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Cover Photo: Aerial image of Fisherman Islands (foreground), looking towards Moreton Bay (background). Photo courtesy of Port of Brisbane Pty Ltd.

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

Telephone +61 2 6274 7210
Fax +61 2 6274 6816
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 issue of *Waterline* covers port terminal activity up to the December quarter 2017.

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 loading and unloading of container ships and the landside transport of containers to and from container terminals. Waterline provides the latest available data on stevedoring productivity and landside performance.

This issue of Waterline was prepared in the Infrastructure and Surface Transport Statistics Section by Thomas Rutherford. For further information on this report please phone Thomas Rutherford on (02) 6274 6818, Jack McAuley on (02) 6274 7309 or email maritime_stats@infrastructure.gov.au.

Gary Dolman
Head of BITRE
Bureau of Infrastructure, Transport and Regional Economics
October 2018

At a glance

Throughput

- In July–December 2017, the *number of unitised cellular container (UCC) vessels handled by stevedores* increased by 2.8 per cent in the five ports, compared to the same period in 2016. The largest increase occurred in Melbourne (6.7 per cent), while there was a decrease of 3.0 per cent in Brisbane.
- The total *number of twenty-foot equivalent units (TEUs) handled by stevedores* increased by 8.6 per cent in July–December 2017, compared to July–December 2016. Increases were recorded at all five ports, led by Adelaide (10.4 per cent) and Brisbane (10.3 per cent).
- The *number of TEUs moved through empty container parks* grew by 5.0 per cent in the period July–December 2017, compared to the same period in 2016. The greatest increases were in Brisbane (8.8 per cent) and Fremantle (7.7 per cent).

Productivity

- The average *lifts per berth-hour* decreased by 0.8 per cent in the five ports in the period July–December 2017 (compared to the same period in 2016). The largest declines were in Adelaide (5.2 per cent) and Fremantle (3.8 per cent). Brisbane was the only port to improve, with an increase of 3.1 per cent.
- Wharfside productivity measures declined in the five ports in July–December 2017, with the *crane rate*, *labour rate* and *ship rate* declining by 3.5 per cent, 1.8 per cent and 0.9 per cent, respectively, as measured in TEUs per unit time. Brisbane saw the only improvement, with *labour rate* and *ship rate* improving by 3.7 per cent and 2.5 per cent, respectively.
- The *proportion of ships waiting at anchorage for more than 2 hours* increased by 2.3 percentage points in the five ports in the period July–December 2017 (compared to the same period in 2016), to 9.6 per cent.
- Average *truck turnaround time* decreased by 23.9 per cent in Melbourne during the period July–December 2017, likely driven by the commencement of operations at VICT since July–December 2016. Truck turnaround times increased at the other four ports, led by Brisbane (11.1 per cent) and Adelaide (10.5 per cent).
- The *proportion of trucks backloaded* in July–December 2017 remained fairly stable, increasing by 0.7 percentage points to 13.6 per cent. In July–December 2017, the largest percentage of backloaded operations was in Adelaide (28.1 per cent).

- The total *number of truck timeslots used* in the five ports increased by 4.0 per cent in July–December 2017 compared to the same period in 2016.

Port interface costs

- Port interface costs for exports decreased for all ship categories in the period July–December 2017:
  - For small ships (5 000 to 20 000 gross tonnes), port interface costs decreased by $19 per TEU.
  - For medium-size ships (35 000 to 40 000 gross tonnes), port interface costs decreased by $12 per TEU.
  - For large ships (50 000 to 55 000 gross tonnes), port interface costs decreased by $14 per TEU.
- Port interface costs for imports decreased for all ship categories in the period July–December 2017:
  - For small ships (5 000 to 20 000 gross tonnes), port interface costs decreased by $3 per TEU.
  - For medium-size ships (35 000 to 40 000 gross tonnes), port interface costs decreased by $2 per TEU.
  - For large ships (50 000 to 55 000 gross tonnes), port interface costs decreased by $13 per TEU.

Acknowledgements

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

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

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CHAPTER 1
Measures of container terminal throughput

Overview

Chapter 1 of *Waterline* presents all container port throughput indicators in a consolidated format. 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:

1.1 UCC ships handled, as reported by stevedores

1.2 Total containers handled by stevedores

1.3 Total TEUs handled by stevedores

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

There are seven landside quarterly throughput indicators:

1.5 Number of trucks used in VBS/TAS operations

1.6 Total number of containers transported by trucks and rail

1.7 Total number of containers transported by trucks

1.8 Number of containers by rail

1.9 Total number of TEUs transported by trucks and rail

1.10 Total number of TEUs transported by trucks

1.11 Number of TEUs by rail

Using data from port authorities, there are two quarterly whole-of-terminal throughput indicators:

1.12 Total number of container ship visits

1.13 Total number of containers (lifts) exchanged

Using data from port authorities, there are seven quarterly whole-of-port throughput indicators:

1.14 Total cargo throughput

1.15 Non-containerised general cargo throughput

1.16 Total number of TEUs exchanged

1.17 Number of TEUs: Full import

1.18 Number of TEUs: Empty import

1.19 Number of TEUs: Full export

1.20 Number of TEUs: Empty export

Indicators are presented separately for Brisbane, Sydney, Melbourne, Adelaide and Fremantle, as well as for the five ports as a whole, where applicable.

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 stacking area adjoining the wharf for storing containers. 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 may also contract with a terminal owner to manage all terminal operations. In Australia, there are three major stevedoring companies which handle containers: 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 1.1 UCC ships handled, as reported by stevedores

Only fully cellular ships, or Unitised 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 at specialised container berths. 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 similar to total containers handled (Indicator 1.2), but measured in 'twenty-foot equivalent units' (TEUs). It accounts for containers of different sizes. The TEU is a universally-recognised measure which represents containers of different sizes in a standardised way. A 20-foot container equals one TEU, and a 40-foot container equals two TEUs. Less common container sizes may be fractions of a TEU.

Indicator 1.4 40-foot containers as proportion of all containers handled

This is the number of 40-foot containers as a proportion 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. Up to Waterline 55, this indicator included the trucks undertaking bulk runs; this has been discontinued due to inconsistent data.

Indicator 1.8 Number of containers by rail

The total number of containers carried by rail in or out of container terminals, using data supplied by container port operators.

This indicator includes containers handled through 'on-dock' and 'near-dock' rail sidings. 'On-dock' refers to rail sidings accessible by yard container handling equipment, whereas 'near-dock' sidings are those within the port precinct, but accessed via the public road network. Only on-dock rail data is reported for Sydney, as port precinct rail data is not available.

Indicator 1.9 Total number of TEUs transported by trucks and rail

This indicator includes the total number of TEUs transported in all modes on the landside, either by trucks or by rail. Counts of TEUs in this indicator are further broken down into Indicator 1.10 (TEUs moved by trucks) and Indicator 1.11 (TEUs moved by rail).

Indicator 1.10 Total number of TEUs transported by trucks

This indicator includes the total number of TEUs transported by VBS/TAS trucks. Up to Waterline 55, this indicator included the number of TEUs transported by trucks undertaking bulk runs; this has been discontinued due to inconsistent data.

Indicator 1.11 Number of TEUs by rail

The total number of TEUs carried by rail in or out of container terminals, using data supplied by container port operators.

This indicator includes containers handled through 'on-dock' and 'near-dock' rail sidings. 'On-dock' refers to rail sidings accessible by yard container handling equipment, whereas 'near-dock' sidings are those within the port precinct, but accessed via the public road network. Only on-dock rail data is reported for Sydney, as port precinct rail data is not available.

Whole of container terminal throughput

Indicator 1.12 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. Tables 1.7 and 1.8 summarise ship visits by size of ship and by container port.

Indicator 1.13 Total number of containers (lifts) exchanged

This indicator is estimated using Indicator 1.4 (proportion of 40-foot containers) and the total number of TEUs exchanged with container vessels, as reported by ports.

Whole of port throughput

Indicator 1.14 Total cargo throughput

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

Indicator 1.15 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 1.16 Total number of TEUs exchanged

This is a count of TEUs, exchanged through the port. This count is further broken down into Indicators 1.17 to 1.20.

Indicator 1.17 Full import TEUs

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

Indicator 1.18 Empty import TEUs

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

Indicator 1.19 Full export TEUs

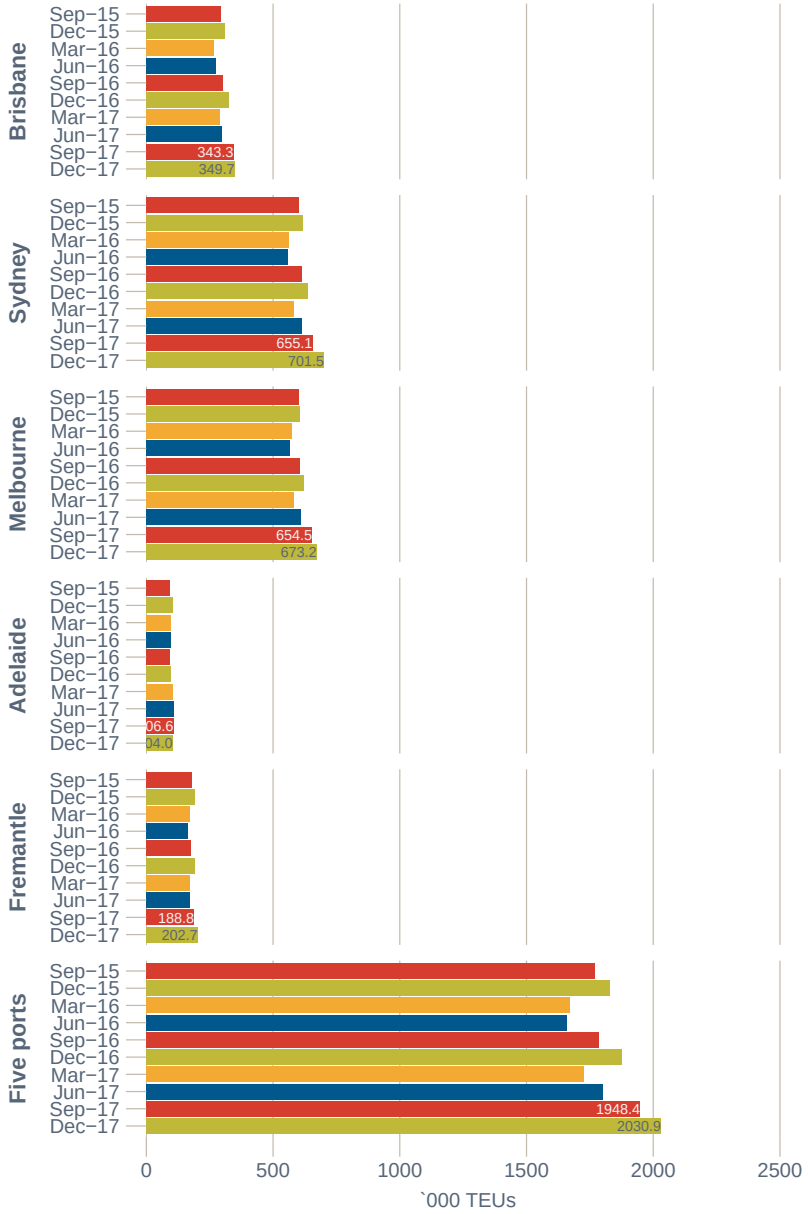
This is a count of full containers in TEUs exported (loaded) at the port.

Indicator 1.20 Empty export TEUs

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

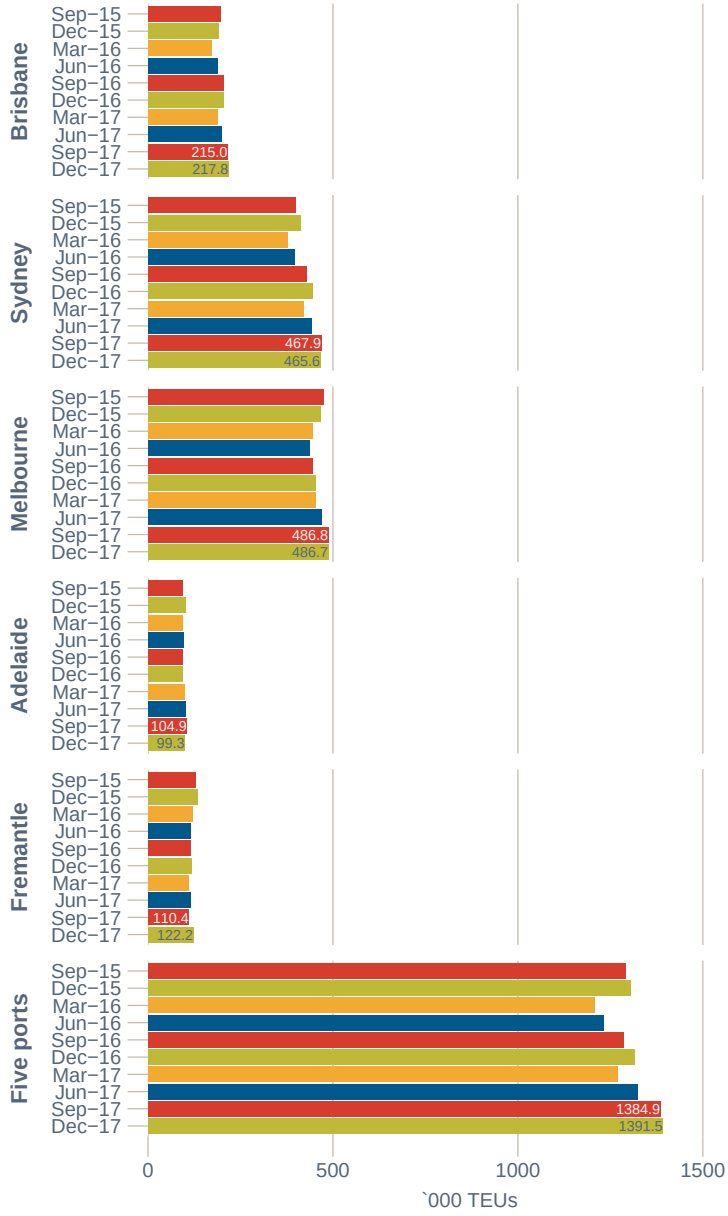
Susan Maersk arriving at Port of Brisbane, aided by *Svitzer Newstead* and *Svitzer Colmslie* (aft). Photo courtesy of Port of Brisbane Pty Ltd.

Figure 1.1 TEU throughput by container port: wharf-side



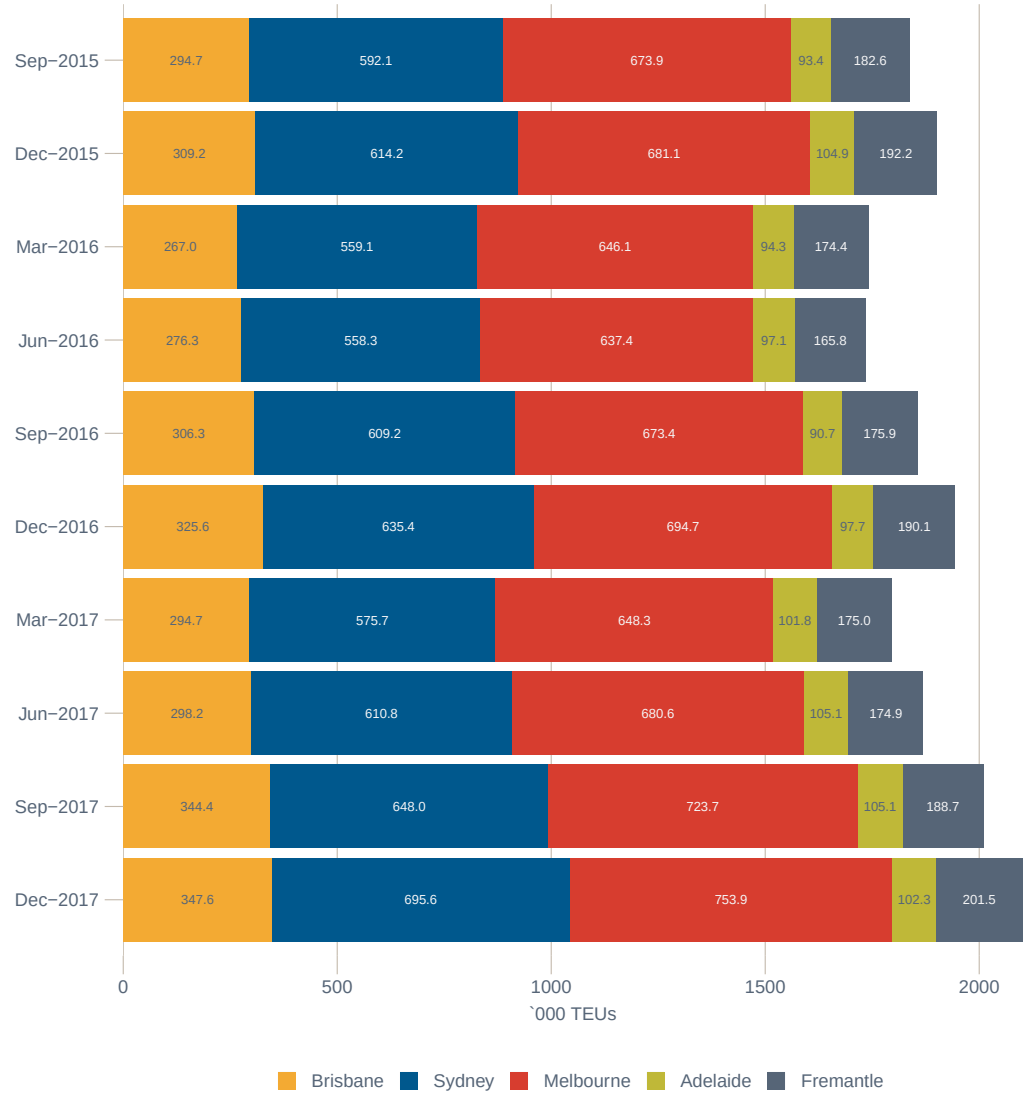
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Figure 1.2 TEU throughput by container port: landside



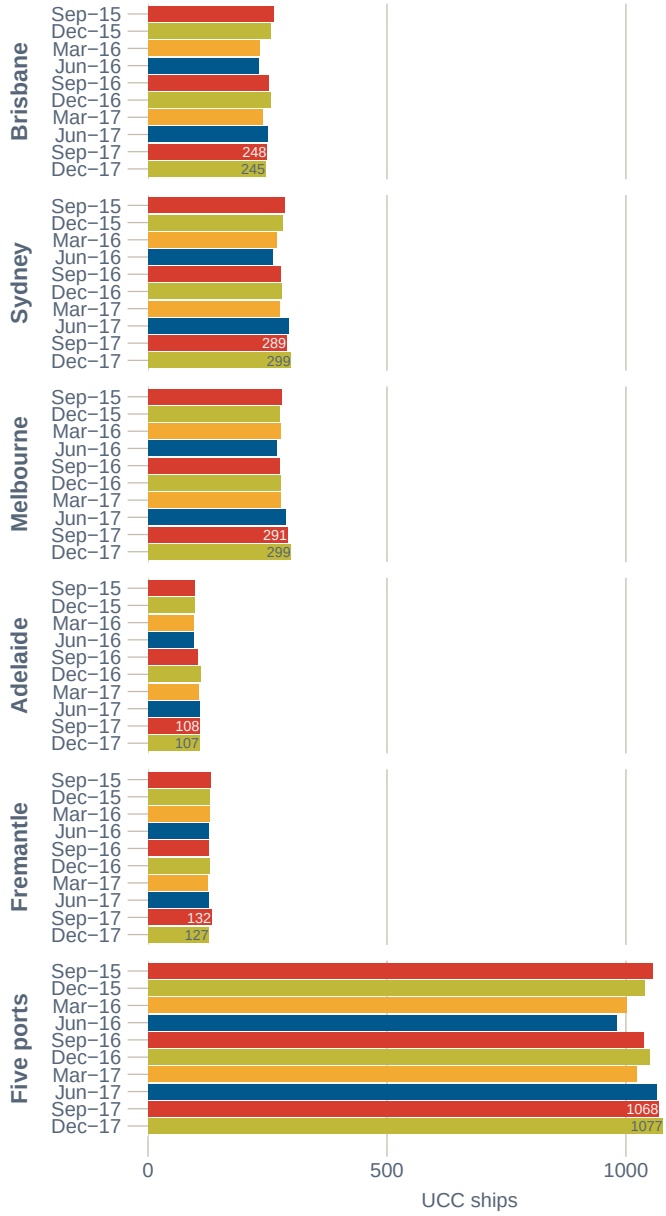
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018), Victoria International Container Terminal (2018), Flinders Ports (2018), Port of Brisbane Pty Ltd (2018), Port of Melbourne Operations Pty Ltd (2018) and Fremantle Ports (2018)

Figure 1.3 TEU throughput by container port: whole of port



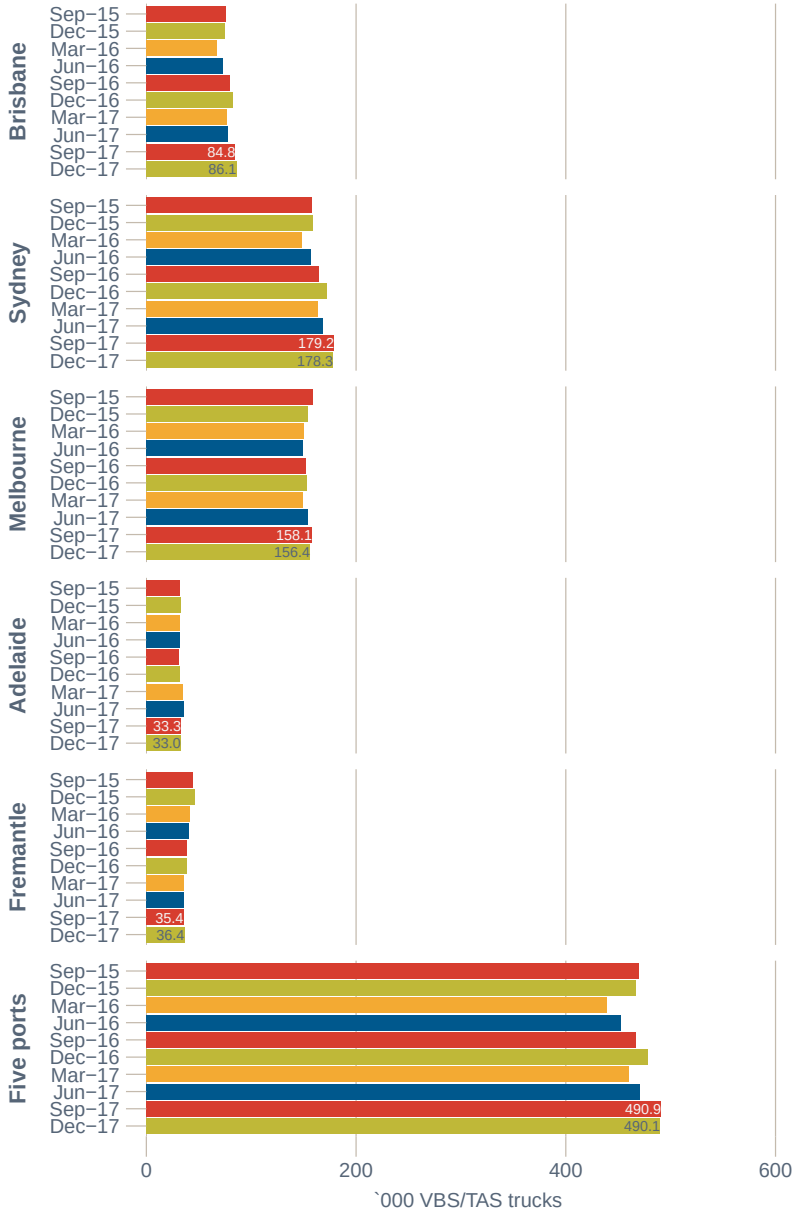
Sources: Port of Brisbane Pty Ltd (2018), Port Authority of New South Wales (2018), Port of Melbourne Operations Pty Ltd (2018), Flinders Ports (2018) and Fremantle Ports (2018)

Figure 1.4 Container terminal traffic: number of UCC ships handled



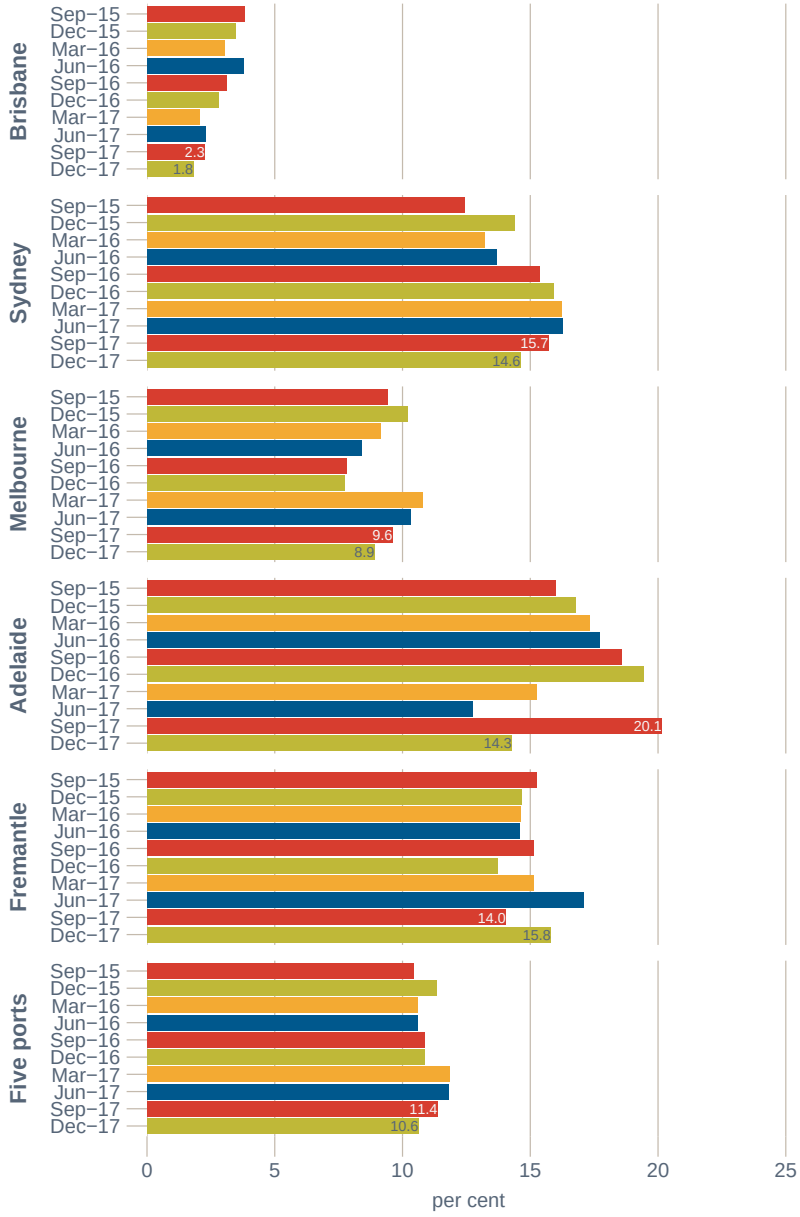
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Figure 1.5 Container terminal traffic: number of trucks used in VBS/TAS operations



Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Figure 1.6 Rail share of TEUs handled



Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018), Flinders Ports (2018), Port of Brisbane Pty Ltd (2018), Port of Melbourne Operations Pty Ltd (2018) and Fremantle Ports (2018)

Table 1.1 Container terminal throughput: Brisbane

	2015			2016						2017					
	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 ships handled, as reported by stevedores	263	257	**520**	233	231	**464**	252	256	**508**	239	250	**489**	248	245	**493**
Total containers handled *('000)*	197.7	208.1	**405.8**	177.8	185.2	**363.0**	200.9	220.4	**421.4**	194.1	196.5	**390.5**	223.2	226.9	**450.1**
Total TEUs handled *('000)*	295.2	308.7	**603.9**	265.8	274.4	**540.1**	301.6	326.7	**628.4**	288.9	296.3	**585.2**	343.3	349.7	**693.0**
40-foot containers as proportion of all containers handled *(%)*	49.3	48.4	**48.8**	49.4	48.2	**48.8**	50.1	48.2	**49.1**	48.9	50.8	**49.8**	53.8	54.1	**54.0**
Landside															
Number of trucks used in VBS/TAS operations *('000)*	76.1	75.0	**151.2**	67.3	72.8	**140.1**	80.1	82.6	**162.7**	76.5	78.1	**154.7**	84.8	86.1	**170.9**
Total containers transported by VBS/TAS trucks and rail *('000)*	136.1	133.8	**269.9**	118.1	130.6	**248.6**	139.9	143.6	**283.5**	131.8	135.5	**267.2**	147.2	148.4	**295.7**
Containers by VBS/TAS trucks *('000)*	125.9	124.2	**250.1**	111.0	121.4	**232.4**	131.6	135.5	**267.1**	126.3	129.3	**255.6**	140.0	142.8	**282.8**
Containers by rail *('000)*	10.2	9.6	**19.8**	7.1	9.2	**16.3**	8.4	8.1	**16.4**	5.4	6.2	**11.6**	7.2	5.7	**12.9**
Total TEUs transported by VBS/TAS trucks and rail *('000)*	195.6	191.3	**386.9**	171.0	188.6	**359.6**	203.6	204.3	**407.9**	187.6	197.7	**385.3**	215.0	217.8	**432.8**
TEUs by VBS/TAS trucks *('000)*	184.4	180.7	**365.0**	163.0	178.2	**341.3**	194.3	195.1	**389.4**	181.7	190.9	**372.6**	207.2	211.4	**418.7**
TEUs by rail *('000)*	11.2	10.6	**21.9**	8.0	10.3	**18.4**	9.3	9.2	**18.5**	6.0	6.7	**12.7**	7.8	6.3	**14.1**
Whole of container terminal															
Total number of container ship visits	246	241	**487**	227	226	**453**	245	236	**481**	229	232	**461**	233	228	**461**
Total number of containers (lifts) exchanged *('000)*	191.1	201.6	**392.7**	174.6	182.8	**357.4**	199.5	214.4	**413.9**	190.0	191.2	**381.1**	216.7	219.9	**436.7**
Whole of port															
Total cargo throughput *(million tonnes)*	7.5	7.7	**15.2**	7.5	7.5	**15.0**	8.3	8.2	**16.5**	8.4	8.3	**16.7**	8.6	8.2	**16.8**
Non-containerised general cargo throughput *(million tonnes)*	0.2	0.2	**0.4**	0.2	0.2	**0.4**	0.2	0.2	**0.4**	0.2	0.2	**0.4**	0.3	0.3	**0.5**
Total TEUs exchanged *('000)*	294.7	309.2	**603.9**	267.0	276.3	**543.3**	306.3	325.6	**632.0**	294.7	298.2	**592.9**	344.4	347.6	**691.9**
Full import *('000)*	131.7	135.5	**267.1**	119.9	122.5	**242.5**	138.7	146.9	**285.6**	131.4	134.4	**265.8**	154.9	164.1	**319.0**
Empty import *('000)*	20.1	19.7	**39.8**	13.2	17.7	**31.0**	19.9	19.8	**39.7**	15.0	17.3	**32.3**	22.1	11.9	**34.0**
Full export *('000)*	81.5	87.6	**169.1**	64.4	83.3	**147.7**	92.5	86.8	**179.4**	80.0	98.3	**178.3**	109.2	80.7	**189.9**
Empty export *('000)*	61.4	66.4	**127.8**	69.5	52.7	**122.2**	55.2	72.1	**127.3**	68.3	48.2	**116.5**	58.2	90.9	**149.1**

Note: Blank cells mean no data were reported in that period.

Sources: DP World (2018), Hutchison Ports Australia (2018), Patrick (2018) and Port of Brisbane Pty Ltd (2018)

Table 1.2 Container terminal throughput: Sydney

	2015			2016						2017					
	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 ships handled, as reported by stevedores	286	281	**567**	268	260	**528**	278	279	**557**	275	293	**568**	289	299	**588**
Total containers handled *('000)*	389.4	399.3	**788.7**	366.2	364.9	**731.2**	395.5	413.1	**808.6**	375.1	396.8	**771.9**	422.0	448.2	**870.2**
Total TEUs handled *('000)*	599.8	618.4	**1 218.2**	564.1	559.8	**1 123.9**	611.6	638.7	**1 250.3**	580.8	614.3	**1 195.1**	655.1	701.5	**1 356.5**
40-foot containers as proportion of all containers handled *(%)*	54.0	54.9	**54.5**	54.0	53.4	**53.7**	54.6	54.6	**54.6**	54.8	54.8	**54.8**	55.2	56.5	**55.9**
Landside															
Number of trucks used in VBS/TAS operations *('000)*	158.3	158.4	**316.7**	148.3	156.7	**305.0**	164.5	171.8	**336.3**	163.2	167.9	**331.0**	179.2	178.3	**357.5**
Total containers transported by VBS/TAS trucks and rail *('000)*	275.3	287.1	**562.3**	261.4	273.5	**535.0**	297.2	313.5	**610.7**	297.0	305.9	**602.9**	320.1	315.5	**635.6**
Containers by VBS/TAS trucks *('000)*	225.0	225.7	**450.7**	209.5	221.5	**431.0**	234.5	244.2	**478.6**	230.7	238.5	**469.2**	252.4	249.3	**501.7**
Containers by rail *('000)*	50.3	61.4	**111.6**	52.0	52.0	**104.0**	62.7	69.4	**132.0**	66.3	67.3	**133.6**	67.7	66.2	**133.9**
Total TEUs transported by VBS/TAS trucks and rail *('000)*	398.4	411.4	**809.7**	377.3	394.9	**772.2**	429.7	445.2	**874.9**	419.1	440.8	**859.9**	467.9	465.6	**933.4**
TEUs by VBS/TAS trucks *('000)*	323.8	322.3	**646.1**	302.8	318.3	**621.1**	335.8	343.6	**679.4**	325.0	340.8	**665.8**	364.9	363.0	**728.0**
TEUs by rail *('000)*	74.6	89.0	**163.7**	74.5	76.6	**151.1**	93.9	101.7	**195.5**	94.2	99.9	**194.1**	102.9	102.5	**205.4**
Whole of container terminal															
Total number of container ship visits	277	271	**548**	258	255	**513**	274	271	**545**	269	281	**550**	274	275	**549**
Total number of containers (lifts) exchanged *('000)*	385.3	392.3	**777.6**	363.5	363.8	**727.2**	388.5	409.5	**798.0**	375.6	388.0	**763.6**	419.4	427.0	**846.4**
Whole of port															
Total cargo throughput *(million tonnes)*	5.7	6.4	**12.1**	5.9	6.1	**12.0**	6.5	6.9	**13.4**	6.6	7.0	**13.6**	6.7	7.7	**14.4**
Non-containerised general cargo throughput *(million tonnes)*	0.0	0.0	**0.0**	0.0	0.0	**0.0**	0.0	0.0	**0.0**	0.0	0.0	**0.0**	0.0	0.0	**0.0**
Total TEUs exchanged *('000)*	592.1	614.2	**1 206.3**	559.1	558.3	**1 117.5**	609.2	635.4	**1 244.6**	575.7	610.8	**1 186.5**	648.0	695.6	**1 343.6**
Full import *('000)*	299.2	307.5	**606.7**	275.6	280.2	**555.8**	312.3	315.9	**628.2**	283.9	305.4	**589.3**	325.0	347.2	**672.1**
Empty import *('000)*	2.1	3.9	**6.0**	1.7	2.7	**4.4**	2.3	3.6	**5.8**	3.3	4.1	**7.4**	2.5	2.6	**5.2**
Full export *('000)*	112.3	121.2	**233.6**	110.8	115.4	**226.2**	127.4	125.9	**253.2**	122.6	131.4	**254.0**	137.8	119.3	**257.2**
Empty export *('000)*	178.4	181.5	**359.9**	171.1	160.0	**331.1**	167.3	190.0	**357.3**	165.8	169.9	**335.7**	182.6	226.5	**409.1**

Note: Blank cells mean no data were reported in that period.
Cells with a value of ''0.0'' mean that data were reported but rounded to zero.
Sources: DP World (2018), Hutchison Ports Australia (2018), Patrick (2018) and NSW Ports (2018)

Table 1.3 Container terminal throughput: Melbourne

	2015			2016						2017					
	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 ships handled, as reported by stevedores	279	275	**554**	278	268	**546**	276	277	**553**	278	287	**565**	291	299	**590**
Total containers handled *('000)*	399.1	400.9	**800.0**	380.7	374.7	**755.4**	397.4	408.4	**805.8**	385.1	399.3	**784.4**	428.4	441.0	**869.5**
Total TEUs handled *('000)*	602.6	604.8	**1 207.4**	574.0	564.6	**1 138.6**	603.8	623.2	**1 227.1**	581.6	609.2	**1 190.8**	654.5	673.2	**1 327.7**
40-foot containers as proportion of all containers handled *(%)*	51.0	50.9	**50.9**	50.8	50.7	**50.7**	51.9	52.6	**52.3**	51.1	52.6	**51.8**	52.8	52.6	**52.7**
Landside															
Number of trucks used in VBS/TAS operations *('000)*	158.9	154.0	**312.9**	150.4	149.6	**300.0**	152.3	153.1	**305.4**	149.5	153.8	**303.3**	158.1	156.4	**314.4**
Total containers transported by VBS/TAS trucks and rail *('000)*	319.5	311.4	**630.8**	296.9	292.2	**589.1**	296.4	301.5	**597.9**	305.6	314.3	**619.8**	323.0	322.8	**645.7**
Containers by VBS/TAS trucks *('000)*	282.0	270.5	**552.5**	262.1	260.8	**522.9**	265.4	270.0	**535.3**	264.0	273.1	**537.1**	281.8	283.5	**565.3**
Containers by rail *('000)*	37.5	40.8	**78.3**	34.8	31.4	**66.2**	31.1	31.5	**62.6**	41.6	41.2	**82.7**	41.2	39.3	**80.5**
Total TEUs transported by VBS/TAS trucks and rail *('000)*	473.8	465.4	**939.2**	444.5	435.5	**880.0**	444.9	453.3	**898.3**	454.2	470.1	**924.4**	486.8	486.7	**973.5**
TEUs by VBS/TAS trucks *('000)*	417.2	403.8	**821.0**	392.1	388.2	**780.2**	397.8	405.2	**802.9**	391.4	407.4	**798.8**	423.9	426.7	**850.6**
TEUs by rail *('000)*	56.6	61.6	**118.2**	52.4	47.4	**99.8**	47.2	48.1	**95.3**	62.8	62.8	**125.6**	62.9	60.0	**122.9**
Whole of container terminal															
Total number of container ship visits	271	267	**538**	268	264	**532**	276	270	**546**	269	275	**544**	267	277	**544**
Total number of containers (lifts) exchanged *('000)*	393.8	393.2	**786.9**	375.2	368.8	**744.0**	397.9	400.9	**798.8**	383.0	390.3	**773.2**	420.4	432.3	**852.7**
Whole of port															
Total cargo throughput *(million tonnes)*	8.7	8.8	**17.5**	8.5	8.7	**17.2**	8.6	8.8	**17.4**	9.1	9.3	**18.4**	9.5	9.7	**19.2**
Non-containerised general cargo throughput *(million tonnes)*	0.6	0.6	**1.1**	0.6	0.5	**1.1**	0.4	0.4	**0.8**	0.4	0.4	**0.8**	0.5	0.4	**0.9**
Total TEUs exchanged *('000)*	673.9	681.1	**1 355.0**	646.1	637.4	**1 283.6**	673.4	694.7	**1 368.2**	648.3	680.6	**1 328.9**	723.7	753.9	**1 477.6**
Full import *('000)*	315.2	313.3	**628.5**	292.7	291.1	**583.8**	319.0	323.2	**642.2**	295.8	308.5	**604.3**	338.0	347.9	**685.9**
Empty import *('000)*	25.2	28.9	**54.1**	30.6	32.0	**62.6**	23.7	24.8	**48.5**	29.7	30.9	**60.7**	27.8	30.7	**58.5**
Full export *('000)*	206.4	213.8	**420.1**	209.8	216.9	**426.7**	216.5	215.6	**432.1**	225.5	240.3	**465.8**	240.1	243.5	**483.6**
Empty export *('000)*	127.1	125.1	**252.2**	113.0	97.5	**210.5**	114.3	131.2	**245.4**	97.3	100.8	**198.1**	117.8	131.9	**249.7**

Note: Blank cells mean no data were reported in that period.
The counts of containers by rail include those handled by Qube Logistics.

Sources: DP World (2018), Patrick (2018), Victoria International Container Terminal (2018) and Port of Melbourne Operations Pty Ltd (2018)

Table 1.4 Container terminal throughput: Adelaide

	2015			2016						2017					
	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 ships handled, as reported by stevedores	97	97	**194**	95	96	**191**	103	110	**213**	106	108	**214**	108	107	**215**
Total containers handled *('000)*	65.0	74.7	**139.7**	64.9	67.7	**132.6**	64.2	70.9	**135.1**	75.1	77.2	**152.3**	73.3	73.5	**146.8**
Total TEUs handled *('000)*	93.2	105.4	**198.6**	95.5	97.5	**193.0**	92.7	98.1	**190.8**	103.5	107.5	**210.9**	106.6	104.0	**210.6**
40-foot containers as proportion of all containers handled *(%)*	43.4	41.0	**42.1**	47.2	44.0	**45.5**	44.4	38.3	**41.2**	37.7	39.2	**38.5**	45.4	41.5	**43.4**
Landside															
Number of trucks used in VBS/TAS operations *('000)*	31.9	33.3	**65.2**	31.5	32.0	**63.5**	31.3	32.4	**63.7**	34.6	35.4	**70.0**	33.3	33.0	**66.3**
Total containers transported by VBS/TAS trucks and rail *('000)*	64.7	71.3	**135.9**	64.1	66.2	**130.4**	64.3	68.7	**133.0**	71.5	71.7	**143.1**	74.9	69.7	**144.6**
Containers by VBS/TAS trucks *('000)*	54.5	58.8	**113.3**	52.7	54.0	**106.7**	52.2	54.3	**106.5**	59.2	61.4	**120.6**	57.5	59.1	**116.6**
Containers by rail *('000)*	10.2	12.5	**22.7**	11.4	12.3	**23.7**	12.1	14.3	**26.4**	12.2	10.3	**22.5**	17.4	10.6	**28.0**
Total TEUs transported by VBS/TAS trucks and rail *('000)*	93.4	101.2	**194.6**	93.9	95.1	**188.9**	92.7	94.5	**187.2**	97.9	100.2	**198.1**	104.9	99.3	**204.2**
TEUs by VBS/TAS trucks *('000)*	78.5	83.5	**162.0**	77.3	77.8	**155.1**	75.5	75.5	**151.0**	82.1	86.5	**168.6**	83.4	84.5	**167.9**
TEUs by rail *('000)*	14.9	17.7	**32.6**	16.5	17.3	**33.8**	17.2	19.1	**36.3**	15.8	13.7	**29.5**	21.5	14.8	**36.3**
Whole of container terminal															
Total number of container ship visits	98	97	**195**	95	96	**191**	105	113	**218**	105	107	**212**	112	107	**219**
Total number of containers (lifts) exchanged *('000)*	65.2	74.4	**139.6**	64.0	67.4	**131.4**	63.3	70.0	**133.3**	73.9	75.4	**149.2**	73.2	72.5	**145.7**
Whole of port															
Total cargo throughput *(million tonnes)*	3.5	3.6	**7.1**	3.6	3.2	**6.8**	3.4	3.7	**7.1**	4.2	4.4	**8.6**	4.2	3.9	**8.2**
Non-containerised general cargo throughput *(million tonnes)*	0.1	0.1	**0.2**	0.1	0.1	**0.2**	0.1	0.1	**0.2**	0.1	0.1	**0.2**	0.0	0.1	**0.1**
Total TEUs exchanged *('000)*	93.4	104.9	**198.4**	94.3	97.1	**191.3**	90.7	97.7	**188.4**	101.8	105.1	**206.9**	105.1	102.3	**207.3**
Full import *('000)*	35.4	39.2	**74.6**	35.8	33.3	**69.1**	34.5	35.9	**70.4**	40.3	35.2	**75.5**	37.7	39.3	**77.0**
Empty import *('000)*	10.4	14.0	**24.4**	9.7	15.5	**25.2**	11.2	11.9	**23.1**	11.2	14.9	**26.1**	15.7	11.6	**27.3**
Full export *('000)*	38.0	41.2	**79.1**	36.8	41.0	**77.8**	37.4	43.9	**81.3**	37.9	45.0	**82.9**	43.0	44.6	**87.7**
Empty export *('000)*	9.7	10.6	**20.2**	11.9	7.4	**19.2**	7.4	5.8	**13.2**	12.4	9.9	**22.3**	8.4	6.6	**15.0**

Note: Blank cells mean no data were reported in that period.
Cells with a value of ''0.0'' mean that data were reported but rounded to zero.
Sources: Flinders Adelaide Container Terminal (2018) and Flinders Ports (2018)

Table 1.5 Container terminal throughput: Fremantle

	2015			2016						2017					
	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 ships handled, as reported by stevedores	130	129	**259**	128	126	**254**	127	128	**255**	125	127	**252**	132	127	**259**
Total containers handled *('000)*	118.2	127.1	**245.3**	115.3	110.2	**225.5**	118.1	126.3	**244.4**	116.1	116.9	**233.0**	125.5	135.3	**260.8**
Total TEUs handled *('000)*	177.6	191.3	**368.9**	172.3	163.1	**335.3**	177.3	189.4	**366.7**	173.4	172.4	**345.8**	188.8	202.7	**391.5**
40-foot containers as proportion of all containers handled *(%)*	50.2	50.5	**50.4**	49.4	48.0	**48.7**	50.2	49.9	**50.0**	49.3	47.5	**48.4**	50.5	49.8	**50.1**
Landside															
Number of trucks used in VBS/TAS operations *('000)*	44.5	46.5	**90.9**	41.8	41.0	**82.8**	38.8	38.7	**77.5**	36.0	35.8	**71.8**	35.4	36.4	**71.8**
Total containers transported by VBS/TAS trucks and rail *('000)*	89.8	93.6	**183.4**	84.6	81.9	**166.6**	81.7	83.3	**165.1**	78.3	82.6	**160.9**	78.0	86.9	**164.9**
Containers by VBS/TAS trucks *('000)*	70.2	73.4	**143.7**	66.6	65.0	**131.6**	62.4	64.2	**126.6**	59.5	60.9	**120.4**	58.5	62.9	**121.4**
Containers by rail *('000)*	19.6	20.2	**39.8**	18.0	16.9	**35.0**	19.3	19.1	**38.4**	18.9	21.6	**40.5**	19.5	24.0	**43.5**
Total TEUs transported by VBS/TAS trucks and rail *('000)*	128.6	135.0	**263.6**	120.5	116.3	**236.8**	115.1	116.9	**232.0**	110.6	115.7	**226.3**	110.4	122.2	**232.6**
TEUs by VBS/TAS trucks *('000)*	101.5	107.0	**208.5**	95.3	92.5	**187.8**	88.3	91.0	**179.2**	84.4	86.3	**170.6**	83.8	90.2	**174.0**
TEUs by rail *('000)*	27.0	28.0	**55.0**	25.2	23.8	**49.0**	26.8	26.0	**52.8**	26.2	29.4	**55.7**	26.5	32.0	**58.5**
Whole of container terminal															
Total number of container ship visits	132	130	**262**	127	128	**255**	126	127	**253**	127	127	**254**	132	126	**258**
Total number of containers (lifts) exchanged *('000)*	119.8	124.7	**244.5**	115.7	111.7	**227.4**	116.1	123.1	**239.1**	116.6	117.4	**234.0**	122.7	131.9	**254.6**
Whole of port															
Total cargo throughput *(million tonnes)*	8.2	8.6	**16.8**	9.3	8.8	**18.1**	8.4	8.8	**17.2**	8.7	9.4	**18.1**	8.2	8.7	**17.0**
Non-containerised general cargo throughput *(million tonnes)*	0.2	0.2	**0.5**	0.2	0.2	**0.4**	0.2	0.2	**0.4**	0.2	0.2	**0.4**	0.2	0.3	**0.5**
Total TEUs exchanged *('000)*	182.6	192.2	**374.9**	174.4	165.8	**340.2**	175.9	190.1	**366.1**	175.0	174.9	**349.9**	188.7	201.5	**390.2**
Full import *('000)*	90.0	93.7	**183.7**	83.4	80.3	**163.7**	88.1	87.4	**175.5**	83.1	84.5	**167.6**	93.4	95.8	**189.2**
Empty import *('000)*	5.1	5.9	**11.0**	4.8	5.9	**10.7**	5.3	7.0	**12.3**	7.0	6.3	**13.2**	4.2	8.1	**12.3**
Full export *('000)*	49.0	52.9	**101.9**	50.2	50.2	**100.5**	49.7	55.3	**105.0**	52.3	57.5	**109.8**	56.7	61.2	**117.9**
Empty export *('000)*	38.7	39.6	**78.3**	35.9	29.4	**65.3**	32.8	40.3	**73.2**	32.6	26.6	**59.3**	34.4	36.4	**70.8**

Note: Blank cells mean no data were reported in that period.
Sources: DP World (2018), Patrick (2018) and Fremantle Ports (2018)

Table 1.6 Container terminal throughput: Five ports

	2015			2016						2017					
	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 ships handled, as reported by stevedores	1 055	1 039	**2 094**	1 002	981	**1 983**	1 036	1 050	**2 086**	1 023	1 065	**2 088**	1 068	1 077	**2 145**
Total containers handled *('000)*	1 169.5	1 210.0	**2 379.5**	1 104.9	1 102.7	**2 207.7**	1 176.2	1 239.0	**2 415.2**	1 145.5	1 186.6	**2 332.1**	1 272.5	1 324.9	**2 597.4**
Total TEUs handled *('000)*	1 768.4	1 828.6	**3 597.0**	1 671.7	1 659.3	**3 331.0**	1 787.1	1 876.1	**3 663.2**	1 728.2	1 799.7	**3 527.9**	1 948.4	2 030.9	**3 979.3**
40-foot containers as proportion of all containers handled *(%)*	51.2	51.1	**51.2**	51.3	50.5	**50.9**	51.9	51.4	**51.7**	50.9	51.7	**51.3**	53.1	53.3	**53.2**
Landside															
Number of trucks used in VBS/TAS operations *('000)*	469.6	467.3	**936.9**	439.3	452.1	**891.4**	467.0	478.6	**945.6**	459.8	470.9	**930.7**	490.9	490.1	**980.9**
Total containers transported by VBS/TAS trucks and rail *('000)*	885.4	897.0	**1 782.4**	825.2	844.5	**1 669.7**	879.6	910.6	**1 790.2**	884.1	909.8	**1 793.9**	943.3	943.2	**1 886.5**
Containers by VBS/TAS trucks *('000)*	757.6	752.6	**1 510.2**	701.9	722.6	**1 424.5**	746.0	768.2	**1 514.2**	739.7	763.2	**1 503.0**	790.3	797.4	**1 587.7**
Containers by rail *('000)*	127.8	144.4	**272.2**	123.3	121.9	**245.1**	133.5	142.4	**275.9**	144.4	146.6	**291.0**	153.0	145.7	**298.7**
Total TEUs transported by VBS/TAS trucks and rail *('000)*	1 289.8	1 304.2	**2 594.0**	1 207.2	1 230.4	**2 437.6**	1 286.0	1 314.3	**2 600.3**	1 269.5	1 324.4	**2 593.9**	1 384.9	1 391.5	**2 776.5**
TEUs by VBS/TAS trucks *('000)*	1 105.4	1 097.3	**2 202.7**	1 030.5	1 055.0	**2 085.5**	1 091.6	1 110.3	**2 202.0**	1 064.6	1 111.8	**2 176.4**	1 163.3	1 175.9	**2 339.2**
TEUs by rail *('000)*	184.4	207.0	**391.4**	176.7	175.4	**352.0**	194.4	204.0	**398.4**	204.9	212.6	**417.5**	221.6	215.7	**437.3**
Whole of container terminal															
Total number of container ship visits	1 024	1 006	**2 030**	975	969	**1 944**	1 026	1 017	**2 043**	999	1 022	**2 021**	1 018	1 013	**2 031**
Total number of containers (lifts) exchanged *('000)*	1 155.2	1 186.1	**2 341.2**	1 093.0	1 094.4	**2 187.4**	1 165.2	1 217.9	**2 383.1**	1 139.3	1 162.1	**2 301.4**	1 252.4	1 283.4	**2 535.8**
Whole of port															
Total cargo throughput *(million tonnes)*	33.6	35.1	**68.7**	34.8	34.2	**69.1**	35.1	36.4	**71.5**	37.0	38.4	**75.4**	37.2	38.3	**75.6**
Non-containerised general cargo throughput *(million tonnes)*	1.1	1.1	**2.2**	1.0	1.0	**2.0**	0.9	0.9	**1.8**	0.8	0.9	**1.8**	1.0	1.0	**2.0**
Total TEUs exchanged *('000)*	1 836.8	1 901.6	**3 738.3**	1 741.0	1 734.9	**3 475.9**	1 855.5	1 943.6	**3 799.1**	1 795.5	1 869.5	**3 665.0**	2 009.7	2 100.9	**4 110.6**
Full import *('000)*	871.5	889.2	**1 760.7**	807.5	807.4	**1 614.9**	892.6	909.3	**1 801.9**	834.5	867.9	**1 702.5**	949.0	994.2	**1 943.3**
Empty import *('000)*	62.9	72.4	**135.3**	60.1	73.8	**133.8**	62.4	67.1	**129.5**	66.2	73.5	**139.7**	72.4	64.9	**137.2**
Full export *('000)*	487.2	516.7	**1 003.8**	472.0	506.9	**978.9**	523.5	527.5	**1 051.0**	518.3	572.5	**1 090.8**	586.8	549.4	**1 136.1**
Empty export *('000)*	415.2	423.2	**838.5**	401.4	346.9	**748.3**	376.9	439.4	**816.3**	376.4	355.4	**731.8**	401.4	492.3	**893.7**

Note: Blank cells mean no data were reported in that period.

