PBLIS Comparison Study

Landside Container Management

Transport for NSW

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Advisian
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Executive Summary

The Port Botany Landside Improvement Strategy (PBLIS) was introduced in 2010 to improve efficiency and reduce congestion in and around the Port Botany precinct, primarily by regulating the performance of stevedores and road carriers at the container terminals. On 12 November 2021, the NSW Government announced a comprehensive review of the Ports and Maritime Administration Act 1995 and PBLIS. The Review is being led by Mr. Ed Willett, the Independent Reviewer, and will be supported by Transport for NSW (TfNSW).

As part of this review Advisian was asked to undertake a comparative analysis of:

- International approaches to government regulation of landside container management at key cargo ports of relevance for the PBLIS review
- Approaches in Australia and New Zealand (NZ) for managing the landside container interface at cargo ports
- Operational experience over the past decade, particularly relating to landside transport.

The following key questions were considered as part of this study:

- Are port landside interface performance measures available?
- Is government involved in the establishment, oversight, or management of the port landside interface via regulation, lease arrangements or another method, or is it managed by industry?
- Analysis of any regulatory frameworks their structure and performance outcomes
- What has the landside operational practice and experience been over the past decade?

TfNSW suggested several ports to be reviewed, while also requesting Advisian undertake a review of international ports to determine ports which may be comparable. Table 0-1, Figure 0-1 and Figure 0-2 provide a summary of the ports which have been included within this report, as well as values for Port Botany. Information on transhipment and road/rail transport mode split is not available for all ports.

Table 0-1 Summary of ports investigated (2020)

Port	Number of Container Terminals	Container exchange (Million TEU)	Empty Containers Import/Export (%)	Transhipment (%)	Road / Rail (%)
Port Botany	3	2.7	0.9% / 63%	5%	85% / 15%
Port of Los Angeles	7	9.2	1% / 65%	-	-
Port of Long Beach	6	8.1	4% / 63%	-	-
Port of Vancouver	4	3.5	3% / 35%	-	-

Port	Number of Container Terminals	Container exchange (Million TEU)	Empty Containers Import/Export (%)	Transhipment (%)	Road / Rail (%)
Northwest Seaport Alliance - Ports of Seattle and Tacoma	8	3.3	8% / 38%	-	-
Port of New York and New Jersey	6	7.6	0.6% / 64%	-	91% / 9%
Port of Valencia	3	5.4	37% / 23%	57%	-
Port of Rotterdam	5	14.3	14% / 19%	36%	-
Port of Antwerp	5	12	14% Total	Unavailable, but has extensive links within Europe.	58% / 7% (35% Barge)
Port of Manila	2	3.1	0.4% / 72%	0%	100% / 0%
Port of Melbourne	3	3	9% / 39%	4%	92% / 8%
Port of Fremantle	2	0.78	5% / 44%	0%	82% / 18%
Port of Brisbane	3	1.4	10% / 48%	5%	97% / 3%
Port of Lyttelton	1	0.45	18% / 34%	8%	79% / 21%
Port of Tauranga	1	1.3	45% / 10%	10%	57% / 43%
Port of Auckland	1	0.88	4% / 53%	4%	90% / 10%

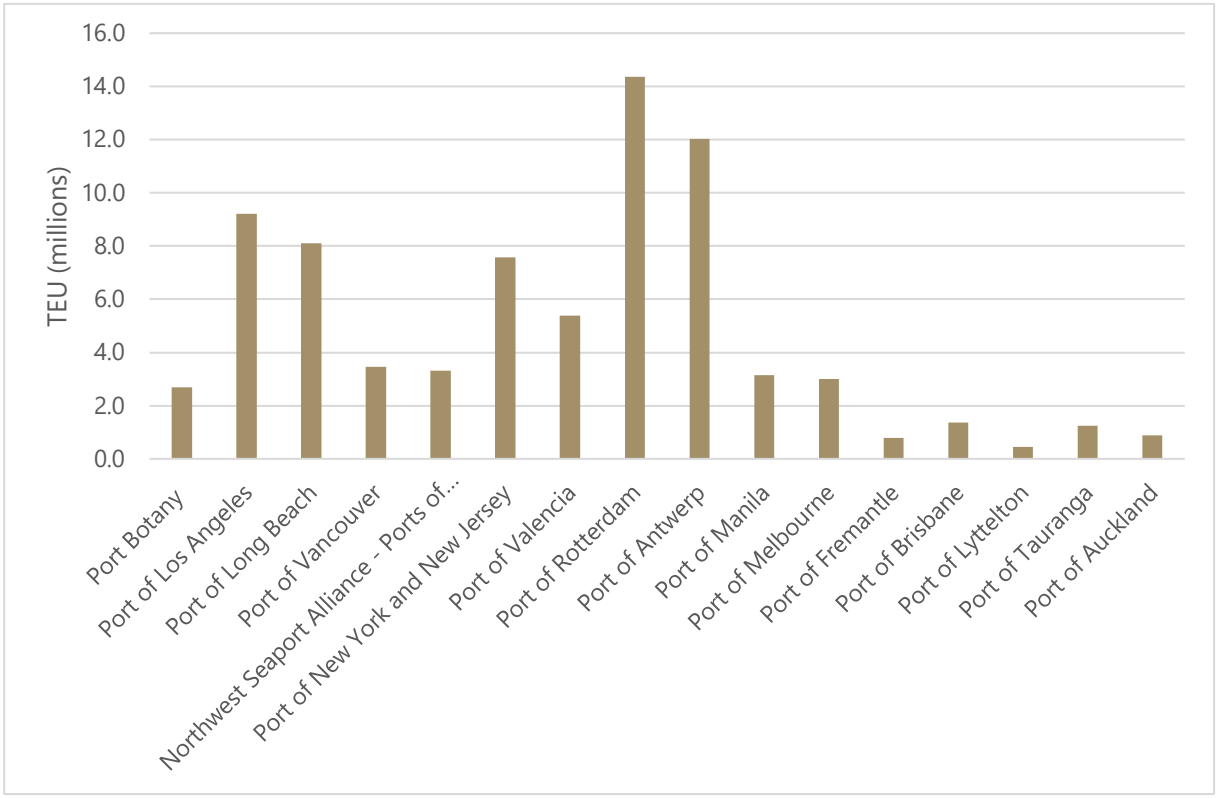


Figure 0-1 Container exchange of ports investigated (2020)

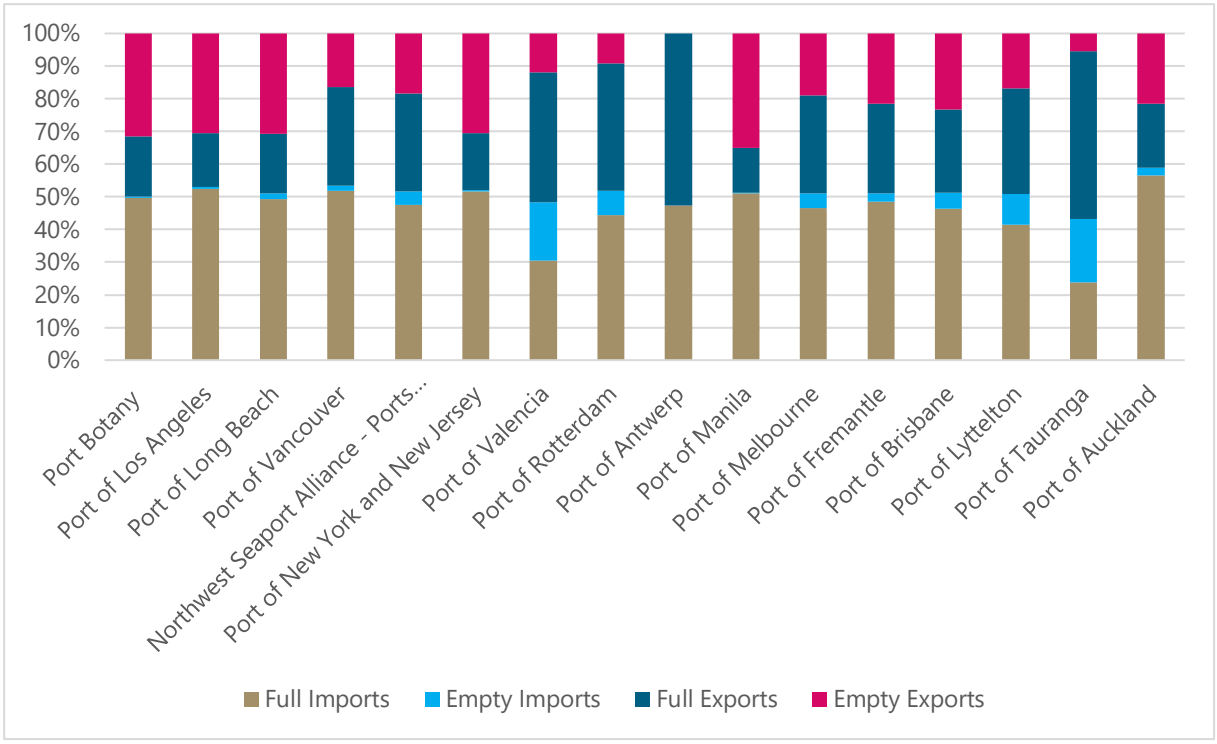


Figure 0-2 Container mix for ports investigated (2020), (No empty data available for the Port of Antwerp)

