchorage (hours)															
Median of waiting time in anchorage (hours)				21.8	28.4	23.9	15.8	30.1	20.9	16.2	17.3	17.1	33.1	27.2	31.3
Total time ships spent in berth ('000 hours)				18.2	23.3	18.6	15.5	24.7	17.2	21.8	16.2	16.7	36.6	27.7	29.1
Average TEUs per hour ship spent in berth (TEUs per hour)				8.4	8.9	17.4	9.0	7.8	15.8	7.4	7.3	14.7	7.4	8.2	15.7
Ship waiting time in berth (lifts per hour)															
Average lifts per hour ship spent in berth (lifts per hour)				45.2	43.0	44.1	38.3	44.5	47.4	48.5	49.6	49.1	51.6	47.2	49.3
Total time ships are available to stevedores ('000 hours)															
Average lifts per stevedores' hour (lifts per hour)				6.6	7.1	13.8	7.4	6.3	13.7	6.4	7.0	13.5	7.2	7.9	15.1
Average lifts per berth visit (lifts)				1280.2	1269.5	1274.8	1218.9	1312.8	1325.6	1376.4	1359.5	1367.8	1445.0	1502.8	1473.5

Note: Blank cells mean no data was reported for the categories. They relate to new indicators first reported in issue 53 of Waterline.

Whole of container terminal refers to East and West Swanson Docks and Webb Dock East 3, 4 and 5.

Half-yearly averages for crane rate, elapsed labour rate and ship rate may not lie between the quarterly averages, due to variations in the weighting scheme across periods. BITRE is currently considering alterations to our methodology to reduce this effect.

Sources: DP World (2015), Patrick (2015) and Port of Melbourne Corporation (2015).

Table 2.5 Container terminal productivity: Fremantle

	2012				2013				2014						
	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec	Mar Qtr	Jun Qtr	Jan-Jun	Sep Qtr	Dec Qtr	Jul-Dec
Wharfside															
Containers per hour															
Crane rate	29.8	30.6	30.2	33.0	31.3	32.1	31.1	31.1	31.1	33.0	35.6	34.3	34.2	34.7	34.5
Elapsed labour rate	32.4	36.3	34.4	36.2	32.5	34.3	30.3	33.1	31.7	38.1	41.1	39.6	43.5	44.9	44.2
Ship rate	49.6	47.8	48.7	46.5	45.7	46.1	35.8	38.6	37.2	45.0	51.1	48.1	48.2	50.6	49.4
TEUs per hour															
Crane rate	44.7	46.0	45.3	48.5	46.0	47.3	46.3	46.6	46.5	48.2	50.8	49.5	49.8	51.4	50.6
Elapsed labour rate	48.6	54.5	51.6	53.3	47.7	50.5	45.2	49.6	47.4	55.6	58.6	57.1	63.3	66.5	64.9
Ship rate	73.7	71.0	72.4	67.9	66.4	67.1	53.4	57.6	55.5	65.8	73.1	69.5	68.5	74.8	71.7
Throughput pbm	93.8	92.2	93.0	80.9	82.2	81.6	86.9	96.9	92.2	88.3	91.0	89.7	100.5	102.9	101.7
Landside															
Containers per truck															
Median (hours)	1.7	1.7	1.7	1.8	1.7	1.7	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
95th percentile (hours)	2.6	2.6	2.6	2.6	2.6	2.6	2.4	2.3	2.3	2.4	2.4	2.4	2.3	2.4	2.3
Truck turnaround time (mins)	28.6	25.9	27.3	23.5	24.7	24.1	27.7	27.9	27.8	27.7	28.4	28.0	27.2	31.7	29.5
Average container turnaround time (mins)	16.6	15.1	15.8	13.4	14.3	13.9	17.2	17.5	17.4	17.0	17.3	17.1	16.6	19.2	17.9
Whole of Container Terminal															
Ship turnaround time															
Median (hours)	36.7	34.1	35.5	29.0	30.8	29.6	33.9	34.1	33.9	30.6	26.6	28.4	28.1	28.5	28.4
95th percentile (hours)	66.3	59.9	64.6	66.7	54.7	57.5	79.1	67.0	73.4	51.7	44.5	50.1	49.9	54.4	54.4
Ship waiting time at anchorage															
Number of ships waited in anchorage for more than 2 hours				7	7	14	9	10	19	6	1	7	2	4	6
Per cent of ships waited in anchorage for more than 2 hours (%)				5.7	5.6	5.7	7.3	7.8	7.5	4.7	0.8	2.8	1.5	3.2	2.3
Average waiting time in anchorage (hours)				14.5	16.5	15.5	17.2	9.2	13.0	11.4	9.7	11.2	14.9	22.3	19.8
Median of waiting time in anchorage (hours)				13.6	10.7	12.2	8.1	6.8	7.2	8.2	9.7	9.7	14.9	22.3	15.4
Total time ships spent in berth ('000 hours)	4.0	3.8	7.8	3.4	3.5	6.9	4.1	4.2	8.3	3.5	3.2	6.7	3.5	3.4	6.9
Average TEUs per hour ship spent in berth (TEUs per hour)	44.5	46.1	45.3	45.5	43.9	44.7	41.3	43.1	42.2	48.0	52.4	50.1	54.4	57.7	56.0
Average lifts per hour ship spent in berth (lifts per hour)	29.7	30.8	30.2	31.1	30.0	30.5	27.8	28.9	28.3	32.9	36.6	34.6	37.1	38.7	37.9
Total time ships are available to stevedores ('000 hours)	3.7	3.3	7.0	2.9	3.3	6.2	3.7	3.8	7.6	3.0	2.9	6.0	3.1	3.1	6.2
Average lifts per stevedores' hour (lifts per hour)	31.8	35.3	33.4	35.9	32.4	34.1	30.2	31.7	31.0	38.2	39.6	38.9	41.8	42.8	42.3
Average lifts per berth visit (lifts)	968.1	929.5	948.6	873.0	864.2	868.6	915.3	944.0	930.0	898.0	929.4	913.6	978.0	1 040.0	1 008.2

Note: Blank cells mean no data was reported for the categories. They relate to new indicators first reported in issue 53 of Waterline.

Half-yearly averages for crane rate, elapsed labour rate and ship rate may not lie between the quarterly averages, due to variations in the weighting scheme across periods. BITRE is currently considering alterations to our methodology to reduce this effect.

Sources: DP World (2015), Patrick (2015) and Fremantle Port Authority (2015).

Table 2.6 Container terminal productivity: Five ports

	2012				2013				2014						
	SepQtr	DecQtr	Jul-Dec	MarQtr	JunQtr	Jan-Jun	SepQtr	DecQtr	Jul-Dec	MarQtr	JunQtr	Jan-Jun	SepQtr	DecQtr	Jul-Dec
Wharfside															
Containers per hour															
Crane rate	28.5	29.0	28.8	30.0	30.2	30.1	30.2	30.4	30.2	31.4	31.2	31.3	29.1	29.3	29.2
Elapsed labour rate	44.6	45.1	44.8	42.6	45.5	44.1	45.4	44.4	44.8	46.2	46.2	46.1	46.5	44.0	45.2
Ship rate	55.8	56.4	56.1	54.3	57.6	56.0	53.9	52.5	53.1	54.7	55.7	55.1	51.3	49.9	50.6
TEUs per hour															
Crane rate	42.8	43.8	43.3	44.9	44.9	44.9	45.3	45.4	45.3	46.5	46.1	46.2	43.3	43.9	43.6
Elapsed labour rate	66.8	68.1	67.5	63.8	63.7	63.8	68.5	66.7	67.5	68.6	68.6	68.5	69.8	66.3	68
Ship rate	83.8	85.3	84.5	81.5	86.1	83.8	81.2	78.6	79.8	81.4	82.8	82.0	76.7	75.1	75.9
Throughput pbm	154.7	161.1	157.9	138.5	143.0	140.7	155.4	161.1	158.4	148.4	153.3	150.9	162.9	167.2	165.0
Landside															
Containers per truck															
TEUs per truck	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6	1.6
Truck turnaround time (mins)	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.3	2.4	2.4	2.4
Average container turnaround time (mins)	34.7	35.6	35.1	33.0	30.6	31.8	32.4	34.7	33.6	32.9	35.5	34.2	36.1	35.0	35.5
Whole of Container Terminal															
Ship turnaround time															
Median (hours)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
95th percentile (hours)	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.	n.a.
Ship waiting time at anchorage															
Number of ships waited in anchorage for more than 2 hours				128	131	259	152	198	350	111	89	200	80	86	166
Per cent of ships waited in anchorage for more than 2 hours (%)				13.3	13.5	13.4	14.8	18.6	16.7	11.1	8.6	9.8	7.8	8.8	8.3
Average waiting time in anchorage (hours)				21.4	18.4	19.9	15.2	18.7	16.5	13.4	13.2	13.3	13.6	15.8	14.7
Median of waiting time in anchorage (hours)				16.5	14.0	15.2	12.3	14.2	12.4	11.8	10.7	11.2	8.2	8.1	8.2
Total time ships spent in berth ('000 hours)	29.6	30.5	60.1	27.8	26.6	54.3	28.7	30.2	58.9	26.6	26.3	52.9	28.7	29.7	58.4
Average TEUs per hour ship spent in berth (TEUs per hour)	54.9	55.7	55.3	52.1	55.2	53.6	56.7	55.3	56.0	57.5	58.4	58.0	59.0	58.3	58.6
Average lifts per hour ship spent in berth (lifts per hour)	36.6	37.0	36.8	34.9	37.2	36.0	37.7	37.0	37.3	38.8	39.7	39.2	39.4	38.6	39.0
Total time ships are available to stevedores ('000 hours)	26.2	26.6	52.8	23.4	23.0	46.4	25.5	27.0	52.5	23.8	25.0	48.8	26.0	27.8	53.8
Average lifts per stevedores' hour (lifts per hour)	41.4	42.4	41.9	41.4	43.0	42.2	42.5	41.4	41.9	43.4	41.8	42.6	43.4	41.3	42.4
Average lifts per berth visit (lifts)	1 071.9	1 078.6	1 075.3	1 005.7	1 019.9	1 012.9	1 051.9	1 051.1	1 051.5	1 028.2	1 014.3	1 021.2	1 105.6	1 176.9	1 140.4

Note: Blank cells mean no data was reported for the categories. They relate to new indicators first reported in issue 53 of Waterline.

Half-yearly averages for crane rate, elapsed labour rate and ship rate may not lie between the quarterly averages, due to variations in the weighting scheme across periods. BITRE is currently considering alterations to our methodology to reduce this effect.

n.a.: not applicable.

Sources: As for Tables 2.1 to 2.5.

CHAPTER 3

Timeslots for trucks at container terminals

Overview

This chapter reports on two main indicators:

1. The number of truck booking or appointments timeslots available at a container terminal
2. The number of truck booking or appointments timeslots used at a container terminal

The data is derived from the Vehicle Booking System (VBS) used by Patrick and DP World and Hutchison Ports Australia's Truck Appointments System (TAS). An important use of these statistics is to monitor the time of day and week when trucks access the container terminals to pick up or deliver containers. For this reason the count of slots available and used are provided for the following windows:

Monday to Friday Day: 6:01 AM to 6:00 PM

Monday to Friday Evening: 6:01 PM to 12:00 Midnight

Monday to Friday Night: 12:01 Midnight to 6:00 AM

Saturday Day: 6:01 AM to 6:00 PM

Saturday Evening: 6:01 PM to 12:00 Midnight

Saturday Night: 12:01 Midnight to 6:00 AM

Sunday Day: 6:01 AM to 6:00 PM

Sunday Evening: 6:01 PM to 12:00 Midnight

Sunday Night: 12:01 Midnight to 6:00 AM

The stevedores at the five container terminals do not have identical day, evening and night shifts. Thus data has been adjusted to fit into these standardised work shifts for comparative purposes.

Indicator 3.1 Number of truck timeslots available

Stevedoring companies make available a number of truck timeslots at various times in each day, based on the deployment of container handling equipment. The main factors affecting the availability of truck timeslots are the volume of containers to be processed, and terminal resources available to process containers. When shipping schedules and container volumes demand extra resources, additional labour and extra equipment can be deployed to the landside of a container terminal and extra available timeslots are advertised normally one or two days in advance.

Indicator 3.2 Number of timeslots actually used

This is the count of timeslots actually used by trucks.

Indicator 3.3 Timeslots used by trucks in all off-peak periods as per cent of total timeslots used at container terminals

This indicator, derived from Indicator 3.2, gives the count of timeslots used by trucks during the off-peak period as a per cent of all timeslots used. The off-peak period is defined as all time periods except Monday to Friday 6:01 AM to 6:00 PM.

Results for this indicator are presented in Figure 3.1. The indicator is further divided up into Monday to Friday off-peak usage (Indicator 3.4) and week-end usage (Indicator 3.5).

Indicator 3.4 Timeslots used by trucks in Monday to Friday off-peak periods as per cent of total timeslots used

This indicator, derived from Indicator 3.2, gives a count of timeslots used by trucks during the Monday to Friday off-peak period as a per cent of all timeslots used. Results for this indicator are presented in Figure 3.2.

Indicator 3.5 Timeslots used by trucks on Saturday and Sunday as per cent of total timeslots used

This indicator, derived from indicator 3.2, gives a count of timeslots used by trucks during the Weekend (Saturday to Sunday) as a per cent of all timeslots used. Results for this indicator are presented in Figure 3.3.

