PORT of NEWCASTLE

UNLOCKING REGIONAL PORTS TO DRIVE MARITIME LOGISTICS PRODUCTIVITY

A SUBMISSION TO THE PRODUCTIVITY COMMISSION ON AUSTRALIA'S MARITIME LOGISTICS SYSTEM

NEWCASTLE, 4 MARCH 2022

CONTENTS

OVERVIEW

The Productivity Commission's review into the maritime logistics system comes at a pivotal time for the industry. The reforms of the 1990's onwards to improve port and landside freight supply chain competitiveness have contributed significantly to Australia's competitiveness and lowered costs within global supply chains.

However, the benefits of these reforms have been diminishing, principally because of bottlenecks stemming from having only one entry point for containers to each major urban centre, particularly in Sydney and Melbourne. Port Botany and the Port of Melbourne are both located within a highly urbanised environment, and with rising road congestion costs, increasing land costs resulting in warehousing being pushed further from the port, and industrial action, maritime logistics system productivity is likely declining.

In addition to rising costs and worsening productivity, our maritime logistics system lacks resilience. For example, major industrial action at a port can result in significant delays and costs, affecting everyone across the maritime logistics system.

The Port of Newcastle believes that there are several actions that should be taken to address declining productivity and worsening resilience, namely:

- accelerating the development of a network of ports across the east coast of Australia that can accommodate larger container ships, to obtain the productivity benefits these ships will provide;
- diversifying the points of entry for containers in Australia, particularly in NSW and Victoria to improve maritime logistics system resilience;
- explicitly considering the value that diversifying the point of entry for containers on improving utilisation of landside infrastructure (ie, roads and rail) to improve end-to-end maritime logistics system productivity;
- factoring in resilience value into investment decision making to address low-probability high-impact events;
- recognising and facilitating port competition to drive productivity improvements through automation and other technological innovations;
- encouraging governments to remove un-economic impediments to new container terminal developments, particularly those impeding the proposed multi-use deepwater terminal in Newcastle; and
- improving maritime logistics system infrastructure planning and investment decision making to place stakeholders at the centre of decision making on priorities and actions.

The Port of Newcastle is proposing to invest in a modern multi-use deepwater terminal in Newcastle, which will have a significant impact on maritime supply chain productivity and resilience. By accommodating larger ships and utilising spare capacity on existing road and rail infrastructure, we estimate that the net benefits of the terminal will be almost $1 billion over 30 years.

Addressing the impediments to this investment will deliver significant improvements to Australia's maritime logistics system.

Finally, as Australia heads towards net zero emissions by 2050 there will be a need to move towards more renewable fuel sources to support the maritime logistics system. There is an opportunity with the Greenfields Newcastle container terminal to design a maritime supply chain that proactively incorporates design features that support hydrogen and electric vehicles, to facilitate transition of the transport sector to no emission fuels.

SUPPLY CHAIN CHALLENGES FOR THE MARITIME LOGISTICS SYSTEM

Container freight is an important and ever-expanding part of Australia's import and export trade. However, inadequate infrastructure, metropolitan growth and increasing container freight demand are exposing weaknesses in Australia's and NSW's maritime supply chains.

In this section, we explain the current and future container freight task for Australia and NSW, and the constraints which Australia and NSW need to overcome to achieve an efficient and resilient supply chain.

KEY POINTS

- Australia's container freight task continues to grow placing pressure on existing logistics infrastructure.
- Land and zoning constraints in metropolitan areas are driving up costs.
- Increased containerised freight demand will contribute to infrastructure congestion problems in metropolitan areas.
- Diversifying points of entry for container imports and exports to and from Australia by investing in regional container ports can help to lower these increasing maritime logistics system costs into the future.
- Investing in infrastructure to accommodate larger container ships will unlock maritime productivity.
- Significant maritime logistics investment is required to cope with increasing containerised freight trade.
- Maritime supply chains can make an important contribution to Australia's transition to net zero emissions.

Australia's container freight task continues to grow placing pressure on existing logistics infrastructure

Australia has historically relied on global trade as a critical element of its economy. As a geographically isolated and sea-locked country, the maritime logistics system is an essential part of Australia's global trade network.

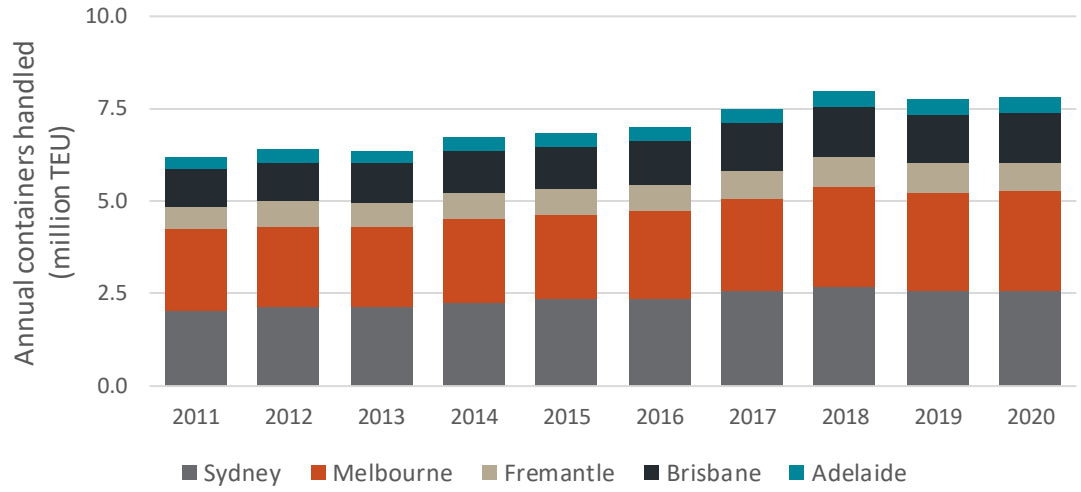
However, Australia's supply chains are under pressure from steadily increasing containerised freight demand. This demand is projected to continue increasing into the future.

AUSTRALIAN AND NSW TRENDS IN CONTAINERISED FREIGHT SHOW STEADY INCREASES IN CONTAINERISED FREIGHT DEMAND

Figure 1 overleaf shows that in the eight years to 2018, containerised trade through Australia's five main container terminals grew by 3.2 per cent per year. Containerised freight saw a slight drop in the second half of 2019, reflecting economic contraction and major bushfire problems from October 2019. Despite a drop in containerised freight associated with the COVID-19 pandemic in 2020 and 2021, Australia's five major ports still processed over 7.8 million TEU in 2020, which was over 200 thousand more TEU in July-December 2020 compared to the same period in 2019.[1] Port Botany accounted for almost one third of national container throughput, handling approximately 2.56 million TEU in 2020.

[1] BITRE, *Waterline 67*, Statistical Report, December 2021, available at https://www.bitre.gov.au/publications/2021/waterline-67, accessed 16 February 2022.

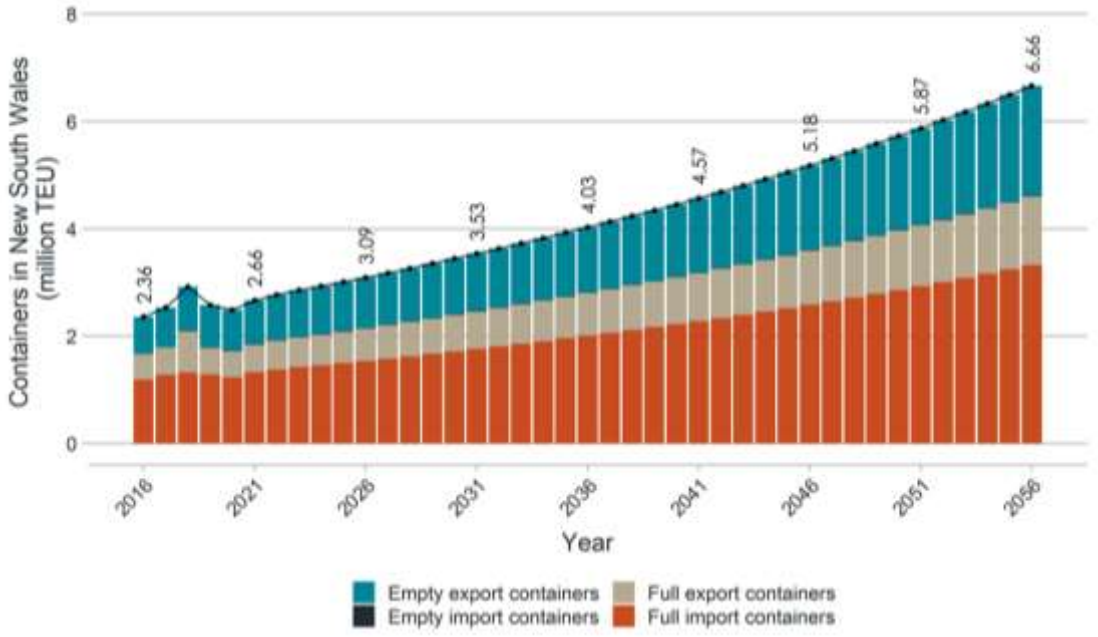
FIGURE 1: ANNUAL CONTAINERISED TRADE AT AUSTRALIA'S FIVE MAJOR PORTS



Source: HoustonKemp analysis of Bureau of Infrastructure, Transport and Regional Economics, Waterline 67, Statistical Report, December 2021, available at https://www.bitre.gov.au/publications/2021/waterline-67, accessed 16 February 2022.

Australia's maritime trade is expected to continue growing into the future, despite the near-term impact of COVID-19. For example, Figure 2 below shows actual volumes of containerised freight between 2016 and 2018 in NSW, with forecasts to 2056 taking a conservative account of the impact of COVID-19.[2]

FIGURE 2: PROJECTED NEW SOUTH WALES IMPORT AND EXPORT CONTAINER VOLUMES – 2016 TO 2056



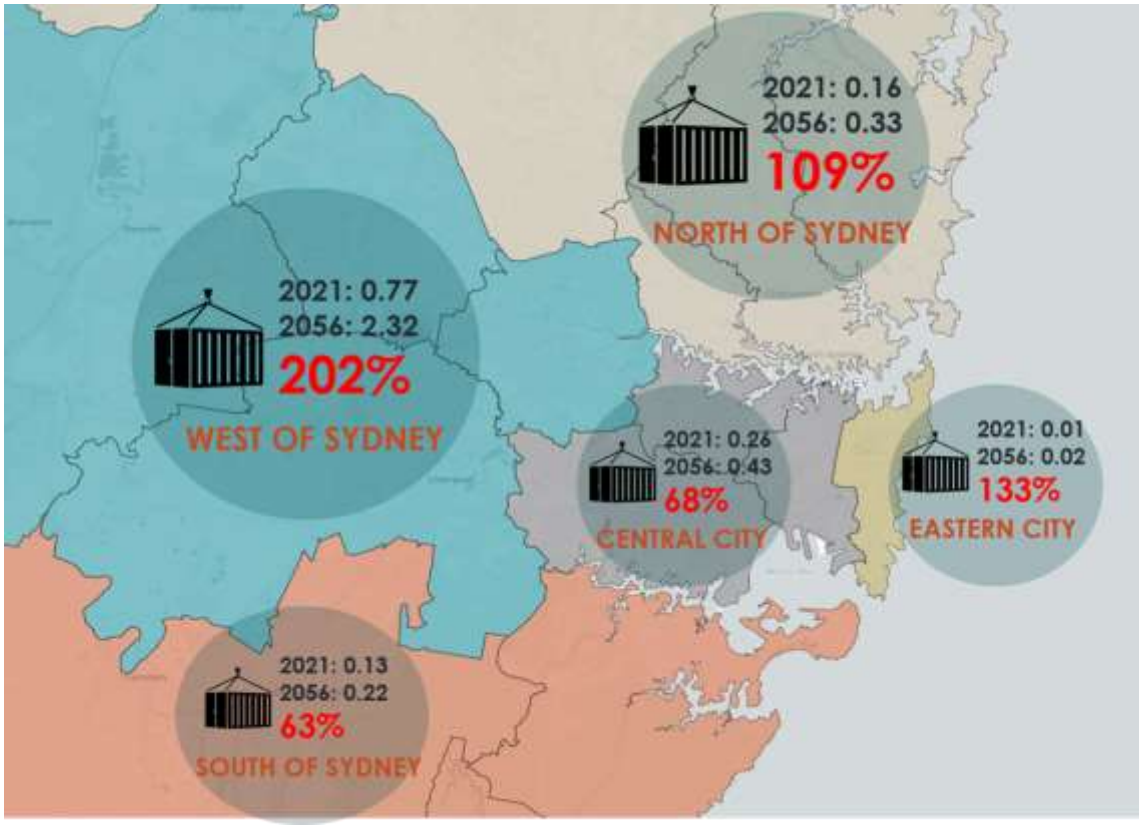
Source: HoustonKemp analysis of Bureau of Infrastructure, Transport and Regional Economics, Waterline 65, Time series tables, December 2019; and McKinsey, Global freight flows after COVID-19: What's next?, July 2020.
Note: Figures from 2019 onwards are forecasts as actual data were only available up to the second quarter of 2019 at the time of accessing in September 2020. The forecasts have accounted for the impact caused by the COVID-19 pandemic on trade.

