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Cost-Benefit Analysis of Port Botany Landside Improvement Strategy (PBLIS) Performance

Report to Transport for NSW

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Definitions

Acronym	Definition
ACCC	Australian Competition and Consumer Commission
ANPR	Automatic Number Plate Recognition
BCO	Beneficial Cargo Owner
BCR	Benefit-Cost Ratio
CAPEX	Capital Expenditures
CBA	Cost-Benefit Analysis
CEOS	Cargo Efficiency Operating System
CO ₂	Carbon Dioxide
COVID-19	Coronavirus Disease
CPI	Consumer Price Index
FY	Financial Year
HPV	High-Performance Vehicles
IAP	Intelligent Access Program
IFCBAA	International Forwarders and Customs Brokers Association of Australia
IPART	Independent Pricing and Regulatory Tribunal
IT	Information Technology
km	Kilometre
MTAS	Mobile Terminating Access Service
NPV	Net Present Value
NSW	New South Wales
OPEX	Operating Expenditures
OPM	Operational Performance Management
OPS	Operational Performance System
PAMA	Ports and Maritime Administration Regulation
PBLIS	Port Botany Landside Improvement Strategy
PPP	Peak Period Pricing
RFNSW	Road Freight New South Wales
SICTL	Sydney International Container Terminal Limited
TAC	Terminal Access Charge

TCA	Transport Certification Australia
TfNSW	Transport for New South Wales
TEU	Twenty-Foot Equivalent Unit
TMA	Truck Marshalling Area
TTT	Truck Turnaround Times
VBS	Vehicle Booking System

Executive summary

The Port Botany Landside Improvement Strategy (PBLIS) was introduced in 2010 to promote the economically efficient operation of the landside supply chain at Port Botany. PBLIS addressed concerns that without policy intervention, terminal operators would not have sufficient incentives to improve the efficiency of their landside operations due to the lack of competitive pressure and their ability to shift costs onto the broader landside supply chain. Similarly, there were concerns that if left to themselves, terminal operators (stevedores) and road carriers would have no incentive and no market mechanisms to improve coordination and minimise congestion around the port precinct. The interventions which constitute PBLIS were intended to address those perceived inefficiencies in the land-based operations.¹

PBLIS aims to achieve its objectives through a series of regulatory and operational interventions which apply to the three stevedores—DP World, Patrick, and Hutchison—and about 350 road carriers. The key interventions include:

- Enhancement of a pre-existing stevedore booking system which releases a minimum number of slots per hour every hour (hence promoting 24/7 operation). The requirement is supported by early, late, and non-arrival penalties on road carriers (paid to stevedores) and cancellation penalties paid by stevedores to road carriers.
- Provision of the Truck Marshalling Area (TMA) at no cost to road carriers to provide them with a waiting area away from public roads, thus enabling road carriers to manage their booking slots without congesting public roads.
- Targets for truck turnaround times (TTTs) imposed on stevedores, supported by penalties paid to road carriers for underperforming landside service targets.
- Provision and management of service lines, as well as broader regulation and enforcement of parking and stopping rules around the port precinct, supported by a sophisticated network of automated cameras.

The interventions which comprise PBLIS incur both direct and indirect costs. The direct costs include the cost of capital investments required to provide PBLIS services, such as the physical infrastructure of the TMA, the camera network, and the overall IT system, as well as the annual operating costs incurred by Transport for New South Wales (TfNSW) in providing all the associated services and enforcement activities. Shipping lines—but not terminal operators or road carriers—incur direct costs to fund these administrative activities in the form of higher wharfage fees for all full imports and exports of containers.² The indirect costs could include any unintended effects on the efficiency of either stevedore or road carrier operations which may arise out of the requirements imposed by PBLIS regulations.

¹ A report by the NSW Independent Pricing and Regulatory Tribunal (IPART) in 2008 on the Interface between the Land Transport Industries and the Stevedores at Port Botany.

² In the original proposal, road carriers would contribute to PBLIS administrative costs through the imposition of a Peak Period Pricing (PPP) regime, with fees collected by stevedores on behalf of the regulator.

The benefits of PBLIS would include improved landside efficiency and reduced congestion, which would not have been possible without PBLIS interventions.

Historical data tracking the available performance indicators since the introduction of PBLIS suggests some progress towards the intended objectives:

- There appears to be some evidence that landside terminal operations have been improving in efficiency, with TTTs down from an average of 32.1 minutes in 2011 to 30.6 minutes in 2021, a 4.7 per cent improvement. TTT consistently declined from 2011 to 2016 but began to increase again from 2016 to 2020.
- There appears to be evidence that congestion in the port precinct is minimal, despite growth in truck movements, and that there is no material spill-over of traffic into the adjacent residential areas.
- There has been a limited shift towards 24/7 logistic chain operations (it is important to emphasise that there are many factors that contribute to such shift—including local council regulations and business practices affecting off-port logistics chain components, so limited progress towards the 24/7 logistics system may not by itself reflect success or lack thereof from the PBLIS interventions).
- There appears to be no evidence of unintended consequences, such as reduced truck utilisation. On the other hand, container density (containers carried per truck) has barely changed since 2011, suggesting that there has also been no improvement.

While the analysis of historical data is interesting and informative, PBLIS is only one of many factors which are driving changes in landside performance. Some of the changes (including some of the observed improvements) may have occurred without PBLIS. While there are concerns about the underlying incentives and relative market power of stevedores and road carriers, some voluntary solutions and improvements would have likely been introduced by the market participants in the absence of PBLIS. For example, while TTT has declined over the last 10 years, most of the TTT distribution since 2011 has been below the regulatory trigger level which attracts PBLIS penalties. In other words, it is unlikely that the existence of penalties would have driven the improvement. In fact, one of the criticisms that has been levelled at PBLIS in previous consultations was that it may have stifled some potentially more efficient voluntary outcomes.

To understand the costs and benefits of PBLIS, it is necessary to compare the outcomes under PBLIS with what would happen without it, rather than just looking at the before and after statistics. Of course, the difficulty of doing so is that we cannot observe and predict with precision what would happen without PBLIS. Hence, to undertake a full cost-benefit analysis (CBA) it is necessary to develop a hypothetical counterfactual of what could and is likely to happen without PBLIS considering current industry trends and observable landside behaviour, as well as the incentives driving interactions between the commercial players—stevedores and road carriers. This CBA analysis takes a forward-looking approach: it considers what the world with and without PBLIS may look like over the next 10 years. The forward-looking approach takes past costs (including past investment that cannot be re-used for other purposes) as sunk costs. It also takes today's business practices as a starting point. Castalia then assesses what costs would need to

continue to be incurred if PBLIS remains, and what benefits may be lost (or gained) if PBLIS is abolished.

The advantage of the forward-looking approach is that it allows the report to focus on the economic value of the decisions that are possible now—that is, decisions that may lead to changes in the level and types of PBLIS interventions from where they are today—rather than try to assess once again if PBLIS was a good idea in the first place. That question has already been addressed in previous CBAs.

There is necessarily a degree of speculation involved in developing a realistic counterfactual, and of course to some extent it must be informed by the historical data. To improve the precision of the analysis, the report considers a series of counterfactuals based on potentially removing each key element of PBLIS, one at a time. For example, what would happen if all other elements of PBLIS remained as they are, but TfNSW stopped funding and providing the TMA? After Castalia compares the factual and the counterfactual for each individual intervention within the overall PBLIS regime, the report undertakes the overall CBA to ensure that it considers interactions and inter-relationships between various PBLIS measures.

The main findings of this CBA are:

- The report finds that the key benefit of PBLIS arises from traffic decongestion and reduced emissions thanks to the removal of heavy vehicles from the roads around the port. This is achieved mainly through the provision of the TMA and enforcement of service lines at terminals and, to a lesser extent, parking rules in the port precinct.
- The report finds that efficiency benefits for port operations (as proxies by declines in TTT) are unlikely to be material. The pattern of changes in TTTs below the PBLIS Mandatory Standard thresholds indicates that TTTs are more likely to be driven by the commercial incentives of the stevedores than by policy interventions.
- The report has not been able to identify the indirect material costs of PBLIS. Direct costs include spending on program administration, investment in TMA and investment in the IT systems and street cameras. The existing IT and camera assets would represent sunk costs—that is, if PBLIS were no longer implemented, those assets would have no alternative use. Hence, the report assumes that going forward, the relevant capital cost is any ongoing investment required to maintain and replace the existing technology assets. By contrast, the land under the TMA has alternative use, and hence there is an ongoing opportunity cost to keeping that land for TMA.

The sensitivity analysis indicates that under all scenarios, the benefits of PBLIS over the 10-year assessment period exceed costs. The results are sensitive to assumptions about future traffic growth and the discount rate to be applied. In general, allowing for the obvious margin of error involved in undertaking analysis of hypothetical counterfactuals, the report concludes that the Benefit-Cost Ratio (BCR) of the PBLIS program is somewhere between 2 and 3.

Table 0.1: CBA results of the PBLIS program, 2021-2031

Discount Rate	BCR	Net Benefit
3%	2.96	\$159,752,191
7%	2.52	\$104,457,418
10%	1.91	\$55,836,020

Consultant's calculations

Overall, the report concludes that separate PBLIS components have facilitated an environment at Port Botany that brought about consistent benefits to the port users, public sector, and citizens. Some PBLIS components have a more positive impact than others, and some PBLIS outcomes are likely to persist through voluntary arrangements between stevedores and the road carriers. However, given the interconnected nature of various interventions which constitute PBLIS, it is important to be cautious about interpreting standalone estimates of the benefits of each component.

1 Background

1.1 Background to PBLIS

Communities and businesses in New South Wales (NSW) gain economic benefits from the ability to buy and sell their goods in overseas markets. The movement of goods in sea freight containers through ports plays a critical part in creating economic benefits to stakeholders along the supply chain, all the way to the final customer.

Port Botany is the largest container port in NSW. It plays an important role in facilitating the movement of export and import container freight through Sydney and, more widely, NSW. It handles 95 per cent of the state's container trade. The port's annual throughput in 2021 amounted to 2.69 million twenty-foot equivalent units (TEUs).

The growth of the NSW freight transport and the demand for a 24/7 operating environment requires active cooperation and commercial adaptation by all port-related stakeholders. While the operation of port terminals is under private sector management, the government has a strategic interest that the port is efficiently managed and generates wider economic and social benefits.

Hence, when the 2008 Independent Pricing and Regulatory Tribunal (IPART) review found inefficiencies with container movements at Port Botany and the bottlenecks at the port causing congestion on the wider Sydney Road network, the government introduced regulations to address the identified inefficiencies in 2010. As described in greater detail in Box 1.1, voluntary actions were considered first over 18 months and then regulations were introduced.

PBLIS was introduced to maximise the overall efficiency of the landside containerised logistics supply chain in Port Botany while minimising congestion and negative impacts on the supply chain. While the objectives of PBLIS are focused on the supply chain of freight connected to Port Botany, it is a subset of broader policy objectives, policies, and interventions in the logistics sector by the government. This CBA only considers PBLIS arrangements and their impact (intended and secondary) on select performance measures of the port and relevant stakeholders.

1.1.1 What is PBLIS?

PBLIS comprises a series of regulatory interventions that interact to improve the landside efficiencies of the Port Botany supply chain. Four components in particular set out how various commercial parties (stevedores and road carriers) contract and do business at Port Botany. These components ultimately drove the success of this government intervention. The four main components of PBLIS are:

- Establishment of the TMA
- Introduction of penalties and Mandatory Standards
- Introduction of vehicle booking slots system (VBS) and rules linked to Mandatory Standards and penalties
- Introduction of service lines and enforcement of parking rules for heavy vehicles on the public streets and roads around the port.

Establishment of the truck marshalling area (TMA). TMA was established in 2012 outside of the port to providing a parking space and rest area for trucks that arrive earlier than their booking slot. TMA was meant to take the trucks off the public roads as they wait for their booked slots. TMA allows trucks to park for up to one hour prior to the booking slot.

Introduction of rules and penalties governing the VBS system. When a truck operator picks up or drops off a container at a stevedore’s terminal, the truck operator must make a booking for a time slot to pick up or drop off the container. The booking is made through the stevedore’s VBS, and the data is shared with the regulator.

Various penalties on carriers and stevedores were introduced to reduce inefficiencies associated with landside container movements at Port Botany. Penalties imposed on carriers are summarised in Table 1.1.

Table 1.1: Penalties on carriers

Penalty	Description
Early arrival	A penalty of \$100 per truck applies to carriers for early arrival if the stevedore turns the truck away.
Late arrival	<p>A truck is a late arrival if it arrives at Port Botany after the end of its booked time slot but no more than 30 minutes after the end of a booked time slot.</p> <ul style="list-style-type: none"> A stevedore must accept the late arrival, the TTT will apply from the time of truck entry, and the carrier will incur a \$50 penalty per ‘late arrival’ slot payable to the stevedore. If the truck arrives more than 30 minutes after the end of a time zone, the stevedore can choose to turn the truck away and the ‘no show’ penalty will apply.
No show	<p>The no show penalty is \$100 per booking slot, payable to the stevedore. A truck is classified as a no show in the following circumstances:</p> <ul style="list-style-type: none"> The truck does not arrive at the terminal for its booked time slot. The truck arrives at the terminal more than 30 minutes after the end of the booked time zone and is accepted by the stevedore. The truck arrives later than 30 minutes of the end of its booked time zone but is turned away by the stevedore.
Cancellation	<p>A carrier may cancel a booked time slot, which may be either returned to an exchange pool or deemed as a cancelled slot depending on the cancellation timeframe.</p> <ul style="list-style-type: none"> If the booking is cancelled more than 24 hours in advance of the time slot, the slot will be placed in the exchange pool. If the booking is cancelled between 12 and 24 hours in advance of the time slot, the slot will be placed in the exchange pool. If the slot is not taken up by another carrier, a \$50 fee for the cancelled slot will apply, payable to the stevedore. If the booking is cancelled within 12 hours of the time slot, a \$50 fee for the cancelled slot must also be paid to the stevedore regardless of whether the slot has been taken up by another carrier or not. If the time zone has already commenced, a time slot cannot be cancelled by a carrier.

Penalties faced by stevedores are summarised in Table 1.2.

Table 1.2: Penalties on stevedores

Penalty	Description
TTT underperformance	Stevedores incur a penalty of \$25 for every 15 minutes beyond the applicable TTT, payable to the carrier.
Time zone cancellation	<p>While stevedores cannot cancel individual slots, the guidelines allow them to cancel all slots within a given time zone. Restrictions and varying penalties are imposed on stevedores depending on the cancellation timeframe.</p> <ul style="list-style-type: none"> Stevedores who cancel the time zone after the time zone begins are subject to \$100 penalty per slot in that time zone. Should stevedores cancel the time zone less than two hours in advance, a penalty of \$100 per slot will be payable to the carriers, VBS administration fees will be waived for carriers, and any storage fees that occur as a result will also be waived. In addition, a non-service penalty will be imposed on the stevedores for each cancelled slot. Moreover, the TTT benchmark will apply for trucks that have passed the designated commencement point. Replacement slots must be offered to all cancelled slots within 36 hours of the start of the time zone. Should stevedores provide more than two hours' notice prior to the cancellation of the time zone, a penalty of \$50 per slot will be payable to the carriers, the VBS administration fees will be waived, and any storage fees that occur as a result will also be waived. Replacement slots must be offered to all cancelled slots within 36 hours of the start of the time zone.
Too few time slots offered	Stevedores must offer carriers a minimum number of 54 slots per hour in a 24-hour period. Infringements apply for any breach of this standard.
Truck non-service	<p>Stevedores are penalised for truck non-service in the following circumstances:</p> <ul style="list-style-type: none"> Failing to service a truck that has a slot booking. Declaring that a container cannot be found or is unable to be loaded or unloaded. <p>In the event of truck non-service, the stevedore must pay \$100 per affected slot to the carrier. The TTT benchmark will also apply, and the stevedore must provide a replacement slot for the non-serviced slot within 24 hours. For carriers, the VBS administration fee and any storage fees that occur as a result will be waived.</p>

Stevedores and road carriers typically offset penalties owed to each other. Stevedores generally invoice road carriers (including PBLIS-related invoices), and TfNSW arbitrates penalty disputes between road carriers and stevedores. Penalty exemptions are generally granted to parties for various reasons, as summarised in Table 1.3.