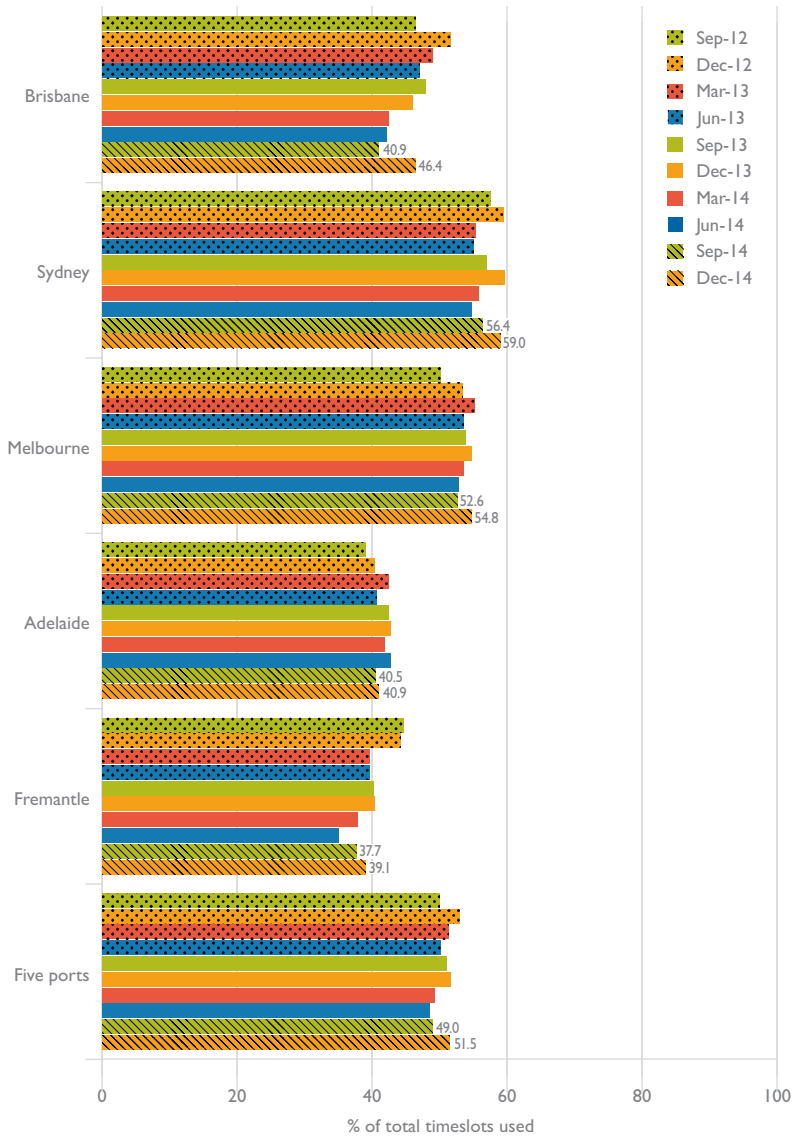
Indicator 3.6 Average TEUs handled per VBS/TAS truck timeslot

This indicator is a measure of the intensity of usage of timeslots. The indicator increases as opportunities for out/return load carrying trips in one job increase. Results for this indicator are presented in Figure 3.4.



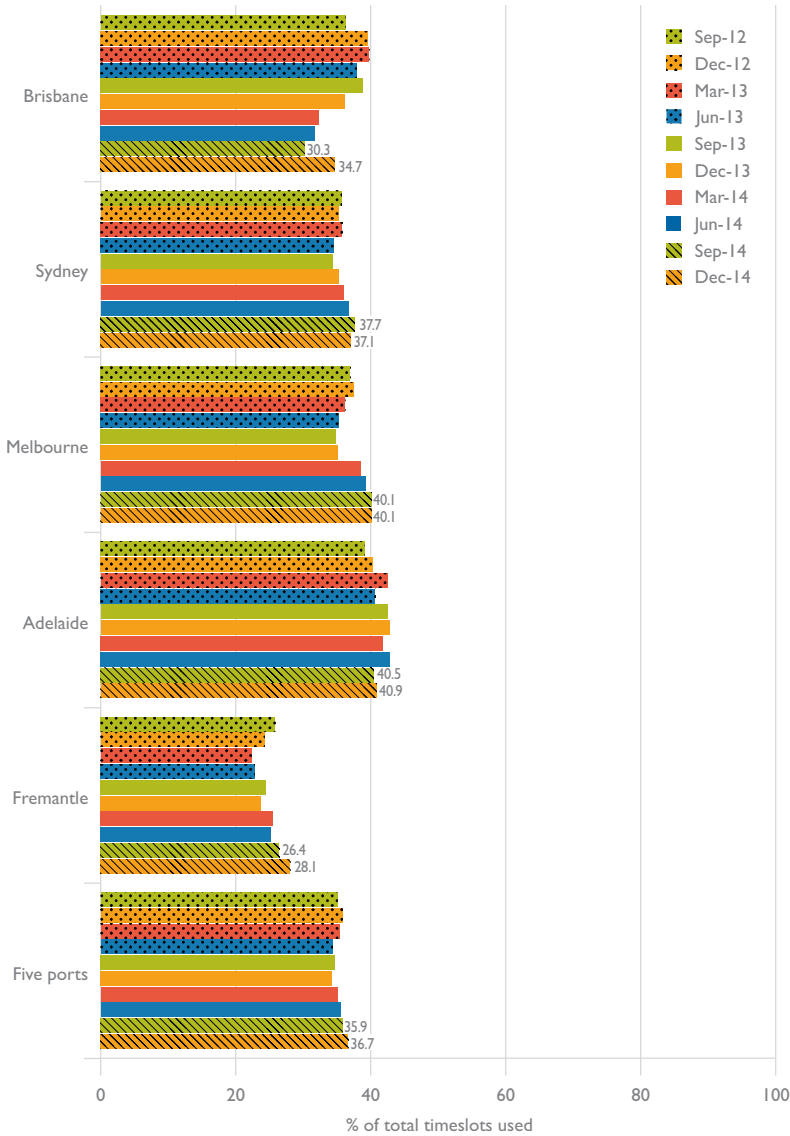
Truck loading area for automated straddle carrier; Brisbane Container Terminals. Photo courtesy of Port of Brisbane Pty Ltd.

Figure 3.1 Timeslots used by trucks in all off-peak periods



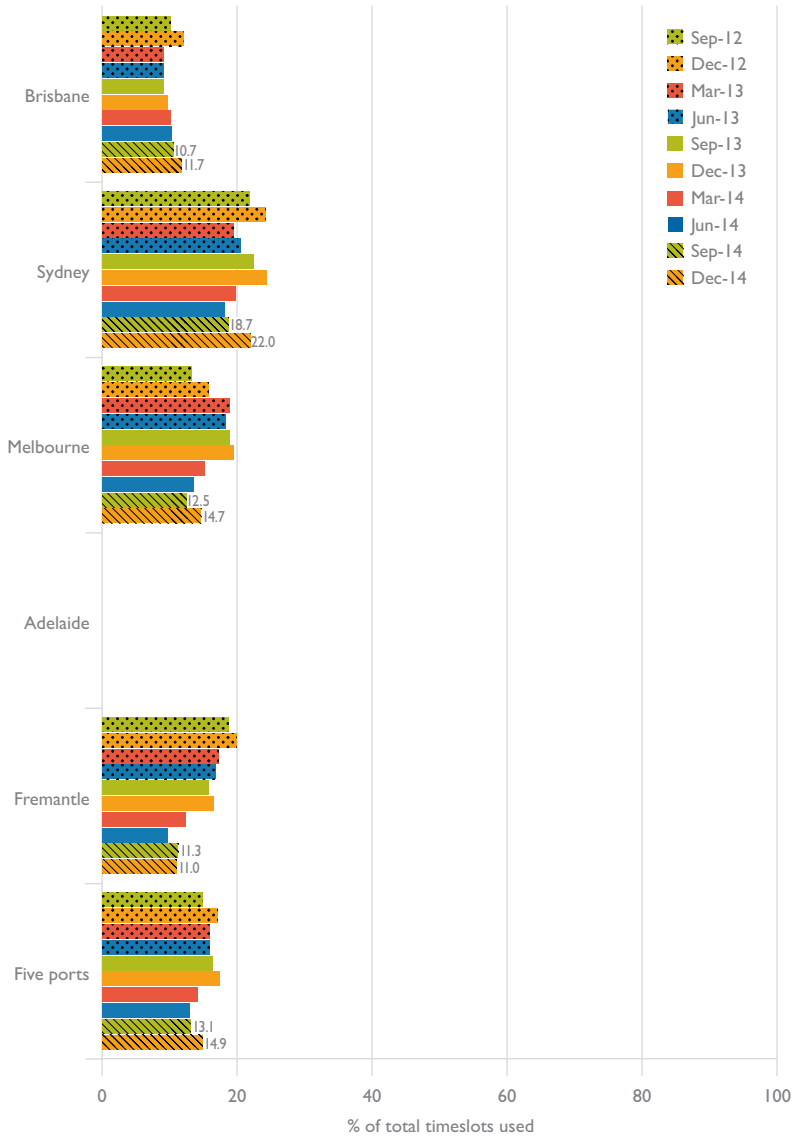
Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Figure 3.2 Timeslots used by trucks in off-peak periods Monday to Friday



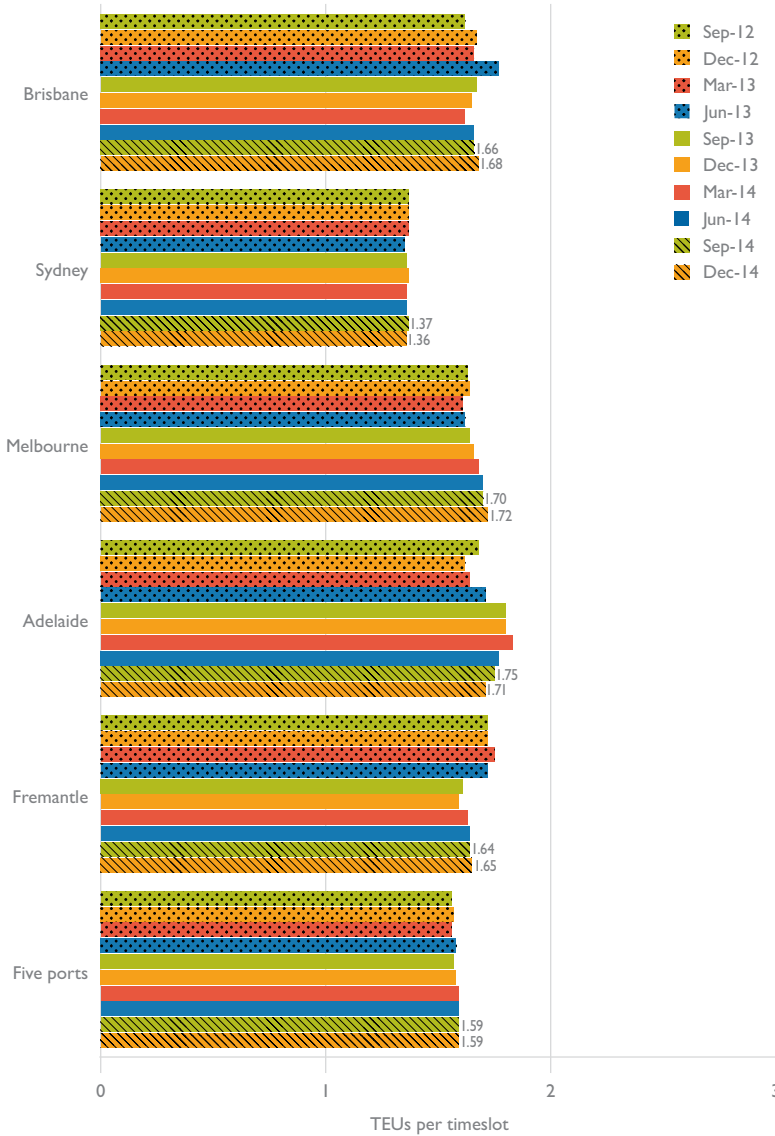
Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Figure 3.3 Timeslots used by trucks on Saturday and Sunday



Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Figure 3.4 TEUs processed per VBS truck at container terminals



Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Table 3.1 Timeslots available and actually used by trucks: Brisbane

Available timeslots (’000)	Weekday	Shift	2012			2013			2014			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Monday – Friday	Day		82.2	79.3	75.2	80.6	94.3	99.4	94.4	100.7	90.2	83.0
	Evening		34.1	37.2	32.7	33.0	38.3	37.7	33.5	37.5	31.7	32.6
	Night		22.0	28.4	27.7	26.3	30.5	28.0	19.4	20.8	14.2	20.4
	Sub-total		138.3	145.0	135.7	139.9	163.1	165.2	147.4	159.0	136.1	136.0
Saturday	Day		9.6	10.5	9.2	8.0	10.5	12.4	11.5	12.8	11.2	10.3
	Evening		0.2	0.2	0.0	0.1	0.4	0.0	1.9	2.2	2.0	2.3
	Night		1.6	2.4	0.0	0.5	0.2	0.6	0.0	0.9	0.0	1.4
	Sub-total		11.5	13.0	9.2	8.7	11.1	13.0	13.4	15.8	13.3	14.0
Sunday	Day		3.5	4.3	3.2	5.2	5.1	4.0	5.7	6.7	4.4	5.0
	Evening		0.3	1.0	0.7	0.6	0.6	0.2	0.5	0.6	0.5	0.0
	Night		0.9	2.9	2.3	2.3	2.1	1.9	1.9	1.4	0.9	0.8
	Sub-total		4.8	8.1	6.1	8.1	7.8	6.1	8.0	8.7	5.8	5.8
Total available timeslots			154.6	166.2	151.0	156.8	181.9	184.2	168.8	183.5	155.2	155.7
Used timeslots (’000)	Monday – Friday	Day	81.1	78.5	74.0	79.5	87.4	92.3	87.8	83.6	85.0	77.2
	Evening		33.3	36.6	32.1	32.2	36.2	35.3	31.9	29.9	29.8	29.3
	Night		21.5	27.8	25.5	24.6	29.2	26.6	17.3	15.9	13.7	20.8
	Sub-total		136.0	142.9	131.6	136.3	152.9	154.2	137.0	129.4	128.6	127.3
Saturday	Day	9.4	10.3	8.7	7.6	9.1	11.2	9.5	9.7	9.7	8.7	
Evening		0.2	0.2	0.0	0.1	0.1	0.0	1.7	1.2	1.3	1.4	
Night		1.6	2.3	0.0	0.5	0.2	0.5	0.0	0.8	0.0	1.8	
Sub-total		11.2	12.8	8.7	8.2	9.4	11.7	11.2	11.6	11.0	11.8	
Sunday	Day	3.0	3.8	2.2	3.2	3.8	3.4	2.7	2.6	3.1	3.6	
Evening		0.1	0.7	0.3	0.4	0.1	0.1	0.3	0.1	0.3	0.0	
Night		0.9	2.4	1.9	1.8	1.8	1.5	1.2	0.7	0.8	1.5	
Sub-total		4.1	6.8	4.5	5.3	5.9	4.9	4.2	3.3	4.3	5.1	
Total used timeslots			151.3	162.5	144.8	149.8	168.2	170.9	152.4	144.4	143.9	144.2

Note: Data are rounded to the nearest 100. Cells with an entry of 0.0 mean that data were reported but are less than 50.

