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Shipping and handling costs for Australia's wood product exports

Data availability and methodological issues

Research by the Australian Bureau of Agricultural
and Resource Economics and Sciences

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1 Introduction

Shipping and port handling costs for wood product exports from Australian ports are key costs in the value chain for forest product industries; these costs affect international competitiveness (Mason & Freeman 2015; VAFI 2014). The volume and value of bulk wood product exports from Australian ports are expected to increase over time, particularly as a result of the anticipated expansion in supply of logs from Australia's hardwood plantation estate. This may place some pressures on port infrastructure capacity in Australia and highlights the importance of understanding cost competitiveness and the role of investment throughout Australia's forestry supply chain.

Readily available shipping and port handling cost data for bulk wood products would assist forest growers and primary product exporters to gauge the competitiveness of their value-chain costs with representative costs across Australian ports and over time. However, these data are generally not publicly available in Australia. ABARES undertakes annual surveys to collect a range of forestry sector datasets, including delivered log costs to mills (milldoor prices), but these surveys do not extend to the costs of loading and shipping these products to overseas destinations.

Forest and Wood Products Australia (FWPA), as the research and development agency for the forestry sector, commissioned ABARES to undertake a review of availability of shipping and handling cost data for bulk wood commodity exports from Australian ports, and to examine ways these data may be estimated for publication.

This report presents an ABARES assessment of the current availability of shipping and port handling cost data for Australia's major ports. The report comprises a review of available datasets and results from preliminary industry consultation, a description of Australia's existing port infrastructure, and assessments of the existing availability and potential methods to estimate shipping and handling costs for wood product exports from Australia.

Future collection and estimation of shipping and port handling cost data is currently not planned, but would require ongoing surveys of port managers and other stakeholders to ensure that the data collected and used as a basis for estimation are consistent and comprehensive.

2 Literature review and consultation

ABARES has undertaken a desktop review of the publicly available data for shipping and port handling costs in Australia, using published documents and by liaising with principal stakeholders in the wood products export industry. This has included presenting the ABARES approach to members of FWPA's reference group, and directly contacting selected ports involved in the export of bulk wood commodities (roundwood logs and woodchips).

This section describes the results of the review and consultations relating to port and freight costs. Some important factors that affect the costs associated with exporting wood products are not included in this review, such as biosecurity requirements of importing countries, procedures to lower the moisture content of products and grading/scaling procedures when loading products.

Port handling costs

For this report, port costs comprise the costs charged to commodity exporters for the services associated with providing vessels at berth, loading and storing bulk cargo and ancillary services such as port security and infrastructure. These costs encompass charges associated with the time a vessel is at anchor outside a port to the time it leaves berth at the port, as well as costs incurred independent of vessel activity, such as in managing wood product delivery and storage.

Estimates of port costs specific to bulk wood products are generally not available for Australia. Hence, the relative importance of these in total wood supply chain costs in Australia, and the differences in costs across ports and over time, is not publicly available. Such limitations are not confined to the forestry sector. The Australian Export Grains Innovation Centre (AEGIC) examined the components of costs in Australia's bulk grain supply chains and found that Australia lags behind other countries in disclosure of supply chain efficiency metrics that enable inter-year comparisons of these costs (AEGIC 2014).

Nevertheless, some reports published in Australia do demonstrate inter-temporal and regional differences in port costs for broad export product categories. These may be indicative of the costs faced by bulk wood product exporters.

Existing datasets: container costs

Two main publications provide estimates of port handling productivity and export costs in Australia, although both of these focus on containerised commodities and do not differentiate costs by commodity.

Firstly, the Bureau of Infrastructure, Transport and Regional Economics (BITRE) publishes annual *Waterline* reports, which contain information on the costs associated with export container movements for five Australian major port terminals: Brisbane, Sydney, Melbourne, Adelaide and Fremantle (BITRE various years). These reports cover the range of costs incurred at port, including towage, navigation, wharfage, stevedoring and other charges, over a three-year period for major ports around Australia. The reports also include assumptions about vessel size and loading times.

Secondly, the Australian Competition & Consumer Commission (ACCC) publishes the annual *Container stevedoring monitoring report*, which provides measures of productivity and costs for Australian wharves by port and terminal operator (ACCC 2014). These reports focus on

estimating time series of stevedoring costs for major ports and do not cover the full range of charges incurred by exporters.

Together, these reports provide annual datasets of port container charges and provide useful insights into the relative competitiveness of Australian ports across locations and over time. For wood product exporters that use containers, these publications provide a review of relative port costs around Australia as well as trends in this component of the value chain. However, these reports are not representative for Australia's principal wood exports (by volume), particularly woodchips and logs (which are transported in bulk).

Costs for bulk wood product exports

Despite focusing on container costs, the datasets may be of some use to stakeholders in Australia's forestry sector because the relative competitiveness of container transport may be indicative of the relative competitiveness of bulk transport costs. However, the charges faced by container exporters are significantly different to those faced by bulk exporters because the logistics of vessel size, cargo storage and loading differ significantly across commodities.

Shipping Australia Limited undertook a study of shipping costs for break bulk cargo in Australia, based on interviews with a variety of organisations involved in port activities (Shipping Australia Limited 2009). Break bulk cargo is defined as cargo that is loaded into ships as individual pieces or unitised on pallets or bundles, and not containerised or loaded as dry or liquid bulk. This may include some wood products such as logs and some timber products. Some port charges, such as stevedoring, were not able to be estimated by Shipping Australia due to commercial confidentiality, and the report found that many other charges were difficult to estimate because they are often negotiated privately and confidentially between service providers and shipping lines.

In the report, Shipping Australia estimated port charges using a standard size and type of vessel to compare costs across ports, and using quoted tariffs (to exclude the possibility of lower negotiated rates). The study found that a number of port infrastructure and logistics issues could be improved to enhance efficiency at many of Australia's major ports, and that vessel towage costs were the largest cost component of port handling charges, despite competing tug operations being present at some ports.

Aside from Shipping Australia Limited (2009), there are no publicly available analyses of port costs for bulk commodities in Australia. Some private analyses have been commissioned, but these are not publicly available so are not able to be utilised by all industry stakeholders to provide price signals and indications of the competitiveness of their export costs.

However, most ports in Australia publish annual port charges documents for bulk commodities. The range of charges provided in these documents varies by port. For example, some port managers are responsible for pilotage and stevedoring activities, but at other ports these activities are undertaken by third parties—hence, the associated costs are not included in published documents. Table 1 provides a summary of the main components given in the port charges documents, categorised using definitions from the BITRE *Waterline* reports, which divide port costs into ship-based charges, cargo-based charges and other charges. Appendix A: Port charges references contains links to some of the port charge documents.

Each port authority may use different terminology to describe port activities, may base charging on different units of time or weight, and may not include all activities in their port charges documents, depending on the role of third party contractors in certain activities. Hence, ensuring consistency in cost estimation across ports can be difficult.

