SHIPPING AUSTRALIA LIMITED

METROPOLITAN INTERMODAL TERMINAL

STUDY 2011

Shipping Australia Limited

Image courtesy of Sydney Ports Corporation

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FOREWORD

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Chi Thai, a Masters graduate from the Institute of Transport and Logistics Studies (ITLS) at The University of Sydney joined Shipping Australia Limited in January 2011 as part of the ITLS postgraduate work experience programme. Her placement was extended for another six months to develop her initial paper on metropolitan intermodal terminals (IMTs) in Sydney and Melbourne.

Shipping Australia appreciates the generous financial contribution from the Cargo Automation Development Fund (a Tradegate/Australian Chamber of Commerce and Industry joint venture) which enabled this study of the issues facing the development of intermodal terminals in metropolitan areas to be undertaken.

Chi Thai carried out extensive research and prepared this study on the basis of the information made available to her as a result of a thorough literature review and interviews. Shipping Australia congratulates her on a job well done in preparing a solid platform on which to base our future deliberations on how to capture the potential benefits these IMTs have to offer.

Llew Russell, AM
Chief Executive Officer
Shipping Australia Limited

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This project was undertaken in consultation with various people from different organizations including:

- Bill Green – Director, Links Consulting (NSW) Pty Ltd
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- Grahame Wright - Managing Director, Maritime Container Services Pty Ltd
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- Lindsay Rae – Manager, Port System Planning, Port of Melbourne Corporation
- Mike Moylan – Johnstons Transport
- Rose Elphick - Chief Executive Officer, Victorian Freight Logistics Council
- Shaun Harris - National Manager Planning & Development, POTA Holdings Pty Ltd
- Wayne Stafford - National Business Manager, P&O Trans Australia

DISCLAIMER

This report has been prepared by Chi Thai who has completed a Master of Logistics Management and Master of Commerce with a major in Business Information Systems at the Institute of Transport and Logistic Studies, The University of Sydney.

The information, statements, statistics and commentary contained in this report have been prepared by Chi Thai from material provided by Shipping Australia Limited (SAL), previous studies and comments on the topic and from sources external to SAL. The paper is intended to inform the development of public policy and readers need to be aware that the information may be incomplete or unsuitable for use in any specific situation.

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Chi Thai has based this report on information received or obtained, on the basis that such information is accurate and, where it is represented as such, complete.

EXECUTIVE SUMMARY

As international container trade continues to grow, additional intermodal terminal capacity will assist in improving efficiency and reduce the contribution of freight movements to congestion and environmental impacts through the increased use of trains in freight transport. Discussion of intermodal terminals (IMTs) has already canvassed topics ranging from the requirements and potential benefits of building such facilities through to terminal designs that are most suitable for handling the increasing freight task in metropolitan areas. However, few studies have considered the practical and commercial issues that need to be addressed to assure the success of IMTs. Seeing this gap, SAL has developed the Metropolitan Intermodal Terminal Study 2011 to identify possible barriers the development of IMTs may encounter, using Sydney and Melbourne as examples. This study does not try to offer all the solutions to the problems associated with the future development of metropolitan IMTs; rather, it seeks to contribute to the ongoing debate on the topic of IMTs and attempts to refocus the discussion on which rail deficiencies have to be confronted to maximise IMTs' capacities.

As the study progressed, it became clear that the current low contribution of rail transport to the total freight task is due to the high costs of operation and poor service quality as compared to road transport. In particular, the combination of track access fees, higher handling charges for containers handled by train at the port, and double handling costs at the rail terminals have prevented rail from gaining competitiveness over road transport. The price gap between rail and road transport is expected to be minimised in the future once rail utilisation rises to the necessary level. Achieving this utilisation level will require a significant transformation from the present rail task. In both Sydney and Melbourne, rail performance is characterised by unreliable and uncertain services due to limited supporting infrastructure, inordinate amounts of time being spent on activities such as shunting and inspection, freight services being compromised for passenger trains and, most importantly, the lack of an efficient rail interface at the container terminals.

In Sydney, impediments to the development of IMTs include the mismatch between the stevedores' time windows and the rail paths, the lack of standardisation of siding lengths and excessive shunting activities at both stevedores' terminals regardless of the length of the train. Melbourne's rail performance is further disadvantaged by the complexity of its rail gauge system and significantly low lifting productivity performed at the port. In order to provide viable and regular rail services that effectively utilise the IMT asset, the development of rail infrastructure, improvement of rail handling capacity and establishment of an efficient rail interface are essential. Financial support from government in the short to medium term could be required.

To transport the expected throughput of 300,000 TEUs per year, it is imperative that the proposed Enfield Intermodal Logistics Centre (ILC) run at least seven 600-metre train shuttles through the port daily, with 60 per cent of the train loaded to achieve 108 TEUs per round trip. A saving of 329 truck trips per day on roads will be achieved every day under this specified configuration. At peak operating efficiency, the Enfield ILC would definitely be viable. However, the conclusions of this study show that in the short to medium term there will be obstacles to achieving minimum efficiency that must be addressed.

The rail reforms Sydney Ports Corporation has been working on to improve rail efficiency, once effectively implemented, together with the recommended areas for improvement identified in this report would potentially increase the success of the Enfield ILC.

It appears that although Melbourne's rail capacity is limited, its road infrastructure makes feasible the operation of high productivity vehicles to and from the ports. Initial development of both rail-road and road-road IMTs is reasonable considering current rail performance; however, in the long term Melbourne's rail task has to be developed to effectively relieve the number of containers moved by trucks and extend the life of the Port of Melbourne.

A suggested solution to relieve the congestion that arises from time to time in the movement of empty containers around the port is to provide empty container park capacity in certain IMTs situated close to the freight catchments.

Areas for improving the intermodal terminals' viability include:

- Better aligning rail paths and time windows.
- Streamlining shunting and inspection activities.
- Allowing automatic underbond movements.
- Considering whether government support for the initial years is required.
- Reconsidering double stacking of containers using low-slung rail wagons, where feasible.
- Investing in IT infrastructure and establishing operational standards.
- Constructing dedicated freight lines that link to IMTs.
- Identifying solutions to increase train utilisation.

Taskforces representing major stakeholders should be established in both cities to address those obstacles identified and other areas to improve the viability of IMTs. SAL is not necessarily recommending subsidies but rather suggesting that all options should be "on the table" and able to be discussed.

1 INTRODUCTION

1.1 SCOPE

The Metropolitan Intermodal Terminal Study 2011 was initiated by Shipping Australia Ltd to identify the practical and commercial implications of utilising metropolitan intermodal terminals (IMTs) to cope with the growth in international container trade. Interviews were conducted with a wide variety of industry stakeholders including port authorities, stevedores, terminal operators, industry representatives and industry advisors. Statistics were gathered from a variety of sources including port authorities' previous studies. Due to their significant economic performance, Sydney and Melbourne are the main focus of the study and the implications for IMT viability derived from these cities could be similarly applied to other freight markets or used as practical examples for other capital cities to draw on.

Numerous studies have been conducted on the topic of IMTs in both Sydney and Melbourne (and more recently in Fremantle). A number of studies related to IMTs are currently being undertaken by the Port of Melbourne Corporation including the Port Dynan precinct planning study. However, it is now opportune to focus attention on how we can commercially optimise the potential benefits of IMTs.

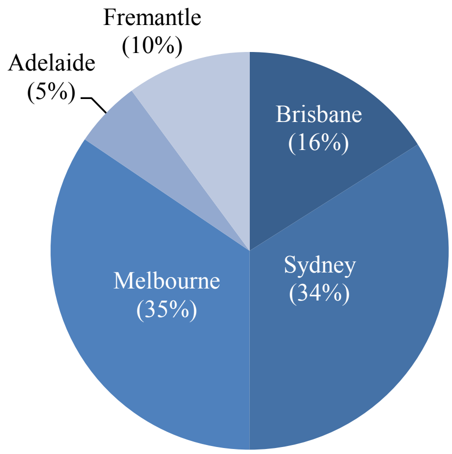
The undeniable benefits of developing additional IMT capacity by increasing the use of rail in freight transport have been highlighted in many previous studies and include subsequent improvements in the landside efficiency of ports and the metropolitan freight task, and significant reductions in the contribution of freight transport to traffic congestion and environmental impacts. This study does not replicate what has been done previously; rather, it is generally assumed that the operation of IMTs is beneficial for freight movements providing these terminals can be effectively designed and operated.

This study was primarily designed to recognise barriers influencing the future development of metropolitan IMTs that need to be addressed to assure the success of those facilities. It does not try to offer all the solutions to the problems, but rather reinforces the necessity of further discussion and feedback from the various industries on how to build a successful IMT system. Nor does it attempt to approach either the regional or interstate containerised freight markets, which are relatively different in their characteristics compared to metropolitan movements.

1.2 BACKGROUND

Melbourne, Sydney, Brisbane, Fremantle and Adelaide are the five major cities that handle most international container trade traffic in Australia. In 2010, approximately 67 per cent of this traffic was handled by Melbourne and Sydney (35 and 34 per cent respectively) (Figure 1). Brisbane handled 16 per cent while Adelaide and Fremantle together handled 15 per cent of the total volume (5 and 10 per cent respectively). Due to its significant economic importance, international container trade traffic is the focus of this paper. It should be recognised that some of the containers handled in Melbourne originated in Tasmania, South Australia and southern New South Wales. Equally, some of the containers handled in Brisbane originated in northern New South Wales.

Figure 1: International container volumes handled at major ports 2010 (percentage)



Source: BITRE Waterline Issue 49, 2011

It is predicted that Australia's total international container trade volume will almost double from 6.5 million TEUs in 2010 to 11 million TEUs in 2020, and increase to more than 15 million TEUs in 2025 (see Table 1).

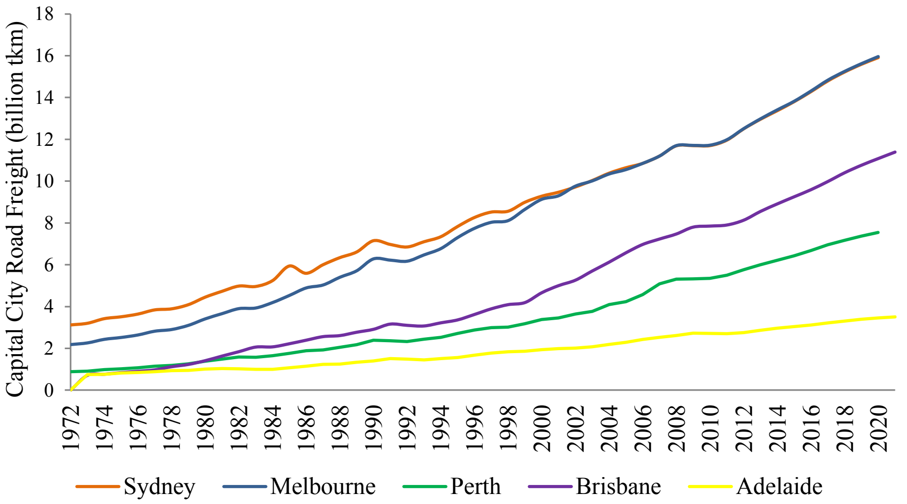
This growth in imports and exports will lead to an increase in associated freight movements and thus place more pressure

Table 1: Forecasted Australian international container volumes (TEU), 2010–2025

Year	Melbourne	Sydney*	Brisbane	Fremantle	Adelaide	Total
2010	2,112,000	1,927,506	1,526,000	582,400	352,500	6,500,406
2015	2,800,000	2,634,641	2,023,000	772,000	467,300	8,696,941
2020	3,676,000	3,635,299	2,656,000	1,013,000	613,300	11,593,599
2025	4,620,000	5,033,446	3,338,000	1,274,000	770,900	15,036,346

Source: Booz & Company, Intermodal Supply Chain Study, 2009, prepared for National Transport Commission (*Sydney figures provided by Sydney Ports Corporation.)

Figure 2: Major capital city road freight tasks, 1972-2020



Source: BITRE estimates

on the transport network and logistics sectors. It is reported that a doubling from about 6,000 truck trips per day to 12,000 truck trips per day to and from the port is expected in Melbourne by 2035. In Sydney, daily truck trips will more than double from 2,900 movements to 6,270 movements by 2021 (please note that these forecasts are for different periods). These forecast figures represent a significant growing component of a larger freight task movement to be absorbed by roads that are already under pressure from general traffic. The future growth in container volumes will also directly influence existing landside capacity closer to the port.

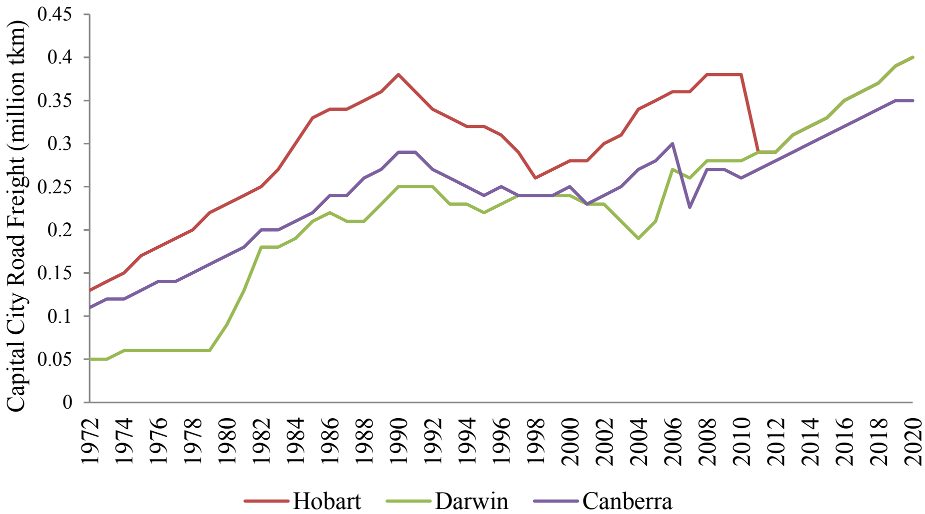
In Australia, road transport is the predominant mode for moving freight between ports and terminals, and for urban freight distribution between warehouses and retail outlets. There is no doubt that road freight significantly contributes to congestion levels and environmental impacts. In some cities, container freight movement has been facing many challenges due to the rapid growth of the freight task and its increasing exposure to congestion around the port precinct, the central city area and on major arterial roads. Although the issues associated with the increasing port-related freight task are valid in all capital cities in Australia, the challenges vary between cities. A report from the Federal Department of Infrastructure and Transport (2010) showed that among all capital cities, road freight tasks were significantly higher in Sydney and Melbourne, followed by Brisbane, Perth and Adelaide (Figure 2).

Road freight tasks were lowest in small capital cities like Hobart, Darwin and Canberra (Figure 3),

One of the solutions proposed to assist in relieving congestion is to improve rail share of freight transport due to its high carrying productivity per trip compared to trucks. The Victorian Government announced the share target of freight transported to and from the ports by rail was an increase from 10 to 30 per cent by 2010 and collaborated with industry to improve the rail network connection. Despite these efforts, the 30 per cent port rail mode share target has not been achieved to date. Also recognising the significance of rail freight performance in managing road congestion, the NSW Government released Stage One of the Port Freight Plan with an objective to move 40 per cent of containers in and out of Port Botany by rail by 2011, and the Federal Government has invested in rail infrastructure and dedicated rail freight networks in the south, north and west of Sydney. The Southern Sydney Freight Line is being constructed to separate freight trains from passenger trains from Sefton Park Junction to Macarthur; the North Sydney Freight Line, which links Sydney to the Central Coast and Newcastle, and the Port Botany freight line duplication are at the planning stage. In addition, the dedicated freight line is proposed to be extended to western Sydney. Currently 14 per cent of total containers are transported by trains. The NSW Government (in the NSW State Plan 2021) has revised the 40 per cent target down to 28 per cent, representing twice the annual rail modal share in the financial year 10/11, and with a target date of 2020.

It is agreed that in order to achieve the rail mode share target, a dependence on interstate long-haul or intrastate rail tasks alone is not sufficient. Nearly 80 per cent of international freight moving through the Port of Melbourne has origins and destinations within a radius of about 40 kilometres of the port, 85 per cent of containers originate from or are bound for a destination within 40 kilometres of Port Botany. Due to the high concentration of freight origins and destinations within metropolitan areas, in order to achieve the rail target, growth will need to come from urban train shuttle services. The slow progress against the port rail mode share targets of Victoria and New South Wales is caused by a number of reasons. One of these is the fact that the existing urban rail movement of freight is near capacity and limited by residential areas. Passenger trains being given priority over freight trains and insufficient staging facilities and locations to consolidate regional services and maintenance facilities also limits the utilisation of rail for freight transport.

Figure 3: Minor capital city road freight tasks, 1972-2020



Source: BITRE estimates

Recognising the urgent need for IMT network development within metropolitan areas to assist in managing increasing traffic congestion, new IMTs are being planned in Melbourne, Sydney, Brisbane and Perth. Existing intermodal facilities in Sydney have been identified as vertically integrated private enterprise developments competing against each other for a sustainable rail volume in a very competitive environment. Meanwhile, the current road transport industry is still very competitive, which further discourages the shift to rail transport. Neither private enterprise nor government have, to date, successfully demonstrated a way to conduct business around IMTs such that they generate either higher returns or higher efficiency at the same cost as existing road only landside transport; hence it is reasonable for industry to retain their current transport practices.