Sources: DP World (2018), Patrick (2018), Hutchison Ports Australia (2018), Flinders Adelaide Container Terminal (2018), Victoria International Container Terminal (2018), Port of Brisbane Pty Ltd (2018), NSW Ports (2018), Port of Melbourne Operations Pty Ltd (2018), Flinders Ports (2018) and Fremantle Ports (2018)

Table 1.7 Container ship visits by port: July–December 2017

	Brisbane	Sydney	Melbourne	Adelaide	Fremantle	Five ports
Gross Tonnage						
5 000–20 000 GT	50	80	82	0	25	237
20 001–35 000 GT	17	62	38	16	3	136
35 001–40 000 GT	38	44	44	22	22	170
40 001–50 000 GT	143	102	102	28	1	376
50 001 GT and above	204	260	264	150	205	1 083
All ship sizes	452	548	530	216	256	2 002

Sources: Port of Brisbane Pty Ltd (2018), NSW Ports (2018), Port of Melbourne Operations Pty Ltd (2018), Flinders Ports (2018) and Fremantle Ports (2018)

Table 1.8 Container ship visits by port: January–June 2017

	Brisbane	Sydney	Melbourne	Adelaide	Fremantle	Five ports
Gross Tonnage						
5 000–20 000 GT	55	88	87	0	25	255
20 001–35 000 GT	17	63	38	18	4	140
35 001–40 000 GT	49	61	65	26	31	232
40 001–50 000 GT	161	117	131	41	29	479
50 001 GT and above	179	221	223	127	165	915
All ship sizes	461	550	544	212	254	2 021

Sources: Port of Brisbane Pty Ltd (2018), NSW Ports (2018), Port of Melbourne Operations Pty Ltd (2018), Flinders Ports (2018) and Fremantle Ports (2018)

CHAPTER 2
Measures of container terminal productivity

Overview

Chapter 2 of *Waterline* presents container terminal productivity measures. The indicators are in three groups—wharfside, 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 five quarterly landside productivity indicators are reported for trucks involved in VBS/TAS operations. Bulk run trucks are not included in calculating these indicators:

2.1 Containers per truck

2.2 TEUs per truck

2.3 Per cent of trucks backloaded

2.4 Average truck turnaround time

2.5 Average container turnaround time

Twelve indicators are reported for whole of container terminal productivity.

2.1 Median of ship turnaround time

2.2 95th percentile of ship turnaround time

2.3 Number of ships waiting at anchorage for more than 2 hours

2.4 Per cent of ships waiting at anchorage for more than 2 hours

2.5 Average waiting time at anchorage

2.6 Median waiting time at anchorage
2.7 Total time ships spent at berth
2.8 Average TEUs per ship-hour at berth
2.9 Average lifts per ship-hour at berth
2.10 Total time ships available to stevedores
2.11 Average lifts per hour of stevedoring operation
2.12 Average lifts per berth visit

The indicators are presented for Brisbane, Sydney, Melbourne, Adelaide, and Fremantle, as well as aggregates of the five ports, where applicable.

Wharfside 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 crane time (see details in Box 2.1).

Indicator 2.2 Elapsed labour rate—containers per hour

This indicator is computed as the number of containers handled divided by the total elapsed labour time (see details in Box 2.2). 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.

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.

Landside productivity measures

These indicators relate to the performance in processing containers through the formal vehicle booking systems (VBS and TAS). They do not include the performance of bulk run trucks.

Box 2.1 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 the sum of hours that each quay crane is allocated to a ship, 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 2.8 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.

Box 2.2 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
- Industrial stoppages
- Break bulk and containers that require manual interventions, e.g. use of wires, chains, non-rigid spreaders or other handling gear.

In contrast to 'crane time' (Box 2.1), elapsed labour time is not equivalent to the total labour-hours worked.

Indicator 2.10 Proportion of trucks backloaded

This indicator shows the number of backloaded trucks as a proportion of the total VBS/TAS trucks. It was published for the first time in Waterline 57.

'Backloaded operations' refers to trucks which haul containers on both the inbound and outbound legs of a single trip. Such operations make more effective use of trucks and landside infrastructure.

Indicator 2.11 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 last container is loaded. It 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 quickly a stevedoring company processes trucks at a container terminal.

Indicator 2.12 Average container turnaround time

This indicator is calculated as the 'average truck turnaround time' (Indicator 2.11) 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 2.13 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 2.14 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 2.15 Number of ships waiting at 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, either at the terminal, the ship, or both.

Indicator 2.16 Proportion of ships waiting at anchorage for more than 2 hours

This is the number of container ships in Indicator 2.15 as a proportion of the total number of container ships that visited the container terminal in the period.

Indicator 2.17 Average waiting time at 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 2.18 Median waiting time at 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 2.19 Total time ships spent at 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 2.20 Average TEUs per ship-hour at berth

This is the total TEUs lifted on/off dedicated container ships (UCC) divided by the total time ship spent in berth (Indicator 2.19). The indicator is strongly influenced by changes in average number of TEUs exchanged per visiting ships and by the mix of ship sizes during the period. The average number of TEUs exchanged also varies seasonally and cyclically.

Indicator 2.21 Average lifts per ship-hour at berth

This indicator is similar to Indicator 2.20 whereas the total crane lifts (containers handled) is used in calculating the indicator rather than the number of TEUs.

Indicator 2.22 Total time ships are available to stevedores

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

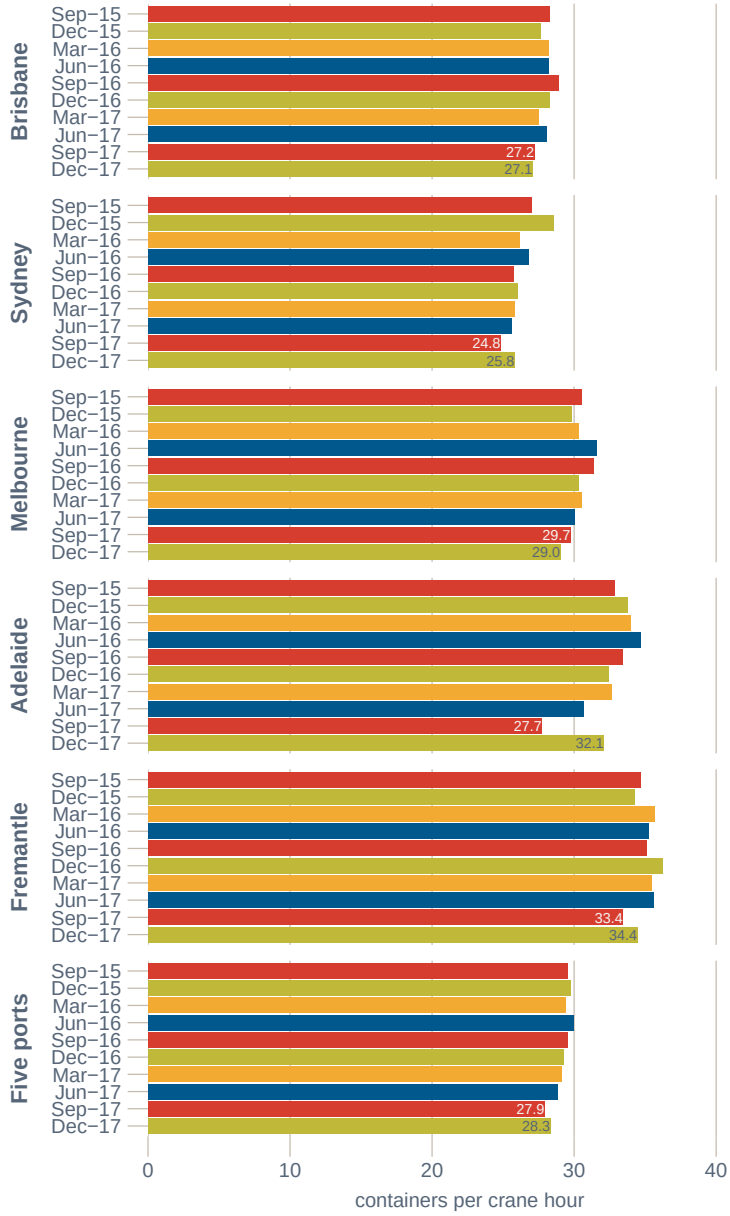
Indicator 2.23 Average lifts per hour of stevedoring operation

This is the total number of crane lifts (containers handled) divided by the total (gross) time available to stevedores for loading and unloading containers.

Indicator 2.24 Average lifts per berth visit

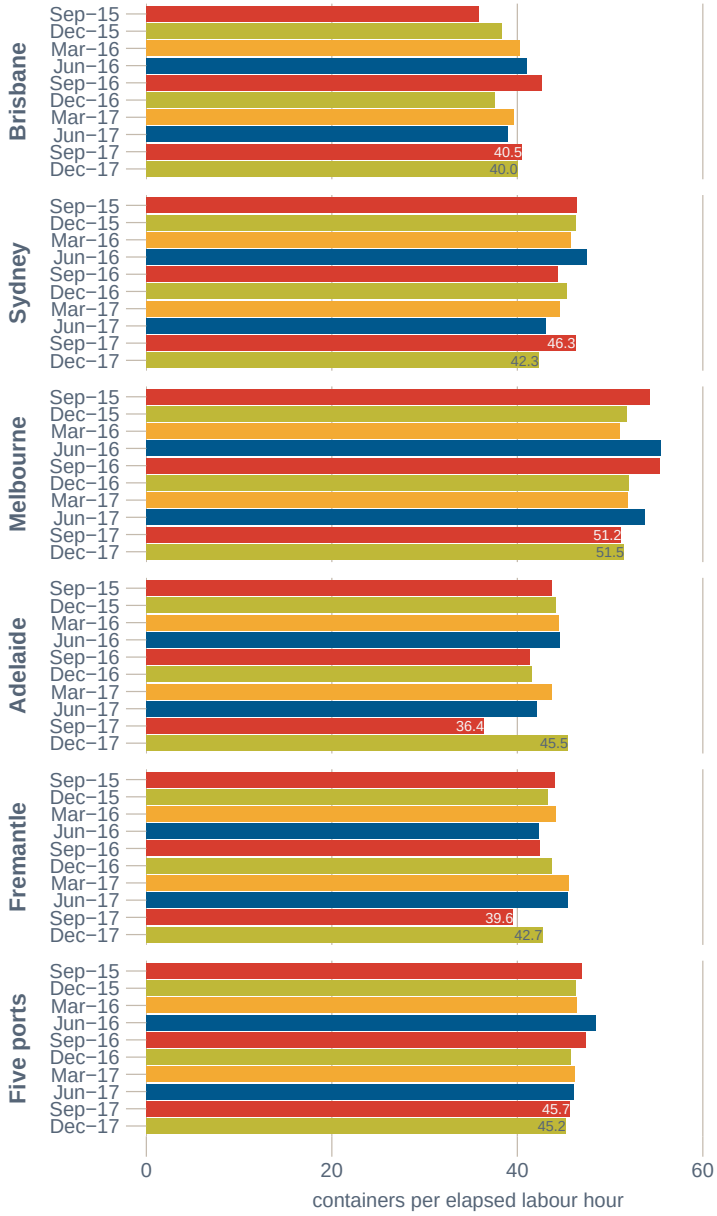
This is the number of crane lifts (containers handled) divided by the number of berth visits of dedicated container ships (UCC).

Figure 2.1 Wharf-side crane rate



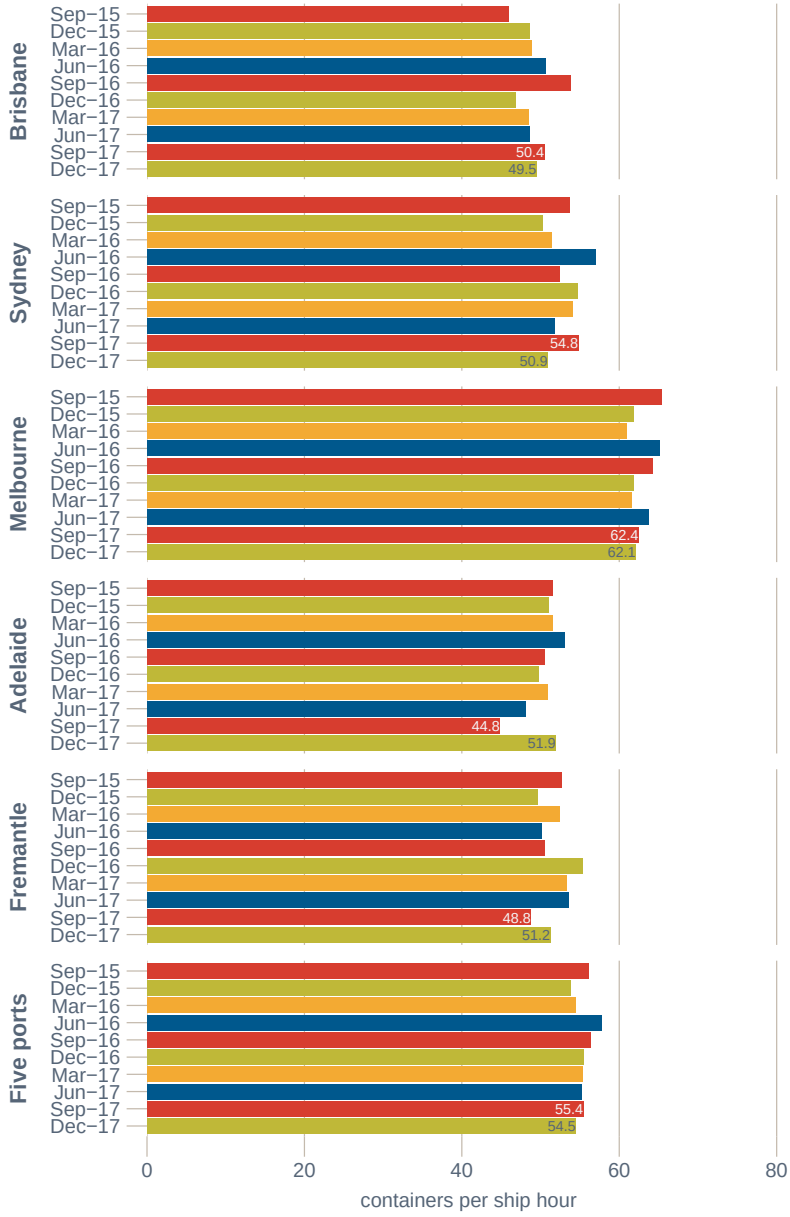
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Figure 2.2 Wharf-side elapsed labour rate



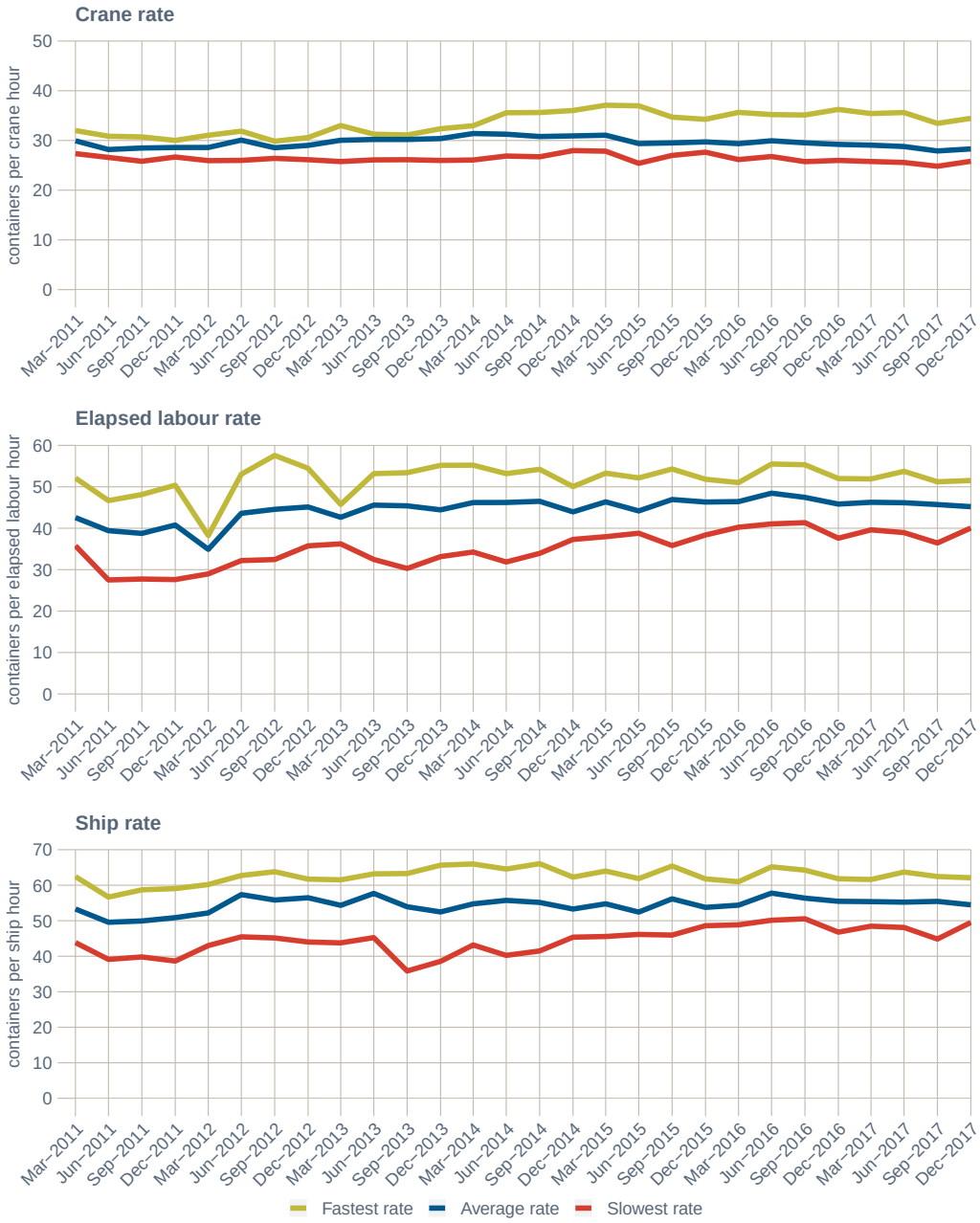
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Figure 2.3 Wharf-side ship rate



Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

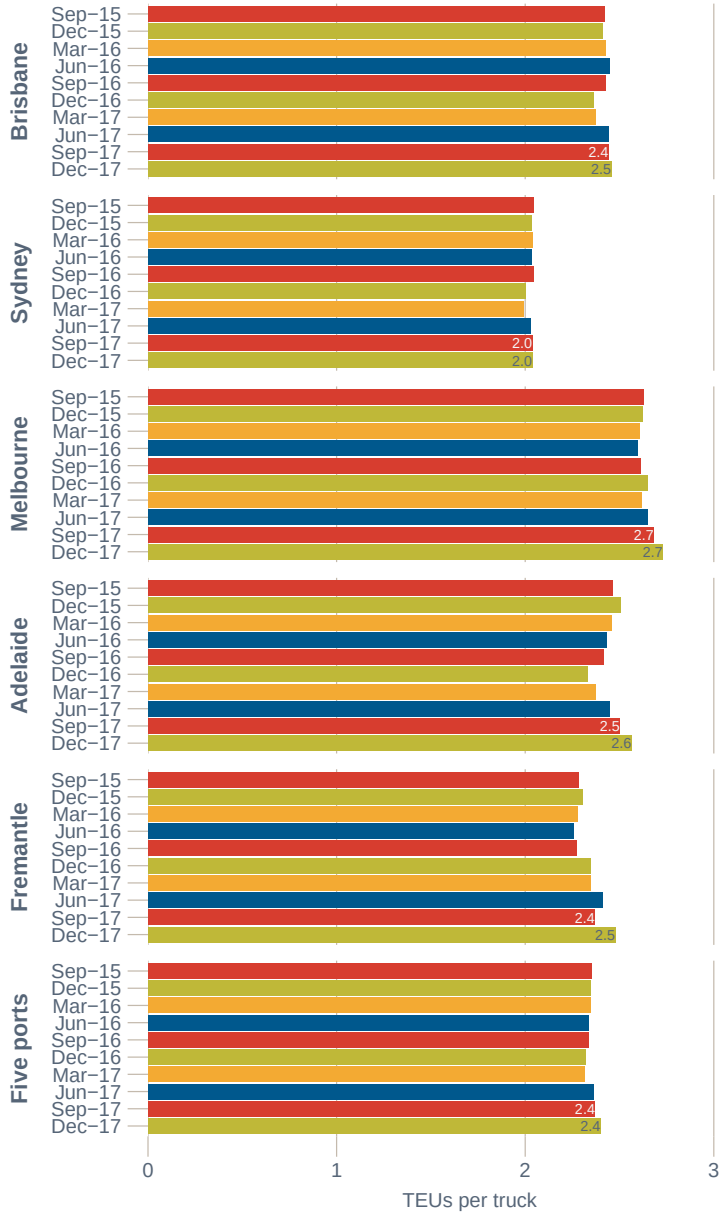
Figure 2.4 Productivity in five ports: Comparison of wharfside rates



Note: 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. The average rate is weighted by the TEU throughput at each port.
Crane rate, labour rate and ship rate are measured in containers per crane hour, elapsed labour hour and berth hour respectively.