[2] For a detailed explanation of the total containerised freight forecast in NSW, see HoustonKemp, *Economic benefits of a Multi-Purpose Deepwater Terminal in Newcastle*, June 2021, pp 3-8 and 61-62.

Port Botany, located 12 kilometres from Sydney's CBD, currently provides 99 per cent of container terminal services for imports and exports in NSW. Containerised freight into and out of NSW is expected to increase from around 2.7 million TEU in 2021 to almost 5.2 million TEU in 2045, and to nearly 6.7 million TEU by 2056. This growth trend is reflective of anticipated growth across Australia – for example, containerised freight at the Port of Melbourne is predicted to grow from 3 million TEU in 2019 to approximately 8.9 million TEU by 2050.[3]

Our forecast of strong long-term growth in NSW's total container volumes over the next 35 years is primarily driven by rising domestic demand of import goods in the population-growing areas to the west and north of Sydney. The growth in demand for imported containerised freight by area in Sydney is shown in Figure 3 below.

FIGURE 3: GROWTH IN DEMAND OF CONTAINERISED IMPORT GOODS BY REGIONS IN NEW SOUTH WALES – 2021 TO 2056



Source: HoustonKemp analysis of Bureau of Infrastructure, Transport and Regional Economics, Waterline 65, Time series tables, December 2019; and TfNSW, SFM model freight flows data; and McKinsey, Global freight flows after COVID-19: What's next?, July 2020.
Note: The diagram shows the volume of containerised import in million TEU (rounded to two decimal places), and the percentage growth over the period between 2021 and 2056.

Two key factors are driving this growth in import demand in Western Sydney, namely:

- high population growth, particularly in the south west area; and
- the availability of larger areas of land for warehouse facilities promoting logistics and freight precinct growth.

[3] Note that Port of Melbourne did not amend their forecasts to adjust for the impacts of the COVID-19 pandemic, as they explained short-term fluctuations in throughput were accounted for in their models; Port of Melbourne, *2050 Port Development Strategy*, 2020 Edition, October 2020, p 23.

We understand that growing import container volumes means that Port Botany is planning to expand its throughput capacity. While this might address port congestion in the short term, land constraints at Port Botany mean that alternative container port capacity is expected to be needed in NSW in the not-too-distant future.

CONTAINERISED FREIGHT IS EXPECTED TO REBOUND STRONGLY FOLLOWING THE COVID-19 PANDEMIC

The COVID-19 pandemic caused a disruption to the global economy, resulting in a sharp decrease in forecast container imports and exports in 2020 and 2021 - Figure 2. However, recent statistics show that despite a sharp drop in container freight in the first half of 2020, container volumes in NSW recovered well in the second half of 2020 to approximately equal pre-pandemic levels, and remained relatively stable throughout 2021 despite further lockdowns and increased industrial action. This is consistent with freight trends at all five of Australia's major ports.

Following the projected short-term impacts of COVID-19, we forecast a reduced throughput growth rate up to 2041 compared to pre-pandemic forecasts.[4] From 2041, containerised throughput returns to long-term growth trends as economic activity returns to pre-pandemic levels. Based on initial data on trade volumes throughout late 2020 and 2021, this estimate reflects a fairly conservative approach to throughput, and so there may be significant volume upside in the outturn container volumes in the future.

Land and zoning constraints in metropolitan areas are driving up costs

Australia's population is forecast to increase from approximately 25 million in 2022 to between 32 and 36 million by 2041, and between 35 and 44 million by 2056.[5] The urban population is expected to comprise a large proportion of this increase. As the urban population in Australia continues to grow, there will be a decreasing availability of land in metropolitan areas which can be used for freight and logistics purposes as:

- this land is increasingly zoned for residential and mixed-use purposes;
- the price of remaining land will see higher prices reflecting non-freight uses; and
- the increased population will create greater road congestion in these areas.

We are already seeing government initiatives that support these observations in NSW. The NSW government has undertaken initiatives to identify and protect land that can be used for freight and logistics purposes to support the economic and population growth of NSW. In particular, NSW has rezoned and reserved large areas in Western Sydney for freight and logistics purposes, known as the Western Sydney Employment Area.[6]

As a result of increasing land costs, congestion and government policy settings, it is becoming more commercially viable for warehouse facilities to relocate further from our inner cities, which increases transport costs from our existing ports. This is already apparent in NSW, with warehouses increasingly relocating to Western Sydney. We anticipate this trend continuing and even accelerating over the next 20 years, particularly in Sydney and Melbourne which are forecast to see consistently high levels of urban growth.

[4] HoustonKemp analysis of TfNSW, *Strategic Freight Forecasts – Freight data*, August 2018; and McKinsey, *Global freight flows after COVID-19: What's next?*, July 2020.

[5] ABS, *3222.0 Population Projections, Australia, 2017 (base) – 2066: Table 1*, 22 November 2018.

[6] NSW government, *NSW freight and ports plan 2018-2023*, September 2018, p 67; and NSW Government, *Overview of the Western Sydney Employment Area*, https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Western-Sydney-Employment-Area/Overview-of-the-Western-Sydney-Employment-Area, accessed 25 February 2022.

Having all containerised freight transit through one metropolitan port is problematic for several reasons, including:

- the travel from the port to warehousing facilities adds congestion to already strained urban infrastructure;
- a concentration of freight processing facilities in one area reduces supply chain resilience in the event of a low probability high impact event, such as a motorway accident or a natural disaster; and
- freight may be travelling a significant distance in the opposite direction to its final destination.

One resolution to this problem is to promote multiple ports to diversify our maritime logistics supply chain, particularly using regional ports that do not face the same land and zoning constraints as in urban areas. Making use of abundant, cheap land which would not otherwise be employed makes sense from a planning perspective. Regional ports also naturally promote a diversification of warehousing and other supply chain facilities towards regional areas, where there are less land and zoning constraints, freeing up urban land for other purposes.

Increased containerised freight demand will contribute to congestion problems in metropolitan areas

Independent of projected increases in freight volumes, many Australian ports are constrained by the limitations of their surrounding infrastructure. Aside from port infrastructure limitations such as berth length and quay depth which prevent ports from accommodating larger and/or more ships, road and rail constraints pose significant barriers to increasing containerised throughput.

Both road and rail freight share the use of infrastructure with the general population. Freight is impacted by the growth in urban population causing higher non-freight demand along existing infrastructure, contributing to greater difficulties and delays in freight being transported to its final destination. This issue is particularly prevalent in space-constrained cities such as Sydney and Melbourne, which have limited room to accommodate road and rail expansions in their inner cities.

ROADS NEAR PORT BOTANY ARE SOME OF THE MOST CONGESTED IN SYDNEY

All of Australia's five major ports are located in key urban areas. This results in freight trucks competing with non-freight traffic along our cities' centre-city roads, many of which are highly congested. By way of example, Sydney's road network is already under significant strain absent further population growth and increased freight demand. This is likely also the case in other Australian cities, particularly Melbourne which makes limited use of rail infrastructure to transport containerised freight. In addition, the key freight corridors surrounding Port Botany are some of the most congested roads in Greater Sydney.

Figure 4 below provides an overview in respect of the congestion level by Statistical Area 2 (SA2), as well as on the key road freight corridors, in Greater Sydney in 2019. The level of congestion indicates the proportion of travelling distance over which the average speed of passing vehicles is less than 60 per cent of the speed limit, weighted by the lengths of links that make up a given road or SA2 area.

Specifically, our analysis finds that:

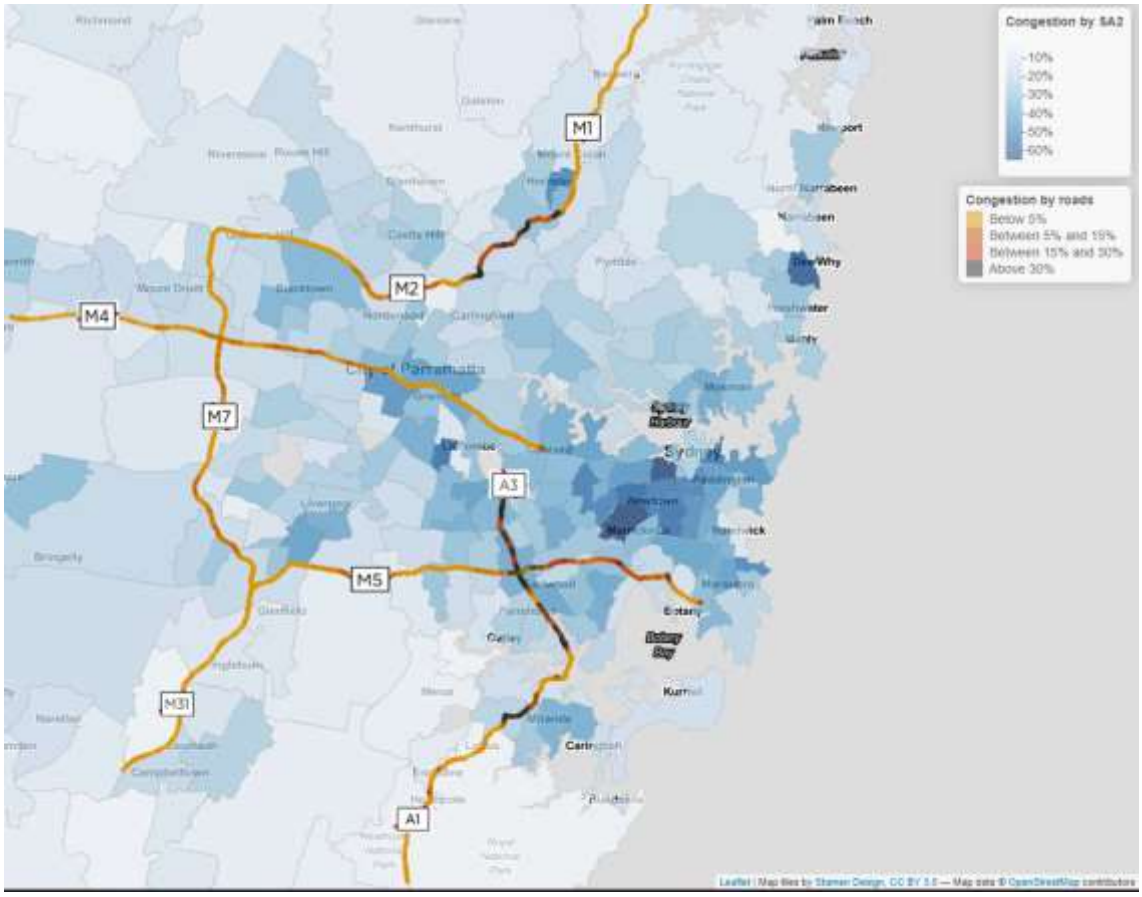
- suburbs in the Port Botany precinct, such as Mascot, Banksmeadow, and Rockdale, are among those in Sydney's inner south and inner west regions with high levels of congestion in 2019;[7] and
- the A3 between the A22 and A1, Pennant Hills Road between the M2 and Wahroonga,[8] and General Holmes Drive are the most congested road freight corridors with level of congestion –

[7] This is consistent with the findings in Infrastructure Australia, *An assessment of Australia's future infrastructure needs – The Australia infrastructure audit 2019*, June 2019, p 340. We note that there is a difference in the congestion metrics being adopted in the Infrastructure Australia study and our analysis.