Table 1 Components of port charges and assumptions

Broad charge/ assumption	Detailed charges/ assumptions	Description
Ship-based charges	–	Charges that ship owners pay for a port visit by the ship once they come into harbour
	Conservancy/navigation	Navigation service charges levied by public authorities, which cover calls by a vessel at one or more ports over a specified period
	Pilotage	Paid per movement when using the services of a marine pilot in a pilotage area
	Towage	Levied by tug boat operators for tugs required for berthing, unberthing and shifting inside the harbour
	Mooring/unmooring (line handling)	Charged to vessels using mooring and unmooring services when entering or leaving the port, or for movements in the port, levied by the port authority, stevedoring company or other providers
	Tonnage	Based on the gross tonnage of the vessel levied by the port authority to recover costs and resources associated with provision and maintenance of port and harbour facilities
	Berth hire/site occupation	Charged to vessels that remain alongside a port berth, including time when not working cargo. May be included in stevedore charge
Cargo-based charges	Security	Recovery of cost of providing maritime security of common user and waterside areas
	–	Charges levied on the volume of cargo to be loaded
	Wharfage	Levied by the port authority on each unit of cargo for accommodation at wharf provided during loading or storage
	Cargo storage	Levied by port authority on goods remaining on the wharf, berth or separate from the port. May involve additional loading expenses
Other charges	Port access charge/harbour dues	Levied on specific commodities that have required investment in significant capital projects
	Stevedoring	Levied by stevedoring companies for handling cargo
	Customs brokers fees	Fees charged by customs brokers for administrative costs associated with organising the export of consignments
	Road transport costs	Charged by transport companies for transporting cargo to or from the wharf
Port and vessel characteristics	Equipment and plant hire	Payment for additional equipment for storage and loading of commodities
	–	Assumptions required to calculate representative shipping and handling costs—averages and ranges by port and financial year
	Gross registered tonnes	Vessel size in terms of internal capacity
	Cargo loaded	Volume/weight of cargo
	Average loading rate	Measure of the productivity of loading, by commodity type
	Average berth utilisation	Average time spent at berth, including loading and non-loading times
Storage area/volume	May affect logistics and cost of delivering products to port and loading in a timely fashion	

Sources: BITRE (various years), *Waterline*; various port charges documents.

In addition to the data available in published port charges documents, several estimates or assumptions are required to calculate equivalent (comparable) costs faced by exporters of bulk commodities across ports. These are listed in Table 1, and include vessel size and the amount of cargo loaded, measures of loading and idle time at berth, and other factors affecting the cost of moving commodities from port gate to vessels such as availability of storage areas. Some of these data are available on several port websites, but they are often not differentiated by commodity or time period. Based on ABARES consultation with most ports, it is feasible to collect the broad additional datasets listed here for each port, commodity and time period. This would provide a basis for estimation of indicative port handling costs.

In addition to these considerations, a number of factors may affect the actual costs faced by wood product commodity exporters. These include specific charges for individual commodities that may not be reported in the public documents, negotiated rates for regular or one-off exports, ownership characteristics of port infrastructure and variation in the time and services required for activities undertaken at the port.

Other considerations may also affect the costs of exporting wood products. These may include the availability of empty containers for some bulk commodities, and changes in the types of bulk commodities exported, such as squared-off logs. Methodologies for estimation of port charges would need to take into account these changing factors.

Shipping costs

Export shipping costs measure the average unit costs (for example, using the Japan Agricultural Standard) of transporting products from domestic to foreign ports. Shipping woodchips and logs to overseas markets is usually contracted to third parties, either by the buyer or seller of the commodities. Shipping costs will vary by port and destination for a number of reasons; insurance, freight distance and fuel prices contribute the most to cost. The volume and regularity of the shipment is also an important component of the quoted rates for shipment.

Several subscription services are available for private stakeholders to access shipping cost information, some of which include cost indexes by port and ship size. For example, the Baltic Dry Index (BDI) measures the rates for chartering large ships for transporting major bulk commodities such as grain, minerals and containers. Daily data are available via subscription on various commercial websites. Other freight indexes also exist, such as the Shanghai Containerized Freight Index, which measures spot rates for shipping containers from Shanghai to selected major destinations. In general, these international indexes are indicative of world freight costs but provide limited useful information to stakeholders interested in the relative costs of exporting wood products from Australian ports to major trading partners.

Based on ABARES research, estimates of shipping costs for specific commodities and routes are not compiled or published in public documents. The potential to undertake a survey or estimate shipping costs for wood products from Australia to major export destinations is limited, because two principal factors limit the potential for such a survey. Firstly, many wood product exporters may not be responsible for the transport of wood products, which may instead be handled by the overseas importer or by third party contractors. In these cases, wood product exporters may be unable to provide the required data. Prospective surveys would need to be expanded to include agents involved in wood product exports or overseas importers.

Secondly, some wood product exporters may be unwilling to provide the data because of commercial sensitivity. This has been the case for several other ABARES surveys, which are voluntary and depend on the goodwill of survey respondents, the perceived public interest in

publishing the data, and assurances about the security and confidentiality of individual data. In general, respondents are more willing to provide non-financial data (such as product volume) than value or price data. A survey of wood exporters, seeking export cost data, would likely meet initial resistance and take time to develop the trust and confidence necessary to obtain sufficient datasets to ensure robust estimates.

Given the absence of publicly available relevant information, the commercial sensitivity of the estimates and their availability on a number of subscription sites, ABARES considered that estimation of representative and reliable datasets may not be feasible.

3 Australia's bulk wood product export infrastructure

Australia has a number of established ports that regularly export bulk wood products, as well as emerging ports beginning to provide export services as log resources in specific regions become available. Table 2 provides a list of ports reported as exporting wood products in 2013–14, including non-bulk products, based on information from the [Ports Australia website](#). This website aggregates data provided voluntarily by ports, so is not necessarily comprehensive or consistent across ports or time periods.

Based on the data in Table 2, Portland in Victoria is Australia's largest port for wood product exports, accounting for around 28 per cent of total woodchip export volumes and 74 per cent of roundwood log exports in 2013–14. According to these data, Australia's other major ports are Bunbury and Albany in Western Australia, and Bell Bay in Tasmania.

However, these data are voluntarily reported, may omit some ports or shipments, and may not be consistent with Australian Bureau of Statistics trade data. For example, the Port of Eden, managed by Port Authority of New South Wales, is New South Wales' largest port for exporting bulk wood products, such as logs and woodchips, but is omitted from the Ports Australia data. In Western Australia, the Esperance Port has recently opened a woodchip terminal, and the Port of Gladstone in Queensland has recently begun exporting logs and woodchips. These ports would not be represented in 2013–14 trade data, but may be more important over time.

Table 2 Ports Australia wood product exports from Australia, by port, 2013–14

Port	Manager	Log exports (tonnes)	Timber products (tonnes)	Woodchips (green tonnes)
Newcastle, New South Wales	Newcastle Port Corp.	na	531	23 900
Geelong, Victoria	Geelong Port	na	na	931 305
Portland, Victoria	Port of Portland	1 292 022	45 100	2 269 966
Brisbane, Queensland	Port of Brisbane Pty Ltd	2 468	140 341	100 057
Mourilyan, Queensland	Ports North	na	na	82 956
Burnie, Tasmania	TasPorts	130 017	88 899	419 635
Bell Bay, Tasmania	TasPorts	65 447	na	1 457 621
Devonport, Tasmania	TasPorts	56 541	na	na
Hobart, Tasmania	TasPorts	60 944	47 384	na
Adelaide, South Australia	Flinders Ports	78 300	na	na
Albany, Western Australia	Southern Ports Authority	na	na	1 398 051
Bunbury, Western Australia	Southern Ports Authority	67 154	21 755	1 506 607
Fremantle, Western Australia	Fremantle Ports	43 797	na	na
Total	–	1 740 149	400 551	8 190 098

na Not available.