The report has been structured into 2 main sections:

Part One: International ports

Part Two: Australian and New Zealand ports

New regulations, new and improvements to systems (Vehicle Booking System [VBS], Port Community System [PCS]), performance requirements, introduction of higher capacity vehicles and changes in operations has seen improvements in port efficiency over the last 10 years. There has been increased container handling rates at all the ports investigated, and in many cases a reported reduction in paperwork. However, performance associated with wharfside operations, landside operations, carrier operations, physical and IT infrastructure is all highly inter-related. Due to this it is difficult to provide statistics showing the improvement or negative impact of one individual change on the overall system. Overall, the study has found:

Performance measures

- Most ports have publicly available landside interface performance measures. For some terminals these are live while others are provided on a historic basis. Data is usually collected directly by the terminal.
- The most common landside metric used to assess performance is the Truck Turn Time (TTT) (measured from gate entry to last container movement or gate exit). It is common for a terminal or port operator to share the real-time TTT metric on their website along with camera footage of the gates, and in some cases the wait time at each gate is also available.
- In Australia and NZ port level data (performance and cargo information) is self-reported by terminals to the government. This is replicated in Melbourne at a terminal level with voluntary reporting to Freight Victoria. Additionally, Freight Victoria has introduced a voluntary pricing protocol (process around price changes) that all the terminals have accepted and has resulted in greater transparency with industry. A similar system is being considered at national level.

Government regulation

- Some ports have government regulations, or requirements from the landlord port operator, about the landside interface, generally around the requirement to use a VBS and/or environmentally friendly engines. This however can vary significantly based on the country or port.
- In North America all the investigated ports require carriers operating into and out of their container terminals to be licensed with the port. The original licence requirement was an initiative to direct trucking companies to use cleaner diesel engines. This has been expanded to require access through scheduling of bookings to address congestion. The result has been a decrease in the number of companies servicing the ports due to these requirements and associated compliance costs.
- The management of the operations are generally left to terminal operators with port operators and regulators preferring to facilitate infrastructure improvement rather than be involved with regulating levels of service. Only at the Port of Valencia is regulation in place that provides carriers with compensation in the event of delays. However, this regulation has no government oversight, leaving the terminal operators to self-manage their compliance, often with carriers unhappy with the outcome.

Performance requirements

- It is uncommon for port operators through their lease agreements with the terminal to include operating or performance requirements however the terminals can be required to submit data on wharf and landside performance to the port, but without any associated requirements. Only the Port of Fremantle reported to use performance requirements to influence behaviour at its leased facilities, with incentives (variable portion of rent) in the lease agreement for meeting the set targets associated with improving cargo flow through the port.

Vehicle Booking Systems

- Over the past decade terminals have moved heavily towards VBS to assist with management of terminal operations. Those ports that do not have a VBS are investigating the installation of a system.
- At most of the ports investigated a VBS was used for managing bookings, with each terminal generally deciding on the specific software used. Generally, 1-hour zones are issued with a specific allocation of slots available within each zone decided by the terminal (one slot is required for each container). The zones include an allowance each side for arriving at the terminal gate.
- For the international ports investigated, arriving outside of the booking time, including allowances, will result in a new booking required for access, and the original booking fee is forfeited.
- In Australian and NZ, it is typical that following the completion of the zone carriers arriving are allowed entry for a few hours (the time varies by terminal operator) however, an additional fee can be charged.
- In the Port of Manila all transactions within the VBS are made with pre-purchased points. Each point is equivalent in value to the local currency. The use of points simplifies the transactions especially around refunds and guarantees that payment was received prior to the rendering of service.

Advanced booking

- Terminals in both Australia and the Port of Manila reported using an advanced booking system. They were generally terminals where the yard is split into modules with dedicated equipment for each module, landside transfers and wharfside transfers. Bookings are made for a specific module; therefore, the yard position of the container is required prior to making a booking. This contrasts to a terminal that has shared yard resources (e.g. straddle terminal) where the yard position of the container is not important to the booking and can therefore be attached later.
- A benefit is carriers can only book import slots when required and not in expectation that the containers will be ready, reducing wasted slots. On the other hand, the high demand for slots can mean that the time between the container being ready and the next available slot can be longer than preferred.
- Where advanced booking is not used, carriers can book slots without an attached container but based on their available labour force. If a particular container is not available for collection it can be swapped for another anywhere in the yard. Alternatively, if a more recently landed container has higher priority, it can be swapped for a previously booked container. However, carriers can also book slots without containers, which are then not used if a suitable container is not available.

Vehicle Booking System fees

- Differential pricing for slot times is limited in its application in the ports investigated, with only the Ports of Los Angeles and Long Beach, the Port of Tauranga, and the Port of Manila having an active program. At the Ports of Los Angeles and Long Beach an additional fee is charged to access the port during peak periods that is then paid to the terminals to cover the cost of operating the landside interface during off-peak periods. The system is credited with helping to decrease congestion during peak hours.
- Fees are associated with VBS use at all the ports investigated. Australia and Manila are unique in allowing booked arrivals outside the booking window, however additional fees are charged for this feature and a penalty if the booking is missed. The Ports of Long Beach and Los Angeles only recently introduced the booking fee to address carrier abuses of the system. The specific VBS fees for bookings can vary by terminal operator. While publicly available in Australia and the Philippines, they are generally not publicly available for the international ports investigated.
- Feedback from industry in Australia is that the fees associated with the VBS (booking, off-slot, no-show) are high and continue to increase with little change to terminal performance. It is believed that the off-slot and no-show fees are a penalty rather than reimbursement of costs and do not result in greater efficiency of the carriers.

Port Community System

- All the European ports investigated had a PCS. The services offered depends on the engagement from stakeholders and the integrations to the platform. Some services may be accessed through the PCS or separately. The PCS is primarily used for the exchange of information between all parties within the port supply chain.
- The availability of real-time information about container status and congestion levels (Valencia) has improved the ability of carriers to plan trips to the port. Only the Port of Rotterdam and the Port of Valencia had their respective booking systems integrated into the PCS.
- Sharing information through the PCS allows the maximum reuse of information and has reduced the number of communications required among stakeholders by providing a single location for all documentation including to the Harbourmaster and Customs.

Staging of containers

- Within Australia there has been a move to staging containers at a depot (normally carriers depot) rather than transporting directly between the terminal and customer.
- Staging allowed carriers to utilise specialist fleets for specific destinations, with high-capacity trucks used for movements between the depot and the port, and lower-capacity trucks for movements between the depot and customer. Similarly, country or long-haul carriers not setup for access to the port can drop containers to a carrier that can access the terminal.
- When it comes to empties, staging is often required due to Empty Container Parks (ECP) having limited operating hours and the requirement that specific empty containers be returned to specific ECPs (shipping lines want their containers returned to their ECP).