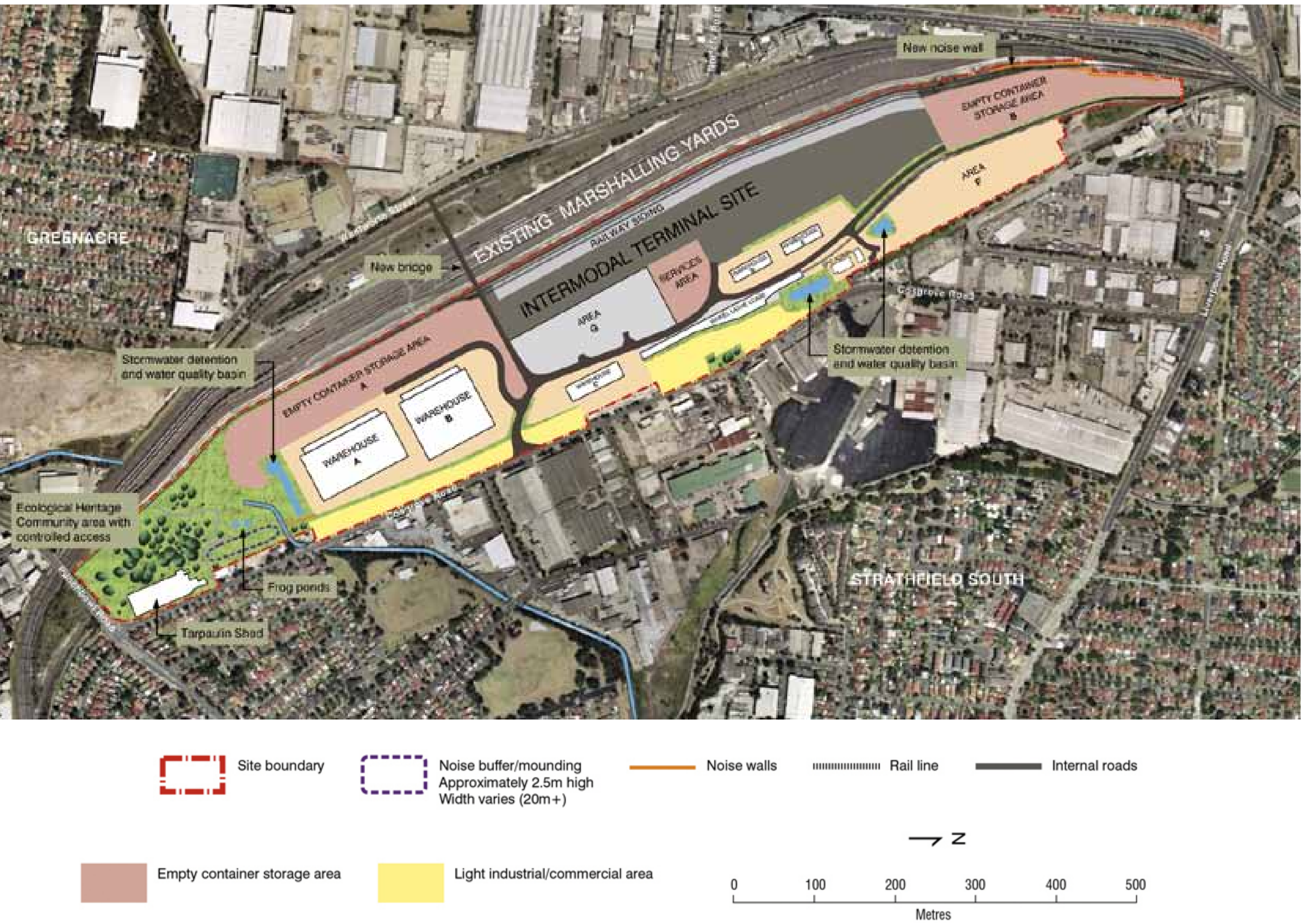
The development of IMTs primarily as a means to benefit the community by reducing road congestion and environmental impacts - but with limited advantages for private enterprise with goals of operational efficiency and sustainable profit - has failed to encourage the collaboration of the transport and logistics industry in implementing the modal shift from road to rail.

1.3 DEFINITIONS

By definition, an intermodal terminal (IMT) is a facility used to provide for the transfer of freight from one mode to another for a single journey. Commonly, an IMT segments a freight distribution task into two haul-line legs that involve a combined use of rail and road modes. In particular, goods will be moved by road from the production site to the IMT and then by rail to the port for export. In the case of imports, the goods will be carried by train to the IMT and then dispatched by road to the final consuming locations. The IMT can offer ancillary services such as warehousing, empty container park capacity, washing of containers, repair and maintenance of containers, packing, unpacking and quarantine.

IMTs should be seen as inland ports where container movements are serviced by two modes, rail and road. It is important that IMTs are authorised to handle bonded cargoes, which necessitates the agreement of Customs to this movement underbond. Ancillary services traditionally carried out at sea ports should also be integrated at IMTs such as customs clearance, inspection and quarantine. This will speed up container movement and reduce container handling and storage space at the port. It is important to note that existing IMTs in Australia do not function as defined above. Instead, they are operated as either a container park or freight hub. Planning and development of new IMTs within urban areas is progressively underway in Melbourne and Sydney.

Enfield ILC concept plan, image courtesy of Sydney Ports Corporation.



2 SYDNEY

2.1 SYDNEY FREIGHT PERFORMANCE

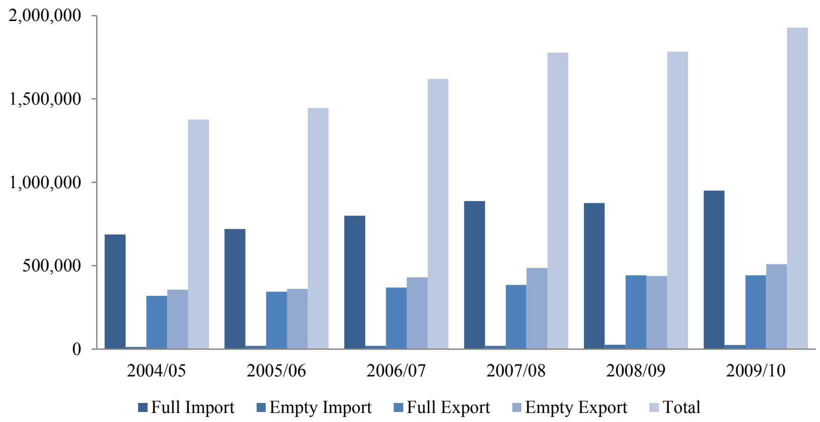
The container trade via Port Botany (Sydney) has grown at a compound rate of 8.6 per cent per annum for the past five years. In 2009/10, container trade through Port Botany reached 1.93 million TEUs. The container trade volume is expected to increase to more than 3.2 million TEUs per year by 2020. The freight task in Sydney will reach a critical point more quickly than in Melbourne due to Sydney's higher population densities within the urban area, its narrow and complex arterial road network, and the severe effect of geographic features on road transport connectivity.

It is important to note that even if NSW achieved a 40 per cent rail mode share, total container truck movements to/from Port Botany would be expected to rise from 2,900 movements per day to 4,700 movements by 2021. An increase to 6,270 total container truck movements by 2021 would be required if a 20 per cent rail mode share is sustainable. In order to achieve the rail mode share target, the number of daily train trips to and from the port would have to significantly increase from 30 trips to 108 trips by 2020. Without any infrastructure development on the Port Botany freight line, existing IMTs will reach their capacity by 2016 with a 20 per cent rail mode share target.

In addition, there has been an imbalance in containerised trade via Port Botany between imports and exports, with import containers accounting for twice the volume of full export containers. Figure 4 illustrates the total containerised trade via Port Botany from FY 04/05 to FY 09/10. In general, total containerised trade in Sydney has constantly increased over this period except for a slight reduction in volumes in FY 08/09 of full import containers and empty export containers.

As shown in Figure 5, total full import containers were more than double the full export containers over the six year period. Less than 2 per cent of the total traded volumes were contributed by empty import containers whereas more than 25 per cent of the total trade was accounted for by empty export containers. Due to the demand imbalance between exports and imports, a majority of unpacked import containers are returned empty to container parks or temporary storage areas and,

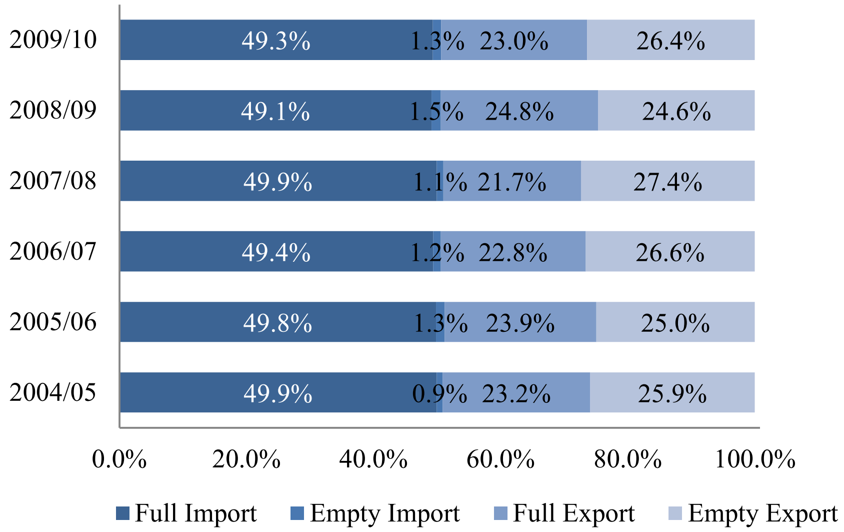
Figure 4: Port Botany total trade TEUs – six year trend FY 04/05-09/10



Year	Full Import	Empty Import	Full Export	Empty Export	Total
2004/05	687,346	12,934	319,659	356,300	1,376,239
2005/06	720,594	19,420	344,924	360,924	1,445,862
2006/07	799,840	19,378	369,622	431,281	1,620,121
2007/08	887,499	19,020	385,079	486,772	1,778,370
2008/09	876,113	26,420	442,426	439,058	1,784,017
2009/10	951,027	25,188	442,567	508,725	1,927,507

Source: Sydney Ports Corporation

Figure 5: Port Botany total share % - six year trend FY 04/05-09/10



Source: estimates based on data from Sydney Ports Corporation once inspected and pre-tripped, are then sent to either an exporter or to stevedores for loading as an empty export.

2.2 SYDNEY FREIGHT MOVEMENT

If the total trade performance was fully reflected in the rail freight task, one would expect the number of import container rail movements to be twice that of exports. However, analysis of current import and export container movements in rail transport services shows otherwise. In particular, regardless of being dominant in terms of trade volume, far fewer import containers are carried by train than export containers.

Figure 6 illustrates the share of rail services of both import and export containers from June 2009 until June 2010, in which full export rail transport was dominant. Despite having lower trade volumes, export containers account for an average of 60 per cent of the total containers moved by rail throughout the period. According to Figure 6, the number of export containers being moved by train is increasing in 2010 as compared to import containers as a result of resumption of agricultural regional exports.

Although not conclusive in establishing a correlation between the total trade volumes and the total rail services due to the short time period examined, this data indicates that a growth in trade volumes is not necessarily equivalent to a rise in rail transport demand. It also appears that the current rail freight task is mainly comprised of export containers despite import containers having twice the volume throughput. To increase rail share to the target 40 per cent, more import containers should be carried by rail to increase train backloads.

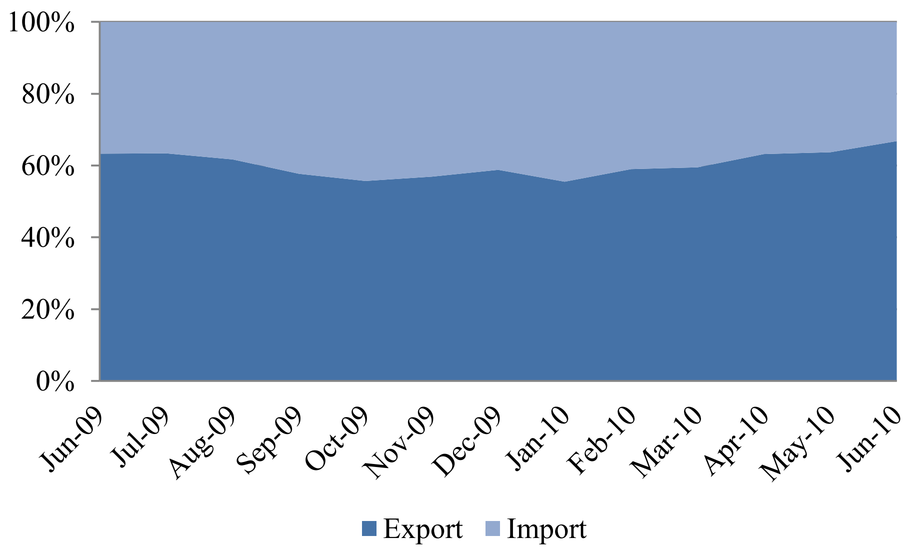
2.2.1 *Rail versus road cost position*

In general, rail transportation is influenced by the container volume carried on each trip and the number of trips taken through the port. The limited contribution of rail transport to the total freight task is found to be caused by a higher cost of rail operation relative to road transport and the inefficiency of service quality.

Among the two impediments, price is the predominant consideration in decisions between mode choices for freight transport. When rail is not price competitive with road, the provision of infrastructure capacity and the improvement of rail handling capacity will not correspondingly increase the demand for rail services but instead lead to these assets being underutilised. It is important to stress that even when rail and road door-to-door prices are equivalent, rail will generally have a lower market share due to its current inferior service quality, in terms of availability and reliability.

Section 2.2.2 provides an estimated comparison in price between transporting a 20' import container by road and rail to a metropolitan destination in Sydney. It examines three different scenarios: road-direct, road-via-transport depot and rail-via-an-IMT. The figures used in the scenarios are averaged numbers based upon current operating practices; thus actual results might differ depending on distance, volume, container size, and weight, time and service levels. The same commercial rates for off-port container lifting and storage used as stated in Table 2 are applied in the examined scenarios.

Figure 6: Total rail shares June 09 to June 10 - imports versus exports full TEUs



Source: estimated based on data from Sydney Ports Corporation

Table 2: Off-port container charges

Charges	Full container	Empty container
Lifting (per lift)	$30.00	$10.00
Storage (per day)	$7.50	$0.75

Source: ATA NSW's 2007 Submission to Draft Report of IPART study, p.12-13

2.2.2 *Scenarios*

In road transport, prices are calculated on a time basis, which depends heavily on traffic conditions and the performance of other parties involved in the movement. On the other hand, rail transport costs are charged on a volume basis; therefore, train operators aim to maximise train utilisation to reduce unit cost for higher revenue. As advised by the Australian Trucking Association of NSW (ATA NSW), the currently used market rate in road haulage for operating over 24 hours and weekends has increased to $100 per hour. The $100 nominal cost per hour covers travel, loading/unloading and waiting from when the container is picked up from the port until the empty container is de-hired at an empty container park. In addition, demurrage might be charged to the importer for a delay that occurs during the transportation as a result of the actions of other parties.

The three scenarios are built upon three main assumptions

- Costs of transporting empty containers to the container park do not differ between scenarios.
- Rail IMT achieves sufficient volume and the costs of land-side inefficiency are borne by rail operators.
- Container handling costs at the transport depots and at the IMT are the same. The handling costs at the container parks are borne by the shipping lines and thus are excluded from the estimates.

2.2.2.1 *Scenario 1: Road direct services*

Scenario 1 represents a typical average price structure for road service where the final pick-up and delivery (PUD) happens within the same day. As shown in Table 3, the average charge for the delivery of a 20' container from Port Botany to the importer's warehouse is estimated to be $458 per container over four and a half hours of service. The total process

Table 3: Scenario 1: Price for 20' container by truck – direct delivery from Port Botany

Process	Minutes	Hours	Hourly rate	Container rate
From port to importer's warehouse	**225**	**3.75**	**$100**	**$375**
Travelling to port	60	1.00		$100
Waiting time at port	60	1.00		$100
Travelling to customer	45	0.75		$75
Unloading at customer	60	1.00		$100
Returning empty container	**50**	**0.83**	**$100**	**$83**
Travelling to empty container park	20	0.33		$33
Unloading time at empty container park	30	0.50		$50
Total	**275**	**4.58**	**$100**	**$458**

* Travel time estimation is based on ATA NSW's 2007 Submission to Draft Report of IPART

Table 4: Scenario 2: Price for 20' container by truck – via transport depot in Sydney

Process	Minutes	Hours	Hourly rate	Container rate
From port to container depot	**155**	**2.58**	**$100**	**$258**
Travelling to port	50	0.83		$83
Waiting time at port	45	0.75		$75
Travelling to container depot	50	0.83		$83
Unloading at container depot	10	0.17		$17
Handling at container depot				**$143**
Lift-off/lift-on				$60
Storage				$7.5
FCL handling costs				$75
From container depot to customer	**90**	**1.50**	**$100**	**$150**
Loading at container depot	10	0.17		$17
Travelling to customer	20	0.33		$33
Unloading at customer	60	1.00		$100
Returning empty container	**50**	**0.83**	**$100**	**$83**
Travelling to empty container park	20	0.33		$33
Unloading at empty container park	30	0.50		$50
Total	**295**	**4.91**		**$634**

* Travel time estimation is based on ATA NSW's 2007 Submission to Draft Report of IPART

comprises just over two hours of physical road movement ($208), one and a half hours for loading and unloading ($150) and one hour waiting at the port precinct ($100).

It is noted that the established market road transport charge of $458 per TEU from Table 2 is similar to BITRE's most recent index (Waterline 49, 2011) of $455 per container.