Sources: DP World (2015), Hutchison Ports Australia (2015) and Patrick (2015).

Table 3.2 Timeslots available and actually used by trucks: Sydney

Available timeslots (’000)	Weekday	Shift	2012				2013				2014			
			SepQtr	DecQtr	MarQtr	JunQtr	SepQtr	DecQtr	MarQtr	JunQtr	SepQtr	DecQtr	MarQtr	JunQtr
Monday – Friday	Day	Day	90.0	93.0	83.8	86.8	86.8	95.0	97.6	101.8	109.0	110.7	104.6	
		Evening	41.5	42.9	38.0	38.5	43.9	44.1	44.4	50.4	53.1	50.3	50.3	
		Night	36.0	38.9	30.2	29.6	35.5	37.3	34.9	39.4	44.1	46.7	46.7	
		Sub-total	167.5	174.8	152.0	155.0	174.4	179.0	181.2	198.7	207.9	201.6	201.6	
Saturday	Day	Day	11.4	15.2	8.3	8.4	11.8	15.9	14.4	16.7	17.2	20.5		
		Evening	3.1	3.7	2.0	2.4	3.4	4.0	1.3	2.0	2.3	4.0		
		Night	7.1	7.8	5.6	5.7	6.6	7.2	3.8	3.9	4.1	5.7		
		Sub-total	21.5	26.7	15.9	16.5	21.7	27.1	19.5	22.7	23.6	30.1	30.1	
Sunday	Day	Day	14.6	17.9	11.7	13.5	16.8	17.1	13.0	13.3	12.1	14.1		
		Evening	7.7	7.9	6.0	6.3	8.2	8.1	6.8	6.4	7.3	7.5		
		Night	3.6	3.8	3.2	3.5	3.6	4.0	3.4	2.9	4.0	5.1		
		Sub-total	25.8	29.6	20.9	23.3	28.6	29.2	23.2	22.7	23.4	26.8	26.8	
Total available timeslots			214.9	231.2	188.7	194.7	224.8	235.3	223.9	244.1	255.0	258.6		
Used timeslots (’000)	Monday – Friday	Day	86.4	89.9	79.9	84.0	90.3	86.5	85.7	95.2	102.3	95.5		
		Evening	39.1	41.5	36.1	37.2	41.5	42.1	41.0	44.6	49.3	45.2		
		Night	33.5	36.8	27.9	27.4	30.4	33.6	28.8	32.7	39.1	41.1		
		Sub-total	159.0	168.2	143.9	148.6	162.1	162.2	155.5	172.5	190.7	181.8		
Saturday	Day	Day	10.7	14.6	7.9	8.2	11.3	14.4	11.4	13.8	15.6	18.8		
		Evening	2.8	3.5	1.9	2.3	3.0	3.8	1.1	1.2	2.0	3.0		
		Night	6.1	7.3	5.1	5.3	5.9	6.5	3.6	3.4	3.9	5.1		
		Sub-total	19.6	25.3	14.9	15.9	20.2	24.7	16.0	18.4	21.5	26.9		
Sunday	Day	Day	14.1	17.2	11.1	13.3	15.8	16.4	12.6	11.4	11.7	12.7		
		Evening	7.4	7.6	5.8	6.0	7.7	7.6	6.6	5.8	7.2	7.1		
		Night	3.5	3.7	3.0	3.3	3.4	3.8	3.1	2.5	3.5	4.4		
		Sub-total	25.0	28.5	20.0	22.6	26.9	27.7	22.4	19.7	22.4	24.2		
Total used timeslots			203.5	222.1	178.8	187.1	209.2	214.6	193.9	210.6	234.6	233.0		

Note: Data are rounded to the nearest 100. Cells with an entry of 0.0 mean that data were reported but are less than 50.

Sources: DP World (2015) and Patrick (2015).

Table 3.3 Timeslots available and actually used by trucks: Melbourne

Available timeslots (’000)	Weekday	Shift	2012			2013			2014			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Monday – Friday	Day		148.5	149.7	133.9	140.9	150.2	147.3	143.1	150.7	159.5	152.0
	Evening		64.9	72.8	60.1	60.1	65.4	65.7	66.6	71.7	74.6	72.6
	Night		46.3	53.3	49.5	49.4	50.4	51.7	55.8	56.8	61.4	62.9
	Sub-total		259.6	275.8	243.5	250.4	266.0	264.7	265.5	279.3	295.5	287.5
Saturday	Day		19.2	26.0	17.6	16.4	17.5	18.4	20.9	20.4	18.7	20.3
	Evening		4.2	4.3	4.2	4.3	4.6	5.6	1.8	0.8	0.6	0.5
	Night		3.2	3.5	9.6	9.1	10.7	11.1	4.0	3.9	4.6	5.5
	Sub-total		26.6	33.8	31.4	29.7	32.8	35.0	26.8	25.1	23.9	26.3
Sunday	Day		4.3	6.5	12.4	13.2	15.3	14.8	9.2	6.9	5.8	8.9
	Evening		4.2	4.9	6.7	6.8	8.7	8.1	6.1	6.2	6.7	8.0
	Night		5.6	5.4	7.2	7.3	7.3	8.0	6.3	5.7	6.2	7.1
	Sub-total		14.1	16.8	26.3	27.3	31.2	30.9	21.6	18.8	18.7	23.9
Total available timeslots			300.3	326.5	301.3	307.4	330.1	330.6	313.8	323.2	338.0	337.8
Used timeslots (’000)	Monday – Friday	Day	148.1	148.8	130.7	138.0	146.3	143.1	138.5	146.8	156.7	148.7
		Evening	63.7	67.0	58.5	58.4	63.1	63.0	63.4	63.4	69.0	73.1
		Night	46.0	52.8	47.1	46.6	47.4	47.8	51.6	51.6	53.0	59.6
		Sub-total	257.8	268.7	236.3	243.0	256.8	254.0	253.4	253.4	268.7	289.4
Saturday	Day	19.1	25.9	17.2	16.0	16.8	17.7	20.1	19.9	18.2	19.4	
	Evening	3.5	4.5	4.1	4.1	4.3	5.4	1.5	0.7	0.6	0.5	
	Night	3.1	3.4	8.7	8.2	9.0	9.2	3.5	3.8	4.5	5.4	
	Sub-total	25.7	33.8	29.9	28.3	30.1	32.3	25.1	24.4	23.4	25.3	
Sunday	Day	4.2	6.4	12.2	12.9	14.6	14.2	8.7	6.6	5.6	8.6	
	Evening	3.7	4.9	6.5	6.6	8.3	7.7	5.7	6.0	6.6	7.8	
	Night	5.6	5.4	6.7	6.8	6.8	7.4	5.7	5.2	5.8	6.6	
	Sub-total	13.5	16.7	25.3	26.2	29.7	29.3	20.1	17.9	18.0	22.9	
Total used timeslots			296.9	319.2	291.5	297.6	316.5	315.6	298.7	311.0	330.7	328.8

Note: Data are rounded to the nearest 100. Cells with an entry of 0.0 mean that data were reported but are less than 50.

Sources: DP World (2015) and Patrick (2015).

Table 3.4 Timeslots available and actually used by trucks: Adelaide

Available timeslots (‘000)	Weekday	Shift	2012			2013			2014			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Monday – Friday	Day	Day	26.2	24.9	25.3	26.7	26.9	23.9	25.9	24.4	26.2	24.8
		Evening	19.1	18.3	20.3	20.1	20.1	18.0	18.7	18.4	18.4	17.5
		Night										
		Sub-total	45.4	43.2	45.7	46.7	47.0	41.9	44.5	42.8	44.6	42.3
Saturday	Day	Day										
		Evening										
		Night										
		Sub-total										
Sunday	Day	Day										
		Evening										
		Night										
		Sub-total										
Total available timeslots	Day	Day	45.4	43.2	45.7	46.7	47.0	41.9	44.5	42.8	44.6	42.3
		Evening	25.8	23.8	23.6	25.0	26.3	24.0	25.6	24.2	25.5	25.1
		Night	16.6	16.1	17.4	17.2	19.5	17.9	18.4	18.2	17.3	17.3
		Sub-total	42.3	39.9	41.0	42.2	45.8	41.9	44.0	42.4	42.8	42.4
Saturday	Day	Day										
		Evening										
		Night										
		Sub-total										
Sunday	Day	Day										
		Evening										
		Night										
		Sub-total										
Total used timeslots	Day	Day	42.3	39.9	41.0	42.2	45.8	41.9	44.0	42.4	42.8	42.4
		Evening										
		Night										
		Sub-total	42.3	39.9	41.0	42.2	45.8	41.9	44.0	42.4	42.8	42.4

Notes: Blank cells mean no data was reported for the categories because the VBS is not operated for trucks in night shift or on weekends at Adelaide.

Data are rounded to the nearest 100. Cells with an entry of 0.0 mean that data were reported but are less than 50.

Source: Flinders Adelaide Container Company (2015).

Table 3.5 Timeslots available and actually used by trucks: Fremantle

Available timeslots (’000)	Weekday	Shift	2012				2013				2014					
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Monday – Friday	Day		62.6	61.8	59.0	61.4	64.8	69.3	70.9	75.1	80.5	59.6				
	Evening		21.5	20.1	17.9	19.1	21.0	21.1	20.9	19.3	22.0	22.1				
	Night		7.7	6.8	3.8	4.1	6.0	6.4	8.5	10.4	12.2	13.4				
	Sub-total		91.8	88.7	80.8	84.7	91.8	96.9	100.3	104.8	114.7	95.1				
Saturday	Day		7.2	7.0	6.2	5.2	4.4	5.5	6.7	7.0	7.3	7.6				
	Evening		0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0				
	Night		1.6	1.4	1.5	1.1	1.3	1.9	1.8	0.0	0.3	0.0				
Sub-total		8.8	8.4	7.7	6.5	5.7	7.4	8.5	7.0	7.6	7.7					
Sunday	Day		11.3	12.2	8.4	9.5	10.4	11.0	5.7	4.2	6.7	30.0				
	Evening		1.3	1.2	0.9	1.1	1.2	1.4	0.3	0.3	0.3	3.1				
	Night		0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1				
Sub-total		12.7	13.4	9.2	10.6	11.6	12.5	6.0	4.5	7.0	33.3					
Total available timeslots			113.3	110.5	97.7	101.7	109.0	116.7	114.8	116.2	129.3	136.1				
Used timeslots (’000)	Monday – Friday	Day	60.8	59.8	57.6	59.9	60.9	65.7	68.6	72.2	79.0	80.0				
		Evening	20.9	19.4	17.5	18.6	19.4	20.0	20.1	18.2	21.6	23.8				
		Night	7.5	6.6	3.8	4.1	5.6	6.1	8.0	9.7	11.9	13.1				
	Sub-total	89.1	85.9	79.0	82.5	85.9	91.9	96.7	100.1	112.5	116.9					
Saturday	Day	7.0	6.8	6.0	5.1	3.9	4.8	6.2	6.6	7.2	7.3					
	Evening	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0					
	Night	1.5	1.4	1.4	1.1	1.2	1.9	1.8	0.0	0.2	0.0					
Sub-total	8.5	8.2	7.5	6.3	5.1	6.7	8.0	6.6	7.4	7.3						
Sunday	Day	10.8	11.9	8.2	9.3	9.7	10.2	5.4	3.9	6.6	6.7					
	Evening	1.2	1.2	0.8	1.1	1.1	1.4	0.2	0.2	0.3	0.4					
	Night	0.1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1					
Sub-total	12.1	13.1	9.0	10.4	10.9	11.6	5.6	4.2	6.9	7.2						
Total used timeslots			109.7	107.2	95.4	99.2	101.9	110.2	110.3	110.9	126.8	131.4				

Note: Data are rounded to the nearest 100. Cells with an entry of 0.0 mean that data were reported but are less than 50.

Sources: DP World (2015) and Patrick (2015).

Table 3.6 Timeslots available and actually used by trucks: Five ports

Available timeslots (’000)	Weekday	Shift	2012			2013			2014			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Monday – Friday	Day		409.6	408.7	377.2	396.4	431.1	437.5	436.2	459.8	467.0	424.1
	Evening		181.1	191.3	169.1	170.8	188.8	186.7	184.0	197.3	199.9	195.1
	Night		112.0	127.5	111.3	109.5	122.4	123.4	118.6	127.4	131.9	143.4
	Sub-total		702.6	727.5	657.6	676.6	742.3	747.6	738.8	784.6	798.8	762.7
Saturday	Day		47.3	58.6	41.3	38.1	44.1	52.1	53.5	56.8	54.4	58.6
	Evening		7.6	8.2	6.2	6.9	8.4	9.6	5.0	5.0	5.0	6.9
	Night		13.6	15.1	16.7	16.5	18.7	20.8	9.7	8.8	9.0	12.5
Sub-total		68.4	82.0	64.2	61.4	71.3	82.5	68.2	70.6	68.4	78.1	
Sunday	Day		33.7	40.8	35.7	41.4	47.6	46.9	33.6	31.1	29.1	57.9
	Evening		13.5	15.1	14.3	14.8	18.6	17.8	13.6	13.5	14.8	18.7
	Night		10.2	12.1	12.6	13.1	13.1	13.9	11.6	10.0	11.1	13.1
Sub-total		57.3	68.1	62.6	69.2	79.2	78.6	58.8	54.6	54.9	89.8	
Total available timeslots			828.4	877.6	784.4	807.3	892.8	908.6	865.7	909.8	922.1	930.5
Used timeslots (’000)	Monday – Friday	Day	402.1	400.8	365.9	386.3	411.3	411.7	406.1	421.9	448.6	426.5
	Evening		173.5	180.7	161.6	163.5	179.7	178.4	174.8	179.9	191.1	186.5
	Night		108.5	124.0	104.3	102.7	112.5	114.1	105.7	111.3	124.3	136.1
	Sub-total		684.2	705.5	631.8	652.6	703.5	704.2	686.6	713.1	764.0	749.0
Saturday	Day	46.0	57.5	39.8	36.8	41.1	48.1	47.1	50.0	50.7	54.2	
Evening		6.6	8.2	6.0	6.7	7.4	9.2	4.2	4.2	3.1	4.8	
Night		12.4	14.5	15.3	15.2	16.3	18.1	8.9	8.9	7.9	8.7	
Sub-total		65.0	80.1	61.0	58.7	64.8	75.4	60.3	61.0	63.3	71.3	
Sunday	Day	32.2	39.4	33.7	38.7	43.9	44.2	29.3	24.5	27.1	31.6	
Evening		12.4	14.4	13.5	14.0	17.5	16.7	12.9	12.2	14.4	15.3	
Night		10.0	11.5	11.6	11.9	12.0	12.7	10.1	8.4	10.1	12.6	
Sub-total		54.6	65.2	58.8	64.6	73.4	73.6	52.3	45.1	51.5	59.5	
Total used timeslots			803.8	850.9	751.6	775.8	841.7	853.1	799.3	819.2	878.8	879.8

Note: Data are rounded to the nearest 100. Cells with an entry of 0.0 mean that data were reported but are less than 50.