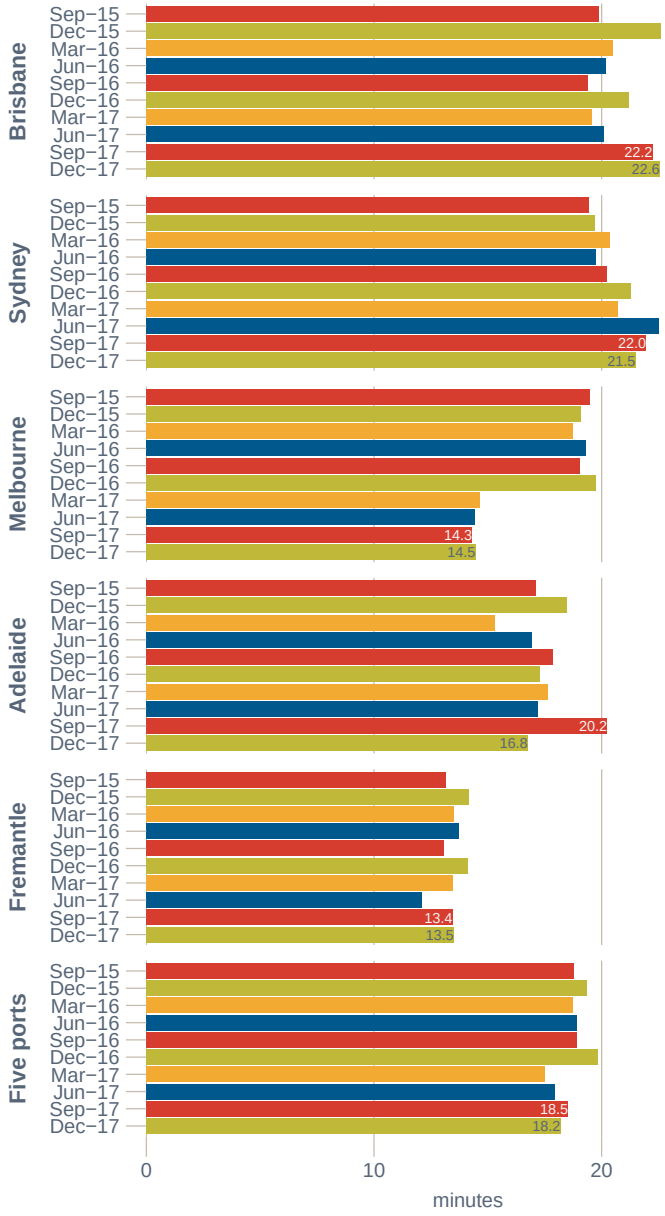
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Figure 2.5 Average TEUs per truck on landside of container terminals



Note: This indicator is based on only the trucks that are processed through the VBS/TAS system.
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

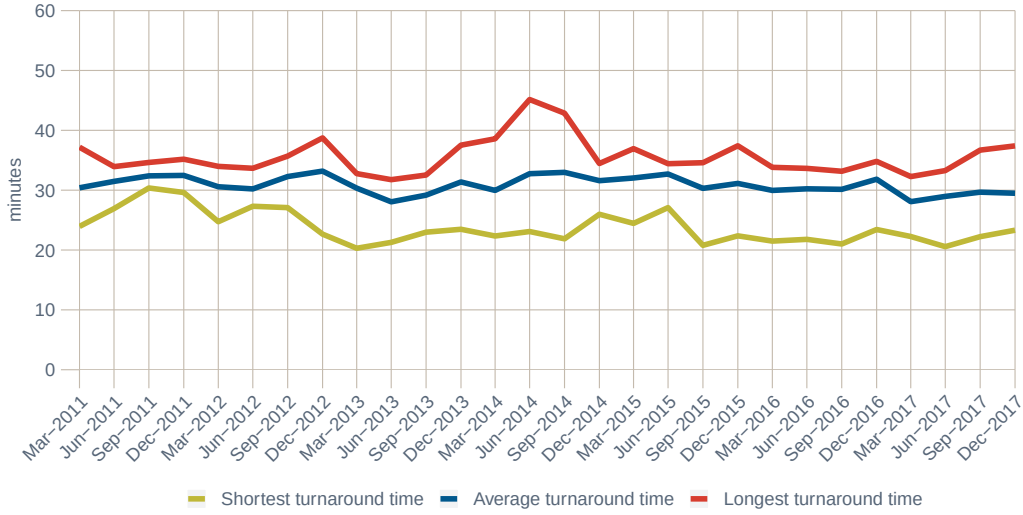
Figure 2.6 Average container turnaround time on landside of container terminals



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

Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

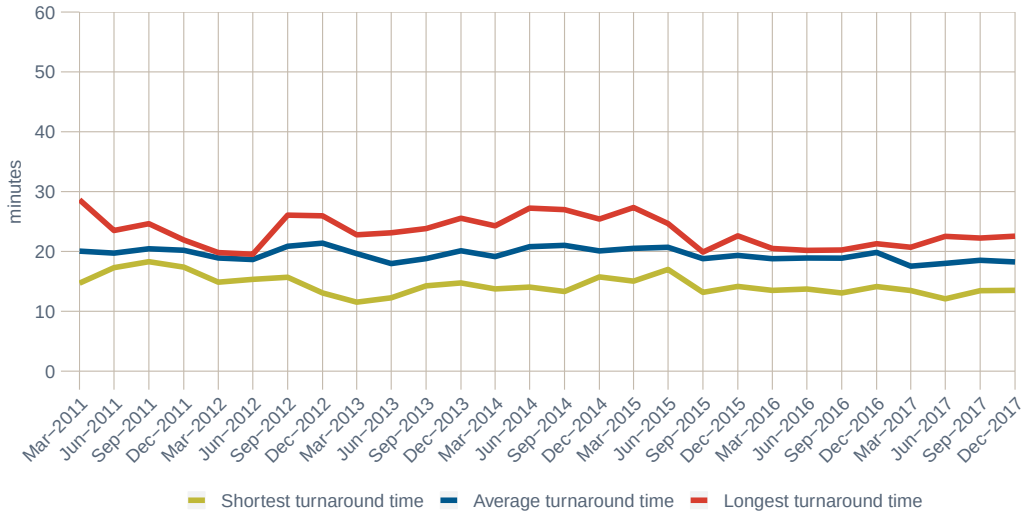
Figure 2.7 Longest and shortest truck turnaround time in five ports



Note: 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. The average rate is weighted by the TEU throughput at each port.

Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

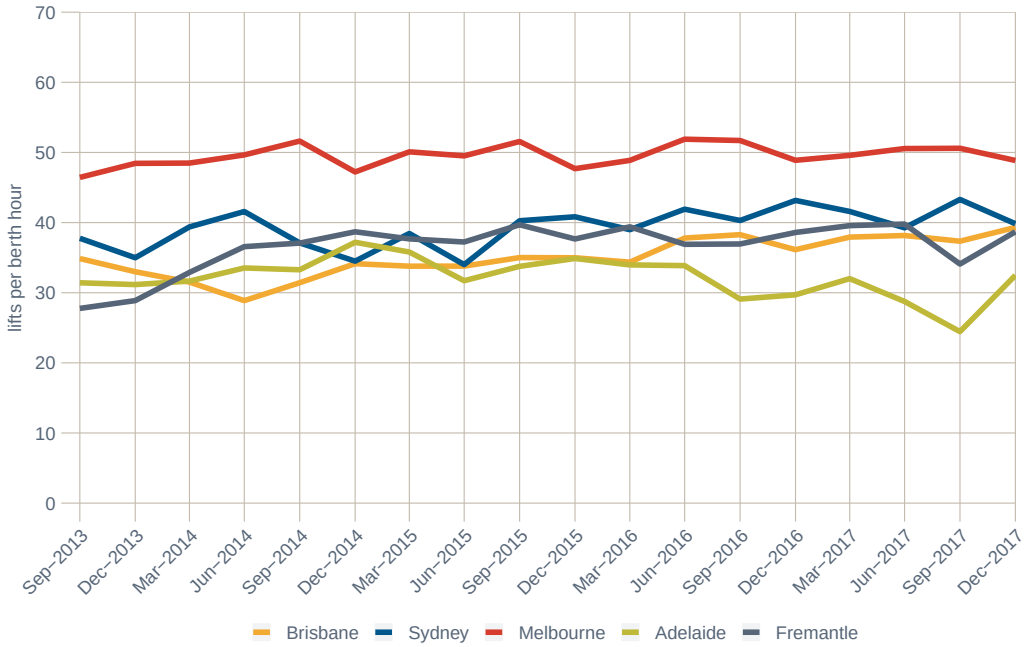
Figure 2.8 Longest and shortest container turnaround time in five ports



Note: 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. The average rate is weighted by the TEU throughput at each port.

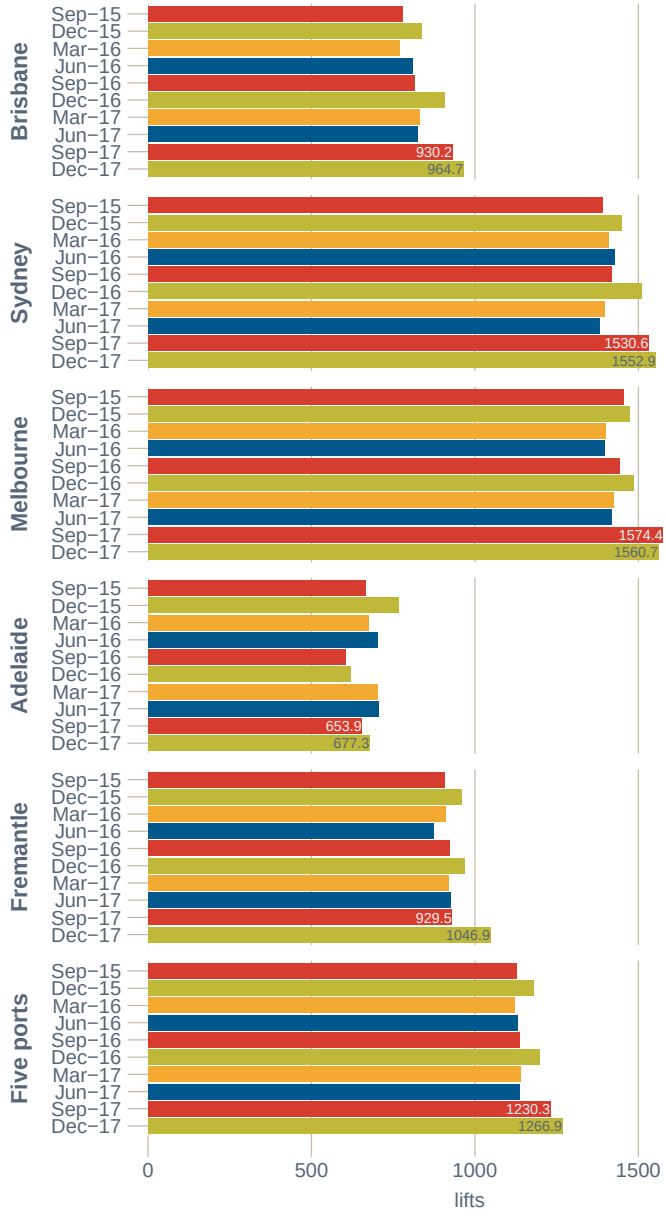
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

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



Sources: BITRE estimates based on data from Port of Brisbane Pty Ltd (2018), NSW Ports (2018), Port of Melbourne Operations Pty Ltd (2018), Flinders Ports (2018) and Fremantle Ports (2018)

Figure 2.10 Average number of lifts per berth visit



Sources: BITRE estimates based on data from Port of Brisbane Pty Ltd (2018), NSW Ports (2018), Port of Melbourne Operations Pty Ltd (2018), Flinders Ports (2018) and Fremantle Ports (2018)

Table 2.1 Container terminal productivity: Brisbane

	2015			2016						2017					
	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	28.3	27.6	**27.9**	28.2	28.2	**28.2**	28.9	28.2	**28.6**	27.5	28.0	**27.8**	27.2	27.1	**27.1**
Elapsed labour rate	35.8	38.4	**37.1**	40.2	41.0	**40.6**	42.7	37.6	**40.0**	39.6	38.9	**39.3**	40.5	40.0	**40.3**
Ship rate	46.0	48.6	**47.3**	48.8	50.6	**49.7**	53.8	46.8	**50.1**	48.5	48.6	**48.5**	50.4	49.5	**50.0**
TEUs per hour															
Crane rate	42.3	41.3	**41.8**	42.5	42.0	**42.2**	43.7	41.9	**42.7**	40.9	42.2	**41.6**	41.8	41.6	**41.7**
Elapsed labour rate	53.7	57.3	**55.5**	60.6	61.1	**60.9**	64.4	55.7	**59.9**	59.0	58.7	**58.9**	62.4	61.8	**62.1**
Ship rate	69.0	72.6	**70.9**	73.6	75.4	**74.5**	81.2	69.3	**75.0**	72.1	73.2	**72.7**	77.5	76.3	**76.9**
Containers per berth metre	79.3	83.5	**81.4**	71.3	74.3	**72.8**	80.6	88.4	**84.5**	77.8	78.8	**78.3**	89.5	91.0	**90.3**
Landside															
Containers per truck	1.7	1.7	**1.7**	1.7	1.7	**1.7**	1.6	1.6	**1.6**	1.7	1.7	**1.7**	1.7	1.7	**1.7**
TEUs per truck	2.4	2.4	**2.4**	2.4	2.4	**2.4**	2.4	2.4	**2.4**	2.4	2.4	**2.4**	2.4	2.5	**2.4**
Per cent of trucks backloaded *(%)*	9.5	9.4	**9.5**	10.8	11.9	**11.3**	12.4	11.5	**11.9**	12.8	13.7	**13.2**	13.1	12.9	**13.0**
Average truck turnaround time *(mins)*	32.9	37.4	**35.2**	33.8	33.6	**33.7**	31.9	34.8	**33.4**	32.3	33.3	**32.8**	36.7	37.4	**37.1**
Average container turnaround time *(mins)*	19.9	22.6	**21.2**	20.5	20.2	**20.3**	19.4	21.2	**20.3**	19.6	20.1	**19.8**	22.2	22.6	**22.4**
Whole of container terminal															
Ship turnaround time															
Median of ship turnaround time *(hours)*	27.9	30.1	**29.0**	27.6	28.0	**27.9**	27.5	30.5	**29.2**	28.7	28.9	**28.8**	31.6	31.7	**31.7**
95th percentile of ship turnaround time *(hours)*	54.5	56.8	**56.1**	49.2	40.3	**45.4**	44.9	76.8	**56.1**	42.7	41.1	**42.5**	52.8	53.1	**53.0**
Port congestion															
Number of ships waiting at anchorage for more than 2 hours	15	17	**32**	8	4	**12**	10	23	**33**	13	10	**23**	11	13	**24**
Per cent of ships waiting at anchorage for more than 2 hours *(%)*	6.1	7.1	**6.6**	3.5	1.8	**2.6**	4.1	9.7	**6.9**	5.7	4.3	**5.0**	4.7	5.7	**5.2**
Average waiting time at anchorage *(hours)*	17.3	14.4	**15.7**	7.1	11.6	**8.6**	79.0	22.9	**39.9**	10.6	13.7	**11.9**	16.6	22.1	**19.6**
Median waiting time at anchorage *(hours)*	13.8	8.3	**11.1**	5.7	4.8	**5.7**	12.4	15.8	**13.0**	10.6	11.2	**10.6**	14.4	11.8	**14.3**
Total time ships spent at berth *('000 hours)*	5.5	5.8	**11.2**	5.1	4.8	**9.9**	5.2	5.9	**11.1**	5.0	5.0	**10.0**	5.8	5.6	**11.4**
Average TEUs per ship-hour at berth *(TEUs per hour)*	52.3	51.9	**52.1**	51.3	56.0	**53.6**	57.5	53.6	**55.4**	56.5	57.5	**57.0**	57.4	60.6	**59.0**
Average lifts per ship-hour at berth *(lifts per hour)*	35.0	35.0	**35.0**	34.4	37.8	**36.0**	38.3	36.1	**37.1**	37.9	38.2	**38.0**	37.3	39.3	**38.3**
Total time ships are available to stevedores *('000 hours)*	5.8	5.8	**11.6**	4.6	4.7	**9.2**	5.0	5.9	**10.9**	5.0	5.1	**10.0**	5.6	5.7	**11.3**
Average lifts per hour of stevedoring operation *(lifts per hour)*	32.8	35.0	**33.9**	38.3	39.0	**38.6**	40.2	36.1	**38.0**	38.4	37.8	**38.1**	39.0	38.4	**38.7**
Average lifts per berth visit *(lifts)*	777.0	836.5	**806.4**	769.0	808.8	**788.9**	814.2	908.3	**860.4**	829.5	824.1	**826.8**	930.2	964.7	**947.3**

Note: Cells may not sum to totals due to rounding.

Sources: DP World (2018), Hutchison Ports Australia (2018), Patrick (2018), Port of Brisbane Pty Ltd (2018) and Maritime Safety Queensland (2018)

Table 2.2 Container terminal productivity: Sydney

	2015			2016						2017					
	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	27.0	28.5	**27.8**	26.2	26.8	**26.5**	25.7	26.0	**25.9**	25.8	25.6	**25.7**	24.8	25.8	**25.3**
Elapsed labour rate	46.4	46.3	**46.3**	45.7	47.5	**46.6**	44.4	45.4	**44.9**	44.6	43.1	**43.8**	46.3	42.3	**44.2**
Ship rate	53.7	50.2	**51.9**	51.3	56.9	**54.1**	52.4	54.7	**53.6**	54.1	51.8	**52.9**	54.8	50.9	**52.8**
TEUs per hour															
Crane rate	41.7	44.2	**43.0**	40.3	41.1	**40.7**	39.8	40.0	**39.9**	39.8	39.5	**39.7**	38.4	40.3	**39.4**
Elapsed labour rate	71.7	71.8	**71.8**	70.8	73.3	**72.0**	69.3	70.7	**70.0**	69.2	67.0	**68.1**	72.0	66.4	**69.1**
Ship rate	82.9	77.8	**80.3**	79.5	87.8	**83.7**	81.6	85.0	**83.3**	83.8	80.5	**82.1**	85.1	79.8	**82.3**
Containers per berth metre	107.1	109.8	**108.4**	100.7	100.3	**100.5**	108.8	113.6	**111.2**	103.1	109.1	**106.1**	116.0	123.2	**119.6**
Landside															
Containers per truck	1.4	1.4	**1.4**	1.4	1.4	**1.4**	1.4	1.4	**1.4**	1.4	1.4	**1.4**	1.4	1.4	**1.4**
TEUs per truck	2.0	2.0	**2.0**	2.0	2.0	**2.0**	2.0	2.0	**2.0**	2.0	2.0	**2.0**	2.0	2.0	**2.0**
Per cent of trucks backloaded *(%)*	8.5	8.7	**8.6**	8.9	10.7	**9.8**	9.2	8.6	**8.9**	7.9	8.6	**8.3**	8.3	7.4	**7.9**
Average truck turnaround time *(mins)*	27.7	28.1	**27.9**	28.7	27.9	**28.3**	28.8	30.3	**29.6**	29.3	32.0	**30.7**	30.9	30.0	**30.5**
Average container turnaround time *(mins)*	19.5	19.7	**19.6**	20.4	19.7	**20.0**	20.2	21.3	**20.8**	20.7	22.5	**21.6**	22.0	21.5	**21.7**
Whole of container terminal															
Ship turnaround time															
Median of ship turnaround time *(hours)*	32.1	33.9	**32.5**	33.7	30.9	**31.8**	32.2	34.1	**33.7**	32.4	33.6	**32.9**	32.9	37.0	**35.5**
95th percentile of ship turnaround time *(hours)*	60.3	57.4	**57.7**	66.5	62.5	**64.8**	56.5	53.5	**55.4**	55.1	62.5	**56.9**	58.0	65.5	**62.4**
Port congestion															
Number of ships waiting at anchorage for more than 2 hours	55	42	**97**	49	37	**86**	45	34	**79**	30	31	**61**	43	60	**103**
Per cent of ships waiting at anchorage for more than 2 hours *(%)*	19.9	15.5	**17.7**	19.0	14.5	**16.8**	16.4	12.5	**14.5**	11.2	11.0	**11.1**	15.7	21.8	**18.8**
Average waiting time at anchorage *(hours)*	15.7	12.5	**14.3**	29.2	13.4	**22.4**	91.0	13.0	**57.4**	12.3	9.3	**10.8**	14.7	17.7	**16.5**
Median waiting time at anchorage *(hours)*	8.6	6.4	**7.4**	7.6	8.6	**7.9**	6.4	5.8	**6.4**	5.5	6.2	**5.8**	8.0	8.9	**8.2**
Total time ships spent at berth *('000 hours)*	9.6	9.6	**19.2**	9.3	8.7	**18.0**	9.6	9.5	**19.1**	9.0	9.9	**18.9**	9.7	10.7	**20.4**
Average TEUs per ship-hour at berth *(TEUs per hour)*	62.0	63.2	**62.6**	60.0	64.3	**62.1**	62.3	66.7	**64.5**	64.4	60.8	**62.5**	67.2	62.3	**64.7**
Average lifts per ship-hour at berth *(lifts per hour)*	40.3	40.8	**40.5**	39.0	41.9	**40.4**	40.3	43.2	**41.7**	41.6	39.3	**40.4**	43.3	39.8	**41.5**
Total time ships are available to stevedores *('000 hours)*	8.5	8.7	**17.2**	8.1	8.1	**16.2**	9.4	9.5	**18.9**	8.5	9.6	**18.1**	9.2	10.7	**19.9**
Average lifts per hour of stevedoring operation *(lifts per hour)*	45.2	45.0	**45.1**	44.7	45.1	**44.9**	41.4	43.2	**42.3**	44.0	40.4	**42.1**	45.5	39.9	**42.5**
Average lifts per berth visit *(lifts)*	1 390.8	1 447.6	**1 418.9**	1 408.8	1 426.6	**1 417.6**	1 417.9	1 511.0	**1 464.2**	1 396.4	1 380.8	**1 388.4**	1 530.6	1 552.9	**1 541.6**

Note: Cells may not sum to totals due to rounding.

Sources: DP World (2018), Hutchison Ports Australia (2018), Patrick (2018), NSW Ports (2018) and Port Authority of New South Wales (2018)

Table 2.3 Container terminal productivity: Melbourne

	2015			2016						2017					
	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	30.5	29.8	**30.2**	30.3	31.5	**30.9**	31.4	30.3	**30.8**	30.5	30.0	**30.3**	29.7	29.0	**29.4**
Elapsed labour rate	54.3	51.8	**53.1**	51.0	55.5	**53.2**	55.3	52.0	**53.6**	51.9	53.7	**52.8**	51.2	51.5	**51.4**
Ship rate	65.4	61.8	**63.6**	61.0	65.2	**63.1**	64.2	61.8	**63.0**	61.6	63.7	**62.7**	62.4	62.1	**62.3**
TEUs per hour															
Crane rate	45.9	44.8	**45.3**	45.5	47.4	**46.4**	47.5	46.2	**46.9**	45.9	45.7	**45.8**	45.2	44.1	**44.7**
Elapsed labour rate	81.9	78.0	**80.0**	76.8	83.6	**80.2**	84.0	79.3	**81.6**	78.3	82.1	**80.3**	78.3	78.5	**78.4**
Ship rate	99.0	93.3	**96.1**	92.1	98.3	**95.2**	97.7	94.3	**96.0**	93.1	97.6	**95.4**	95.6	94.9	**95.2**
Containers per berth metre	182.4	183.2	**182.8**	174.0	171.2	**172.6**	181.6	186.6	**184.1**	135.0	140.0	**137.5**	150.2	154.6	**152.4**
Landside															
Containers per truck	1.8	1.8	**1.8**	1.7	1.7	**1.7**	1.7	1.8	**1.8**	1.8	1.8	**1.8**	1.8	1.8	**1.8**
TEUs per truck	2.6	2.6	**2.6**	2.6	2.6	**2.6**	2.6	2.6	**2.6**	2.6	2.6	**2.6**	2.7	2.7	**2.7**
Per cent of trucks backloaded *(%)*	16.5	15.2	**15.9**	14.9	15.9	**15.4**	16.6	15.5	**16.0**	16.7	17.2	**16.9**	17.3	17.7	**17.5**
Average truck turnaround time *(mins)*	34.6	33.5	**34.1**	32.7	33.6	**33.2**	33.2	34.8	**34.0**	25.9	25.6	**25.7**	25.5	26.2	**25.9**
Average container turnaround time *(mins)*	19.5	19.1	**19.3**	18.7	19.3	**19.0**	19.0	19.7	**19.4**	14.6	14.4	**14.5**	14.3	14.5	**14.4**
Whole of container terminal															
Ship turnaround time															
Median of ship turnaround time *(hours)*	35.3	37.5	**36.3**	35.4	33.0	**34.0**	35.5	37.9	**36.8**	36.4	35.9	**36.0**	39.4	40.0	**39.7**
95th percentile of ship turnaround time *(hours)*	47.9	60.7	**56.8**	60.4	50.7	**57.0**	70.3	57.7	**59.5**	53.1	49.5	**51.7**	64.4	64.6	**64.6**
Port congestion															
Number of ships waiting at anchorage for more than 2 hours	5	2	**7**	3	2	**5**	1	2	**3**	4	1	**5**	8	8	**16**
Per cent of ships waiting at anchorage for more than 2 hours *(%)*	1.8	0.7	**1.3**	1.1	0.8	**0.9**	0.4	0.7	**0.5**	1.5	0.4	**0.9**	3.0	2.9	**2.9**
Average waiting time at anchorage *(hours)*	19.4	14.8	**18.1**	14.7	63.9	**34.3**	3.7	8.6	**7.0**	9.9	75.1	**23.0**	28.1	25.6	**26.8**
Median waiting time at anchorage *(hours)*	20.4	14.8	**20.0**	10.9	63.9	**30.8**	3.7	8.6	**6.5**	7.7	75.1	**12.3**	23.4	20.3	**20.3**
Total time ships spent at berth *('000 hours)*	7.6	8.2	**15.9**	7.7	7.1	**14.8**	7.7	8.2	**15.9**	7.7	7.7	**15.4**	8.3	8.8	**17.2**
Average TEUs per ship-hour at berth *(TEUs per hour)*	77.8	71.9	**74.8**	73.7	78.2	**75.9**	78.6	74.6	**76.5**	74.9	77.1	**76.0**	77.3	74.6	**75.9**
Average lifts per ship-hour at berth *(lifts per hour)*	51.6	47.7	**49.6**	48.9	51.9	**50.3**	51.7	48.9	**50.2**	49.6	50.6	**50.1**	50.6	48.9	**49.7**
Total time ships are available to stevedores *('000 hours)*	7.4	7.8	**15.2**	7.5	6.8	**14.2**	7.2	7.9	**15.1**	7.5	7.5	**15.0**	8.4	8.6	**17.0**
Average lifts per hour of stevedoring operation *(lifts per hour)*	53.5	50.4	**51.9**	50.2	54.6	**52.3**	55.3	50.8	**53.0**	51.3	52.2	**51.7**	50.2	50.3	**50.2**
Average lifts per berth visit *(lifts)*	1 453.1	1 472.5	**1 462.7**	1 400.1	1 396.8	**1 398.5**	1 441.7	1 484.8	**1 463.0**	1 423.8	1 419.1	**1 421.4**	1 574.4	1 560.7	**1 567.5**

Note: Cells may not sum to totals due to rounding.
Whole of container terminal refers to East and West Swanson Docks and Webb Dock East.