2.2.2.2 *Scenario 2: Staging at transport depot*

The second scenario (see Table 4) illustrates the case when the container is staged at the transport depot prior to being delivered to the final destination. This movement pattern is preferred by importers who are more concerned about just-in-time supply, and require flexibility in arranging and managing unloading and loading at their receival and dispatch facilities. In this scenario, the total travel time is calculated to be 2.3 hours ($230), which is 15 minutes longer than Scenario 1. However, the container rate for the road transport is dramatically increased to $634 per container, a difference of $176 compared to the road direct model. The increased price is primarily attributed to the extra handling costs ($143) incurred at the transport depot.

Although Scenario 2 displays significantly higher costs compared to the road-direct model, it is by far the more popular method. It is estimated that between 70 to 75 per cent of roaded containers are transported via off-port facilities.

2.2.2.3 *Scenario 3: Rail via intermodal terminal in Sydney*

Scenario 3 (see Table 5) shows the example where the container is railed via the IMT. According to the intermodal study conducted by the Sea Freight Council in 2007, the rail transport cost per container of $100 was achievable subject to a sufficient container volume. Based on that assumed rail transport cost, the nominal cost for this situation is $476 per container including the cost for rail and road movements (excluding waiting time) of $166.

It is important to emphasise that the price shown in Scenario 3 does not incorporate the costs incurred as the result of land-side inefficiency at the port rail terminal. Since rail freight is influenced by volume instead of time, it is generally assumed that those costs are borne by the train operator. However, an inefficient port rail interface does lower service reliability.

Table 5: Scenario 3: Price for 20' container by rail

Process	Minutes	Hours	Hourly rate	Container rate
Rail movement from port to IMT				**$100**
Handling at IMT				**$143**
Lift-off/lift-on				$60
Storage				$7.5
FCL handling costs				$75
From IMT to customer	**90**	**1.50**	**$100**	**$150**
Loading at IMT	10	0.17		$17
Travelling to customer	20	0.33		$33
Unloading at customer	60	1.00		$100
Returning empty	**50**	**0.83**	**$100**	**$83**
Travelling to empty container park	20	0.33		$33
Unloading at empty container park	30	0.50		$50
Total				**$476**

*Based on the $100 per rail movement per container estimated by the NSW Sea Freight Council

2.3 *Scenarios analysis for Sydney*

Figure 7 summarises the key results from analysis of the three scenarios. Door to door direct truck service is the most competitive among the three examples. Road transport via a transport depot proved to be the most expensive of the three solutions, costing $176 and $158 more than scenarios 1 and 3 respectively.

The transport cost achieved in Scenario 3 is lowest although the differences between the three scenarios in terms of transport costs are not significant. Road-direct and road-via-transport depot scenarios are $41 and $63 higher than the rail IMT model, respectively. Comparing the three scenarios, rail IMT is $18 more expensive than the road direct model due to its high handling cost at its terminal. However, it provides significant customer savings ($158) as opposed to staging the container via the transport yard providing that sufficient volume is achieved. The rail IMT model also includes fewer costs for loading/unloading and waiting time that are borne by the importers.

Although it is the cheapest mode of transport, road direct service requires higher costs for loading/unloading and waiting as opposed to transporting the container via the rail IMT, given that it requires the importer to pay an extra $84 per container.

2.3.1 *Road transport*

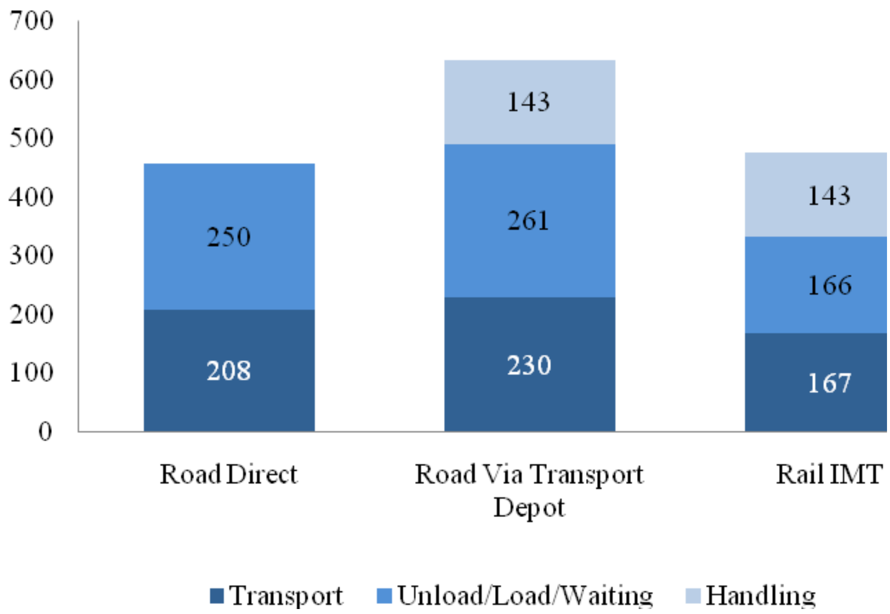
In current operational practices, truck turn-around times are critical to the truck operator in establishing reliable rostering of staff and scheduling of vehicles. For the truck operator, delays may result at a client's warehouse, at a stevedore's terminal, at an empty container depot, in traffic, or due to a breakdown.

The road-direct model represents the most efficient and cost effective process of moving a container from the port to the consignee via a direct truck movement to the customer, unloading and returning the empty container within the same day. In Scenario 1, the price package comprises one hour waiting at the port, one hour unloading FCL at the importer's warehouse and 30 minutes unloading the empty container. These timings are agreed between the transporter and the importer upon the commencement of the service. If any of these time frames are breached as the result of other parties, the importer is charged demurrage for the delay(s).

Factors that might influence physical travel time include distance, route condition, driver and vehicle performance. Sydney's urban road network experiences congestion primarily during peak hours on key corridors and radial roads such as Pennant Hills Road, M2, M5, M5 East, Airport Tunnel, General Holmes Drive, King George Road to Roberts Roads and Princes Highway as well as M4, Parramatta Road, Eastern Distributor, and Qantas Drive. The level of congestion on these roads is expected to exponentially increase by 2016 with the number of trucks forecast to increase 120 per cent over the next 20 years.

Given that Sydney already experiences significant congestion on major arterial roads, and in the absence of enhancement works on road infrastructure, it is likely that truck operators will miss the importer's receiving window due to lengthening average journey times and variable trip times. Other results include

Figure 7: Road and IMT costs comparison summary



Source: Aggregated data from Scenarios 1-3 higher vehicle operating costs, increased fuel consumption, poor environmental outcomes with possible futile truck trips, and costs associated with staging of the container via the carrier container depot. Because poor road network condition is likely to contribute to truck service uncertainty and unreliability, a time and price buffer may be introduced into the ongoing road freight planning, making the road-direct model less competitive or operationally impossible.

2.3.2 Rail IMT

Unlike road services, port shuttle trains depend on the number of trips and the volume carried on each trip. Because the IMT is expected to operate on a 24/7 basis and the containers must be staged at the IMT prior to final delivery, rail operation is not significantly exposed to the road-side challenges addressed above and the mismatch of operational hours that affects the remaining parties in the supply chain.

Rail operation is characterised by a high level of fixed costs which necessitates the achievement of a certain volume threshold per annum to offset terminal and train operating costs as well as reduce overall unit costs. Short haul rail of less than 150 kilometres is said to have difficulty competing with road transport given the additional costs of certification, safety standards, access to infrastructure, and unavoidable lift-on and lift-off costs which are not incurred by road transporters. For a haul distance of less than 50 kilometres, the IMT's viability is determined by the cost and efficiency of the pickup and delivery activities, which ideally should be situated within 10 kilometres of the terminal. However, for services that require quick delivery, customers might opt for road transport.

As previously mentioned, Scenario 3 heavily relies on the average transport cost between the IMT and Port Botany of $100 per 20' container estimated by the Sea Freight Council of NSW under the condition that train utilisation and daily cycles are improved. Unfortunately, the study did not explain the corresponding volume required on each trip to achieve this rate. It is apparent that this unit rate does not reflect the current market condition for rail operation. It is generally agreed that the current cost disadvantage of rail transport is partially due to the higher access charges for travelling on the rail track and the time windows' fee paid to the stevedores as compared to road transport. For rail IMT to stay competitive, the whole rail network costing needs to be reviewed so that the gap between road and rail transport is eliminated or significantly reduced.

Table 6: Transport methods market share comparison

Method	Share
Road direct	21.5% - 25.8%
Road via transport depot	60.2% - 64.5%
Rail IMT	14%

Source: Multiple sources

Currently, road freight tasks account for nearly 86 per cent of total freight movement, with some 70-75 per cent of the road transport task handled via off-port facilities. The market shares of the road models considered in this study are calculated to be 21.5-26 per cent and 60–64.5 per cent (see Table 6). Instead of seeing the freight market as a road dominant zone, the freight task now offers three alternatives in which rail is not far behind (14 per cent). At present, it might be difficult for rail via IMT to compete with road transport. However, rail via IMT will increase in competitiveness as trade and urban freight congestion increase and escalate pricing for road transport. Road transport prices will continue to rise regardless of the increase in trade volume, whereas rail transport prices should fall as rail networks improve and IMTs aggregate sufficient volumes.

2.4 INEFFICIENCY OF RAIL SERVICE QUALITY

Factors that affect the performance of the train operation in terms of service quality include:

- The misalignment between the rail paths and the stevedores' time windows that creates difficulties for rail operators scheduling services via the port.
- The insufficient rail capacity at the port terminals caused by the lack of rail infrastructure, the limited rail sidings to service rail at the port and insufficient lifting productivity.

2.4.1 Rail access

2.4.1.1 ARTC rail time paths

Currently, freight trains travelling through Port Botany are regulated by the Rail Corporation New South Wales (RailCorp) and the Australian Rail Track Corporation (ARTC). While RailCorp controls the freight lines and associated rail paths, the ARTC manages the Botany yard and Enfield West to Sefton Park Junction. To participate in the rail track through Port Botany, a rail operator needs permission from both parties and to pay the access fee which comprises two amounts: dollars per train kilometres and dollars per '000 gross tonne kilometres.

In addition to the standard working timetable which is agreed between the rail network owners and train operators in advance, there are also ad hoc paths submitted by those operators close to the live run requesting permission to access the corridor late or ahead of the dedicated time. Their requests will be reviewed and approved or not approved by RailCorp for metropolitan services depending on pathing availability around the already scheduled timetable. If a mandatory path and service is cancelled, the train operator is required to pay the flag fall.

The Port Botany rail freight line is considered the key corridor through which all port-related rail services pass. According to the ARTC, the Port Botany railway has a capacity of about 30-35 trains from all destinations, which can also be expanded with line duplication between Mascot and Botany to increase total capacity to over 90 trains per day. At the moment only 15 trains participate on the Port Botany railway line, taking up less than 50 per cent of the available track capacity. In the short to medium term the number of trains can be doubled on the same infrastructure but only after the operational methodologies have been changed and standardised.

2.4.1.2 Stevedore time windows

Existing train operators are allocated dedicated time windows ahead of time to access the stevedore terminal. Given the expected time intervals between each train service, the stevedores design their own time windows for each train accessing their terminal which may or may not align with the RailCorp/ARTC train paths. As a result it is very difficult for train operators to work around the two time systems and also around passenger peak curfews to come up with the most suitable schedule for their train services.

Typically rail freight starts when the containers are booked with the rail operator, usually two days prior to ship arrival. The rail operator then provides the container numbers to the stevedore at least six hours in advance of the agreed time window so that there is sufficient time for the booked containers to be stacked into blocks ready for the train. As previously noted, the rail operator is allocated a firm time window during which the stevedore will load and unload the containers onto the train. A train being served at the stevedores' terminals must leave the port when its allowable time window is reached, regardless of how much freight has been loaded or unloaded. Therefore, when the train arrives late at the terminal, or even when it arrives on time but has an exchange greater than the stevedore's window has capacity to deliver, it is likely that the train will depart leaving a number of import containers behind or with export containers remaining on the train.

Because of the uncertainty of train arrival time and limitation of the stevedore's rail productivity, rail freight possesses less visibility and certainty. The train operator has no knowledge of what freight the train collected during a particular window until being informed by the crew and the stevedore after the train is loaded. Although the train operator provides all the container numbers beforehand to the stevedore, the containers are unknown until they arrive at the IMT. This subsequently creates problems for customers attempting to manage "just-in-time" production or time-sensitive supply chains whose containers happen to be left behind.

It is important to stress that the future operation of a third terminal operator may not necessarily result in an increase in the stevedore time windows as its sidings are likely to be an extension from the Patrick sidings. In fact, the current deficiency at Port Botany might be exacerbated with more congestion and excess shunting.

For a comparable container movement, the stevedore's booking slot pricing for rail operation is significantly higher than for truck operation. The terminal access charges or rail windows are calculated based on the length of time of the window. For each one hour service in a rail window, the terminals will guarantee to deliver a negotiated minimum lifting capacity. Since the commencement of the new rail regulatory charges in September 2011 at Port Botany, a minimum lift of 36 per hour at $15 per lift is required by both Patrick and DP World. An extra charge of $30 per lift will be applied for any lifts in excess of the 36 lifts per hour. A window cancelled within 48 hours is charged at $540 per hour regardless of it being reused or not.

In comparison, the servicing charges imposed on road transport are significantly lower than for rail transport. DP World's charge system for road operation comprises a $5 monthly registration fee and $5 for each timeslot arranged, Patrick charges a fixed $10 monthly fee and $5.50 per timeslot provided. The difference between the charges imposed for rail service as compared to road should be eliminated or significantly reduced.

Image courtesy of Sydney Ports Corporation

2.4.2 *Insufficient rail capacity*

2.4.2.1 *Inadequate rail infrastructure*

At present, the Port Botany freight line, which extends from Port Botany to Sefton Junction via the Enfield marshalling yard, is the only dedicated freight railway to the port. Freight trains travelling beyond the dedicated freight track, including trains servicing the IMTs at Leightonfield, Yennora or Minto, travel on shared networks where passenger trains have priority. In the peak hours from 6.00-9.00am and from 3.00-6.00pm on weekdays, freight trains are not allowed on the urban rail system to clear the way for passenger trains.

The proposed Southern Sydney Freight Corridor is anticipated to improve the rail freight network as it will connect Ingleburn, Minto, Moorebank and Leightonfield with Chullora and Enfield en route to Port Botany. The NSW Government is cooperating with the Australian Government to undertake feasibility research on the delivery of a Northern Sydney Freight Line. The project is expected to increase capacity for freight trains on the main northern line between North Strathfield and Broadmeadow, Newcastle.

2.4.2.2 *Limited rail siding capacity at Port Botany terminals*

Apart from the mismatch between the stevedores' time windows and the ARTC's rail time paths, another factor contributing to the poor rail freight task is the inefficient track configuration within the stevedore terminals. Patrick's onsite rail facilities comprise two 600-metre sidings; whereas currently, there are three 340-metre sidings within DP World's terminal. Rail infrastructure at the empty container park operated by P&O Trans Australia (POTA) consists of two 475-metre sidings.

Trains operating on the Port Botany railway vary in length with regional NSW trains generally measuring 600 metres or longer, while a proportion of metropolitan trains are shorter than the 600-metre standard. Port shuttle trains are proposed to be 600 metres trailing load plus locomotives to give a total length of 650 metres. The long-term aim is to have dedicated port shuttles to a single container terminal to reduce excessive shunting and propelling.

Due to the lack of standardisation of siding lengths within the stevedores, there is at times a need for splitting and shunting to access different terminals for trains that exceed the siding lengths. Shunting might also be required for some services that have loading for both stevedores regardless of the length of the train. Long export trains are split between the two stevedores and can only be re-joined once both the stevedores finish unloading. Because trains must depart on the same route by which they arrived, there is a high probability that one stevedore has to wait unproductively for the other to finish loading the other half of the train.

The shunting operation at Port Botany is complicated and varied according to the respective start and finish times at each of the stevedores and depending upon the train's length, the proportion of loading for Patrick and DP World, and the collection requirement of empty containers from POTA. An example of shunting operation at Port Botany rail yard is described in Appendix D. On average, the actual train loading operation at the stevedore requires about five steps (steps 1,3,7,15,16 in Appendix D); the rest of the time is spent on shunting (up to 7 steps) and collecting empty containers at POTA (up to 4 steps).

It is recorded that about half of the 15 trains currently operating on the Port Botany railway line require splitting and shunting to serve both stevedores. On average, each train requires six shunting movements; i.e. the current 15 train movements on the rail track generate around 90 shunting movements per day. There will be a significant saving when all these redundant activities (shunting at Botany Yard, and shunting and collecting empty containers at POTA) are mitigated.

2.4.3 *Stevedore lifting productivity*

At present, for each one hour service in a rail window, DP World and Patrick are committed to load/unload 36 containers. Without taking into account the shunting time, a 24-hour operation at one stevedore is expected to perform 864 lifts per day. The operation of the two stevedoring companies at Port Botany would roughly deliver 72 lifts per hour or 1,728 lifts per day. In reality, the total lifts performed by the two stevedores are much lower than 864 lifts per day due to a large number of shunting moves as discussed previously.

According to the ARTC, the Enfield IMT will be a good terminal for the port shuttle market so long as capacity throughput, which has a planning cap set at 300,000 TEUs, is achieved by rail. It is expected that train shuttles operated by the Enfield IMT will be 650-metre trains. When fully loaded, each train will carry around 90 TEUs. More capacity could be added by double-stacking containers onto the wagons. However, according to the ARTC this configuration is precluded due to the presence of overbridges and overhead wiring.