Sources: DP World (2015), Flinders Adelaide Container Company (2015), Hutchison Ports Australia (2015) and Patrick (2015).

CHAPTER 4

Port interface cost index

Overview

The port interface cost index (PICI) provides a measure of shore-based shipping charges which approximate costs of carting containers through Australia's mainland major city ports. The PICI is based on an indicative approach; that is, the index is not an average of all charges, but is based on those typically charged by service providers in most instances. The PICI is computed as a national average (Table 4.6) taking into account the port fees and charges for imports and exports of containers at the five major container ports (Table 4.1 to 4.5).

What PICI measures

The PICI is a measure of shore-based shipping costs or charges for containers moved through mainland capital city ports. These are called "shore-based" because they are that part of the charges paid by importers and exporters of containers which are directly related to the activity which occurs in the port and on the wharf. They do not include the total price for importing or exporting goods carried in containers paid by customers to customs brokers and freight forwarders. The index is a measure of the movements in costs to users of waterfront and related services, and signals whether the cost is increasing or decreasing. The waterfront is defined as the interface between seaports and land transport, hence the term port interface cost index. Port interface costs are estimated for standard representative ships.

The port interface cost index is based on twenty indicators which fall in four main groups:

- a. Parameters used in computing the index
- b. Ship based charges;
- c. Cargo based charges; and
- d. Other charges, namely: stevedoring costs; customs brokers' fees; road transport costs.

Parameters used in computing the index

These parameters enable the PICI charges to be estimated on a per TEU basis for these typical ships.

Indicator 4.1 Ship size

The port interface costs vary by ship size.

Ship size is the total internal capacity of a ship often referred to as Gross (Registered) Tonnage. The PICI has as its starting point the estimation of parameters for three typical sizes of container ships.

- 9 991 GT ship represents all ships of sizes ranging from 5 000 to 20 000 GT
- 37 394 GT ship represents all ships of sizes ranging from 35 000 to 40 000 GT
- 53 324 GT ship represents all ships of sizes ranging from 50 000 to 55 000 GT

Indicator 4.2 Average TEUs exchanged

This is the sum of Indicator 4.3 and Indicator 4.6.

Indicator 4.3 Average TEUs Full (or loaded)

This is the sum of Indicator 4.4 and Indicator 4.5.

Indicator 4.4 Average TEUs Full inwards (or imports)

This is the sum of full (or loaded) import containers converted to standardised twenty foot equivalent units for moved into a port by ships in a GT range, divided by the number of ship visits in the GT range for the given period.

Indicator 4.5 TEUs Full outwards (or exports)

This is the sum of full (or loaded) export containers converted to standardised twenty foot equivalent units moved out of a port by ships in a GT range, divided by the number of ship visits in the GT range for the given period.

Indicator 4.6 Empty TEUs

This is the sum of empty import and empty export containers converted to standardised twenty foot equivalent units that are moved into and out of a port by ships in a GT range, divided by the number of ship visits in the GT range for the given period.

Indicator 4.7 Average number of port calls by ships in the GT range

This is the total number of ship calls to a container port by ships in the GT range, divided by the number of ship visits in the GT range for the given period.

Indicator 4.8 Average elapsed berth time for ships in GT range

This is the total number of elapsed berth time in hours for ships in the GT range, divided by the number of ship visits in the GT range for the given period. A ship's elapsed berth time (hours) is the time between a ship's arrival at berth, and a ship's departure from berth.

These parameters are summarised at the table of each of Tables 4.1 to 4.5 for each container port.

Ship based charges (\$ per ship visit)

Indicator 4.9 Total ship-based charges by ship visit

Ship-based charges are the charges ship owners pay for a port visit by the ship.

Indicator 4.10 Total ship-based charges for handling empty containers

This is also a summary cost indicator for the port. It is computed as the sum of wharfage, harbour dues, berth charges and channel fees charged per empty TEU multiplied by the average number of empty TEUs exchanged.

Ship based charges (\$ per TEU)

Indicator 4.11 Conservancy

Conservancy charges are navigation service charges levied by the government of the state in which the port is situated.

Indicator 4.12 Tonnage

Tonnage charges are based on the Gross Tonnage of the ship—port service charges levied by the port authority.

Indicator 4.13 Pilotage

Pilotage charges cover services for piloting the ship. A pilot is a mariner who guides ships through dangerous or congested waters, such as harbors or river mouths. Pilots are expert ship handlers who possess detailed knowledge of local waterways.

Indicator 4.14 Towage

Towage charges are levied by the operator of a tugboat—a boat that manoeuvres vessels by pushing or towing them.

Indicator 4.15 Mooring, unmooring charges

These relate to the services provided to moor—make fasten (a ship, for example) by means of cables, anchors, or lines or to unmoor—to loosen (a ship) from moorings or anchorage. These charges can be levied either by the port authority, stevedoring company or other service providers.

Indicator 4.16 Total ship-based charges per TEU

The total costs are the sum of the ship-based charges in Indicators 4.11 to 4.15.

Cargo based fees and charges (\$ per TEU)

Each of these fees and charges are discussed only once in the text below. They are however, listed separately for imports and exports in Tables 4.1 to 4.5.

Indicator 4.17 Cargo based: Wharfage

Wharfage is the charge assessed against cargo or merchandise, vessel's stores, fuel and supplies for passage on, over, under or through any wharf, pier, or bank controlled by a port authority. Wharfage is also charged for cargo passing between ships or overside ships (to or from barge, lighter or water) when berthed at a wharf, pier or bank controlled by the port authority.

Indicator 4.18 Cargo based: Harbour dues

These are monies that a ship owner must pay to a port authority for keeping a ship in a harbour. The amount of money charged is usually based on the volume of cargo the ship is carrying.

Other cargo based charges (\$ per TEU)

Indicator 4.19 Other charges: Stevedoring charge

Stevedoring charges are the charges levied by stevedoring companies for handling containers. They are estimated for Australia each year by the Australian Competition and Consumer Commission (ACCC) which monitors their price. The stevedoring costs are taken from the ACCC's annual report on the stevedoring industry.

Indicator 4.20 Other charges: Customs broker fees

These are the fees charged by customs brokers for the administrative costs associated with organising the import and export of containers for a representative consignment.

Indicator 4.21 Other charges: Road transport charges

Transport charges are estimates of what transport companies charge for transporting a container to or from the wharf from/to the metropolitan area of the capital city in which the port is situated. These charges are estimated for a representative transport distance.

Indicator 4.22 Total fees and charges (\$/TEU)

This is the sum of ship-based charges per TEU, the cargo-based charges per TEU, and the other cargo-based charges per TEU. These costs enable the calculation of the national PICI measured in current and constant prices in dollars per TEU. These are computed separately for imports and exports in Tables 4.2 to 4.6.

Indicator 4.23 Port's share in national index

These shares are used in computing the national PICI and they are computed for exports and imports separately as follows.

For each port compute the port shares for imports:

- Compute PICI (port k, imports) is given by the average (total) port interface cost for imports (Indicator 4.22) times the total TEUs imported through the port (Indicator 4.4);
- Compute PICI (5 ports, imports) is the sum PICI (Brisbane, imports), PICI (Sydney, imports), PICI (Melbourne, imports), PICI (Adelaide, imports), PICI (Fremantle, imports);
- Then share (port k, imports) = PICI (port k, imports)/ PICI (5 ports, imports).

Similarly for each port compute the port shares for exports:

- Compute PICI (port k, exports) is given by the average (total) port interface cost for exports (Indicator 4.22) times the total TEUs imported through the port (Indicator 4.5);
- Compute PICI (5 ports, exports) is the sum PICI (Brisbane, exports), PICI (Sydney, exports), PICI (Melbourne, exports), PICI (Adelaide, exports), PICI (Fremantle, exports);
- Then share (port k, exports) = PICI (port k, exports)/ PICI (5 ports, exports).

Indicator 4.24 National Port Interface Cost index for ships in GT range

The national port interface cost indexes are the main outputs of the PICI calculations. These indexes are computed separately for imports and exports and for each of the ship GT ranges monitored in Waterline.

- 5 000 to 20 000 GT
- 35 000 to 40 000 GT
- 50 000 to 55 000 GT.

The national PICI for ships in a GT range is the national average cost per TEU. From BTCE (1993) this is a weighted average of individual port estimates computed as follows, taking imports shipped in ships in the 5 000 to 20 000 GT as an example.

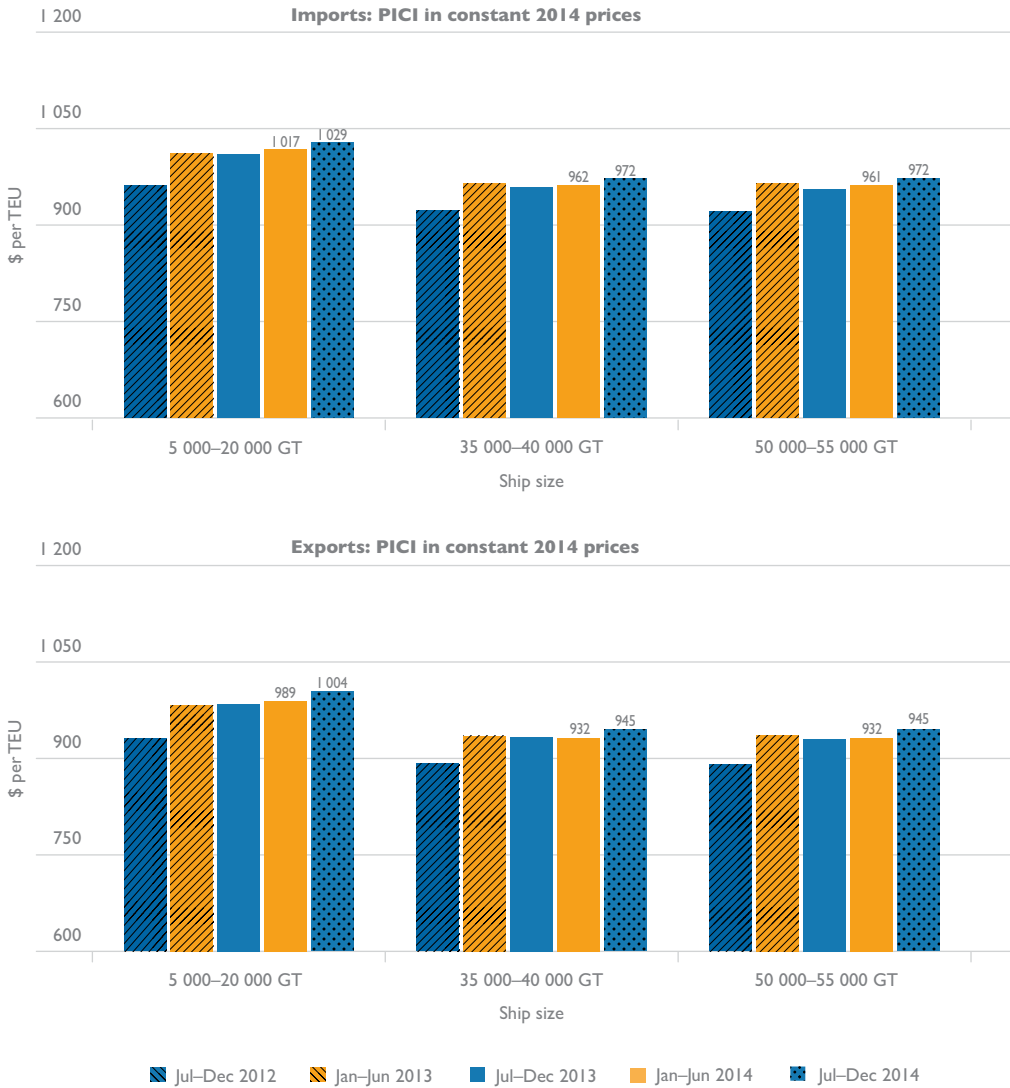
Now let $TC_{Br,M}$, $TC_{Sy,M}$, $TC_{Mel,M}$, $TC_{Ad,M}$, $TC_{Fr,M}$, respectively stand for the sum of ship-based, cargo-based and other fees and charges on each TEU of imports transported to a Brisbane port (Br), Sydney port (Sy), Melbourne port (Mel), Adelaide (Ad) and Frematle (Fr) for ships in the 5 000 to 20 000 GT range.

Then PICI for imports shipped in ships in the 5 000 to 20 000 GT

$$= b_1 * TC_{Br,M} + b_2 * TC_{Sy,M} + b_3 * TC_{Mel,M} + b_4 * TC_{Ad,M} + b_5 * TC_{Fr,M}$$

The shares b_1 , b_2 , b_3 , b_4 , b_5 are as computed in Indicator 4.23. Note that these shares are different for imports and exports.

Figure 4.1 Port Interface Cost Index for container imports and exports, by ship size



Sources: BITRE estimates based on data in Tables 4.1 to 4.5 and data from ABS (2015).



Fisherman Islands container terminals. Photo courtesy of Port of Brisbane Pty Ltd.