Note: All units mass tonnes. Woodchips are measured in green tonnes, which differ from Australian Bureau of Statistics units (bone dry tonnes). Data has not been confirmed by ABARES, and some ports may be omitted.

Source: Ports Australia (2014).

In addition to the data available on the Ports Australia website, individual port authorities publish some data on the scope and capacity of the export berths for selected bulk commodities. These publicly available data are presented in Appendix A: Port charges references. The amount of information publicly available differs across ports and could be supplemented through surveys of port authorities and other stakeholders if required. ABARES has not undertaken a comprehensive survey to confirm or supplement the data presented.

New South Wales

New South Wales has several ports that have the potential to export bulk wood products, including Eden port, and Newcastle and Yamba ports in northern New South Wales. However, since the Boral woodchip export operations in Newcastle and Yamba closed in 2013, Eden port remains the principal bulk export port in the state.

Table 3 summarises publicly available data available for the Eden port. While the Eden port is managed by Port Authority of New South Wales, the woodchip export facility is privately owned. Woodchips are exported through the former South East Forest Exports (SEFE) berth, now owned by Allied Natural Wood Exports. Logs are exported through Eden port's multi-purpose wharf, managed by Port Authority of New South Wales which applies berth hire charges. Stevedoring logistics and fees are charged by Australian Marshalling Services and towage services are provided by Svitzer Australia.

According to shipping schedule data from the Port of Eden website, average vessel size for woodchip exports is around 50 000 tonnes and log ships are around 30 000 tonnes. Woodchip loading rates are around 1 200 tonnes per hour. Loading rates for roundwood logs are not available.

Table 3 Port of Eden details

Port services	Manager	Description	Commodities	Characteristics
Berths				
Multi-purpose wharf	Port Authority of NSW	Max. LOA: 185m Max. draft: 10.5m	Logs	Vessel mean: 30 000t Loading rate: na
Woodchip (former SEFE) Berth	Allied Natural Wood Exports	Max. LOA: 235m Max. draft: 11.3m	Woodchips	Vessel mean: 50 000t Loading rate: 1 200t/hr
Other activities				
Pilotage	Port of Eden	-	-	-
Stevedore	Australian Marshalling Services	-	-	-
Towage	Svitzer Australia	Two x 41t Bollard Pull tugs	-	-
Storage	Port of Eden	Uncovered, hard stand storage area	-	8 hectares

LOA Length overall. **na** Not available.

Sources: Pentarch Forestry (2016); Port Authority of NSW (2016).

Victoria

In Victoria, wood products are primarily exported from the Port of Melbourne, Geelong Port and the Port of Portland. While processed timber products and containerised commodities are exported via Melbourne and Geelong Ports, the latter is also important for bulk wood product exports, such as woodchips and logs. However, the Port of Portland is the principal wood product export port in both Victoria and Australia, accounting for a significant share of bulk wood products such as woodchips and logs.

The woodchip export berths at Geelong Port (Table 4) are utilised by Softwood Plantation Exporters (SPE Management), a partnership between Hancock Victorian Plantations (HVP), Associated Kiln Driers (AKD Softwoods) and Midway. Other activities, such as towage and stevedoring, are provided by third parties.

Loading rates for woodchips are estimated between 750 and 1 000 tonnes per hour. Data on the size of vessels used for woodchip export are not available.

Table 4 Geelong Port details

Port services	Manager	Description	Commodities	Characteristics
Berths				
Corio Quay North Berths No. 1 & No. 2	Geelong Port, SPE Management	Max. LOA: na Depth alongside: 11.0m	Woodchips	Vessel mean: na Loading rate: 750– 1 000t/hr
Corio Quay North 4	Geelong Port, Midway	Max. LOA: na Depth alongside: na	Woodchips	Vessel mean: na Loading rate: 1 000t/hr
Other activities				
Pilotage	Port Phillip Sea Pilots Pty Ltd	–	–	–
Stevedore	Patrick Stevedoring	–	–	–
Towage	Svitzer Geelong	–	–	–
Storage	Geelong Port	No. 1: 6 500m ² hard stand storage No. 2: 91m x 30.5m cargo shed	–	–

LOA Length overall. **na** Not available.

Sources: Geelong Port (2016); Softwood Plantation Exporters (2016).

According to Ports Australia data, the Port of Portland accounted for almost three-quarters of log export volumes and 28 per cent of woodchip exports in 2013–14, and is reported as one of the biggest hardwood woodchip export ports in the world (ABC 2015). The port primarily services forest and wood products grown or processed in the Green Triangle region of Victoria and South Australia.

Based on publicly available information, the Port of Portland utilises three berths for export of bulk wood products (Table 5). KSA Berth 1 is owned and operated by GrainCorp, and Berth No. 6 is operated by Australian Bluegum Plantations. Stevedoring services at the port are provided by Qube Ports & Bulk and Port of Portland; storage, towage and infrastructure (berth hire, tonnage and wharfage) services are provided for and charged by Port of Portland.

Based on publicly available shipping information available in May 2016, average vessel size for woodchip exports was around 45 000 tonnes, and for log exports vessels averaged 25 000 tonnes.

Table 5 Port of Portland details

Port services	Manager	Description	Commodities	Characteristics
Berths				
K.S. Anderson Berth 1	Port of Portland; GrainCorp	Max. LOA: 265m Max. draught: 11.5m (arrival) Depth alongside: 12.5m	Woodchips	Vessel mean: 45 000t Loading rate: 900–1 200t/hr
Berth No. 5	Port of Portland	Max. LOA: 230m Max. draught: 11.9m	Logs	Vessel range: 17–33 000t Vessel mean: 25 000t Loading rate: na
Berth No. 6	Port of Portland; Australian Bluegum Plantations	Max. LOA: 230m Max. draught: 11.4m (arrival) Depth alongside: 7.0m	Woodchips Logs	Vessel range: 33–55 000t Loading rate: 900t/hr
Other activities				
Pilotage	Port of Portland	–	–	–
Stevedore	Qube Ports & Bulk; Port of Portland	–	–	–
Towage	Port of Portland	–	–	–
Storage	Port of Portland	3 open-air and 1 undercover stockpile storage areas linked to ship loading facilities on Berth No. 6 and KSA Berth 1.	Woodchips	SW undercover: 60 000t SW open: 120 000t HW open: 80 000t HW open: 150 000t
Storage (continued)	Port of Portland	Open log storage	Logs	8 hectares

HW Hardwood. **LOA** Length overall. **na** Not available. **SW** Softwood.

Note: Vessel ranges are based on available data and may not represent full range of vessel sizes utilising the port. Maximum draught for berthing vessels loading woodchips at KSA 1 is less than for other vessels.

Sources: Port of Portland (2015, 2016a, b).

Queensland

Based on Ports Australia data, Brisbane and Mourilyan (south of Cairns) ports accounted for the majority of Queensland's wood product exports in 2013–14. In addition, the Port of Gladstone has begun exporting woodchips and logs, but data are not currently available.

Brisbane woodchip export operations are conducted from the Fisherman Islands berth by Queensland Commodity Exports Pty Ltd (Table 6). Pilotage from the port is the responsibility of Brisbane Marine Pilots Pty Ltd. Loading rates for woodchips average 700 tonnes per hour.

According to port data, woodchips and logs were exported through the Port of Mourilyan, which is managed by Ports North. Towage services from the port are provided by Svitzer Australia. Woodchip loading rates are not available for the port. Based on publicly available information,

woodchips were exported from the port using vessels ranging from 33 600 to 39 900 tonnes between January to March 2016. The major user of the port for wood product exports was Hancock Queensland Plantations (HQP).