Table 1.3: Reasons for penalty exemptions

Exemption	Exempted party	Description
Unforeseen events	Carriers and stevedores	<p>Any financial penalty that is payable by a party for a failure to comply with a Mandatory Standard is reduced to \$0 in the following circumstances:</p> <ul style="list-style-type: none"> The party is unable to comply with that Mandatory Standard because of an unforeseen event; and

		<ul style="list-style-type: none"> The party provides detailed particulars of the unforeseen event in writing to TfNSW no later than 24 hours after it occurs.
Stevedore impacted trucks	Carriers	Stevedores must not deny stevedore impacted trucks entry into that stevedore's terminal on the basis that the truck has arrived late. Any financial penalty required to be paid by the carrier to the stevedore on the basis that the truck has arrived late is reduced to \$0.
Truck arrives to fulfil two or more bookings in the same time zone for different carriers	Carriers	<p>Any financial penalty that is payable by a carrier for a failure to comply with the regulation is reduced to \$0 in the following circumstance:</p> <ul style="list-style-type: none"> The carrier's truck arrives at a terminal at Port Botany and is manifest in respect of two or more bookings in the same time zone; The bookings were made by different carriers; and The carrier's booking was not the first of those bookings to be manifested.
Early arrivals	Carriers	<p>Any financial penalty that is payable by a carrier for an early arrival is reduced to \$0 in either of the following circumstances:</p> <ul style="list-style-type: none"> At the time the truck arrives at the relevant terminal, a designated TMA is not available for early arriving trucks; or At the time the truck arrives at the relevant terminal the truck is accepted by the relevant stevedore, notwithstanding its early arrival.
Cancellation of bookings (import cargo)	Carriers	<p>Any financial penalty that is payable by a carrier for a failure to comply with the regulation is reduced to \$0 in the following circumstance:</p> <ul style="list-style-type: none"> The stevedore notifies the carrier that a vessel is available; The carrier makes a booking in respect of a container from that vessel; and The stevedore subsequently notifies the carrier that the vessel is no longer available for the time zone in which the booking occurs.
Cancellation of bookings (export cargo)	Carriers	<p>Any financial penalty that is payable by a carrier for a failure to comply with the regulation is reduced to \$0 in the following circumstance:</p> <ul style="list-style-type: none"> The stevedore notifies the carrier that export cargo may be delivered for an export vessel; The carrier makes a booking in respect of a container for an export vessel; and The stevedore subsequently notifies the carrier that export cargo for an export vessel may no longer be delivered for the time zone in which the booking occurs.
Minimum number of slots	Stevedore	<p>A stevedore may reduce the minimum number of slots available within one or more time zones as follows:</p> <ul style="list-style-type: none"> Where the affected time zones occur (either wholly or partially) during the period from the commencement of the stevedore's midnight shift on a weekday or public holiday that is not a Friday until the commencement of the Stevedore's midnight shift for the following weekday. Where the affected time zones occur during the period from the stevedore's midnight shift on a Friday until commencement of the stevedore's first morning shift following the weekend period. Where the stevedore has received the prior written approval of TfNSW, provided that any slots that have been booked in any affected

		time zones are not cancelled other than in accordance with these Mandatory Standards.
Red line hazardous containers	Carriers and stevedores	<p>For Red Line Hazardous Containers, any financial penalty that is payable in respect of that slot for a failure to comply with the Mandatory Standards relating to any of the following is reduced to \$0:</p> <ul style="list-style-type: none"> • The time that a truck arrives at the relevant terminal. • The failure of a truck to arrive at the relevant terminal in respect of that slot. • The truck services performed in respect of the truck that arrives at the relevant terminal in respect of that slot. • The TTT.
Stack runs	Carriers and stevedores	<p>If a carrier makes a booking for a slot that is an empty bulk or full bulk stack run booking, then any financial penalty that is payable for a failure to comply with the Mandatory Standards relating to any of the following is reduced to \$0:</p> <ul style="list-style-type: none"> • The time that a truck arrives at the relevant terminal in respect of that slot. • The failure of a truck to arrive at the relevant terminal in respect of that slot. • The truck services performed in respect of the truck that arrives at the relevant terminal in respect of that slot. • The TTT. <p>Stack runs are not counted toward the minimum number of slots required to be made available under the regulation.</p>
Reduction of number of slots offered per hour	Stevedore	<p>Any financial penalty that is payable by a stevedore for a failure to comply with the Mandatory Standard with respect of the number of slots to be made available by that stevedore in one or more hours is reduced to \$0 in the following circumstances:</p> <ul style="list-style-type: none"> • TfNSW approves a reduction in the minimum number of slots to be made available by that stevedore in each affected hour. • The stevedore makes available no less than the reduced minimum number of slots in each affected hour in respect of which all carriers can make bookings. • The stevedore gives notice of the reduced number of slots for each affected hour to every carrier within one hour after receiving the approval of TfNSW. • TfNSW has not revoked its approval before the time that the failure occurs.
Failure by a carrier to provide information to TfNSW	Stevedore	<p>Any financial penalty that is payable by a stevedore to a carrier for a failure to comply with a Mandatory Standard is reduced to \$0 in circumstances where, at the time of the failure, the carrier has not given TfNSW the information that is required to be given by that carrier in accordance with the regulation.</p>
Failure by a carrier to provide information to the stevedore	Stevedore	<p>Any financial penalty that is payable by a stevedore to a carrier for a failure to comply with the Mandatory Standard in respect to a booking is reduced to \$0 if the carrier fails to provide the requisite information to the stevedore.</p>

<p>Change of availability of the vessel</p>	<p>Stevedore</p>	<p>Any financial penalty that is payable by a stevedore to a carrier for a failure to comply with a Mandatory Standard is reduced to \$0 in the following circumstance:</p> <ul style="list-style-type: none"> • The stevedore notifies the carrier that a vessel would be available for a booking of a container to be collected or delivered from or for that vessel; • The carrier makes a booking for the purpose of collecting or delivering that container; • The vessel subsequently becomes unavailable to the stevedore; and • The stevedore notifies the carrier at least 12 hours in advance.
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As Table 1.3 demonstrates, TfNSW exercises a considerable degree of discretion in granting exemptions to breaches of the Mandatory Standards. Stevedores and carriers also have some flexibility in contracting with one another—and oftentimes a mateship culture has developed between the parties. In a joint response to TfNSW in 2021, the International Forwarders and Customs Brokers Association of Australia (IFCBAA) and Road Freight New South Wales (RFNSW) characterised the ‘mates’ structure’ between certain members of the supply chain and stevedores as inefficient.³

Mandatory Standards. Penalties cannot be designed without clearly defined standards against which they are charged. Mandatory Standards were introduced in December 2010 as a part of Phase 2 of PBLIS implementation. The standards are set by the Minister under the authority of the Ports and Maritime Administration Regulation 2021 (Part 6). Mandatory Standards apply to road carriers, stevedores, and VBS providers with respect to their operations conducted at or in connection with Port Botany.

The standards prescribe the allowable ceiling for TTTs and early or late arrivals, as well as defining other aspects of the PBLIS regime that would incur penalties if violated. Mandatory Standards are intended to create accountability between stevedores and road carriers and ensure consistently high operational performance from both parties. For example, stevedores need to financially compensate road carriers if the stevedores exceed the maximum allowed time for TTT for one container of 45 minutes (with an extra 20 minutes for each additional container).⁴ This standard encourages stevedores to improve their business operations and sustain their operating efficiencies.

Service lines and enforcement of parking rules for heavy vehicles on the public streets and roads around the port. A service line is a corridor leading to the terminal gate, where trucks are expected to smoothly proceed in a queue for their turn to be serviced. While the TTT clock generally starts as trucks pass through the gate, it can start earlier if there are long queues at

³ International Forwarders and Customs Brokers Association of Australia (IFCBAA) and Road Freight New South Wales (RFNSW), *Ports and Maritime Administration (PAMA) Regulatory Remake*, Sydney, Australia, January 2021.

⁴ Minor changes to the allowed TTT range have taken place since the introduction of PBLIS. The referenced TTT range came into force in late 2015.

service lines. This is done to penalise a stevedore for inefficiencies that lead to queueing along the service line which can potentially spill over to the residential areas around the port. To minimise the negative consequences of truck traffic in surrounding streets, the areas surrounding the port have limits on where heavy trucks can park. Traffic management on these streets discourages illegal stopping and congestion. It should be emphasised that PBLIS is often not directly responsible for the introduction of traffic controls on these streets. Given the problem of congestion due to parking of heavy vehicles on public roads surrounding the port, strict traffic management and parking enforcement on these roads is also handled by the local governments.

These four components of PBLIS regulation were introduced at slightly different times. While intended to be complementary and work as a package, it is possible to estimate the impact of each individual component on the performance measures. This is addressed in Section 3.

Box 1.1 describes the two-stage process of PBLIS implementation.

Box 1.1: Staged implementation of PBLIS

Implementation of PBLIS was carried out in two phases. Phase 1 focused on developing and implementing voluntary initiatives with the assistance and leadership of Sydney Ports Corporation. In addition, Phase 1 saw the introduction of voluntary road and rail performance standards and reporting requirements. Parties agreed that if voluntary interventions were not successful in reducing congestion and improving efficiency, government intervention, or Phase 2, was to be initiated to correct inefficiencies.

Because Phase 1 did not result in significant improvements, regulated requirements and operating performance standards were introduced through the Regulation and the Mandatory Standards in December 2010 (Phase 2).

Phase 2 introduced the Operational Performance Management (OPM) framework for carriers and stevedores. The OPM framework provided incentives to improve efficiency and imposed penalties on carriers and stevedores for failing to meet certain performance standards, such as on-time arrival and failure to provide services that had been booked.

	Carrier OPM	Stevedore OPM
Objective	The main goals of the Carrier OPM were to improve carrier ability to arrive within the time zone and spread the workload for stevedores.	The Stevedore OPM sought to improve stevedore efficiency by imposing penalties on stevedores for failing to perform within specified timeframes or failing to complete all services.
Penalties	No Show fees, Late Entry fees, and Booking Cancellation fees	TTT fees, Truck Non-Servicing (total or partial) fees, and Time Zone Cancellation fees

1.2 This Cost-Benefit Analysis

TfNSW requested economic consulting services to undertake a CBA of PBLIS to inform an Independent Review of PBLIS and the Ports and Maritime Administration Act 1995 (the Act). TfNSW seeks to understand what PBLIS has achieved since its inception, whether the PBLIS arrangements are appropriate, and whether PBLIS remains the best regulatory approach to manage the landside interface at Port Botany. If PBLIS is not meeting its objectives, TfNSW will consider alternative regulatory options.

The outcome of this CBA is the qualitative and quantitative estimation of direct and indirect economic, social, and environmental costs and benefits of PBLIS, which focus on the impacts on road freight carriers, stevedores, beneficial cargo owners (BCOs), and the government. Analysis of a counterfactual scenario (a hypothetical scenario in which the various PBLIS components are abolished) will provide additional visibility on what the containerised freight supply chain would look like without PBLIS, assuming parallel developments in the sector.

1.2.1 Structure of CBA

To provide substantiated evidence on the performance of PBLIS, this CBA will:

- Introduce the methodological approach it uses (Section 2).
- Review previous analyses of PBLIS performance, analyse what PBLIS has achieved to date, and determine whether it created any unintended impacts (Section 3).
- Look at a counterfactual scenario and estimate the impact of key PBLIS components on efficiency improvements (Section 4).
- Quantify its costs and benefits to different stakeholders (Section 5).
- Discuss its impact on rail freight in Port Botany (Section 6).
- Provide conclusions as to whether PBLIS remains the best approach for managing the landside interface at Port Botany (Section 7).

Our approach to conducting this CBA is in line with the TfNSW *Cost-Benefit Analysis Guide* which also aligns with the high-level guidance in the NSW Treasury's *Guide to Cost-Benefit Analysis*.

2 Performance measures and methodology

The set of interventions implemented under PBLIS was designed to achieve changes in the behaviour of port players and the specific attributes of port performance. Measuring these port performance measures and how they changed since the inception of PBLIS can indicate the degree of success in achieving PBLIS objectives.

Measures deliberately targeted by PBLIS are described in Table 2.1.

Table 2.1: Performance measures expected to be improved under PBLIS

Measure	Intended impact	Rationale
TTT	Reduced	Faster truck turnaround time indicates how efficient the stevedore is at servicing each truck. Mandatory Standards and penalties were imposed on stevedores for not meeting the standards. In this way, PBLIS aimed to incentivise stevedores to improve the efficiency and consistency of their services.
Consistency in TTT	Improved	Consistency of TTT is an important factor indicating predictability and reliability of stevedore services. Consistency of stevedore services allows road carriers to plan more accurately.
Congestion on the roads	Reduced	One of the objectives of PBLIS was to reduce the congestion on the public roads in the port precinct. Truck parking on the streets as well as queueing were two related concerns for the government.
Queueing	Reduced	Queueing in and around terminals causes a negative effect on the road carriers as well as a negative environmental externality. Queueing reduces the overall port and freight supply chain efficiency and productivity.
Freight by rail	Increased	In FY2020-21 Port Botany's container rail mode share was 15.3 per cent—a figure that has barely changed since the inception of PBLIS in 2010. The government's long-term goal is to increase the rail mode share of Port Botany. ⁵
Shift to a 24/7 port	Increased	One of the objectives of PBLIS is to increase landside efficiency at the port by smoothing the demand profile (that is, booking slot allocation across the week and throughout the day). This is expected to have a positive impact on queues at terminals and congestion on the roads.

To better understand the impact of PBLIS, one must look at a broader set of measures than those specifically targeted by PBLIS. By looking at impacts on the logistics sector, it is possible to uncover both positive and unintended consequences down the supply chain which may not be easily visible. To get a fuller picture of the PBLIS impact on the various aspects of the freight logistics supply chain associated with Port Botany, this report considers two additional performance measures:

- **Truck fleet utilisation.** Trucks are expensive to hire and are most optimally utilised when not idle or waiting in queues. For trucks to be optimally utilised, they should be on the move carrying containers and increasing productivity and utility for their BCOs. While PBLIS aimed to reduce TTT, and hence, assumed to also reduce the degree of idleness of trucks, this analysis verifies whether this was in fact true. Instead of being idle in the terminal

⁵ A strategic target of the NSW Freight and Ports Plan 2018-2023 was to increase the share of rail freight at Port Botany to 28 per cent by 2021 (against a 2016 baseline of 17 per cent).

queue or parked on surrounding roads, trucks may be waiting at the TMA or on the supporting roads.

