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Infrastructure Australia and the National Transport Commission

Background Paper 3 for the NPS

"Analysis of landside costs and the potential for container productivity gains"

April 2010

Contents

1. Introduction

This background paper, one in a series to help inform the development of the National Ports Strategy (NPS), focuses on determining and confirming the relative importance of landside costs in the container transport chain versus other port interface costs for containers, and identifies the key area of potential for container productivity gains.

Estimates of the costs involved in transferring containers across the wharf and inland are currently published in "*Waterline*" by the Bureau of Infrastructure, Transport and Regional Economics (BITRE) in the form of a "Port Interface Cost Index".

The contents of this paper:

» Provide a historical perspective on the development of the Port Interface Cost Index in order to understand its rationale and objectives

» Reconcile the components of the Port Interface Cost Index with respect to the activities comprising the landside container logistics task

» Determine the scale of identified deficiencies in the Port Interface Cost Index by providing cost estimates of those elements not covered by the Index; and

» Provides recommendations arising from the analysis including the identification of the key area for potential container productivity gains and its relative magnitude.

As the Port Interface Cost Index has not been externally scrutinised since it was published in its current form, this study also provides an excellent opportunity to review the appropriateness of the Port Interface Cost Index as a strategic policy and planning tool[1].

This background paper number three, entitled "Analysis of Landside Costs and the Potential for Container Productivity Gains", may be used as a reference document for stakeholder and general public review of the draft NPS document jointly released for comment by Infrastructure Australia and the National Transport Commission.

[1] The team leader (Anthony Carlson) for this analysis by GHD was previously responsible for the development of the Port Interface Cost Index and was the founding editor of *Waterline*.

2. History of the port interface cost index

The Port Interface Cost Index, as produced by the Bureau of Infrastructure, Transport and Regional Economics (BITRE), has a long history.

In July 1984, at the request of the then Federal Minister for Transport, the Hon. Peter Morris MHR, BITRE conducted a seminar with representatives from the shore-based shipping sector to discuss the issues relating to the performance of Australian land-port interfaces. As a result of this seminar, the Minister established the Industry Task Force on Shore Based Shipping Costs[2] to which BITRE provided research support and ultimately provided estimates of the costs of the major components of the moving non-bulk freight to, from and through Australian ports[3].

In 1991, the House of Representatives Standing committee on Transport, Communications and Infrastructure (HORSCOTCI) commissioned BITRE to provide updated estimates of shore based shipping costs for the Inquiry into the Efficiency of the Interface between Seaports and Land Transport[4].

The input provided to the Committee by BITRE is contained in its report *Shore-Based Shipping Costs of Containerised Cargo: A 1991 Update* (BTCE 1992)[5]. The value of BITRE's analysis to the Committee's considerations led the Committee to recommend that BITRE "produce a six monthly Port Performance Indicator on sea/land transport interface efficiency" (CoA 1992, p. xviii)[6].

In making this recommendation, the Committee believed the publication of such an indicator would have two principal functions:

» A tool for monitoring interface efficiency and pinpoint where inefficiencies remain; and

» A measure by which an assessment of whether improvements in interface efficiency were being passed on to users in the form of lower costs.

In practice, this dual objective could never be achieved by a single indicator, and it was always the intention of BITRE to provide a cost index as part of a suit of measures "designed to keep pressure on the industry"[7]. This objective was realised with the first issue of *Waterline* on 27 July, 1994.

The final development of what is now known as the Port Interface Cost Index can be found in BITRE's Report 84, *Port Interface Cost Index*, published in 1993, and provides the foundation and structure of the

[2] The Webber Inquiry (Task Force on Shore-Based Shipping Costs 1986, *Shore-Based Shipping, Final Report*, Australian Government Publishing Service, Canberra). A copy of the report is held by the National Library of Australia.

[3] See BTE 1986, *Shore-Based Shipping Costs, Non-Bulk Cargo*, Occasional Paper No. 80, Bureau of Transport Economics, Australian Government Publishing Service, Canberra. An electronic copy of the report can be found at http://www.bitre.gov.au/publications/46/Files/OP080.pdf

[4] This Inquiry is also known as the Warehouse to Wharf Inquiry and the Morris Inquiry (after the then Chair of HORSCOTCI and former Federal Minister for Transport, the Hon. Peter Morris MHR).