Gladstone Port wood product exports comprise log exports; wood pellets are exported from Bundaberg Port Berth 2. Based on the Gladstone Ports Corporation website, in June, July and September 2015 and December 2016 wood pellets were exported from Bundaberg in shipments from 4 800 to 26 000 tonnes. Vessel size and loading rates for logs are not available.

Table 6 Queensland port details

Port services	Manager	Description	Commodities	Characteristics
Ports/berths				
Brisbane (Fisherman Islands)	Port of Brisbane Pty Ltd, Queensland Commodity Exports Pty Ltd	Length: 285m Nominal depth: 13m	Woodchips	Loading rate 700t/hr
Mourilyan	Ports North	Max. LOA: 195m Max. draft: 9.6m	Woodchips	Vessel range: 33 600–39 900t Vessel mean: 37 000t Loading rate: na
Gladstone (Auckland Point)	Gladstone Ports Corporation Ltd	Max. LOA: 200–238m Max. draft: na	Logs Woodchips	Vessel range: na Vessel max.: 55 000– 70 000DWT Loading rate: na
Bundaberg Berth 2	Gladstone Ports Corporation Ltd	Max. LOA: 190m Max. draft: 9.5m	Wood pellets	Vessel range: 4 800–26 000t Loading rate: na
Other activities				
Pilotage	Maritime Safety Queensland (MSQ)	–	–	–
Stevedore	Northern Stevedoring Services (Gladstone); Patricks	–	–	–
Towage	Svitzer Australia Smit Marine Australia	Mourilyan Gladstone	–	–
Storage	Qube, Port Authorities	–	–	–

DWT Deadweight tonnes. **LOA** Length overall. **na** Not available.

Note: Vessel ranges are based on available data and may not represent full range of vessel sizes utilising the port.

Sources: Gladstone Ports Corporation (2016); Maritime Safety Queensland (2016); Ports North (2013); Qube (2016).

Tasmania

Four ports are currently utilised for wood product exports in Tasmania: Bell Bay, Burnie, Devonport and Hobart. All of these are managed by TasPorts; however, some berths used for bulk wood commodity exports are operated privately. Port infrastructure has been identified as one of the major constraints and risks in Tasmania's forest export supply chain (IndustryEdge 2013), particularly following cessation of Triabunna woodchip exports in 2011 and the subsequent sale of that port facility. Currently, the principal ports for woodchip exports from Tasmania are Burnie and Bell Bay; an additional port is being sought in the south of the state.

Two berths, managed by TasPorts, are used at the Port of Burnie for exporting woodchips and roundwood logs. Average vessel sizes are not available for the berths at Burnie port, but woodchip loading rates at Berth No. 7 are estimated at 1 200 tonnes per hour.

Three berths are used for woodchip exports at Bell Bay, on the Tamar River. Forico now manages the former Gunns Ltd woodchip and export facilities at Long Reach Berths No. 1 and 2 (Table 7). Average loading rates for the Bell Bay Long Reach berths are available on [Forico's website](#), according to which a proposed upgrade to the facilities may substantially increase loading rates, from 900 to 1 300 tonnes per hour. Bell Bay Berth No. 6 is utilised by Artec and Smartfibre, where private conveyor belts connect with a conveyor belt operated by TasPorts.

According to Ports Australia data, Devonport and Hobart ports are used for roundwood log and timber product exports. Average vessel size and loading rates are not available for these ports.

Table 7 Tasmanian port details

Port services	Manager	Description	Commodities	Characteristics
Ports/berths				
Burnie Berth No. 7	TasPorts	Max. vessel length: 260m Declared depth: 11.5m	Woodchips	Vessel range: na Loading rate: 1 200t/hr
Burnie Berth No. 6	TasPorts	Max. vessel length: Declared depth: 11.2m	Logs	Vessel range: na Loading rate: na
Bell Bay Long Reach No. 1 & No. 2	Forico (former Gunns Ltd)	Depths alongside: 11.2–11.5m	Woodchips	Loading rate: 900t/hr (average) Proposed upgrade: 1 300t/hr
Bell Bay Berth No. 6	TasPorts, Smartfibre, Artec	Max. vessel length: 250m Depth alongside: 9–12.4m	Woodchips	Average vessel size: 33 000t Loading rate: na
Devonport	TasPorts	–	Logs	Vessel range: na Loading rate: na
Hobart	TasPorts	–	Logs	Vessel range: na Loading rate: na
Other activities				
Pilotage	TasPorts	–	–	–
Stevedore	Bell Bay: Qube Burnie: Australian Marshalling Services	–	–	–
Towage	TasPorts Towage	–	–	–
Storage	Bell Bay: Artec, Smartfibre	Outside chip stockpile	–	Smartfibre: 100 000t single product; 80 000t two products

na Not available.

Sources: Forico (2016); Smartfibre (2016); TasPorts (2016a, b).

South Australia

South Australia's exported wood products consist of hardwood and softwood plantation logs and woodchips grown in the Green Triangle region (which are exported through Port of Portland) and softwood plantations in the Adelaide Hills and the mid north of the state. The latter are exported through Flinders Port in Adelaide. According to Ports Australia data, exports through the Adelaide port consist entirely of roundwood log exports.

Public data are not available for average vessel sizes and loading rates for logs exported through Adelaide.

Table 8 South Australian port details

Port services	Manager	Description	Commodities	Characteristics
Berths				
Adelaide Inner Harbour (ADL IH) 19 and 20	Flinders Ports	Max. vessel length: 206m Declared depth: 10.0m	Forestry products	Vessel range: na Loading rate: na
Other activities				
Pilotage	Flinders Ports	-	-	-
Stevedore	Qube	-	-	-
Towage	Flinders Ports	-	-	-
Storage	na	-	-	-

na Not available.

Source: Flinders Ports (2016).

Western Australia

Western Australia currently has two main ports for bulk wood product export: Albany and Bunbury. Both of these are managed by Southern Ports Authority. In addition, there is a proposal for Australian Plantation Log Exports, and potentially Southern Pacific Fibre, to export woodchips and/or plantation logs from Esperance Port, which currently focuses on mineral exports. Trees will be chipped at the plantation and stockpiled offsite before being road transported into the port and loaded directly onto a ship alongside Berth No. 2 using mobile facilities (Southern Ports Authority 2014).

Albany Port has two berths for bulk wood product export. Berth No. 6 is used for woodchip export and services vessels from 24 000 to 54 000 tonnes with an average loading rate of 900–960 tonnes per hour (Albany Port Authority 2016a) (Table 9). Woodchips accounted for around 24 per cent of the port's throughput (imports and exports) in 2014–15 (WA Department of Transport 2015). According to trade statistics provided by the port, in 2014–15 woodchip exports were estimated at 1.17 million tonnes, 17 per cent below the 2013–14 volume. Woodchips were the second largest export from the port (by volume).

There were 140 vessels in total entering the port, with 5.3 million gross registered tonnage (GRT, which measures the ship's internal capacity) and 7.7 million deadweight tonnes (DWT, which measures the total weight of cargo a vessel can lift less fuel, water and stores). The principal destinations for woodchip exports in 2014–15 were Japan and China, and APEC and Australian Bluegum Plantations were the main companies exporting woodchips. The port resumed log exports from Berth No. 2 in September 2015 (Albany Advertiser 2015).