[8] The opening of NorthConnex in October 2020 is expected to reduce congestion along Pennant Hills Road.

measured as the proportion of the total road length where the observed average speed is less than 60 per cent of the speed limit – greater than 20 per cent in 2019.

FIGURE 4: CONGESTION IN THE GREATER SYDNEY AREA AND KEY ROAD FREIGHT CORRIDORS IN 2019



Source: HoustonKemp analysis of HERE data.
Note: The level of congestion for an individual link is measured as the proportion of travelling distance over which the observed average speed is less than 60 per cent of the posted speed limit. The level of congestion for a SA2 (or a freight corridor) is calculated from the level of congestion for all the links in the SA2 (or the freight corridor), weighted by the length of links. The underlying average speed data were provided by HERE Technologies – See www.here.com.

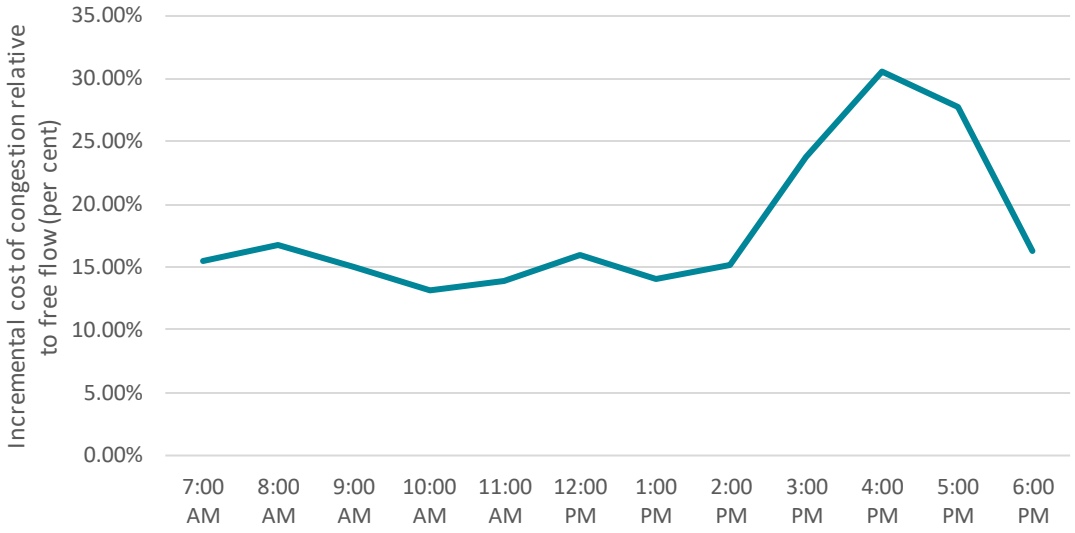
These corridors will become more congested as freight demand in Western Sydney grows rapidly in the coming years, and generally with the projected increases in Sydney's population. Of particular concern is the risk that areas in the south west growth area, located around the intersections of the M7, M5 and M31, is more prone to higher congestion than other parts of Sydney, ie, on the eastern side of the M5 or further north towards the M4. This area of Sydney is expected to experience large population and employment growth in the near future, which could lead to a significant increase in congestion in these regions.[9]

Road congestion leading to time delays, extra fuel and labour costs poses substantial costs for both freight and non-freight traffic, and contributes to a reduction in maritime logistics productivity. Figure 5 below demonstrates that the incremental costs of congestion for containerised freight on the route between Port Botany and Western Sydney are significant throughout the day, increasing the incremental

[9] The NSW Government's infrastructure plan for the high growth south west region is detailed at https://caportal.com.au/rms/greater-sydney, accessed 25 February 2022.

cost of freight transit by approximately 15 per cent. Further, there is a significant increase in the incremental cost between 3pm and 6pm, reflecting PM peak traffic flows around metropolitan Sydney.

FIGURE 5: COST OF CONGESTION RELATIVE TO FREE-FLOWING TRAFFIC FROM PORT BOTANY TO WESTERN SYDNEY



Source: HoustonKemp analysis using data from HERE Technologies.
Note: Analysis occurs on the route between Port Botany and the Western Sydney Employment Area.

Overall, the incremental cost of congestion adds approximately $5 per TEU outside of the afternoon peak hour, and over $10 per TEU at the height of the afternoon peak. This represents substantial avoidable costs from transferring congestion away from metropolitan roads.

This analysis focuses on how congestion is affecting road freight costs in Sydney, and does not include the additional cost of congestion for non-freight vehicles. Further, as traffic around metropolitan Sydney worsens in the coming years, incremental costs of congestion will continue to increase, which further increases the value of diverting containerised freight away from the roads around Port Botany.

INCREASING RAIL MODAL SHARE WILL ALLEVIATE ROAD CONGESTION AND IMPROVE INFRASTRUCTURE PRODUCTIVITY

With sufficient infrastructure, rail has the ability to reduce road congestion and transport a large number of containers to industrial/warehouse areas. Historically, rail has achieved a low modal share of freight across Australia, particularly in Melbourne and Sydney, as it does not have the flexibility of road transport in urban areas.

However, recognising the need to address metropolitan congestion, planners have begun targeting increased rail usage from our major ports. For example, the NSW government has set a target of increasing rail's share of throughput at Port Botany to 28 per cent by 2021,[10] and in the long term NSW ports has identified a target of 40 per cent of total container volumes transported on rail by 2045.[11]

These higher rail shares are essential to support the forecast increase in total freight throughput, although the targets place additional pressure on existing rail infrastructure connecting Port Botany to areas in Western Sydney.

[10] NSW Government, *NSW freight and ports plan 2018-2023*, September 2018, p 4

[11] NSW Ports, *Navigating the Future: NSW Ports' 30 Year Master Plan*, October 2015, p 27. See also: *NSW Ports, Port Development Plan 2019-2023*, July 2020, p 40.

In particular, IA has expressed concern that:[12]

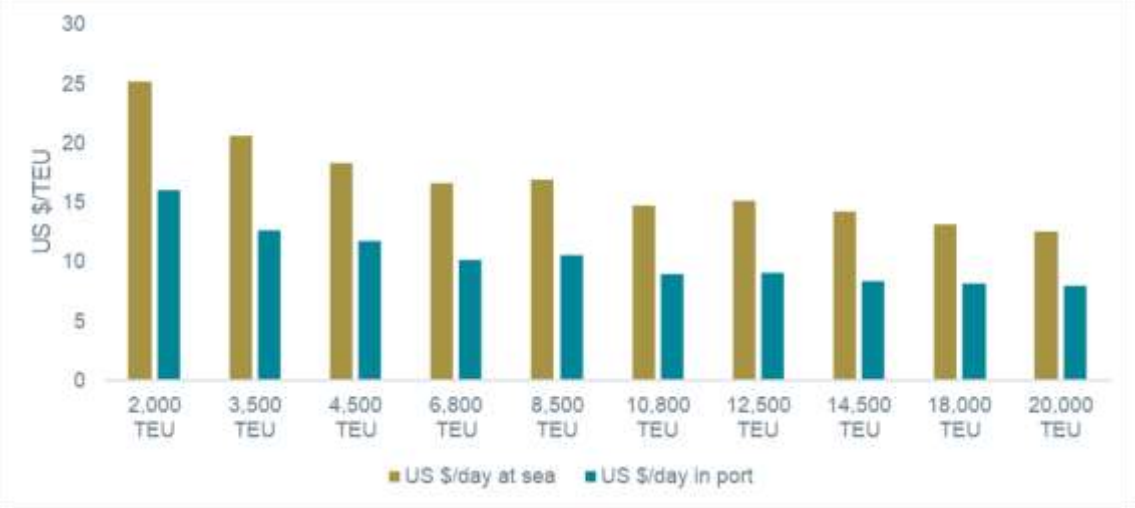
> *…demand is expected to exceed capacity on the Southern Sydney Freight Line (SSFL) and Port Botany Rail Line (PBRL) from 2026.*

Infrastructure Australia has also identified that rail is essential for moving freight from Webb Dock at the Port of Melbourne,[13] and that rail's modal share at Melbourne and Brisbane is also low.[14]

Investing in infrastructure to accommodate larger container ships will unlock maritime productivity

Going forward, shipping companies are increasingly investing in larger ships which are more efficient to operate. Figure 6 below shows that the cost savings from the scale of 10,800-12,500 TEU ships are approximately 11 per cent at sea and 13 per cent in port compared to the smaller 6,800-8,500 TEU ships.[15]

FIGURE 6: PER DAY COST OF CONTAINER SHIPS



Source: https://www.wsp.com/en-AU/insights/the-ceiling-on-economies-of-scale-in-container-vessels, accessed 16 February 2022.

Australia is currently capable of accommodating container ships up to a maximum of 8,000 to 10,000 TEU at the Port of Melbourne, Port Botany and the Port of Brisbane.[16] To accommodate more efficient ships between 10,000 and 24,000 TEU, Australian container ports would need to resolve physical capacity constraints including investing in deeper shipping channels and berths, lengthening berths and acquiring new cranes which can span beams (ie width) of between 50 and 60 metres. Further, additional constraints such as bridges and air draft restrictions prevent some ports from accommodating and managing the loading and offloading of larger ships without significant additional landside expenditure and/or policy interventions.

[12] Infrastructure Australia, *Project business case evaluation summary – Port Botany rail line duplication and Cabramatta passing loop*, 20 February 2020, p 1.

[13] https://www.infrastructureaustralia.gov.au/map/rail-access-webb-dock. accessed 25 February 2022.

[14] Infrastructure Australia, *An assessment of Australia's future infrastructure needs – The Australia infrastructure audit 2019*, June 2019, pp 339-340.

[15] Calculated as the average cost of using a 10,800 or 12,500 TEU ship as compared to the average cost of using a 6,800 or 8,500 TEU ship.

[16] Approximately figures have been sourced from Port of Melbourne, *2050 Port Development Strategy Discussion Paper*, p 16; Infrastructure Victoria, *Advice on securing Victoria's ports capacity*, May 2017, p 59.

Some ports in Australia have plans to expand to accommodate larger ships, but major costs particularly associated with channel dredging make this an expensive investment. Making use of these larger ships will improve efficiency and productivity, which in turn will bring down the cost of importing goods and reduce the cost of goods for Australian consumers. Further, it will reduce the costs for Australian exports, improving their competitiveness with overseas goods.

Significant investment is required to cope with increasing containerised freight demand

Demand for containerised freight has rebounded strongly since the start of the pandemic and is projected to increase significantly over the next 30 years. Associated with this increase in demand is a need to increase investment into port, road and rail infrastructure to cope with additional throughput. However, additional investment such as freight storage investment is also required.

By way of example, following expansions at Port Botany, its effective operational capacity is expected to be 4.4 million TEU in total throughput per annum. However, this capacity is constrained by the capacity of associated road and rail infrastructure for freight transport, which are an area of concern around Port Botany.

Assuming that all containerised freight in NSW must pass through Port Botany, our analysis finds that Port Botany will reach its effective operational capacity of 4.4 million TEU by 2040 following planned expansion investment, and design capacity of 5.5 million TEU by 2048.[17] Further, our analysis indicates that the volumes above the effective operational capacity from 2040 to 2054 are attributed to empty export containers, while all volume in excess of the design capacity is attributed to empty export containers.

The empty export container management problem, which is driven by the inherent gap between import and export flows into and out of Greater Sydney, is a major factor in the need for increased port capacity. It follows that the necessary infrastructure investment is not limited to increasing terminal, road and rail capacity, but also in infrastructure to support increased levels of empty containers, ie, storage facilities.