Table 4.1 Port interface costs by ship type – parameters and estimates: Brisbane

	5 000 to 20 000 GT ships						35 000 to 40 000 GT ships						50 000 to 55 000 GT ships					
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun		
	2012	2013	2014	2013	2014	2014	2012	2013	2014	2013	2014	2014	2012	2013	2014	2013	2014	
Parameters used in estimation of the port interface fees and charges^a																		
Total TEUs exchanged	350	374	310	258	286	1 499	1 260	1 187	1 127	1 273	1 746	1 471	1 396	1 232	1 489			
Loaded	156	288	241	222	223	619	973	934	839	957	909	1 019	1 031	858	1 034			
Loaded inwards	132	167	154	137	104	416	638	602	552	620	582	550	582	507	617			
Loaded outwards	24	121	86	85	119	203	335	332	287	336	327	469	449	350	417			
Empty	194	86	69	37	63	880	287	253	287	316	838	452	365	374	455			
No of port calls by ships in GT range	4	5	5	5	4	3	3	3	3	4	4	3	3	4	4			
Elapsed berth time for ships in GT range (hours)	25	23	17	16	19	26	23	23	26	27	23	24	21	22	24			
Charges per ship visit (\$)																		
Total ship-based charges	21 208	21 817	22 161	23 126	23 851	39 902	40 956	41 599	43 106	44 374	47 247	48 417	49 178	50 913	52 402			
Empty TEUs ^b	3 612	1 604	1 315	698	1 234	16 367	5 343	4 833	5 482	6 208	15 588	8 408	6 968	7 134	8 935			
Ship-based charges (\$/TEU)																		
Conservancy	5	5	6	8	7	5	6	6	7	6	6	7	7	9	7			
Tonnage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Pilotage	22	21	26	32	30	10	12	13	14	13	10	12	13	15	13			
Towage	27	26	31	39	36	11	13	14	15	14	10	12	13	15	13			
Mooring, unmooring ^c	7	6	8	11	11	2	2	2	3	2	1	2	2	2	2			
Total ship-based charges (\$/TEU)	61	58	72	90	83	27	32	35	38	35	27	33	35	41	35			
Fees and charges for imports (\$/TEU)																		
Ship-based charges	61	58	72	90	83	27	32	35	38	35	27	33	35	41	35			
Cargo-based charges	32	32	33	33	34	32	32	33	33	34	32	32	33	33	34			
Wharfage	62	62	63	63	56	62	62	63	63	56	62	62	63	63	56			
Other charges	177	177	177	176	176	177	177	177	176	176	177	177	177	176	176			
Stevedoring	146	151	142	149	150	146	151	142	149	150	146	151	142	149	150			
Customs brokers' fees	401	446	452	456	459	401	446	452	456	459	401	446	452	456	459			
Road transport charges	878	926	939	967	959	844	900	902	916	910	845	900	902	919	911			
Total fees and charges (\$/TEU)	17%	17%	18%	16%	16%	16%	16%	17%	15%	15%	16%	16%	17%	15%	15%			
Port's share in national index^d																		
Fees and charges for exports (\$/TEU)	61	58	72	90	35	27	32	35	38	35	27	33	35	41	35			
Ship-based charges	61	58	72	90	35	27	32	35	38	35	27	33	35	41	35			

	5 000 to 20 000 GT ships						35 000 to 40 000 GT ships						50 000 to 55 000 GT ships									
	Jul-Dec		Jan-Jun		Jul-Dec		Jan-Jun		Jul-Dec		Jan-Jun		Jul-Dec		Jan-Jun		Jul-Dec					
	2012	2013	2013	2014	2014	2012	2013	2013	2014	2014	2012	2013	2013	2014	2014	2012	2013	2013	2014	2014		
Cargo-based charges																						
Wharfage	32	32	33	33	34	32	32	32	33	33	32	32	32	33	34	32	32	32	33	33	33	34
Harbour dues	62	62	63	63	56	62	62	62	63	63	62	62	62	63	56	62	62	62	63	63	63	56
Other charges																						
Stevedoring	177	177	177	176	176	177	177	177	177	176	177	177	177	176	176	177	177	177	177	176	177	176
Customs brokers' fees	146	151	142	149	150	146	151	146	151	149	146	151	146	146	164	146	151	146	142	149	149	164
Road transport charges	401	446	452	456	459	401	446	401	446	456	401	446	401	446	459	401	446	401	446	456	456	459
Total fees and charges (\$/TEU)	878	926	939	967	910	844	900	844	900	916	845	900	845	900	925	845	900	845	902	919	919	925
Port's share in national index^e	17%	17%	18%	16%	15%	16%	16%	16%	16%	15%	16%	16%	16%	16%	15%	16%	16%	16%	17%	15%	15%	15%

a The average TEUs exchanged and the ship call parameters are mean values for ships in the GT category for the period in question.

b Sum of wharfage, harbour dues, berth charges and channel fees charged per empty TEU multiplied by the average number of empty TEUs exchanged.

c BITRE estimates.

d This is estimated as the TEU imports brought to the port as a per cent of five ports TEU imports.

e This is estimated as the TEU exports brought to the port as a per cent of five ports TEU exports.

Notes: Estimates of charges and fees are rounded to the nearest whole dollar. A value of zero indicates that the charge or fees per TEU is less than fifty cents.

Sources: BITRE estimates based on ship call data from port authorities and other sources as described in text.

Table 4.2 Port interface costs by ship type – parameters and estimates: Sydney

	5 000 to 20 000 GT ships						35 000 to 40 000 GT ships						50 000 to 55 000 GT ships					
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun		
	2012	2013	2014	2013	2014	2014	2012	2013	2014	2013	2014	2014	2012	2013	2014	2013	2014	
Parameters used in estimation of the port interface fees and charges^a																		
Total TEUs exchanged	260	204	179	196	203	1 997	2 115	1 824	1 861	2 071	2 379	2 088	2 323	1 998	2 220			
Loaded	185	154	141	153	154	1 345	1 395	1 191	1 195	1 360	1 648	1 460	1 606	1 303	1 512			
Loaded inwards	95	63	71	69	54	1 008	1 011	846	867	963	1 232	1 051	1 179	928	1 083			
Loaded outwards	90	92	70	84	100	337	384	345	328	397	416	409	427	376	429			
Empty	75	50	37	42	49	652	720	633	666	711	731	628	717	695	709			
No of port calls by ships in GT range	3	3	4	4	4	3	2	3	3	3	3	3	3	3	4			
Elapsed berth time for ships in GT range (hours)	26	20	18	17	25	35	34	35	28	33	36	34	36	29	37			
Charges per ship visit (\$)																		
Total ship-based charges	19 464	19 772	20 078	20 260	21 261	40 770	41 954	42 663	42 884	44 595	50 187	50 727	51 649	51 863	55 433			
Empty TEUs ^b	951	629	484	547	649	8 218	9 080	8 178	8 613	9 438	9 215	7 913	9 271	8 982	9 404			
Ship-based charges (\$/TEU)																		
Conservancy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Tonnage	19	24	28	26	27	9	9	10	10	10	11	13	12	13	13			
Pilotage	6	8	9	9	9	2	2	3	3	2	2	2	2	2	2			
Towage	40	52	60	56	56	7	7	8	8	7	6	7	7	8	7			
Moorings, unmooring ^c	10	13	15	13	13	2	2	2	2	2	2	2	2	2	2			
Total ship-based charges (\$/TEU)	75	97	112	104	105	20	20	23	23	22	21	24	22	26	25			
Fees and charges for imports																		
Ship-based charges	75	97	112	104	105	20	20	23	23	22	21	24	22	26	25			
Cargo-based charges	114	114	117	117	125	114	114	117	117	125	114	114	117	117	125			
Wharfage	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0			
Harbour dues	177	177	177	176	176	177	177	177	177	176	177	177	177	176	176			
Other charges	139	148	148	153	153	139	148	148	153	153	139	148	148	153	153			
Stevedoring	485	522	525	525	529	485	522	525	525	529	485	522	525	525	529			
Customs brokers' fees	991	1 058	1 079	1 075	1 088	936	981	990	995	1 005	937	985	989	998	1 008			
Road transport charges	33%	33%	31%	34%	34%	32%	32%	29%	32%	32%	32%	32%	29%	32%	32%			
Total fees and charges (\$/TEU)																		
Port's share in national index ^d	33%	33%	31%	34%	34%	32%	32%	29%	32%	32%	32%	32%	29%	32%	32%			
Fees and charges for exports																		

	5 000 to 20 000 GT ships						35 000 to 40 000 GT ships						50 000 to 55 000 GT ships					
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun		
	2012	2013	2014	2013	2012	2014	2012	2013	2014	2013	2012	2014	2012	2013	2014	2013		
Ship-based charges	75	97	112	104	105	20	20	23	23	23	21	21	24	22	26	25		
Cargo-based charges																		
Wharfage	70	70	72	72	79	70	70	72	72	72	79	79	70	70	72	79		
Harbour dues	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0		
Other charges																		
Stevedoring	177	177	177	176	176	177	177	177	176	176	176	177	177	177	176	176		
Customs brokers' fees	137	138	138	137	144	137	138	138	137	137	144	137	138	138	137	144		
Road transport charges	485	522	525	525	529	485	522	525	525	525	529	485	522	525	525	529		
Total fees and charges (\$/TEU)	944	1 004	1 025	1 013	1 033	890	927	936	933	933	950	890	932	934	936	953		
Port's share in national index^e	33%	34%	31%	34%	34%	32%	32%	29%	32%	29%	32%	32%	32%	29%	32%	32%		

a The average TEUs exchanged and the ship call parameters are mean values for ships in the GT category for the period in question.

b Sum of wharfage, harbour dues, berth charges and channel fees charged per empty TEU multiplied by the average number of empty TEUs exchanged.

c BITRE estimates.

d This is estimated as the TEU imports brought to the port as a per cent of five ports TEU imports.

e This is estimated as the TEU exports brought to the port as a per cent of five ports TEU exports.

Notes: Estimates of charges and fees are rounded to the nearest whole dollar. A value of zero indicates that the charge or fees per TEU is less than fifty cents.

Sources: BITRE estimates based on ship call data from port authorities and other sources as described in text.

Table 4.3 Port interface costs by ship type – parameters and estimates: Melbourne

	5 000 to 20 000 GT ships				35 000 to 40 000 GT ships				50 000 to 55 000 GT ships						
	Jul-Dec 2012	Jan-Jun 2013	Jul-Dec 2013	Jan-Jun 2014	Jul-Dec 2012	Jan-Jun 2013	Jul-Dec 2013	Jan-Jun 2014	Jul-Dec 2012	Jan-Jun 2013	Jul-Dec 2013	Jan-Jun 2014	Jul-Dec 2014		
Parameters used in estimation of the port interface fees and charges^a															
Total TEUs exchanged	496	476	442	400	407	1 892	2 026	1 904	2 032	2 286	2 702	2 354	2 577	2 456	2 623
Loaded	343	340	335	294	289	1 518	1 702	1 597	1 701	1 877	2 159	1 983	2 078	1 979	2 059
Loaded inwards	141	139	151	103	53	929	973	1 004	1 014	1 198	1 263	1 133	1 202	1 094	1 246
Loaded outwards	203	201	185	191	236	589	729	593	687	679	897	850	876	885	812
Empty	153	136	106	106	118	374	324	307	331	410	542	371	499	477	565
No of port calls by ships in GT range	3	3	3	3	3	3	3	3	3	3	3	3	3	3	4
Elapsed berth time for ships in GT range (hours)	32	38	29	26	23	28	29	28	28	31	32	29	29	29	31
Charges per ship visit (\$)															
Total ship-based charges	24 282	24 473	25 162	25 438	26 810	47 692	48 038	49 680	50 053	53 903	57 837	58 247	60 371	60 758	65 883
Empty TEUs ^b	2 551	2 279	1 867	1 869	2 088	6 252	5 421	5 398	5 831	7 256	9 069	6 208	8 786	8 386	9 999
Ship-based charges (\$/TEU)															
Conservancy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tonnage	11	11	13	14	16	11	10	11	10	11	11	11	12	12	13
Pilotage	15	15	17	19	19	6	6	7	6	6	5	6	5	6	5
Towage	22	23	25	29	29	8	7	8	8	7	6	6	6	6	6
Mooring, unmooring ^c	2	2	2	2	2	0	0	1	0	0	0	0	0	0	0
Total ship-based charges (\$/TEU)	49	51	57	64	66	25	24	26	25	24	21	25	23	25	25
Fees and charges for imports															
Ship-based charges	49	51	57	64	66	25	24	26	25	24	21	25	23	25	25
Cargo-based charges	67	67	71	71	71	67	67	71	71	71	67	67	71	71	71
Wharfage	39	39	39	39	40	39	39	39	39	40	39	39	39	39	40
Harbour dues															
Other charges	177	177	177	176	176	177	177	177	176	176	177	177	177	176	176
Stevedoring	153	153	153	153	153	153	153	153	153	153	153	153	153	153	153
Customs brokers' fees	484	529	531	534	536	484	529	531	534	536	484	529	531	534	536
Road transport charges															
Total fees and charges (\$/TEU)	969	1 016	1 027	1 036	1 043	945	989	996	997	1 000	941	990	994	997	1 002
Port's share in national index^d	39%	39%	40%	39%	39%	37%	37%	38%	37%	37%	37%	37%	38%	37%	37%

	5 000 to 20 000 GT ships						35 000 to 40 000 GT ships						50 000 to 55 000 GT ships					
	Jul-Dec 2012		Jan-Jun 2013		Jul-Dec 2014		Jan-Jun 2013		Jul-Dec 2012		Jan-Jun 2014		Jul-Dec 2013		Jan-Jun 2012		Jul-Dec 2014	
	2012	2013	2012	2013	2012	2014	2013	2014	2013	2012	2013	2014	2013	2012	2013	2014	2013	2014
Fees and charges for exports (\$/TEU)																		
Ship-based charges	49	51	57	64	66	64	66	25	24	25	24	26	25	24	21	25	23	25
Cargo-based charges																		
Wharfage	67	67	71	71	71	71	71	67	67	71	71	71	71	71	67	67	71	71
Harbour dues	39	39	39	39	40	39	40	39	39	39	40	39	39	40	39	39	39	40
Other charges																		
Stevedoring	177	177	177	176	176	176	176	177	177	177	176	177	177	176	177	177	177	176
Customs brokers' fees	134	142	142	143	144	144	144	134	142	142	143	142	143	144	134	142	142	144
Road transport charges	484	529	531	534	536	536	536	484	529	531	534	531	534	536	484	529	531	534
Total fees and charges (\$/TEU)	950	1 006	1 017	1 026	1 033	1 033	1 033	926	978	986	988	986	988	991	923	979	983	988
Port's share in national index^e	39%	40%	40%	39%	39%	39%	39%	37%	38%	38%	37%	38%	37%	37%	37%	38%	38%	37%

a The average TEUs exchanged and the ship call parameters are mean values for ships in the GT category for the period in question.

b Sum of wharfage, harbour dues, berth charges and channel fees charged per empty TEU multiplied by the average number of empty TEUs exchanged.

c BITRE estimates.

d This is estimated as the TEU imports brought to the port as a per cent of five ports TEU imports.

e This is estimated as the TEU exports brought to the port as a per cent of five ports TEU exports.