In 2014–15 woodchip exports accounted for around 10 per cent of Port of Bunbury throughput (imports and exports) by volume. Woodchips are exported from Berth No. 3 at Bunbury port (Table 9). Woodchip mills operated by WAPRES and Bunbury Fibre Exports (BFE) send log and woodchip product through the port.

Table 9 Western Australian port details

Port services	Manager	Description	Commodities	Characteristics
Berths				
Albany Berth No. 6	Southern Ports Authority	Berth length: 216m Max. draught: 11.5m	Woodchips	Vessel range: 24 000–54 000t Vessel mean: 50 000t Loading rate: 900–960t/hr
Albany Berth No. 2	Southern Ports Authority	Berth length: 172m Max. draught: 9.8m	Logs	Vessel range: 11 000–19 000t Vessel mean: 15 000t Loading rate: 375–500t/hr
Bunbury Berth No. 3	Southern Ports Authority; WAPRES	Max. length: 210m Max. draught: 11.6m Depth alongside: 12.2m	Woodchips	Vessel range: 45 000–50 000t Vessel mean: 47 500t Loading rate: 1 000t/hr
Bunbury Berth No. 8	Southern Ports Authority; BFE	Berth length: 229m Max. draught: 11.6m Depth alongside: 12.2m	Woodchips	Vessel range: 45 000–50 000t Vessel mean: 50 000t Loading rate: 2 000t/hr a
Other activities				
Pilotage	na	–	–	–
Stevedore	Albany: Australian Bulk Stevedoring; Bunbury: Qube	–	–	–
Towage	Svitzer Australia P/L (Albany); Riverwijs P/L (Bunbury)	–	–	–
Storage	na	–	–	–

a May not apply to bulk wood products. **BFE** Bunbury Fibre Exporters. **na** Not available.

Note: Vessel ranges are based on available data and may not represent full range of vessel sizes utilising the port.

Sources: Albany Port Authority (2016a, b); Bunbury Port Authority (2010, 2014, 2016a,b); Southern Ports Authority (2013); WA Department of Transport (2015).

4 Shipping costs

For this report ABARES examined options to estimate the costs of shipping bulk wood products from Australian ports. This review of methods and data availability concluded that detailed information for wood products is not publicly available and commercial sensitivity of data is exacerbated because of the limited number of companies involved in exporting bulk wood products such as roundwood logs and woodchips. Hence, information on shipping costs for wood products from Australia may be commercially sensitive and ABARES is unlikely to be able to collect such data for the purpose of publication.

Nevertheless, publicly available alternatives exist that may represent reasonable proxies for the costs of shipping to major export destinations.

The Baltic Dry Index (BDI), and associated subsets, are widely available and quoted data that provide indicative shipping costs for a composite of ship sizes and raw material commodities. While not necessarily relevant to bulk wood commodity trade, they are often quoted in a number of forestry publications as indicators of the trends in costs faced by Australian exporters (for example, various issues of *Wood Market Edge* (IndustryEdge (various years)) and *Wood Matters* (PF Olsen (various years)) newsletters).

The BDI is a measure of variations in the cost of shipping major raw materials such as metals, grains and fossil fuels by sea, averaged across principal shipping routes. It is created by the London Baltic Exchange based on daily assessments from a panel of shipbrokers. The BDI is a composite of three sub-indexes, each covering a different carrier size: Capesize, Panamax and Supramax. Capesize vessels represent the largest ships with a capacity greater than 150 000 deadweight tonnes (DWT). Panamax refers to the maximum size allowed for ships travelling through the Panama Canal, typically 65 000 to 80 000 DWT, while the Supramax Index covers carriers with a capacity of 50 000 to 60 000 DWT. As already described, the average size of vessels exporting bulk wood products from Australia are generally smaller than these, although some woodchip carriers departing Australia exceed 50 000 DWT.

Bulk commodity exports such as woodchips and roundwood logs generally utilise smaller vessels, such as Handymax (35 000–40 000 DWT) and Handysize (Bulkers) (15 000–35 000 DWT).

Figure 1 illustrates the five-year trend in the Baltic Dry, Panamax and Supramax indexes. The data show that shipping costs have fallen considerably over the past year, and the BDI has fallen from a peak of 2 337 in December 2014 to around 500 in December 2015, a decline of around 40 per cent. Over the same time period, the Panamax and Supramax indexes fell by 59 per cent and 53 per cent, respectively.

Based on Figure 1, the Panamax and Supramax indexes tend to move in similar directions, though with different magnitudes. The BDI is a composite of these indexes, plus others. Hence, while comparable indexes are not available for the Handysize and Handymax vessel sizes, these publicly available indexes may be indicative of the movement in the shipping costs associated with smaller vessel sizes.

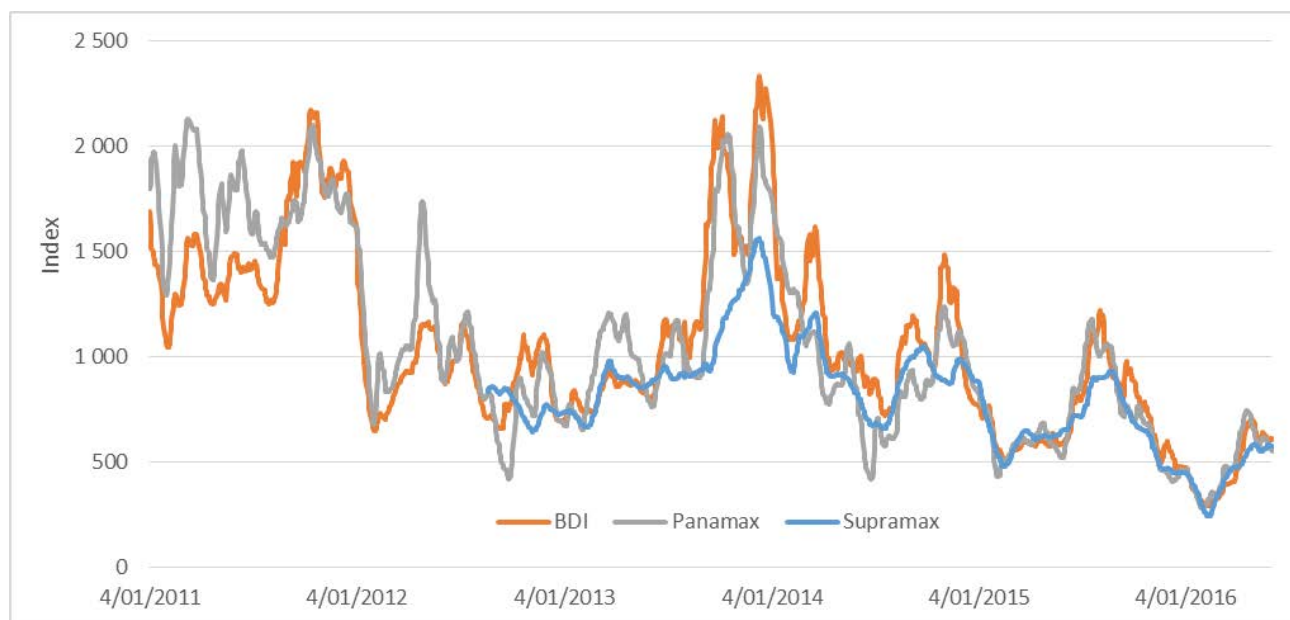
However, in some cases these indexes may not be relevant to considerations of the competitiveness of shipping Australia's bulk wood products to overseas destinations. First, the indexes allow estimates of change in costs over time, but not a comparison of these costs with other charges and prices associated with these products. Hence, the relative importance of these

costs is not indicated in these indexes. Second, these indexes estimate average costs over a number of shipping routes, which may not be relevant to many Australian exporters. Useful data for domestic exporters would comprise shipping cost estimates for each Australian port, overseas export destination and wood product type.