[5] BTCE 1992, *Shore Based Shipping Costs of Containerised Cargo: A 1991 Update*, Information Paper No. 36, Bureau of Transport and Communications Economics, Canberra. An electronic copy of the report can be found at http://www.bitre.gov.au/publications/92/Files/IP036.pdf

[6] CoA 1992, *Efficiency of the Interface between Seaports and Land Transport*, Report from the House of Representatives Standing Committee on Transport, Communications and Infrastructure, The Parliament of the Commonwealth of Australia, April 1992, Australian Government Publishing Service, Canberra. An electronic copy of the report can be found at http://www.aph.gov.au/House/committee/reports/1992/1992_PP67.pdf

[7] See the letter from the Bureau to the Committee, Appendix 5 of CoA 1992.

Index as currently published in *Waterline*. From its consultations, BITRE states that "it became clear that the index should satisfy two criteria. The index should:

» Provide a simple, understandable measure of shore based shipping costs; and

» Allow identification of areas where performance is improving and areas where there may be some problems" (BTCE 1993, p. 2).

The simplicity criterion dictated that the index should "focus on the essential operations of the waterfront" (BTCE 1993, p. 2). Consequently, BITRE excluded the less than container load (LCL) element of the container logistics chain as it was evident that the significance of LCL operations was in decline. While this exclusion remains relevant today, there are two elements of the landside logistics chain that have grown in significance, namely:

» Rail operations; and

» Stack runs of empty containers from empty container parks to the stevedores.

The rise in significance of rail and stack run operations at most of the mainland container ports has resulted in landside container systems that are more complex and, as a consequence, potentially more difficult to monitor using 'simplistic' measures.

As a measure for monitoring performance and assessing whether improvements in interface efficiency are being passed on to users in the form of lower costs, the Port Interface Cost Index has some limitations:

» Costs can change due to external influences not related to efficiency. For example, a slump in economic conditions may result in lower charges (to keep customers) or higher charges (reflecting higher unit costs)

» The Index is constructed by estimating indicative charges that best reflect the costs to *most* users. For some services (e.g. customs brokerage), charges can vary significantly reflecting:

  – the number and type of items in each consignment; or

  – the number of containers per consignment. Consequently, the indicative charge per period may vary widely without any significant change in performance

» By reporting charges (i.e. costs to users), the Index can only measure changes in efficiency if those changes are reflected in changes to user charges. In less competitive markets, it is possible that the benefits of improved efficiency may be retained by the service provider, increasing the latter's margins; and

» The Index does not measure changes in service quality, and may provide a false result with respect to the benefits of improved services. For example, a road transport operator providing an above average service may be able to charge a price that reflects more than the cost of this improved service. Higher charges may therefore reflect net benefit if the user values the improved service higher than the increase in price.

2.1 Background approach

The Port Interface Cost Index is "intended to measure the *average* cost of moving a container (measured in TEUs) through a port. It is "designed to capture the *most significant* costs involved in these movements" (BTCE 1993, p4, emphasis added).

The main cost elements of the Index have remained unchanged since it was first published and are:

» Port and related charges

» Stevedoring charges

» Customs brokerage

» Road transport charges

The focus of this study is on the landside container logistics task, particularly with respect to those activities associated with the transport and storage of international containers.

2.2 The landside international container system

2.2.1 Overview

The landside international container system is a complex network of flows, for example:

» *Full import containers*

  – Road transport from the stevedoring terminal to metropolitan and regional freight centres (e.g. importers premises and distribution centres)
  – Rail transport from the stevedoring terminal to metropolitan and regional rail terminals
  – Road transport from metropolitan and regional rail terminals to freight centres

» *Full export containers*

  – Road transport from metropolitan and regional freight centres to the stevedoring terminal
  – Road transport from metropolitan and regional freight centres to rail terminals
  – Rail transport from metropolitan and regional rail terminals to the stevedoring terminal

» *De-hire empty containers*

  – Road transport from freight centres to empty container parks or rail terminals
  – Rail transport from regional rail terminals to metropolitan rail terminals
  – Road transport from metropolitan rail terminals to empty container parks