Table 7: Estimates of minimum services required from Enfield IMT on a round trip basis

Payload	TEUs per round trip	Daily trips	TEUs per year	Equivalent daily truck trips
60%	108	7	275,940	329
65%	117	7	298,935	356
70%	126	6	275,940	329
75%	135	6	295,650	352

*Assumptions: a) Rail freight windows are unlimited. b) The number of railed containers serviced by the stevedores is equal. c) Shunting is excluded in daily operation. d) Trains operate on a 24/7 basis.

2.4.3.1 *Allocating time windows to the Enfield IMT*

Different scenarios have been assessed to estimate the number of trips the Enfield IMT must operate in order to achieve 300,000 TEUs throughput per year under different payload levels. The train utilisation applied in the scenarios ranges from 60 to 75 per cent. This range was chosen because 60 per cent is the current average payload and 75 per cent is statistically assumed to be optimal. Train utilisation of 60 per cent is a growth from 55 per cent in 2006, which in turn was an increase from 50 per cent in 2001, suggesting that train utilisation increases by 5 per cent over each five-year period. Providing this growth rate remains stable, train utilisation of 75 per cent could be achieved by 2026. However, it should be noted that the Enfield IMT will also operate as an empty container park. It also has the potential to act as a hub for regional export trains, thus increasing the capacity of freight available to each port-bound service and new equipment at the container terminals may also assist in increasing train utilisation.

Assuming there is unlimited rail window capacity on the Port Botany dedicated freight line and that shuttle trains from the Enfield IMT operate on a 24/7 basis, the results of four different train utilisation scenarios with 60, 65, 70 and 75 per cent payloads are summarised in Table 7. It shows that for each train utilisation level, a certain number of daily trips are required to maximise the total throughput. A detailed estimation of each scenario is included as Appendix A.

Under the 60 and 65 per cent payload levels, the IMT is obliged to make at least seven trips daily through Port Botany in order to move totals of 275,940 and 298,935 TEUs respectively. When 70 or 75 per cent of train utilisation is warranted, a minimum of six trips will be required from the terminal to reach the target volume. At the optimal payload of 75 per cent, the IMT is expected to deliver 295,650 TEUs annually. As can be seen, the IMT shuttle train movements result in a significant reduction in daily truck trips on already-congested roads. With a 75 per cent payload, the daily operation of six shuttles through the port effectively removes 352 trucks from the road system every day.

The introduction of performance incentives in September 2011 at Port Botany has seen an increase in the stevedores' minimum lifting productivity from 30 to 36 lifts per hour. A 650-metre train shuttle that carries 108 TEUs (60 per cent payload) would require a maximum of three hours of rail service from the stevedore. For the terminal to make seven trips daily through the port, an additional 21 hours of handling dedicated to the port shuttle trains is expected. This is considered challenging given the downtime each day due to shift changes, breaks and shunting at the stevedores' terminals. However, the future lift rate could increase commensurate with an increase in demand.

2.4.3.2 *Expected future handling capacity*

Because volume is the most critical driver for commercial sustainability of IMT operation, the ability of the stevedores to guarantee sufficient windows to the IMT trains plays an important role in maximising the terminal capacity.

Table 8 illustrates the capacity of the stevedores to handle the future increase in the number of containers transported by trains through the port with a rail market share of 20 per cent. Trade forecasts indicate that the international trade volume for each of the coming years will continue to grow at a rate between 5 and 7 per cent. Refer to Appendix B for a detailed estimation covering the period 2011-2020.

As can be seen, demand could exceed stevedore handling capacity by 2020 regardless of whether the total trade growth rate is 5, 6 or 7 per cent. In particular, with volume growth rates of 6 and 7 per cent per annum, the rail share

Table 8: Stevedore handling capacity (TEUs) 2018-2020 (rail share 20%)

Trade growth rate	Year		
	2018	2019	2020
5%	161	84	2
6%	40	-64	-168
7%	-91	-233	-360

*Assumptions: a) Stevedores handling capacity 36 lifts per hour. b) The number of railed containers serviced is equal at both stevedores. c) Train operation on a 24/7 basis. d) Shunting times are excluded in daily operation. e) 1 container equals 1 TEU

of 20 per cent would not be achievable in 2019 and 2020. It is imperative that lifting productivity be improved.

Table 9 presents the estimated additional handling capacity of the stevedores required in 2020 subject to 40 per cent of container throughput being moved by rail. In order to reach a rail market share target of 40 per cent, the stevedores' lifting performance must improve to 72 TEUs per hour, 79 TEUs per hour and 87 TEUs per hour for container volume growth rates of 5, 6 and 7 per cent respectively. The opportunity for an increase in the time windows at Port Botany is expected once Hutchison Port Holdings (HPH) commences operations, adding two 650-metre rail sidings to the existing facilities. It is anticipated additional sidings for trains accessing the new terminal area may motivate the two existing terminal operators to improve their current rail window alignment with the ARTC's time paths.

2.4.4 *Port Botany Landside Improvement Strategy rail reforms*

2.4.4.1 *Background*

From the Government's response to the IPART report in 2008, Sydney Ports Corporation (SPC) formulated the Port Botany Landside Improvement Strategy (PBLIS) to enable the port to improve landside efficiency for both road and rail transport of containers. The key PBLIS objectives are to provide efficiency, consistency, transparency and 24/7 operation.

SPC established two taskforces to take on the roles and responsibilities of PBLIS: the Port Road Taskforce (PRT) and the Port Botany Rail Team (PBRT). The PRT developed performance standards to facilitate an improvement in truck efficiency at the port and these standards were implemented by SPC in February 2011. The Operational Performance Measures (OPMs) provide a reliability of servicing for carriers in terms of turnaround times and slot availability and also more certainty for the stevedores while spreading the workload more evenly across the day and week, along with a series of penalties for poor performance by either party.

The PBRT has investigated reasons for poor performance in the rail supply chain, and has monitored performance such as train on-time running and train call-up over the period since 2008. Two performance trials were held in November 2009 and May 2010 which identified that generally rail data was lacking in consistency and that data quality was poor.

2.4.4.2 *Rail strategy*

The PBRT has also worked on developing performance standards for rail, however SPC recognised that something more was required in order to facilitate an increase in rail volumes and mode share for the port. The NSW Government and SPC have identified that increased intermodal capacity, appropriate rail network capacity and port performance are all fundamental to make rail more consistent and reliable.

SPC has developed a rail strategy to assist in delivering the Government's objective in the new State Plan 2021 "to double the proportion of freight by rail". The fundamentals are rail pricing, performance standards and systems to support rail business. SPC and the PBRT have focused on developing a suite of rail OPMs to facilitate an improvement in performance by the rail operators and stevedores at the port. In addition SPC has identified the need for appropriate governance to be in place as well as an independent overarching body to oversee the rail supply chain for the port.

In the longer term SPC believes that rail windows are inflexible and constrain rail growth at the port. The corporation anticipates that a co-ordination centre can optimise and manage the Botany–Enfield corridor for port trains in co-operation with the rail network owner, and utilise available siding capacity (for example at Enfield Marshalling Yard), forecasting methodology and dynamic scheduling to greatly improve efficiency and productivity of the port rail supply chain, in line with intermodal development.

The recent introduction of the rail pricing regulation with its underlying base lift rate and performance incentive has provided an opportunity to improve productivity at the port-rail interface. In the short term SPC expects that a review of the rail window system will identify latent capacity that can be unlocked to provide further efficiencies and growth opportunities. This will be supported by the introduction of rail performance standards (with suitable penalties) and appropriate systems that facilitate efficient flows of accurate and standardised information in a consistent and timely manner.

All of these components of the rail strategy will address the underlying issues impacting on rail productivity at the port.

Table 9: Additional stevedore handling capacity demand forecast 2020

(1) Year	(2) Trade growth rate	(3) Port volume (million TEUs)	(4) Rail volume (million TEUs) [(3) x 40%]	(5) Daily rail (TEUs) [(4) / 365 x 1,000,000]	(6) Equivalent daily lifts (TEUs) [(5) / 2 / 24]
2020	5%	3.15	1.26	3,452	72
	6%	3.46	1.38	3,792	79
	7%	3.81	1.52	4,175	87

Assumptions: a) The current port volume cap of 3.2 million TEUs is removed. b) The number of railed containers serviced by the stevedores is equal. c) Train operation on a 24/7 basis. d) Shunting times are excluded in daily operation. e) 1 container equals 1 TEU

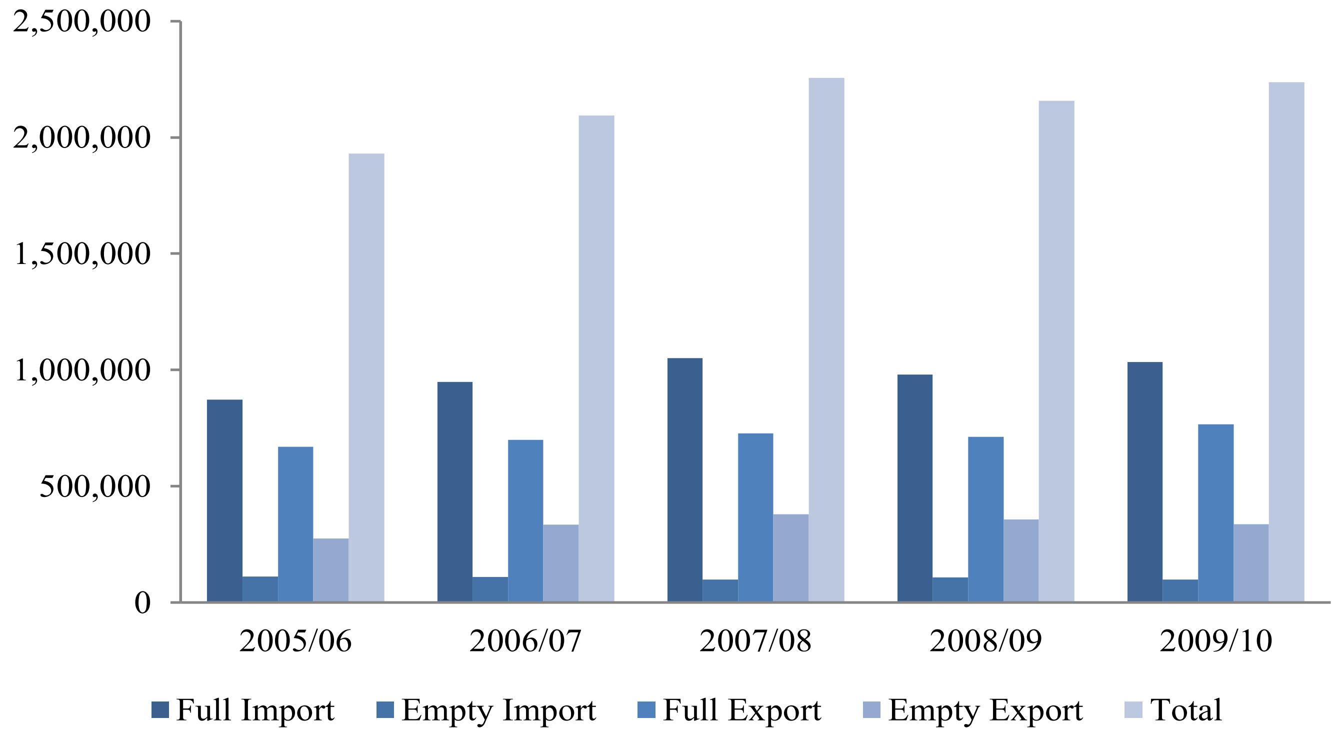
3 MELBOURNE

3.1 MELBOURNE FREIGHT PERFORMANCE

The Port of Melbourne is the largest containerised terminal port in Australia. Its container trade has increased from 1.93 million TEUs in 2005 to nearly 2.24 million TEUs in 2010 (Figure 8). The future annual growth of the container throughput via the Port of Melbourne is expected to be approximately 5 per cent, growing to around 3.8 million TEUs in 2020 and 8 million TEUs by 2035.

Similarly to Sydney, Melbourne's total import containers accounted for nearly 50 per cent of the total containerised volumes over the five year period. About 5 per cent of the total traded volumes were contributed by empty import containers. The difference in container trade structure between Sydney and Melbourne is that in Sydney, a majority of the export containers were empty, whereas in Melbourne loaded export containers were predominant. It is estimated that full export containers represent more than 33 per cent of total traded containers, and more

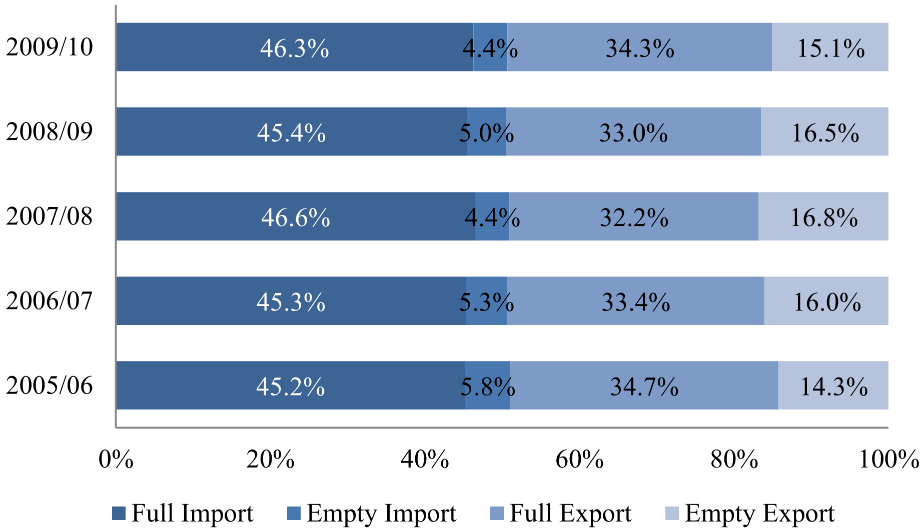
Figure 8: Port of Melbourne total trade – five year trend FY 05/06-09/10



Year	Full Import	Empty Import	Full Export	Empty Export	Total
2005/06	872,668	111,941	669,952	275,464	1,930,025
2006/07	948,880	110,435	698,608	335,688	2,093,611
2007/08	1,050,575	98,820	727,040	380,209	2,256,644
2008/09	980,422	108,168	712,532	356,230	2,157,352
2009/10	1,034,742	98,315	766,627	336,951	2,236,635

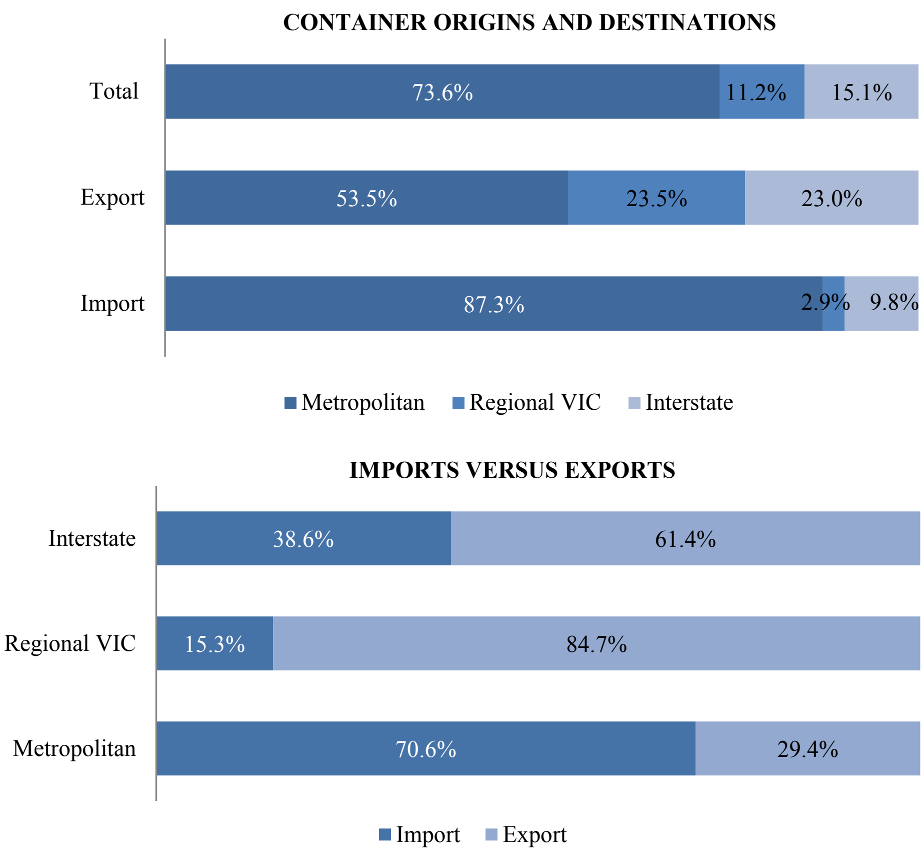
Source: Estimates based on BITRE Waterline 46, 47, 48

Figure 9: Port of Melbourne total share % – five year trend FY 05/06-09/10



Source: Estimates based on BITRE Waterline 46, 47, 48

Figure 10: Port of Melbourne container origins and destinations 2009



Source: Estimated based on Port of Melbourne 2009 Container Logistics Chain Study

than twice the volume of empty export containers (Figure 9). There is also an imbalance between imports and exports in Melbourne; however, the gap between full import and export containers is less extreme than that in Sydney.

At present, import and export containers are mainly handled at Swanson Dock. International vehicles, Bass Strait cargo trade, break-bulk and a small volume of international container flow are currently handled at Webb Dock. A 30-year strategy plan for Webb Dock was developed by the Port of Melbourne Corporation (PoMC) as part of its Port Development Plan, which provided that Webb Dock would continue its current operation until 2015 or 2017, from when Webb Dock's east would be progressively upgraded to service increasing international containers to relieve pressure on the congested Swanson Dock. Its provision of vehicle and break-bulk services therefore would be moved to Webb Dock's west or to other ports. It should be stressed that the current Victorian Government has not approved this proposal at the time of writing this report.