Other online services exist which may be used to estimate more specific costs of shipping bulk wood products from Australian ports. For example, the [SeaRates website](#) offers online quotes for exporting by source and destination. However, the validity of these quotes has not been confirmed by ABARES.

While some selected bulk commodity data are available on commercial websites (such as the [International Seaborne Market website](#)), detailed commodity data for download are generally available for subscribers only. Hence, in cases where private industry wishes to estimate export costs and compare costs over time or across ports, these data may be available to them at their own cost.

Figure 1 Publicly available shipping cost indexes: Baltic Dry, Panamax and Supramax indexes, 2011–2016



Source: Quandl (2016)

5 Port charges—draft estimates

Based on an analysis of the data availability, liaison with FWPA and industry stakeholders, and communication with major ports in Australia, ABARES assessed the availability of port charges and assumptions required to estimate equivalent costs across Australian ports. This section presents the results of this analysis, including a summary of the port charges published by selected Australian ports. This selection of ports is based on data availability, so some ports that currently export bulk wood products are omitted.

Port charges and assumptions

Table 10 provides a summary of the port cost data for the cost items discussed in Table 1, derived from publicly available sources, principally the port charges documents listed in Appendix A: Port charges references. The data show that there is both a large range of data not available from publicly available sources, and that the range of some cost estimates is large, either implying significant differences in the costs components of some ports or that the quoted rates are open to interpretation or negotiation.

In general, data relating to pilotage, berth hire and wharfage are available across most ports and are the most reliable data in the collected dataset. However, as mentioned in Shipping Australia Limited (2009), many of these charges may be negotiable and may not represent the actual costs faced by all exporters. Table 10 shows that significant differences are apparent in many of the port charges, with the ratio of high-to-low charges often exceeding 2:1. Variance in port charges are likely to reflect factors such as port size and economies of scale, the extent of spare capacity for different port services (and hence ability to respond to demand peaks) and the extent of competition between ports, berths or service providers at the port. However, some of the ranges of estimates presented here may be due to other factors, such as the interpretation of what are included in different charges or the assumptions used to convert these costs to common units.

Additionally, all port charges rely on assumptions specific to export consignments, including the vessel size, the volume or weight of cargo to be loaded, the loading rate and other factors affecting vessel time at berth or cargo storage. Estimates of these assumptions are presented in Table 11 and are based on publicly available data and limited industry consultation. However, a comprehensive survey of Australian ports would be required to confirm the assumptions presented in Table 11 and to derive estimates of bulk export costs. Estimates of the costs of exporting bulk consignments from Australian ports will be sensitive to differences in vessel size and loading rates across ports, the amount of cargo shipped (including negotiated rates for ongoing export contracts), the timing of shipping (peak versus non-peak periods), and other factors.

As a result of these data limitations, ABARES has not estimated handling costs for Australian ports in this report. Based on discussion with industry stakeholders, the coverage and comparability of data across ports identified in these datasets could be improved through consultation with port managers and a small survey of port authorities and wood product exporters. Such further work would be required to develop the current publicly available data into nationally consistent datasets that can be used to produce robust estimates of port handling costs for bulk wood product exports.

Table 10 Estimated ranges of port charges, 2014–15

Detailed charge	Range	Description and assumptions
Conservancy/navigation	Not available	Generally not available—payments made to government agencies, and differ by state or port authority
Pilotage	\$0.16–\$0.25/GRT	Generally available for all ports, but sometimes included in other charges. Requires assumptions about number of movements and size of vessels
Towage	\$13 850–\$17 800 flat fee	Not available for all ports. Charges may be based on different criteria—for example, flat fee or per hour. Requires assumptions on number tugs required, number of hours and number of movements
Mooring	\$34–\$84/hour	Not available for all ports. Charges based on different units—for example, per hour, flat or per linesman. Requires assumptions on number of hours or linesmen
Tonnage	\$0.56–\$0.96/GRT	Generally available for all ports. Often called 'navigation charges'. Require assumptions on vessel size
Berth hire	\$39–\$322/hour	Generally available for all ports. Charges based on different units—for example, per hour or per day, or based on vessel size. Broad range of values may suggest problem interpreting published data. Requires assumptions on hours at berth and vessel size
Security	Not available	Not available for all ports
Wharfage	\$1.25–\$2.59/tonne cargo	Generally available for all ports. Require assumptions on volume cargo
Cargo storage	Not available	Generally not available
Port access charge/harbour dues	Not available	Generally not available
Stevedoring	Not available	Generally not available
Customs brokers fees	Not available	Generally not available
Road transport costs	Not available	Generally not available
Equipment and plant hire	Not available	Generally not available

GRT Gross revenue tonnes.

Note: Some data not available due to insufficient number of samples.

Source: See Appendix A: Port charges references for links to port charges documents; industry consultation

Port charges over time

ABARES approach to estimating port handling costs can also be used to develop annual time series. However, this requires additional data, including published port charges documents and time series of the assumptions used (vessel size, loading rates and time at berth). While some historical port charges documents are available publicly, these are not consistently available across all ports and other data are not available. However, ABARES review indicates that these data could be collected from port authorities and wood product exporters, and used to estimate time series of port costs by bulk wood commodity.

Table 11 Estimated ranges of port handling assumptions, 2014–15

Assumptions	Range	Description
Average vessel size: woodchips	37 000–50 000GRT	Range of average sizes across ports—individual vessel ranges would be wider
Average vessel size: logs	15 000–30 000GRT	Range of average sizes across ports—individual vessel ranges would be wider
Cargo loaded	Not available	Not available in public documents—require a survey
Average loading rate: woodchips	960–1 200t/hr	Range of average loading rates across ports. Not available for all ports
Average loading rate: logs	500–600t/hr	Range of average loading rates across ports. Not available for all ports
Average berth utilisation: woodchips	37–52 hours	Data presented here are calculated using vessel size and loading rates. Range of averages across ports. Actual time spent at berth may exceed these due to other delays in loading and ship movements
Average berth utilisation: logs	30–50 hours	Data presented here are calculated using vessel size and loading rates. Range of averages across ports. Actual time spent at berth may exceed these due to other delays in loading and ship movements

GRT Gross revenue tonnes.