Trucking and rail

- Most of the ports investigated are interested in increasing the share of cargo movements that are completed via rail. The ways this is being done is through:

  - On dock rail: at container terminals, terminals have an incentive to shift containers by rail if the siding is within the terminal, as they can shift large numbers at once. When the siding is located elsewhere an additional truck movement is required and the movement is no different to a normal road exchange or stack run.
  - Subsidies: The Port of Antwerp is providing subsidies to lessen the cost of rail transport through the intermodal terminal at the port and the port shuttle service to the terminals.
- North American carriers generally have Global Positioning System (GPS) systems which track the truck, with the tags read and tracked by the terminal, local dispatch, or a third-party VBS. GPS or Radio Frequency Identification Device (RFID) tags are required on all port-licensed trucks, allowing the port operator to track and report on TTT and wait times.
- High Productivity Freight Vehicles (HPFV) are common especially for carrier fleets focused on container movements to and from the port. HPFV carry up to 4 Twenty-foot Equivalent Units (TEU), on a single trip potentially 8 TEUs can be exchanged at the terminal, delivering exports, and collecting imports.

Table 0-2 contains a summary of the performance measures, regulations/performance requirements, structure, and operational experience for individual ports.

Table 0-2 Executive summary of ports investigated

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Ports of Los Angeles & Long Beach	Long Beach publishes a Weekly Advance Volume Estimate (WAVE). The report provides a forecast of the expected activity at the port over the following week.	Port registration and licence required for carriers to operate within the port precinct. The Clean Truck Program calls for carriers to replace older trucks working at the ports. PierPass charges carriers for bookings during peak times, and then pays the terminals to operate landside during off-peak.	To obtain a port licence a carrier must meet several obligations including using a VBS and abiding by clean truck regulations. The addition of PierPass to the VBS is credited with reducing TTT from 2 hours to 58 minutes over the last decade. This has been through reducing peak periods by incentivising off-peak movements.	To address carrier abuses (multiple bookings for a single container, no-shows) of the VBS, a booking fee has been introduced. To address road congestion trucks queueing on the road prior to their booking time are subject to fines from local police. These actions have reduced carrier VBS abuses and road congestion. Some terminals have rebates based on a high percentage of meeting the booking times and providing the correct container data. The clean truck program and the registration requirements has resulted in only the larger carriers having access to the ports. The largest threat to a carrier is the loss of the port licence, abuses of the VBS can result in losing that licence.
Ports of Vancouver	The waiting time at the terminal pre-gate and the TTT are collected through truck GPS and publicly published live.	The Canadian Federal Government introduced a Truck Licensing System (TLS) for all Canadian port authorities. Enforcement and administration are by the Province of British Columbia via an appointed Container Trucking Commissioner. The Port of Vancouver has launched a Smart Fleet trucking strategy for the purposes of managing carriers within the port.	The TLS licence includes a rolling truck age program (<10 years), and an access agreement that requires truck registration and the use of a VBS. One requirement of the Smart Fleet trucking strategy is all trucks to be equipped with GPS for the tracking of landside performance. Terminal/carrier access agreements requires the use of a VBS to enter a marine terminal. Long-haul trucks can enter the port with an advanced registration and are not required to use the VBS.	The 4 container terminals have agreed to use the same internally developed platform with the Port monitoring compliance. These programs have resulted in a reduction in the number of registered carrier companies from 2,000 to 85. Having a group of drivers who frequently visit the terminals, increases the industry knowledge of the terminal and the processes required. This combined with the introduction of a VBS, limiting arrivals to the booking window, and regular night gates reduced the TTT from 70 minutes in 2015 to 40 minutes in 2021.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Ports of Seattle & Tacoma	The Northwest Seaport Alliance - Ports of Seattle and Tacoma (NWSA) publishes the live camera feed and TTT for each terminal gate on its website.	The NWSA joined the Port of Vancouver in adopting trucking guidelines to promote the use of cleaner engines and cleaner fuels.	The NWSA Clean Truck Program requires a port licence for access, engines less than 10 years old, and all trucks be equipped with a RFID tag. The port licence requires all bookings be made through the VBS. NWSA is offering a USD10,000 grant to registered carriers to upgrade their engines to be within the Clean Truck Program.	To address congestion NWSA has created several off-terminal parking areas for short and long-haul trucks.
New York and New Jersey	There is no public visibility of landside performance data for the terminals within the Port authority of New York and New Jersey (PANYNJ).	The PANYNJ requires all trucks accessing the terminals to be registered with the Port.	The requirements for registration are a valid TWIC (identification card), Commercial Driver's licence, insurance, & driver registration with PANYNJ, engines must also be less than 10 years old. A VBS is not required by PANYNJ but is highly encouraged.	A few terminals do require carrier bookings for access. Carriers with bookings can use several specific gates for entry within their booking time. Carriers without bookings or outside their time must queue in a separate lane for a limited number of gates.
Port of Valencia	There is no public visibility of landside performance data for the terminals within the port.	A compensation system for delays to carriers accessing the terminals at the port is in place. The requirements for compensation from government legislation outlined in Law 15/2009, on the land transport of goods contract with Article 22. Stoppages	The compensation system applies for a truck delayed within the terminal gates for more than 75 minutes. The compensation is based the length of the delay. The government and the Port do not take an active role in the application of the law with each terminal responsible for its implementation. A Transport Order system is used for bookings. An order is generated for each agreed exchange between the terminal and carrier. The order is valid for 3 days during which time the driver can decide when to visit the terminal. The system is accessed through the PCS. Drivers can also see the status of containers to check for issues prior to pick up.	The compensation system is a sensitive issue for carriers as there is no clear guidance on the requirements. Terminals make it complicated to claim and have many exceptions leading to most carriers giving up their claim when the only resolution is to pursue a legal remedy. Carriers prefer the Transport Order system over a VBS as the lack of a set booking time and wider pickup window (3 days instead of 1 hour) provides greater flexibility in their operations. The terminal operator manages its service levels based on the number of currently valid transport orders.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Port of Rotterdam	There is no public visibility of landside performance data for the terminals within the port.	The Port, local government, and Ministry of Infrastructure introduced the Maasvlakte Air Quality Agreement 2008, which created access requirements to enter Maasvlakte (area of the port with all deep-sea container terminals). Enforcement of the access requirements is through camera surveillance with licence plate recognition.	The development of the Maasvlakte area led to increased road activity. To improve the air quality in the local area, trucks that enter the Maasvlakte area are subject to additional requirements for registration. They must be fitted with an engine less than 7 years old and rated to Euro VI emission standards. A VBS is available for all container terminals at the port through a PCS.	There was initially resistance to the introduction of VBS from carriers due to the additional fee and increased paperwork (previously handled by the terminal). To handle the container volume the Port sees the VBS as necessary and successful with a TTT generally of 30 minutes.
Port of Antwerp	There is no public visibility of landside performance data for the terminals within the port.	The Port introduced Certified Pick up. It is a container release process based on authorised identification. The Port and the Flemish Government have introduced a port wide ordinance for increased mobility of port equipment. They have also jointly introduced subsidies for rail services and intermodal terminals.	Certified pick-up requires approval prior to all import container collection (regardless of transport mode). This system is a separate requirement to the VBS used by each terminal. The cargo owner must release the container to the carrier and the terminal must release it as ready. The approval is linked to the driver's ID card, used for terminal access. The traffic ordinance is intended to smooth cargo transfer between local operations by allowing port vehicles (e.g. straddle carriers) access to public highways around the port. Rail subsidies were introduced to assist with increasing the number of rail services and reduce the cost of bundling containers from different terminals. The Port has a PCS in operation.	The Antwerp PCS is used to improve efficiency in the supply chain at the port. It is an initiative by the Port and the industry association that is provided by a third party. The intention with the PCS is that several services are offered to the users through a common platform. The exchange of information is through standard international formats that allows exchange between other applications. Many services relate to the relay of container information and status updates between stakeholders. Being able to access this information on a single platform reduces the communication required to update all stakeholders. The reduction in duplicate communication across the industry reduces the administrative burden, increasing the efficiency in managing port operations including landside movements.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Port of Manila	There is no public visibility of landside performance data for the terminals within the port.	