Notes: Estimates of charges and fees are rounded to the nearest whole dollar. A value of zero indicates that the charge or fees per TEU is less than fifty cents.

Sources: BITRE estimates based on ship call data from port authorities and other sources as described in text.

Table 4.4 Port interface costs by ship type – parameters and estimates: Adelaide

	5 000 to 20 000 GT ships						35 000 to 40 000 GT ships						50 000 to 55 000 GT ships					
	Jul-Dec 2012	Jan-Jun 2013	Jul-Dec 2013	Jan-Jun 2014	Jul-Dec 2014	Jan-Jun 2014	Jul-Dec 2012	Jan-Jun 2013	Jul-Dec 2013	Jan-Jun 2014	Jul-Dec 2014	Jan-Jun 2012	Jul-Dec 2012	Jan-Jun 2013	Jul-Dec 2013	Jan-Jun 2014	Jul-Dec 2014	
Parameters used in estimation of the port interface fees and charges^a																		
Total TEUs exchanged	-	-	-	-	-	-	921	1037	903	981	1023	1311	1268	1337	1069	1109	1363	1109
Loaded	-	-	-	-	-	-	728	824	673	750	757	1017	1055	1069	903	1104	903	
Loaded inwards	-	-	-	-	-	-	358	347	293	306	329	550	504	525	490	425	425	
Loaded outwards	-	-	-	-	-	-	371	477	380	444	427	467	551	544	614	478	478	
Empty	-	-	-	-	-	-	192	213	230	231	266	295	214	268	259	206	206	
No of port calls by ships in GT range	-	-	-	-	-	-	3	2	2	2	2	2	2	3	2	2	2	
Elapsed berth time for ships in GT range (hours)	-	-	-	-	-	-	22	24	22	23	21	26	26	29	28	23	23	
Charges per ship visit (\$)																		
Total ship-based charges	-	-	-	-	-	-	38 840	39 574	40 189	40 496	41 940	45 832	46 130	48 463	48 410	48 556	48 556	
Empty TEUs ^b	-	-	-	-	-	-	1 249	1 380	1 519	1 521	1 815	1 912	1 388	1 769	1 712	1 405	1 405	
Ship-based charges (\$/TEU)																		
Conservancy	-	-	-	-	-	-	5	5	5	5	5	5	5	5	5	5	6	
Tonnage	-	-	-	-	-	-	10	9	10	10	9	10	10	10	10	10	11	
Pilotage	-	-	-	-	-	-	6	5	7	6	6	4	4	4	4	6	6	
Towage	-	-	-	-	-	-	21	19	22	21	21	16	17	17	16	21	21	
Moorings, unmooring ^c	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Total ship-based charges (\$/TEU)	-	-	-	-	-	-	42	38	45	41	41	35	36	36	36	36	44	
Fees and charges for imports																		
Ship-based charges	-	-	-	-	-	-	42	38	45	41	41	35	36	36	36	36	44	
Cargo-based charges	-	-	-	-	-	-	79	79	82	82	84	79	79	82	82	84	84	
Wharfage	-	-	-	-	-	-	6	6	7	7	7	6	6	7	7	7	7	
Harbour dues	-	-	-	-	-	-	177	177	177	176	176	177	177	177	176	176	176	
Other charges	-	-	-	-	-	-	148	148	148	148	149	148	148	148	148	148	148	
Stevedoring	-	-	-	-	-	-	312	348	350	354	358	312	348	350	354	358	358	
Customs brokers' fees	-	-	-	-	-	-	765	798	808	808	814	758	796	800	802	817	817	
Road transport charges	-	-	-	-	-	-	5	5	6	6	6	5	5	6	6	6	6	
Total fees and charges (\$/TEU)	-	-	-	-	-	-	5	5	6	6	6	5	5	6	6	6	6	
Port's share in national index^d																		
Fees and charges for exports	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	

	5 000 to 20 000 GT ships						35 000 to 40 000 GT ships						50 000 to 55 000 GT ships					
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun		
	2012	2013	2014	2013	2014	2012	2013	2014	2013	2014	2012	2013	2014	2013	2014			
Ship-based charges	-	-	-	-	-	42	38	45	41	41	35	36	36	36	44			
Cargo-based charges	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Wharfage	-	-	-	-	-	79	79	82	82	84	79	79	82	82	84			
Harbour dues	-	-	-	-	-	6	6	7	7	7	6	6	7	7	7			
Other charges	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Stevedoring	-	-	-	-	-	177	177	177	176	176	177	177	177	176	176			
Customs brokers' fees	-	-	-	-	-	103	111	111	112	112	103	111	111	112	112			
Road transport charges	-	-	-	-	-	312	348	350	354	358	312	348	350	354	358			
Total fees and charges (\$/TEU)	-	-	-	-	-	720	761	771	771	777	713	759	763	766	780			
Port's share in national index^e	-	-	-	-	-	5%	5%	6%	6%	6%	5%	5%	6%	6%	6%			

a The average TEUs exchanged and the ship call parameters are mean values for ships in the GT category for the period in question.

b Sum of wharfage, harbour dues, berth charges and channel fees charged per empty TEU multiplied by the average number of empty TEUs exchanged.

c BITRE estimates.

d This is estimated as the TEU imports brought to the port as a per cent of five ports TEU imports.

e This is estimated as the TEU exports brought to the port as a per cent of five ports TEU exports.

Notes: Estimates of charges and fees are rounded to the nearest whole dollar. A value of zero indicates that the charge or fees per TEU is less than fifty cents.

Blank cells mean the data are not reported.

Sources: BITRE estimates based on ship call data from port authorities and other sources as described in text.

Table 4.5 Port interface costs by ship type – parameters and estimates: Fremantle

	5 000 to 20 000 GT ships						35 000 to 40 000 GT ships						50 000 to 55 000 GT ships					
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun		
	2012	2013	2013	2014	2014	2014	2012	2013	2013	2014	2014	2014	2012	2013	2013	2014		
Parameters used in estimation of the port interface fees and charges^a																		
Total TEUs exchanged	2 744	2 339	2 709	2 532	2 831	1 038	971	854	793	786	1 646	1 447	1 519	1 451	1 620			
Loaded	2 185	1 944	2 112	2 120	2 251	783	725	664	637	641	1 172	1 129	1 152	1 129	1 225			
Loaded inwards	1 360	1 117	1 303	1 218	1 359	594	461	453	424	449	800	727	753	679	746			
Loaded outwards	825	826	809	902	893	188	264	211	213	192	372	403	399	450	479			
Empty	560	395	597	413	580	255	246	190	156	146	475	318	368	322	395			
No of port calls by ships in GT range	12	8	13	12	13	3	3	3	3	2	4	3	4	3	4			
Elapsed berth time for ships in GT range (hours)	46	46	48	35	33	27	27	27	22	19	31	26	34	28	29			
Charges per ship visit (\$)																		
Total ship-based charges	12 105	12 105	12 676	12 644	13 299	31 702	31 702	33 092	32 985	34 399	37 579	37 579	39 269	39 141	40 844			
Empty TEUs ^b	5 753	4 064	6 443	4 452	6 574	2 625	2 528	2 055	1 685	1 650	4 877	3 263	3 967	3 474	4 478			
Ship-based charges (\$/TEU)																		
Conservancy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-			
Tonnage	1	1	1	1	1	8	8	10	11	11	7	8	8	8	8			
Pilotage	2	2	2	2	2	4	5	6	6	7	3	3	3	3	3			
Towage	2	2	2	2	2	17	18	22	23	24	12	14	14	15	13			
Mooring, unmooring ^c	0	1	0	0	0	1	1	1	2	2	1	1	1	1	1			
Total ship-based charges (\$/TEU)	4	5	5	5	5	31	33	39	42	44	23	26	26	27	25			
Fees and charges for imports																		
Ship-based charges	4	5	5	5	5	31	33	39	42	44	23	26	26	27	25			
Cargo-based charges																		
Wharfage	68	68	72	72	75	68	68	72	72	75	68	68	72	72	75			
Harbour dues	32	32	34	34	35	32	32	34	34	35	32	32	34	34	35			
Other charges																		
Stevedoring	177	177	177	176	176	177	177	177	176	176	177	177	177	176	176			
Customs brokers' fees	156	163	163	163	163	156	163	163	163	163	156	163	163	163	163			
Road transport charges	409	455	458	453	457	409	455	458	453	457	409	455	458	453	457			
Total fees and charges (\$/TEU)	847	900	908	902	911	873	928	942	939	950	865	921	929	924	932			
Port's share in national index^d	11%	11%	11%	11%	11%	10%	10%	11%	11%	11%	10%	10%	11%	11%	11%			
Fees and charges for exports																		

	5 000 to 20 000 GT ships						35 000 to 40 000 GT ships						50 000 to 55 000 GT ships					
	Jul-Dec		Jan-Jun		Jul-Dec		Jan-Jun		Jul-Dec		Jan-Jun		Jul-Dec		Jan-Jun		Jul-Dec	
	2012	2013	2013	2014	2012	2013	2013	2014	2012	2013	2013	2014	2012	2013	2013	2014	2013	2014
Ship-based charges	4	5	5	5	5	31	33	39	42	44	23	26	26	26	27	25		
Cargo-based charges																		
Wharfage	62	62	72	72	75	62	62	72	72	75	62	62	62	62	72	75		
Harbour dues	32	32	34	34	35	32	32	34	34	35	32	32	32	32	34	35		
Other charges																		
Stevedoring	177	177	177	176	176	177	177	177	176	176	177	177	177	177	176	176		
Customs brokers' fees	84	97	97	97	97	84	97	97	97	97	84	97	84	97	97	97		
Road transport charges	409	455	458	453	457	409	455	458	453	457	409	455	409	455	458	453		
Total fees and charges (\$/TEU)	769	829	842	837	845	795	856	876	873	884	787	849	863	849	859	866		
Port's share in national index^e	11%	10%	11%	11%	11%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%	10%		

a The average TEUs exchanged and the ship call parameters are mean values for ships in the GT category for the period in question.

b Sum of wharfage, harbour dues, berth charges and channel fees charged per empty TEU multiplied by the average number of empty TEUs exchanged.

c BITRE estimates.

d This is estimated as the TEU imports brought to the port as a per cent of five ports TEU imports.

e This is estimated as the TEU exports brought to the port as a per cent of five ports TEU exports.

Notes: Estimates of charges and fees are rounded to the nearest whole dollar. A value of zero indicates that the charge or fees per TEU is less than fifty cents.

Blank cells mean the data are not reported.

Sources: BITRE estimates based on ship call data from port authorities and other sources as described in text.

Table 4.6 The national port interface cost indices, by size of ship

	Jul-Dec 2012	Jan-Jun 2013	Jul-Dec 2013	Jan-Jun 2014	Jul-Dec 2014
ABS GDP deflator (100.0 for Jul-Dec 2014)	98.6	99.2	100.4	100.5	100.0
5 000 – 20 000 GT ships					
Import costs: in nominal price	948	1 003	1 014	1 023	1 029
Import costs: constant 2014 price	961	1 011	1 010	1 017	1 029
Export costs: nominal price	918	975	989	995	1 004
Export costs: in constant 2014 price	931	983	985	989	1 004
35 000 – 40 000 GT ships					
Import costs: in nominal price	910	956	962	967	972
Import costs: constant 2014 price	923	964	958	962	972
Export costs: nominal price	879	928	936	937	945
Export costs: in constant 2014 price	892	935	933	932	945
50 000 – 55 000 GT ships					
Import costs: in nominal price	908	957	959	967	972
Import costs: constant 2014 price	921	965	955	961	972
Export costs: nominal price	877	929	933	937	945
Export costs: in constant 2014 price	889	936	930	932	945

Notes: Values in constant 2014 prices are derived using the ABS GDP deflator with Jul-Dec 2014 as the base period. Constant price = Nominal or current price* (Base period deflator/ Current year deflator).

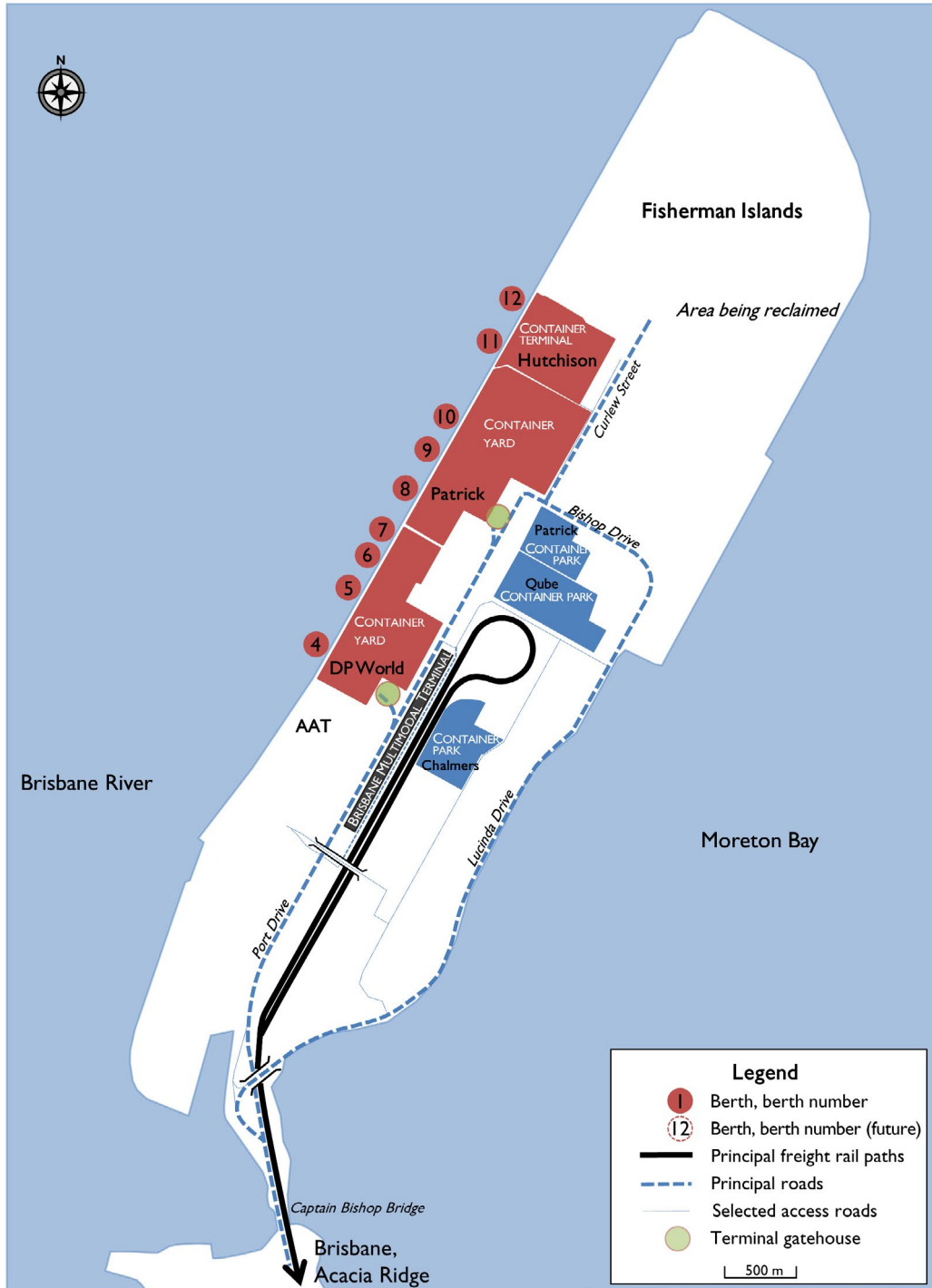
Sources: BITRE estimates based on data in Tables 4.1 to 4.5 and data from ABS (2015).