Sources: DP World (2018), Patrick (2018), Port of Melbourne Operations Pty Ltd (2018) and Victoria International Container Terminal (2018)

Table 2.4 Container terminal productivity: Adelaide

	2015			2016						2017					
	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	32.9	33.7	**33.3**	34.0	34.7	**34.3**	33.4	32.4	**32.9**	32.7	30.7	**31.7**	27.7	32.1	**29.9**
Elapsed labour rate	43.7	44.1	**43.9**	44.5	44.6	**44.6**	41.3	41.6	**41.5**	43.7	42.1	**42.9**	36.4	45.5	**41.0**
Ship rate	51.5	51.0	**51.2**	51.6	53.0	**52.3**	50.5	49.8	**50.2**	50.8	48.1	**49.4**	44.8	51.9	**48.4**
TEUs per hour															
Crane rate	47.1	47.6	**47.4**	50.0	50.0	**50.0**	48.3	44.9	**46.5**	45.0	42.7	**43.8**	40.3	45.4	**42.8**
Elapsed labour rate	62.7	62.2	**62.4**	65.5	64.2	**64.9**	59.7	57.5	**58.6**	60.2	58.7	**59.4**	53.0	64.3	**58.6**
Ship rate	73.8	71.9	**72.8**	75.9	76.3	**76.1**	73.0	68.9	**70.9**	70.0	67.0	**68.4**	65.2	73.5	**69.3**
Containers per berth metre	108.3	124.5	**116.4**	108.1	112.9	**110.5**	107.0	118.1	**112.6**	125.2	128.6	**126.9**	122.2	122.5	**122.4**
Landside															
Containers per truck	1.7	1.8	**1.7**	1.7	1.7	**1.7**	1.7	1.7	**1.7**	1.7	1.7	**1.7**	1.7	1.8	**1.8**
TEUs per truck	2.5	2.5	**2.5**	2.5	2.4	**2.4**	2.4	2.3	**2.4**	2.4	2.4	**2.4**	2.5	2.6	**2.5**
Per cent of trucks backloaded *(%)*	24.7	26.5	**25.7**	23.9	24.5	**24.2**	22.6	23.2	**22.9**	26.3	29.5	**27.9**	27.6	28.7	**28.1**
Average truck turnaround time *(mins)*	29.3	32.6	**31.0**	25.6	28.6	**27.1**	29.8	29.0	**29.4**	30.2	29.8	**30.0**	34.9	30.0	**32.5**
Average container turnaround time *(mins)*	17.1	18.5	**17.8**	15.3	16.9	**16.1**	17.9	17.3	**17.6**	17.6	17.2	**17.4**	20.2	16.8	**18.5**
Whole of container terminal															
Ship turnaround time															
Median of ship turnaround time *(hours)*	18.1	20.8	**20.0**	19.0	19.9	**19.6**	18.1	20.7	**19.1**	21.8	23.2	**22.9**	24.3	18.5	**22.8**
95th percentile of ship turnaround time *(hours)*	32.3	33.4	**33.0**	29.8	34.8	**33.0**	37.2	32.3	**35.3**	36.0	41.1	**39.2**	53.4	36.2	**46.3**
Port congestion															
Number of ships waiting at anchorage for more than 2 hours	5	4	**9**	6	5	**11**	8	16	**24**	11	18	**29**	25	12	**37**
Per cent of ships waiting at anchorage for more than 2 hours *(%)*	5.1	4.1	**4.6**	6.3	5.2	**5.8**	7.6	14.2	**11.0**	10.5	16.8	**13.7**	22.3	11.2	**16.9**
Average waiting time at anchorage *(hours)*	17.5	21.8	**19.4**	8.6	10.7	**9.6**	30.7	18.3	**22.5**	15.9	17.0	**16.5**	25.2	17.6	**22.8**
Median waiting time at anchorage *(hours)*	14.8	16.3	**14.8**	8.2	9.0	**9.0**	27.2	13.5	**17.9**	11.2	12.7	**12.2**	17.0	14.1	**17.0**
Total time ships spent at berth *('000 hours)*	1.9	2.1	**4.1**	1.9	2.0	**3.9**	2.2	2.4	**4.5**	2.3	2.6	**4.9**	3.0	2.2	**5.2**
Average TEUs per ship-hour at berth *(TEUs per hour)*	48.4	49.2	**48.8**	50.0	48.7	**49.4**	42.0	41.1	**41.5**	44.1	40.0	**41.9**	35.6	45.9	**40.0**
Average lifts per ship-hour at berth *(lifts per hour)*	33.8	34.9	**34.3**	34.0	33.9	**33.9**	29.1	29.7	**29.4**	32.0	28.8	**30.3**	24.5	32.5	**27.9**
Total time ships are available to stevedores *('000 hours)*	1.5	1.7	**3.2**	1.5	1.5	**3.0**	1.6	1.7	**3.3**	1.7	1.8	**3.5**	2.0	1.6	**3.6**
Average lifts per hour of stevedoring operation *(lifts per hour)*	43.8	43.9	**43.9**	43.9	44.4	**44.2**	40.8	41.1	**40.9**	43.0	41.1	**42.0**	36.4	44.8	**40.2**
Average lifts per berth visit *(lifts)*	665.0	766.8	**715.7**	673.7	701.9	**687.8**	602.7	619.5	**611.4**	703.5	704.4	**703.9**	653.9	677.3	**665.4**

Note: Cells may not sum to totals due to rounding.
Sources: Flinders Adelaide Container Terminal (2018) and Flinders Ports (2018)

Table 2.5 Container terminal productivity: Fremantle

	2015			2016						2017					
	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	34.7	34.3	**34.5**	35.6	35.2	**35.4**	35.1	36.2	**35.7**	35.4	35.6	**35.5**	33.4	34.4	**34.0**
Elapsed labour rate	44.1	43.3	**43.7**	44.1	42.3	**43.2**	42.4	43.8	**43.1**	45.6	45.4	**45.5**	39.6	42.7	**41.2**
Ship rate	52.7	49.6	**51.1**	52.4	50.1	**51.3**	50.5	55.3	**53.0**	53.3	53.6	**53.4**	48.8	51.2	**50.0**
TEUs per hour															
Crane rate	51.6	51.1	**51.4**	52.9	51.9	**52.4**	52.6	54.2	**53.4**	52.8	52.5	**52.7**	50.4	51.6	**51.1**
Elapsed labour rate	66.0	64.9	**65.5**	65.8	62.4	**64.1**	63.6	65.5	**64.6**	68.0	67.0	**67.5**	59.6	64.0	**61.9**
Ship rate	79.2	74.6	**76.8**	78.3	74.0	**76.2**	75.8	82.9	**79.5**	79.5	79.0	**79.3**	73.5	76.8	**75.2**
Containers per berth metre	92.2	99.0	**95.6**	89.9	85.9	**87.9**	92.0	98.4	**95.2**	90.5	91.1	**90.8**	97.8	105.4	**101.6**
Landside															
Containers per truck	1.6	1.6	**1.6**	1.6	1.6	**1.6**	1.6	1.7	**1.6**	1.7	1.7	**1.7**	1.7	1.7	**1.7**
TEUs per truck	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	2.5	**2.4**
Per cent of trucks backloaded *(%)*	11.0	11.1	**11.1**	11.5	12.0	**11.8**	11.9	12.0	**11.9**	12.2	12.4	**12.3**	11.9	12.4	**12.1**
Average truck turnaround time *(mins)*	20.8	22.4	**21.6**	21.5	21.8	**21.6**	21.0	23.4	**22.2**	22.3	20.6	**21.4**	22.2	23.3	**22.8**
Average container turnaround time *(mins)*	13.2	14.2	**13.7**	13.5	13.7	**13.6**	13.1	14.1	**13.6**	13.5	12.1	**12.8**	13.4	13.5	**13.5**
Whole of container terminal															
Ship turnaround time															
Median of ship turnaround time *(hours)*	23.9	27.5	**25.2**	25.1	24.7	**24.9**	26.5	27.4	**27.3**	24.1	24.3	**24.1**	29.0	29.1	**29.1**
95th percentile of ship turnaround time *(hours)*	44.7	61.6	**50.9**	46.3	49.2	**47.8**	50.3	46.0	**48.2**	48.8	40.4	**42.2**	69.8	56.2	**66.0**
Port congestion															
Number of ships waiting at anchorage for more than 2 hours	6	5	**11**	4	3	**7**	4	6	**10**	3	5	**8**	12	3	**15**
Per cent of ships waiting at anchorage for more than 2 hours *(%)*	4.5	3.8	**4.2**	3.1	2.3	**2.7**	3.2	4.7	**4.0**	2.4	3.9	**3.1**	9.1	2.4	**5.8**
Average waiting time at anchorage *(hours)*	13.7	28.1	**20.2**	29.6	18.3	**24.8**	16.5	14.4	**15.2**	13.9	13.1	**13.4**	15.9	17.3	**16.2**
Median waiting time at anchorage *(hours)*	11.7	23.8	**11.7**	13.4	16.1	**15.0**	15.2	11.0	**13.3**	17.5	13.9	**15.4**	13.4	6.2	**12.7**
Total time ships spent at berth *('000 hours)*	3.0	3.3	**6.3**	2.9	3.0	**6.0**	3.1	3.2	**6.3**	2.9	3.0	**5.9**	3.6	3.4	**7.0**
Average TEUs per ship-hour at berth *(TEUs per hour)*	59.6	56.7	**58.1**	58.9	54.6	**56.7**	55.5	57.9	**56.7**	59.1	58.7	**58.9**	51.3	58.0	**54.5**
Average lifts per ship-hour at berth *(lifts per hour)*	39.7	37.7	**38.6**	39.4	36.9	**38.1**	37.0	38.6	**37.8**	39.6	39.8	**39.7**	34.1	38.7	**36.3**
Total time ships are available to stevedores *('000 hours)*	2.7	3.0	**5.7**	2.6	2.7	**5.3**	2.8	2.9	**5.7**	2.6	2.6	**5.2**	3.3	3.2	**6.5**
Average lifts per hour of stevedoring operation *(lifts per hour)*	44.4	42.0	**43.2**	43.9	41.9	**42.9**	41.2	42.1	**41.6**	45.1	44.9	**45.0**	37.2	40.7	**38.9**
Average lifts per berth visit *(lifts)*	907.6	959.0	**933.1**	911.0	872.9	**891.8**	921.3	969.0	**945.2**	918.4	924.4	**921.4**	929.5	1 046.9	**986.8**

Note: Cells may not sum to totals due to rounding.
Sources: DP World (2018), Patrick (2018) and Fremantle Ports (2018)

Table 2.6 Container terminal productivity: Five ports

	2015			2016						2017					
	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	29.5	29.7	**29.6**	29.4	30.0	**29.7**	29.5	29.2	**29.4**	29.1	28.8	**28.9**	27.9	28.3	**28.1**
Elapsed labour rate	46.9	46.3	**46.6**	46.4	48.4	**47.4**	47.4	45.8	**46.6**	46.2	46.1	**46.2**	45.7	45.2	**45.4**
Ship rate	56.1	53.8	**54.9**	54.4	57.8	**56.1**	56.4	55.4	**55.9**	55.4	55.2	**55.3**	55.4	54.5	**54.9**
TEUs per hour															
Crane rate	44.5	44.8	**44.7**	44.3	45.0	**44.6**	44.8	44.1	**44.4**	43.7	43.5	**43.6**	42.6	43.2	**42.9**
Elapsed labour rate	71.1	70.2	**70.6**	70.4	73.2	**71.8**	72.4	69.7	**71.0**	69.9	70.3	**70.1**	70.2	69.3	**69.7**
Ship rate	85.2	81.4	**83.3**	82.6	87.3	**84.9**	85.9	84.3	**85.1**	83.7	84.1	**83.9**	85.1	83.5	**84.3**
Containers per berth metre	114.6	118.6	**116.6**	108.3	108.1	**108.2**	115.3	121.5	**118.4**	105.4	109.2	**107.3**	117.1	121.9	**119.5**
Landside															
Containers 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**
TEUs per truck	2.4	2.3	**2.4**	2.3	2.3	**2.3**	2.3	2.3	**2.3**	2.3	2.4	**2.3**	2.4	2.4	**2.4**
Per cent of trucks backloaded *(%)*	12.3	12.1	**12.2**	12.3	13.5	**12.9**	13.2	12.6	**12.9**	13.4	14.2	**13.8**	13.7	13.5	**13.6**
Average truck turnaround time *(mins)*	30.3	31.1	**30.7**	30.0	30.2	**30.1**	30.2	31.9	**31.0**	28.2	29.1	**28.6**	29.8	29.6	**29.7**
Average container turnaround time *(mins)*	18.8	19.3	**19.1**	18.7	18.9	**18.8**	18.9	19.8	**19.4**	17.5	18.0	**17.7**	18.5	18.2	**18.4**
Whole of container terminal															
Ship turnaround time															
Median of ship turnaround time *(hours)*	30.1	31.7	**30.9**	30.0	29.4	**29.7**	30.4	32.2	**31.2**	30.4	31.0	**30.6**	33.0	34.0	**33.6**
95th percentile of ship turnaround time *(hours)*	51.6	57.7	**55.6**	55.3	50.2	**52.9**	52.9	56.3	**54.6**	50.2	51.1	**50.4**	59.7	62.2	**61.5**
Port congestion															
Number of ships waiting at anchorage for more than 2 hours	86	70	**156**	70	51	**121**	68	81	**149**	61	65	**126**	99	96	**195**
Per cent of ships waiting at anchorage for more than 2 hours *(%)*	8.4	7.0	**7.7**	7.2	5.3	**6.2**	6.6	8.0	**7.3**	6.1	6.4	**6.2**	9.7	9.5	**9.6**
Average waiting time at anchorage *(hours)*	16.1	14.6	**15.5**	24.3	15.3	**20.5**	76.4	16.9	**44.1**	12.5	13.4	**13.0**	18.8	18.9	**18.9**
Median waiting time at anchorage *(hours)*	11.5	8.4	**9.9**	8.2	10.2	**8.5**	8.9	10.4	**9.5**	8.9	9.4	**9.3**	11.8	11.0	**11.4**
Total time ships spent at berth *('000 hours)*	27.6	29.1	**56.7**	26.9	25.6	**52.5**	27.9	29.2	**57.0**	27.0	28.2	**55.2**	30.4	30.8	**61.2**
Average TEUs per ship-hour at berth *(TEUs per hour)*	63.3	61.7	**62.4**	61.5	64.2	**62.8**	63.5	63.2	**63.4**	63.6	62.5	**63.1**	63.1	63.9	**63.5**
Average lifts per ship-hour at berth *(lifts per hour)*	41.8	40.8	**41.3**	40.6	42.7	**41.6**	41.8	41.8	**41.8**	42.2	41.2	**41.7**	41.2	41.7	**41.4**
Total time ships are available to stevedores *('000 hours)*	25.9	26.9	**52.8**	24.3	23.7	**48.0**	25.9	27.9	**53.8**	25.3	26.6	**51.8**	28.5	29.9	**58.3**
Average lifts per hour of stevedoring operation *(lifts per hour)*	44.6	44.0	**44.3**	45.0	46.2	**45.6**	45.0	43.6	**44.3**	45.1	43.7	**44.4**	44.0	42.9	**43.5**
Average lifts per berth visit *(lifts)*	1 128.1	1 179.0	**1 153.3**	1 121.0	1 129.5	**1 125.2**	1 135.7	1 197.6	**1 166.5**	1 140.4	1 137.1	**1 138.7**	1 230.3	1 266.9	**1 248.6**

Note: Cells may not sum to totals due to rounding.

Sources: DP World (2018), Patrick (2018), Hutchison Ports Australia (2018), Flinders Adelaide Container Terminal (2018), Victoria International Container Terminal (2018), Port of Brisbane Pty Ltd (2018), Maritime Safety Queensland (2018), Port Authority of New South Wales (2018), NSW Ports (2018), Port of Melbourne Operations Pty Ltd (2018), Flinders Ports (2018) and Fremantle Ports (2018)

CHAPTER 3
Vehicle booking system and empty container park operations

Overview

This chapter reports on three main indicator types:

1. The number of truck booking or appointment timeslots available at a container terminal
2. The number of truck booking or appointment timeslots used at a container terminal
3. The volume of container traffic through empty container parks

The data is derived from the vehicle booking systems used by the stevedores. 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 land-side 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 proportion 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 proportion 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 (Indicator 3.4) and weekend usage (Indicator 3.5).

Indicator 3.4 Timeslots used by trucks in Monday to Friday off-peak periods as proportion 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 proportion 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 proportion 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 proportion 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.

Indicator 3.7 Number of containers moved through empty container parks

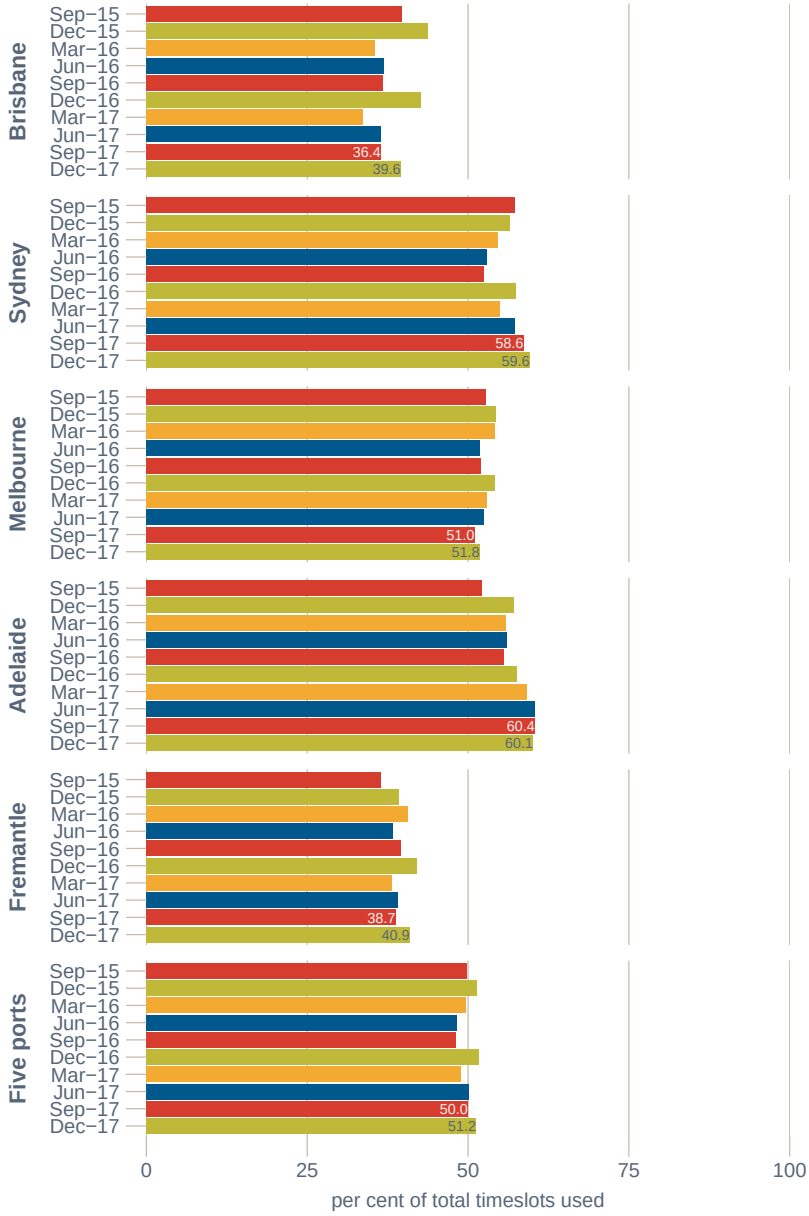
This indicator is a measure of the usage of empty container parks. It shows the number of notifications of container movements to empty container parks in the vicinity of each port.

Indicator 3.8 Number of TEUs moved through empty container parks

This indicator is a measure of the usage of empty container parks. It shows the number of TEUs moved in the operations shown by Indicator 3.7.

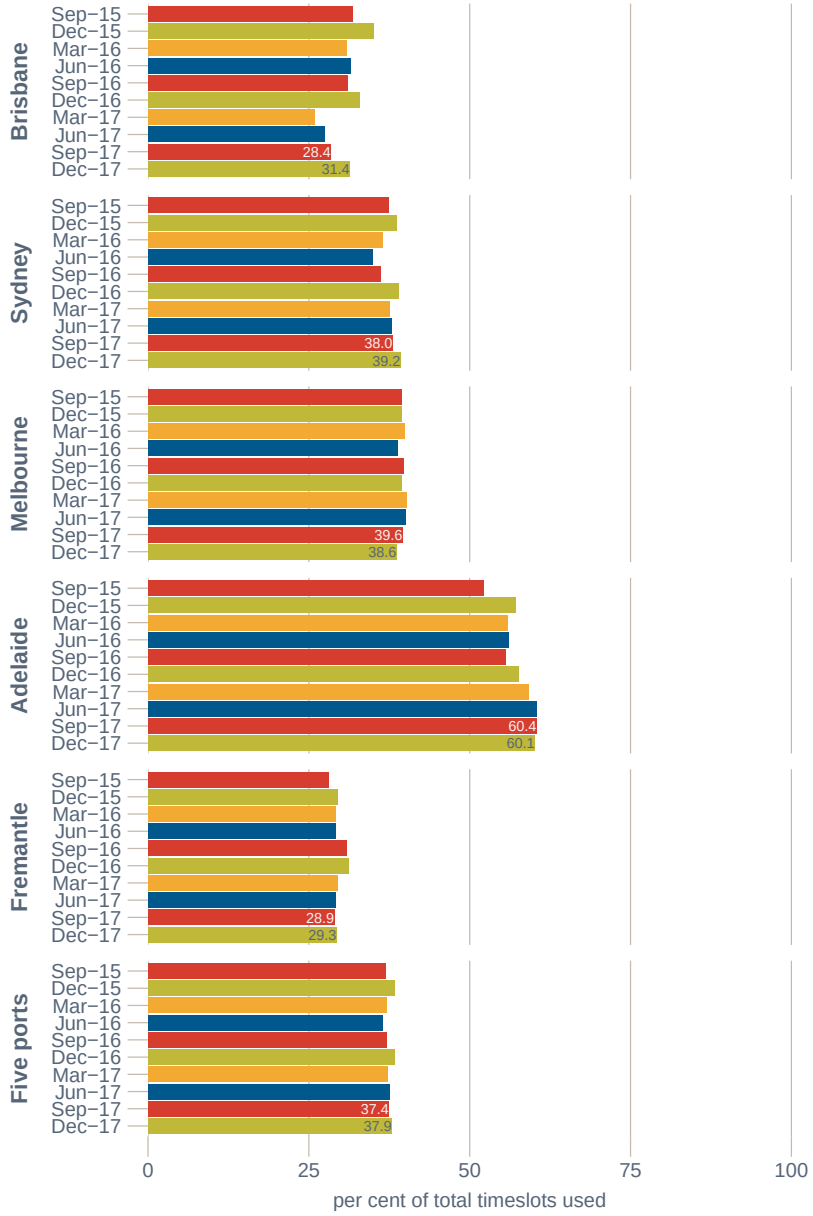
Aerial image of the Port Drive Upgrade at Port of Brisbane. Photo courtesy of Port of Brisbane Pty Ltd.