- **Stevedore efficiency.** Prior to PBLIS (that is, when there was no government regulatory intervention that prescribed market discipline and rules in how stevedores operated in relation to road carriers), stevedores had significant market power. In absence of penalties for high TTT, stevedores could shift the cost burden to other parties. Truck drivers would be idle for longer as they waited to be serviced and would congest public roads or queue in terminals. PBLIS could have reduced the market power of stevedores, making the commercial relations between the port players fairer and more equitable. It was expected that stevedores would be incentivised to invest in improving their business processes to consistently meet the Mandatory Standards and avoid penalties.

Section 3 presents findings of how these performance measures have performed under PBLIS.

2.1 CBA Methodology

The following section outlines the methodology the report utilises in undertaking the CBA. The methodology follows the principles, concepts, and procedures outlined in the Transport for NSW Cost-Benefit Analysis Guide to measure the full economic, social, and environmental impacts of PBLIS on the NSW community.⁶ In keeping with this guidance, the CBA will consider both qualitative and quantitative dimensions of PBLIS, with inflation-adjusted and discounted monetary estimates using the TfNSW Economic Parameter Values wherever practicable.⁷

2.1.1 Designing a counterfactual and defining the appraisal period

First, the report constructs a series of counterfactual scenarios to analyse what the situation would look like if one of key PBLIS components were abolished starting now. The counterfactual analysis and this CBA take a *forward-looking approach* to inform policy decisions with respect to the regulation. In other words, instead of asking how the world has changed with PBLIS, the report asks how it would change from now if PBLIS overall, or its components, were abolished. Castalia considers such a forward-looking analysis appropriate for a review of a long-established intervention since the policy choices available now are not the same as when the implementation of PBLIS was being contemplated. The on-the-ground reality is the continuation of the existing intervention, while the counterfactual is modifying or abolishing it.⁸

Assessment period

Given the forward-looking nature of the assessment, this CBA defines its appraisal period as the 10-year period between 2022 and 2031. For calculations involving inflation, 2021 is utilised as the common base year on which real dollar values will be compared.

⁶ Source: <https://www.transport.nsw.gov.au/projects/project-delivery-requirements/evaluation-and-assurance/transport-for-nsw-cost-benefit>

⁷ Source: <https://www.transport.nsw.gov.au/projects/project-delivery-requirements/evaluation-and-assurance/technical-guidance>

⁸ This counterfactual scenario differs from that adopted in previous CBAs, which consisted of before-and-after comparisons.

2.1.2 Determining project options

The report examines the four main components of PBLIS which together set out the regulated side of landside interactions of the commercial parties at the port:

- The TMA,
- VBS system,
- Mandatory Standards and penalties, and
- Service lines and parking rules for heavy vehicles on the streets around the port.

The project (policy) options are the available options to modify or terminate those interventions going forward. In Section 5, the report discusses the possible impact of removing each of the four PBLIS components, followed by hypotheses on what could happen at the terminals and the wider supply chain in each respective scenario.

2.1.3 Determining costs and benefits

Table 2.2 summarises potential benefits from the intervention.

Table 2.2: Benefits of PBLIS

Category	Item
User benefits (landside efficiencies)	<ul style="list-style-type: none">▪ TTT▪ Container density
Social benefits	<ul style="list-style-type: none">▪ Environmental externalities▪ Safety benefits▪ Decongestion benefits
Government benefits	<ul style="list-style-type: none">▪ Avoided road maintenance (avoided)

Source: Transport for NSW Cost-Benefit Analysis Guide

Similarly, Table 2.3 shows a preliminary summary of potential economic, environmental, and social costs.

Table 2.3: Costs of PBLIS

Category	Item
Capital costs	<ul style="list-style-type: none">▪ Annual reinvestment cost▪ Opportunity cost of TMA land
Recurrent costs	<ul style="list-style-type: none">▪ Administrative costs (non-labour)▪ Labour costs
Indirect costs	<ul style="list-style-type: none">▪ Potential reduction in private sector innovation and other unintended effects

Source: TfNSW Cost-Benefit Analysis Guide

2.1.4 Transport modelling

For the purposes of this exercise, Castalia models transport impacts as additional vehicle kilometres that would likely be travelled around the port precinct in the event of changes to PBLIS.

The forward-looking model of benefits uses a central forecast of annual truck growth of 2.92%. This forecast is based on the trend average annual container growth rate at Port Botany in the period 2011-2021.⁹ Since container densities per truck did not change materially in this period, truck growth rate was assumed to be the same. The model additionally calculates sensitivities based on different annual truck growth rates (lower and higher than the base 2.92%) to see the impact on the net benefit and cost-benefit ratio.

2.1.5 Social discount rate

While the costs and benefits of PBLIS are distributed relatively evenly over time, Castalia finds that the time value of costs and benefits does make a difference to the analysis. Following government guidance, this CBA undertakes discounting at a central or reference discount rate of 7 per cent (in real terms), with sensitivity testing undertaken at 3 per cent and 10 per cent.

2.1.6 Determining the preferred option

The report then utilises the economic, social, and environmental impacts of PBLIS to calculate the BCR and the Net Present Value (NPV) of the regulation. Castalia also considers qualitative factors and suggests possible modifications to PBLIS which emerge from our analysis that may better align the goals of the regulation with its effects on stakeholders at Port Botany and along the broader supply chain.

3 PBLIS performance to date

3.1 Findings from past studies

This CBA will not be the first study that aimed to measure PBLIS performance against a selected set of performance measures. Previous assessments of PBLIS performance (using data analysis, surveys, and consultations) found that overall, PBLIS has been delivering positive benefits, and was cost-benefit justified. Box 3.1 below describes some key findings from Deloitte Access Economics, a consultancy that undertook past CBA analyses.

⁹ TfNSW data

Box 3.1: Assessment of PBLIS performance—past studies

Previous analyses found that TTTs improved more than anticipated, but this was somewhat offset by a smaller than expected increase in dual running and unchanged container densities (compared with an expectation that peak period pricing would lead to improvements in the latter two). Previous analyses did not consider the full impacts of PBLIS and excluded the impacts of rail price regulation and stevedore data provision requirements on rail servicing.

Deloitte Access Economics provided a cost-benefit analysis of Stage 1 of PBLIS in 2009. Subsequently, updates were produced in 2012 and 2016. This analysis indicated that PBLIS has improved efficiency at Port Botany. Analysis using data to August 2015 estimated that PBLIS would deliver almost \$100 million in economic benefits to importers, exporters, taxpayers, and consumers by 2018.

Deloitte's analysis showed that average TTT decreased by almost 30 per cent between 2009 and 2012. Moreover, on-time running improved from 72 per cent in 2009 to 95 per cent of trucks arriving on time in 2012, to 96 per cent in 2015. It was also found, however, that container densities remained relatively stable at 1.31 containers per truck during the PBLIS trials, with a drop in density to 1.29 containers per truck in 2012, and back to 1.31 containers per truck in 2015. Dual runs initially decreased from 11.5 per cent during the trials to 9.8 per cent under PBLIS in 2012 (excluding ECP journeys). However, they picked back up again to 11.7 per cent in 2015.

Deloitte Access Economics

3.2 Historical evolution of PBLIS performance indicators

This CBA complements previous work measuring PBLIS performance by expanding the analysis to the most recently available data in 2021. It also adds a conceptual discussion on whole-of-supply chain interactions (Section 3.3) and adopts a novel counterfactual scenario (Section 4). Together, these analytical pieces can provide the government and the industry a basis for thinking about whether PBLIS remains the best regulatory approach to the landside interface at Port Botany.

Several caveats should be mentioned prior to interpreting the results, especially in the years 2020-2021:

- In 2019-20, TfNSW transitioned from the Operational Performance System (OPS), which had provided business warehouse reporting services from 2011-19, to the Cargo Efficiency Operating System (CEOS). In general, there is data consistency between OPS and CEOS but there are small differences in wording and definitions of certain variables. CEOS collects a greater amount of data.
 - CEOS encompasses 16 files and 27 tables in a complicated relational database. While CEOS renders the data to the front end and cleans the raw data to represent the data in a similar way to OPS, there are differences between the two systems.
- The COVID-19 pandemic has negatively impacted the global container freight supply chain. Lockdowns, border closures, and travel restrictions have shifted consumer demand from

services towards manufactured household goods that are typically transported in containers. At the same time as this shift in consumer preferences, negative shocks to the supply chain have reduced shipping and port capacity.

- In the context of a whole-of-life PBLIS review, however, TfNSW reports that the pandemic’s impacts on the landside supply chain at Port Botany have been manageable. In reviewing the data in the context of macro shocks, it is important to consider whether COVID-19 represents an inflection point or a prolonged but ultimately transitory event.
 - Figure 3.1 demonstrates that TTT declined 2.8 minutes (8.3 per cent) between 2020 and 2021 despite pandemic-related shocks to the supply chain. The decline of TTT was somewhat unexpected since COVID-19 protocols resulted in disruptions to the landside interface, including the outright cancellation of time zones to allow for deep cleaning between shifts. In hindsight and assuming the impact of time zone cancellations applied equally to both landside and quayside components of the supply chain, such events should not have significantly impacted measurable landside indicators. It therefore appears that the observed reductions in TTT were driven by exogenous factors and can be sustained in the future.
 - Figure 3.11 and Figure 3.13 show that containers per truck and container throughput have also increased during the pandemic. To the extent the shift in consumer preferences from hospitality services to durable goods represents a transitory pandemic-related reduction in leisure opportunities, the effects of the pandemic on these indicators will likely be short-lived.

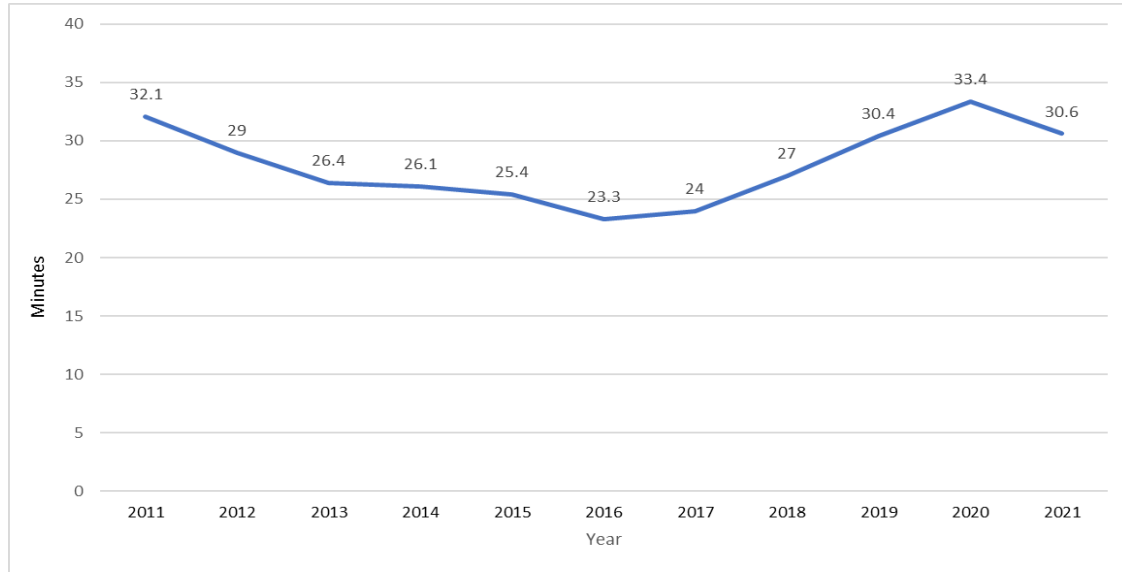
To estimate PBLIS performance, this report examines how the performance measures associated with PBLIS have been changing since 2011.

3.2.1 Truck Turnaround Time

TTT declined from 2011 to 2016 but began to increase again from 2016 to 2020. Between 2011 and 2021, average TTT improved by 4.7 per cent, from 32.1 minutes in 2011 to 30.6 minutes in 2021. The average TTT for the period was 28.0 minutes.

The largest year-on-year reduction in TTT was between 2011 and 2012, when TTT dropped 9.7 per cent. The largest year-on-year increase in TTT was between 2018 and 2019, when TTT jumped 12.7 per cent from 27.0 minutes to 30.4 minutes.

Figure 3.1: Port Botany average TTT, 2011-2021



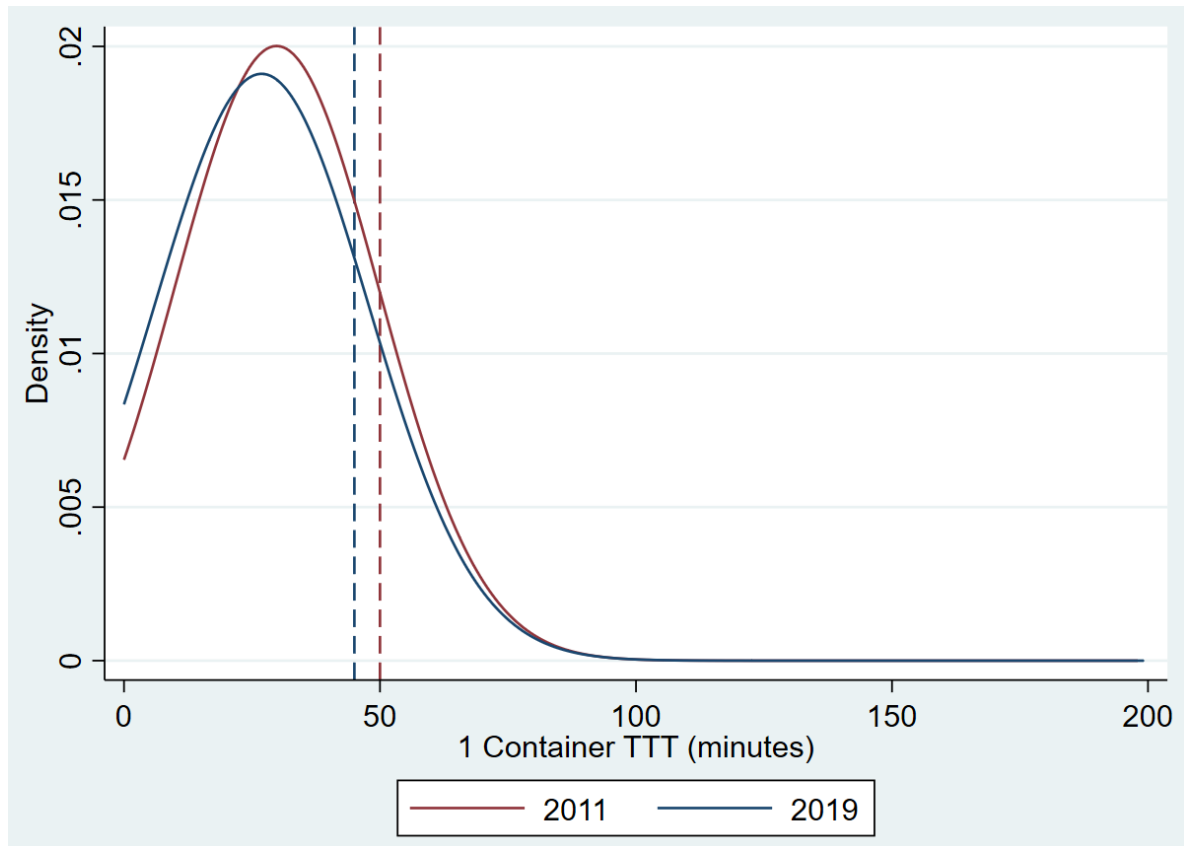
Note: Data is updated as of October 2021
Source: TfNSW

Figure 3.2 illustrates the normalised TTT distribution for trucks carrying one container in 2011 and 2019 (our approach to understanding the effects of Mandatory Standards is to compare the first year of full PBLIS implementation with the last year before the COVID-19 effects). Between 2011 and 2019, the TTT distribution has shifted inwards, as one might expect given the reduction in average TTT time shown in Figure 3.1. However, as a proportion of total truck trips, arrivals within the Mandatory Standards threshold actually decreased (after allowing for the reduction in mandatory threshold from 50 minutes to 45 minutes in late 2015). Around 86.6 per cent of one-container truck turnarounds in 2011 were at or below the allowed TTT, while in 2019 85.1 per cent of one-container turnarounds satisfied the requirement.¹⁰

Overall, it appears that there was little effort by stevedores to reduce the tail of long turn-around time in response to the reduction in the mandatory threshold. Most of the decline in average TTT can be explained by the shift in the distribution that has occurred to the left of the 45-minute maximum 2019 TTT allowance (the dashed red line). In other words, while some improvement in TTT can be attributed to the Mandatory Standard, most of the improvement seems to be occurring well within the range of turnaround times that is not influenced by the penalties. The reduction in mandatory threshold in 2015 appears to have directly translated into a 1.5 percentage point reduction in within-threshold turnarounds.