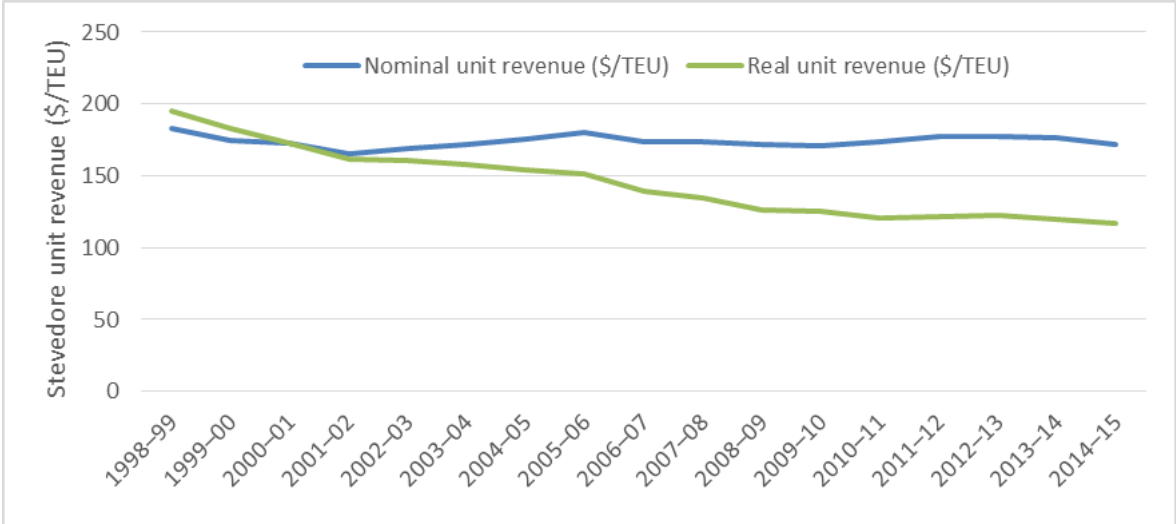
Source: Port websites; industry consultation

Because of the lack of consistent time series data, ABARES estimates are not presented in this report. Some time series data of port costs are available in other publications but generally do not cover the relevant ports or wood product commodities discussed in this report. The *Waterline* series produced by BITRE provide limited (three-year) time series of containerised port costs (spanning ship-based and cargo-based costs) for major ports, including assumptions for time spent at berth for major ports. However, these assumptions for container commodities are generally not relevant for estimating bulk export costs and the ports estimated by BITRE tend to be those responsible for the majority of containerised traffic, such as capital city ports.

The ACCC *Container stevedoring monitoring reports* also focus on commodities not relevant to those studied in this report. However, the ACCC reports provide an indication of stevedoring costs, which are otherwise not available publicly (Shipping Australia Limited 2009).

Figure 2 illustrates estimated national (five-port) average stevedoring costs between 1998–99 and 2014–15. To estimate these data, the ACCC uses stevedoring revenues as a proxy for the prices charged for loading and unloading containerised cargo. The data show that, in nominal terms, prices have remained relatively stable over the past 16 years, and in real terms have fallen by around 40 per cent. The data are a five-port average, comprising Sydney, Brisbane, Melbourne, Adelaide and Fremantle. The ACCC notes that prices have fallen due to several factors, such as higher trade volumes which facilitate investment in capacity, new entrants into stevedoring at these ports which has improved competition, and operational efficiencies which have increased productivity.

Figure 2 ACCC estimates of stevedoring prices, nominal and real, 1998–99 to 2014–15



Source: ACCC (2014)

6 Conclusions

Australia's forestry sector has become increasingly trade focused over recent decades, and anticipated increases in domestic wood fibre availability and international competition requires ongoing improvement and efficiencies throughout the value chain. As the last point in the value chain for domestic wood product exporters, handling and shipping operations at Australian ports are key components of the costs of doing business for that part of Australia's forestry sector that competes in international markets.

Bulk wood products exports such as woodchips and roundwood logs are important to many regions in Australia, and critically important to many forestry operations. Dedicated export infrastructure for bulk wood products are established at many ports, although competition between ports and service providers is limited due to the large distances between ports.

Estimating shipping and port handling costs for Australian ports is problematic. Most ports publish charges for a range of services but the availability of these data is not consistent across ports. Ports often use alternative criteria for calculating costs and several key cost components are not available, such as stevedoring and shipping costs. Availability is generally limited due to commercial confidentiality restrictions between infrastructure/service providers and customers. In addition, published port charges may not represent the actual prices paid by some exporters because prices may be negotiated based on the level of competition, and the seasonality or regularity of shipments.

ABARES has undertaken a review of data availability and explored a methodology for estimating port handling costs in this report; however, estimation of these costs is subject to data limitations and contingent on key assumptions. Based on publicly available data, robust estimates of shipping and port handling costs cannot be produced.

7 References

- ABC 2015, *Port of Portland now biggest exporter of blue gum hardwood chips in the world*, Australian Broadcasting Corporation, <http://www.abc.net.au/news/2015-08-18/blue-gum-portland-woodchips-exports-china-japan-forestry/6704158>, accessed May 2016.
- ACCC 2014, *Container stevedoring monitoring report no. 16*, Australian Competition & Consumer Commission, Canberra, October, <https://www.accc.gov.au/publications/container-stevedoring-monitoring-report>, accessed May 2016.
- AEGIC 2014, *The cost of Australia's bulk grain export supply chains: an information paper*, Australian Export Grains Innovation Centre, January, <http://aegic.org.au/wp-content/uploads/2016/04/The-cost-of-Australias-bulk-grain-export-supply-chains-Postscript.pdf> (pdf 2.42mb).
- Albany Advertiser 2015, *Albany revives timber export*, <http://www.infogo.com.au/1/aa/?http://au.news.yahoo.com/thewest/regional/great-southern/a/-/news/29487325/albany-revives-timber-export/>, accessed May 2016.
- Albany Port Authority 2016a, *Shipping procedures*, <http://www.albanyport.com.au/htm/proceedures2011.html>, accessed May 2016.
- Albany Port Authority 2016b, *Shipping movements - departed vessels*, <http://www.albanyport.com.au/htm/shipdepart11.html>, accessed May 2016.
- Bunbury Port Authority 2010, *No 8 Berth*, <http://www.byport.com.au/berth8.html>, September, accessed May 2016.
- Bunbury Port Authority 2014, *No 3 Berth*, <http://www.byport.com.au/berth3.html>, January, accessed May 2016.
- Bunbury Port Authority 2016a, *Trade statistics and commodities*, <http://www.byport.com.au/cargoes.html>, accessed May 2016.
- Bunbury Port Authority 2016b, *Bunbury - expected shipping*, <http://www.byport.com.au/shipping/shiplist.htm>, accessed May 2016.
- BITRE various years, *Waterline*, Bureau of Infrastructure, Transport and Regional Economics, Department of Infrastructure and Regional Development, Canberra, <http://bitre.gov.au/publications/publications.aspx?query=s:%22waterline%22&link-search=true>, accessed May 2016.
- Flinders Ports 2016, *Port Adelaide*, <http://www.flindersports.com.au/ports-facilities/port-adelaide/>, accessed May 2016.
- Forico 2016, *Long Reach Mill*, <http://forico.com.au/long-reach-mill>, accessed May 2016.
- Geelong Port 2016, *Project and special cargo facilities*, <http://www.geelongport.com.au/>, accessed May 2016.
- Gladstone Ports Corporation 2016, *GPC Terminals - Operations*, <http://content1.gpcl.com.au/Navigation/>, accessed May 2016.

IndustryEdge 2013, *Australian hardwood chip export volume & price forecasts and stumpage and harvest cost review*, report prepared for Macquarie Forestry Services Pty Ltd, April, <http://www.macquarie.com.au/dafiles/Internet/mgl/au/advisers/campaign/static-file/independent-expert-report.pdf> (pdf 0.408mb).

IndustryEdge, various years, *Wood Market Edge*, <http://www.industryedge.com.au/index.php/forestry/wood-market-edge>, accessed May 2016.

Maritime Safety Queensland, 2016, *Port procedures and information for shipping manuals*, <http://www.msq.qld.gov.au/Shipping/Port-procedures>, accessed August 2016.