» *Release of empty containers*

  – Road transport from empty container parks to metropolitan and regional freight centres
  – Road transport from empty container parks to metropolitan rail terminals
  – Rail transport from metropolitan rail terminals to regional rail terminals
  – Road transport from regional rail terminals to regional freight centres

» *Repositioning of empty containers by shipping lines*

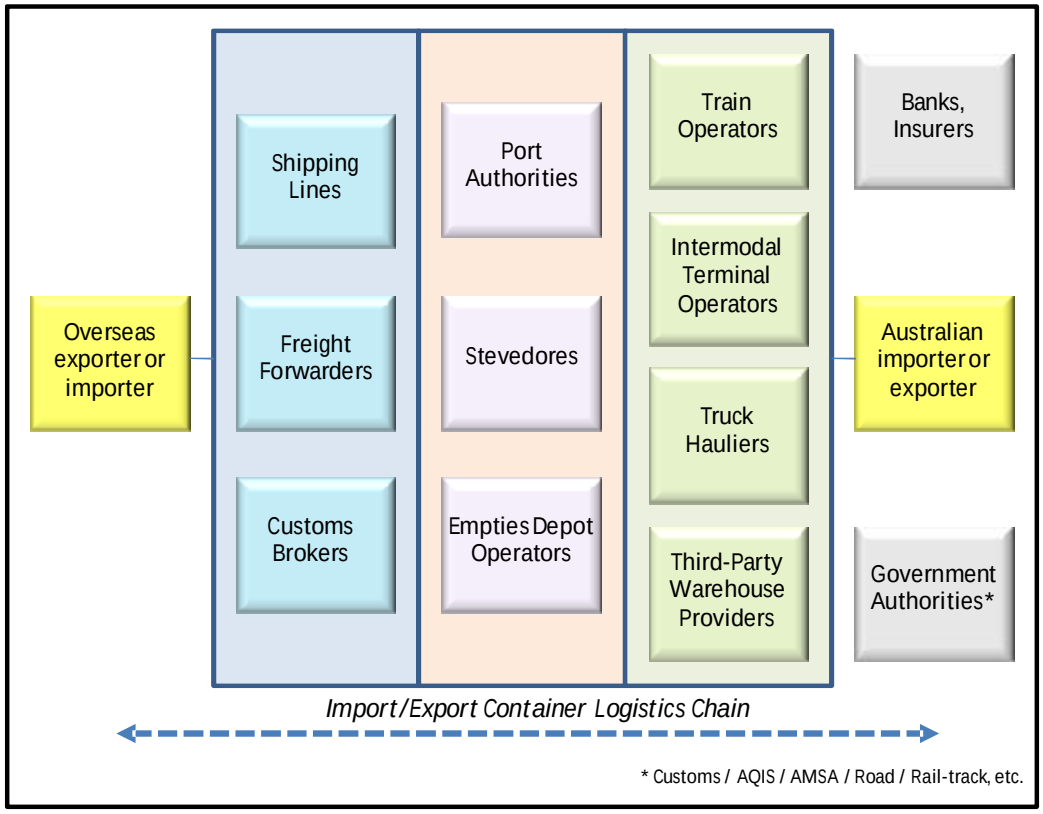
  – Ad hoc road and rail transport of empty containers from the stevedoring terminal to empty container parks
  – Stack runs of empty containers from the stevedoring terminal to empty container parks
  – Ad hoc road and rail transport of empty containers from empty container parks to the stevedoring terminal
  – Stack runs of empty containers from empty container parks to the stevedoring terminal.

Empty container flows are complex because each shipping line determines which empty container park is to be used for the de-hiring activity.

For the purposes of measuring container land transport charges, the Port Interface Cost Index is designed to provide only the metropolitan component of the task.

Part of the complexity is that there are many parties involved in the import and export container supply chains – see Figure 1.

Figure 1 Overview of parties involved in the container logistics chain



Source: GHD

2.2.2 The metropolitan container road transport tasks

Figure 2 provides an overview of the metropolitan container road transport tasks and also illustrates a reconciliation of the major metropolitan container road transport tasks and those to which BITRE measures charges for those activities. It is rare for the import / export tasks to be synchronised in such a way that a container can be immediately released to an exporter after being stripped (unloaded of cargo) by the importer.