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



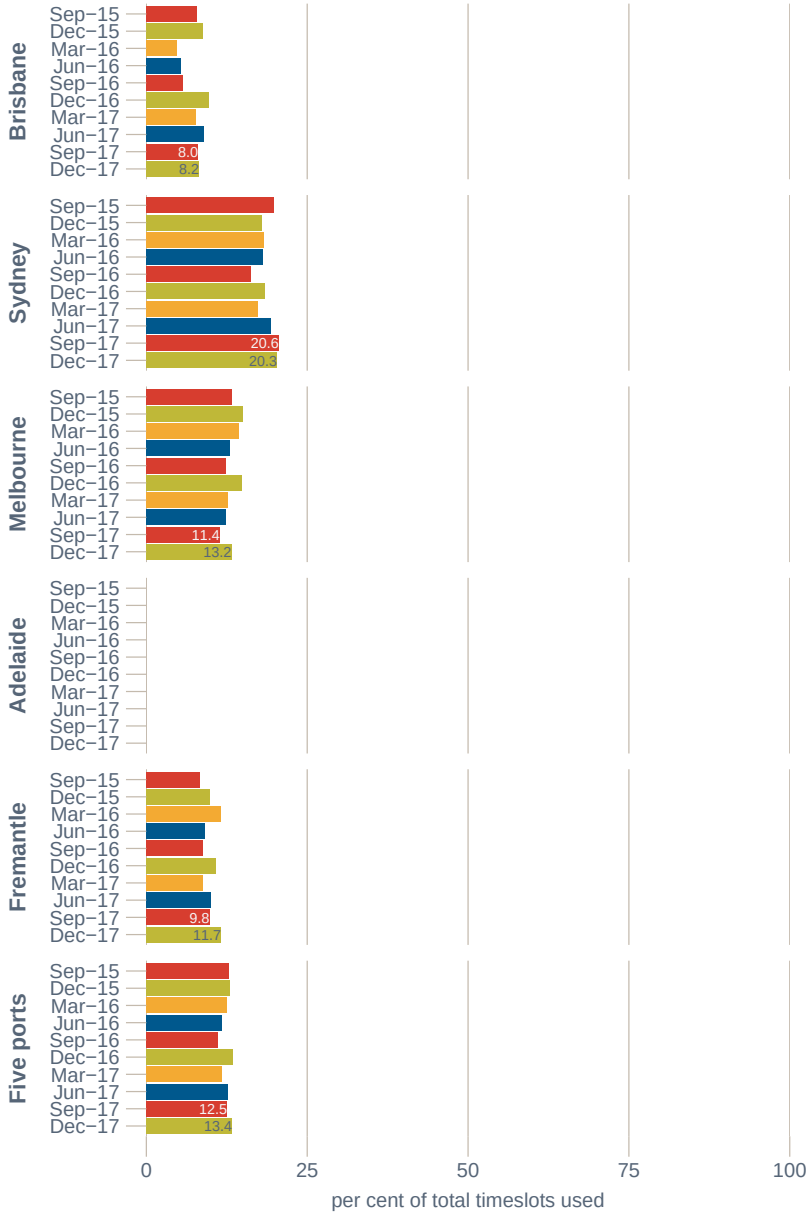
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

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



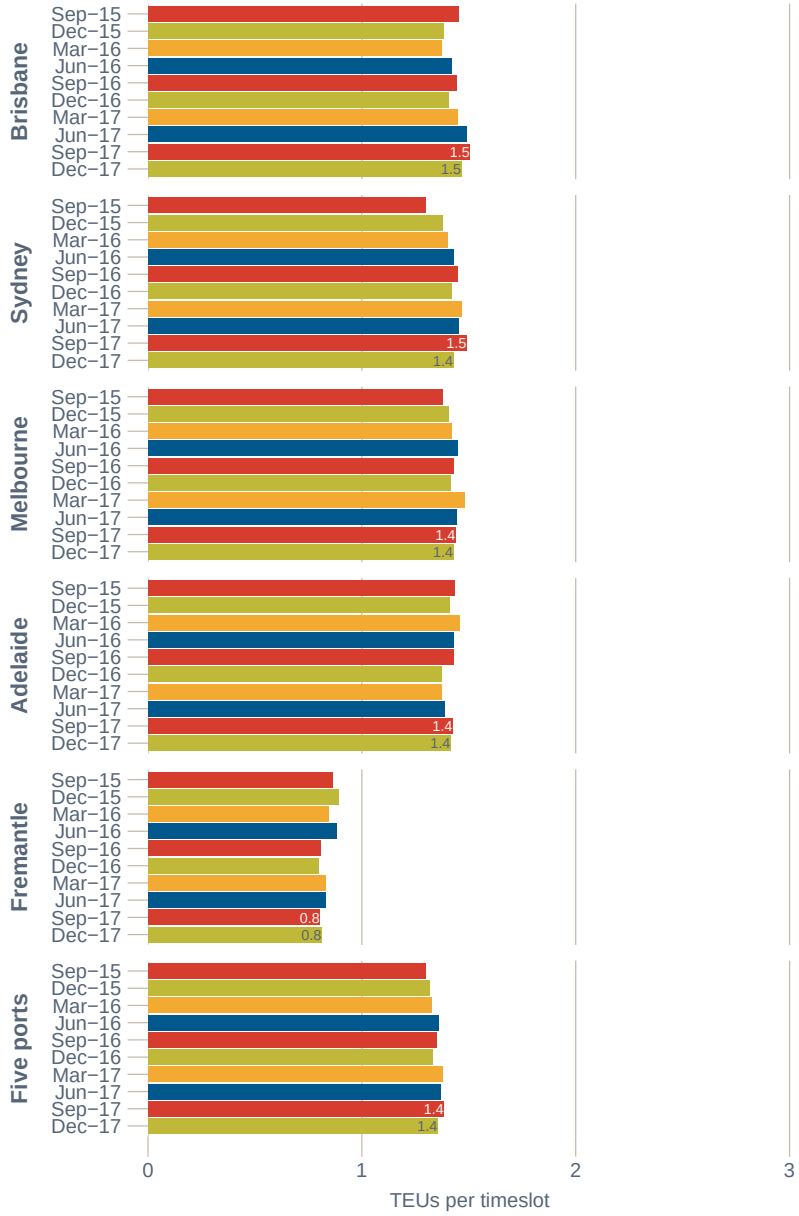
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Figure 3.3 Timeslots used by trucks on Saturday and Sunday



Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Figure 3.4 TEUs processed per VBS timeslot used at container terminals



Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Table 3.1 Timeslots available and actually used by trucks: Brisbane

	Weekday	Shift	2015		2016				2017			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Available *('000)*	Monday–Friday	Day	82.6	81.0	104.4	123.1	150.6	130.9	135.4	102.8	125.0	129.5
		Evening	26.4	28.2	32.9	40.4	50.8	52.6	51.8	34.5	44.4	49.6
		Night	16.3	21.5	21.4	28.8	38.2	39.7	29.8	15.8	22.1	27.3
		Sub-total	125.3	130.6	158.7	192.3	239.6	223.3	217.0	153.0	191.5	206.4
	Saturday	Day	10.2	8.3	5.2	5.8	6.5	15.8	24.0	17.7	19.3	23.5
		Evening	1.7	0.1	0.0	0.2	0.1	3.6	5.0	3.3	4.0	5.1
		Night	0.6	1.6	0.5	0.2	1.2	5.4	8.4	1.2	2.8	4.6
		Sub-total	12.4	10.0	5.7	6.3	7.8	24.8	37.3	22.2	26.1	33.1
	Sunday	Day	2.5	2.0	0.1	0.1	0.2	6.7	3.8	1.6	1.8	2.4
		Evening	0.1	0.0	0.0	0.0	0.0	0.9	1.0	0.0	0.0	0.4
		Night	0.9	0.8	0.5	0.6	0.6	2.1	1.3	0.7	0.8	0.9
		Sub-total	3.5	2.9	0.6	0.7	0.9	9.7	6.1	2.3	2.7	3.6
		Total timeslots available	141.2	143.5	165.1	199.2	248.4	257.8	260.4	177.4	220.3	243.2
Used *('000)*	Monday–Friday	Day	76.6	73.6	76.6	79.4	85.1	79.5	83.3	81.5	87.6	87.3
		Evening	24.7	25.5	22.5	24.5	25.6	27.6	23.3	24.3	26.5	27.9
		Night	15.8	20.4	14.1	15.1	16.2	18.1	9.2	10.9	12.6	17.4
		Sub-total	117.1	119.5	113.2	119.1	126.9	125.2	115.8	116.7	126.7	132.5
	Saturday	Day	8.0	7.1	4.6	5.6	5.8	8.8	8.1	9.9	9.1	9.0
		Evening	0.5	0.1	0.0	0.2	0.1	0.6	0.5	0.7	0.7	0.9
		Night	0.5	1.5	0.5	0.2	1.0	1.7	0.2	0.0	0.3	0.9
		Sub-total	9.0	8.7	5.1	6.0	6.9	11.2	8.8	10.6	10.1	10.8
	Sunday	Day	0.4	1.9	0.1	0.1	0.2	1.6	0.3	0.2	0.2	0.2
		Evening	0.0	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2
		Night	0.7	0.8	0.5	0.6	0.6	0.6	0.6	0.7	0.8	0.7
		Sub-total	1.0	2.7	0.6	0.7	0.8	2.3	0.9	0.8	1.0	1.0
		Total timeslots used	127.1	131.0	118.9	125.7	134.6	138.7	125.5	128.2	137.8	144.4

Note: Data are rounded to the nearest 1000. Cells with an entry of ''0.0'' mean that data were reported but rounded to zero.
Sources: DP World (2018), Hutchison Ports Australia (2018) and Patrick (2018)

Table 3.2 Timeslots available and actually used by trucks: Sydney

	Weekday	Shift	2015		2016				2017			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Available *('000)*	Monday–Friday	Day	131.4	128.1	134.0	134.8	135.7	168.0	166.1	170.5	149.3	154.5
		Evening	58.4	53.9	48.4	47.7	52.3	83.6	71.6	77.5	70.1	79.2
		Night	49.1	47.2	39.7	37.6	41.9	63.6	56.2	65.5	59.5	64.0
		Sub-total	238.8	229.2	222.1	220.1	229.9	315.2	293.8	313.5	278.9	297.8
	Saturday	Day	19.6	21.5	18.1	19.0	17.8	36.4	21.7	25.9	27.3	36.6
		Evening	2.9	1.6	1.1	1.6	1.1	4.0	4.1	4.7	4.5	5.6
		Night	6.4	5.5	4.0	4.5	4.8	21.4	10.9	10.5	10.4	16.5
		Sub-total	28.9	28.7	23.1	25.0	23.8	61.9	36.7	41.1	42.2	58.7
	Sunday	Day	13.8	12.0	11.8	10.7	8.3	11.1	12.9	14.6	15.2	17.6
		Evening	7.8	7.0	6.7	6.1	6.4	6.2	6.1	6.5	7.6	7.8
		Night	5.5	3.2	3.6	3.3	3.3	4.6	6.0	7.2	7.8	7.9
		Sub-total	27.1	22.2	22.1	20.1	18.0	21.9	25.0	28.4	30.6	33.4
		Total timeslots available	294.8	280.1	267.3	265.3	271.6	398.9	355.6	383.0	351.7	389.8
Used *('000)*	Monday–Friday	Day	106.4	101.7	98.1	104.6	110.4	103.1	100.0	100.4	101.5	102.8
		Evening	49.6	47.9	42.3	42.4	45.9	49.9	45.0	47.0	50.1	53.8
		Night	43.8	42.4	36.4	35.3	37.9	44.3	38.5	41.7	43.1	46.0
		Sub-total	199.9	192.1	176.8	182.2	194.2	197.3	183.5	189.0	194.7	202.6
	Saturday	Day	16.1	14.8	14.9	16.0	14.9	16.8	14.2	16.0	17.8	17.2
		Evening	2.2	1.3	0.7	1.4	1.0	2.1	1.6	2.6	2.4	2.1
		Night	6.2	5.4	3.9	4.3	4.8	6.6	4.9	5.8	6.4	8.0
		Sub-total	24.5	21.5	19.4	21.7	20.7	25.5	20.6	24.3	26.6	27.3
	Sunday	Day	13.4	11.3	10.7	9.7	7.9	10.3	9.2	11.0	11.9	12.9
		Evening	7.2	6.5	6.1	5.7	6.2	5.8	5.7	6.3	7.2	6.9
		Night	4.5	2.6	3.2	3.1	3.1	3.0	2.9	3.9	4.8	4.7
		Sub-total	25.1	20.4	20.0	18.5	17.2	19.1	17.9	21.2	23.9	24.5
		Total timeslots used	249.4	234.0	216.2	222.5	232.1	241.9	222.0	234.6	245.2	254.4

Sources: DP World (2018), Hutchison Ports Australia (2018) and Patrick (2018)

Table 3.3 Timeslots available and actually used by trucks: Melbourne

	Weekday	Shift	2015		2016				2017			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Available *('000)*	Monday–Friday	Day	145.8	133.9	129.1	131.3	136.1	133.7	125.6	128.7	132.8	133.8
		Evening	66.4	62.1	60.1	57.2	61.2	64.3	60.3	59.7	62.1	62.9
		Night	55.6	54.9	52.8	49.4	52.2	51.5	46.3	48.3	47.7	50.2
		Sub-total	267.8	250.9	241.9	237.9	249.5	249.4	232.2	236.7	242.7	246.9
	Saturday	Day	18.5	19.1	18.2	17.2	15.5	18.3	15.5	16.1	15.1	16.0
		Evening	0.3	0.6	0.6	0.2	0.0	0.3	0.4	0.2	0.0	0.3
		Night	4.8	4.6	4.7	4.0	4.8	6.0	3.6	4.3	4.4	4.5
		Sub-total	23.7	24.3	23.6	21.4	20.3	24.6	19.5	20.6	19.5	20.7
	Sunday	Day	6.3	9.1	7.4	6.1	5.5	8.2	7.1	6.1	4.2	7.6
		Evening	6.7	6.7	6.2	5.0	6.0	7.0	5.2	4.7	5.3	5.6
		Night	5.2	5.0	4.6	3.9	3.9	4.3	3.6	3.6	4.4	4.0
		Sub-total	18.2	20.7	18.2	14.9	15.5	19.5	15.9	14.4	13.9	17.2
		Total timeslots available	309.6	296.0	283.7	274.2	285.3	293.5	267.6	271.6	276.1	284.8
Used *('000)*	Monday–Friday	Day	143.0	131.3	126.5	129.2	133.8	131.1	124.9	134.3	144.5	144.0
		Evening	64.9	60.4	58.6	56.1	59.6	62.8	61.3	65.9	69.9	66.4
		Night	54.5	52.9	51.2	48.0	51.0	49.9	44.9	47.2	46.7	49.0
		Sub-total	262.3	244.6	236.3	233.4	244.4	243.8	231.2	247.4	261.2	259.4
	Saturday	Day	17.8	18.5	17.4	16.5	14.8	17.4	14.5	16.7	15.9	18.1
		Evening	0.3	0.6	0.5	0.1	0.0	0.3	0.3	0.1	0.0	0.3
		Night	4.8	4.5	4.7	3.9	4.7	5.9	3.5	4.2	4.3	4.4
		Sub-total	22.9	23.5	22.5	20.5	19.5	23.6	18.4	21.0	20.2	22.8
	Sunday	Day	6.1	8.8	7.2	5.8	5.3	8.0	6.8	6.0	4.1	7.5
		Evening	6.5	6.3	5.8	4.9	5.8	6.7	5.1	4.6	5.2	5.5
		Night	4.8	4.5	4.1	3.7	3.8	4.0	3.4	3.4	4.2	3.8
		Sub-total	17.3	19.6	17.1	14.3	14.9	18.7	15.3	14.0	13.5	16.8
		Total timeslots used	302.6	287.8	275.9	268.3	278.8	286.1	264.8	282.4	294.9	299.0

Note: 'Used timeslots' data are included for VICT from March Quarter 2017. VICT data are not included in 'Available timeslots'.
Sources: DP World (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Table 3.4 Timeslots available and actually used by trucks: Adelaide

	Weekday	Shift	2015		2016				2017			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Available *('000)*	Monday–Friday	Day	26.6	25.6	24.1	24.5	24.4	23.7	24.7	25.0	23.8	24.4
		Evening	18.2	18.7	17.2	17.0	17.5	17.6	19.3	20.1	18.7	19.1
		Night	15.6	17.2	15.6	16.7	16.2	16.1	18.2	20.1	19.7	19.3
		Sub-total	60.4	61.4	56.9	58.3	58.1	57.4	62.2	65.2	62.2	62.9
	Saturday	Day										
		Evening										
		Night										
		Sub-total										
	Sunday	Day										
		Evening										
		Night										
		Sub-total										
		Total timeslots available	60.4	61.4	56.9	58.3	58.1	57.4	62.2	65.2	62.2	62.9
Used *('000)*	Monday–Friday	Day	26.3	25.5	23.5	23.9	23.5	23.3	24.5	24.7	23.2	23.8
		Evening	17.4	18.4	16.3	15.8	16.1	17.2	19.0	19.9	18.3	18.9
		Night	11.2	15.4	13.4	14.7	13.2	14.4	16.4	17.8	17.1	17.0
		Sub-total	54.9	59.3	53.1	54.4	52.8	55.0	59.9	62.3	58.6	59.7
	Saturday	Day										
		Evening										
		Night										
		Sub-total										
	Sunday	Day										
		Evening										
		Night										
		Sub-total										
		Total timeslots used	54.9	59.3	53.1	54.4	52.8	55.0	59.9	62.3	58.6	59.7

Note: Blank cells mean no data was reported for the categories.
Sources: Flinders Adelaide Container Terminal (2018)

Table 3.5 Timeslots available and actually used by trucks: Fremantle

	Weekday	Shift	2015		2016				2017			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Available *('000)*	Monday–Friday	Day	76.1	74.4	68.3	66.1	67.1	67.2	63.7	64.4	65.2	66.8
		Evening	24.9	25.3	24.2	23.1	23.8	24.9	21.6	21.9	22.5	23.8
		Night	9.3	11.1	9.6	9.0	11.2	12.4	9.3	9.7	9.3	9.9
		Sub-total	110.3	110.8	102.1	98.2	102.0	104.5	94.5	95.9	96.9	100.5
	Saturday	Day	4.5	4.5	7.0	4.8	4.7	6.5	5.8	6.3	4.9	6.2
		Evening	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
		Night	0.2	0.1	0.0	0.3	0.0	0.2	0.1	0.0	0.0	0.0
		Sub-total	4.8	4.6	7.1	5.3	4.8	6.7	5.9	6.3	4.9	6.2
	Sunday	Day	4.9	7.0	6.0	4.3	4.7	6.1	3.1	3.9	5.3	6.6
		Evening	0.4	0.4	0.2	0.2	0.3	0.6	0.2	0.3	0.3	0.6
		Night	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.2	0.0	0.0
		Sub-total	5.3	7.5	6.3	4.6	5.2	6.8	3.4	4.4	5.6	7.2
		Total timeslots available	120.5	122.9	115.5	108.1	112.0	118.0	103.8	106.7	107.4	113.9
Used *('000)*	Monday–Friday	Day	75.0	73.1	67.0	64.7	66.2	66.3	62.7	63.3	64.0	65.7
		Evening	24.0	24.5	23.4	21.9	23.0	23.3	20.7	20.8	21.1	22.8
		Night	9.1	10.9	9.6	8.7	10.7	12.3	9.2	9.6	9.1	9.8
		Sub-total	108.1	108.5	100.0	95.3	100.0	101.9	92.6	93.7	94.2	98.2
	Saturday	Day	4.3	4.4	6.9	4.7	4.5	5.8	5.6	6.1	4.8	6.0
		Evening	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.0
		Night	0.2	0.1	0.0	0.3	0.0	0.2	0.1	0.0	0.0	0.0
		Sub-total	4.6	4.5	6.9	5.1	4.5	5.9	5.6	6.1	4.8	6.0
	Sunday	Day	4.7	6.8	5.9	4.2	4.6	5.9	3.1	3.8	5.2	6.4
		Evening	0.4	0.4	0.2	0.2	0.3	0.5	0.2	0.3	0.3	0.6
		Night	0.1	0.1	0.0	0.0	0.2	0.1	0.0	0.2	0.0	0.0
		Sub-total	5.1	7.3	6.2	4.4	5.1	6.5	3.3	4.3	5.4	7.0
		Total timeslots used	117.8	120.4	113.1	104.8	109.6	114.3	101.6	104.1	104.4	111.2

Note: Data are rounded to the nearest 1000. Cells with an entry of ''0.0'' mean that data were reported but rounded to zero.
Sources: DP World (2018) and Patrick (2018)

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

	Weekday	Shift	2015		2016				2017			
			Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Available *('000)*	Monday–Friday	Day	462.4	442.9	459.8	479.9	513.9	523.6	515.5	491.4	496.1	509.0
		Evening	194.2	188.2	182.7	185.5	205.6	243.0	224.5	213.6	217.9	234.6
		Night	145.9	151.7	139.2	141.5	159.6	183.2	159.7	159.2	158.2	170.7
		Sub-total	802.5	782.8	781.7	806.9	879.1	949.8	899.7	864.3	872.2	914.4
	Saturday	Day	52.8	53.5	48.5	46.8	44.6	77.1	67.0	66.0	66.6	82.3
		Evening	4.9	2.4	1.7	2.1	1.2	7.9	9.5	8.2	8.6	10.9
		Night	12.1	11.8	9.2	9.1	10.8	33.0	22.9	16.0	17.5	25.6
		Sub-total	69.8	67.7	59.5	57.9	56.6	118.0	99.5	90.2	92.7	118.8
	Sunday	Day	27.3	30.2	25.4	21.2	18.8	32.1	27.0	26.1	26.6	34.2
		Evening	15.1	14.1	13.1	11.3	12.8	14.6	12.5	11.6	13.2	14.4
		Night	11.7	9.1	8.7	7.8	8.1	11.1	10.9	11.7	13.0	12.8
		Sub-total	54.1	53.4	47.2	40.3	39.6	57.9	50.4	49.4	52.8	61.4
		Total timeslots available	926.4	903.9	888.4	905.1	975.4	1 125.6	1 049.6	1 003.8	1 017.7	1 094.6
Used *('000)*	Monday–Friday	Day	427.3	405.2	391.6	401.9	419.1	403.3	395.5	404.3	420.8	423.5
		Evening	180.6	176.7	163.2	160.7	170.2	180.8	169.3	177.8	186.0	189.9
		Night	134.4	142.1	124.6	121.8	129.1	139.1	118.2	127.1	128.6	139.2
		Sub-total	742.3	724.0	679.4	684.4	718.4	723.2	683.0	709.2	735.3	752.5
	Saturday	Day	46.3	44.8	43.7	42.7	40.1	48.8	42.4	48.8	47.5	50.2
		Evening	2.9	2.0	1.2	1.8	1.1	2.9	2.4	3.4	3.1	3.3
		Night	11.7	11.5	9.1	8.8	10.5	14.4	8.7	10.0	11.0	13.3
		Sub-total	61.0	58.3	54.0	53.4	51.7	66.2	53.5	62.1	61.7	66.8
	Sunday	Day	24.5	28.8	23.9	19.8	17.9	25.8	19.4	20.9	21.4	26.9
		Evening	14.1	13.3	12.1	10.8	12.3	13.1	11.1	11.2	12.7	13.1
		Night	10.0	8.0	7.8	7.4	7.7	7.7	6.9	8.2	9.8	9.2
		Sub-total	48.6	50.0	43.8	38.0	37.9	46.6	37.3	40.3	43.9	49.3
		Total timeslots used	851.8	832.4	777.2	775.8	808.0	836.0	773.8	811.6	840.9	868.6

Note: 'Used timeslots' data are included for VICT from March Quarter 2017. VICT data are not included in 'Available timeslots'.
Sources: DP World (2018), Flinders Adelaide Container Terminal (2018), Hutchison Ports Australia (2018), Patrick (2018) and Victoria International Container Terminal (2018)

Table 3.7 Empty container park operations

	Port	2015		2016				2017			
		Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr	Mar Qtr	Jun Qtr	Sep Qtr	Dec Qtr
Number of containers *('000)*	Brisbane	133.9	135.3	115.7	127.7	135.4	139.1	130.1	142.4	151.0	134.5
	Sydney	217.4	207.2	193.3	189.2	188.7	195.0	178.1	178.3	196.5	194.1
	Melbourne	344.6	332.1	314.1	316.2	329.8	356.8	347.2	337.0	350.3	361.3
	Adelaide	18.3	19.4	18.6	20.1	22.0	23.6	25.1	23.4	22.2	24.2
	Fremantle	82.7	84.8	79.8	81.2	82.4	87.7	86.7	89.2	86.5	95.3
	Five ports	797.0	778.9	721.5	734.5	758.4	802.3	767.2	770.3	806.5	809.3
Number of TEUs *('000)*	Brisbane	186.2	186.5	159.6	178.4	190.3	186.5	175.2	201.8	219.8	190.1
	Sydney	328.7	311.7	289.9	281.1	281.2	289.0	263.5	262.9	293.0	294.8
	Melbourne	509.1	492.7	466.0	469.6	488.3	529.0	512.9	502.6	522.8	536.8
	Adelaide	26.6	27.3	26.3	28.0	32.3	33.3	35.1	32.6	33.1	34.3
	Fremantle	118.0	121.1	114.5	115.6	117.6	124.3	123.5	127.7	123.6	137.0
	Five ports	1 168.6	1 139.2	1 056.2	1 072.6	1 109.6	1 162.1	1 110.1	1 127.6	1 192.3	1 193.0

Sources: Containerchain Pty Ltd (2018)

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. 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.

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 (Tables 4.1 to 4.5).

What PICI measures

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.

PICI is based on twenty-one indicators which fall in four main groups:

1. Parameters used in computing the index;
2. Ship-based charges;
3. Cargo-based charges; and
4. 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

Port interface costs vary by ship size. To calculate PICI, ships are divided into three size ranges (based on 'gross tonnage', or GT) which are represented by a 'typical' vessel within that size range. The vessel's other parameters, such as length and draft, are used as necessary.

The three size ranges currently computed for PICI are:

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

Indicator 4.2 Average TEUs exchanged

The total TEUs exchanged by ships in the size range, averaged over the number of visits made by those ships. Equivalent to the sum of Indicator 4.3 and Indicator 4.6.

Indicator 4.3 Average full (loaded) TEUs exchanged

The total loaded TEUs exchanged by ships in the size range, averaged over the number of visits made by those ships. Equivalent to the sum of Indicator 4.4 and Indicator 4.5.

Indicator 4.4 Average full import TEUs

The sum of full (loaded) import containers moved into a port by ships in the size range, averaged over the number of visits made by those ships during the specified period.

Indicator 4.5 Average full export TEUs

The sum of full (loaded) export containers moved out of a port by ships in the size range, averaged over the number of visits made by those ships during the specified period.

Indicator 4.6 Empty TEUs

The sum of empty import and export containers exchanged by ships in the size range, averaged over the number of visits made by those ships.

Indicator 4.7 Number of port calls

The average number of port calls made by ships in the size range, to a given port, during the period.

Indicator 4.8 Average elapsed berth time

The total elapsed berth time for ships in the size range, divided by the number of ship visits (by ships in the size range) during the period. A ship's elapsed berth time is the time between a ship's arrival at berth, and its departure.

Ship-based charges (per ship visit)

Indicator 4.9 Total ship-based charges by ship visit

The total ship-based charges paid by the size range's representative vessel, given the parameters in Indicators 4.1 to 4.8.

Indicator 4.10 Total ship-based charges for handling empty containers

The total charges paid on empty containers, given the parameters in Indicators 4.1 to 4.8.

This is the sum of wharfage, harbour dues, berth charges and channel fees levied per empty TEU, multiplied by the average number of empty TEUs exchanged (Indicator 4.6).