The port is owned and regulated by the Philippine Ports Authority (PPA) with the terminals leased to private companies. The terminal operators are responsible for operations with the PPA overseeing / supporting through the issuing of directives. The Manila city council, to address congestion in the city enforces regulations restricting the movement of vehicles within the city. For trucks this has been bans during periods of the day and restricted access to routes in the city. The introduction of the VBS was a collaborative effort between the terminal operators and the PPA with a regulation issued that detailed the structure and mandated use of the VBS. High yard volumes at the port were contributing to lower port productivity. To improve cargo flow the Bureau of Customs implemented the requirement for a loading permit (SPTL) for empties delivered to the port area.	The use of a VBS is required at the 2 international container terminals. Booking zones are classified by demand with specific rules, fees, and penalties for each demand category. Demand categories include free and rebate categories. Payment transactions within the VBS are by using points rather than the local currency. A point is equivalent to a Philippine Peso. Points are pre-purchased with all VBS bookings requiring pre-payment. This system simplifies the payment process associated with the VBS. The SPTL only allows empties to be delivered to the port within 72 hours of loading, this has reduced volumes at the port and encouraged the use of empty depots outside the port area. There was some push back on having to use off site depots due to the additional cost.	There was no formal land interface system at the port before VBS. Trucks would queue outside the gates waiting for their turn to deliver or collect containers. Wait times could exceed 1 day. Queues at the port would create further congestion in the surrounding areas impacting the local community. The introduction of a VBS improved congestion at the port with there no longer being an issue with queuing. Journey planning only requires consideration of the city congestion. Trucks able to make 2-3 visits to the port per day compared to one prior to VBS. Trucks with valid bookings were exempted from truck bans after VBS introduction. Trucks are restricted to traveling on specific routes, however these routes often have dedicated lanes for trucks with valid bookings. Initial pushback on the VBS was based on having to learn the new system, the additional burden to make bookings and the high fees associated with bookings and penalties. Port stakeholders now generally support the VBS given the improved landside performance at the port.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Port of Melbourne	There is no public visibility of landside performance data for the individual terminals. For all the Australian ports investigated the Bureau of Infrastructure and Transport Research Economics (BITRE) publishes the Waterline statistical report on wharfside and landside productivity. This information is aggregated at a port level.	Freight Victoria introduced the Voluntary Performance Monitoring Framework (VPMF). which includes the Voluntary Pricing protocol (VPP) and the Voluntary Port Performance Model (VPPM). The Port requires terminals as part of their lease to manage their traffic and not cause hazards on the port roads. Local restrictions (bridges) on HPFV increases the number of trucks on local road networks.	The VPP was implemented to provide transparency around landside pricing with a protocol that includes providing reasons for the change, a feedback period, publishing of feedback themes and a response. The VPPM was implemented to provide visibility on landside performance. Terminals submit data each month. The terminals were onboard with providing data aligned with BITRE, and the voluntary model has assisted with building relationships without pressure of regulation. All terminals operate a VBS. Victoria International Container Terminal (VICT) uses Advanced Booking which requires the container to be in the yard to be booked for pick-up.	Freight Victoria has received fewer complaints regarding pricing from industry since VPP was introduced, with the assumption being that the increased notice on changes allows industry time to adjust their rates. The general feedback from industry was that VBS fees are too high and increased frequently. Delays can occur with Advanced Booking between a container being ready and the next available slot, especially if peak times are preferred. The other terminals allow slots to be booked without a specific container attached. Staging of containers at carrier depots is common even with empties. Staging empties is due to the ECP limited operating hours and the need to return specific containers to each park. Congestion can result due to the lack of truck marshalling area (TMA). The Port advised there is some short-term parking on the roads leading into the port however, the lack of parking is an issue raised by industry, with no truck parking areas at the port. VICT only has a TMA for trucks within their zone.
Port of Fremantle	There is no public visibility of landside performance data for the terminals within the Port of Fremantle. The Port is installing cameras that will recognise types of vehicles and load carried for increased real-time data on movements.	The Port uses performance requirements to influence behaviour at its leased facilities (container terminals and ECPs). The agreements include both incentives (variable portion of lease) and performance requirements.	Terminal Key Performance Indicators (KPIs) are focused on improving the flow of cargo. Fortnightly data is provided with deficits to be addressed. KPIs include proportion of volume during off-peak, minimum number of slots, average TTT, proportion of volume by rail. All terminals use a VBS. A Congestion Management System (CMS) is in place with a TMA. The terminal can	Off-peak stack runs are common for shifting large volumes for containers (full and empty), freeing up the peak times for smaller carriers that don't operate 24/7. Staging of containers is common (80% of the full imports by road). Rather than being supplied directly to the customer from the terminal they go via a depot. This has relieved pressure on the carriers as they can focus solely on port collections.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
			activate the CMS, which directs carriers to the TMA to prevent congestion on the road. The TMA operates as a remote gate with carriers called up in the order they arrived.	
Port of Brisbane	There is no public visibility of landside performance data for the terminals within the Port of Brisbane.	The Port has leases with the terminals that requires the provision of average monthly performance data. The Port has approved the use of high mass HPFV within the port precinct. Trucks are allowed to park on approach roads within the port.	High mass HPFVs have been approved for 2 decades, but only within the port, due to their high payload. All 3 container terminals operate a VBS, Patrick terminals (Patrick) and DP World (DPW) use the 1-Stop system and Hutchison Ports uses a similar internal system. DPW uses Advanced Booking. The Port hosts a landside logistics forum every 3 months where issues affecting the industry can be raised and the industry can be informed of proposed changes. This forum is very popular and well attended.	Carriers based outside of the port precinct adopted a lower payload HPFV approved on general roads to achieve the same efficiency as those within the port precinct. DPW believes Advanced Booking "evens the playing field" between carriers, as bookings can only occur for a container that is ready versus booking for preferred slots. No issues with the availability of slots after landing in the yard were reported. Queueing is uncommon as there is sufficient capacity within 2 of the terminals to wait if needed. There is no measurement or monitoring of congestion and no means for the port to influence outcomes if queuing does occur. The use of staging has allowed economies of scale in carrier fleets. A dedicated fleet of HPFV can be used for port visits and a lower capacity fleet for customer transits. Under-utilised off-peak zones are due to limited demand by industry, with only one terminal operating 24/7. There are high labour costs to maintain a consistent night shift and overall container volumes are catered for in normal operating times.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Port of Lyttelton	There is no public visibility of landside performance data for the terminal. The NZ Ministry of Transport; Freight Information Gathering System (FIGS) publishes self-reported port data.	The South Island Port User Working Group (SIPUWG) is currently in its early stages having been formed in 2019. One of the topics that will be discussed is fair targets for container operations however, it is still early in the process	The Port uses a single VBS for its container and intermodal terminals. The Port has internal targets for approximately 70% of road visits to be serviced within 30 minutes of arrival at the entrance gate.	The terminal provides monthly VBS reporting to carriers with direct contact if a high number of unexplained late/no-show occurrences are occurring. In the event of a terminal issue, booking times are extended or alternatively storage fees are waived. The same would be considered at the ECP to avoid flow on impacts.
Port of Tauranga	The Port publishes live on its website the current real-time average TTT for the hour at the container and intermodal terminals.	There are no regulatory requirements or performance targets.	The Port uses a VBS with the gate in/out process GPS enabled through a driver application. Reduced off-peak booking fees are used to encourage spread of arrival times.	The electronic interaction with the driver application ensures information is validated, minimising issues on arrival. Late arrival or no-show fees are currently not enforced due to non-port related traffic issues that are impacting carriers. A new landside truck exchange provides expanded capacity for truck bays at the terminal allowing more trucks to be serviced at the same time. This combined with the VBS which limits the number of bookings per zone, spreading operations over the day, has decreased average TTT to 20 minutes.
Port of Auckland	The Port publishes landside performance data monthly to its website.	There are no regulatory requirements or performance targets.	The Port operates a VBS and was understood to be transferring its VBS between providers (1-Stop to ContainerChain) for all its sites in July 2021. The change is to establish a standard approach for carriers when booking slots across the logistics terminals in the Upper North island.	The Port has published that they will use a demand-based pricing model however this is yet to be implemented with off-peak and peak fees currently set the same.