The costs of returning empty containers for de-hire and the costs of picking up an empty container for the export are borne by the importer and exporter respectively. Consequently, the 'de-hire' and 'release for export' empty container movements should be included the Port Interface Cost Index as part of the typical road transport charge indicators for each port.

As most empty container parks are located within the port precincts, the transport costs associated with empty container movements would be equivalent to the movement of full containers to and from the stevedores. However, the costs associated with the empty container park interface will be less than the stevedoring interface as average truck turnaround times at empty container parks are significantly less than those at stevedoring terminals. Also the amount of fuel used per kilometre hauling an empty container will be less than that of a loaded container (the tare weight of an empty is a few tonnes compared with 10-30 tonnes for a loaded container).

Figure 2 Overview of the metropolitan container road transport tasks

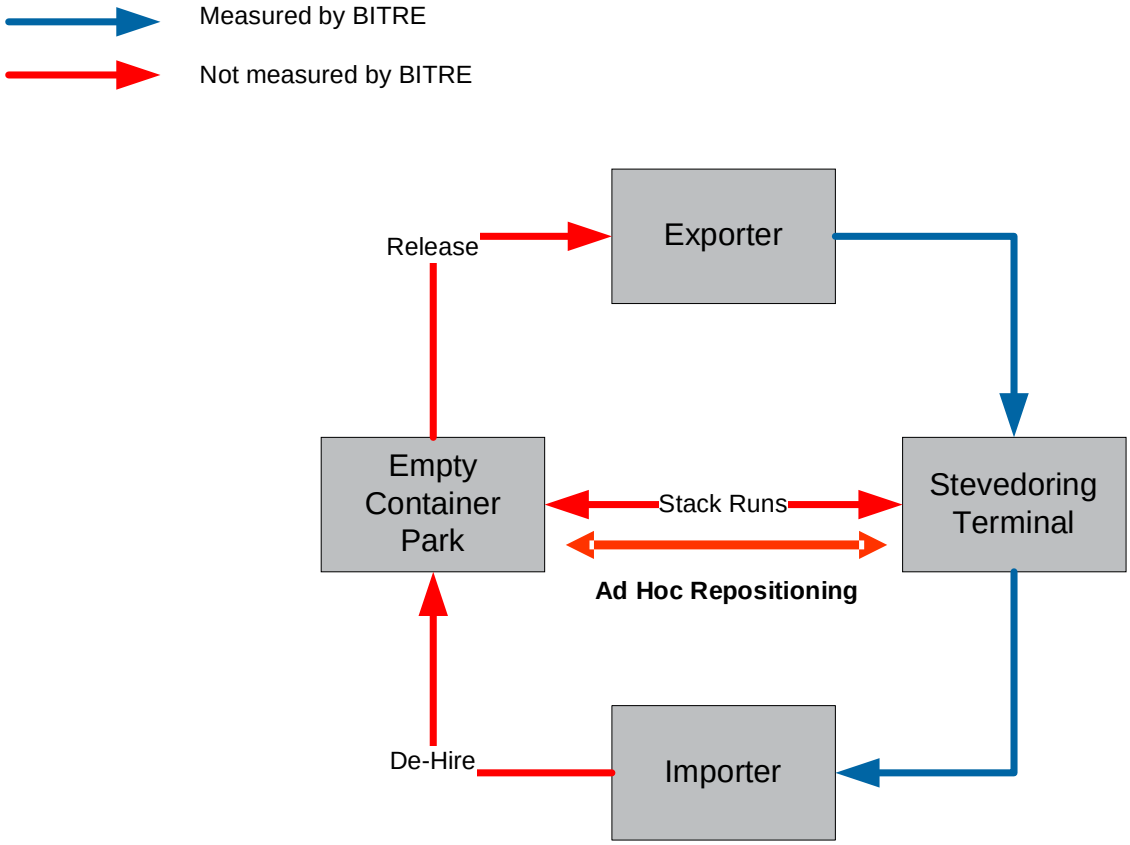


Table 1 provides estimates for the de-hire and release for export road transport container tasks, based on the parameters used by BITRE to estimate the full import and export road transport container tasks – these assumptions are also included in the table. The road transport charges, using the analysis assumptions in Table 1, that shippers (importers/exporters) are likely to face for the de-hire and release for export tasks range from $150 per TEU in Fremantle to $288 per TEU in Melbourne.