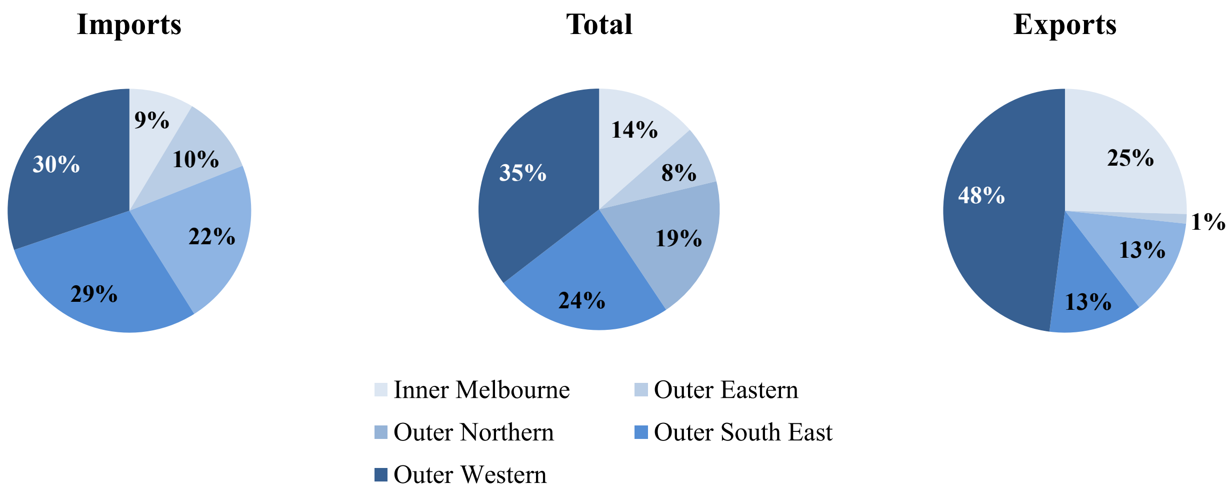
3.2 MELBOURNE FREIGHT ORIGINS AND DESTINATIONS

As shown in Figure 10, the majority of Melbourne's international containers are bound for or originated from the metropolitan areas, accounting for 87 per cent of import containers and 54 per cent of export containers. The balance is carried from/to regional and interstate locations. The origins of export containers are more widely spread between metropolitan Melbourne (54 per cent), regional Victoria (23 per cent) and interstate (23 per cent).

Regional Victorian areas were predominantly export zones, receiving only 15.3 per cent of import containers. Melbourne metropolitan areas, on the other hand, had higher demand for imports than exports. More than 70 per cent of the total containers traded through the metropolitan areas are for imports whereas only 29 per cent were exported from there.

The western, south-east and northern regions were the three biggest destinations and origins for international containerised trade, contributing a combined 78 per cent of the total volume through the metropolitan areas (Figure 11). The western Melbourne region was the highest market for both imports and exports among the five regions, and accounted for

Figure 11: Port of Melbourne full import and export metropolitan origins and destinations 2009 (percentage)



Source: Port of Melbourne 2009 Container Logistics Chain Study

30 per cent of import containers and 48 per cent of export containers. The south-east of Melbourne was second in terms of total trade and was the second largest destination for import containers with 29 per cent. Although inner Melbourne received the least number of import containers, it was the second largest catchment area for exports and delivered 25 per cent of containers to the Port of Melbourne. It is expected that the ongoing trend will be for higher growth in the west at the expense of the south-east.

As detailed in Table 10, the majority of container staging activities occurred in inner Melbourne and the western region. In total, only 61,321 TEUs were actually destined for inner Melbourne yet another 386,292 TEUs were temporarily stored there before being delivered to other metropolitan areas or interstate. Repositioning the container storage facilities away from inner Melbourne will remove pressure from roads if rail freight is used.

The western region was the second largest origin and destination for staging activities with 128,607 TEUs. In fact, it is the largest staging location for exports with 166,208 TEUs temporarily stored there prior to being transported to the Port of Melbourne. Unlike other regions, more export containers were staged in the western Melbourne region than import containers. Compared to other metropolitan regions, the western region of Melbourne also had the least imbalance in total container trade after inner Melbourne. It was also the only area with fairly equal shares between final and staged imports and exports, which suggests that this is likely the most feasible market for IMT establishment, especially for rail IMTs due to the high potential for maximising train utilisation both ways.

Table 10: Port of Melbourne staged and final freight origins and destinations 2009 (TEU)

Region	Final origins and destinations		Staging origins and destinations	
	Import	Export	Import	Export
Inner Melbourne	61,321	75,590	447,613	95,058
Northern	157,362	38,218	2,721	-
South-east	204,827	37,091	41,852	13,480
Western	215,414	142,542	128,607	166,208
Total	**638,924**	**293,441**	**620,793**	**274,746**

Source: Port of Melbourne 2009 Container Logistics Chain Study

Although the north and the south-east of Melbourne were the second and third largest markets for import containers (157,362 TEUs and 204,827 TEUs respectively), few containers were physically stored in these two regions before being transported to their final locations. In fact, only 2,721 import TEUs and 41,852 import TEUs were staged in the north and the south-east respectively. In addition, there was no staging for exports in the north and there were only 13,480 export TEUs temporarily stored in the south-east. The imbalance between import and export containers in these areas was comparatively large with the approximate ratios of 4:1 (north) and 5:1 (south-east).

Table 11 lists the top locations for both import and export containers of each metropolitan region by suburb. Of all the suburbs, Dandenong in the south-east had the highest import volume of 71,323 TEUs in 2009; Laverton in western Melbourne originated the highest export volume of 41,739 TEUs.

In the inner Melbourne region, the top four suburbs (Port Melbourne, West Melbourne, Yarraville and Footscray) together took up 57 per cent of import containers and almost all export containers. Of these four suburbs, West Melbourne delivered the highest export volume, accounting for more than half the total containers of the region.

In the northern region, Tullamarine, Somerton and Campbellfield were the top destinations and origins, transporting 59 per cent of import containers and 78.4 per cent of export containers. The majority of the region's export containers – 69 per cent - were transported from Somerton.

Table 11: Port of Melbourne top destinations and origins by suburb 2009

Region	Suburb	Postcode	Import		Export	
			TEUs	Region %	TEUs	Region %
Inner Melbourne	West Melbourne	3003	10,471	17.1%	41,551	55.0%
	Footscray	3011	5,026	8.2%	845	1.1%
	Yarraville	3013	4,108	6.7%	5,493	7.3%
	Port Melbourne	3207	15,408	25.1%	21,691	28.7%
	Total		**35,013**	**57.1%**	**69,580**	**92.0%**
Northern	Tullamarine	3043	29,880	19%	2,911	7.6%
	Somerton	3062	36,398	23.1%	26,386	69%
	Campbellfield	3061	26,523	16.9%	657	1.7%
	Total		**92,801**	**59.0%**	**29,954**	**78.4%**
South-east	Dandenong	3175	71,323	34.8%	6,010	16.2%
	Clayton	3168	18,063	8.8%	23,194	62.5%
	Aspendale	3195	19,253	9.4%	1,784	4.8%
	Total		**108,639**	**53%**	**30,988**	**83.5%**
Western	West Footscray	3012	27,304	12.7%	34,697	24.3%
	Altona	3025	31,841	14.8%	27,325	19.2%
	Laverton North	3026	58,462	27.1%	29,250	20.5%
	Laverton	3028	13,096	6.1%	41,739	29.3%
	Hoppers Crossing	3029	17,799	8.3%	3,521	2.5%
	Werribee	3030	25,430	11.8%	4,695	3.3%
	Total		**173,932**	**80.7%**	**141,227**	**99.1%**

Source: Port of Melbourne 2009 Container Logistics Chain Study

3.3 TRANSPORT MODES

According to Figure 12, road transport is the dominant mode of transport used for port-related containers. More than 90 per cent of containerised freight via the Port of Melbourne was transported by trucks while rail transport accounted for only 9 per cent of the total movement. Road-direct and road-via-transport depot had predominant shares of 43 and 48 per cent respectively. Similarly to Sydney, rail was used mainly for moving export containers. Only 3 per cent of import containers were transported by rail while 18 per cent of export containers were railed to the port.

3.3.1 Rail freight

Rail access to the Port of Melbourne is via a single, dual gauge track that crosses Footscray Road, linking the port with the South Dynon rail terminal and other state and national rail systems. In total, six near-dock rail terminals are operated in the Port of Melbourne. Freight trains are used mainly for regional Victoria and interstate destinations and origins collecting 5 per cent of import containers and delivering 20 per cent of export containers. Port shuttle train services have played a very minimal role in freight distribution, less than 1 per cent, although metropolitan containers represent around 74 per cent of the port's total container trade. At present the rail on-time arrival rate is around 15 per cent, leading to operational stagnation and ineffective resource allocation.

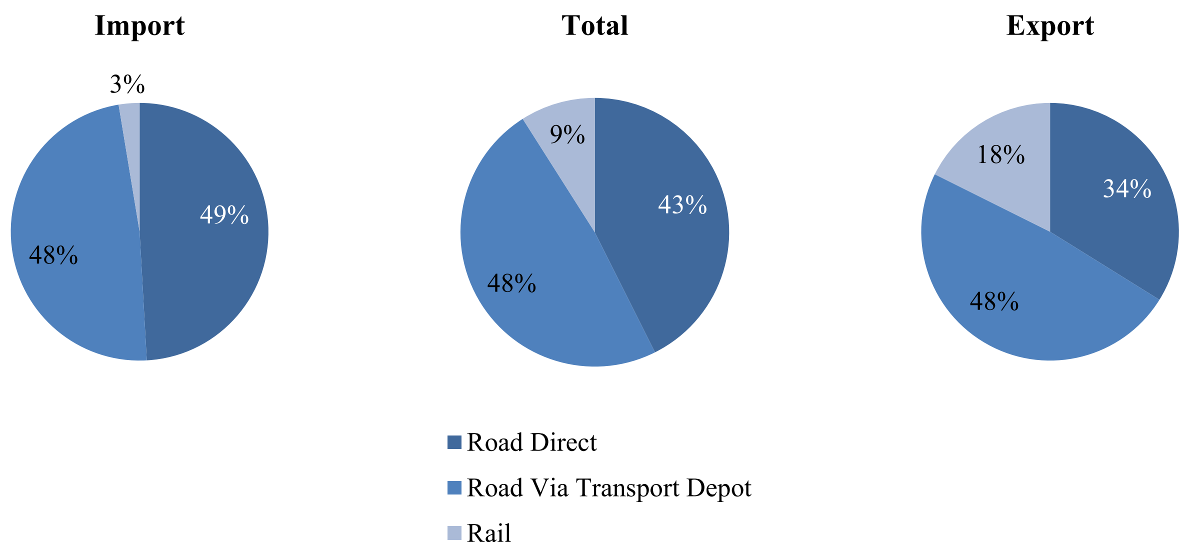
Melbourne's rail infrastructure displays significant variation in its rail gauge system. Unlike Sydney, Melbourne's gauge system is more complex because of the co-existence of broad gauge, standard and dual gauge. Interstate freight trains travel from the west and north of Melbourne to the Port of Melbourne via standard or dual gauges, while the south-east is connected to the port terminal only by broad gauge and is currently shared between passenger and regional freight trains. Previous attempts to set up metropolitan rail shuttles from/to IMTs such as Somerton and Altona found that passenger trains and regional trains were prioritised over the shuttles passing through the rail network.

It is important to note that in Melbourne freight trains are handled outside the stevedores' port terminals. Containers to be placed onto trains are first transported by trucks to a rail terminal.

At an operational level, there is very little support for the commencement of metropolitan train shuttles. There is currently no port rail interface available to accommodate trains from the IMTs. The on-dock rail service once provided by Patrick displayed significant operational inefficiency. Only one train can be loaded/unloaded at a time due to limitation of rail sidings at the dock. As advised by Patrick, current lifting capacity at the terminal is about 15 containers per hour, which is only half of the handling capacity achieved at Port Botany. As reported by Patrick Rail, when a train arrives at the rail terminal between 6.00am and 8.00am, the loading and unloading is expected to finish at around 2.00pm including all shunting time.

In addition, the rail service at the Port of Melbourne is further impeded by the lengthy time wasted for train inspection.

Figure 12: Port of Melbourne container movements per transport mode (percentage)



Source: Estimated based on Port of Melbourne 2009 Container Logistics Chain Study

It is estimated that it generally takes one and a half hours in total to finish checking a 60-wagon train, with each wagon having a three-minute inspection time. In Sydney, the total inspection time is estimated at about 30 minutes per train and only happens when the train is ready to leave the terminal. Reducing current inspection times is expected to increase train turnaround time significantly.

3.3.2 Road freight

It is important to note that, while working towards a rail option, the ongoing dominant role of road transport should be acknowledged in the short, medium and probably long term. Unlike Sydney, Melbourne's freight market comprises three defined market zones: the west, north and south-east. Melbourne's geography allows three-side movements whereas in Sydney movement is mostly in the west and south-west. In addition, the Port of Melbourne is located in the middle where products can easily find their way back to the port and, in return, freight is positioned nearer to the market.

Melbourne's arterial road network comprises radial and rectangular grid roads. Major road links most vulnerable to capacity concentration include the West Gate Bridge, the Monash-West Gate Corridor, the Western Ring Road, the Eastern Corridor, the Tullamarine Freeway and Citylink roads servicing the Port of Melbourne. Of all those routes, the Monash-West Gate Freeway together with Citylink and the West Ring Road are the principle links connecting the east-west and north-south freight traffic. As reported, about 45 per cent of total freight movements took place between 6.00pm and 6.00am and 55 per cent occurred between 6.00am and 6.00pm. In general, congestion has been continuingly increasing in those corridors due to high usage in peak periods and the limited alternatives for making cross-town trips.

The Monash-West Gate Corridor accommodates public transport from the south-eastern and western suburbs to the central business areas and freight traffic between the inner suburbs and the Port of Melbourne precinct. It has experienced high concentrations of traffic flow due to limited road crossings of the Yarra and Maribyrnong rivers. In addition, it is a preferable route for freight movements between the north and south-east because of fewer intersection traffic lights compared to alternative routes.

Besides having better access to and from the port, Melbourne's trucking industry is not as competitive as Sydney, which allows it to operate more efficiently. Sydney's road transport market is characterised as dissipate and fragmented. There are about 250 truck operators moving containers to and from Port Botany. Among them, no single operator plays a dominant role in container transport, with the largest participant taking up no more than 15 per cent of the market. On the other hand, Melbourne has about 150 trucking companies moving international container trade through the Port of Melbourne. Among them, the top 25 transport companies have an aggregate market share of containerised freight of approximately 70 to 80 per cent.

Table 12 presents key performance indicators provided by the stevedores in Sydney and Melbourne in 2010. In general, Melbourne's roadside performance demonstrated higher efficiency than achieved in Sydney. In 2010, about 837,926 trucks visited the Port of Melbourne; whereas only 551,553 trucks travelled through Port Botany.

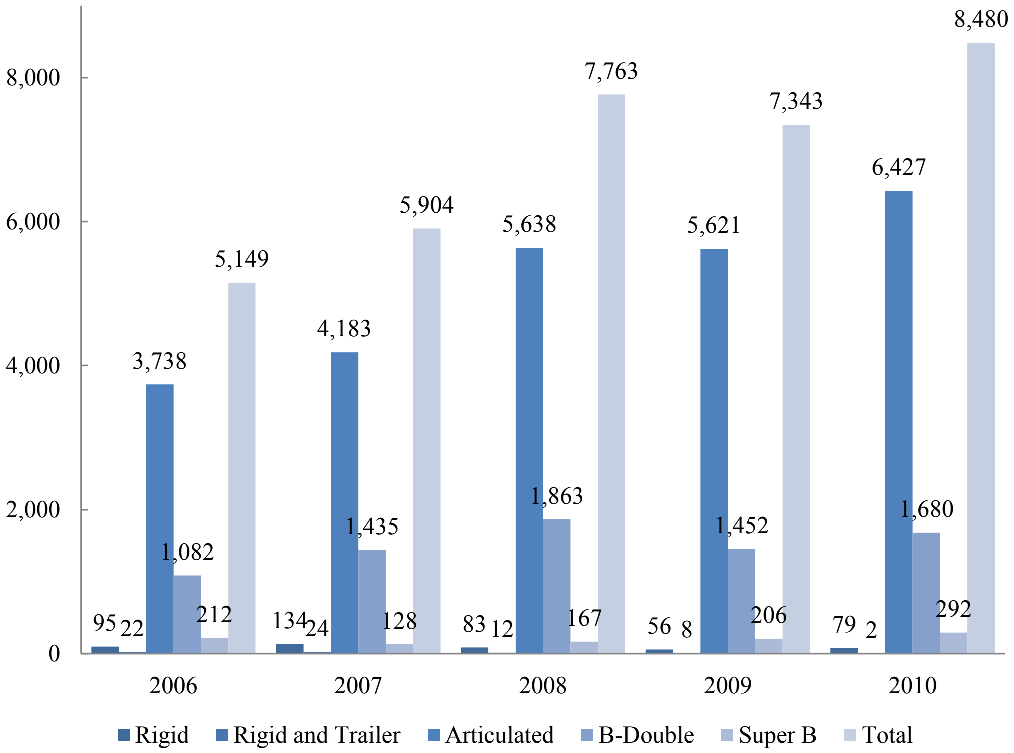
It is important to note that Port Botany has a firm timeslot system in which the truck operators book slots in advance. On the other hand, in Melbourne the number of timeslots is decided by the stevedores according to their volume capabilities on a daily basis. As recorded, in 2010 the Port of Melbourne provided over 1 million timeslots, 300,000 slots more than were provided in Sydney.