Supply chains must facilitate the transition to lower emissions

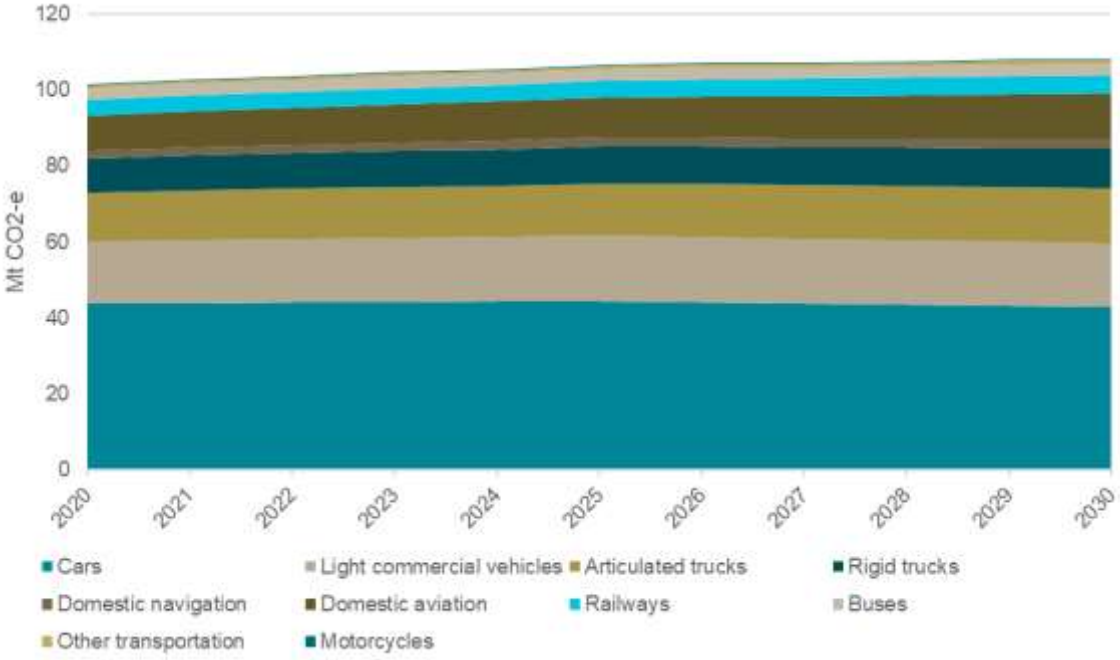
As Australia transitions to net-zero, supply chains need to be mindful of their contribution to emissions. This is particularly relevant for the transport sector, which contributes 17 per cent of Australia's emissions per annum. How supply chain investments are designed in the short-term can contribute to the lowering of emissions in the long-term.

Currently, transport emissions are projected to continue to rise until around the mid-2020s and then plateau, reaching 108 million tonnes CO_2-e in 2030 – Figure 7.[18] This represents an increase of around 7 million tonnes CO_2-e or 7 per cent above 2020 levels.

[17] HoustonKemp analysis in a submission to Infrastructure Australia.

[18] Australian Government, Department of the Environment and Energy, *Australia's emissions projections 2019*, December 2019, p 20.

FIGURE 7: PROJECTED TRANSPORT EMISSIONS BY SOURCE, 2020 TO 2030



Source: HoustonKemp analysis of Australian Government, Department of Industry, Science Energy and Resources, Australia's emissions projections - chart data, 19 December 2019.

Looking forward, road transport will continue to contribute the majority of emissions from the transport sector. Although emissions from passenger vehicles (cars) will still make up highest proportion of road transport emissions, they are projected to decrease overall from 2020 to 2030.[19]

Unlike emissions from other sectors, emissions from heavy vehicle transport are expected to continue to grow into the future. Emissions from rigid and articulated trucks are expected to grow by approximately 14 per cent between 2020 and 2030.[20] In 2017 climate analytics noted that according in projections to 2030, emissions from heavy trucks had the largest growth rate of all transport forms, at 31 per cent.[21]

The increase in heavy vehicle emissions is driven by expectations of an increasing freight load leading to an overall increase in fuel consumption.[22] This growth is projected to slow despite ongoing freight growth from 2025 due to anticipated improvements in fuel efficiency of heavy vehicles and expectations of fuel switching to lower emitting alterantives, including electric and potentially hydrogen vehicles.

Minimising the length of land side supply chains would also make an important contribution to lowering transport emissions in the near term.

[19] Australian Government, Department, of the Environment and Energy, *Australia's emissions projections 2019*, December 2019, p 21.

[20] Australian Government, Department, of the Environment and Energy, *Australia's emissions projections 2019*, December 2019, p 21.

[21] Climate analytics, M, Beer et al, *Australia's vehicle fleet - dirty and falling further behind*, 2019, p 2.

[22] Australian Government, Department, of the Environment and Energy, *Australia's emissions projections 2019*, December 2019, p 21.

In considering logistic supply chain productivity, consideration needs to be given to how Australia will support the transition to lower emission heavy vehicles over the longer term, through supporting targeted freight supply chain infrastructure investments. This will likely include:

- designing freight supply chain facilities to support the fitting of electric fast charging technologies, and if relevant, hydrogen storage and refuelling infrastructure;
- considering the design and operation of depots, warehousing and port facilities to support fast charging of heavy vehicles during the loading and unloading of those vehicles;
- identifying opportunities for targeted pilots of battery electric and/or hydrogen fuel cell heavy vehicle haulage for specific haulage tasks; and
- proactively reducing the length of supply chains so as to lower transport costs and emissions.

The use of pilots for specific freight haulage tasks will allow for the charging/refuelling infrastructure to be tested, which will facilitate future lowering of costs and improvements in design for the future.

IMPROVING AUSTRALIA'S SUPPLY CHAIN RESILIENCE

The maritime freight supply chain is crucial for Australia's economy, particularly for importing essential goods and distributing Australia's exports across the world. Over 99 per cent of Australia's international trade travels by ships. Consequently, the reliability of maritime supply chains is crucial for Australia's economy.

Resilience is the ability for supply chains to continue operating with minimal delays when faced with disruptions, such as unforeseen increases in throughput, or a situation which reduces or removes the ability for one link in the chain to process freight. In this section, we explain that it is essential for Australia to improve its maritime logistics supply chain resilience, to secure maritime freight movement in the face of low probability but high impact events.

KEY POINTS

- There is a need to think strategically about building resilience in Australia's supply chains.
- Low probability high impact events have caused significant maritime supply chain problems since the onset of the COVID-19 pandemic.
- Diversifying the points of entry for containers, particularly in NSW and Victoria, will contribute significantly to building maritime supply chain resilience.
- Shipping delays cost thousands and increase the cost of goods for Australian consumers.
- A lack of supply chain resilience may lead to shipping companies reallocating ships to more reliable and profitable routes.

There is a need to think strategically about building further resilience in Australia's supply chains

One of the key factors in supply chain investment planning is to determine the peak volume each element of the supply chain is expected to face in the future as part of cost benefit analysis. This is typically done using weighted profiles of forecast increases in supply and/or demand, plus some risk profile to allow for events which place additional strain on the network, such as using a probability of exceedance method.

However, this method of risk profiling does not account for low probability high impact events which can have significant short-term impacts on one or more elements of the supply chain, because they are low probability events. This problem has been addressed in other major infrastructure industries such as electricity networks but has not yet been a key consideration for maritime freight supply chain investment.

One recent example which showcases the problems with Australia's supply chain resilience is the floods in South Australia which severed road and rail infrastructure to WA. This highlighted the problem of only one major highway and railway to WA, completely preventing rail freight transport and forcing trucks to undertake detours of over 1,200km to travel between Adelaide and Perth.

It is essential for the maritime supply chain to continue operating under all circumstances as all types of goods including essential goods are regularly brought into Australia on container ships. Supply chain investment must therefore incorporate resilience considerations into investment prioritisation.

Low probability high impact events have caused significant maritime supply chain problems since the onset of the COVID-19 pandemic

Supply chains are typically designed to handle normal levels of demand, plus a margin for unforeseen challenges. However, low probability high impact events can often have severe impacts on demand and/or supply. Consequently, in the absence of effective planning, supply chains can slow or halt entirely when faced with low probability high impact events.

This effect is amplified when supply chains have a funnel point, ie, when all freight transits through one place. For example, Port Botany acts as a funnel point in NSW as it services 99 per cent of NSW's containerised freight demand.

Recent events have highlighted that Australia's maritime supply chain resilience is inadequate when faced with low probability high impact events. The COVID-19 pandemic significantly altered Australians' consumption patterns which placed a large strain on the maritime supply chain. Extended travel restrictions and lockdowns during 2020 and 2021 shifted consumer demand from travel and hospitality towards manufactured goods, which are predominantly transported via containerised freight.

Further, health-measures to combat transmission reduced port productivity and frequently reduced the size of the available workforce due to testing, isolation and social distancing requirements. This combination of increased demand for containerised freight and reduced port processing ability left Australia's maritime supply chains strained, and occasionally halted freight movement altogether.

On top of pandemic pressures, industrial action resulted in significant freight delays, particularly at Port Botany. Specifically, the ACCC found in its stevedoring inquiry that industrial action at Port Botany in 2020-21 caused shipping lines to spend, on average, 21 hours waiting idly at Port Botany.[23] Consequently, several shipping lines transferred their cargo to the Port of Melbourne instead of facing the lengthy delays. Significant road transport costs and additional transport emissions were incurred getting the goods back from Melbourne to NSW, which were shared by importers and consumers.

These low probability high impact events highlighted:

- the importance of Australia's maritime supply chain to the economy; and
- the vulnerability of ports in Australia's supply chain to increases in demand and reduced access to workers.

The key lesson for maritime logistics planners is that the maritime freight industry plays such a significant role in Australia's economy that investment needs to occur to ensure maritime supply chains are robust to significant low probability high impact events.

We believe that this can be achieved in part by diversifying the points of entry for containers in Australia, particularly in NSW and Victoria, facilitating competition and building supply chain resilience.

Shipping delays cost thousands and increase the cost of goods for consumers

Shipping delays do not just cause inconvenience for customers and exports waiting on goods. Supply chain failure has major cost impacts for importers and exporters, which funnel down to end consumers. These costs arise for ships sitting idly waiting to offload their goods, which disrupts highly optimised schedules. Shipping companies plan their freight transit routes, berthing times, shipping speeds and TEU volumes based on fuel efficiency, as fuel makes up a large portion of the transit cost.

[23] ACCC, *Container stevedoring monitoring report – overview*, October 2021, p 10.

As ships are held up at a particular port, they must increase their speed on the next leg of their journey in order to meet designated berthing times, or potentially face additional fees for rescheduling this time. This increase in speed comes with an associated increase in fuel costs, which is the main component of variable cost for maritime freight transit.

Anecdotal evidence from the Port Botany industrial action suggests that strikes from stevedore service providers causes delay costs of $25,000 per day for shipping companies, which ultimately will be recovered by passing down costs to end consumers.[24] Consequently, Australians will end up paying higher prices for their imported goods, and Australian exports may cost more on the global market, reducing their attractiveness against other countries' goods.

As shipping companies transition towards larger vessels, the opportunity cost of delay increases because more freight is held up on each vessel, and more fuel is required to make up additional speed for larger, heavier ships. This means that delay costs will continue to rise in the future, and consequently will increasingly be considered by shipping company planners when determining their routes.

Australia's port resilience must be improved to keep maritime freight costs down. This is particularly important as Australia uses maritime transit for 99 per cent of its international trade, and is heavily reliant on trade for essential goods, cars, electronics and homewares. Failure to secure the resilience of our ports will therefore result in a higher cost of these goods for Australian consumers.

A lack of supply chain resilience may lead to shipping companies reallocating ships to more reliable and profitable routes

For one-off delays at a port in Australia, ships can increase their speed on the next leg of their journey, at the expense of increased fuel costs. However, for regular delays at a specific Australian port, shipping companies will factor in risk costs of increased fuel for the delays. Consequently, shipping companies will increase their allocation of costs for visiting the port, which may reduce their profits if they cannot pass the entire cost increase through to consumers. In response, some shipping companies may reallocate ships to other ports, or stop visiting that port altogether. This reduces competition for shipping lines, which drives up the price of maritime freight transport for Australian importers and exporters.