APPENDIX A

Maps of five major Australian container ports

This appendix presents maps and supplementary information such as facilities and services at the five major Australian container ports.

Brisbane (Fisherman Islands terminals)



(Last updated: November 2014)

Brisbane (Fisherman Islands Terminals)

The Port of Brisbane is managed and developed by the Port of Brisbane Pty Ltd, under a 99-year lease from the Queensland Government.

Dockside

- **Stevedores.** The map shows the DP World, Patrick and Hutchison Ports Australia terminals. Some containers are also handled by Australian Amalgamated Terminals (AAT), who provide a multi-purpose, multi-user facility that is based at Berths 1–3, to the west of the DP World container yard.
- **Berths.** DP World operates from container berths 4–7. The Patrick container berths are 8–10. The Hutchison berths are Berth 11 and (in the second-phase development) Berth 12.
- **Equipment.** DP World has 6 cranes, including 2 post-Panamax cranes and 2 Super post-Panamax cranes. Patrick has 5 cranes, consisting of 3 Panamax cranes and 2 post-Panamax cranes; in addition, Patrick has 27 automated straddle carriers. Hutchison's first phase development includes 2 post-Panamax cranes and 6 automated stacking cranes.

Road

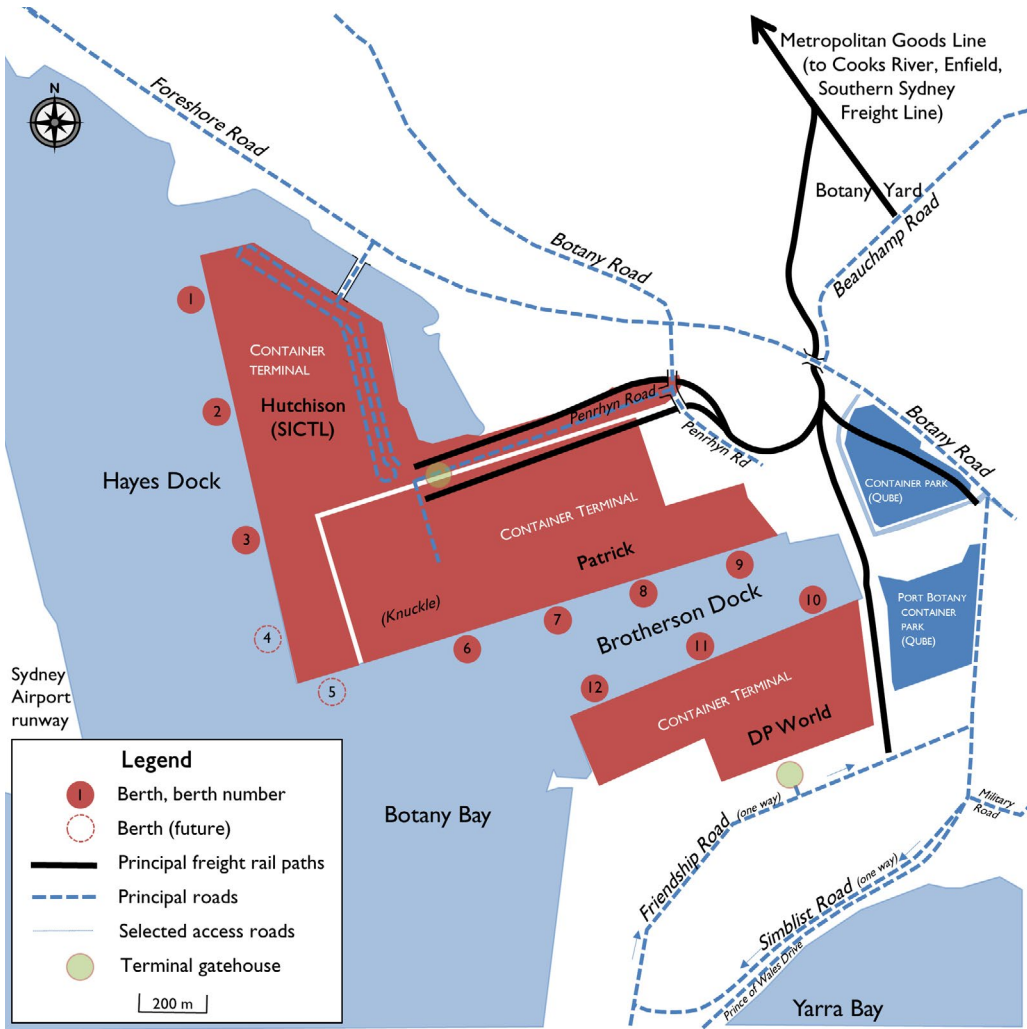
- Road access to the area is via the bridge to Fisherman Islands, over the Captain Bishop Bridge. Access to the DP World and Patrick terminals is via Port Drive or Lucinda Drive/Bishop Drive/Curlew Street; access to the Hutchison terminal is via Curlew Street.

Rail

- **Facilities.** An intermodal facility is provided on Fisherman Islands—the Brisbane Multimodal Terminal. Train lengths of up to 850 metres are permitted. Containers are shifted by road between that terminal and the container terminals. In that context, rail access is classed as having “near-dock” facilities.
- **Services.** Scheduled rail services to the Brisbane Multimodal Terminal include:
 - Long-haul:
 - bulk trains from West Moreton (coal) and from western Queensland (grain)—both via narrow gauge;
 - on a seasonal basis, containers are brought by (narrow-gauge) trains from Goondiwindi and Dalby (carrying cotton), for export;
 - reefer containers containing meat from northern abattoirs are brought by (narrow-gauge) trains;
 - some containers are taken from Fisherman Islands—the presumption is that they are mainly empty containers;
 - there are no scheduled standard-gauge container trains.

National rail connections. Dual narrow and (national) standard gauge tracks are installed between Fisherman Islands and the interstate/intrastate intermodal terminal at Acacia Ridge.

Sydney (Port Botany Terminals)



(Last updated: November 2014)

Sydney (Container Terminals at Port Botany)

Port Botany is managed by NSW Ports Consortium, which has a 99-year lease of the State-owned assets at the port.

Dockside

- **Stevedores.** The three container terminals at Port Botany are served by the stevedores Patrick, DP World and Hutchison (Sydney International Container Terminals Pty Limited, SICTL).
- **Berths.** Patrick operates from berths 7–9; the stevedore will operate a fourth berth in future at the Knuckle, to the west of its existing berths. DP World's three berths are numbered 10–12. Hutchison has three operational berths (1–3), with berths 4 and 5 to be added in the future.
- **Equipment.** DP World equipment includes 3 twin-lift quay cranes and 4 single-lift quay cranes. Patrick equipment includes 5 twin-lift quay cranes and 3 single-lift quay cranes. The Hutchison terminal includes 4 post-Panamax quay cranes.
- The Patrick terminal is currently undergoing an upgrade to implement an automated terminal, to be commissioned early in 2015.

Road

- Access to the DP World terminal is via Friendship Road (one-way). The Patrick terminal is accessed from Penrhyn Road. Hutchison's terminal is accessed via a bridge from Foreshore Road.

Rail

- **Facilities.** Each stevedore has rail facilities near to, but not on, its berths.
- DP World has 3 sidings of 340 metre length. Patrick has 2 sidings of 650 metre length. Hutchison's terminal has 2 rail sidings of 680 metres; these are parallel to the Patrick sidings.
- **Services.** Scheduled rail container services between Botany and the hinterland include:

Short-haul:

- Yennora, Cooks River and Minto.

Long-haul:

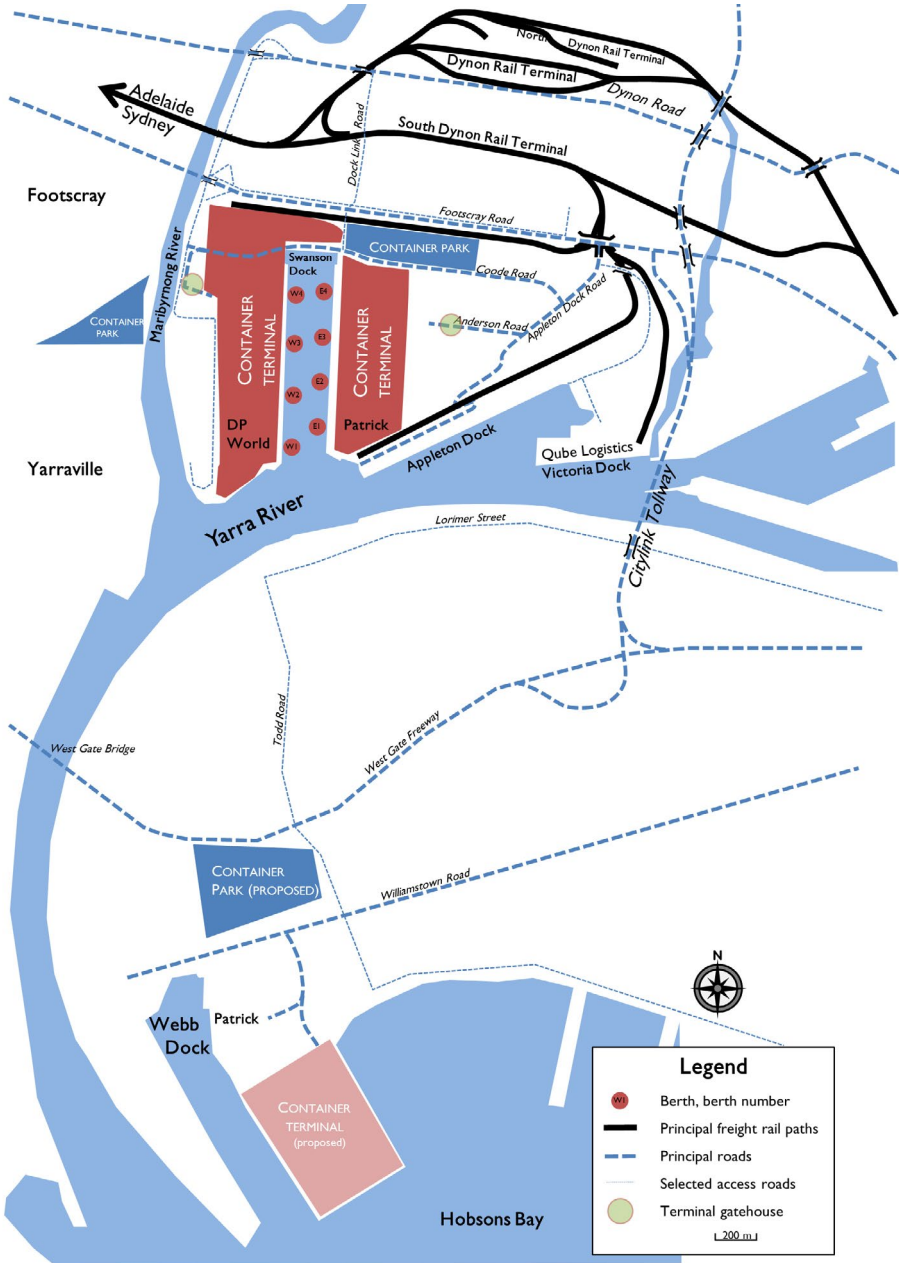
- Kelso (logs and grain) (Southern Shorthaul Railroad; Pacific National);
- Dubbo (processed meat, in reefer containers; grain) (Fletcher Export International/ Southern Shorthaul Railroad; Qube);
- Coonamble (specialised grain) (Qube)
- Nevertire, Warren, Warren South, Narrabri, Wee Waa, Narromine, Forbes (cotton and other agricultural products) (Qube and Genesee & Wyoming);
- Harefield (June) (paper products, grain);
- Canberra (scrap metal) (Espee Railroad Services);
- Walsh Point, Carrington and Sandgate [Newcastle] (aluminium, logs and other agricultural products) (Qube and Crawford's Freightlines/Sydney Rail Services).

- **Rail access.** Railway sidings at Botany Yard are used to regulate train entry to the port, and to split trains where necessary, for onwards movements to the port; and to re-form trains from port-terminal wagon rakes, for movements to Cooks River, Enfield and beyond.
- **National and regional rail connections.** The port is linked to the intrastate and interstate rail network, including the Southern Sydney Freight Line, and Northern Sydney Freight Corridor via the Metropolitan Freight Network (including the Port Botany Goods Line).



Vessel alongside at Brisbane Container Terminals. Photo courtesy of Port of Brisbane Pty Ltd..

Melbourne



(Last updated: November 2014)

Melbourne (Swanson, Appleton and Victoria Dock terminals)

The Port of Melbourne Corporation, a public corporation, manages the port.