Table 12: Container terminal roadside performance 2010 – Sydney versus Melbourne

Criteria	Sydney	Melbourne
Total trucks	551,553	837,926
Total timeslots	5,092	5,473
Truck turnaround time (minutes)	37	26

Source: Estimates based on data from Waterline 49, 2011

Figure 13: Changes in numbers of container trucks



Not only were more timeslots provided than at Port Botany, the trucks visiting the Port of Melbourne spent less time at the terminal, with a turnaround time of 26 minutes per truck as compared to 37 minutes per truck in Sydney. In addition, Melbourne also had slightly higher truck utilisation on average in 2010.

In terms of share, there was little difference in the number of containers transported by road-direct and road-via-transport depot methods, although a slightly higher share of the containers was staged through a transport depot.

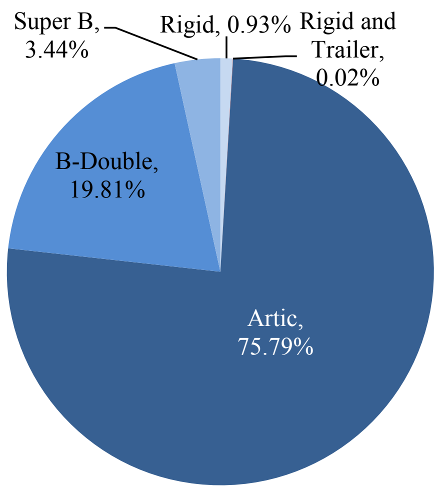
The majority of full import containers were staged via a transport depot (69 per cent) and so were full and empty export containers (55 per cent and 63 per cent respectively). On the contrary, the road-direct method was highly preferred in returning empty containers to the container park, accounting for 70 per cent of the total empty imports. Because of the large number of transport depots and container parks located in inner Melbourne, there was a considerably higher number of trucks moving through this area.

Changes in the types of vehicles used in transporting containers are presented in Figure 13. Overall, the total number of trucks travelling through the Port of Melbourne has increased over the years despite a slight reduction in 2009. The total number of vehicles in 2010 increased by 1,137 from 7,343 to 8,480 units. This was mostly due to the rise in the number of articulated trucks being employed during the period. Low capacity vehicles such as rigid and rigid with trailer trucks became less popular and in 2009 only 79 rigid and 2 rigid with trailer trucks were operated in container movement. In addition, an increasing number of containers were transported on high capacity B-Double and Super B trucks, demonstrated by the growth in their numbers observed over the five year period.

In 2010, articulated trucks were the most popular vehicles used in transporting containers (Figure 14). Nearly 76 per cent of the trucks transporting freight through the Port of Melbourne were articulated; 20 per cent of the remaining trucks were B-Double, followed by Super B trucks at 3.44 per cent. Although high productivity vehicles are restricted to specific freight corridors and hours due to weight and noise limitations, a high percentage of B-Double and Super B Double were used to stage containers at transport depots. In contrast, articulated vehicles; i.e. semi-trailers, were the preferred form of transport for direct delivery and collection of containers.

Since September 2009, a two-year trial of a longer B-Double truck termed a High Productivity Freight Vehicle (HPFV) has been conducted. The trial took place between Melbourne Port and the western and northern metropolitan freight corridors, mainly along the West Gate Freeway, West Ring Road and Hume Freeway up to Somerton. The outcome of the trial is expected to help form future HPFV operation on roads in Victoria. The result of the trial has not yet been released. However, due to the high cost of building and running vehicles and restrictions on the times of operation, the HPV shuttle between Somerton IMT, run by POTA, and the Port of Melbourne was commercially unsuccessful.

Figure 14: Observed vehicle types through the Port of Melbourne 2010



Source: Data provided by the Port of Melbourne Corporation

4 SYDNEY AND MELBOURNE IMT DEVELOPMENT

Subject to the forecasted demand in future container trade and supporting transport infrastructure capacity, the need for the development of IMTs in Sydney and Melbourne metropolitan areas is undeniable.

4.1 IMT ANCILLARY SERVICES

Ancillary services are those chargeable services provided by the IMT for activities beyond the movement of freight between two ends. The ancillary services are expected to add value to the supply chain to attract freight transporters and cargo owners, and generate incentives for the efficient utilisation of the IMT assets. Complementary services expected to be provided by IMTs include full and empty container storage, warehousing, quarantine, fumigation, and repair and maintenance on empty containers. The additional income generated from these ancillary services is expected to offset the costs of the IMTs and provide greater flexibility to fund high capacity road and rail operation.

4.1.1 Empty container movements

As previously discussed, there has been an imbalance between the import container task and the export task in terms of the container volumes and types in favour of import containers. In Sydney, about 27 per cent of the total containers are empty; whereas in Melbourne, empty containers account for 20 per cent of the total trade volume. As reported, empty container movements in Sydney increased 14.7 per cent to 533,913 TEUs in 2010 which was mainly as a result of empty container exports. In contrast, empty container movements through the Port of Melbourne declined 6.3 per cent to 435,000 TEUs during the same period.

Empty container parks play a vital role in positioning containers throughout the import and export supply chain. Because of the mismatch between the trade volume of import and export containers and issues such as incompatible container types, different shipping lines carrying the import and export containers, location of the importer relative to the exporter, different sizes and types of equipment and different requirements for repair, handling and storage, it is difficult to allocate an empty container directly from an importer to an exporter. Import containers once unloaded at the consignee's unpacking facility are de-hired at an empty container park. The service provided by the empty container park, in addition to storage, may include inspection for damage, container repairs and preparation of the container for release to an exporter. At a functional level, the empty container task comprises three main movements: de-hire, release and reposition.

Higher import container volumes than export volumes and the limited use of import containers for exports have resulted in the majority of empty container parks being situated close to ports to minimise the costs of bulk runs of those empty containers for repositioning. The shipping lines often want to quickly access these containers for loading when spare ship capacity arises. The commercial value provided by the empty container parks, especially those located in the port precinct, is likely to remain substantially lower than the value that could be generated by other economic activities using the same land. Due to high costs of operation, the majority of the empty container parks do not operate on a 24/7 basis.

In both Sydney and Melbourne, the majority of import containers are destined to be unloaded at locations beyond the port vicinity. Those containers once de-stuffed are delivered, mainly by truck, back to empty container parks and then generate many empty container movements between these areas and the ports. According to some of the consulted parties, the movements of empty containers could be reduced if the empty container parks were located beyond the port precinct and near the freight catchments of importers and exporters to minimise de-hire and release movements. It was suggested that the primary role of the empty container parks in or nearby the ports should be limited to the storage of empty containers destined for repositioning overseas.

There seems to be substantial empty container demand in outer city areas in Sydney and Melbourne, i.e. the west and south-west in Sydney; and the west, north and south-east in Melbourne, where most containers are destined for or originated from. Due to the concentration of trade activities in these areas, they have a real need for empty container parks to facilitate future additional volume throughput.

When the empty container park is integrated with the IMT it will not only provide extra capacity for empty containers but also enhance the opportunity for the empty containers to be reused for a loaded export movement. Instead of travelling to and from the ports, the importer and exporter in the same geographic region only need to transport to the empty container park in that region for de-hire or release of empty containers.

This will help reduce the overall de-hire costs and the demand on capacity at empty container parks. IMTs with the

Table 13: Sydney empty container storage capacity 2011

No	Park	Capacity (TEU)	Holding (TEU)	Holding (%)
1	Patrick Botany Link 2400	2,000	2,039	102%
2	MCS Rail	13,000	12,584	96.8%
3	TYNES	10,500	9,202	87.6%
4	P&O Port Botany	9,000	7,724	85.8%
5	POTA Link	3,000	2,326	77.5%
6	TYNE / ACFS	4,000	2,985	74.6%
7	Patrick Port Botany	3,000	2,149	71.6%
8	MT Movements (Molineaux Point)	2,400	1,673	69.7%
9	TYNE Punchbowl	2,000	807	40.4%
10	MCS Banksmeadow	3,500	988	28.2%
11	Western	3,200	729	22.8%
Total		**55,600**	**43,206**	**77.7%**

Source: IIRA Operational Capacity Survey on one day in Oct 2011

ability to provide 24/7 access for hiring and de-hiring purposes including repair and maintenance services on the empty containers are expected to add more flexibility to the hours of operation of transport providers. However, shipping lines must have the flexibility to return empty containers back to the port precinct should the need arise to minimise the costs of exporting empty containers.

4.1.2 Storage

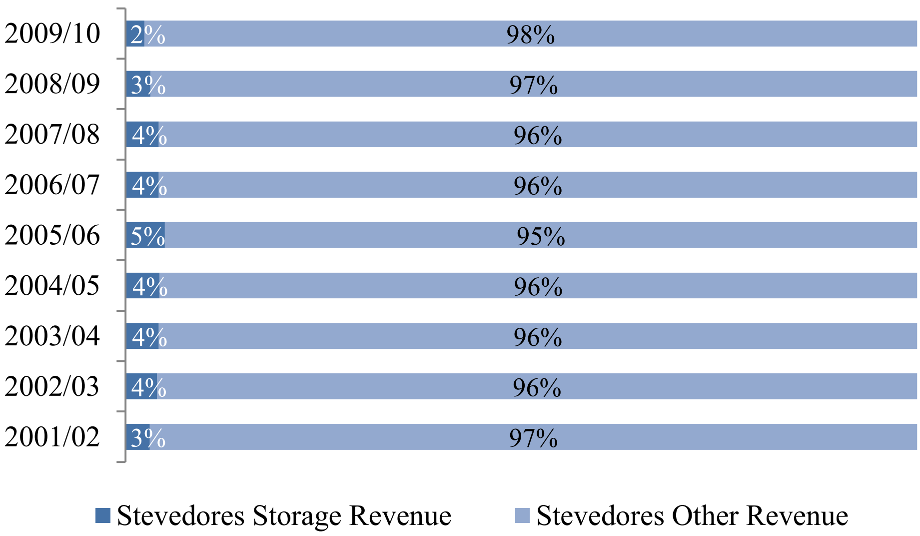
The stevedores allow the road or rail transporters three working days (Monday to Sunday) of free on-port storage to remove import containers, and five days of free on-port storage to provide export containers to reduce the likelihood of a large daily landside task. Import containers remaining in the stevedores' terminals after the free period plus the day of availability are subject to storage charges and yard handling fees.

A container that stays five days after the free period would be levied a penalty of between $585 (Sydney) and $683.70 (Melbourne) in storage fees and between $433.50 (Sydney) and $458 (Melbourne) in handling fees per TEU at Patrick terminal; and between $608.90 (Sydney) and $585.60 (Melbourne) in storage fees and between $471.50 (Sydney) and $433.50 (Melbourne) in handling fees per TEU at DP World terminal.

The development of future IMTs in Sydney and Melbourne, situated further away from the expensive port precinct, would provide additional storage space with significantly lower fees as well as help relieve the container density at the stevedores' terminals. According to the ACCC's container stevedoring monitoring report number 12 (October 2010), the storage revenue for all Australian ports represented just 5 per cent or less of the total revenue each year (Figure 15).

Since 2005/06, the revenue per TEU from storage gradually reduced and only accounted for 2 per cent of the revenue in 2009/10. The small financial contribution of the storage charge suggests that it is not a financial focus of the stevedore. Patrick Stevedore supports the greater use of inland terminals away from the scarce space surrounding the port to reduce the increasing opportunity costs of using land for storage. It was recorded in 2006 that half of DP World's storage revenue related to containers remaining at the terminal more than six days beyond the deadline. The situation was similar at Patrick terminal, with 79 per cent of its storage revenue contributed by containers

Figure 15: Components (%) of total stevedores revenue per TEU, 2001/02 – 2009/10



Source: ACCC, Container Stevedoring – Monitoring report no.12, October 2010, p.10-19

Table 14: Import storage and yard handling charges

Storage tariff	Sydney		Melbourne	
	Patrick	DP World	Patrick	DP World
1-2 days after free period	$75.00	$65.20	$73.20	$75.00
3rd day onwards after free period	$145.00	$159.50	$179.10	$145.20
Yard handling fee	$86.70	$94.30	$91.60	$86.70

Source: Patrick Stevedore and DP World websites

not picked up after the free storage period. The space occupied by those containers could be used for other stevedoring activities servicing vessels that generate higher income.

4.1.3 Customs clearance

As mentioned, one of the desired characteristics of the IMT is authorisation as a customs bonded facility, i.e. a commercial point of discharge or delivery of a container as opposed to the sea port where it is physically imported or exported. The IMTs would become the point at which taxes and levies imposed on the goods are settled rather than when they leave the sea port. This therefore gives the consignees some additional days during which they do not have to carry the costs of cargoes and the associated taxes themselves. Currently underbond movement is only granted upon request from the importer. Automatic underbond movement for containers destined for the IMT is desired to help clear the containers out of the ports faster and allow IMTs to effectively perform as inland ports. Customs has this issue under consideration. The capital and operating costs of setting up customs facilities at IMTs needs to be recognised.

4.2 SYDNEY INTERMODAL TERMINALS

Sydney has the most extensive urban IMT network in Australia including four significant terminals within a radius of 50 kilometres from Port Botany (see Table 15).

Total capacity provided by these IMTs per year is approximately 120,000 TEUs. The IMT at Minto is being developed to cater for 200,000 TEUs per year. The Yennora terminal is also projected to improve its capacity per annum to 200,000 TEUs. As the container trade in Sydney continues to rise and is expected to exceed between 3.15 million TEUs and 3.81 million TEUs by 2020, it will generate a huge demand for distribution and delivery of these containers to and from Port Botany as well as terminal facilities to facilitate the freight task.

Assuming that a 40 per cent mode share on rail could be achieved, the urban freight task is expected to handle between 1.26 million TEUs and 1.52 million TEUs by rail by 2020. Since the future total capacity of the existing IMTs is expected to be 720,000 TEUs, an extra capacity of between 540,000 TEUs and 800,000 TEUs would be required from new intermodal facilities. Locations for possible IMTs have been identified by the NSW Government and SPC including Moorebank and possibly Eastern Creek. The IMT network is expected to help manage road congestion caused by container truck movements and provide greater utilisation of the urban rail task.

The Enfield Intermodal Logistics Centre (ILC) is being progressively developed. The centre is located 18 kilometres from Port Botany and its main construction is scheduled for completion by early 2013. The development involves a 60-hectare ILC comprising an intermodal terminal, empty container storage, warehousing, commercial facilities and an ecological area. In August 2011, the NSW Government appointed Hutchison Port Holdings (HPH) operator of the Enfield ILC. HPH will equip the terminal with the latest technology and modern facilities in preparation for the opening in 2013.

Although the concept of port train shuttles from IMTs seems to be viable once the volume is warranted, when taking into consideration the intermodal movements and travel distances, particularly in the case of Enfield, the justification tends to rely on avoidance of significant congestion on roads and within the port. There is no doubt that operation of the Enfield ILC will assist in relieving congestion on the road network and within the port precinct. However, because of its close proximity to the port, the viability of the facility is driven by its ability to attract sufficient volume to be able to operate viable and regular rail services through the port. With no support from government, the commercial sustainability of the Enfield IMT would mainly rely on the desire of freight owners to utilise the facility. When the IMT is unable to provide economical alternatives to involved stakeholders, it is unrealistic to expect them to utilise the IMT for freight distribution. For Enfield to operate efficiently, a minimum level of operational efficiency must be provided and sustained at the port and on the supporting rail network to allow the terminal to aggregate adequate volume throughput.

A potential IMT also in the west of Sydney, possibly at Eastern Creek, has been identified by the Freight Infrastructure Advisory Board (FIAB) to cater for at least 500,000 TEUs annually. A specific location for the terminal has not been selected although the development of the terminal would require significant land acquisition, holding and construction costs as well as the costs associated with building a dedicated freight line linking the terminal with the Southern Sydney Freight Line.

In the south-west of Sydney, defence land at Moorebank has been studied to identify its potential for development of an IMT to service the south-west area. The location of the site would provide access to key motorway roads and a dedicated rail line

Table 15: Significant metropolitan intermodal terminals in Sydney

Terminal	Annual capacity (TEU)	Forecasted capacity (TEU)
Villawood	20,000	20,000
Minto	50,000	200,000
Yennora	50,000	200,000
Enfield	-	300,000
Total	120,000	720,000

Source: Multiple sources

via the planned Southern Sydney Freight Line to Port Botany. The site is expected to accommodate an annual handling capacity of 1 million TEUs and cater for a 1,500-metre-long interstate freight train. A feasibility study has been undertaken and is scheduled for completion by 2012. Subject to the study's outcomes and a decision by the Commonwealth Government, the staged development of the Moorebank IMT could occur from 2014.

Although relative proximity to the port is one distinguishing characteristic of Enfield IMT compared to Moorebank or Eastern Creek, which are located 15-20 kilometres from Enfield, present rail deficiencies pose similar threats to service certainty and hence the viability of all three terminals.