Definitions and Abbreviations

Term	Definition
ACC	Automatic Container Carriers
AIDC	Automatic identification and data capture
AO	Administrative Order
APA	Antwerp Port Authority
APM	A.P. Moller-Maersk
ASC	Automatic Stacking Cranes
ATI	Asian Terminals, Inc.
BITRE	Bureau of Infrastructure and Transport Research Economics
BMT	Brisbane Multiuser Terminal
BOC	Bureau of Customs
Carrier	a company (regardless of size) that moves containers by truck into or out of a marine terminal.
Chassis	Trailer used to carry containers
CMS	Congestion Management System
CSPV	CSP IBERIAN VALENCIA TERMINAL, S.A.U., part of the COSCO SHIPPING Ports (Spain) Terminals group
CTT	Container Turn Time
DoT	Department of Transport
DPW	DP World
DRE	Direct Return Empties
ECP	Empty Container Park
ELSA	Empty Loadout Shipping Alliance
EPA	Environmental Protection Agency
Export Cut-off	Deadline for all containers to be in the terminal ready for vessel loading
Gate	The gate is generally the entry point to the terminal truck exchange area, there may be also be gates to enter the port precinct and terminal waiting area
GCT	Global Container Terminals; a container terminal operator in Vancouver, BC and the PANYNJ

Term	Definition
GPS	Global Positioning System
HPFV	High Productivity Freight Vehicles
ICTSI	International Container Terminal Services, Inc.
Import last free day	Last day before storage fee apply
KPI	Key Performance Indicator
Landside	Area of the terminal that yard and road/rail exchange activities occur
Long-haul	Trucks that are used for container hauls into and out of the local metropolitan region to points inland. Distance is typically more than 100 miles (160 km) from the port.
LPC	Lyttelton Port Company
MICT	Manila International Container Terminal
MMDA	Metropolitan Manila Development Authority
MSC	Mediterranean Shipping Company
NQRT	North Quay Rail Terminal
NWSA	Northwest Seaport Alliance, an alliance between the Ports of Seattle and Tacoma (Washington)
NZ	New Zealand
OCR	Optical Character Recognition
PANYNJ	The Port Authority of New York and New Jersey
Patrick	Patrick terminals
PAV	Port of Valencia
PBLIS	Port Botany Landside Improvement Strategy
PCS	Port Community System
POAL	Ports of Auckland
POB	Port of Brisbane
POLA	Port of Los Angeles California
POLB	Port of Long Beach California
PoM	Port of Melbourne Operations Pty Ltd
POR	Port of Rotterdam Authority
Port	The landlord port operator with responsibility for the area containing terminals and services to transport goods to vessels

Term	Definition
POT	Port of Tauranga Ltd
POV	Port of Vancouver
PPA	Philippine Ports Authority
PPS	Points Payment System
QR	Quick Response Code
RFID	Radio Frequency Identification Device
RTG	Rubber tyred gantry crane
SIPUWG	South Island Port User Working Group
Slot	Booking for a single container movement within a zone
SPTL	Special Permit to Load
Stack	Group of containers placed together in the terminal yard
Stack Run	The pre-arranged movement of a large volume of containers, with little consideration of the specific containers, into or out of a terminal by a single carrier, within a short period of time
Staging	Holding containers at an intermediate location between origin and destination
TABS	Terminal Appointment Booking System
Terminal	Location within the port where cargo operations occur, operated by a stevedore
Terminal Operator	The terminal operator responsible for the cargo operations also known as 'Stevedore'
TEU	Twenty-foot equivalent unit, unit for measuring containers
TfNSW	Transport for NSW
TLS	Port of Vancouver's Truck Licensing System
TMA	Truck Marshalling Area
TMF	Traffic Mitigation Fee- Fee charged by PierPass
TOS	Terminal Operating System
Tractor	Propulsion unit for trucks
TRB	Transportation Research Board - US National Academy of Sciences
Truck	In this report, a truck is the combination of tractor and trailer used to pick up a container. A carrier may operate a number of trucks.
TTT	Truck Turn Time

Term	Definition
TWIC	Transportation Worker Identification Credential Card requirement for all drivers and anyone entering a US marine terminal.
US	United States of America
VBS	Vehicle Booking System. The systems generally offer the ability to make bookings for the delivery or collection of containers to the terminal.
VICT	Victoria International Container Terminal
VPMF	Voluntary Performance Monitoring Framework
VPP	Voluntary Pricing Protocol
VPPM	Voluntary Port Performance Model
VTA	Victorian Transport Association
WAVE	Weekly Advance Volume Estimate
Wharfside	The area of the terminal where goods are loaded or unloaded from a vessel
Zone	Specific period for which a booking is made for container exchange

1 Introduction

The Port Botany Landside Improvement Strategy (PBLIS) was introduced in 2010 to improve efficiency and reduce congestion in and around the Port Botany precinct, primarily by regulating the performance of stevedores and road carriers at the container terminals. On 12 November 2021, the NSW Government announced a comprehensive review of the Ports and Maritime Administration Act 1995 and PBLIS. The Review is being led by Mr. Ed Willett, the Independent Reviewer, and will be supported by Transport for NSW (TfNSW).

As part of this review Advisian was asked to undertake a comparative analysis of:

- International approaches to government regulation of landside container management at key cargo ports of relevance for the PBLIS review
- Approaches in Australia and New Zealand (NZ) for managing the landside container interface at cargo ports
- Operational experience over the past decade, particularly relating to landside transport.

The following key questions were considered as part of this study:

- Are port landside interface performance measures available?
- Is government involved in the establishment, oversight, or management of the port landside interface via regulation, lease arrangements or another method, or is it managed by industry?
- Analysis of any regulatory frameworks their structure and performance outcomes.
- What has the landside operational practice and experience been over the past decade?

TfNSW suggested several ports to be reviewed, while also requesting Advisian undertake a review of international ports to determine ports which may be comparable. Table 1-1 contains a summary of the ports which have been included within this report.

The report has been structured into 2 main sections:

Part One: International ports

Part Two: Australian and New Zealand ports

The structure of a port will generally be that the land and infrastructure in the area is owned or leased long term by a port operator (the Port), often a private company. The Port will lease areas within the port to terminal operators to manage cargo operations. The Port will maintain responsibility for shared infrastructure which may include safe navigation.

Within the port there can be several terminals where cargo operations are performed. The terminals will generally be focussed on a specific cargo type such as containers, dry or liquid bulk, vehicles etc. For this report container operations are investigated and all further references to terminals, carriers and trucks is in relation to containers only.

While terminals may share common road and rail infrastructure approaching their facilities, the terminal itself is responsible for the management of operations within its facility. Operations include:

- Wharfside which is responsible for the movement to and from ships and barges to the terminals' storage yard

- Landside which is responsible for the movement from the terminals' storage yard to and from trucks or rail.

Road transport outside the terminal is performed by carriers that may have a fleet of trucks or be a single truck owner-operator. The fleet can vary in the carrying capacity from a single Twenty-foot equivalent unit (TEU) through to high mass 4 TEU capacity. The Port may approve certain trucks within the port area but outside trucks will be subject to the applicable road regulations.

As can be seen in Table 1-1, the number of terminals in a port generally increases with port container volume.

The landside operations between terminal operators and carriers involves coordination between the 2 parties with the goal to exchange containers in and out of the terminal. This report will focus on the landside operations of the ports as listed in the below table. For comparison, Figure 1-1 and Figure 1-2 show the total container exchange and percentage of empty containers through each port. Data on transhipment and road/rail split is not available for all ports. Given the local shipping market within North America, it is understood transhipment volumes are low at the ports investigated.

Table 1-1 Summary of ports investigated (2020) (1)

Port	Number of Container Terminals	Container exchange (Million TEU)	Empty Containers Import/Export (%)	Transhipment (%)	Road / Rail (%)
Port Botany	3	2.7	0.9% / 63%	5%	85% / 15%
Port of Los Angeles	7	9.2	1% / 65%	-	-
Port of Long Beach	6	8.1	4% / 63%	-	-
Port of Vancouver	4	3.5	3% / 35%	-	
North West Seaport Alliance - Ports of Seattle and Tacoma	8	3.3	8% / 38%	-	-
Port of New York and New Jersey	6	7.6	0.6% / 64%	-	91% / 9%
Port of Valencia	3	5.4	37% / 23%	57%	-
Port of Rotterdam	5	14.3	14% / 19%	36%	-

Port	Number of Container Terminals	Container exchange (Million TEU)	Empty Containers Import/Export (%)	Transhipment (%)	Road / Rail (%)
Port of Antwerp	5	12	14% Total	Unavailable, but has extensive links within Europe.	58% / 7% (35% Barge)
Port of Manila	2	3.1	0% / 72%	0%	100 / 0%
Port of Melbourne	3	3	9% / 39%	4%	92% / 8%
Port of Fremantle	2	0.78	5% / 44%	0%	82% / 18%
Port of Brisbane	3	1.4	10% / 48%	5%	97% / 3%
Port of Lyttelton	1	0.45	18% / 34%	8%	79% / 21%
Port of Tauranga	1	1.3	45% / 10%	10%	57% / 43%
Port of Auckland	1	0.88	4% / 53%	4%	90% / 10%