Losing business at one port is extremely problematic for both state-specific and nationwide supply chains. Each of Australia's five major ports primarily services its own state – for example, Port Botany services 99 per cent of NSW's freight demand. This indicates that Australian ports do not generally compete with each other interstate, and shipping companies do not have an alternate port within each State to deliver freight. Consequently, if shipping companies no longer wanted to deliver freight at Port Botany, they do not have an alternative port option to deliver freight destined for NSW. This results in decreased shipping lines servicing NSW, which will increase the price of shipping and goods in NSW.

In addition, due to Australia's relative geographic isolation, shipping companies visiting Australia's east coast often stop at more than one port on their route. This means that delays at a particular port may increase the cost of fuel along that route, which shipping companies may spread amongst visits to other Australian ports. Further, shipping lines may withdraw from Australia altogether, which reduces competition and increases transport costs at other Australian ports. Finally, shipping companies may bypass a future stop to make up lost time, which can reduce the resilience of Australia's maritime freight transport. For example, anecdotal evidence from the ACCC stevedoring report showed that 20 per cent of container ships were bypassing Port Adelaide because of low profitability and to make up delay times.[25]

[24] ABC, *Port Botany dispute off to Fair Work Commission as exporters want union, stevedores to pay for delays*, https://www.abc.net.au/news/rural/2020-09-29/port-botany-exporters-want-union-or-stevedores-to-pay-fordelays/12712876, accessed 25 February 2022.

[25] ACCC, *Container stevedoring monitoring report – overview*, October 2021, p 13.

Evidence suggests that Australian ports are already facing these problems. The ACCC found that 'ongoing disruptions and delays at Australian ports are becoming unpalatable for shipping lines', and that several shipping lines have already started withdrawing their services from Australia altogether.[26] Over time, this will result in reduced choice of shipping lines and higher transport prices, which will primarily be borne by Australian consumers and exporters.

Australian infrastructure planners should therefore be looking into methods to improve supply chain resilience to secure competitive prices between shipping lines.

Diversifying maritime supply chains can help to improve supply chain resilience

One method of improving resilience is to reduce the number of funnel points in the supply chain, ie, to diversify maritime infrastructure and provide port choice for shipping companies. In addition to several other benefits which we will discuss further into our submission, diversifying maritime supply chains by using regional ports can provide resilience benefits through:

- allowing for additional capacity when maritime supply chains are under pressure from non-localised low probability high impact events;
- providing supply chain security by receiving maritime freight when an incumbent port suffers a localised low probability high impact event; and
- allowing an additional location for port infrastructure in the event of a landside low probability high impact event, such as a rail infrastructure failure.

By way of example, a regional port in NSW would be able to pick up additional freight demand from manufactured goods due to pandemic pressures, alleviating throughput constraints for port and landside infrastructure at and around Port Botany. This prevents problems associated with operating a port near its capacity such as increased freight delay times and increased labour costs, which improves NSW's supply chain resilience and keeps costs of imported goods relatively low for consumers.

Further, for localised low probability high impact events such as catastrophic machinery failure or industrial action, a regional port would be able to receive a significant amount of Port Botany's throughput, reducing delays for shipping companies relative to diverting to another major port or waiting idle at Port Botany. This would keep shipping companies from including increased risk costs in their charges for transporting goods to NSW, which will reduce shipping costs for consumers and exporters. For example, if the Port of Newcastle was operational during the industrial action at Port Botany in October 2021, ships could have re-routed to the Port of Newcastle instead of the Port of Melbourne, saving significant additional maritime fuel costs, delay times and road freight costs.

Finally, for landside low probability high impact events such as a rail infrastructure failure near Port Botany, the load could be shared between trucks heading to Port Botany and trucks and trains heading to a regional port. This would keep road congestion changes low, reducing negative externalities on Greater Sydney commuters.

[26] ACCC, *Container stevedoring monitoring report – overview*, October 2021, p 10.

SUPERCHARGING PRODUCTIVITY AT AUSTRALIA'S PORTS

Australia's port productivity currently ranks poorly on a global scale, with all of its five major ports scoring in the bottom 50 per cent for efficiency.[27] Further, Australia's two largest ports, Port of Melbourne and Port Botany, scored in the bottom 15 and 10 per cent respectively.[28]

This section explains how investing in a new, fully automated port with the capacity to handle large ships will position Australia to improve port efficiency and reliability, providing significant benefits to Australia into the future.

KEY POINTS

- There is a need to drive a new phase of port productivity.
- Port congestion is likely contributing to declining productivity at Australia's ports.
- Automation provides an opportunity to increase productivity and improve reliability.
- Improving opportunities for port choice and competition will supercharge productivity at ports.
- Creating a network of ports (including regional ports) that can effectively compete with existing infrastructure and accommodate larger ships will provide significant benefits to Australia.

There is a need to drive a new phase of port productivity

Australia has benefited significantly from port reforms during the 1990's that addressed labour inefficiencies, promoted stevedore competition, and led to the corportisation of ports, with the provision of leases to the private sector. These reforms contributed to improved port productivity improving Australia's competitiveness in overseas markets, and lowering the costs of imported goods for Australian consumers.

However, the benefits from these reforms have naturally diminished, and so there is a need to create an environment for the next phase of port productivity improvement. Practically, this requires consideration of the opportunities and impediments to further port productivity improvements.

Further, Australia's geographically distant location to major international consumer and manufacturing centres means that improvements to the efficiency of shipping and port operations can have a proportionally bigger effect for Australia than other countries, because shipping costs make up a larger proportion of total product costs.

Port congestion is likely contributing to declining productivity at Australia's ports

With growing import and export freight demand, there is a need to expand container terminal capacity to support Australia into the future. This is particularly the case in Sydney as forecast container throughput is expected to exceed current capacity in the coming years.

Generally, as ports approach their capacity limits, this will contribute towards declining productivity. Increasing container throughput will put pressure on berth and crane infrastructure, and result in increased road and rail traffic at the ports. Growing maritime traffic is also likely to increase delay times

[27] The World Bank and IHS Markit, *The Container Port Performance Index 2020: A Comparable Assessment of Container Port Performance*, Washington, DC, 2021; ACCC, *Container stevedoring monitoring report – executive summary*, October 2021, p 15.

[28] ACCC, *Container stevedoring monitoring report – overview*, October 2021, p 10.

and push up transport costs. Deteriorating road and rail traffic will put pressure on already strained landside infrastructure, further contributing towards reduced port productivity.

Unlike the Port of Melbourne, Port Botany has limited capacity for expansion. Limited berthing points and increasingly reallocated container storage facilities are key constraints for expansion at Port Botany.

However, there are diminishing marginal returns from expanding the capacity of Port Botany because of significant landside infrastructure constraints, and because operating near capacity will continue to hamper productivity. Specifically, accommodating this increased containerised throughput will require additional cranes, trucks and trains to handle increased cargo. In addition, stevedoring efficiency must improve to keep ship delay times low. This increased port congestion is unlikely to be conducive to improved stevedoring efficiency, as more vehicles and more containers leads to increased opportunity for delays and errors.

Investing in regional ports as an alternative to expanding existing ports will alleviate metropolitan congestion issues and provide supply chain diversification for a lower cost than expansion of existing ports' capacity. Further, investing in locations where channel dredging is not required to accommodate larger ships will reduce total investment costs.

Automation provides an opportunity to increase productivity and improve reliability

Evidence from the Port of Melbourne, which is more automated and efficiently designed than Port Botany, shows that it has a port productivity of 117 TEU per hour. This is approximately 15 per cent higher than Port Botany, which has a port productivity of 101 TEU per hour.[29] Consequently, Port of Melbourne has an average time saving of one and a half hours per ship as compared to Port Botany.

Further, Port Botany has been shown to be relatively inefficient on a global scale, ranking in the bottom 10 per cent of global container ports for efficiency.[30]

Investing in a new, fully automated port represents an opportunity to increase productivity and bring Australian port infrastructure up to global standards.

Improving opportunities for port choice and competition will supercharge productivity at ports

During the last decade, shipping lines have increasingly consolidated with one another. This allows for fewer companies to make more efficient journeys with larger ships. Currently, the top 10 shipping firms, grouped into three major alliances, hold approximately 80 per cent of the market share.[31] However, with concentrated market power comes increased bargaining power in port negotiations, and the potential to increase costs and improve profit margins.

With the consolidation of shipping lines and Australia's currently limited port choice, Australian importers and exporters may soon be faced with a limited selection of shipping lines, which could increase the cost of containerised transport.

By increasing port choice, stevedores and shipping lines will effectively face competition constraints which improve both shipping prices and port productivity. The introduction of a new technically advanced port which makes use of automated stevedoring infrastructure, such that it significantly

[29] BITRE, *Waterline 67*, December 2021, Productivity sheet. Values taken for January to December 2019.

[30] ACCC, *Container stevedoring monitoring report - overview*, October 2021, pp 10, 15.

[31] ITF, *The Impact of Alliances in Container Shipping*, p. 7; ACCC, *Container stevedoring monitoring report – Executive summary*, October 2021, p 20.

reduces offload times for ships, would force incumbent ports to invest in infrastructure and improve productivity to keep ships from diverting their business.

For example, the ACCC found in its stevedoring monitoring report that an increase in stevedore competition from Hutchinson in 2012 and VICT in 2017 resulted in a reduction in the incumbent stevedores' profit margins and substantial increases to the incumbents' investment into expanding terminal capacity, which increased each stevedore's tangible asset base.[32] This demonstrates that increased stevedoring competition reduces prices and drives investment, both of which result in benefits for Australian consumers and exporters.

Further, an increase in port choice would drive innovation as a means of competition between the ports, leading to substantial productivity gains. As an important case study of the effects of port choice, Box 1 below provides a summary of the benefits of the Port of Tauranga to New Zealand's maritime logistics supply chain.

BOX 1: PORT OF TAURANGA DEMONSTRATES HOW PORT COMPETITION CAN IMPROVE PRODUCTIVITY

The Port of Tauranga (PoT) in New Zealand serves as an important case study in understanding the benefits of establishing a second port proximate to a major city. Tauranga is located 200 kilometres south-east of Auckland, which is New Zealand's largest city and has historically been home to New Zealand's largest port in terms of container throughput.

Since the introduction of PoT's Auckland MetroPort facility in June 1999, which established an efficient landside freight connection between Tauranga and Auckland, PoT's throughput has increased by over 1,000 per cent, from 112 thousand TEU in 1999 to over 1.23 million TEU in 2019.[33] Throughput at PoT overtook the Port of Auckland in 2016, and by 2019 was 30 per cent greater than Port of Auckland which had a throughput of 939 thousand TEU, marking PoT as a crucial component of New Zealand's supply chain.

With Auckland's main industrial facilities located in the south of the city, and the Port of Auckland in the city's geographical centre, landside transport between these two locations creates road congestion on transport infrastructure that is needed for daily non-freight use. Shifting container volumes to PoT, whose freight can access Auckland's south without disrupting inner-city traffic flows reduces this congestion.

In late 2016, PoT completed channel deepening works which prepared for the shift in international shipping trends and allowed PoT to accommodate larger vessels. PoT being able to provide the necessary capacity for these ships on behalf of all New Zealand has ultimately alleviated pressure from the Port of Auckland to undergo channel deepening works of its own.

The presence of two major ports servicing Auckland contributes to its supply chain resilience. With PoT and the Port of Auckland sharing the freight task, the effect of unforeseen shocks to the operation of either of these ports is mitigated by the flexibility of having spare capacity located nearby, which improves New Zealand's maritime supply chain security.

Having a second port also naturally introduces competition, which has the potential to promote increases in productivity and decreases in stevedoring charges, both of which make these ports more attractive to shipping lines.

[32] ACCC, *Container stevedoring monitoring report*, October 2021, pp 36, 41.

[33] Note that throughput increased in 2020 but decreased in 2021 following the impacts of the COVID-19 pandemic; see Port of Tauranga, *Port Trade and Statistics Information*, August 2021, p 5.