Table 1: Road transport charges for full and empty container movements

Parameters	Brisbane	Sydney	Melbourne	Adelaide	Fremantle
Full Import and Export Containers:					
Turnaround time at stevedoring terminal (hr)	1.00	1.00	1.00	1.00	1.00
Turnaround time at shipper (hr)	1.50	1.50	1.00	1.00	1.00
Transit time between shipper and terminal (hr)	1.50	2.50	2.50	2.00	1.00
Approximate total time (hr)	4.00	5.00	4.50	4.00	3.00
Road transport charge per TEU	$364	$495	$471	$275	$360
Average road transport charge per hour	$91	$99	$105	$69	$120
De-Hire of Empty Container:					
Transit time to de-hire empty (hr)	1.50	2.50	2.50	2.00	1.00
Turnaround time at empty container park (hr)	0.25	0.25	0.25	0.25	0.25
Total time for de-hire (hr)	1.75	2.75	2.75	2.25	1.25
Road transport charge for de-hire per TEU	$159	$272	$288	$155	$150
Empty Container Released for Export:					
Transit time to pick up empty (hr)	1.50	2.50	2.50	2.00	1.00
Turnaround time at empty container park (hr)	0.25	0.25	0.25	0.25	0.25
Total time for release (hr)	1.75	2.75	2.75	2.25	1.25
Road transport charge for release per TEU	$159	$272	$288	$155	$150

Source: Full import and export container estimates from the BITRE's Port Interface Cost Index (Jul-Dec 2008). De-hire and release for export empty container estimates calculated by GHD.

The road transport activity associated with the repositioning of empty containers to (or from) the stevedoring terminals by shipping lines is not measured by BITRE. The costs associated with this activity depend upon the number of empty containers that are moved either as a 'stack run' or by the ad hoc movement of empties by trucks returning to the port. In both instances, the costs associated with repositioning empty containers are borne by the shipping lines and are unlikely to be significant when compared to the road transport charges for the import and export tasks.

However, this is unlikely to remain the case as the container task grows and new empty container parks are established. For example, there is a pressing need for new empty container park capacity in Sydney and it is likely that some of this capacity will be established in the inner and outer west. It will be the shipping lines that determine how the new capacity will be used and to what extent the outer parks will be used for de-hire of containers that will then be repositioned to the port at the shipping line's expense.