¹⁰ The allowed TTT threshold for one-container shipments decreased from 50 minutes to 45 minutes in late 2015.

Figure 3.2: Normalised TTT distribution of trucks carrying one container in 2011 and 2019



Note: Dashed red line indicates the allowable TTT for trucks carrying one container in 2011 (50 minutes). Dashed blue line indicates the allowable TTT for trucks carrying one container in 2019 (45 minutes).

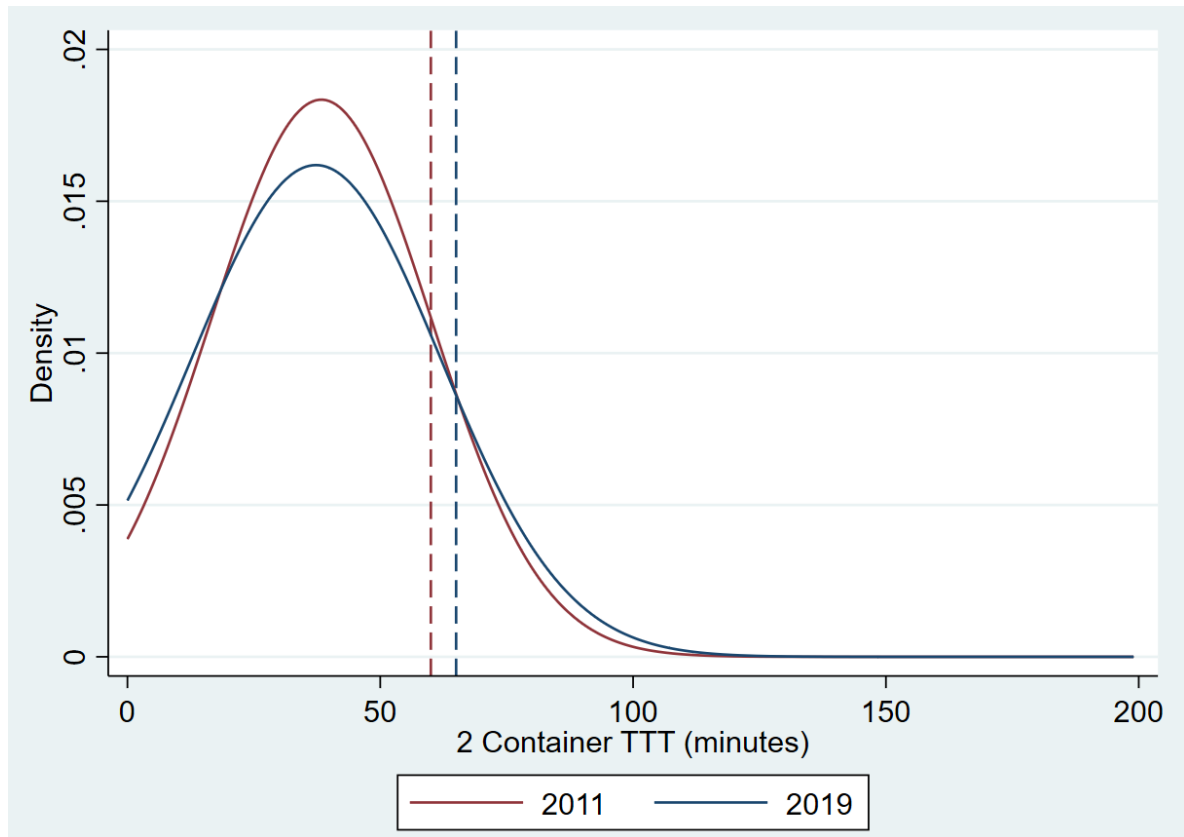
37,800 observations (6.3 per cent of the total number of observations) greater than or equal to 200 minutes were dropped from the dataset.

Source: TfNSW

Figure 3.3 shows the normalised TTT distribution for trucks carrying two containers in 2011 and 2019. Between 2011 and 2019, the TTT distribution became more dispersed, with more observations occurring away from the centre of the dataset. For two-container trucks, TTTs within the Mandatory Standards threshold improved: in 2011, 86.5 per cent of two-container truck arrivals were within the limit, compared with 88.5 per cent in 2019.¹¹ However, this again appears to be explained by the increase in the Mandatory Standard turnaround, and there is no obvious evidence of the threat of TTT penalty driving avoidance behaviour.

¹¹ The allowed TTT threshold for two-container shipments increased from 60 minutes to 65 minutes between 2011 and 2019.

Figure 3.3: Normalised TTT distribution of trucks carrying two containers in 2011 and 2019



Note: Dashed red line indicates the allowable TTT for trucks carrying two containers in 2011 (60 minutes). Dashed blue line indicates the allowable TTT for trucks carrying two containers in 2019 (65 minutes). 11,850 observations (also 6.3 per cent of the total number of observations) greater than or equal to 200 minutes were dropped from the dataset.

Source: TfNSW

3.2.2 Congestion on public roads and queuing

The various components under PBLIS were collectively meant to help reduce queuing and excessive parking around the port. Using the Transport Certification Australia (TCA) data,¹² we can observe that the problem of congestion spilling over on the local roads appears to be largely resolved. As the images below show, the journeys seem to occur where they are supposed to be (major roads leading to the port) with only very minor spill-over to the residential streets.

¹² TCA. Port Botany Container Movements Report. Assessed on TCA portal, February 7, 2022. Data on 232 High-Productivity Vehicles (HPV) that passed through the Port Botany container terminal.

Figure 3.4: Number of truck journeys on the streets around Port Botany



Note: This dashboard contains data from approximately 232 vehicles monitored in 2020 through the Intelligent Access Program (IAP) within the National Telematics Framework that have recorded movement through the Port Botany container terminal. The vehicles are all High-Performance Vehicles (HPV) and are either longer, wider, or heavier than most port trucks and are not able to use all the same roads or go to all the same locations as most trucks. Castalia therefore does not treat this dataset as a representative sample of port trucks in general.

Source: TCA data

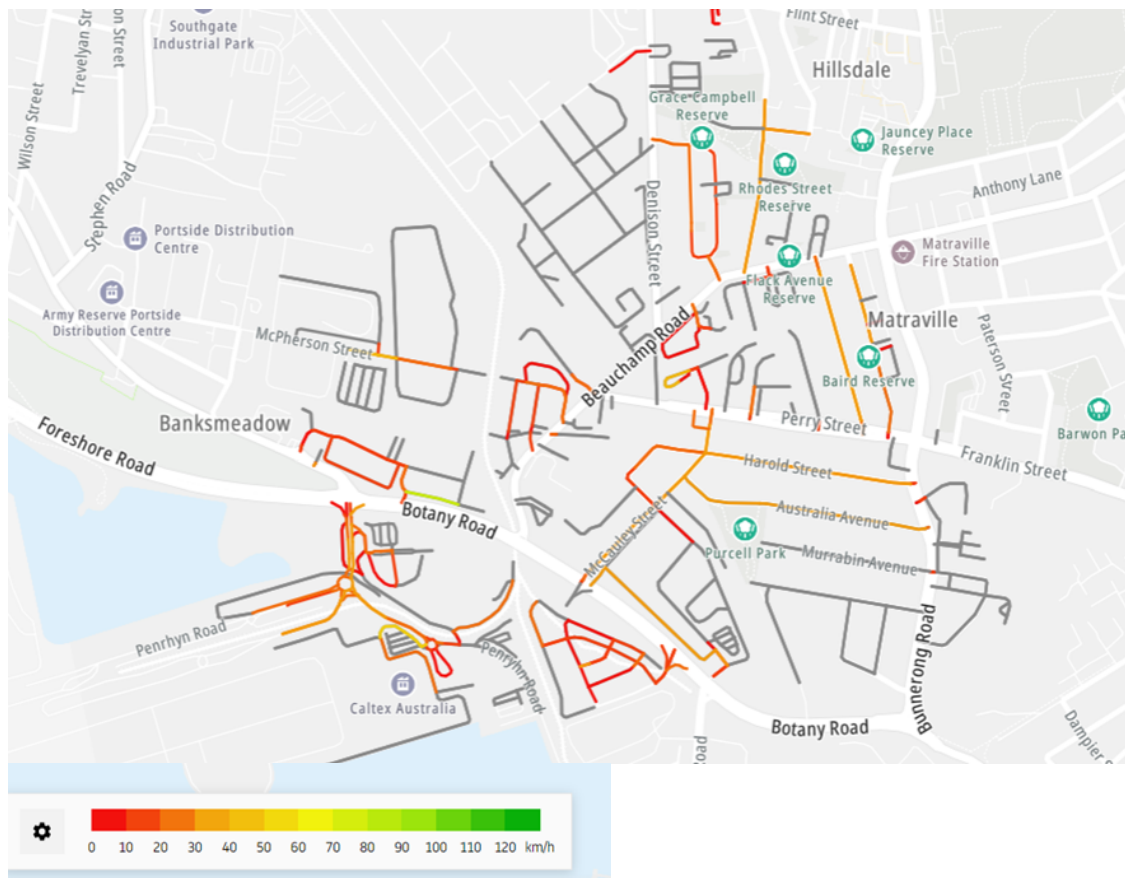
The TCA data also indicates that the average time spent by the trucks covered by the data on the main thoroughfares around the port precinct is in line with the expected travel times and is not consistent with periods of parking on the roadside.

During a site visit to the port area, the Castalia team observed that sometimes trucks choose to park on the streets adjacent to the port rather than stay at TMA. Castalia understands from discussions with the TfNSW team that in the past six months TMA reached its full capacity on a few occasions, but that generally there is capacity available. There could be several reasons why trucks may still have incentives to park on the streets:

- TMA limits parking to the hour prior to the booked time zone.
- Not all the trucks that park on the streets are waiting to go to terminals. Rather, some are waiting to enter yards.
- Hutchison terminal is located farther to the TMA than other stevedores (requiring 5 to 7 minutes driving). Hence, trucks going to Hutchison could have a higher incentive to park on the roadside closer to the Hutchison gates instead of at the TMA.

While there is still no consistent data to analyse long-term developments of traffic movements around the port, a snapshot of public data averaged over January 2022 (Figure 3.5) indicates that public roads around Port Botany remain somewhat congested (however, the TomTom data includes all types of vehicles).

Figure 3.5: Median speed on local roads and streets in the precinct of Port Botany, January 2022



Source: TomTom Move

3.2.3 Booking slots released and the shift towards a 24/7 port

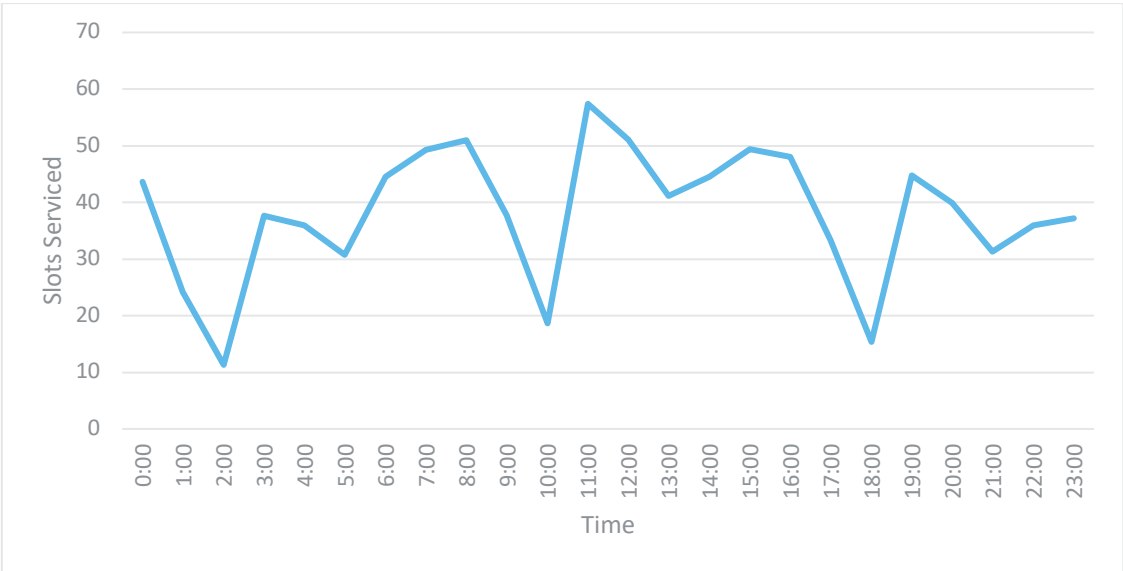
Mandatory Standards regulate the minimum number of booking slots per hour that stevedores must release. The minimum number of released slots per hour as required by the Mandatory

Standards is 54 slots per hour. The objective is to smooth out the operations of the port and promote round-the-clock operations.

Figure 3.6 shows the distribution of booking slots released between 2011 and 2021 by hour of the day. According to TfNSW, certain time zones are less productive than others due to meal breaks. In practice, stevedores are required to compensate for these unproductive periods by offering additional bookings in other time zones. However, the figure suggests that the regulations governing the minimum number of slots per hour in the Mandatory Standards may not be the main driver of slot availability and utilisation. Slots are also adjusted for the capacity of various terminals. On average, road carriers booked 38.1 slots per hour—below the minimum requirement for each stevedore to release 54 booking slots in a single time zone.¹³

The minimum requirement does not seem to affect performance, as stevedores can continue to release the minimum slots required while accepting the slots that make business sense. Regulators should ensure that the stevedore incentives reflect the objective to further spread the demand profile over the 24-hour workday and explore opportunities to change the regulations governing the minimum booking slots per stevedore.