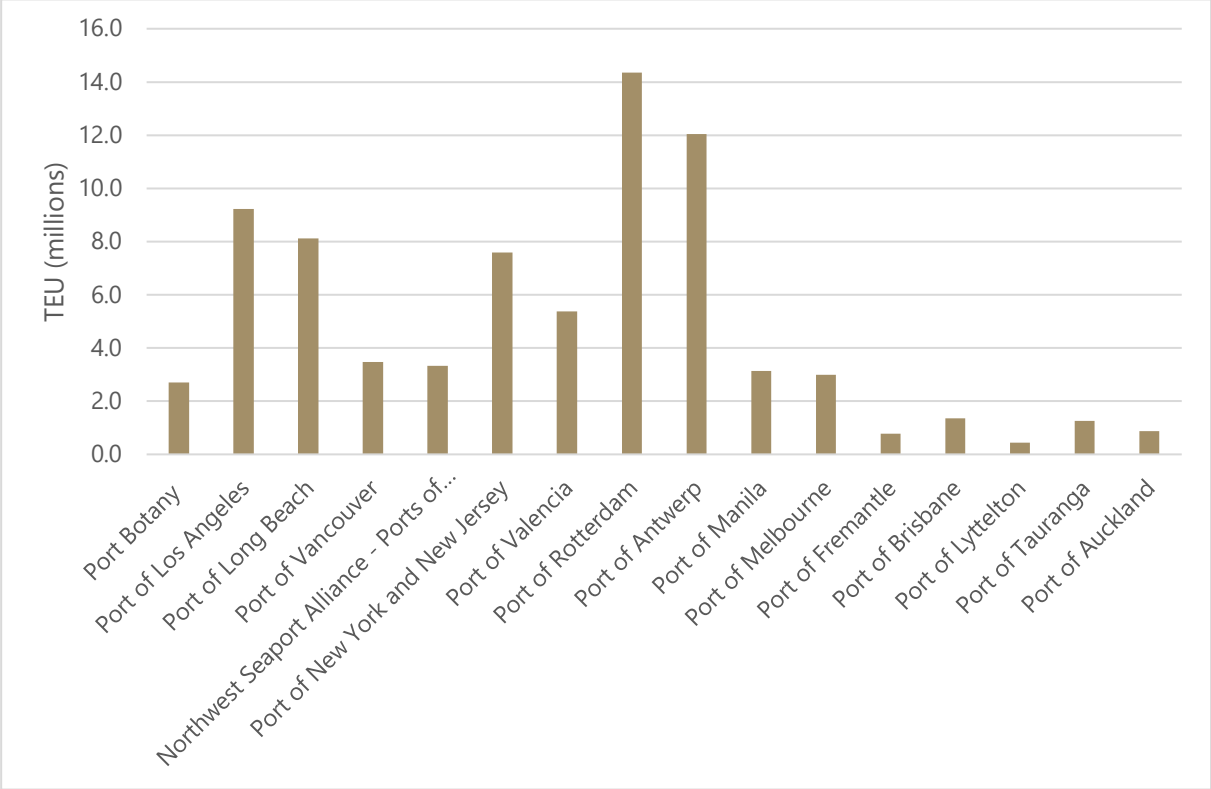


Figure 1-1 Total container exchange for ports investigated (2020)

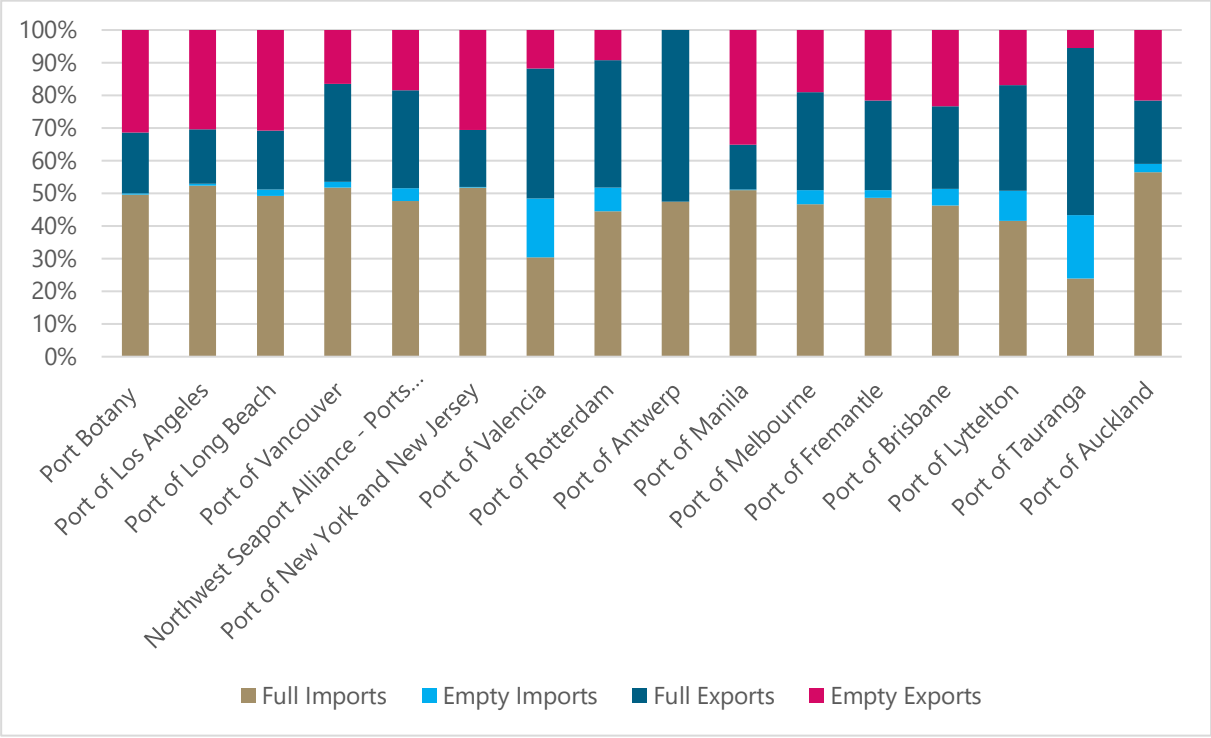


Figure 1-2 Empty container mix for ports investigated (2020), (No empty data available for the Port of Antwerp)

2 Part One: Study of International Container Port Landside Management Models

The focus for the study of international ports is to understand what systems the ports have in place for managing the landside processes, and how the systems operate within the context of the ports landside infrastructure, location, and cargo flow.

Ports through North America, Europe, and Southeast Asia have been investigated with research based on publicly available information and input from stakeholders listed in Table 2-1. The Ports investigated were:

- The San Pedro Bay ports - Ports of Los Angeles and Long Beach, California, USA
- Port of Vancouver, British Columbia, Canada
- The Northwest Seaport Alliance - Ports of Seattle and Tacoma, Washington, USA
- Port Authority of New York And New Jersey, USA
- Port of Valencia, Spain
- Port of Antwerp, Belgium
- Port of Rotterdam, Netherlands
- Port of Manila, Philippines.

The location of the ports investigated are shown on the maps in Figure 2-1, Figure 2-2, & Figure 2-3.

Table 2-1 Part one; Stakeholders engaged for discussion

Port	Stakeholders Engaged
Port of Los Angeles	Carrix SSA Marine, Fenix Terminals
Port of Long Beach	Carrix SSA Marine, A.P. Moller-Maersk (APM) Terminals
Port of Vancouver	Global Container Terminals
Northwest Seaport Alliance (Ports of Seattle and Tacoma)	Carrix SSA Marine, Washington United Terminals
Port Authority of New York and New Jersey	APM Terminals, Global Container Terminals (GCT)
Port of Valencia	Port Authority of Valencia, Xavi Más García (Transport Operator)
Port of Rotterdam	Port Authority of Rotterdam
Port of Antwerp	Stakeholders were unavailable for participation
Port of Manila	Philippine Ports Authority, Bureau of Customs, Industry members; Supply chain company & Carrier. The 2 international container terminal operators (Manila International Container Terminal & Asian Terminals Inc) were unavailable for participation.