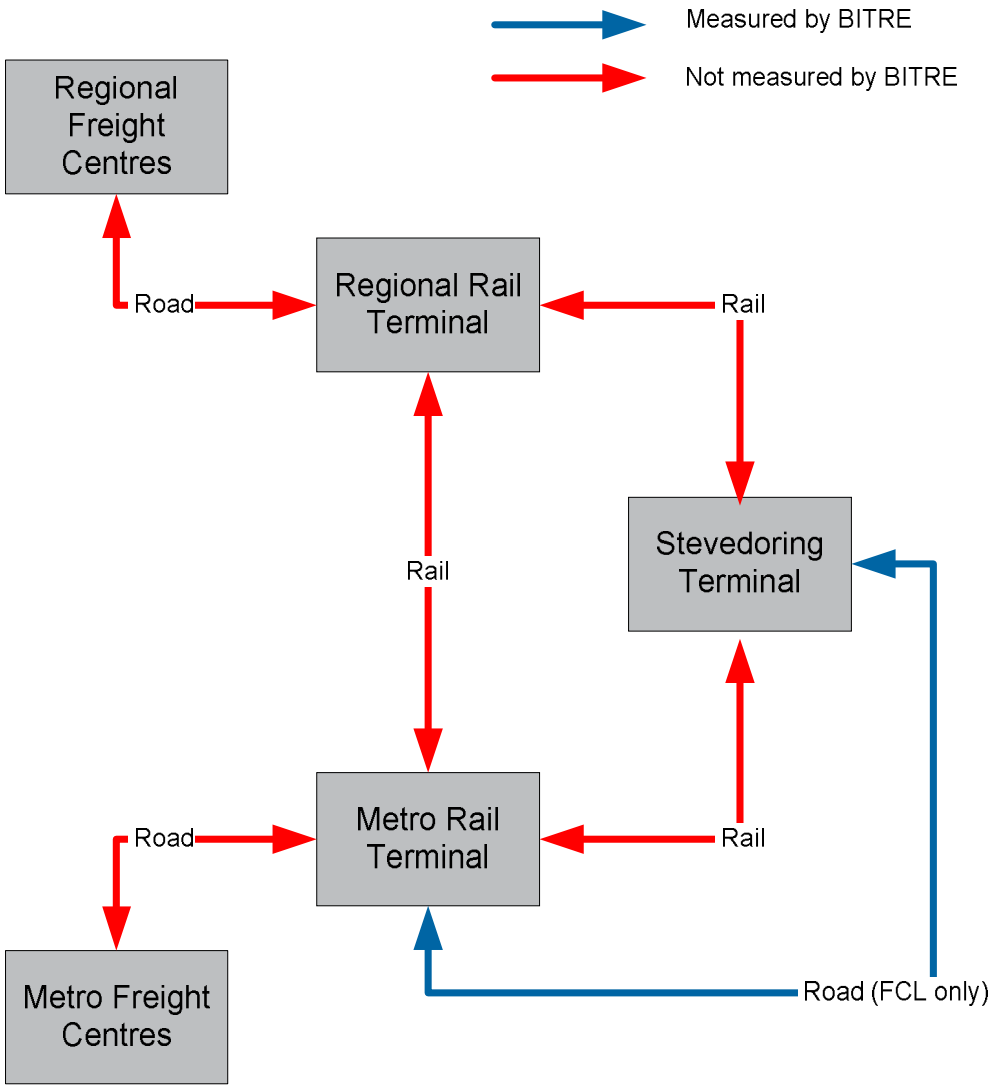
It should be noted that the BITRE road transport charge per TEU is an average market rate and should have some built-in averaging by the market-place of the mix of loaded and empty container running for trucks. In reality, it is cheaper per kilometre to haul an empty container compared with a loaded container (empty container road transport cost per km is likely to be around 10-15% less than for a loaded one, due to the impact of fuel cost savings). If the components of De-hire and Release of empty containers, (currently not accounted for by BITRE) are added in, the revised road transport charges (including empty legs) are around $ 523-767 per TEU for the Brisbane/Sydney/Melbourne port range.

This would mean that the revised BITRE total Port Interface Cost (Jul-Dec 2008) for the Brisbane/Sydney/Melbourne port range is around $ 940-1,170 per TEU and that the revised road transport charge component makes up around 74-83% of the revised total – that is, the most significant part of the total.

2.2.3 The container rail transport tasks

Figure 3 provides an overview of the metropolitan container rail transport tasks and also illustrates a reconciliation of the major metropolitan container rail transport tasks and those to which BITRE measures charges for those activities. BITRE does not measure the charges associated with the major tasks associated with the rail transport of import and export containers. However, as shown in Figure 3, the charges associated with road transport movements of containers to and from metropolitan rail terminals and the port stevedoring terminals are indirectly captured in the current Port Interface Cost estimates.

Figure 3 Container rail transport tasks



BITRE collects data relating to the movement of containers by rail, directly to or from the stevedoring terminals, i.e. on- or near- dock port related intermodal rail terminals. However, there are other rail movements that need to be taken into account, in particular the rail transportation between the port and regional rail terminals and, the road transport legs to/from rail terminals.