Figure 3.6: Average slots booked per time zone, 2011-2021



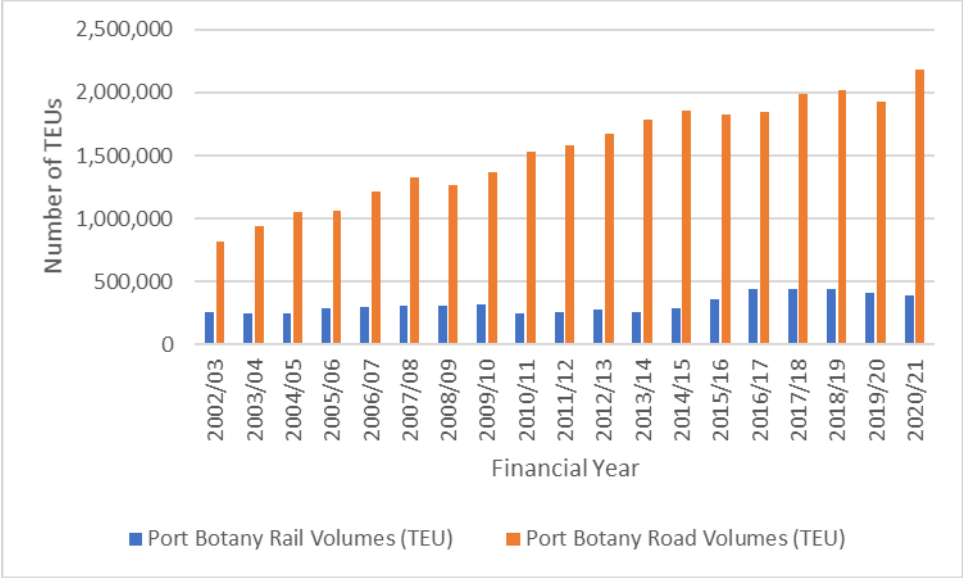
Note: Includes slots booked and subsequently cancelled
Source: TfNSW

Road carriers expressed desire for stevedores to release more slots during peak hours to avoid a ‘scramble’ for slots. Given the limited working hours of downstream supply chain participants such

¹³ Figure includes weekends. Some stevedores have less capacity than others and as such can only handle a limited number of bookings. This is understood by TfNSW and accommodated in the slots available.

as warehouses and stores, there is a significant preference among road carriers for peak hour slots for truck servicing. Road carriers would prefer to see stevedores increase their capacity to service more trucks at peak periods while minimising the variations in TTT. As Figure 3.7 shows, container throughput at Port Botany has increased in the aggregate since 2002, primarily driven by increases in road volumes.

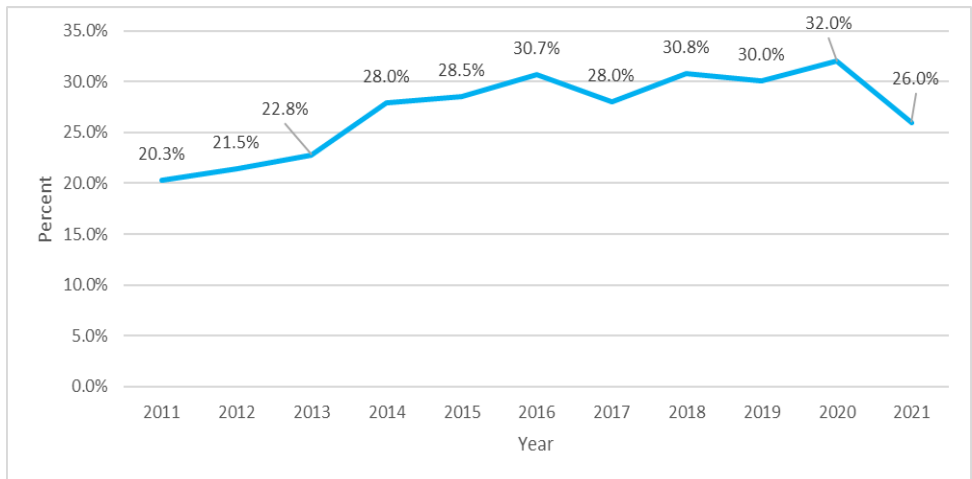
Figure 3.7: Total Port Botany road and rail throughput volumes (TEU), 2011-2021



Source: TfNSW

As a proportion of total booking slots, penalised slots have increased slightly since 2011 (Figure 3.8). This may indicate that port players have incorporated the costs of penalties into their cost of doing business. This may also indicate that the dollar values of the penalties are not enough of a deterrent to change behaviour.

Figure 3.8: Breaches of the Mandatory Standards over time

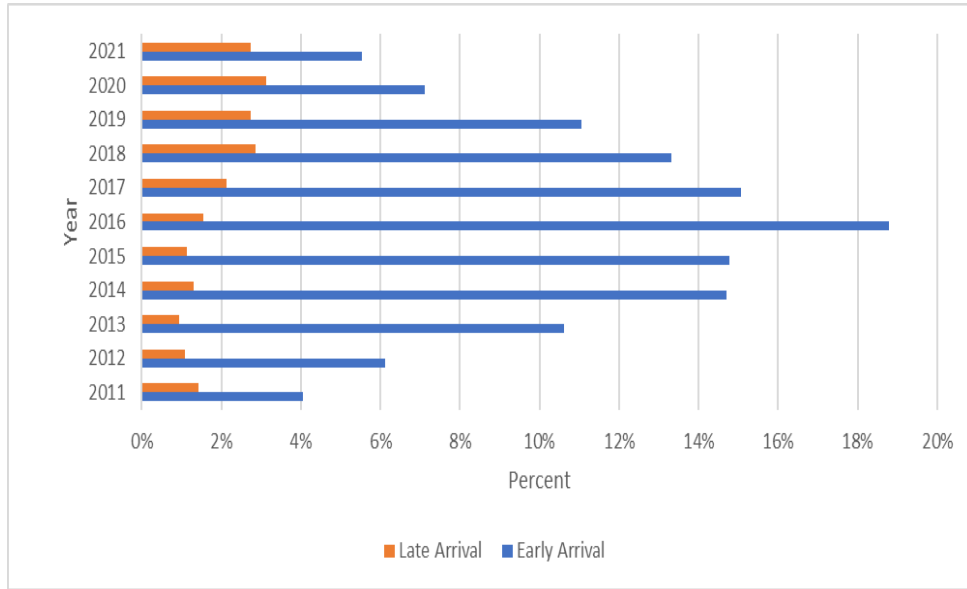


Note: Calculated by dividing the total number of breaches by the total number of bookings available (multiple penalties possible for one booking)

Source: TfNSW

As a proportion of total booking slots, Figure 3.9 demonstrates that early arrivals occur more frequently than late arrivals. It is important to emphasise that almost all recorded early arrivals tend to be accepted by stevedores and hence do not incur penalties, while late arrivals do. If road carriers were concerned that their recorded early arrival would not be accepted, they obviously would have the opportunity to circle around the port precinct—precisely the activity that PBLIS seeks to minimise—or wait at the TMA, where a notice board informs drivers when specific time zones have opened early. Notwithstanding the formal arrangements at the TMA, the fact that drivers present themselves early on so many occasions suggests a degree of commercial flexibility around the Mandatory Standards.

Figure 3.9: Late and early arrivals over time



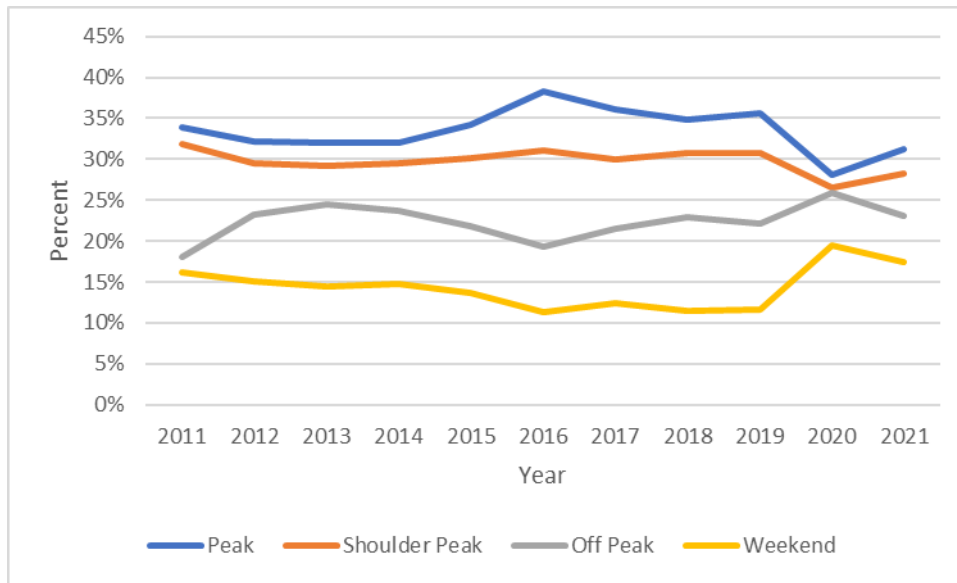
Note: Early arrivals include non-penalised instances wherein stevedores invite road carriers to the port prior to their booking slot
Source: TfNSW

With respect to the distribution of the slots throughout the week, Figure 3.10 demonstrates a limited shift towards 24/7 logistic chain operations. However, it is important to emphasise that TfNSW observed a more substantial shift toward 24/7 operations soon after PBLIS was introduced in 2010, and this is not captured in the period under consideration (2011 to 2021). As Deloitte observed in its 2012 report, which examined data prior to the introduction of PBLIS, ‘There has been a shift towards 24/7 operations. This move has come from a decrease in both peak and shoulder activity and an increase in off-peak and weekend activity’.¹⁴

Moreover, there are many factors that contribute to such a shift—including COVID-19 bottlenecks, local council regulations and business practices affecting off-port logistics chain components. TfNSW officials expect the recent increase in off-peak and weekend utilisation to moderate once pandemic pressures ease.

¹⁴ Deloitte Access Economics, *Sydney Ports Corporation: Port Botany Landside Improvement Strategy (PBLIS) Stage 1 CBA Review*, Sydney, Australia, May 2012.

Figure 3.10: Port utilisation by time and day



Note: Data is updated as of November 2021

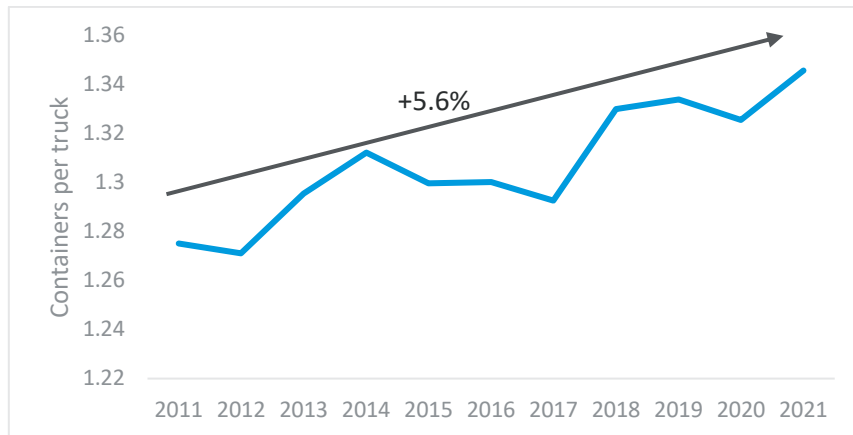
Source: TfNSW

3.2.4 Truck fleet utilisation

Trucks are expensive to hire and are most optimally utilised when they are neither idling nor waiting in queues. For trucks to be optimally operated, they should be on-the-move and carrying containers, increasing productivity and utility for the cargo owners. TTT is one measure of the effectiveness of truck fleet utilisation—the lower the TTT, the more productive the use of a truck. That is, trucks with lower TTTs can theoretically do more delivery rounds.

However, looking at TTT alone gives an incomplete picture of truck fleet utilisation. Another helpful indicator is container densities, or the average number of containers carried by trucks. Historical data suggests that container densities have not changed significantly, increasing only by 5.6 per cent between 2011 and 2021 (annual averages).

Figure 3.11: PBLIS containers per truck



Source: TfNSW

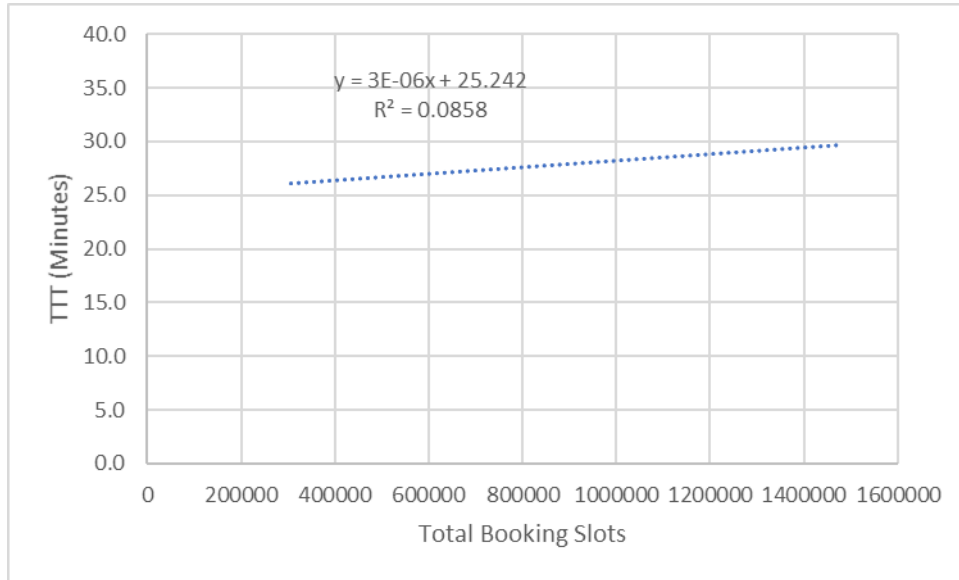
3.2.5 Stevedore efficiency

With the introduction of penalties on stevedores for not meeting mandatory service standards, PBLIS aimed to incentivise stevedores to improve the efficiency and consistency of their services. Prior to PBLIS, stevedores had significant market power. In absence of penalties for high TTT, stevedores shifted the cost burden to other parties: truck drivers waited longer to be serviced, resulting in the congestion of public roads and queuing in terminals. PBLIS made the commercial relations between the players fairer and more equitable. It was expected that stevedores would be incentivised to invest in improving their business processes to consistently meet the Mandatory Standards and avoid penalties.

As discussed above, the TTT value—the main measure of stevedore efficiency—showed a positive trend for all three stevedores. However, stevedores still demonstrate inefficiencies to different degrees (for example, the inefficient stacking of containers and lost containers). And while TTT is the main measure of stevedores’ efficiency, simply looking at TTT values is insufficient to capture the full picture of stevedores’ efficiency. For example, TTTs could be improving because of the reduced volume of containers and trucks serviced.

By considering the interaction between the number of booking slots and TTT (Figure 3.12), there is a positive but statistically insignificant relationship. It indicates that, all things equal, stevedores took more time to service trucks when they had a larger number of slots to service.