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

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. Charges are typically levied per tug, with higher charges for larger vessels.

Depending on ship's equipment, larger vessels may also require additional tugs. For PICI, the standard towage requirements published in port information handbooks are used.

Indicator 4.15 Mooring, unmooring charges

Mooring charges relate to the services of linesmen and related line and launch hire. (Un)mooring is the making fast (loosening) of a ship to (from) moorings or anchorage by means of lines, cables and/or anchors. Depending on local arrangements for lines services, mooring charges may be levied by the port authority, stevedore or another service provider.

Indicator 4.16 Total ship-based charges per TEU

The sum of the charges in Indicators 4.11 to 4.15 or, equivalently, the total ship-based charges (Indicator 4.9) divided by the total TEUs exchanged (Indicator 4.2).

Cargo-based 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.

Some charge schedules levy a different fee for a forty-foot container than for a twenty-foot container. Where this occurs, PICI uses the fee charged per twenty-foot container.

Indicator 4.17 Wharfage

Wharfage is a 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 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 charges (per TEU)

Indicator 4.19 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, the *Container Stevedoring Monitoring Report*.

Indicator 4.20 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 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

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 4.1 to 4.6.

Indicator 4.23 Port's share in national index

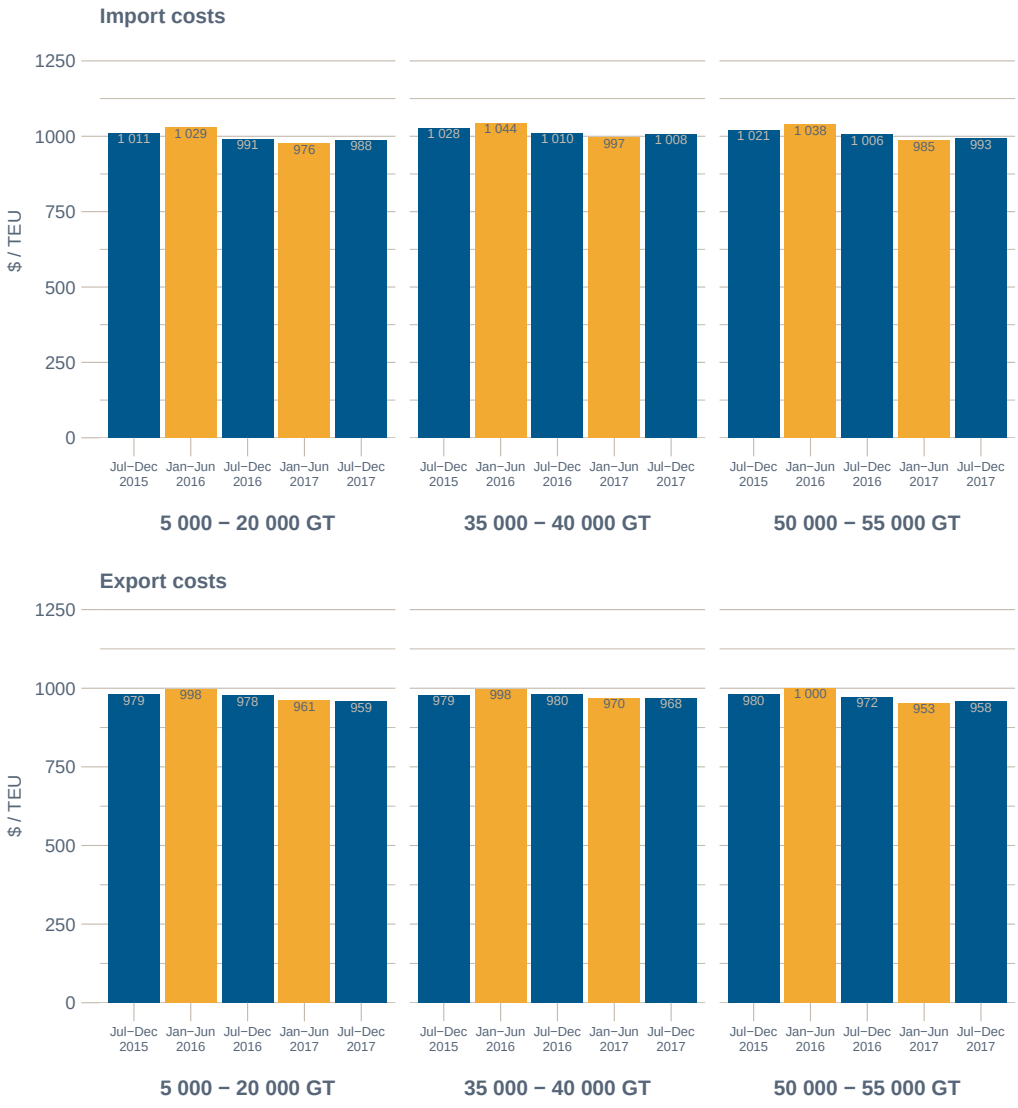
These shares are used in computing the national PICI and they are computed for exports and imports separately.

Indicator 4.24 National Port Interface Cost Index

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 size ranges monitored in *Waterline*.

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.

Figure 4.1 Port interface costs, constant prices (July–December 2017), by ship size



Sources: BITRE estimates based on data in Tables 4.1 to 4.5 and ABS (2018).

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				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Port call parameters[a]															
Total TEUs exchanged	267	246	283	296	298	1 391	1 253	1 388	1 189	1 276	1 449	1 469	1 623	1 506	1 806
Loaded	208	182	217	232	286	1 000	939	1 011	918	952	974	1 003	1 164	1 080	1 259
Loaded inwards	80	115	82	101	127	665	330	586	455	424	593	376	774	694	861
Loaded outwards	128	67	135	130	159	336	609	426	463	528	382	627	390	386	399
Empty[b]	60	63	65	64	53	390	313	377	271	324	475	466	459	426	557
Number of port calls	5	6	5	6	6	5	5	5	5	4	4	4	5	5	5
Elapsed berth time *(hours)*	27	21	24	22	23	28	26	23	22	23	21	21	23	22	25
Charges per ship visit *($)*															
Total ship-based charges	20 830	20 901	21 407	21 534	22 121	51 453	52 116	53 702	54 148	55 549	60 478	61 215	63 103	63 600	65 288
Empty	1 194	1 271	1 326	1 308	1 088	7 813	6 272	7 686	5 524	6 724	9 505	9 337	9 362	8 680	11 536
Ship-based charges *($/TEU)*															
Conservancy	8	9	8	8	8	6	6	6	7	7	8	8	7	8	7
Tonnage	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pilotage	34	37	33	32	33	12	13	13	15	14	14	13	13	14	12
Towage	26	29	25	25	25	17	20	18	22	21	18	19	17	19	16
Mooring, unmooring[c]	9	10	9	9	9	2	2	2	2	2	2	2	2	2	1
Total ship-based charges *($/TEU)*	78	85	76	73	74	37	42	39	46	44	42	42	39	42	36
Fees and charges for imports															
Total ship-based charges *($/TEU)*	78	85	76	73	74	37	42	39	46	44	42	42	39	42	36
Cargo-based charges															
Wharfage	36	36	37	37	38	36	36	37	37	38	36	36	37	37	38
Harbour dues	65	65	66	66	67	65	65	66	66	67	65	65	66	66	67
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	150	150	150	150	133	150	150	150	150	133	150	150	150	150	133
Road transport charges[d]	470	486	486	486	474	470	486	486	486	474	470	486	486	486	474
Infrastructure charges[e]	-	-	-	-	51	-	-	-	-	51	-	-	-	-	51
Total fees and charges *($ / import TEU)*	969	992	984	981	1 007	928	948	946	953	976	933	948	947	950	968
Port's share in national index[f] *(%)*	5	9	9	10	8	15	8	17	15	14	14	12	25	23	27

(cont.)

Table 4.1 Port interface costs by ship type—parameters and estimates: Brisbane *(continued)*

	5 000 to 20 000 GT ships					35 000 to 40 000 GT ships					50 000 to 55 000 GT ships				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Fees and charges for exports															
Total ship-based charges *($/TEU)*	78	85	76	73	74	37	42	39	46	44	42	42	39	42	36
Cargo-based charges															
Wharfage	36	36	37	37	38	36	36	37	37	38	36	36	37	37	38
Harbour dues	65	65	66	66	67	65	65	66	66	67	65	65	66	66	67
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	156	156	156	156	125	156	156	156	156	125	156	156	156	156	125
Road transport charges[d]	470	486	486	486	474	470	486	486	486	474	470	486	486	486	474
Infrastructure charges[e]	-	-	-	-	51	-	-	-	-	51	-	-	-	-	51
Total fees and charges *($ / export TEU)*	975	998	990	987	998	934	955	953	960	967	939	955	953	957	960
Port's share in national index[g] *(%)*	8	5	11	10	11	13	22	20	25	34	17	27	20	18	25

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

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

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

c BITRE estimates.

d BITRE estimates based on a survey of road transport operators. Survey responses from July–December 2017 are not directly comparable to prior figures.

e Charges as levied by road transport operators. These were not treated separately prior to July–December 2017.

f Estimated as the TEUs imported through the port by ships in the size class, as a fraction of TEUs imported through the five ports by ships in the size class.

g Estimated as the TEUs exported through the port by ships in the size class, as a fraction of TEUs exported through the five ports by ships in the size class.

Sources: BITRE estimates based on ship call data from Port of Brisbane Pty Ltd (2018) and other sources (see 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				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Port call parameters[a]															
Total TEUs exchanged	620	625	556	484	825	2 163	2 102	1 933	1 821	1 911	2 530	2 470	2 706	2 581	2 673
Loaded	582	579	318	298	655	1 451	1 389	1 060	1 001	1 314	1 725	1 762	1 416	1 330	1 846
Loaded inwards	274	242	26	37	340	1 009	892	569	536	904	1 180	1 159	775	701	1 320
Loaded outwards	308	337	293	261	315	442	497	491	465	410	545	603	641	629	526
Empty[b]	38	45	238	186	170	712	713	873	820	596	805	708	1 290	1 251	827
Number of port calls	7	8	7	7	7	3	3	4	3	3	4	4	3	4	4
Elapsed berth time *(hours)*	28	31	30	25	26	32	35	34	32	37	38	35	36	37	40
Charges per ship visit *($)*															
Total ship-based charges	21 602	22 423	23 090	23 264	23 785	54 956	57 246	59 159	59 509	60 984	66 508	69 331	71 681	72 062	73 931
Empty	512	614	3 301	2 579	2 395	9 667	9 684	12 102	11 363	8 419	10 929	9 618	17 886	17 339	11 676
Ship-based charges *($/TEU)*															
Conservancy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tonnage	9	9	11	12	8	10	10	12	12	12	12	12	12	12	12
Pilotage	6	6	7	8	5	4	5	5	5	5	4	4	4	4	4
Towage	16	16	19	22	13	10	10	12	13	12	9	9	9	9	9
Mooring, unmooring[c]	4	4	5	6	3	2	2	2	2	2	2	2	2	2	2
Total ship-based charges *($/TEU)*	35	36	42	48	29	25	27	31	33	32	26	28	26	28	28
Fees and charges for imports															
Total ship-based charges *($/TEU)*	35	36	42	48	29	25	27	31	33	32	26	28	26	28	28
Cargo-based charges															
Wharfage	127	127	130	130	132	127	127	130	130	132	127	127	130	130	132
Harbour dues	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	153	151	151	151	135	153	151	151	151	135	153	151	151	151	135
Road transport charges[d]	517	542	542	542	505	517	542	542	542	505	517	542	542	542	505
Infrastructure charges[e]	-	-	-	-	50	-	-	-	-	50	-	-	-	-	50
Total fees and charges *($ / import TEU)*	1 003	1 027	1 034	1 041	1 022	993	1 018	1 023	1 025	1 025	994	1 019	1 019	1 021	1 020
Port's share in national index[f] *(%)*	21	23	3	6	30	35	32	21	22	34	29	30	20	19	28

(cont.)

Table 4.2 Port interface costs by ship type—parameters and estimates: Sydney *(continued)*

	5 000 to 20 000 GT ships					35 000 to 40 000 GT ships					50 000 to 55 000 GT ships				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Fees and charges for exports															
Total ship-based charges *($/TEU)*	35	36	42	48	29	25	27	31	33	32	26	28	26	28	28
Cargo-based charges															
Wharfage	82	82	85	85	87	82	82	85	85	87	82	82	85	85	87
Harbour dues	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	137	133	133	133	110	137	133	133	133	110	137	133	133	133	110
Road transport charges[d]	517	542	542	542	505	517	542	542	542	505	517	542	542	542	505
Infrastructure charges[e]	-	-	-	-	50	-	-	-	-	50	-	-	-	-	50
Total fees and charges *($ / export TEU)*	941	964	971	978	951	931	955	960	962	955	932	956	956	958	950
Port's share in national index[g] *(%)*	25	32	31	31	31	28	26	30	31	31	24	21	26	24	22

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

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

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

c BITRE estimates.

d BITRE estimates based on a survey of road transport operators. Survey responses from July–December 2017 are not directly comparable to prior figures.

e Charges as levied by road transport operators. These were not treated separately prior to July–December 2017.

f Estimated as the TEUs imported through the port by ships in the size class, as a fraction of TEUs imported through the five ports by ships in the size class.

g Estimated as the TEUs exported through the port by ships in the size class, as a fraction of TEUs exported through the five ports by ships in the size class.

Sources: BITRE estimates based on ship call data from NSW Ports (2018) and other sources (see 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				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Port call parameters[a]															
Total TEUs exchanged	769	725	608	543	665	2 158	2 042	2 003	1 729	1 613	2 829	2 701	2 775	2 795	3 115
Loaded	699	633	571	463	560	1 730	1 644	1 644	1 489	1 359	2 210	2 166	2 187	2 283	2 500
Loaded inwards	328	306	276	212	253	1 142	1 062	1 094	989	964	1 392	1 295	1 391	1 316	1 579
Loaded outwards	371	328	296	252	307	588	582	550	501	395	819	871	796	967	920
Empty[b]	70	91	37	80	105	428	398	359	240	254	618	536	587	512	615
Number of port calls	7	7	7	7	6	3	3	4	4	3	4	4	4	4	4
Elapsed berth time *(hours)*	22	20	22	20	22	31	27	28	24	26	31	29	31	30	35
Charges per ship visit *($)*															
Total ship-based charges	30 361	31 560	32 478	32 663	33 139	56 993	58 062	59 508	59 759	60 753	79 053	80 252	82 380	82 730	84 133
Empty	1 266	1 663	685	1 477	1 980	7 788	7 238	6 619	4 425	4 774	11 245	9 744	10 832	9 441	11 589
Ship-based charges *($/TEU)*															
Conservancy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tonnage	8	8	10	11	9	10	11	11	13	14	12	13	13	13	12
Pilotage	11	11	14	15	13	6	7	7	8	9	5	6	5	5	5
Towage	19	20	25	29	24	9	10	10	12	13	10	10	10	10	10
Mooring, unmooring[c]	2	4	5	5	4	1	1	1	2	2	1	1	1	1	1
Total ship-based charges *($/TEU)*	39	44	53	60	50	26	28	30	35	38	28	30	30	30	27
Fees and charges for imports															
Total ship-based charges *($/TEU)*	39	44	53	60	50	26	28	30	35	38	28	30	30	30	27
Cargo-based charges															
Wharfage	73	73	74	74	118	73	73	74	74	118	73	73	74	74	118
Harbour dues	41	41	41	41	0	41	41	41	41	0	41	41	41	41	0
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	155	155	155	155	133	155	155	155	155	133	155	155	155	155	133
Road transport charges[d]	539	549	549	549	501	539	549	549	549	501	539	549	549	549	501
Infrastructure charges[e]	-	-	-	-	53	-	-	-	-	53	-	-	-	-	53
Total fees and charges *($ / import TEU)*	1 018	1 032	1 043	1 049	1 025	1 005	1 017	1 019	1 024	1 013	1 007	1 018	1 019	1 019	1 002
Port's share in national index[f] *(%)*	28	29	34	32	23	41	44	44	43	36	36	38	39	37	35

(cont.)

Table 4.3 Port interface costs by ship type—parameters and estimates: Melbourne *(continued)*

	5 000 to 20 000 GT ships					35 000 to 40 000 GT ships					50 000 to 55 000 GT ships				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Fees and charges for exports															
Total ship-based charges *($/TEU)*	39	44	53	60	50	26	28	30	35	38	28	30	30	30	27
Cargo-based charges															
Wharfage	71	71	70	70	108	71	71	70	70	108	71	71	70	70	108
Harbour dues	41	41	41	41	0	41	41	41	41	0	41	41	41	41	0
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	141	141	141	141	119	141	141	141	141	119	141	141	141	141	119
Road transport charges[d]	539	549	549	549	501	539	549	549	549	501	539	549	549	549	501
Infrastructure charges[e]	-	-	-	-	53	-	-	-	-	53	-	-	-	-	53
Total fees and charges *($ / export TEU)*	1 003	1 016	1 024	1 031	1 001	989	1 001	1 001	1 005	988	991	1 002	1 001	1 000	978
Port's share in national index[g] *(%)*	35	32	29	29	31	39	36	37	35	30	37	35	35	38	40

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

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

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

c BITRE estimates.

d BITRE estimates based on a survey of road transport operators. Survey responses from July–December 2017 are not directly comparable to prior figures.

e Charges as levied by road transport operators. These were not treated separately prior to July–December 2017.

f Estimated as the TEUs imported through the port by ships in the size class, as a fraction of TEUs imported through the five ports by ships in the size class.

g Estimated as the TEUs exported through the port by ships in the size class, as a fraction of TEUs exported through the five ports by ships in the size class.

Sources: BITRE estimates based on ship call data from Port of Melbourne Operations Pty Ltd (2018) and other sources (see 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				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Port call parameters[a]															
Total TEUs exchanged	-	-	-	-	-	968	873	768	611	502	1 060	1 165	978	1 079	1 021
Loaded	-	-	-	-	-	681	679	667	570	477	814	855	816	847	797
Loaded inwards	-	-	-	-	-	237	314	441	433	409	422	449	386	383	379
Loaded outwards	-	-	-	-	-	444	366	226	137	68	391	405	430	464	418
Empty[b]	-	-	-	-	-	287	194	101	41	25	246	310	162	232	224
Number of port calls	-	-	-	-	-	2	3	4	4	4	3	3	3	3	3
Elapsed berth time *(hours)*	-	-	-	-	-	20	17	21	18	15	21	21	22	22	23
Charges per ship visit *($)*															
Total ship-based charges	23 399	23 531	24 024	24 202	24 754	50 298	49 266	51 228	50 778	51 181	56 255	58 057	59 622	60 092	60 140
Empty	-	-	-	-	-	0	0	0	0	0	0	0	0	0	0
Ship-based charges *($/TEU)*															
Conservancy	-	-	-	-	-	5	5	6	7	9	6	6	7	7	6
Tonnage	-	-	-	-	-	10	10	13	14	17	11	10	13	12	13
Pilotage	-	-	-	-	-	7	8	9	11	14	6	6	7	6	7
Towage	-	-	-	-	-	30	34	39	50	62	30	28	34	31	33
Mooring, unmooring[c]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total ship-based charges *($/TEU)*	-	-	-	-	-	52	56	67	83	102	53	50	61	56	59
Fees and charges for imports															
Total ship-based charges *($/TEU)*	-	-	-	-	-	52	56	67	83	102	53	50	61	56	59
Cargo-based charges															
Wharfage	85	85	86	86	88	85	85	86	86	88	85	85	86	86	88
Harbour dues	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	149	149	149	149	143	149	149	149	149	143	149	149	149	149	143
Road transport charges[d]	381	399	399	399	419	381	399	399	399	419	381	399	399	399	419
Infrastructure charges[e]	-	-	-	-	53	-	-	-	-	53	-	-	-	-	53
Total fees and charges *($ / import TEU)*	-	-	-	-	-	844	866	877	893	980	845	860	871	866	937
Port's share in national index[f] *(%)*	-	-	-	-	-	4	6	7	8	8	5	5	5	6	3

(cont.)

Table 4.4 Port interface costs by ship type—parameters and estimates: Adelaide *(continued)*

	5 000 to 20 000 GT ships					35 000 to 40 000 GT ships					50 000 to 55 000 GT ships				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Fees and charges for exports															
Total ship-based charges *($/TEU)*	-	-	-	-	-	52	56	67	83	102	53	50	61	56	59
Cargo-based charges															
Wharfage	85	85	86	86	88	85	85	86	86	88	85	85	86	86	88
Harbour dues	7	7	7	7	7	7	7	7	7	7	7	7	7	7	7
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	103	92	92	92	93	103	92	92	92	93	103	92	92	92	93
Road transport charges[d]	381	399	399	399	419	381	399	399	399	419	381	399	399	399	419
Infrastructure charges[e]	-	-	-	-	53	-	-	-	-	53	-	-	-	-	53
Total fees and charges *($ / export TEU)*	-	-	-	-	-	798	810	820	837	931	800	803	815	809	888
Port's share in national index[g] *(%)*	-	-	-	-	-	13	11	6	4	3	9	7	8	9	7

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

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

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

c BITRE estimates.

d BITRE estimates based on a survey of road transport operators. Survey responses from July–December 2017 are not directly comparable to prior figures.

e Charges as levied by road transport operators. These were not treated separately prior to July–December 2017.

f Estimated as the TEUs imported through the port by ships in the size class, as a fraction of TEUs imported through the five ports by ships in the size class.

g Estimated as the TEUs exported through the port by ships in the size class, as a fraction of TEUs exported through the five ports by ships in the size class.

Sources: BITRE estimates based on ship call data from Flinders Ports (2018) and other sources (see 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				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Port call parameters[a]															
Total TEUs exchanged	2 587	2 455	2 698	2 487	2 917	780	759	825	791	609	1 503	1 502	1 365	1 472	1 735
Loaded	2 029	2 039	2 204	2 116	2 332	621	657	736	739	590	1 110	1 088	1 023	1 155	1 206
Loaded inwards	1 264	1 159	1 315	1 187	1 432	361	484	540	573	514	744	707	638	732	795
Loaded outwards	766	881	889	929	900	260	173	197	165	76	367	381	385	423	411
Empty[b]	558	415	494	371	586	160	103	89	52	18	393	414	342	317	529
Number of port calls	12	13	13	13	13	3	3	4	4	4	5	4	4	5	3
Elapsed berth time *(hours)*	34	34	35	33	38	19	17	20	18	18	24	23	24	25	28
Charges per ship visit *($)*															
Total ship-based charges	18 184	18 248	18 492	18 578	18 896	39 188	39 324	39 853	40 039	40 730	56 881	57 115	57 818	58 134	59 053
Empty	6 482	4 821	5 856	4 396	7 111	1 853	1 192	1 054	613	224	4 562	4 812	4 051	3 759	6 424
Ship-based charges *($/TEU)*															
Conservancy	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tonnage	1	1	1	1	1	12	12	11	12	16	9	9	10	9	8
Pilotage	2	2	2	2	2	12	12	12	12	16	6	6	7	6	6
Towage	4	4	3	4	3	25	26	24	25	33	22	22	25	23	20
Mooring, unmooring[c]	1	1	1	1	0	2	2	2	2	2	1	1	1	1	1
Total ship-based charges *($/TEU)*	7	7	7	7	6	50	52	48	51	67	38	38	42	39	34
Fees and charges for imports															
Total ship-based charges *($/TEU)*	7	7	7	7	6	50	52	48	51	67	38	38	42	39	34
Cargo-based charges															
Wharfage	77	77	79	79	80	77	77	79	79	80	77	77	79	79	80
Harbour dues	36	36	37	37	38	36	36	37	37	38	36	36	37	37	38
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	163	162	162	162	166	163	162	162	162	166	163	162	162	162	166
Road transport charges[d]	462	467	467	467	462	462	467	467	467	462	462	467	467	467	462
Infrastructure charges[e]	-	-	-	-	14	-	-	-	-	14	-	-	-	-	14
Total fees and charges *($ / import TEU)*	916	919	921	921	936	959	964	962	964	997	947	950	956	953	964
Port's share in national index[f] *(%)*	47	39	54	52	39	6	10	11	12	10	15	14	11	15	7

(cont.)

Table 4.5 Port interface costs by ship type—parameters and estimates: Fremantle *(continued)*

	5 000 to 20 000 GT ships					35 000 to 40 000 GT ships					50 000 to 55 000 GT ships				
	2015	2016		2017		2015	2016		2017		2015	2016		2017	
	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec	Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
Fees and charges for exports															
Total ship-based charges *($/TEU)*	7	7	7	7	6	50	52	48	51	67	38	38	42	39	34
Cargo-based charges															
Wharfage	77	77	79	79	80	77	77	79	79	80	77	77	79	79	80
Harbour dues	36	36	37	37	38	36	36	37	37	38	36	36	37	37	38
Other charges															
Stevedoring	170	170	170	170	170	170	170	170	170	170	170	170	170	170	170
Customs broker fees	89	109	109	109	134	89	109	109	109	134	89	109	109	109	134
Road transport charges[d]	462	467	467	467	462	462	467	467	467	462	462	467	467	467	462
Infrastructure charges[e]	-	-	-	-	14	-	-	-	-	14	-	-	-	-	14
Total fees and charges *($ / export TEU)*	842	867	868	869	904	885	911	909	912	965	873	897	903	901	932
Port's share in national index[g] *(%)*	31	30	29	31	27	8	5	6	6	3	13	10	11	12	8

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

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

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

c BITRE estimates.

d BITRE estimates based on a survey of road transport operators. Survey responses from July–December 2017 are not directly comparable to prior figures.

e Charges as levied by road transport operators. These were not treated separately prior to July–December 2017.

f Estimated as the TEUs imported through the port by ships in the size class, as a fraction of TEUs imported through the five ports by ships in the size class.

g Estimated as the TEUs exported through the port by ships in the size class, as a fraction of TEUs exported through the five ports by ships in the size class.