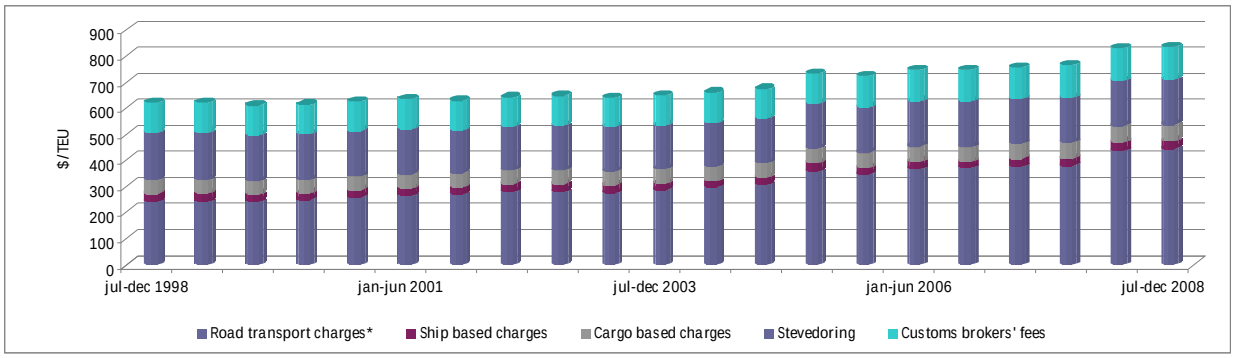
It should be noted that, currently, direct road transportation to/from the ports makes up the majority (some 80%+) of inland container movements. But if government policies of shifting more container freight onto rail are effective, the share of rail will increase in the future making the need for cost transparency more necessary.

3. The trend of road transport charges and their potential for productivity gains

3.1 The trend of container road transport charges and their position

The monitoring of the components of the port interface index by BITRE shows that container road transport charges over the ten-year period 1998 to 2008 (as captured by BITRE) have increased more than any other component of the index – see Figure 4.

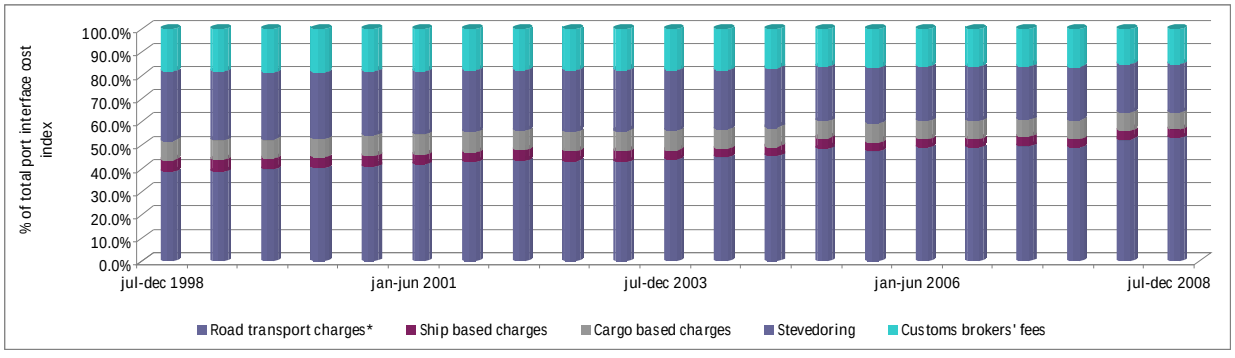
Figure 4 Development of road transport charges within the port interface index, 1998-2008



(*) Source BITRE Waterline publications (15-20,000 GT ship range) with road transport charges calculated by GHD as the average of BITRE import and export road transport charges for Brisbane, Sydney and Melbourne and then re-graphed by GHD.