Creating a network of ports (including regional ports) that can effectively compete with existing infrastructure and accommodate larger ships will provide significant benefits to Australia

Looking ahead, there is an opportunity to create a network of ports capable of supporting larger containerised ships, which will help to promote supply chain efficiency well into the future. By having the ability to support ships between 10,000 and 24,000 TEU, Australia will greatly increase its attractiveness to shipping lines.

This is because there are considerable economies of scale associated with maritime freight transport. A fundamental principle of shipping is that the cost of transporting a container falls as the vessel size increases. The key impediment to realising these cost reductions are port facility limitations.

Another key challenge is to place port infrastructure in locations that either have a relatively small impact on existing supporting road and rail supply chain infrastructure, or help to address other infrastructure congestion problems. This approach ensures that Australia benefits from both the cost savings from accessing larger ships, while also helping to alleviate other infrastructure challenges, cost effectively.

Australia must start investing in this port network which accommodates larger ships soon, as 44 per cent of ships ordered between January and mid-July in 2021 were over 11,800 TEU.[34] Peter Sand, chief analyst at Xeneta and former maritime economics teacher at the Danish Shipping Academy, commented that recent political and pandemic influenced trade patterns have resulted in 13,000 – 16,000 TEU ships being preferred to ultra-large container ships.[35]

However, ships over 14,000 TEU are typically used on long distance east-west routes between large transhipment ports which serve as a hub in a global hub and spoke network,[36] such as the high-density Shanghai-Rotterdam route. Australia typically forms part of the complementary north-south routes which connect to the global transhipment ports in a relay pattern.

For Australia, there is the potential to facilitate larger ship routes between Singapore, Australia, New Zealand (Tauranga) and South America. This has the potential to provide opportunities to substantial lower trade costs between Australia, South America and South East Asia. This can be expected in turn to improve the competitiveness of Australian goods overseas, while lower the transport costs for goods arriving in Australia.

[34] Calculated as 168 ordered ships of at least 11,800 TEU divided by 381 ships ordered by mid-July 2021. https://www.bimco.org/news/market_analysis/2021/20210826-container_ship_orders_due_for_deli, accessed 7 February 2022.

[35] https://www.bimco.org/news/market_analysis/2021/20210826-container_ship_orders_due_for_deli, accessed 7 February 2022.

[36] UNCTAD, *Review of Maritime Transport 2018*, October 2018, p 29.

UNLOCKING THE OPPORTUNITIES OF REGIONAL PORTS WILL DELIVER SIGNIFICANT BENEFITS

It is clear that Australia faces several major challenges to adequately prepare its maritime logistics system for projected containerised throughput growth over the next 10 to 30 years. Existing port and landside infrastructure is substantially ill-equipped to handle containerised freight growth alongside increased urbanisation and worsening metropolitan congestion. Further, Australia's supply chain resilience is vulnerable to low probability high impact events, and incumbent ports face little competition or incentive to invest in innovative and productive new technologies.

However, this presents an opportunity to use regional ports to unlock maritime supply chain benefits. Regional ports can resolve many of Australia's supply chain challenges and provide wider-ranging benefits to the economy. Further, regional ports can deliver significant productivity benefits across the supply chain.

In this section, we explain that the Newcastle DCT is a good example of a significant opportunity to unlock the benefits of regional ports in Australia. Our analysis provides insights on the magnitude of benefits that diversifying Australia's port network can deliver to Australia.

KEY POINTS

- The Newcastle DCT will deliver significant benefits if current impediments to the investment are removed.
- The Newcastle DCT would provide up to 2.5 million TEU of capacity, creating the opportunity to avoid or delay investment at Port Botany and on Sydney's roads.
- Freight transiting through the Newcastle DCT will alleviate road and rail congestion in Sydney and reduce container freight transport distances:
    - redirecting freight trucks to the Newcastle DCT will reduce the number of trucks on inner-Sydney roads; and
    - the Newcastle DCT increases rail utilisation and alleviates stress on Sydney's passenger rail network.
- Regional areas such as Newcastle have an abundance of land available to support the maritime logistics industry.
- A Newcastle DCT will provide supply chain resilience.
- A Newcastle DCT is expected to deliver port productivity benefits;
    - the Newcastle DCT will deliver significant direct productivity benefits through automation, diversification and reduced congestion; and
    - indirect benefits from the Newcastle DCT are expected to improve productivity at port botany and across the maritime logistics supply chain.

A multi-use deepwater terminal at the Port of Newcastle will deliver significant benefits if current impediments are removed

The Port of Newcastle is proposing to construct a state-of-the-art Deepwater Container Terminal (DCT) that, once fully constructed, will have a capacity of 2.5 million TEU per year. The project end-state includes 12 individual quay cranes, along a total quay line of 1,320 metres with capacity to handle three large ships simultaneously, ie, two 400 metre vessels, and one 370 metre vessel.

The proposed location of the Newcastle DCT is an enviable site with access to large amounts of land for container storage and an existing rail network linking the Port of Newcastle to Sydney. A key feature of the proposed Newcastle DCT is the automation of container movement, and transfer onto rail, which is expected to provide significant efficiency benefits to the Port of Newcastle's operations.

The Newcastle DCT represents an opportunity to resolve congestion and resilience issues whilst delivering almost $1 billion in net economic benefits to NSW.[37] Further, the Newcastle DCT can help to drive port productivity across Australia's maritime logistics system.

In addition, the Newcastle DCT has the scope to accommodate larger ships (between 10,000 and 24,000 TEU) which creates the opportunity to position Australia amongst a network of deepwater terminals. This would open Australia up to new more efficient trade routes, such as the potential for a deepwater route linking Singapore and South America via Sydney and Tauranga. Cost savings arising from the economies of scale large ships will flow down to Australian consumers and exporters, providing benefits across Australia's economy.

The Newcastle DCT would provide up to 2.5 million TEU of capacity, creating the opportunity to avoid or delay investment at Port Botany and on Sydney's roads

As discussed earlier, projected freight volumes are expected to exceed Port Botany's capacity even following expansion by 2040. However, if NSW government restrictions on Newcastle DCT's throughput are relaxed immediately, Newcastle DCT could begin alleviating containerised freight demand increases by 2025, with capacity ramping up significantly by 2031. The Newcastle DCT would provide up to 2.5 million TEU of additional capacity once completed, which would capture a significant portion of projected containerised freight growth in NSW.

By diverting containerised freight volumes away from Port Botany before it becomes capacity constrained, the presence of the Newcastle DCT is able to avoid or delay certain investments at Port Botany that may have been necessary absent the DCT. Further, as the Newcastle DCT would be designed to accept larger ships, any channel deepening and dredging costs, expenditure to change the quay alignment or crane specifications to handle larger ships could be avoided at Port Botany.

The Newcastle DCT also provides the opportunity to flexibly utilise spare capacity on the northern rail lines, alleviating conflicting rail traffic on the inner-Sydney rail network. Further, diverting trucks away from inner Sydney to Newcastle will reduce traffic on previously constrained roads. The Newcastle DCT is therefore a viable alternative to investment in landside infrastructure upgrades across the Greater Sydney road and rail network that may otherwise be needed to support increased throughput at Port Botany.

Freight transiting through the Newcastle DCT will alleviate road and rail congestion in Sydney and reduce container freight transport distances

Projects like the DCT provide more than just direct productivity benefits to the maritime logistics supply chain. By changing the pattern of freight infrastructure use, they can contribute to reduced infrastructure congestion benefiting all infrastructure users.

REDIRECTING FREIGHT TRUCKS TO THE NEWCASTLE DCT WILL REDUCE THE NUMBER OF TRUCKS ON INNER-SYDNEY ROADS

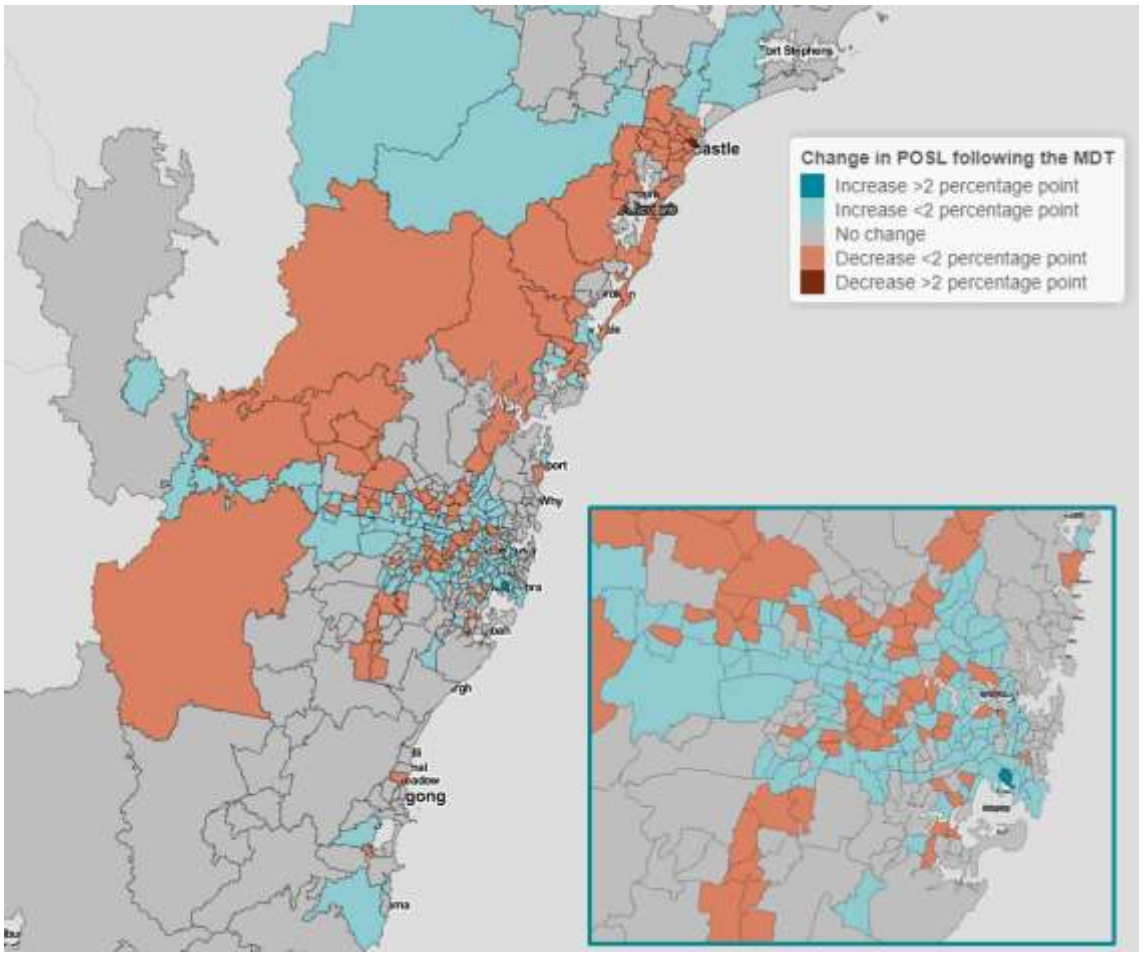
As noted earlier, the roads around Port Botany are some of the most congested roads in Sydney, shared by passenger and commercial vehicles. The Newcastle DCT provides an opportunity to divert

[37] HoustonKemp analysis in a submission to Infrastructure Australia.

freight trucks away from Port Botany to Newcastle and along key roads in Northern Sydney, which are by comparison much less congested.

Figure 8 below shows that the presence of the Newcastle DCT can positively impact speed outcomes across Greater Sydney, particularly through metropolitan Sydney, whilst offsetting the increased congestion on road connections between Newcastle and Sydney. The areas in blue on the map indicate improvements in the percentage of speed limit (POSL), and hence reduced congestion throughout metropolitan Sydney and in parts of Western Sydney. This is a timely solution to congestion problems as Sydney's projected urban population growth is anticipated to worsen road network strain in the coming years.

FIGURE 8: CHANGE IN THE PERCENTAGE OF SPEED LIMIT ACROSS GREATER SYDNEY BY SA2 AREA WITH THE NEWCASTLE DCT IN 2056



In addition to congestion benefits, freight transiting to and from Northern Sydney or Northern NSW will be able to travel directly from Newcastle, which reduces truck haulage distances, decreasing costs of transportation. This will avoid these trucks' need to use the roads in metropolitan or Western Sydney, which will further alleviate congestion and optimise freight transport.