Figure 2-1 Part one; Location of ports of interest in North America (2)

Figure 2-2 Part one; Location of ports of interest located in Europe (3)

Figure 2-3 Part one; Location of the Port of Manila, Philippines (4)

2.1 North American Ports

In investigating the North American ports, it was found that they shared similar operating conditions and faced similar issues. Sections 2.1.1 and 2.1.2 contains details similar across all ports while sections 2.1.3 to 2.1.6 provide information relevant to particular ports.

2.1.1 Vehicle Booking Systems

All the port operators at the investigated ports require carriers operating into and out of their container terminals to be licensed with the Port. The original licence requirement was an initiative to direct trucking companies to use cleaner diesel engines. This has been expanded to require the scheduling of bookings to reduce congestion and improve security at all terminals.

All North American container ports have embraced technological solutions as part of landside operations since the late 1990's. The need for further technological solutions has increased substantially during the pandemic with enhancements continuing to be developed.

Vehicle Booking Systems (VBS) are a key component of the landside technology enhancements. Advent eModal, Voyage Control, and the Blume Booking Platform are 3 commercial systems offered that provide users with information on:

- Container and chassis availability
- Payment and customs status
- Other critical data to speed up securing bookings for the pick-up or delivery of containers.

The systems generally offer the ability to make bookings for export and empty returns and import pick-ups. These systems tie directly into the terminal's terminal operating system (TOS) to determine

container status, which then updates the carrier's dispatch system. The carrier can make a booking for delivery or collection of a container(s) from the available slots issued by the terminal. The systems are also tied into local chassis pools to dispatch and receive chassis[1]. The carriers, the shipper, the ocean carrier, and the intermodal railroad now have complete visibility to the status of the container, the chassis, and the scheduled events for every asset. The systems also offer the ability to make payments to various components including US and Canadian Customs.

The more advanced VBSs also track the utilization of yard equipment and yard congestion (obtained from the TOS). If yard congestion is projected to significantly increase the Truck Turn Time (TTT), the system will alert the incoming drivers so they can adjust schedules.

2.1.2 Common Issues

The ports contacted face similar, if not identical, issues relating to road traffic and the increasing volumes of containers being moved into and out of the container terminals. The issues faced are:

- Congestion
  - On local street and highways
  - At terminal gates
  - In the terminal affecting Turn time metrics
- Security and accountability
  - Of Cargo and container tracking systems
  - Of Chassis management systems
- Environmental
  - Requirements to shift towards cleaner engines and fuel, or electric
  - Requirements for noise reduction
- Labour
  - Shortage / turnover of qualified drivers
  - Federal Hours of Service requirements
  - Requirement for driver Transportation Worker Identification Credential Card (TWIC)
  - Health and benefits burden for drivers.

2.1.2.1 Congestion

Most container terminals throughout North America operate wharfside activities 24/7, however landside operations are at reduced hours. Most landside operations, due to terminal labour contracts close for breaks, evenings, and weekends. This historically has caused back-ups prior to terminal gate

[1] One of the key issues in today's operations is control of the chassis. Marine terminals previously typically owned and managed a chassis pool but due to maintenance and operating requirements imposed by the Federal Government are no longer offering this service. Local/regional chassis pools have been established to control and maintain chassis fleets with many of the local carriers participating in the pool to ensure a supply of chassis for their operations.

opening and during the breaks. Queues would routinely back up onto the local highways and roads, and even with advanced gate processes, would cause a truck to be in the queue for up to several hours. Many of the local jurisdictions started policing and ticketing vehicles caught in the queue while on a public street. This forced the terminals to create VBSs to spread out the arrival of trucks to the terminal. The early systems developed in the 2000's were terminal based and merely provided a window for a truck to show up without any details, such as the container status. Since then, additional features and integrations with other terminal and port systems have been developed.

Internal congestion has become a very critical element directly affecting the terminals. The metric captured by most ports is the TTT. TTT is the time taken from when a truck enters through the gate until it exits the terminal. The problem is defining when entering the gate queue occurs. Most North American terminals have a reader at the entrance to the gate which starts the official TTT. On heavy days, or during peak periods, trucks can wait in line for a significant amount of time before they reach the gate reader.

2.1.2.2 Security and Accountability

Containers and chassis are valuable commodities and there are currently various systems that track the movement and location of both assets. The carriers, either long haul or local, generally have Global Positioning Systems (GPS) which track the truck. Given the cost, smaller carriers tend to use Radio Frequency Identification Device (RFID) tags which are relatively inexpensive, but do not include GPS tracking. Both chassis (trailer that carries the container) and tractors (truck's propulsion unit or primary mover) have RFID tags for the various port locations, with the tags read and tracked by the terminal, local dispatch, or a third-party VBS.

2.1.2.3 Environmental

Federal, State, and local (especially California and the United States [US] West Coast) Clean Air requirements for heavy-duty trucks (Class 5 and higher; over 16,000 gross weight tonnage) are becoming very stringent. In 2019 the US Environmental Protection Agency (EPA) indicated that heavy-duty trucks were responsible for 23% of the US greenhouse gas emissions. The EPA's Clean Trucks Plan takes effect with model year 2027 trucks and while the exact criteria are yet to be announced, it is expected to require trucks to be 20%-40% cleaner by either engine technology or fuel, including all-electric propulsion systems. All the investigated ports have, in their strategic plans, the requirement to meet or better the EPA standards. Environment Canada, Canada's equivalent environmental agency to the US EPA, has the same Federal Standards as the US EPA.

Local jurisdictions set standards for engine noise, including the elimination of dynamic engine braking, idling while parked, and operating engine noise. The issue for ports is when long haul trucks come into the area while the gates are not open or operating, forcing them to find a place to park near the terminal. Typically, this is in a commercial and/or residential area where the parking (including idling) creates disturbance.

2.1.2.4 Labour

At the January 2022 Transportation Research Board (TRB) Freight and Logistics Committee meeting, 4 major North American carriers indicated that they have on average, for the prior 4 months, a more than 90% vacancy or turnover rate among the trained and experienced truck driver labour pool. While

this may be a pandemic related issue, historically long-haul carriers have a greater than 70% annual turnover rate, and a high vacancy rate, due to a labour pool that is historically scarce.

All drivers accessing a terminal are required to have a TWIC Card. The card is relatively easy to obtain but it requires a full federal agency background check and even a minor previous criminal event can eliminate the driver from consideration. It takes on average, 4-6 weeks for the TWIC card to be issued. The American Trucking Association has estimated that the TWIC requirement has eliminated approximately 80% of the driver pool eligible from entering a marine terminal.

With the pandemic, health and benefits has become a very important issue with all aspects of US labour. However, the cost of these benefits makes it difficult for an individual or even small company to provide them, while this is less of an issue for the larger carriers.

2.1.3 The San Pedro Bay Ports; Port of Los Angeles and Port of Long Beach, California

Table 2-2 San Pedro Bay ports; Summary table (2020)

Measure	Port Botany	Port of Los Angeles	Port of Long Beach
Volume of TEU	2.7 Million TEU	9.2 Million TEU	8.1 Million TEU
Number of Container Terminals	3	7	6
Empty Containers Import/Export	0.9% / 63%	1% / 65%	4% / 63%

The San Pedro Bay ports are 2 separate entities located alongside each other, which in combination in 2021 handled just over 20 million TEUs. Figure 2-4 shows container volumes for the 2 ports from 2010 to 2021. The future combined capacity after planned expansions is estimated to be a combined capacity of 42 million TEUs per year. The combined cargo forecast (revised in 2020) for both ports projects the 42 million TEU forecast will be achieved between 2035 and 2040.