4.3 MELBOURNE PROPOSED METROPOLITAN INTERMODAL SYSTEM

In The Victorian Transport Plan, Freight Futures and Port Futures, the Victorian Government proposed the development of a Metropolitan Freight Terminal Network (MFTN) in each of Melbourne's major industrial areas and at the Port of Melbourne. The idea of an integrated system of freight terminals was developed into 12 defined "key design propositions" in a discussion paper, Shaping Melbourne's Freight Future by the Department of Transport (2010). In this paper, it is noted that if the road-direct model remains the only means of moving freight, the increased truck numbers accessing the port will generate more congestion and affect the efficiency and reliability of freight movements in the metropolitan area. The suggested solution is the establishment of a Metropolitan Intermodal System (MIS) within the urban areas, which will utilise trains and/or high productivity vehicles to ease the average number of trucks entering and exiting the port. With the MIS at the three main corridors, about 6000 truck trips per day (as semi and B-Doubles) would be generated by 2035 to and from the port, a significant reduction from an estimated 12,000 daily trips.

According to the Melbourne Intermodal System Study conducted in 2008, the total throughput via Melbourne's IMTs was expected to be 500,000 TEUs in the initial years and increase to 1.5 million TEUs by 2035. Based on the current freight performance of each metropolitan area, it is apparent that higher IMT capacity will be required in the western Melbourne region, followed by the south-east and then the north.

At the moment there are 10 IMTs within Melbourne metropolitan areas. Six of them are located within the port precinct, including the East Swanson IMT, West Swanson IMT, Victoria Dock Terminal, South Dynon IMT, and Dynon IMT (see Table 16). The Altona Terminal, Altona North Terminal and Patrick IMT Laverton North operate in western Melbourne. The Somerton IMT, operated by POTA, is positioned in the north of Melbourne.

Possible IMT locations have been suggested in the north (Somerton), west (Altona) and the south-east (Dandenong South or Lyndhurst) of Melbourne. Among the three, only Somerton and Altona have existing IMT infrastructure and rail tracks. An early stage of IMT development could involve consideration of utilisation of the existing private terminals in the Altona and Somerton areas. The south-east is the only region without established public or private intermodal facilities. The development of an intermodal terminal there will require selection of a preferred terminal site and the initiation of road-road operations and then rail-road operation once rail infrastructure is established.

According to the VFLC, the best approach to MIS development in Melbourne metropolitan areas is directing containers to the IMT located near their origins or destinations. For example, an import container with a final destination in the northern region will be transported to Somerton IMT and from there will be picked up and delivered by truck to the importer's premises. In the case of an export container, it will be sent to the Somerton IMT by truck and then railed to the Port of Melbourne on a port shuttle. The concept is expected to reduce the truck movements around the port precinct and provide sufficient volume for the operation of the IMTs.

This concept is heavily dependent on the role of shipping lines in working with importers and exporters and the replication of all three IMT corridors: the west, the north and the south-east. Automatic underbond movements are desired to move the containers quickly between the port and the IMTs and the liability for land legs between the port and the IMT lies with the stevedore. The Victorian Government

Table 16: Melbourne existing intermodal terminals

Intermodal Terminal	Location	Operator
East Swanson (Appleton Park Rail Terminal)	West Melbourne	Patrick Port Logistics
West Swanson Intermodal Terminal	West Melbourne	DP World
Victoria Dock Terminal	West Melbourne	Westgate Port Services
Altona Terminal	Altona	SCT Group
Altona-North Terminal	Altona North	CRT Group
South Dynon Intermodal Terminal	Footscray	Pacific Nation
Dynon Intermodal Terminal	Footscray	P&O Trans Australia
North Dynon Intermodal Terminal	Footscray	Toll
Somerton Intermodal Terminal	Somerton	P&O Trans Australia
Patrick Intermodal Terminal Laverton North	Laverton North	McKenzie

Source: Port of Melbourne 2009 Container Logistics Chain Study

Image courtesy of Sydney Ports Corporation

can assist by helping the shipping lines zoning customers and supporting road-dependent forwarders and transport operators in transition because there will be a shift in profit once the IMTs commence increased operations.

It is generally acknowledged that the forthcoming presence of the IMTs will emphasise the importance of an efficient rail interface set-up and a good balance of import and export containers. The Department of Transport is undertaking a market sounding exercise to request interest from freight and logistics suppliers in potentially investing in and/or operating services associated with the MIS. The success of developing the MIS may be determined by the willingness of Government to provide subsidies to participating parties.

The Victorian Government plans to conduct a two-year small-scale trial running port rail shuttles and HPVs via the MIS in three main corridors (the west, north and south-east) as of July 2012. Due to the lack of standard and dual gauge, the west and north of Melbourne will conduct both rail and HPV trials, while the south-east is expected to run HPVs only. The objective of the trial is to provide inputs on matters including operational, infrastructure and business planning to form the development and design of the final MIS proposed to the State Government. A request for tender for the trial has been released highlighting certain requirements to be demonstrated by participants in terminal operations, road operations, rail operations, port interface, and the provision of common services.

As reported, at the moment rail transport is more expensive than road transport from between $60 and $150 per container depending on route and commodity. A large commitment from the Government would be required if subsidies were to be given to improve road-rail parity and the commercial sustainability of the MIS operation.

4.4 SYDNEY VERSUS MELBOURNE

Although there are differences in terms of trade and freight movements, the development of IMTs in Sydney and Melbourne is characterised by certain similarities. In general, there is sufficient container volume for the development of IMTs in both cities. Secondly, road transport has played a predominant role in transporting international containerised freight as compared to rail and will continue to prevail in the short, medium and probably long term. A good port-rail interface is required in both cities and especially in Melbourne, not only for the viable operation of the port shuttle but also to meet the target market share of rail mode. Last, but not least, annual benefits would not offset the costs to run the IMTs in the early years but would grow gradually as efficiency is achieved and critical mass is assembled.

Melbourne's MIS construction has a more systematic approach along the whole system. The MIS trial will be conducted to help inform the configurations of the development and design for the final proposed IMT network. The development of all three proposed IMTs has been developed, coordinated and facilitated by one single government body, the Victorian Department of Transport, which allows a more holistic evaluation over the whole MIS system. Although terminal operators are the responsible parties that will run the terminals, certain configurations are required from their performance to maintain consistency across the system. By conducting a trial in three different corridors, it also provides opportunities to compare between IMTs, and between the IMTs and other sections of the supply chain.

On the other hand, in Sydney, each IMT establishment is independently initiated. The land of the proposed terminals in Sydney is owned by the initiators whereas the right to operate the terminals will be contracted out. At the moment, no trial is planned to be conducted at these IMTs. It is apparent that the operation of each IMT may be determined by respective contracted operators. The operation of Enfield ILC in 2013 could provide valuable inputs for future IMT development such as Moorebank and Eastern Creek. It is not possible to conclude which managerial approach is better than the other because of regional differences. However, subject to landside capacity constraints each city is facing, room for mistakes in IMT development in Sydney is narrower than in Melbourne.

In addition, except for the terminal in the south-east region, the IMTs in the west and the north of Melbourne are planned to utilise existing intermodal facilities initially. The proposed IMTs at Somerton and Altona have established a good business profile in the local areas and have substantial experience and investment in essential infrastructure for IMT operation. In Sydney, the development of IMTs at Enfield and Moorebank will start from scratch, which requires significantly higher start-up investment and substantial time establishing sufficient business.

Although rail freight in both Melbourne and Sydney accounted for a small percentage of total transport, being 9 per cent for Melbourne and 14 per cent for Sydney, the importance of utilising trains for freight movements to remove pressure on roads is undeniable. Rail shuttle operation through Port Botany is considered more developed than that through the Port of Melbourne. The low contribution of rail share in Sydney is attributable to the existing mismatch between rail paths and stevedores' time windows and the limited rail capacity at the port terminal. The lack of sufficient rail sidings is expected to be solved once DP World extends its sidings and the third port operator commences operation. The stevedores' productivity has been improved since the launch of the new rail pricing regulation. In the future, the proposed rail strategy including the removal of time windows at the port terminals and the introduction of daily dynamic scheduling is predicted to assist in optimising current rail performance. Because Sydney's road system is at its critical level of constraint, it is important that trains be effectively utilised in transporting containers as soon as possible.

Unlike Sydney, Melbourne's rail performance is hindered by the complexity of its rail gauge system and the lack of infrastructure and operational support at the port. All freight trains travelling through the Port of Melbourne are loaded and unloaded outside the stevedores' terminals because a good rail interface to accommodate port shuttle trains does not exist at present. The handling capacity provided by the stevedores in Melbourne is less than half that in Sydney at just 15 containers per hour. Because of the lack of a reliable port rail system in Melbourne, it is reasonable to initiate both the rail-road and road-road IMTs while establishing a good rail interface and until volume is achievable. Although Melbourne's road network has additional capacity compared to Sydney and is conducive to the operation of high productivity vehicles, in the long term Melbourne's rail freight task must be developed to effectively relieve road pressure and extend the life of the port.

Image courtesy of Sydney Ports Corporation

5 CONCLUSIONS

This report has identified practical and commercial issues that need to be addressed if the development of IMT systems within Sydney and Melbourne metropolitan areas are to be successful. It has emphasised the need for a wider understanding of infrastructure needs and the constraints that need to be overcome to achieve viable IMTs. Conclusions have been made based upon those findings and in relation to the proposed metropolitan intermodal terminals in Sydney and Melbourne.

Image courtesy of Sydney Ports Corporation

5.1 SUMMARY OF FINDINGS

Although there are regional differences in terms of freight markets and infrastructure, similar findings have emerged as the study progressed in both Sydney and Melbourne:

- The need for the development of IMTs in Sydney and Melbourne to cope with the increase in future trade volume is undeniable. While road transport will continue to play a predominant role in transporting containers in the short, medium and long term, more containers should be transported by rail in order to significantly relieve road and port congestion.
- In both cities, regardless of being dominant in terms of trade volume, fewer import containers are moved by trains than export containers. It is suggested that more import containers should be carried by rail to maximise train utilisation.
- Comments have been made regarding the uncompetitive cost positioning of rail operation as compared to road transport for a comparable distance, including track access fee, higher stevedores' lifting charges and double handling costs at the IMTs.
- Inefficiency of rail service quality is characterised by
  - Misalignment between the rail paths and the stevedores' time windows that leads to service delays, operational stagnation and ineffective resource allocation at the terminals.
  - Unavoidable shunting before and after each service and inspection activities that consumes an inordinate amount of time at the terminals.
- Lack of dedicated freight lines and service priority being given to passenger trains during peak hour on the shared network. Rail transport is expected to be more competitive in the future if particular strategies to lift rail utilisation are put into place. In particular, while increased trade and urban freight congestion will make road transport more expensive, the rail price will fall as the rail network is improved and IMTs aggregate sufficient volumes.
- Benefits of IMTs include reducing road congestion and related environmental and social costs, providing staging locations at lower costs, and easing container density at port terminals.
- The co-location of empty container parks in the same vicinity as the IMT would reduce the de-hire costs of empty containers for importers. However, if the current imbalance between imports and exports continues to increase it is possible that shipping lines will request that empty containers surplus to export requirements be returned to the port precinct to minimise the cost of positioning. Shipping lines could consider drip-feeding empty containers to stevedores on a regular basis if stevedores adopt dedicated terminal empty areas.

To support the operation of port rail shuttles from the IMTs and to meet the target rail mode share, a good port rail interface is required in both cities. Distinguishing characteristics associated with the port's current rail interface have been highlighted for each city:

- In Sydney,
  - Rollout of new and upgraded IMTs over the next two to seven years.

- Freight trains are serviced directly at the stevedores' terminals.
- Trains travelling through Port Botany operate on a dedicated freight rail track.
- Handling productivity performed by the stevedores in Sydney has been increased from 30 lifts to 36 lifts per hour.
- Mismatch between the stevedores' time windows and RailCorp's rail path adds substantial inflexibility to train operation.
- The lack of standardisation of siding lengths at Port Botany causes a need for splitting to access different terminals for trains, lengths of which exceed the siding lengths.
- Shunting might also be required for some services that have loading for both stevedores regardless of the length of the train.
- A new rail strategy has been proposed to solve rail inefficiencies at Port Botany, including removal of existing windows and a dedicated optimising ports team that dynamically controls daily train movements.

In Melbourne,

- A rail yard outside the stevedores' terminals is used to service freight trains while movements between the yard and the stevedores' terminals are conducted by trucks.
- Stevedores' lifting productivity is significantly lower than in Sydney, being only 15 lifts per hour.
- Melbourne's rail gauge system is more complex because of a co-existence of broad gauge, standard and dual gauge.
- Previous attempts to run metropolitan rail shuttles have shown that passenger and regional trains get priority over the IMT train shuttles.
- Shunting and inspection activities have needlessly accounted for excessive amounts of time at the terminals.

5.2 ENFIELD INTERMODAL LOGISTICS CENTRE

Under the current operational environment, to meet the expected annual throughput of 300,000 TEUs, the proposed Enfield Intermodal Logistics Centre (ILC) must run at least seven 600-metre train shuttles through the port daily, providing that 60 per cent of the train is loaded to give 108 TEUs per trip. It has been estimated that a saving of 329 truck trips per day will be achieved each day on roads under this configuration. To achieve this, additional handling capacity will be required from the stevedores to service the shuttle trains, but is currently limited by lifting productivity and inefficient activities at the ports. Because of its close proximity to the port, the facility might not operate effectively when road service could be more competitive over such a short distance. In the short term government support may assist in obtaining sufficient volume for the terminal to operate in a commercially viable manner. Given the present rail performance at Port Botany, it is concluded that operation of a new IMT at Enfield may not be viable. However, once the identified rail deficiencies are eliminated and the new rail reforms initiated by SPC are effectively implemented, potentially not only Enfield ILC but also other IMTs could succeed.

Aerial view of Enfield IMT site. Image courtesy of Sydney Ports Corporation

5.3 MELBOURNE METROPOLITAN INTERMODAL SYSTEM

In Melbourne, the lack of an efficient port rail interface means it is reasonable to develop both rail-road and road-road IMTs until a critical mass is achievable. Although the road infrastructure in Melbourne is able to accommodate High Productivity Vehicles (HPV) movements from IMTs, in the long term Melbourne's rail freight task will have to be developed to significantly relieve road pressure and extend the life of the port.

5.4 AREAS FOR IMPROVING INTERMODAL TERMINALS' COMMERCIAL PRACTICALITY

- Increasing train on-time performance by better aligning rail paths and time windows. One single body controlling train movement between the IMT and the port is extremely important to facilitate the demand growth brought about by modal change. It will be easier for train operators to arrange train operation and sustain service certainty and reliability.
- Dedicated stevedore rail services to minimise shunting activities and guarantee seamless 24/7 rail movements at the port terminals. This initiative, however, relies on a critical level of volume being developed. Until then, shunting activities could be reduced by increasing the length of sidings at the ports.
- Constructing dedicated rail freight lines that link to the IMTs to improve the utilisation of the rail network for freight such that rail services from the IMTs will not be compromised by passenger trains. Port shuttle trains must also be treated equally with regional or interstate trains when it comes to rail paths.
- Streamlining inspection procedures to make the process more efficient and allow trains to depart the terminal in a timely fashion. In Melbourne, the

process takes a significant amount of time at the port and limits the number of trains being serviced daily. Streamlining the inspection process would considerably free up capacity at the port and provide better asset utilisation at the stevedores' terminals.

- Allowing automatic underbond movements to move containers quickly out of the port to the IMTs, allowing them to perform effectively as inland ports. This is the key desired function that must be provided at the terminal so that it could effectively replicate the sea port, i.e. the IMT would become the location of final delivery for imports and place of dispatch for exports and be shown on relevant trade documents.
- Solutions to overcome the inability to double-stack containers should be reconsidered/identified to increase train utilisation, especially for empty containers, such as the use of low-slung rail wagons. However, it is acknowledged this may not be feasible in all areas.
- Governments' support in promoting the benefits of using IMTs or through subsidies at least for initial years to create incentives for rail to compete with road until rail utilisation is built up.
- Stevedores to invest additional resources to improve the lift rate per hour and allow more trains to be serviced at the terminals. The improvement in lifting productivity will result in an increase in the total number of time windows that could be allocated daily at the port. The handling cost applied for trains should be minimised or at least be equivalent to trucks.
- Daily metropolitan train services from the IMTs should be guaranteed at the ports to sustain utilisation and service quality. It is especially critical in Melbourne since previous attempts at rail shuttle trains failed because regional and interstate trains got priority, which limited the ability of the metropolitan shuttle trains to operate.
- IT infrastructure and operational standards should be in place and regularly revisited to continuously increase the coordination and performance of stakeholders and to address incoming issues in a timely manner. However, the costs of investment in these initiatives should not further disadvantage the overall competitiveness of rail operation.

5.5 RECOMMENDATIONS

The commercial viability of the successful metropolitan IMT network in Sydney and Melbourne requires the acceptance and collaboration of all participants in the transport and logistics industry to work together toward effective solutions. It is important that these parties not see the development of new IMTs as threats to their businesses but instead as a source of cost savings and enhanced profitability by improving overall efficiency. Task forces representing major stakeholders, including rail operators, shipping lines, freight forwarders and brokers, stevedores, intermodal terminal operators, truck operators, customs and quarantine authorities and the State governments should be established in both Sydney and Melbourne to address these and other areas that will improve the commercial viability of IMTs. The possibility of initial government subsidies to assist with the establishment of the facilities and operating subsidies for a specific period should be part of those deliberations. SAL is not recommending subsidies, as such, but rather suggesting that all options should be "on the table".