THE NEWCASTLE DCT INCREASES RAIL UTILISATION AND ALLEVIATES STRESS ON SYDNEY'S PASSENGER RAIL NETWORK

The NSW government has set a goal of Port Botany amending its modal share to accommodate 28 per cent of freight on rail by 2021, and to move 3 million TEUs on rail by 2045, or 40 per cent of total

volumes, to address Sydney's road congestion problem.[38] However, the rail network in metropolitan Sydney is already under strain from passenger services and has limited room for network augmentation.

TfNSW data to date indicates that under 16 per cent of rail was moved by freight in the first four months of 2021,[39] with unaudited TfNSW data showing a significant fall in rail's modal share from Port Botany in the second half of 2021.[40] This falls significantly short of NSW government targets. This highlights the difficulty in increasing rail modal share on Sydney's rail network, and indicates that the NSW government's 40 per cent target by 2045 is likely to be optimistic.

The Newcastle DCT is in the enviable position of already being connected to the Northern Rail Line, and presents an opportunity to make use of spare rail freight capacity to deliver containers more efficiently to Western Sydney. Table A below presents estimates of annual additional rail capacity in addition to current services between Newcastle and Western Sydney.

TABLE A: ESTIMATES OF ANNUAL AVAILABLE RAIL CAPACITY BETWEEN NEWCASTLE AND WESTERN SYDNEY

	Newcastle to Flemington	Flemington to St Marys	Flemington to Moorebank
Only 650-metre trains	427,000 – 492,000 TEU	307,000 – 354,000 TEU	631,000 – 728,000 TEU
650-metre and 1,200-metre trains	637,000 – 735,000 TEU	397,000 – 458,000 TEU	N/A

Source: HoustonKemp, Implications for road and rail infrastructure of a Multi-Purpose Deepwater Terminal in Newcastle, June 2021, p ii.
Note: The Moorebank intermodal terminal is designed to run short standard port shuttles trains only.

The Newcastle DCT, and the availability of rail slots from the region, allows for containerised freight to use existing infrastructure in a different manner to satisfy the freight task. That is, the Newcastle DCT opens up new opportunities along the freight rail network without the need for new investment, as it provides access to Western Sydney that is not obstructed by other freight travelling shorter distances on the rail line, ie, to areas in the inner West of Sydney.

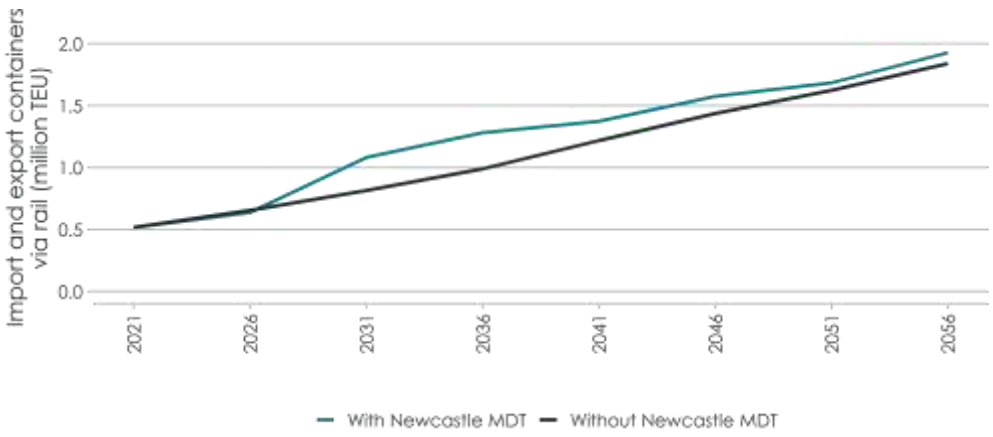
Figure 9 below shows that the Newcastle DCT would increase total annual container freight transported by rail by 30 per cent by 2036 compared to having Port Botany alone. This highlights that the Newcastle DCT contributes to increasing rail throughput in the immediate future. This additional rail volume declines to 5 per cent by 2056 as Port Botany transitions towards its long term rail target. However, in a future state-of-the-world where Port Botany does not meet its rail targets, the Newcastle DCT contributes further to greater total rail throughput.

[38] NSW Ports, *Major initiatives: growth in rail*, https://www.nswports.com.au/rail, accessed 25 February 2022; NSW Ports, *Port Development Plan 2019-2023*, July 2020, p 40; and NSW Ports, *Navigating the Future: NSW Ports' 30 Year Master Plan*, October 2015, p 27.

[39] TfNSW, *Use of Rail Freight*, 1 June 2021, available at https://opendata.transport.nsw.gov.au/dataset/freight-data/resource/5624d1c8-da56-4723-a580-7e36a70702cd, accessed 2 March 2022.

[40] TfNSW, *Use of Rail Freight*, January 2022, available at https://www.transport.nsw.gov.au/data-and-research/freight-data/freight-performance-dashboard, accessed 2 March 2022.

FIGURE 9: PROJECTED RAIL FREIGHT FLOWS WITH AND WITHOUT THE NEWCASTLE DCT



Source: HoustonKemp analysis of transport logistics and congestion.

Regional areas such as Newcastle have an abundance of land available to support the maritime logistics industry

As compared to metropolitan areas, regional areas typically have ample available land to support the infrastructure required for efficient port operations. These include the direct land required for cranes, berths and ships, but also the indirect land required for port operations such as container storage facilities.

The proposed site for the Newcastle DCT at Mayfield has 90 hectares of available land, which is of immense value because of its proximity to port infrastructure and major population centres. This advantage would be impossible to create for any existing container terminals in NSW without large scale rezoning and development of land adjacent to these terminals. This is unlikely to occur as the NSW government has rezoned and reserved large areas in Western Sydney for freight and logistics purposes, known as the Western Sydney Employment Area.[41]

In addition, rezoning and developing metropolitan land around Port Botany would be much more expensive than making use of the existing land resources available at and around the Newcastle site. It would also be inefficient, as the land is extremely desirable for other purposes such as residential housing, whereas the land at the Newcastle site has limited alternative uses.

Utilising the available land in Newcastle for container storage will improve supply chain efficiency by providing container storage for freight destined for Northern Sydney and Northern NSW, removing the need to transit via Western Sydney. This land will also provide a location to store empty export containers. Having empty export containers close to the terminal is desirable, as they can easily be added to or removed from ships with higher/lower freight capacity than anticipated, which will improve supply chain efficiency.

A Newcastle DCT provides supply chain resilience

As discussed earlier in our report, one method of improving resilience is to reduce the number of funnel points in the supply chain. The Newcastle DCT would provide an alternative berthing point in NSW which is operated privately by separate owners to Port Botany. If a low probability high impact event were to occur, the Newcastle DCT could assist in smoothing excess containerised freight

[41] NSW government, *NSW freight and ports plan 2018-2023*, September 2018, p 67; and NSW Government, *Overview of the Western Sydney Employment Area*, https://www.planning.nsw.gov.au/Plans-for-your-area/Priority-Growth-Areas-and-Precincts/Western-Sydney-Employment-Area/Overview-of-the-Western-Sydney-Employment-Area, accessed 8 February 2022.

demand. Further, the Newcastle DCT could capture ships that were unable to dock at Port Botany due to a localised event, such as catastrophic machinery failure or industrial action.

Having the Newcastle DCT nearby would provide shipping companies with additional certainty that should they face delays at Port Botany (or vice versa), they could easily and cheaply transition to a nearby port and offload their cargo. This is opposed to the current situation, where shipping companies must offload at either Port of Melbourne or Port Brisbane, both of which involve significant travel. Consequently, shipping delays would become less costly for ships arriving in NSW, making Sydney a more attractive and secure location for shipping companies to service.

Having a reliable, fully automated port near to Port Botany would provide competition incentives for Port Botany to invest in infrastructure, which would reduce delays and improve port productivity. If the Newcastle DCT had a significantly shorter wait time or higher reliability than Port Botany, then ships would likely change their route to offload in Newcastle. Like the ACCC observed with the entrance of new stevedoring companies, it is likely that the Newcastle DCT's entrance would promote investment into Port Botany's tangible asset base for the benefit of shipping companies and consumers.

A Newcastle DCT is expected to deliver significant port productivity benefits

Port Botany has consistently performed as one of Australia's most congested ports. The Newcastle DCT has been designed to optimise freight handling with regards to a number of factors to maximise efficiency and minimise congestion, and as such, is expected to display certain productivity improvements relative to Port Botany.

This notion of efficiency or productivity occurs at all points along the freight handling process at the port, including:

- wait times at anchorage for ships to berth at the quay to be serviced by the terminal;
- ship rates, where the portside infrastructure and configuration loads and/or unloads freight from the ship to the yard and subsequently onto road or rail freight infrastructure; and
- the rate at which this freight is able to leave and/or arrive at the port on this road and rail infrastructure.

The wait time at anchorage and the ship rate are a reflection of the port's performance and have an explicit impact on the costs incurred by ships and the economic cost of freight being delayed on its journey to its final destination. The rate at which freight leaves the terminal yard for delivery via road or rail explicitly contributes to the cost of wait time for both freight and labour in the haulage of freight to or from its destination.

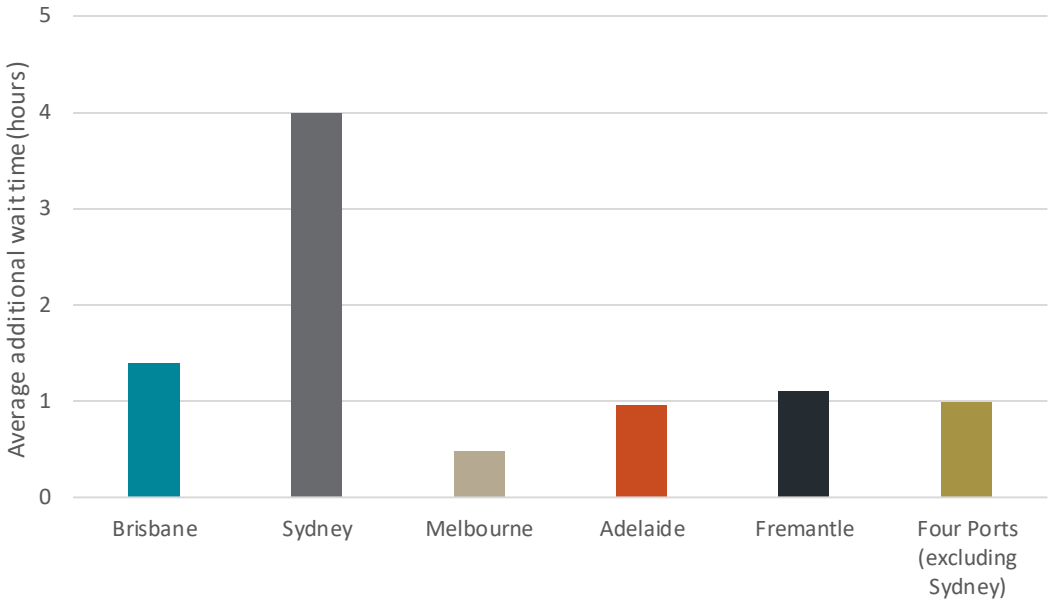
Port Botany performs as one of the poorest Australian ports for wait time at anchorage. Prior to the COVID-19 pandemic, nearly 22 per cent of ships that called at Port Botany waited at anchorage for more than two hours, compared to an average of around 5 per cent of ships for ports in Melbourne, Brisbane, Adelaide and Fremantle.[42]

We assume that the Newcastle DCT will have the same anchorage wait time as Port Botany. However, the proportion of ships that must wait longer than two hours is 5 per cent, ie, more in line with the

[42] BITRE, *Waterline 67*, December 2021, Productivity sheet. Simple averages have been taken for values between January to June and July to December 2019.

other Australian ports. This results in 17 per cent of ships avoiding 18 hours of anchorage, or a three hour wait time improvement across all ships calling to port in Newcastle.[43]

FIGURE 10: AVERAGE ADDITIONAL WAIT TIME FOR SHIPS WAITING OVER TWO HOURS AT ANCHORAGE – JANUARY TO DECEMBER 2019



Source: HoustonKemp analysis of BITRE, Waterline 67, December 2021, Productivity Sheet.
Note: Calculated as the per cent of ships waiting at anchorage for more than two hours multiplied by the average waiting time at anchorage. The Four Ports wait time was calculated using the simple average of non-Sydney ports.