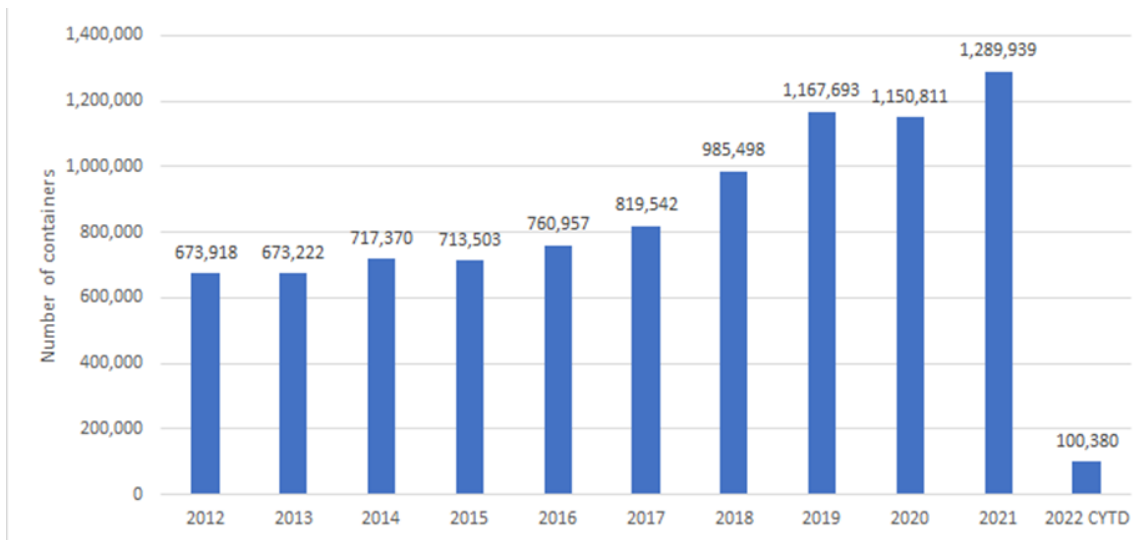
Figure 3.12: Insignificant relationship between slot bookings and TTT



Source: TfNSW

As Figure 3.13 indicates, container throughput at Port Botany has been rising over time. Given the positive relationship between booking slots and TTT, rising container volumes could be one factor driving increases in TTT.

Figure 3.13: Container volumes over time in Port Botany



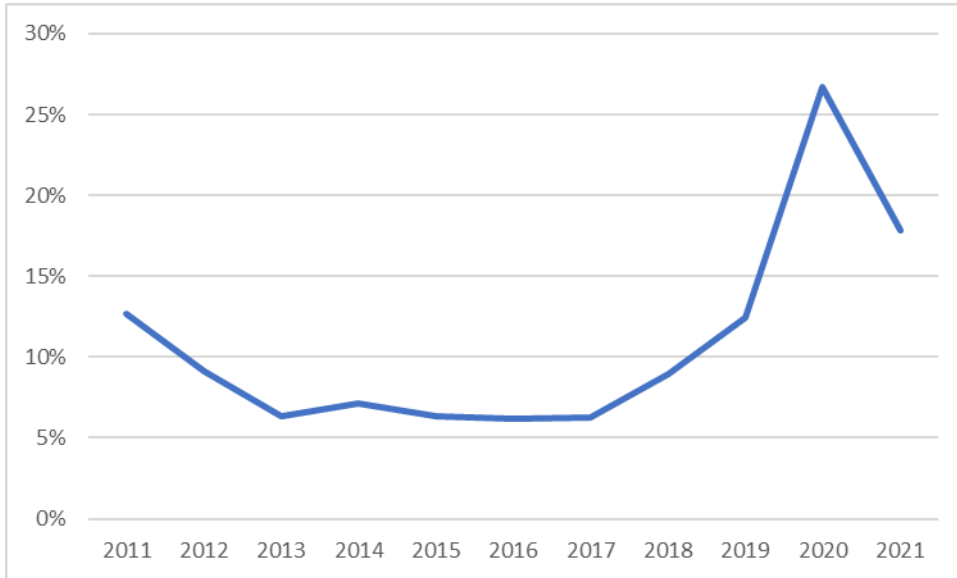
Note: For 2022, data are as of February 2022

Source: TfNSW

3.2.6 Breaches and penalties

Stevedores' violation of maximum allowable TTT constitutes, along with early arrivals, the largest share of PBLIS penalties. As Figure 3.14 demonstrates, TTT violations as a proportion of truck trips increased from 2017 to 2020 and declined in 2021.

Figure 3.14: TTT violations over time



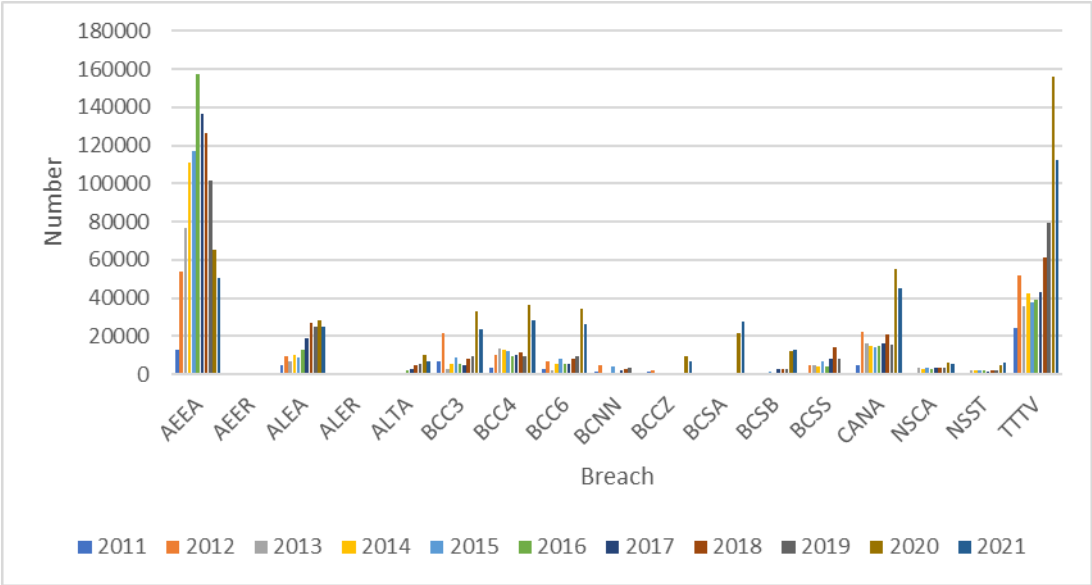
Note: Calculated by dividing the total number of TTT violations by the total number of truck trips
Source: TfNSW

Stevedores have the option of opening a time zone early, and if they do so are required to exempt penalties associated with early arrival. This was implemented to reduce congestion at the start of the time zone and to provide further operational flexibility. It is also interesting to note road carriers generally should be able to avoid an early arrival penalty by delaying their arrival—the fact that they present themselves at the terminal suggests the stevedore has opened the time zone early in most cases.

Here, the distinction between different early arrival penalties and simple breaches of the Mandatory Standards should be noted: this report defines breaches as violations of the Mandatory Standards that may or may not incur financial penalties. Conversely, penalties are breaches of the Mandatory Standards that incur financial penalties. A penalty is always a breach, but a breach is not always a penalty.

Early arrivals that are rejected by stevedore incur a \$100 penalty, but there are not many of this type of breach (AEER in Figure 3.15).¹⁵ The largest breach category is early arrivals (AEEA in Figure 3.15).¹⁶ Many of these early arrivals do not incur any financial penalty because either the TMA is not available for early arriving trucks, or the relevant stevedore accepts the truck notwithstanding its early arrival.

Figure 3.15: PBLIS breaches and exempted penalties over time



Legend:

Term	Meaning	Responsible party	Financial penalty
AEEA	Early arrival	Carrier	\$0 or \$100
AEER	Early arrival (rejected)	Carrier	\$100
ALEA	Late arrival within extended arrival time	Carrier	\$50
ALER	Late arrival (rejected)	Carrier	\$100
ALTA	Late arrival after expiration of extended arrival time	Carrier	\$100
BCC3	Booking cancelled by carrier between no penalty threshold and penalty threshold but not accepted by another carrier	Carrier	\$50

¹⁵ TfNSW reports that the AEER figure may be significantly undercounted, as most stevedores could not find an IT solution to having several statuses for a single booking.

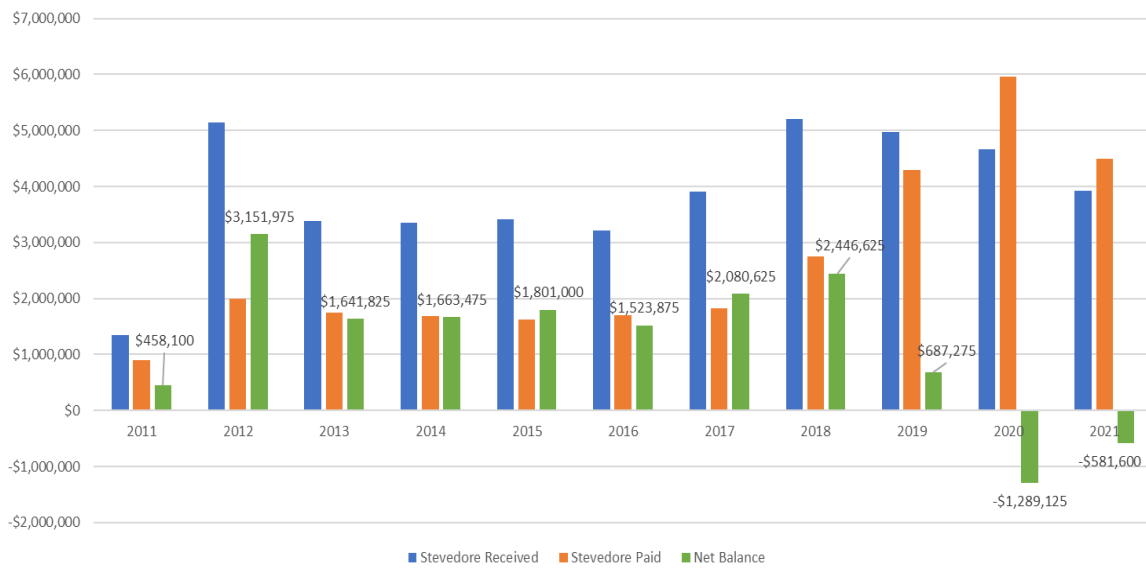
¹⁶ It should be noted that any discretionary waiver of penalties was not included in the data provided by TfNSW to Castalia.

BCC4	Booking cancelled by carrier within penalty threshold and accepted by another carrier	Carrier	\$50
BCC6	Booking cancelled by carrier within penalty threshold but not accepted by another carrier	Carrier	\$50
BCNN	No notice sent by stevedore for cancellation of booking	Stevedore	\$100
BCCZ	Booking cancelled by carrier after start of time zone	Carrier	\$100
BCSA	Booking cancelled by stevedore after notice threshold	Stevedore	\$100
BCSB	Booking cancelled by stevedore before notice threshold	Stevedore	\$50
BCSS	Single booking cancelled by stevedore	Stevedore	\$100
CANA	Carrier non-arrival	Carrier	\$100
NSCA	Non-service due to carrier	Carrier	\$100
NSST	Non-service by stevedore	Stevedore	\$100
TTTV	TTT violation	Stevedore	\$25 per 15 minutes over the allowable TTT

*Note: Exemptions are listed in the Mandatory Standards under the Ports and Maritime Administration Regulation 2021, Part 6
Source: Transport for NSW*

Putting the exempted early arrivals aside, carriers breach the Mandatory Standards more often than stevedores. As Figure 3.16 shows, stevedores tend to incur fewer penalties than carriers. Between 2011 and 2019, stevedores received more in penalties than they paid. In the years 2020 and 2021, however, stevedores paid almost \$1.9 million more in penalties than they received.

Figure 3.16: Stevedore penalties paid and received



Source: Transport for NSW

3.3 Broader supply chain considerations

The efficiency of road transport operators, railway services, and shipping lines has been adversely affected by upstream and downstream bottlenecks. While transport operators have continued to operate through the pandemic, pandemic-related restrictions have caused staff shortages and worsened logistical uncertainties. According to the Australian Competition and Consumer Commission (ACCC), the pandemic has led to a shift from ‘just-in-time’ business models to ‘just-in-case’ models in which a higher proportion of inventory is held as safety stock.¹⁷ As a result, storage costs have increased, and capital has been diverted from other projects.

Another major bottleneck that is beyond the scope of the PBLIS regime alone to address is the absence of a 24/7 containerised supply chain. According to a 2012 Colmar Brunton survey commissioned by Sydney Ports, key stakeholders such as quarantine officials, container parks, and storage yards and warehouses are not open 24/7 which is resulting in double-handling of containers and cost overruns.¹⁸ While local council curfews and restrictions were relaxed during the pandemic, local regulations have deterred 24/7 operations in the past.

To facilitate the development of a 24/7 supply chain, two key regulatory interventions have been introduced:

¹⁷ Australian Competition and Consumer Commission, *Container Stevedoring Monitoring Report 2020-21*, Canberra, Australia, 2021.

¹⁸ Colmar Brunton, *Sydney Ports Market Research to Inform Stage 1 PBLIS Review*, Sydney, Australia, 2012.

- Stevedores must offer a minimum number of slots per hour to spread out loads in peak, shoulder peak, and off-peak periods.
- PBLIS requires stevedores to offer three free days of container storage.

As Figure 3.9 demonstrates, such policy interventions have contributed to the observed marginal increase in weekend and off-peak utilisation. Yet other bottlenecks, such as business practices affecting off-port logistics chain components, continue to impede the transition to 24/7 operations.

4 Counterfactual—what would happen without PBLIS?

4.1 Market incentives

To develop counterfactual scenarios, it is important to understand what incentives would drive market participants—both stevedores and road carriers—towards voluntary arrangements and what market mechanisms would be available to them.

This report’s analysis indicates several potential market failures which may affect hypothetical voluntary outcomes.

First, stevedores may not face strong competitive pressure to improve their landside operations. While stevedores clearly compete with each other, their customers who make critical decisions which affect stevedores are shipping lines. The experience of road carriers at each terminal, and more generally the landside efficiency of the terminal, is unlikely to have any effect on the decisions made by shipping lines. Freight forwarders make decisions that affect which shipping lines they use, and that could have an indirect link to the terminal which the shipping lines select. However, the link is tenuous. The experience of road carriers in Australia is unlikely to feed into the preference of the freight forwarders who make decisions in countries from which containers originate, and similarly, since shipping lines often contract carriage of containers to each other, the choice of the shipping line does not guarantee the terminal of arrival.

Shipping lines care about quayside services but have considerably less interest in the efficiency of the landside services provided by stevedores. Overall, this report finds that stevedores face almost no competitive pressure to improve the efficiency of their landside operations. Of course, stevedores would be motivated to reduce their own costs as well as to move containers off the terminal, and this will drive some improvements in efficiency. However, to the extent that stevedores are able to shift costs to road carriers and other road users, they are unlikely to face any market penalties for doing so.

Second, stevedores have market power relative to road carriers. In simple terms, road carriers have no choice but to collect the container from the terminal at which it is manifested. This means that in considering hypothetical voluntary arrangements for the efficient management of booking slots, stevedores are likely to be in a position to impose charges on road carriers to penalise inefficiencies imposed by road user behaviour, while it is not plausible to expect that road carriers

would be able to impose charges on stevedores for failing to meet agreed standards. Hence, any hypothetical voluntary arrangements would need to be based on a realistic assessment of the relative market power of the market participants.