Image courtesy of Sydney Ports Corporation

6 APPENDIX A

Train utilisation scenarios

(1) Payload	(2) TEUs per round trip	(3) Daily trips	(4) TEUs per year [(2) x (3) x 365]	(5) Difference to plan [(4) - 300,000]	(6) Equivalent daily truck trips [(4) / 2.3 / 365]
60%	108	4	157,680	-142,320 (-47%)	188
		5	197,100	-102,900 (-34%)	235
		6	236,520	-63,480 (-21%)	282
		7	275,940	-24,060 (-8%)	329
65%	117	4	170,820	-129,180 (-43%)	203
		5	213,525	-86,475 (-29%)	254
		6	256,230	-43,770 (-15%)	305
		7	298,935	-1,065 (-0.3%)	356
70%	126	4	183,960	-116,040 (-39%)	219
		5	229,950	-70,050 (-23%)	274
		6	275,940	-24,060 (-8%)	329
		7	321,930	21,930 (7%)	383
75%	135	4	197,100	-102,900 (-24%)	235
		5	246,375	-53,625 (-18%)	293
		6	295,650	-4,350 (-1%)	352
		7	344,925	44,925 (15%)	411

*Assumptions: a) Rail freight windows are unlimited. b) The number of railed containers serviced by the stevedores are equal. c) Shunting is excluded in daily operation. d) Trains operate on a 24/7 basis.

7 APPENDIX B

Stevedore handling capacity 2011–2020 (rail share 20%)

(1) Year	(2) Daily lifts (TEUs) [36 x 24 x 2]	(3) Trade growth rate	(4) Forecasted yearly port trade (million TEUs)	(5) Annual rail volume (million TEUs) [(4) x 20%]	(6) Daily rail (TEUs) [(5) / 365 x 1,000,000]	(7) Extra handling capacity (TEUs)[(2) - (6)]
2011	1,728	5%	2.03	0.406	1,112	616
2012			2.13	0.426	1,167	561
2013			2.23	0.446	1,222	506
2014			2.35	0.47	1,288	440
2015			2.46	0.492	1,348	380
2016			2.59	0.518	1,419	309
2017			2.72	0.544	1,490	238
2018			2.86	0.572	1,567	161
2019			3	0.6	1,644	84
2020			3.15	0.63	1,726	2
2011	1,728	6%	2.05	0.41	1,123	605
2012			2.17	0.434	1,189	539
2013			2.3	0.46	1,260	468
2014			2.44	0.488	1,337	391
2015			2.58	0.516	1,414	314
2016			2.74	0.548	1,501	227
2017			2.91	0.582	1,595	133
2018			3.08	0.616	1,688	40
2019			3.27	0.654	1,792	-64
2020			3.46	0.692	1,896	-168
2011	1,728	7%	2.07	0.414	1,134	594
2012			2.21	0.442	1,211	517
2013			2.36	0.472	1,293	435
2014			2.53	0.506	1,386	342
2015			2.71	0.542	1,485	243
2016			2.9	0.58	1,589	139
2017			3.11	0.622	1,704	24
2018			3.32	0.664	1,819	-91
2019			3.56	0.712	1,951	-223
2020			3.81	0.762	2,088	-360

Assumptions: a) Stevedores handling capacity 36 lifts per hour. b) The number of railed containers serviced is equal at both stevedores. c) Train operation on a 24/7 basis. d) Shunting times are excluded in daily operation. e) 1 container equals 1 TEU

8 APPENDIX C

Port of Melbourne freight catchment by suburbs – inner Melbourne

Region	Suburb	Postcode	Suburb	Postcode
Inner Melbourne	Melbourne	3000	Brunswick South	3055
	East Melbourne	3002	Brunswick	3056
	West Melbourne	3003	Brunswick East	3057
	Southbank	3006	Fitzroy	3065
	Docklands	3008	Collingwood	3066
	Footscray	3011	Clifton Hill	3068
	Yarraville	3013	Burnley	3121
	Newport	3015	South Yarra	3141
	Williamstown	3016	Prahran	3181
	Flemington	3031	St Kilda	3182
	North Melbourne	3051	South Melbourne	3205
	Melbourne University	3052	Albert Park	3206
	Carlton	3053	Port Melbourne	3207

Port of Melbourne freight catchment by suburbs – eastern region

Region	Suburb	Postcode	Suburb	Postcode
Eastern	Kew	3101	Ringwood	3134
	Kew East	3102	Heathmont	3135
	Balwyn	3103	Croydon	3135
	Balwyn North	3104	Kilsyth	3137
	Bulleen	3105	Mooroolbark	3138
	Templestowe	3106	Lilydale	3140
	Templestowe Lower	3107	Glen Iris	3146
	Doncaster	3108	Ashburton	3147
	Doncaster East	3109	Mount Waverley	3149
	Chirnside Park	3116	Glen Waverley	3150
	Hawthorn	3122	Burwood East	3151
	Auburn	3123	Know City Centre	3152
	Camberwell	3124	Bayswater	3153
	Burwood	3125	Boronia	3155
	Camberwell East	3126	Ferntree Gully	3156

Port of Melbourne freight catchment by suburbs – eastern region (continued)

Region	Suburb	Postcode	Suburb	Postcode
Eastern	Mont Albert	3127	Rowville	3178
	Box Hill	3128	Scoresby	3179
	Box Hill North	3129	Knoxfield	3180
	Blackburn	3130	Montrose	3765
	Nunawading	3131	Monbulk	3793
	Mitcham	3132	Silvan	3795
	Vermont	3133	Mount Evelyn	3796

Port of Melbourne freight catchment by suburbs – northern region

Region	Suburb	Postcode	Suburb	Postcode
Northern	Ascot vale	3032	Thornbury	3071
	Keilor East	3033	Preston	3072
	Avondale Heights	3034	Keon Park	3073
	Keilor	3036	Thomastown	3074
	Keilor Downs	3038	Lalor	3075
	Moonee Ponds	3039	Epping	3076
	Essendon	3040	Alphington	3078
	Essendon North	3041	Ivanhoe	3079
	Airport West	3042	Heidelberg West	3081
	Tullamarine	3043	Mill Park	3082
	Pascoe Vale	3044	Bundoora	3083
	Melbourne Airport	3045	Heidelberg	3084
	Glenroy	3046	Watsonia	3087
	Broadmeadows	3047	Greensborough	3088
	Coolaroo	3048	Montmorency	3094
	Attwood	3049	Eltham	3095
	Coburg	3058	Arthurs Creek	3099
	Fawkner	3060	Bulla	3428
	Campbellfield	3061	Morang South	3752
	Somerton	3062	Mernda	3754
	Craigieburn	3064	Whittlesea	3757
	Northcote	3070		

Port of Melbourne freight catchment by suburbs – south-east region

Region	Suburb	Postcode	Suburb	Postcode
South-east	Armadale North	3143	Moorabbin	3189
	Kooyong	3144	Highett	3190
	Caulfield East	3145	Sandringham	3191
	Caulfield North	3161	Cheltenham	3192
	Caulfield	3162	Beaumaris	3193
	Carnegie	3163	Mentone	3194
	Bentleigh East	3165	Aspendale	3195
	Hughesdale	3166	Bonbeach	3196
	Oakleigh South	3167	Seaford	3198
	Clayton	3168	Frankston	3199
	Clarinda	3169	Carrum Dowms	3201
	Mulgrave	3170	Heatherton	3202
	Springvale	3171	Bentleigh South	3204
	Dingley Village	3172	Hallam	3803
	Keysborough	3173	Narre Warren East	3804
	Noble Park	3174	Fountain Gate	3805
	Dandenong	3175	Berwick	3806
	Doveton	3177	Officer	3809
	Elsternwick	3185	Pakenham	3810
	Brighton	3186	Lynbrook	3975
	Brighton East	3187	Hampton Park	3976
	Hampton East	3188	Cranbourne	3977

Port of Melbourne freight catchment by suburbs – western region

Region	Suburb	Postcode	Suburb	Postcode
Western	West Footscray	3012	Laverton North	3026
	Altona	3018	Laverton North	3028
	Braybrook	3019	Hoppers Crossing	3029
	Sunshine	3020	Werribee	3030
	St Albans	3021	Delahey	3037
	Ardeer	3022	Plumpton	3335
	Deer Park	3023	Melton	3337
	Altona	3025	Brookfield	3338

9 APPENDIX D

Shunting operations at Botany Yard

1. Train arrives at Botany Yard.
2. Trains with loading for both Patrick and DP World will need to be split within the yard (referred to here as Portion A and Portion B).
Note: in practice the sequence of shunting of Portions A and B at steps 3-13 will vary, according to the respective window start and finish times at each of the stevedores.
3. Portion A for Patrick propelled from Botany Yard into the Patrick siding. Locomotive returns to Botany Yard.
4. Depending upon the length of the remainder, Portion B may need to be further split into two portions because of the siding length restriction in DP World.
5. Portion B for DP World propelled from Botany Yard into the DP World sidings. Locomotive returns to Botany Yard.
6. Potentially a second movement into DP World (repeat of step 5) if Portion B has had to be divided at step 4.
7. Upon completion of loading of Portion A, locomotive returns to Patrick to retrieve Portion A. Portion A hauled to Botany Yard.
8. Portion A may then need to be split and a sub-portion propelled into P&O Trans Australia to be loaded with empty containers.
9. Upon completion of empty container loading, Portion A hauled from P&O Trans Australia to Botany Yard.
10. Upon completion of loading of Portion B, locomotive returns to DP World to retrieve Portion B. Portion B hauled to Botany Yard.
11. If Portion B has been split at step 4; step 10 will need to be repeated for each sub-option.
12. Portion B (or parts thereof) may need to be propelled into P&O Trans Australia to collect empty containers.
13. Upon completion of empty container loading, Portion B hauled from P&O Trans Australia to Botany Yard.
14. Portions re-amalgamated in Botany Yard.
15. A full train examination must then take place to ensure that all brakes on the train are operational (45-90 minutes). Any defective brakes will need to be fixed.
16. Train departs Botany Yard.

Source: ARTC, 2007, Review of the Interface between the Land Transport Industries and the Stevedores at Port Botany, Submission to IPART, p11

10 GLOSSARY TERMS

ARTC	Australian Rail Track Corporation
ATA NSW	Australian Trucking Association NSW
Bulk runs	Transportation of predetermined minimum volumes of empty containers between empty container parks and stevedores by heavy road vehicles
Container movement	The movement of a container from one location to another
De-hire	The process of returning an empty container to an empty container park by an importer.
Empty container park	A handling and storage facility for empty containers, either within a port location or inland
HPV or HPFV	High Productivity Vehicles or High Productivity Freight Vehicles. Specialised road truck and trailer combination that provide the ability to shift more TEUs at a time
IMT	Intermodal terminal
Intermodal	Movement of containers interchangeably between transport modes (e.g. road and rail)
Landside movement	All the inland rail or road movements once a container is unloaded from a vessel (for import containers) or before a container is loaded onto a vessel (for export containers)
MIS	Metropolitan Intermodal System. The combined use of rail and road modes for the transport of containerised freight from the port to suburban areas, with rail generally carrying the higher volume, longer distance “line haul” leg of the journey and road undertaking the shorter “pick-up and delivery” leg at each end (Melbourne areas)
MIS Trial	Metropolitan Intermodal System trial. A pilot program that operationalizes (on a small scale) each of the individual components that will make up a fully developed MIS (Melbourne areas)
POTA	P&O Trans Australia
RailCorp	Rail Corporation New South Wales
SPC	Sydney Ports Corporation
Super B-double	A vehicle comprising two 40-foot skeleton trailers, capable of carrying four TEUs
PoMC	Port of Melbourne Corporation
TEU	Twenty Foot Equivalent Unit – a standard used as the basis for measuring and comparing container volumes.
Transport depot	A staged stop where containers are stored prior to delivery to importers or prior to delivery to stevedores.

11 BIBLIOGRAPHY

ARTC, 2007, *Review of the Interface between the Land Transport Industries and the Stevedores at Port Botany,* Submission to IPART, Australia.

ARUP and Meyrick and Associates, 2006, *National Intermodal Terminal Study: Final Report,* Prepared for the Department of Transport and Regional Services.

Australian Trucking Association NSW, 2007, *Review of the Interface between the Land Transport Industries and the Stevedores at Port Botany,* Submission to IPART.

Bureau of Transport and Regional Economics [BTRE], 2007, *Estimating urban traffic and congestion cost trends for Australian cities*, Working paper 71, BTRE, Canberra ACT.

Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2010, *Road freight estimates and forecasts in Australia: interstate, capital cities and rest of state*, Report 121, Canberra ACT.

Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2010, *Waterline 47*, Canberra ACT.

Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2010, *Waterline 48*, Canberra ACT.

Bureau of Infrastructure, Transport and Regional Economics (BITRE), 2011, *Waterline 49*, Canberra ACT.

Cleland, K (Deputy Chairperson Commissioners of Inquiry for Environment and Planning), 2005, *Proposed Port Botany Expansion*, Report to the Honorable Craig Knowles MP, Australia.

Colliers International, 2010, *The National Intermodal Terminal Challenge,* Available online www.newcastle.colliers.com.au, Accessed April 2011.

Container Logistics Action Group, 2007, *Review of the Interface between the Land Transport Industries and the Stevedores at Port Botany*, Submission to IPART.

Department of Infrastructure, 2007, National Transport Links: *Growing Victoria's Economy,* 2nd ed., Available online www.transport.vic.gov.au, Retrieved 19 April 2011.

Department of Transport, 2010, *Shaping Melbourne's Freight Future – Proposal for an intermodal solution to service Melbourne's growing containerized freight task,* 2010, Discussion Paper, Victoria, Australia.

Department of Transport and Regional Services, the Victorian Department of Infrastructure and VicRoads, 2007, *Melbourne Urban Corridor Strategy: at a glance*, Available online www.infrastructure.gov.au, Retrieved 19 April 2011.

Department of Transport and Regional Services, 2007, *Sydney Urban Corridor Strategy: Building our National Transport Future*. Available online www.infrastructure.gov.au, Accessed 20 February 2011.

DP World, Carrier Access Agreement July 2010 – June 2011: *DP World Sydney Port Botany Terminal,* Available online http://dpworld.1-stop.biz, Accessed 28 March 2011.

DP World, 2007, *Review of the Interface between the Land Transport Industries and the Stevedores at Port Botany*, Submission to IPART.

Enfield Intermodal – It Just Doesn't Make Sense, Available online www.strathfield.nsw.gov.au, Accessed 5 April 2011.

GHD Meyrick, 2009, *Review of the Port Botany Empty Container Task: Options for Action*, Prepared for NSW Maritime.

IPART, 2008, *Reforming Port Botany's links with inland transport; Review of the interface between the Land Transport Industries and the Stevedores at Port Botany,* Independent Pricing and Regulatory Tribunal, Australia.

Maunsell Australia, 2006, *AusLink Urban Arterial Road Network Congestion Review: Traffic Management Systems (Non-Freeways),* Prepared for Transport, Energy and Infrastructure, Available online www.btre.gov.au, Retrieved 19 April 2011.

Merchant, D, CEO, ARTC, 2009, *Sydney Commuter Should Support Dedicated Freight Rail Lines in Sydney,* Available online www.artc.com.au, Accessed 5 July 2011.

Port of Melbourne Corporation et al., 2010, *Port of Melbourne and Dynon Terminals: 2009 Container Logistics Chain Study,* Victoria, Australia.

Port of Melbourne Corporation, 2010, *Port of Melbourne trade figures declare an end to the GFC*, Media Release, Available online www.portofmelbourne.com, Accessed 1 June 2010.

QR National, *Review of the Interface between the Land Transport Industries and the Stevedores at Port Botany,* Submission to IPART.

Sea Freight Council, 2007, *Sydney's Intermodal System: Development of a business plan for an open access intermodal terminal in Sydney*, NSW, Australia.

Strategic Design + Development, 2004, *Regional Intermodal Terminals – Indicators for Sustainability*, prepared for Sea Freight Council of NSW Inc., Australia.

Strategic Design + Development, 2005, *NSW Landside Infrastructure Capability: International Containers,* Prepared for Sea Freight Council of NSW Inc., Australia.

Strategic Design + Development, 2008, *Melbourne Intermodal System Study Report*, Prepared for the Department of Transport, Victoria, Australia.

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Sydney Ports Corporation, 2008, *Port Freight Logistics Plan*, Available online www.sydneyports.com.au, Accessed 15 January 2011.

Sydney Ports Corporation, 2008, *ILC at Enfield: Project Overview,* Available online www.sydneyports.com.au, Accessed 20 Feb 2011.

Sydney Ports Corporation, 2010, *Logistics Review 2009/10*, Available online www.sydneyports.com.au, Accessed 1 Oct 2011.

Sydney Ports Corporation, 2010, *Port Botany Landside Improvement Strategy (PBLIS): Performance Standards & Industry Financial Penalties commence Monday 28 February 2011*, Available online www.sydneyports.com.au, Accessed 27 March 2011.

The Hon. Duncan Gay MLC (Minister for Roads and Ports), 2011, *Port Botany Project Handed over to Operation, Available online www.sydneyports.com.au, Accessed 1 August 2011.*

Transport Construction Authority, 2011, *Northern Sydney Freight Corridor Program: Project Profile*, Available online www.tca.nsw.gov.au, Accessed 4 July 2011.

Transport and Logistics News, *Sydney Port, Patrick at ten paces at Port Botany*, 2010, Available online www.tandlnews.com.au, Retrieved 29 March 2011.

Transport and Logistics News, *Animosity on waterfront continues,* Available online www.truckworld.com.au, Accessed 28 March 2011.

Transport and Logistics News, *The numbers behind the Moorebank Intermodal Terminal,* Available online www.tandlnews.com.au, Retrieved 15 March 2011.

VicRoads, 2009, *Guidelines for Next Generation High Productivity Freight Vehicle Trail in Victoria*, Victoria, Australia.

Victorian Freight and Logistics Council, *A toolkit for the development of intermodal hubs,* 2006, Consultation Paper, Victoria, Australia.

Victorian Trucking Association, 2007, *Review of the Interface between the Land Transport Industries and the Stevedores at Port Botany,* Submission to IPART.

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