To understand the potential value from improved wait times, we have applied a value of time assumption from TfNSW to the quantity of volume estimated through the Newcastle DCT to quantify the productivity benefits associated with this three-hour improvement in wait times. We estimate cost savings from wait time improvements of approximately $70 per TEU for freight that passes through the Newcastle DCT relative to Port Botany.

On the other hand, due to inefficiencies in transporting freight off a ship and out of the yard Port Botany can only exchange 101 TEU per hour, which is around 15 per cent lower than the more automated and efficiently designed Melbourne Ports, which can handle 117 TEU per hour.[44] Assuming the Newcastle DCT has the same handling rate as Melbourne, since both are newly designed with automated features, we anticipate the same time saving to be present between the Newcastle DCT and Port Botany, which is equal to 2.84 hours or approximately 170 minutes per ship.

We estimate that the productivity benefits associated with this 170-minute improvement in ship rate as approximately $65 per TEU for freight that passes through the Newcastle DCT relative to Port Botany. Collectively, these savings represent a port productivity improvement of approximately $135 per TEU for freight that switches from Port Botany to the Newcastle DCT.[45]

[43] HoustonKemp analysis of BITRE, *Waterline 67*, December 2021, Productivity sheet. Values taken for January to December 2019. Calculated as the proportion of ships that wait over two hours at Port Botany (22 per cent) less the proportion of ships that wait over two hours at the Newcastle MDT (5 per cent) multiplied by the average wait time over two hours in Sydney (18 hours).

[44] BITRE, *Waterline 67*, December 2019, Productivity sheet. Values taken for January to December 2019.

[45] Further detail on HoustonKemp assumptions for calculating this port productivity improvement can be found in Appendix A - Assumptions.

ADDRESSING IMPEDIMENTS TO PRIVATE SECTOR INVESTMENT TO DELIVER MARITIME LOGISTICS PRODUCTIVITY IMPROVEMENTS

The current system of planning and investing in maritime logistics infrastructure has been typically undertaken by governments. This reflects the use of infrastructure such as roads and rail by both freight and passenger vehicles, and the significant planning required for major infrastructure projects such as ports.

However, as a consequence of this, there is a lack of innovation in thinking and planning for maritime logistics supply chains' evolution. Indeed, much of the focus is on incremental increases in capacity to support increasing freight demand, without considering whether diversifying supply chains could lead to greater benefits.

Relevantly, such an approach to supply chain management and planning does not adequately incorporate advances in technology, systems and processes, that collectively if adopted could result in significant productivity benefits.

In this section, we discuss several impediments to greater coordinated private sector maritime logistic infrastructure investment. They include:

- a focus by governments on expanding the capacity of existing, centralised maritime supply chains, rather than considering whether diversifying supply chains could deliver greater community benefits through competition and making better use of road and rail infrastructure;
- historical government agreements that directly affect scope for port competition to evolve; and
- a lack of focus and effective engagement between governments and key players in the maritime logistics sector to optimise and prioritise infrastructure investments to maximise productivity.

KEY POINTS

- A focus on incremental capacity expansion inhibits innovation and productivity in maritime logistics.
- Competition in ports is affected by government agreements that expressly prevent beneficial outcomes for the community.
- Governments should remove un-economic penalty or planning impediments to new container terminal developments, such as the Newcastle DCT.
- Maritime logistics system stakeholders should be at the centre of formulating planning and investment decision making priorities and actions.
- Creating an environment of maritime logistics stakeholder engagement to co-design future infrastructure plans will promote better outcomes.

A focus on incremental capacity expansion inhibits innovation and productivity in maritime logistics

A key challenge for delivering improved productivity in the maritime logistics system arises from the approach taken by governments to infrastructure planning and investment. Historically, maritime logistics system investments have been planned and made by governments. The focus has been on

minimising total system costs, typically by utilising economies of scale from existing infrastructure through incremental capacity expansion.

Practically, this has meant that we have incrementally expanded ports, and continued to expand road, rail and warehousing infrastructure to meet ever increasing throughput.

However, this approach fails to adequately consider whether there may be benefits from redesigning the geographic locations of supply chains to lower infrastructure congestion, make better use of spare capacity in existing infrastructure, and utilise land away from built up areas near our major capital cities.

In addition, the absence of adequate competition means that there is little incentive to innovate or invest in new technologies that can drive significant productivity improvements, particularly at ports.

In short, the current system of infrastructure planning and investment does not provide the right incentives to drive productivity improvements across the entire maritime logistics supply chain.

Competition in ports is affected by government agreements that expressly prevent beneficial outcomes for the community

The lack of incentives to improve productivity, particularly at ports, arises principally from a lack of port to port competition. Relevantly, with ongoing urbanisation and road congestion in and around existing ports, it is now economic to facilitate investments that promote port competition. The planning and investment framework should encourage and support those investments to drive the next phase of productivity improvements at ports.

While the Port of Newcastle has put considerable effort into understanding the financial and economic benefits of a container terminal in Newcastle, this investment is currently impeded by NSW government restrictions that place financial penalties on container volumes through such a facility.

The penalties are set out in the Port Commitment Deed that was put in place upon the lease of the Port of Newcastle. It requires the Port of Newcastle to pay penalties to the NSW government for throughput of containers through the port that would otherwise have been handled at Port Botany, with those penalty payments being remitted to the operators of Port Botany. This transfer makes the investment in a container terminal in Newcastle not financial, despite the economic benefits that we estimate would be achieved.

Although the legality of the Port Commitment Deed is a matter currently before the courts, we believe that the Productivity Commission should examine these payments and recommend to the NSW government that they not be enforced, so as to deliver productivity benefits to the maritime logistics system.

Creating an environment of maritime logistics stakeholder engagement to co-design future infrastructure plans will promote better outcomes

The most recent plan for NSW freight and ports was published in September 2018, with the immediate prior plan being developed in 2013. This suggests that the next plan will be developed for implementation around 2023.

The Port of Newcastle believes that five yearly, set and forget freight and port infrastructure plans are inconsistent with investment strategy that is sufficiently agile to respond to changing freight and port needs. Given the increasingly dynamic nature of freight and its associated logistics infrastructure, there is a need to continuously update these plans, and conduct detailed reviews at least every two to three years. This will ensure that infrastructure keeps up with changing circumstances affecting the maritime logistics system.

In addition, there is a need for these infrastructure plans to be co-designed with all stakeholders involved in the maritime logistics system. The historic approach whereby a draft plan is developed and stakeholders are invited to comment is no longer an effective mechanism for achieving the best outcomes. Advances in infrastructure planning in other sectors (such as electricity) involves developing a common understanding of possible future states of the industry, thereby allowing stakeholders to make necessary investment decisions to optimise outcomes. It is time for the maritime logistics system to adopt similar practices to its planning and investment processes.

This could be achieved by:

- governments placing infrastructure users and providers at the centre of logistics and supply chain planning, to ensure that investments are well coordinated and optimised;
- providing an investment environment that encourages private sector investments that compliment existing infrastructure; and
- recognising how diversifying maritime infrastructure can deliver wider public benefits by making better use of existing infrastructure with spare capacity.

We expect that this would create an environment for significant productivity improvements across the maritime logistics system.

APPENDIX A - ASSUMPTIONS

TABLE A1: ASSUMPTIONS FOR THE CALCULATION OF THE COST OF FREIGHT

Description	Value	Source
Containers per truck	1.33	HoustonKemp assumption
TEU per container	1.60	HoustonKemp assumption
Average TEU per truck	2.13	Calculated as containers per truck multiplied by TEU per container
Average cost of running a truck per hour	$47.58	HoustonKemp calculation based on Transport for NSW, *Economic parameter values*, June 2020, p 11, Table 3.
Value of freight per TEU per hour	$22.36	Calculated as average cost of running a truck per hour divided by average TEU per truck.

Tables A2 and A3 below set out HoustonKemp's assumptions for calculating the value of ship wait time improvements and port productivity. Calculations using BITRE, *Waterline 67*, December 2021, Productivity sheet, take the simple average of values between January-June 2019 and July-December 2019.

TABLE A2: ASSUMPTIONS FOR THE CALCULATION OF SHIP WAIT TIME IMPROVEMENTS

Description	Value	Source
Operating cost of a ship	$1,042 per hour	HoustonKemp assumption, based on evidence that stevedoring delays result in increased costs of $25,000 per day. See: ABC, Port Botany dispute off to Fair Work Commission as exporters want union, stevedores to pay for delays, https://www.abc.net.au/news/rural/2020-09-29/port-botanyexporters-want-union-or-stevedores-to-pay-fordelays/12712876.
Regular ship size	8,000 TEU	HoustonKemp assumption
Exchange of containers per ship	25%	HoustonKemp assumption
TEU exchanged per ship	2,000 TEU per ship	HoustonKemp assumption. We note that a 35,000-50,000 GT ship exchanges around 2,000 TEU in Sydney in 2019. See: BITRE, *Waterline 67*, December 2021, PICI Sheet.
Proportion of ships waiting at anchorage at the Newcastle DCT	5.0%	Assumed equal to the other Australian container terminals, excluding Port Botany. See: BITRE, *Waterline 67*, December 2021, Productivity sheet, Jan-Dec 2019.
Proportion of ships waiting at anchorage at Port Botany	21.9%	BITRE, *Waterline 67*, December 2021, Productivity sheet, Jan-Dec 2019.

Average wait time at the Newcastle DCT	18.25 hours	Assumed the same as Port Botany. See: BITRE, *Waterline 67*, December 2021, Productivity sheet, Jan-Dec 2019.
Avoided wait time for ships switching from Port Botany to the Newcastle DCT	3.09 hours	Calculated as the proportion of ships avoiding more than two hours wait time by the average wait time.
Avoided ship operating costs due to reduced wait time	$1.61 per TEU	Calculated as the operating cost of a ship per hour multiplied by the number of hours saved divided by the number of TEU exchanged per ship
Value of freight associated with reduced wait time	$69.04 per TEU	Calculated as the value of freight per hour multiplied by the number of hours saved.
Savings from wait time improvement	$70.65 per TEU	Calculated as the sum of the avoided ship operating costs due to reduced wait time and the value of freight associated with reduced wait time.

TABLE A3: ASSUMPTIONS FOR THE CALCULATION OF PORT PRODUCTIVITY

Description	Value	Source
Ship rate for container terminals in Sydney	100.50 TEU per hour	BITRE, *Waterline 67*, December 2021, Productivity sheet, Jan-Dec 2019.
Ship rate for container terminals in Melbourne	117.25 TEU per hour	BITRE, *Waterline 67*, December 2021, Productivity sheet, Jan-Dec 2019.
Time to exchange containers on an average ship in Sydney	19.90 hours	Calculated as the total TEU exchanged per ship divided by the ship rate in Sydney.
Time to exchange containers on an average ship in Melbourne	17.06 hours	Calculated as the total TEU exchanged per ship divided by the ship rate in Melbourne.
Time to exchange an average ship at the Newcastle DCT	17.06 hours	Assume same as container terminals in Melbourne.
Time saving on exchanging an average ship for ships switching to the Newcastle DCT from Port Botany	2.84 hours	Calculated as the difference between the time to exchange
Avoided costs due to faster container exchange	$1.48 per TEU	Calculated as the operating cost per hour multiplied by the number of hours saved divided by the number of TEU exchanged per average ship.
Value of freight associated with faster container exchange	$63.40 per TEU	Calculated as the value of freight per hour multiplied by the number of hours saved.
Savings from ship rate improvement	$64.88 per TEU	Calculated as the sum of the avoided costs due to faster container exchange and the value of freight associated with faster container exchange.