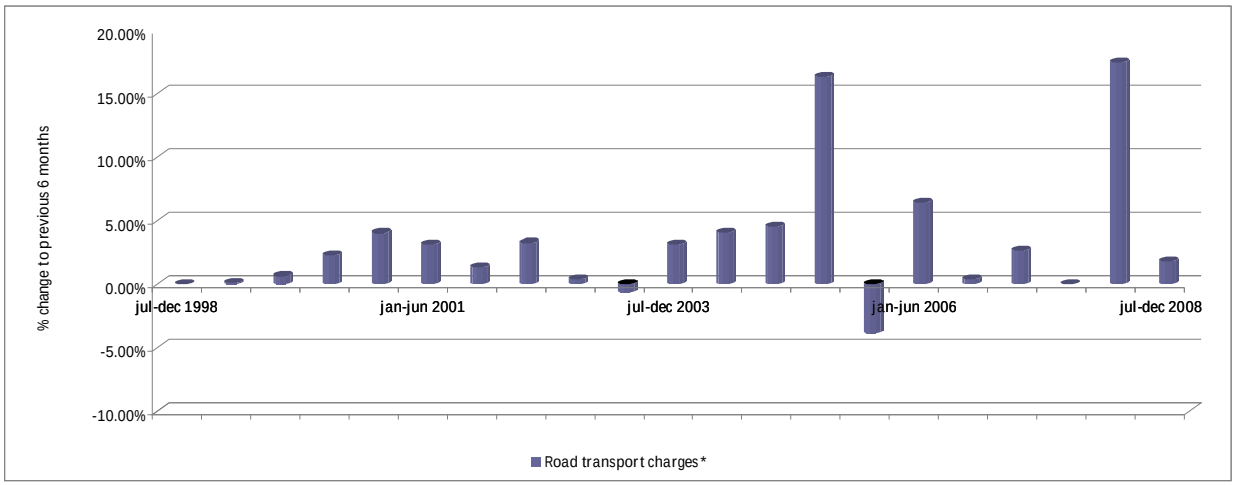
Given the BITRE methodology and assumptions, container road transport charges now represent around 50% of the total port interface cost, up from around 35% in 1998 – see Figure 5. As discussed earlier, this share is even greater when empty container logistics costs are added to the BITRE methodology.

Figure 5 Trend in share of road transport charges within the port interface index, 1998-2008



(*) Source BITRE Waterline publications (15-20,000 GT ship range) with road transport charges calculated by GHD as the average of BITRE import and export road transport charges for Brisbane, Sydney and Melbourne and then re-graphed by GHD.

Figure 6 Changes to previous six-months of road transport charges, 1998-2008



(*) Source BITRE Waterline publications (15-20,000 GT ship range) with road transport charges calculated by GHD as the average of BITRE import and export road transport charges for Brisbane, Sydney and Melbourne and then re-graphed by GHD.

Container road charges have also shown the greatest number of six-month increases over the 1998-2008 period with some changes to the previous six-months being greater than 15% - see Figure 6.

These trends in the charges, as recorded by BITRE, would suggest that port activities have become more efficient (productive), whilst the road transport activity has become less efficient (productive) and/or more costly.

More detailed research, involving the road transport industry, is needed to understand the reasons (drivers) and relative importance of each possible driver on the development in road transport charges.

Increases in driver-wages and fuel have resulted in increases in road transport costs. However, anecdotal evidence suggests that trucks are generally carrying more containers and making more trips in a day than before, despite peak congestion issues at terminals and empty container issues.

Also, truck utilisation is monitored by BITRE and shown in their Waterline publication as Containers or TEU per truck. In 2006, the five main container port average for truck utilisation was 2.1 TEU per truck turnaround at terminals with this slightly increasing to 2.3-2.4 TEU per truck in 2007/08 reported period. Notably, both Adelaide and Sydney have lower truck utilisations than those of Brisbane, Melbourne and Fremantle.

Taking the anecdotal and BITRE Waterline information, this may suggest that charges (market rates), as measured by BITRE, may not be necessarily or fully reflecting the actual changes in efficiency (productivity) of road transportation to/from the major ports over time.

3.2 Assessment of the potential for container productivity gains

It is clear, that given the information presented by BITRE and with the inclusion of empty container logistics, the greatest potential for reducing costs in the container logistics chain comes from the road transportation activity. This is not to say that further productivity gains are not to be made in the other

port activities, but the priority focus at a national level should be on reducing the cost of road transportation caused by system in-efficiencies and failures.

An indication of the potential monetary value per annum involved can be gauged by taking the current national level of port throughput of around 5 million TEU of international full (loaded) containers, and assuming approximately 90% road transport share and a current road transport charge (use BITRE information plus an empty container transport leg) of around $ 700 per TEU.

The result is an approximation of the total expenditure on container road transport of $ 3.2 billion per year. Hence, a potential 10% saving, which may or may not be able to be realised in full, would therefore represent over $ 300 million per year to the nationally economy.

This can also be put in perspective by noting that the cost of importing containers from Asia (i.e. ocean freight charges) is around $1,000-2,000 per TEU, whilst ocean freight for exports to Asia is around half the import cost or less.[8]

[8] This is an indicative average. Industry sources have indicated that these figures can vary significantly according to time period, volumes and market supply/demand situation

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
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