As has been observed, this market power over road carriers despite an overall competitive environment for stevedore services is similar to the Mobile Terminating Access Service (MTAS) in cellular phone services, whereby each mobile network has market power in terminating calls on its network, despite an overall competitive environment in mobile services. MTAS is a regulated service in most developed countries, including Australia.

4.2 Qualitative impact of removing each of the four PBLIS components on the performance measures

In this subsection, the report discusses forward-looking counterfactual scenarios and analyses the impact of removing each of the four PBLIS components. Castalia first measures the qualitative impact of the removal, and then discusses the quantitative impact in Section 5.

4.2.1 Removal of TMA

The principle behind the establishment of the TMA is to provide a waiting area for the trucks to facilitate a more organised flow of trucks to terminals. When stevedores release time slots, they do so to manage the flow of containers at terminals since the order in which trucks arrive is approximate. Stevedores want to minimise truck movements within the terminal. Without the TMA, the stevedores would essentially service trucks on a first-come-first-served basis, making it harder to operate the increasingly congested terminal.

If all other components under PBLIS remain in place, but TMA is absent, this would negatively affect the overall efficiency of the terminal operations. In particular, the congestion in the nearby streets would likely increase, even with strict parking rules enforcement.

One could predict a worsening situation with parking and congestion as the result of increasing throughput at the port. As stevedores handle more containers, they will need to service more trucks (assuming the container density per truck value stays the same). Even though the minimum standard for minimum booking slots released per hour is 54, we observe that stevedores release and road carriers take up significantly more slots during some hours based on the container volumes.

In this situation, it is likely that road carriers would eventually lobby TfNSW for an alternative rest area or an area equivalent to TMA close to the port.

Table 4.1: Impact of non-existence of TMA on performance measures

Performance measure	Impact	Comments
TTT	Negative	With the removal of TMA, the TTT could be negatively affected because trucks may arrive at more random times, making it more difficult to manage the flow of trucks for servicing.

Congestion	Highly negative	The absence of TMA would have a highly adverse impact on the congestion of the public roads around Port Botany. The trucks would park nearby when they arrived early.
Booking slot efficiency and shift to a 24/7 port	Neutral or positive	The absence of TMA may not have any impact on the spread of booking slots across the week and times. It is possible that trucks would avoid peak hours since finding a parking spot on the public roads around the port would be even harder without TMA.
Truck fleet utilisation	Neutral or negative	Optimal truck utilisation means that trucks are not idle (that is, either waiting somewhere for their booking slot or waiting in line at the terminal while being serviced). Instead, trucks are spending as much time moving containers as possible. Without the TMA, trucks arriving early to their booking slot would find alternative spots in the streets around the port. Hence, they may still be idle, however in this instance, the trucks would linger on the public roads instead of the dedicated TMA area. The TMA offers a guarantee that the trucks arriving early would have a spot where to park and wait; while without TMA, trucks would not have a guaranteed spot to park. Hence, they may arrive even earlier to look for a spot.
Stevedore efficiency	Negative	Removal of TMA would negatively affect stevedore efficiency. More trucks would likely arrive early, and stevedores would be more congested. The arrival of trucks would be more random, making it more difficult to manage the flow of trucks for servicing.

4.2.2 Removal of VBS

VBS is a booking system provided by a stevedore (or its VBS Service Provider) that is generally accessed online and used by road carriers to make, cancel, or exchange bookings. Carriers make booking through the stevedore's VBS and the data is shared with the regulator. The introduction of VBS consistent with the Mandatory Standards was a regulatory requirement at the time PBLIS was implemented because the booking systems run by stevedores at the time lacked rigor in enforcement of on-time arrival. Under PBLIS, stevedores use VBS systems that fully align with the requirements for booking standards under the Mandatory Standards.

In a hypothetical forward-looking counterfactual without PBLIS, Castalia expects that stevedores would not get rid of VBS systems (they may possibly somewhat tailor them). Hence, the absence of a regulatory requirement to maintain VBS would not by itself have a material impact on any of the performance measures. Rather, it is the functionalities of the VBS as defined in Mandatory Standards that create an effect on performance measures, as discussed in the following section.

4.2.3 Removal of Mandatory Standards and penalties

Penalties

Even in the absence of legally enforced penalties, stevedores might utilise their market power to penalise road carriers. Without the regulated two-way penalty system, it is possible that stevedores could have introduced penalties to discourage road carriers from arriving early or late.

Since the terminal operations industry is highly competitive, these charges would not be regulated.

At the same time, road carriers would have no way of introducing a reciprocal penalty regime on stevedores. This would bring into question the issue of fairness and abuse of market power by stevedores.

If stevedores start setting unreasonable charges on road carriers, it is possible that road carriers could take collective action, seeking either government intervention or passing on costs to freight forwarders and customers. Additional stevedores—including those in other ports—might also attempt to enter the market.

Generally, stevedores enjoy significant market power. The limited ability of transport operators to ‘shop around’ for a stevedore ensures that stevedores can set charges as they see fit. Today, many cargo owners argue that stevedores are taking advantage of their market power. Stevedores levy terminal access charges (TACs) on trucks and trains for dropping off or picking up a laden container at the stevedore’s terminal. During consultations with the ACCC, many cargo owners and transport operators have raised concerns about these charges. A large number commented that TACs have increased significantly over the past few years without there being any noticeable improvements in landside productivity. It is also interesting to note that TACs have increased at similar rates across most ports in Australia, suggesting that the incentive and the ability to impose charges on road carriers exists without PBLIS.

It is possible that stevedores could impose a Peak Period Pricing (PPP) system to reduce the burden of excessive demand for truck servicing during peak hours in the workweek. The introduction of PPP could yield better results with respect to smoothing demand across the workweek and moving the port to 24/7 operations.

Additionally, stevedores could introduce arbitrary fees as an additional source of revenue. Under PBLIS, penalties are meant as instruments to change behaviour and are not meant to be revenue sources.

Mandatory Standards

Mandatory Standards define allowed ranges against which breaches can be detected and penalised. Without PBLIS, it is possible that stevedores would implement a harsher and more arbitrary system of standards and penalties, shifting inefficiencies to the road carriers.

Table 4.2: Impact of removing Mandatory Standards and penalties on performance measures

Performance measure	Impact	Comments
TTT	Neutral	Without regulated standards and penalties attached to not meeting the standards, stevedores would be free to service trucks in the manner convenient to them. There are economic costs associated with providing quick turnarounds, and stevedores can choose to shift these costs to the road carriers. For example, if stevedores do not want to pay overtime, they would potentially service trucks less efficiently. Evidence appears to indicate that removing current Mandatory Standards and penalties with respect for exceeding TTT thresholds may have minimal effect on stevedore behaviour. As Figure 3.2 demonstrates, the tail of TTIs

exceeding the mandatory thresholds has largely remained unchanged or even worsened, with improvements to the average TTT coming mainly from the area in the distribution to the left of the allowed TTT. Improvements to TTT efficiency within this range suggest that stevedores are responding to economic incentives instead of regulatory incentives. If there were no strong economic incentives, stevedores would have been expected to reduce the short turnaround time tail to avoid costs as well as to reduce the tail of TTTs that exceed the mandatory thresholds to avoid regulatory penalties. Instead, Castalia observes the opposite, with the over-limit tail virtually unchanged between 2011 and 2019, and the under-limit tail demonstrating substantial TTT reductions.

In the absence of Mandatory Standards that are applicable to both parties, stevedores could use their market power to the disadvantage of road carriers. However, it is in the stevedores' interest to operate as efficiently as possible. Furthermore, competitive pressures create strong commercial incentives for stevedores to keep TTTs low.

Hence, removing Mandatory Standards and penalties is likely to have neutral or only mildly negative impact on TTT and its consistency.

Congestion and queuing	Negative	Without PBLIS, stevedores would likely introduce certain standards and penalties to regulate in-time truck arrivals. In such a scenario, road carriers would face similar incentives to those they face under PBLIS. On the other hand, without self-imposed penalties for high TTTs (if they ever exceed the PBLIS ceiling), stevedores could end up creating queues and congestion around the port if they are inefficient.
Promote a shift to a 24/7 port	Unclear	<p>Shifting to a 24/7 operating port could result in some businesses and their supply chains extending their business hours to accommodate deliveries. This could then further promote a shift towards a 24/7 port with a more even distribution of booking slots.</p> <p>Under the Mandatory Standards, stevedores must make at least 54 slots per hour available. This is meant to extend the operating hours at the port. However, 54 bookings are not always serviced. Castalia observes some regulatory flexibility to accommodate the differences in volumes handled by the stevedores and their working schedules while preserving productivity.</p> <p>For example, for the time zones when shift changes or meal breaks happen, stevedores release minimum or no slots. The regulation allows them to compensate for these periods by opening more slots during the day. Further, if stevedores do not handle enough volume so that there are less than 54 slots booked per hour, TfNSW can negotiate alternative export slots.</p> <p>With regards to weekends, stevedores must keep at least 12 time zones available to satisfy the definition of a working day as per the Mandatory Standards.</p> <p>Without PBLIS, stevedores would potentially only release slots during a specific period of time during the weekend as convenient for them (for example, only on Saturday). Stevedores could also lump bookings to peak hour periods (to reduce overtime pay), and generally release and distribute booking slots as is convenient for them. This may shrink the operating hours of the port.</p> <p>The total number of booking slots released is unlikely to change as it is proportional to the volume of containers handled by stevedores.</p>

Truck fleet utilisation	Negative	The absence of TTT requirements and the associated financial penalty would likely result in varying truck servicing times, inefficiencies at terminals, and frequent truck queuing, which reduces truck fleet utilisation.
Stevedore efficiency	Neutral or slightly negative	Stevedores have an incentive to be efficient with unloading containers from the ships and distributing them to the road carriers. Quick turnaround is not only desirable but is essential both to stay competitive and because of terminal area constraints. Hence, it is likely that stevedores would continue operating as efficiently as today, driven by commercial incentives. Without Mandatory Standards and associated penalties, the average TTT may increase, however, it is likely to stay well within the PBLIS threshold. In case of unforeseen events, however, stevedores will likely have stronger incentives to restore services under PBLIS than in its absence. Without PBLIS, delays due to infrequent unforeseen events may be longer. Mandatory Standards will likely improve communication and re-booking of container pick-ups during major events.

4.2.4 Removal of service lines, street cameras on public roads, and parking rules enforcement

Mandatory Standards prescribe gate requirements for truck servicing. Trucks can only enter terminals by joining the service line for entry into that terminal and by passing through the prescribed gate for that terminal:

- The service line for the DP World Terminal commences from the entrance gate to the port precinct located on Simblist Road.
- The service line for Patrick Terminal commences from the intersection of Foreshore Road, Botany Road, and Penrhyn Road.
- The service line for the Sydney International Container Terminal Limited (SICTL) commences from the intersection of Sirius Road and Foreshore Road.

Without appropriate traffic management and parking rules enforcement, more trucks would park illegally, creating congestion on the roads close to the port. Public roads around the port have limited space for parking and once fully occupied, the streets would not have space for more trucks to park. This could result in more congestion on the roads, greater coverage of residential streets with parked heavy vehicles, and more car exhaust and pollution.

Both service lines and parking rules are designed to take the trucks off the road:

- Service lines are essentially public roads where queueing is allowed and regulated.
- Street cameras on public roads and parking rules enforcement are designed to regulate the flow of traffic and limit truck utilisation of residential streets.
- In theory, these two interventions should have the same effect on TTT, congestion, booking slot efficiency and shift to a 24/7 port, truck fleet utilisation, and stevedore efficiency.

Table 4.3: Impact of removing service lines, street cameras on public roads, and parking rules enforcement on performance measures

Performance measure	Impact	Comments
TTT	Negative	In the absence of the service lines, trucks would have to queue on public roads that are not fit-for-purpose. Similarly, the absence of parking enforcement would lead to greater traffic on the streets surrounding the port. As a result, late arrivals would increase, with negative effects for TTT.
Congestion	Negative	Since trucks would be queueing without a dedicated slip lane, some drivers would be forced to drive around while waiting. Congestion would be highly likely without enforcement of heavy truck movements and parking. In turn, this would lead to residential complaints and the eventual introduction of road usage regulations.
Booking slot efficiency and shift to a 24/7 port	Overall neutral, possibly slightly positive	In the absence of service lines or available spots to park on the streets, trucks would find it increasingly difficult to circulate around the port while waiting for their booked slots. They would either accept the early arrival penalty (assuming stevedores' booking systems allow that) or possibly shift to off-peak slots when parking around the port is more easily available.
Truck fleet utilisation	Negative	In this scenario, trucks would have more freedom to park on public roads without incurring a penalty. Truck fleet utilisation is equally suboptimal whether the trucks park on the streets outside of the port, or wait in TMA, or queue in the service line. With respect to service lines, the order in which trucks arrive may be messier and cause congestion on the way to the gate. This may lead to longer wait times, hence worsening truck fleet utilization.
Stevedore efficiency	Negative	There is no clear association between stevedore efficiency and parking enforcement. Stevedores generally are not concerned by where the trucks park and how long they wait until their scheduled time. However, without the service line, an area where trucks are meant to queue in an organised way, trucks would arrive to the gate in a more random sequence, negatively impacting the efficiency of the stevedores to service the truck.

4.3 Other non-quantifiable benefits

This assessment concurs with past assessments and concludes that PBLIS overall generates positive economy-wide benefits:

- Reduced truck movements around the port likely results in less traffic congestion.
- Smoothing the demand profile for booked slots reduces the need for additional infrastructure investments in the area surrounding Port Botany.
- The improved efficiency and productivity at the port are likely to have some follow-on benefits to the wider supply chain and the economy. For example, the improved

consistency of delivery timelines equally benefits importers and exporters through better business certainty.

Further, the removal of heavy trucks from the roads and local streets close to Port Botany would have resulted in less toxic particles emitted from vehicle engines that adversely impact human health.

4.4 Conclusion

From the above analysis of the hypothetical scenarios, Castalia observes that the more impactful interventions under PBLIS are the introduction of the Mandatory Standards and penalties, and the construction of the TMA. If left to voluntary industry dynamics, the report does not envision that the players would fully and voluntarily self-correct the landside inefficiencies that PBLIS was introduced to address. Notwithstanding these issues, it is highly probable that the players would negotiate and adopt alternative or similar solutions to that of PBLIS. For example, it is probable that stevedores would price discriminate to regulate high peak hour demand (by introducing some type of peak point pricing). Street parking rules and enforcement is another logical solution that would likely materialise without PBLIS.

Given the high degree of market power that stevedores enjoy, it is possible that they would introduce measures to improve their own efficiencies—possibly at the expense of road carriers and the remainder of the supply chain. However, evidence from the historical behaviour of stevedores suggests that there would be no incentive to significantly worsen TTTs given inherent economic incentives to stay competitive and efficient. If stevedores do exceed the regulatory threshold for servicing, they would not have to compensate the road carriers as required under PBLIS. Hence, while Castalia does not expect the average TTTs to deteriorate, there may be some shifting of stevedore inefficiencies to the road carriers.

5 Quantification of Costs and Benefits

5.1 Quantitative benefits of PBLIS

This report first estimates the standalone benefits of each of the four counterfactual scenarios. To quantify the overall impact of PBLIS, this report then links each of the separate interventions to consider the composite impact in Table 5.3.

A brief methodology for estimating benefits is outlined below:

1. Use standard values and parameters according to the NSW CBA guidelines and TfNSW¹⁹ to calculate the benefits in a representative year (2021).