Mason, J & Freeman, B 2015, *Investment Plan: research needs and priorities for Australian log exports and woodchip exports*, report prepared for Forest and Wood Products Australia, September, <http://www.fwpa.com.au/images/investmentplans/Investment-Plan-Research-Needs-And-Priorities-For-Australian-LogExports-and-Woodchip-Exports.pdf> (pdf 0.374mb).

Pentarch Forestry 2016, *Australian Marshalling Services (AMS) Overview*, http://www.pentarch.com.au/pentarch_forestry/forestry_au/port_services.html, accessed May 2016.

PF Olsen various years, *Wood Matters*, <http://nz.pfolsen.com/market-info-news/wood-matters/>, accessed May 2016.

Port Authority of New South Wales, 2016, *Port of Eden: port facilities & services*, http://edenport.com.au/port_facilities_and_services, accessed May 2016.

Port of Portland 2015, *Port of Portland Tourism Brochure*, <http://www.glenelg.vic.gov.au/files/PortOfPortland-TourismBrochure-UpdatedFebruary15.pdf> (pdf 0.183mb).

Port of Portland 2016a, *Wharf facilities & capacity*, <http://www.portofportland.com.au/port-facilities/wharf-facilities-a-capacity.html>, accessed May 2016.

Port of Portland 2016b, *Berth Line Up: Results - NetSuite Australia (Port of Portland Pty Ltd)*, http://www.portofportland.com.au/images/stories/shipping_information/tentative_shipping.pdf (pdf 0.141mb).

Ports Australia 2014, *Timber Exports (mass tonnes) for 2013/2014*, <http://www.portsaustralia.com.au/aus-ports-industry/trade-statistics/?id=19&period=14>, accessed May 2016.

Ports North 2013, *Port of Mourilyan*, <http://www.portsnorth.com.au/our-ports/mourilyan.php>, accessed May 2016.

Quandl 2016, *Baltic Dry Index; Baltic Capesize Index; Baltic Panamax Index; Baltic Supramax Index*, <https://www.quandl.com/data/LLOYDS/BSI-Baltic-Supramax-Index>, accessed May 2016.

Qube 2016, *Fisherman Island Facility*, <http://www.qube.com.au/ports-and-bulk/facilities/fisherman-island-facility>, accessed May 2016.

Shipping Australia Limited 2009, *Break Bulk Shipping Study*, Sydney, <https://shippingaustralia.com.au/wp-content/uploads/2012/03/Break-Bulk-Study-Final.pdf> (pdf 1.17mb).

Smartfibre 2016, *Process overview*, <http://smartfibre.myshopify.com/pages/process-overview>, accessed May 2016.

Softwood Plantation Exporters 2016, *Softwood Plantation Exporters Geelong Australia*, <http://www.spemanagement.com.au/>, accessed May 2016.

Southern Ports Authority 2013, *Port of Albany: Ship pre-arrival information, woodchip carriers*, <http://www.albanyport.com.au/images/woodchiparrivalspa.pdf> (pdf 0.182mb).

Southern Ports Authority 2014, *RePort Issue 8*, October, <http://www.esperanceport.com.au/downloads/Report/Esperance-RePort-Oct2014.pdf> (pdf 0.561mb).

TasPorts 2016a, *TasPorts Port Information: Port of Burnie*, http://www.tasports.com.au/pdf/Tasports_Port_Info_Burnie.pdf (pdf 0.784mb).

TasPorts 2016b, *TasPorts Port Information: Bell Bay*, <http://www.tasports.com.au/pdf/140064-Tasports-Port-Information-2014-Bell-Bay.pdf> (pdf 0.612mb).

VAFI 2014, *Submission to the Rural and Regional Committee's Inquiry into the opportunities for increasing exports of goods and services from regional Victoria*, Victorian Association of Forest Industries, April, <http://www.parliament.vic.gov.au/images/stories/committees/rrc/IEGS/Subs/045.20140505.VAFI.pdf> (pdf 0.195mb).

WA Department of Transport 2015, *Ports Handbook: Western Australia 2015*, http://www.transport.wa.gov.au/mediaFiles/marine/MAC_B_WAPortsHandbook2015.pdf (pdf 2.31mb).

Appendix A: Port charges references

New South Wales

NSW Ports: Port Botany 2014, *Schedule of Port Charges, Effective 1 March*, <http://www.nswportsbotany.com.au/assets/Trade-Reports---2013/Port-Botany-Schedule-of-Port-Charges-Final-effective-1-March-2014.pdf> (pdf 0.415mb).

Port Authority of New South Wales 2016, *Schedule of Port Charges: Sydney, Effective 1 January*, http://www.sydneyports.com.au/_data/assets/pdf_file/0019/33247/Port_Authority_of_NSW_-_Sydney_Schedule_of_Port_Charges_FINAL_-_15Dec2015.pdf (pdf 0.315mb).

Port Authority of New South Wales 2016, *Schedule of Port Charges: Eden, Effective 1 January*, http://www.edenport.com.au/_data/assets/pdf_file/0017/33245/Eden_Schedule_of_Port_Charges_1_January_2016_FINAL_8_Dec_2015.pdf (pdf 0.173mb).

Sydney Ports Corporation 2013, *Schedule of Port Charges, Effective 1 January*, http://www.sydneyports.com.au/_data/assets/pdf_file/0005/28337/sydportcharges_final.pdf (pdf 0.167mb).

Victoria

Geelong Port 2014, *Schedule of Port Charges, Effective from May 1*, <http://www.geelongport.com.au/downloads/GeelongPort%20Tarrif%20%20-%20Effective%20May%201,%202014.pdf> (pdf 1.49mb).

Geelong Port 2015, *Schedule of Port Charges, Effective from July 1, 2015*, <http://www.geelongport.com.au/downloads/GeelongPort%20Tarrif%20-%20Effective%201%20July%202015.pdf> (pdf 1.64mb).

Port of Portland 2014, *2014/15 Port Charges*, https://www.bimco.org/~media/Operations/Tariffs/Australia/Victoria/Portland/Portland_port_charges_2014_07_01.ashx, accessed May 2016.

Port of Portland 2015, *2015/16 Port Charges*, http://www.portofportland.com.au/images/stories/port_charges/port_charges_2015_2016_q2_webpage.pdf (pdf 0.182mb).

Queensland

Far North Queensland Ports Corporation Limited 2013, *Port of Mourilyan Port Charges and Port Rules, Effective 1 January*, http://www.iss-shipping.com/Attachments/1021555464_Mourilyan%20Port%20Charges%202013.pdf (pdf 0.233mb).

Far North Queensland Ports Corporation Limited 2015, *Port of Mourilyan Charges, Effective 1 January*, http://www.portsnorth.com.au/pdfs/Mourilyan/Charges-Mourilyan_2015.pdf (pdf 0.169mb).

Tasmania

TasPorts 2015, *Schedule of Ports Charges (includes King Island and Flinders Island)*, Valid from 1 July,

http://www.tasports.com.au/pdf/port_services/20150601c_Tasports_Schedule_of_Port_Charges.pdf (pdf 0.861mb).

South Australia

Flinders Ports 2015, *Port Charges as of 1st July*, <http://www.flindersports.com.au/wp-content/uploads/PtUserGuideCharges2015-2016.pdf> (pdf 0.133mb).

Western Australia

Bunbury Port Authority 2015, *Port Charges*, <http://byport.com.au/charges.html>, accessed May 2016.