Dockside

- **Stevedores.** DP World's container terminal is at Swanson Dock West. Patrick has a container terminal across the dock at Swanson Dock East. Patrick also handles some containers along with general freight at its 3-berth Webb Dock East site.
- **Logistics.** Qube Logistics has a container and general cargo terminal at Victoria Dock, with one berth.
- **Equipment.** The Patrick terminal has 8 cranes, of which 3 are post-Panamax; the DP World terminal has 8 cranes, including 3 post-Panamax. Patrick has 42 straddle carriers while DP World has 48 straddle carriers.
- **Berths.** There are 4 container berths at Patrick's Swanson Dock East—berths E1–E4. There are 4 berths at DP World's Swanson Dock West—berths W1–W4. There is one general cargo berth at Victoria Dock (berth 24), which handles containers.

Road

- Access to the DP World terminal is via Coode Road. Access to the Patrick terminal is via Appleton Dock Road; an access road leads to the Qube terminal from Appleton Dock Road.

Rail

- **Facilities.** Import and export containers are rail-served to near the dockside. Containers are also railed through the Dynon rail terminals (to the north of the docks) and conveyed by road between those terminals and the on-dock container stacks.
 - West Swanson Intermodal Terminal serves DP World. This is a single dual-gauge (standard and broad) siding of 510 metres, running just to the south of Footscray Road; there is also a locomotive run-around track;
 - Appleton Dock rail yard serves Patrick. The yard has two dual (standard and broad) gauge tracks of 640 metres in length and a locomotive run-around track;
 - Qube's Victoria Dock sidings have two dual-gauge (standard and broad) sidings, with 630 metre lengths, plus a locomotive run-around track.
- **Services.** Scheduled rail services shifting containers include:

Short-haul:

- In June 2014 Salta Properties opened a terminal at Altona; the company intends to operate shuttle services between the facility and the port.

Long-haul:

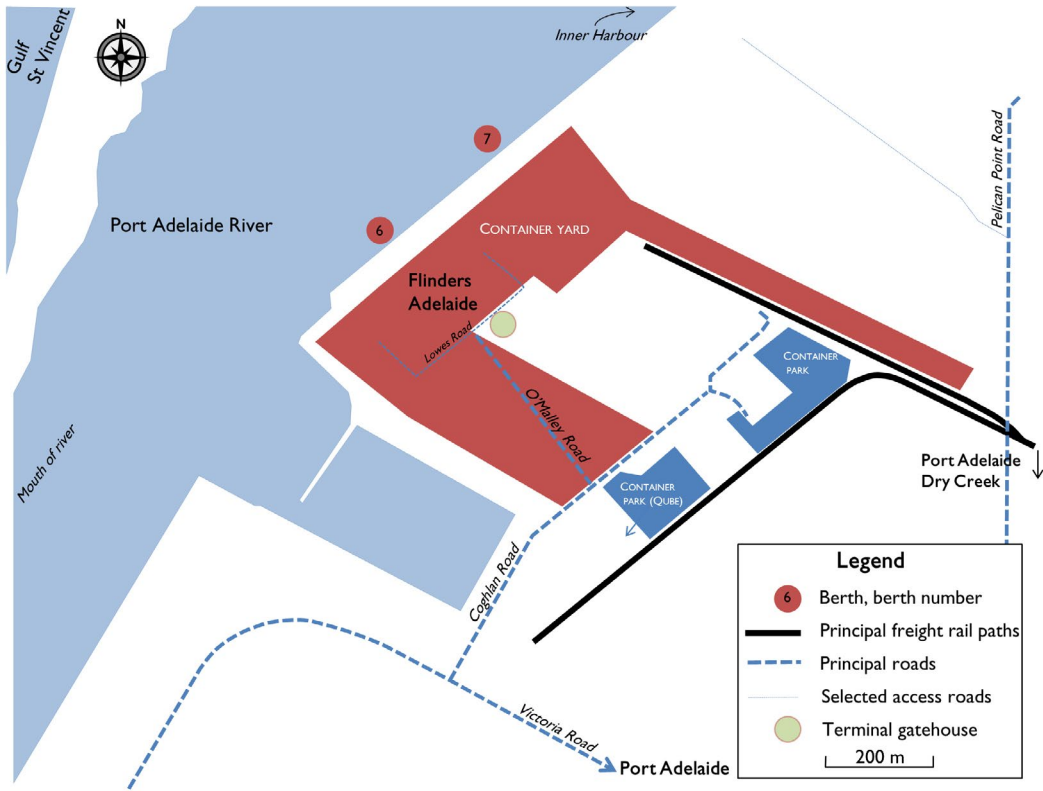
- Deniliquin to Qube's sidings adjacent to Victoria Dock (Qube, broad gauge);
- Maryvale Paper Mill to Qube's sidings adjacent to Victoria Dock (Qube, broad gauge);
- Westvic/Warrnambool to Appleton Dock (Pacific National, broad gauge);

- Tocumwal to Appleton Dock (Pacific National, broad gauge);
 - Merbein/Mildura to Appleton Dock (Pacific National, broad gauge);
 - Adelaide (Port Flat) to Appleton Dock (Patrick, standard gauge);
 - Griffith to Appleton Dock (Pacific National, standard gauge).
- Port rail containers also arrive by road shuttles from the Dynon railway terminals, including:
 - Adelaide (Islington) to South Dynon (Pacific National, standard gauge).
 - **Rail linkages.** The dock area consists of rail facilities near the docks and the nearby intermodal container terminals at South Dynon, Dynon and North Dynon. Although there is an eastern link from the Dynon terminals towards the east (Southern Cross and Flinders Street), the container movements are to and from the west via the Tottenham–Dynon line.
 - Of the five container ports represented here, the Port of Melbourne is unique in the proximity of intermodal terminals near to the docks as well as the on/near-dock facilities.
 - **National rail connections.** Principal freight rail paths are shown; most tracks (including dockside tracks) are dual gauge (namely, broad- and standard-gauge tracks). Access to the interstate network is via the dual-gauge track to the west, via Tottenham.



New container terminal under construction, Photo courtesy of Port of Brisbane Pty Ltd.

Adelaide (Flinders Adelaide Container Terminal at Outer Harbor/Pelican Point)



(Last updated: November 2014)

Adelaide (Flinders Adelaide Container Terminal at Outer Harbor/Pelican Point)

Flinders Ports manages the port facilities in Adelaide; these are at Outer Harbor and the Inner Harbour (up the Port Adelaide River).

Dockside

- **Stevedores.** Port Adelaide's Outer Harbor Container Terminal is operated by Flinders Adelaide, using two berths.
- **Berths.** The map shows the container terminal, located in the outer harbour (at Outer Harbor) of Port Adelaide; the Inner Harbour at Port Adelaide is not shown. The Flinders Adelaide container facilities use berths 6 and 7.
- **Equipment.** The terminal has four travelling container-handling cranes (Panamax-standard).

Road

- Flinders Adelaide Container Terminal is accessed via O'Malley Road, leading from Coghlan Road.

Rail

- **Facilities.** The Outer Harbor terminal has two sets of standard-gauge rail sidings. Two sidings, each of 640 metre length, serve the Flinders Adelaide Container Terminal. The other set of sidings serve the Qube Logistics terminal and container park.
- **Services.** Scheduled railed movements to the dockside include:

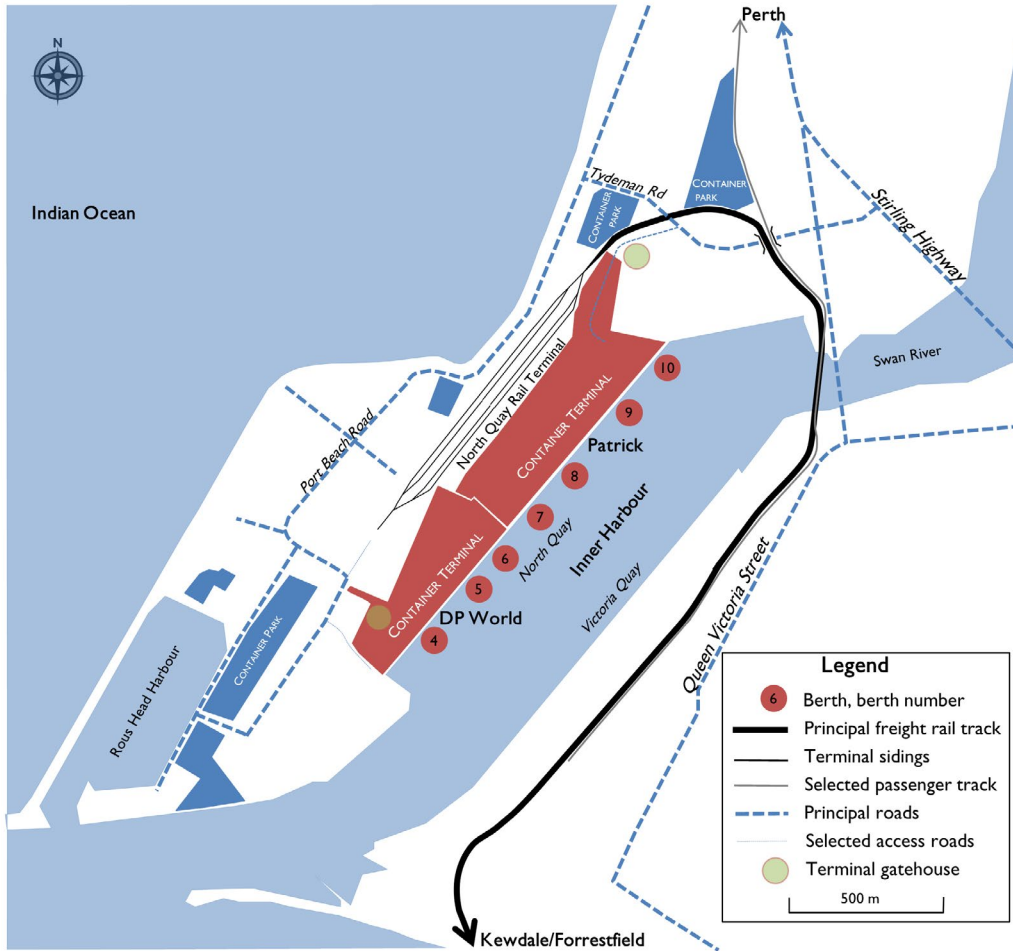
Short-haul:

- Penfield (Direk) to Flinders Adelaide (SCT Logistics); these services were introduced in the first half of 2014.

Long-haul:

- A regular train from Port Pirie and Bowmans operates to Flinders Adelaide's terminal via Port Flat terminal. Containers on the train include lead (from Port Pirie) and agricultural produce (from the Balco terminal at Bowmans) (Patrick).
- Grain is brought to Port Adelaide by rail in hopper wagons; some is then loaded into containers at Viterra's (ABB) container grain loader (inverter) and then exported.
- **Rail linkages.** The Outer Harbor facility is at the extremity of a freight-only railway between Outer Harbor; Port Adelaide and Dry Creek.
- **National rail connections.** The Outer Harbor–Dry Creek line connects with the interstate network at Dry Creek. Nearby intermodal terminals include the Asciano terminals at Port Flat and Islington and the SCT Logistics terminal at Penfield (Direk).

Fremantle (North Quay Terminals in the Inner Harbour)



(Last updated: November 2014)

Fremantle (North Quay Terminals in the Inner Harbour)

Fremantle Ports, a Western Australian Government trading enterprise, manages the port.

Dockside

- **Stevedores.** Container stevedoring is undertaken at North Quay in the Inner Harbour by Patrick and DP World. Patrick have four berths and DP World has three berths.
- **Berths.** Patrick's berth 10 is a multi-purpose container, ro-ro and general cargo facility. The six other stevedore berths are dedicated container ship berths.

Road

- The principal roads on this peninsula are Tyderman Road (from the Stirling Highway) and Port Beach Road/Rudderham Drive. The DP World terminal is accessed via Rudderham Drive while the Patrick terminal is accessed via Tyderman Road.

Rail

- **Facilities.** North Quay Rail Terminal, to the west of the Patrick terminal, serves both Patrick and DP World container terminals. The sidings at that location are around 690 metres in length, accommodating blocks of 600 metre-length trains. The Rail Terminal has dual-gauge tracks.
- **Services.** Scheduled rail services to the port include the following (standard-gauge) trains:
 - Short-haul:
 - A container train operates between Kewdale/Forrestfield and the North Quay Rail Terminal; the service is operated under contract from the State government.
 - Long-haul:
 - Aurizon operates container services between Kalgoorlie and Fremantle; the contents of the containers is nickel matte, for the WMC Resources (part of BHP Billiton);
 - Lead (from Magellan Metals) is railed to the port in containers from Kalgoorlie via Forrestfield Container Terminal.
- **Rail linkages.** Trains access the Rail Terminal on a dual narrow- and standard-gauge freight-only line from Midland. Freight and passenger trains share a track on the bridge over the Swan River.
- **National rail connections.** The rail link to Midland, on the interstate network, includes spur tracks to interstate intermodal terminals at Kewdale and Forrestfield.

References

- Australian Bureau of Statistics (ABS), 2014, *Estimates of Industry Multifactor Productivity, 2013–14*, 5260.0.55.002, December 2014.
- Australian Bureau of Statistics (ABS), 2015. *Australian National Accounts: National Income, Expenditure and Product, Selected Analytical Series, Table 24*, 5206.0, April 2015.
- Australian Competition and Consumer Commission (ACCC) 2014. *Container Stevedoring Monitoring, Report no. 16*, October 2014.
- Bureau of Transport and Communications Economics, 1993, *Port Interface Cost Index, Report 84*, BTCE, Australian Government Publishing Service, Canberra
- DP World 2015. (unpublished data).
- Flinders Adelaide Container Company 2015. (unpublished data).
- Fremantle Port Authority 2015. (unpublished data).
- Hutchison Ports Australia 2015. (unpublished data).
- NSW Ports 2015. (unpublished data).
- Patrick 2015, Patrick Stevedores. (unpublished data).
- Port Authority of New South Wales 2015. (unpublished data).
- Port of Adelaide 2015. (unpublished data).
- Port of Brisbane Pty Ltd, 2015. (unpublished data).
- Port of Melbourne Corporation 2015. (unpublished data).
- Ports Australia 2015. (unpublished data).
- SA Track and Signal 2014, Australian railway track and signal drawings and signal locations, (Online railway and port maps) <http://www.sa-trackandsignal.net/>.

bitre

www.bitre.gov.au