¹⁹ TfNSW. Economic Parameter Values – Workbook in Excel format. Version 2.0 – June 2020.

2. Project these benefits forward for the next 10 years. The forward projection is driven primarily by assumptions of inflation and the truck growth rate:
 - Inflation, as measured by the Consumer Price Index (CPI): 2.5 per cent annually²⁰
 - Annual truck growth rate: 2.92 per cent annually (based on the average annual container growth rate at Port Botany in 2011-2021, with container densities per truck assumed to be constant).²¹
3. Discount annual benefits and costs back at 3 per cent, 7 per cent, and 10 per cent separately to compare present values across the years.

5.1.1 Truck Marshalling Area

TMA allows trucks to park in the facility for up to one hour as they wait for their slot. In effect, this measure takes trucks off the road. The benefits of taking trucks off the road include:

- Reduction in emissions
- Decongestion benefits
- Safety benefits
- Avoided cost of road maintenance.

Table 5.1 shows the assumptions used in calculating the dollar value of the benefits brought by the TMA in 2021.

Table 5.1: Assumptions used and benefits calculated

Assumption	Unit	Value	Details
Days in a year	days	365	
Wait period at TMA	hour	1	Assumes trucks park in TMA for the maximum allowed time—1 hour, meaning that they are potentially not circling around the port, not causing congestion, and the associated emissions approach zero.
Trucks serviced per day in the Port	number	4,000	Estimation based on TfNSW data
Trucks using TMA	per cent of total	15 per cent	Estimation based on TfNSW data
Distance that would have been travelled	km	10	Assumes that an average truck drives 10 vehicle-kilometres each hour in the absence of TMA.

²⁰ Reserve Bank of Australia

²¹ TfNSW data

Benefit	Value, AU\$
Emissions	2,840,868
Decongestion	4,914,360
Safety	2,535.8
Road maintenance	409,530
Total	8,167,294

Consultant's calculations

5.1.2 VBS

VBS does not yield any material benefits intended under PBLIS on its own. Instead, the benefits are generated by the Mandatory Standards and the associated penalties which are enabled through the VBS. Mandatory Standards and penalties incentivise behaviour change and strengthen efficiency. Hence, VBS indirectly supports congestion improvements and contributes to the generation of other benefits.

5.1.3 Mandatory Standards and penalties

As discussed in Section 4.2.3, the impact of removing Mandatory Standards and penalties on TTTs is limited. This is because of:

- **Stevedore efficiency.** The increase in the port throughput and the reduction in TTT could be the result of the pressures from PBLIS and natural incentives at the port. Historical data suggests that a large majority of the TTT distribution has consistently been below the Mandatory Standards threshold (Figure 3.2 and Figure 3.3). This suggests that the efficiency of stevedore operations is driven primarily by commercial self-interest rather than by the regulatory intervention.
- **Road carrier efficiency.** Stevedores do not appear to be motivated to shift inefficiencies to road carriers. If stevedores were really motivated to push costs to users, they could have already done so under PBLIS, by pushing the TTTs closer to the regulatory threshold. However, the changes in the TTT distributions between 2011 and 2019 in Figure 3.2 and Figure 3.3 suggest that stevedores are behaving on the basis of inherent economic incentives. While Castalia expects the cost of worsened TTT in absence of PBLIS to be minor, this disbenefit can be quantified.
 - In a previous assessment, Deloitte Access Economics estimated the economic benefit of observed reductions in average TTT. Deloitte calculated that a 5.3-minute reduction in TTT between 2012 and 2015 (years for which Deloitte reports corresponding TTT data) generated an additional benefit of \$1.8 million. These estimates imply an annual benefit of \$0.34 million (in nominal terms in 2015 dollars) for every one-minute reduction in average TTT. Adjusting for inflation, in 2021 dollars this figure is equal to \$0.38 million

per minute of reduction.²² The CBA model uses this figure for the base year (2021) and adjusts it for inflation in the forward-looking analysis until 2031.

5.1.4 Service lines, street cameras on public roads, and parking rules enforcement

The introduction of service lines, street cameras on public roads, and parking rules enforcement aimed to decongest the surrounding roads and facilitate a smoother progression of the trucks from their destinations to the terminal gates for servicing.

If the TMA still exists but the service line is absent, the issue of trucks arriving to the gate in a reasonable order remains. The absence of a service line means there is no orderly approach to the gate. This means that as trucks approach the terminal gate, there is no orderly way to form a queue. Put simply, if there is someone already in front of the gate, the truck has no space to join the line. If trucks face this problem and street parking regulations are enforced, trucks must make an additional lap around the terminal to try to get to the gate. As trucks drive around and crowd around the gate, they cause congestion and emissions. This also leads to less efficient truck utilisation.

Table 5.2 below shows the assumptions used and the total benefits of having the TMA in place in 2021.

Table 5.2: Assumptions used and results

Assumption	Unit	Value	Details
Trucks serviced per day at the port	number	4,000	Estimation based on TfNSW data
Distance that would have been travelled	km	2	Assuming every truck needs to do an additional circuit to get into the gate, and a circuit length is two kilometres

Parameter	Value, AU\$
Emissions	3,787,824
Decongestion	6,552,480.0
Safety	338,109.7
Road maintenance	546,040
Total	10,886,344

Consultant's calculations

²² RBA inflation calculator: <https://www.rba.gov.au/calculator/annualDecimal.html>

5.2 Quantitative costs of PBLIS

This report divides the costs under PBLIS into recurrent operating costs (labour and non-labour), and capital investment costs.

- **CAPEX**

- *IT-related investments.* In the past several years, there were significant investments made to upgrade computer systems and install ANPR cameras. The total investment in 2019-2021 was \$10.35 million. Going forward, the amount of investment is likely to decline. Thus, the CAPEX going forward is calculated as depreciation and maintenance investment in the current systems (IT and cameras) equal to about 10 per cent of the combined 2019-21 CAPEX.
- *Opportunity cost of land under the TMA.* Castalia estimates the market value of the land plot under the TMA to be about \$27.1 million.²³ The opportunity cost of this plot of land for the government is estimated using a weighted average cost of capital for the real estate business of 10 per cent.

- **OPEX**

- Non-labour operating costs are the IT-related expenses, PBLIS administration costs, project implementation, and other related port-related work. On average, non-labour operating costs accounted for 41 per cent of total OPEX in the past five years.
- Labour operating costs relate to staff costs (salaries and benefits).
- The report assumes that from 2022 onwards, the 2021 value of OPEX grows by the inflation rate.

With respect to potential costs, such as noise pollution, this report finds that such costs have not materialised under PBLIS.

²³ Area is 12.9 hectares. Market value per square meter is \$2,100 (Source: <https://www.commercialrealestate.com.au/news/prices-surge-on-shortage-of-undeveloped-industrial-land-in-sydneys-inner-south-60955/>).

Table 5.3: Benefits and costs of PBLIS, AU\$

Category	Item	Total	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
				1	2	3	4	5	6	7	8	9	10
Benefits													
User benefits (stevedore and road carriers)	TTT		0.38	0.39	0.40	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48
	Container densities		0	0	0	0	0	0	0	0	0	0	0
Environmental and social benefits	Environmental		6,628,692	6,992,731	7,376,763	7,781,885	8,209,256	8,660,098	9,135,699	9,637,420	10,166,695	10,725,036	11,314,042
	Safety benefits		340,646	359,353	379,089	399,908	421,870	445,039	469,480	495,263	522,462	551,155	581,424
	Decongestion benefits		11,466,840	12,096,584	12,760,913	13,461,726	14,201,026	14,980,928	15,803,661	16,671,578	17,587,159	18,553,023	19,571,931
Government benefits	Road maintenance cost avoided		955,570	1,008,049	1,063,409	1,121,810	1,183,419	1,248,411	1,316,972	1,389,298	1,465,597	1,546,085	1,630,994
Total (nominal)	Total benefits		19,391,748	20,456,718	21,580,174	22,765,329	24,015,572	25,334,476	26,725,812	28,193,559	29,741,913	31,375,300	33,098,391
Present Value	At 3%	241,078,587	19,391,748	19,860,891	20,341,384	20,833,501	21,337,524	21,853,741	22,382,447	22,923,944	23,478,541	24,046,555	24,628,311
	At 7%	173,040,825	19,391,748	18,561,580	17,766,952	17,006,343	16,278,295	15,581,415	14,914,370	14,275,880	13,664,724	13,079,733	12,519,785
	At 10%	117,012,842	19,391,748	16,874,164	14,683,432	12,777,117	11,118,295	9,674,833	8,418,773	7,325,784	6,374,695	5,547,083	4,826,919
Costs													
Capital	CAPEX - annual investment		4,488,871	1,060,429	1,086,940	1,114,113	1,141,966	1,170,515	1,199,778	1,229,773	1,260,517	1,292,030	1,324,331
	Opportunity cost of TMA land (annual)		2,709,000	2,709,000	2,709,000	2,709,000	2,709,000	2,709,000	2,709,000	2,709,000	2,709,000	2,709,000	2,709,000
Recurrent	OPEX (Non Labour)		1,969,049	2,018,275	2,068,732	2,120,451	2,173,462	2,227,798	2,283,493	2,340,581	2,399,095	2,459,072	2,520,549
	Opex (Labour)		1,807,589	1,860,351	1,914,653	1,970,539	2,028,057	2,087,254	2,148,179	2,210,882	2,275,416	2,341,833	2,410,189
Total (nominal)	Total costs		\$ 10,974,510	\$ 7,648,055	\$ 7,779,325	\$ 7,914,103	\$ 8,052,485	\$ 8,194,568	\$ 8,340,451	\$ 8,490,236	\$ 8,644,028	\$ 8,801,935	\$ 8,964,069
Present Value	At 3%	81,326,397	10,974,510	7,425,297	7,332,760	7,242,526	7,154,529	7,068,706	6,984,996	6,903,339	6,823,675	6,745,950	6,670,109
	At 7%	68,583,408	10,974,510	7,147,715	6,794,764	6,460,266	6,143,203	5,842,614	5,557,595	5,287,292	5,030,903	4,787,670	4,556,878
	At 10%	61,176,822	10,974,510	6,952,778	6,429,194	5,945,983	5,499,956	5,088,182	4,707,967	4,356,833	4,032,503	3,732,880	3,456,036
Results													
		at 3%	BCR	2.96		Net benefit	\$ 159,752,191						
		At 7%		2.52			\$ 104,457,418						
		At 10%		1.91			\$ 55,836,020						

Consultant's calculations

5.3 Sensitivities

In addition to applying three discount rates as sensitivities, Castalia examined different annual truck growth rates to see how net benefits might be affected with more or less trucks serviced.

The base growth rate is taken at 2.92 per cent which is the annual average container growth at Port Botany from 2011 to 2021. Castalia assumes the truck growth rate is the same since the container density has largely remained constant between 2011 and 2021 (a 5 per cent increase in the period). For the sensitivity analysis, Castalia looks at growth rates of 1.5 per cent, 5 per cent, and 7 per cent. Table 5.4 below summarises the results of the sensitivity analysis using a 7 per cent discount rate. The results suggest that with a growth in container throughput, net benefits and the BCR increase. The same holds true for all other discount rates (3 per cent and 10 per cent).

Table 5.4: Sensitivity analysis – Truck growth rate

Truck growth rate	BCR	Net benefit, AU\$
1.5%	2.37	\$ 93,987,732
2.92% (base)	2.52	\$ 104,457,418
5%	2.77	\$ 121,390,089
7%	3.04	\$ 139,623,082

Consultant calculations

6 PBLIS impact on Rail

One of the objectives of PBLIS within the TfNSW strategy is to increase the proportion of containers transported via rail. Currently, most freight is carried by trucks. Over the past decade, on average, only around 10 to 12 per cent of the containers entering or leaving the Australian container ports were transported by rail. In Port Botany, this figure is around 18 per cent and has not changed much since 2011.

According to the ACCC,²⁴ there is potential to better integrate rail into the supply chain and increase its market share. An increase in rail utilisation can increase capacity and efficiencies. Transport by rail compared to road is considered more reliable and efficient for large cargo volumes. Increases in rail capacity would particularly benefit farmers and other regional exporters who currently rely more on rail.

Access to ports by rail is achieved in two ways:

- Through on-dock rail terminals constructed at the port, or
- Intermodal terminals constructed elsewhere, which require containers to be transported from the intermodal terminal to the port.

On-dock rail terminals are considered the most efficient, as this eliminates needing to transfer containers by truck

In November 2019, NSW Ports announced plans to significantly improve rail infrastructure capacity at Port Botany. The first stage involves \$120 million from NSW Ports to deliver on-dock rail infrastructure and \$70 million from Patrick Terminals to deliver automated rail operating equipment. At completion in 2023, Patrick's rail capacity terminal will increase to 0.5 million TEUs and Port Botany's overall rail capacity will increase to 1.5 million TEUs. Some of the proposed key benefits of this increased capacity include improved rail efficiency, reduced costs for importers and exporters as the result of faster train turnaround times, an increase in rail service and rail windows for cargo owners, and reduction of truck travel in Sydney.

Our analysis does not provide any evidence of any influence of PBLIS interventions on the proportion of freight entering the port by rail. In theory, to the extent that PBLIS assists in the decongestion of traffic around the port, it may make truck transport more attractive and hence, all things being equal, tip the choice away from rail and in favour of roads. However, any such effect is likely to be immaterial, and in any case, it hardly makes policy sense to promote rail by deliberately making road transport less efficient.

However, given recent significant investment by stevedores in rail connectivity at the port, it is likely that stevedores may also have an increased incentive to favour their rail investments with better service, while the improved capacity will in any case make rail more competitive with trucks. The continuation of Mandatory Standards applied to the truck turnarounds may play a role

²⁴ ACCC, *Container stevedoring monitoring report*.

in ensuring that reductions in road efficiency are not used as a tool to increase returns from rail investments.

7 Conclusion

Overall, this report finds that PBLIS delivers a net material benefit. Given where the industry is today, the removal of key PBLIS components is likely to generate net costs. While the main benefits of PBLIS are delivered through enabling trucks to wait in the TMA and then proceed into orderly service lines, all other elements—including Mandatory Standards and operation of the IT and camera systems—are necessary to maintain the orderly road processes around the port precinct.

7.1 Recommendations

Based on this analysis and a review of industry submissions on the Ports and Maritime Administration Regulation (PAMA), potential improvement to PBLIS could include:

- Extending the allowed time at TMA to two hours to further reduce the incidence of truck parking on the streets and to provide great flexibility to road carriers. Road carriers would clearly have no incentive to spend time at TMA unnecessarily, as it reduces the utilisation of their equipment. Hence, any road operators who do wish to remain at TMA for more than the currently allowed one hour would likely have good reason to remain in the port precinct and would have been forced to congest the road instead.
- The requirement to release the minimum number of slots per hour does not appear to constrain conduct, nor is it contributing sufficiently to off-peak operations. More nuanced requirements on the minimum number of slots in each time period may be more effective in promoting the move to 24/7 logistics.

While the above changes could further improve the operations at the port, the most material constraint that leads to queues and truck parking in the port precinct is the organisation of the rest of the supply chain. Most trucks can only work during peak hours on weekdays due to the working hours of warehouses and businesses. Furthermore, council curfews prohibit heavy vehicles from driving between Saturday evening and Monday morning. Without the rest of the supply chain working 24/7, the problem of excess demand for booking slots will remain.



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