Sources: BITRE estimates based on ship call data from Fremantle Ports (2018) and other sources (see text).

Table 4.6 National port interface costs, by size of ship

Ship gross tonnage range	Port interface costs ($ / TEU)	2015	2016		2017	
		Jul-Dec	Jan-Jun	Jul-Dec	Jan-Jun	Jul-Dec
5 000 – 20 000 GT	Import *(nominal)*	965	983	972	975	988
	Import *(real)*	1 011	1 029	991	976	988
	Export *(nominal)*	935	953	959	960	959
	Export *(real)*	979	998	978	961	959
35 000 – 40 000 GT	Import *(nominal)*	981	997	991	997	1 008
	Import *(real)*	1 028	1 044	1 010	997	1 008
	Export *(nominal)*	934	953	961	969	968
	Export *(real)*	979	998	980	970	968
50 000 – 55 000 GT	Import *(nominal)*	974	992	987	985	993
	Import *(real)*	1 021	1 038	1 006	985	993
	Export *(nominal)*	936	956	954	953	958
	Export *(real)*	980	1 000	972	953	958
	ABS non-farm GDP deflator	95.4	95.5	98.1	100.0	100.0

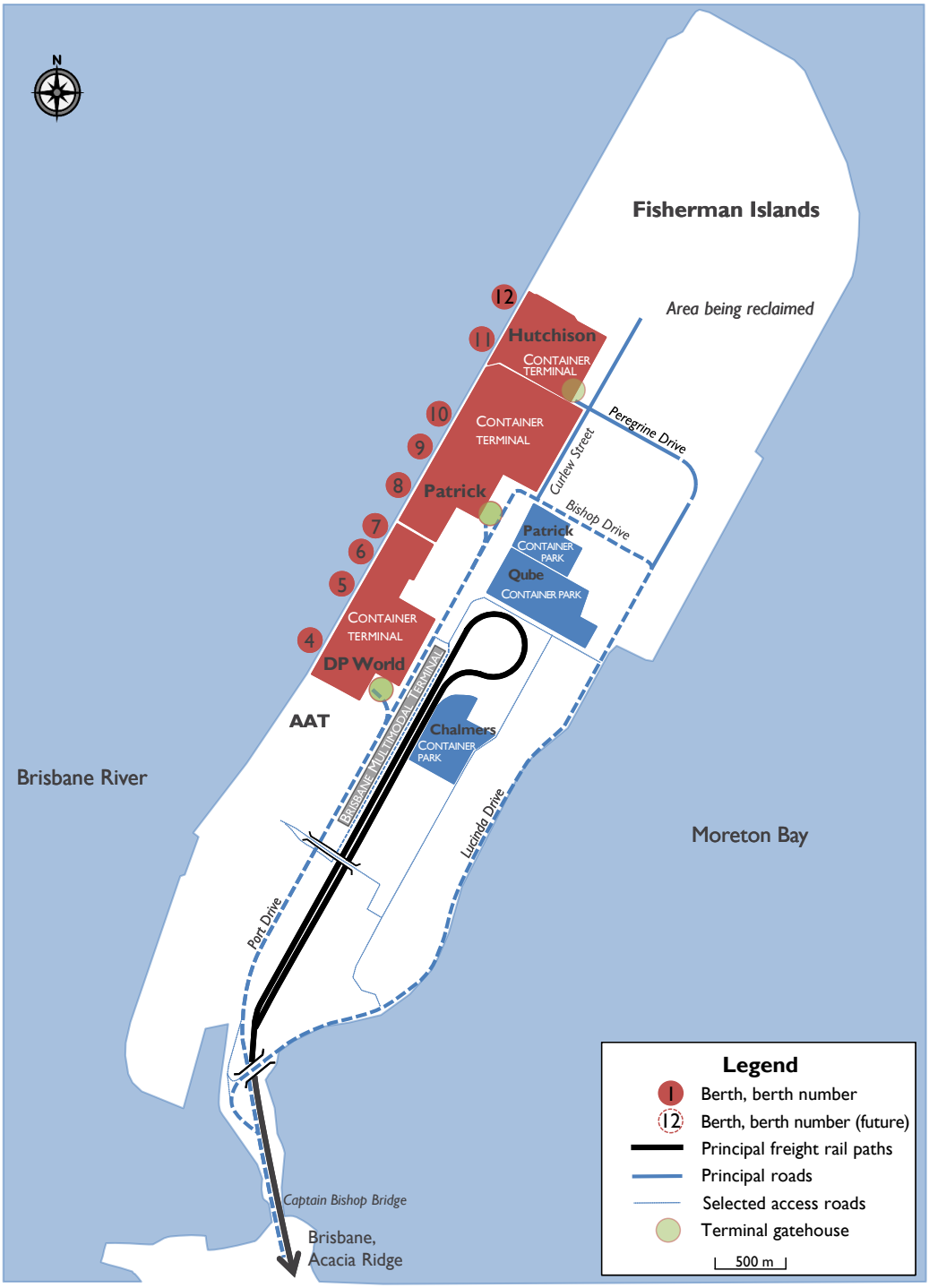
Notes: Values in constant prices are derived using the ABS non-farm GDP deflator, with July–December 2017 as the base period.
Sources: BITRE estimates based on data in Tables 4.1 to 4.5 and ABS (2018).

APPENDIX A

Maps of five major Australian container ports

This appendix presents maps of container terminals and supplementary information about facilities and port services available at the five major Australian container ports as at December 2017.

Figure A.1 Brisbane (Fisherman Islands terminals)



(Last updated: September 2016)

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. Hutchison operates berths 11 and 12.

Equipment. DP World has 4 cranes, including 3 post-Panamax cranes and one Panamax crane. DP World's semi-automated terminal has 16 automated stacking cranes. Patrick has 5 cranes, consisting of 4 post-Panamax cranes and one Panamax crane; in addition, Patrick has 31 automated straddle carriers (AutoStrads). Hutchison's Brisbane Container Terminals includes 4 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

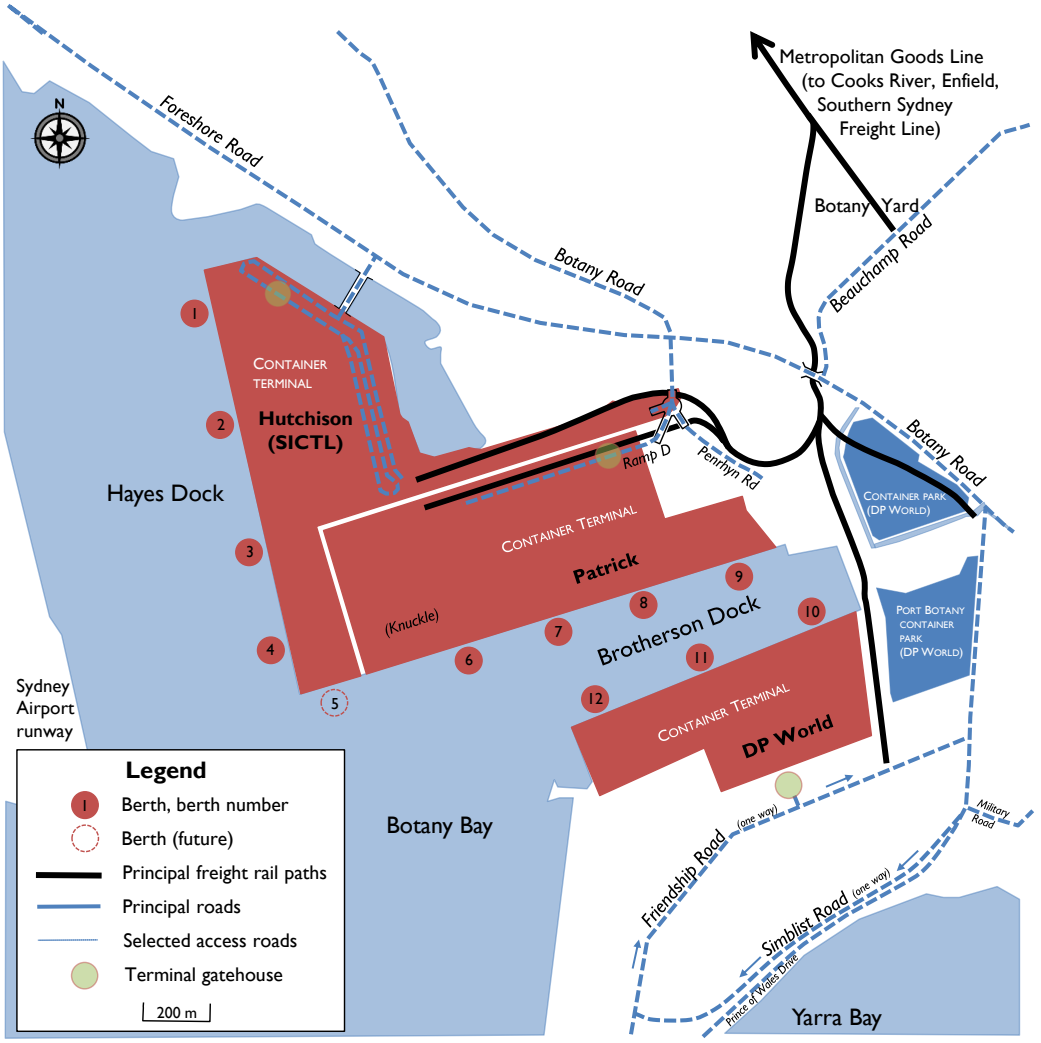
Facilities. An intermodal facility is provided on Fisherman Islands—the Brisbane Multimodal Terminal. Train lengths of up to 850 metres are permitted. Containers are shifted by road between that terminal and the container terminals. In that context, rail access is classed as having ''near-dock'' facilities.

Services. Scheduled rail services to the Brisbane Multimodal Terminal include long haul:

- bulk coal from West Moreton and grain from western Queensland, both via narrow gauge;
- reefer containers containing meat from northern abattoirs, by narrow-gauge trains;
- some containers are taken from Fisherman Islands—the presumption is that they are mainly empty containers; and
- 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 inter-/intra-state intermodal terminal at Acacia Ridge.

Figure A.2 Sydney (Port Botany terminals)



(Last updated: February 2017)

Sydney (Port Botany terminals)

Port Botany is managed by the 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 Limited, SICTL).

Berths. Patrick operates four berths, numbers 6–9. DP World's three berths are numbered 10–12. Hutchison has four operational berths (1–4).

Equipment. DP World equipment includes 4 twin-lift quay cranes and 4 single-lift quay cranes. DP World took delivery of their latest twin-lift, post-Panamax crane in March 2015. Patrick equipment includes 7 twin-lift quay cranes and 1 single-lift quay crane. The Hutchison terminal includes 4 post-Panamax quay cranes.

The Patrick terminal has implemented an automated container yard, with 45 automated straddle carriers (AutoStrads). Automatic operations commenced on 2 April 2015.

The Hutchison terminal operates 12 automated stacking cranes.

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 short haul and long haul rail container services between Botany and the hinterland include:

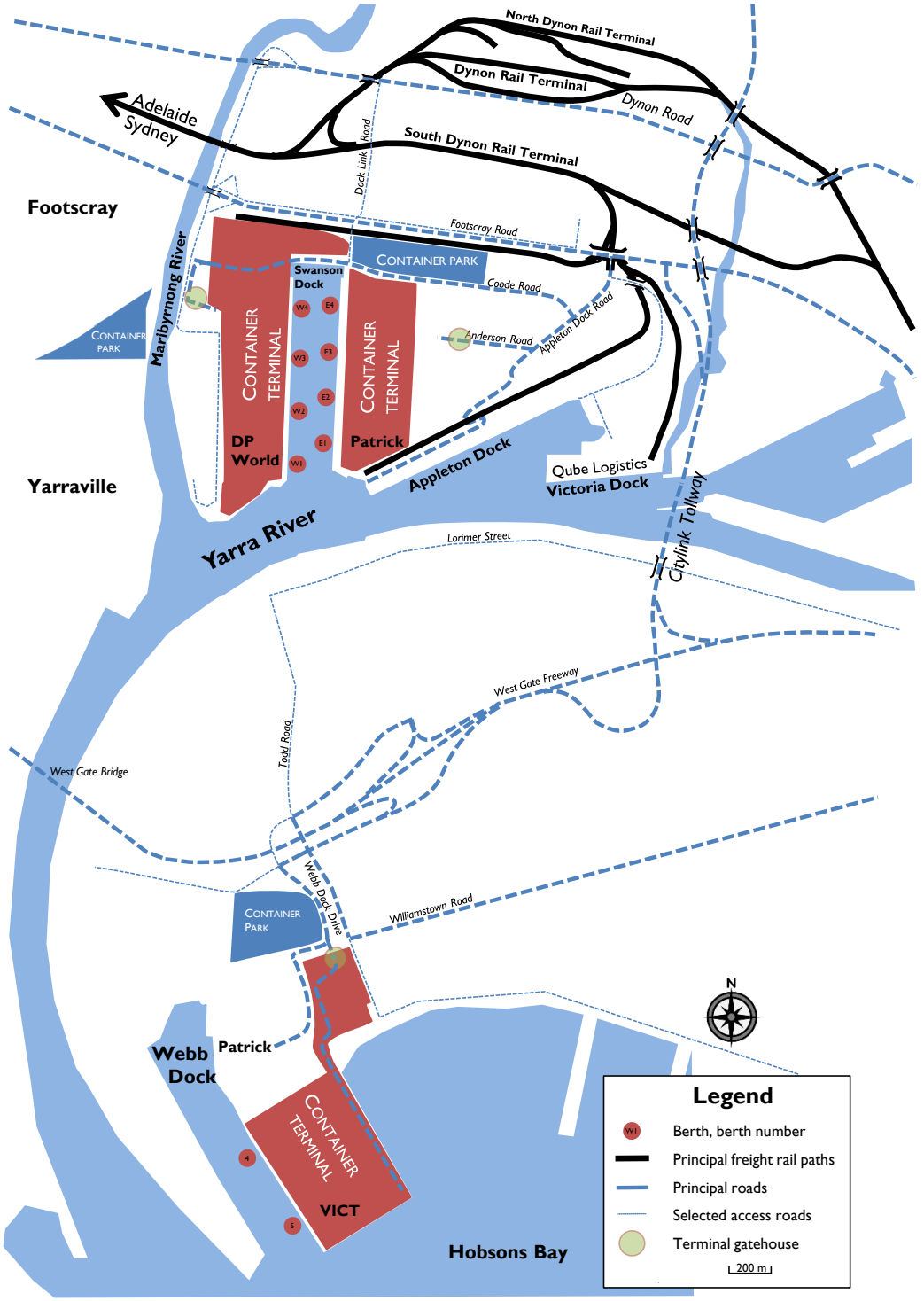
- Yennora, Cooks River, Minto and Enfield.
- logs and grain from Kelso (Southern Shorthaul Railroad; Pacific National);
- logs from Goulburn (Qube Logistics);
- processed meat, grain and other agricultural products from Dubbo (Fletcher Export International / Southern Shorthaul Railroad; Qube Logistics);
- specialised grain transport from Coonamble (Qube Logistics);
- cotton and agricultural produce from Nevertire, Warren, Warren South, Trangie, Narrabri, Wee Waa, Narromine and Forbes (Qube Logistics; Genesee & Wyoming Australia; Sydney Rail Services);
- paper products and grain from Harefield (Qube Logistics);
- aluminium, logs and agricultural produce from Walsh Point, Carrington and Sandgate [Newcastle] (Qube Logistics and Crawfords Freightlines / Sydney Rail Services).

Rail access. Railway sidings at Botany Yard are used to regulate train entry to the port; 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 via the Metropolitan Freight Network (including the Port Botany Goods Line).

Fisherman Islands aerial showing the Future Port Expansion Area (foreground) and port operations (background). Photo courtesy of Port of Brisbane Pty Ltd.

Figure A.3 Melbourne (Swanson and Webb Dock terminals)



(Last updated: October 2017)

Melbourne (Swanson and Webb Dock terminals)

The Port of Melbourne is operated by Port of Melbourne Operations Pty Ltd on behalf of the Lonsdale Consortium, which holds a 50-year lease of the State-owned assets at 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. Victoria International Container Terminal (VICT) operates on Webb Dock East.

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. VICT has 5 remotely operated Neo-Panamax quay cranes. Patrick has 42 straddle carriers, DP World has 48 straddle carriers and VICT has 11 automated container carriers and 20 automated stacking cranes (ASCs).

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 are two berths at Webb Dock East operated by VICT. 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. Access to VICT is from Webb 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;
- Patrick (East Swanson Dock) is served by a single dual-gauge siding off the Appleton Dock rail yard. The Appleton Dock rail yard also services the ACFS Logistics depot on Appleton Dock Road. 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 long-haul rail services shifting containers include:

- rice from Deniliquin to Victoria Dock sidings (Qube Logistics, broad gauge);
- paper products from Maryvale to Victoria Dock sidings (Qube Logistics, broad gauge);
- cotton from Barnawartha to West Swanson Dock (SCT, standard gauge);

- grain and other agricultural products from Dooen to West Swanson Dock (SCT / Wimmera Container Line, standard gauge);
- meat and milk products from Westvic / Warrnambool to Appleton Dock (Pacific National, broad gauge);
- grain and other agricultural products from Tocumwal to Appleton Dock (Pacific National and Qube Logistics, broad gauge);
- wine and agricultural products, including fruit in reefer containers, from Merbein / Mildura to Appleton Dock (Pacific National, standard gauge);
- grain and agricultural products from Donald to Appleton Dock (Pacific National, standard gauge);
- cotton, beverages, meat and agricultural products from Griffith, Wumbulgal, Leeton and Ettamogah to West Swanson Dock and Appleton Dock (Pacific National, standard gauge).

Port rail containers also arrive by road shuttles from the Dynon railway terminals.

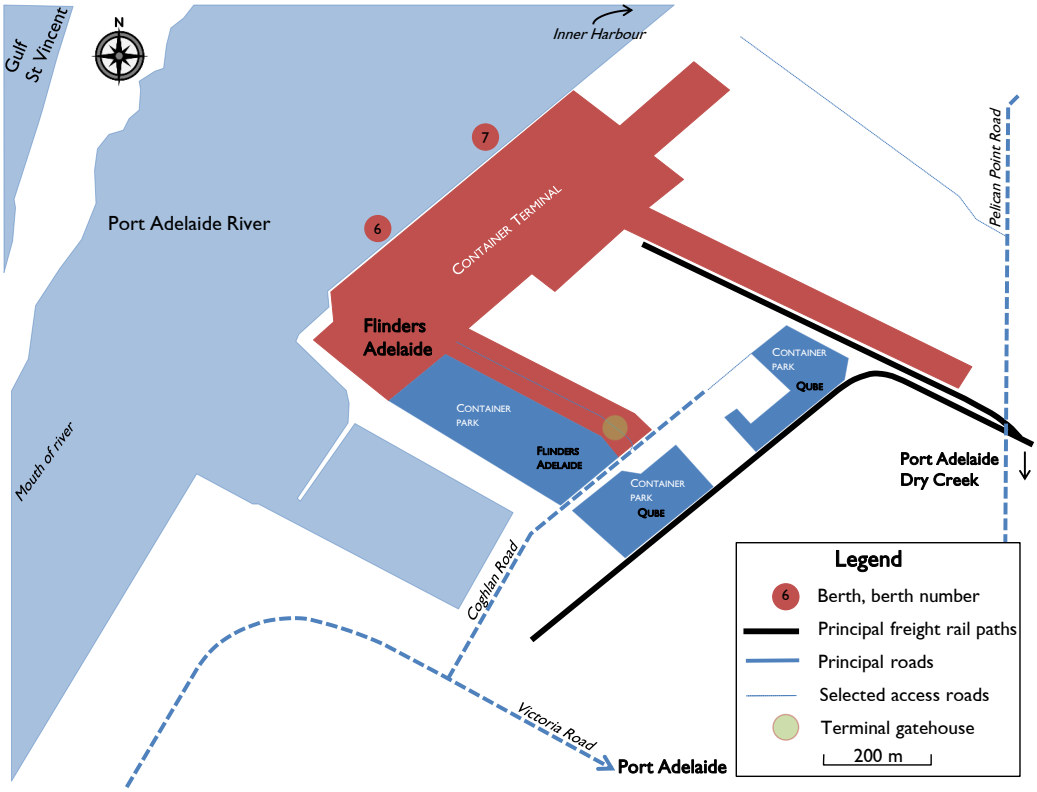
Rail linkages. The dock area consists of rail facilities near the docks and the nearby intermodal container terminals at South Dynon, Dynon and North Dynon. Although there is an eastern link from the Dynon terminals towards the east (Southern Cross and Flinders Street), the container movements are to 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.

OOCL Rotterdam berthed at Port of Brisbane. Photo courtesy of Port of Brisbane Pty Ltd.

Figure A.4 Adelaide (Outer Harbor / Pelican Point)



(Last updated: October 2018, showing port as of December 2017.)

Adelaide (Flinders Adelaide Container Terminal)

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

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 three post-Panamax container-handling cranes. A fourth, Panamax-sized crane was decommissioned in December 2017.

Road

Flinders Adelaide Container Terminal is accessed via 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).

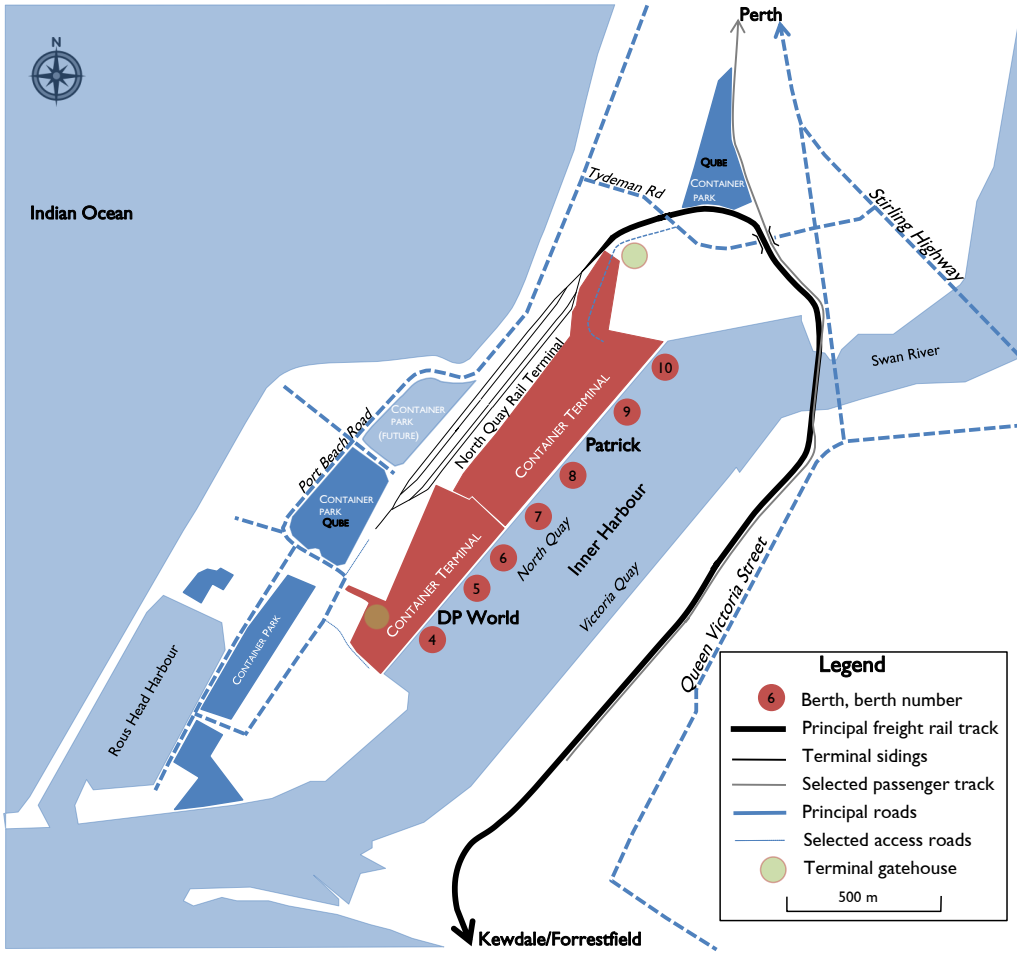
Long-haul:

- containerised lead from Port Pirie, agricultural products from Bowmans Intermodal Terminal, via Port Flat (Bowmans Rail);
- copper concentrates from Prominent Hill (Genesee and Wyoming Australia);
- mineral sands from Kanandah (Bowmans Rail);
- bulk grain from various producers. Some of this is containerised for export by Viterra's 'inverter' grain loader at Inner Harbour.

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 Genesee and Wyoming Australia terminal at Dry Creek, the Pacific National terminal at Islington (including the Northline logistics facility) and the SCT Logistics terminal at Penfield.

Figure A.5 Fremantle (North Quay terminals in the Inner Harbour)



(Last updated: October 2018, showing port as of December 2017.)

Fremantle (North Quay terminals)

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. DP World operates three berths, numbers 4–6. Patrick operates from berths 7–10.

Equipment. The Patrick terminal has 4 cranes, of which 3 are post-Panamax; the DP World terminal has 3 cranes, including 2 post-Panamax. DP World commissioned its second post-Panamax crane in April 2015.

Road

The principal roads on this peninsula are Tydeman 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 Tydeman 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:

- containers between Kewdale / Forrestfield and North Quay Rail Terminal (Intermodal Link Services);
- a container shuttle service between Kwinana and North Quay Rail Terminal (Aurizon);
- containers from Kalgoorlie, via the Kwinana service (Aurizon).

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.

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