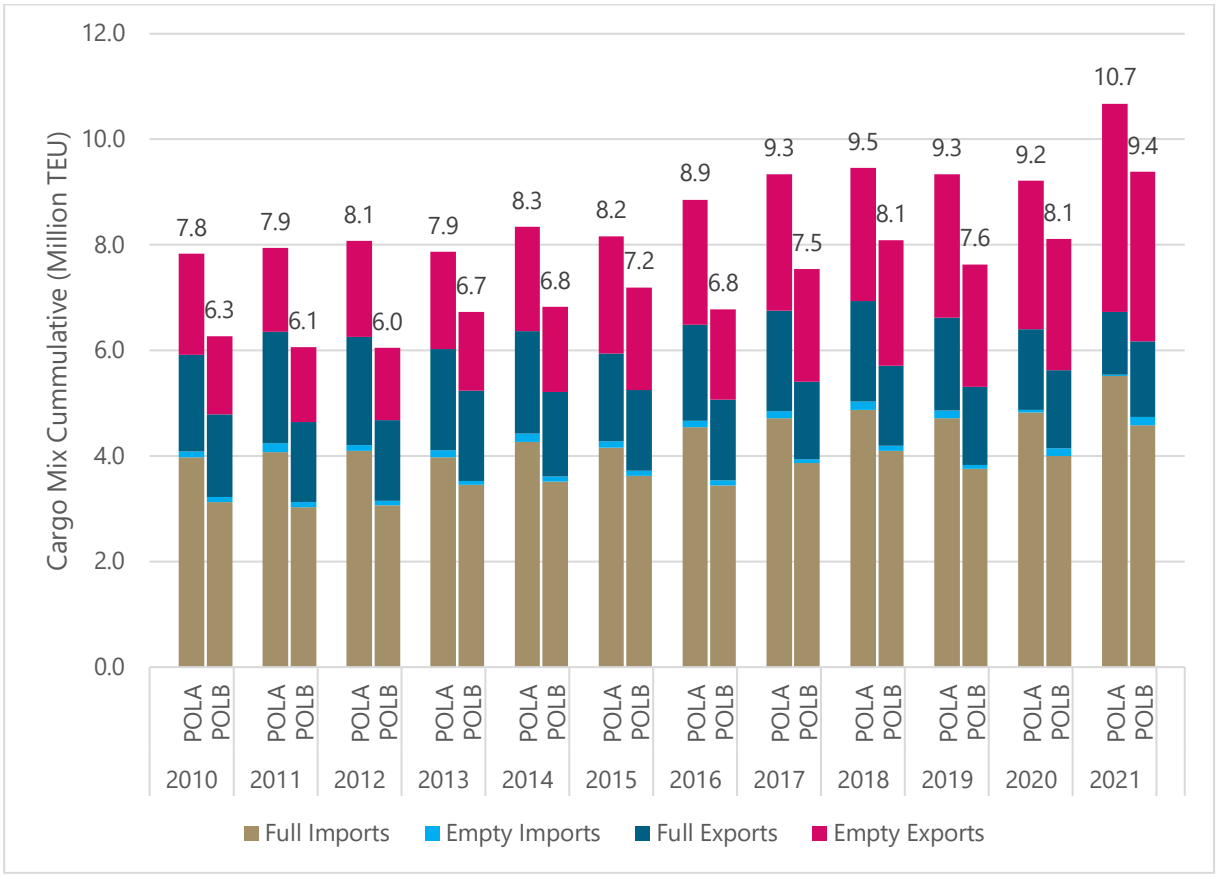


Figure 2-4 POLA & POLB; Container cargo mix and exchange from 2010 to 2021 (5) (6)

Each port is an independent department of the respective city government structure (City of Los Angeles and City of Long Beach) and operate as landlord ports. Each port is under the control of an appointed Harbor Board of Commissioners.

The Port of Los Angeles (POLA) has 25 cargo terminals with 7 container terminals. It has a planned container expansion of 2 new terminals, and expansion of 4 existing terminals. One of the planned new terminals is a 500-acre reclamation with capacity for 3-4 million TEUs. Figure 2-5 shows the existing POLA layout, container terminal location and proximity to non-port zones.

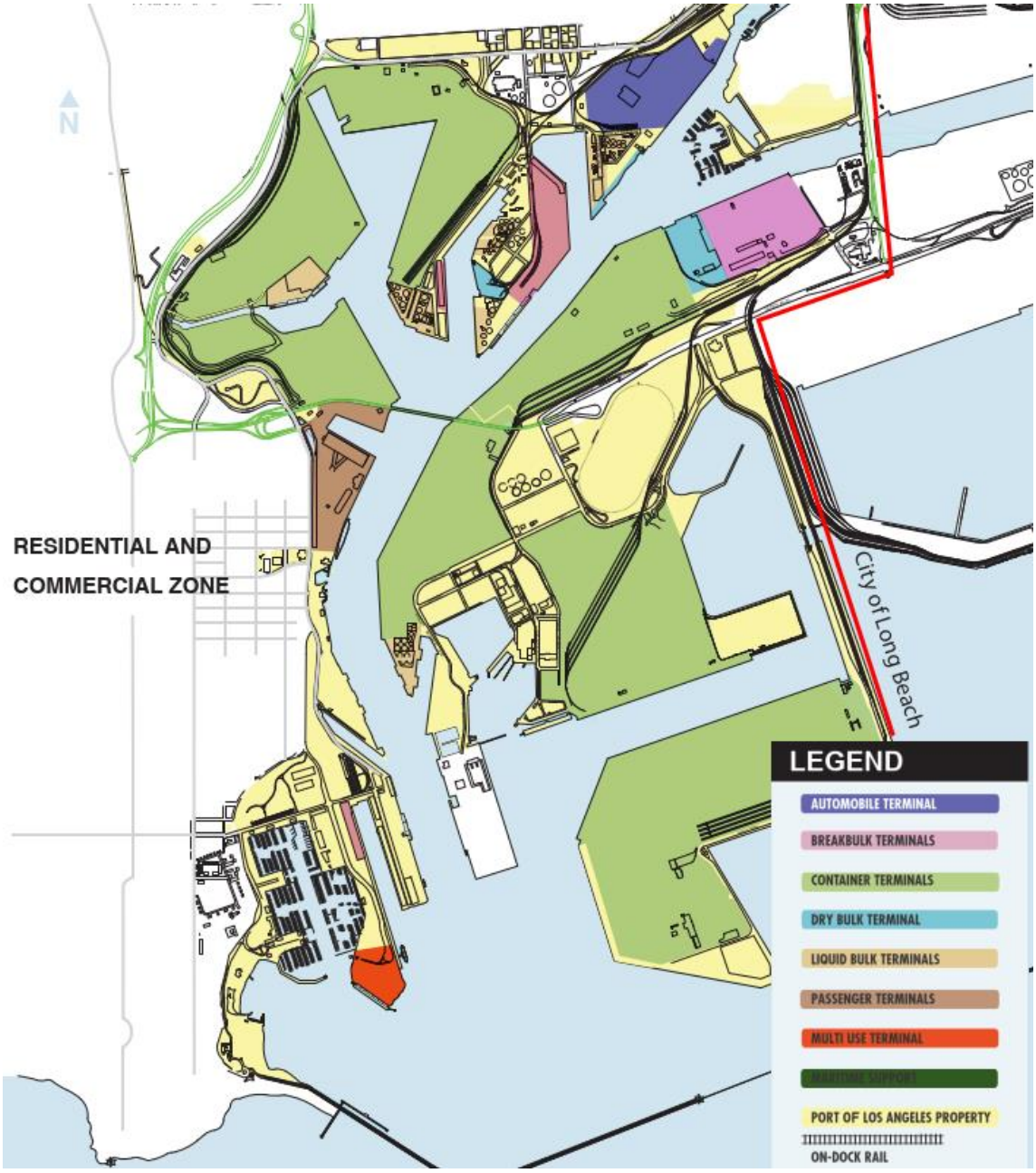


Figure 2-5 POLA; Terminals and proximity to local zones (white). Light blue indicates areas of water (7)

The Port of Long Beach (POLB) has 22 cargo terminals with 6 container terminals. The Port is in year 8 of a 10-year container terminal expansion program for Pier E (Middle Harbor Terminal) which, when completed, will add over 3.3 million TEUs of capacity. Figure 2-6 shows the existing POLB layout, container terminal location and proximity to non-port zones.

Figure 2-6 POLB; Terminals and proximity to local zones (brown). Light blue indicates areas of water (8)

POLA and POLB require carriers to have a port registration and licence to operate within the port precinct but rely on other mandated systems (e.g. PierPass [Section 2.1.3.1] and VBS) to control the road transport activity and flow.

A more recent component implemented due to congestion extremes (pandemic related) is the enforcement of existing rules and policies around street queues by local police ticketing them for blocking the street and impeding traffic. Queues may be created by trucks arriving early before the gate opened or appointment time started. A vehicle booking fee has also recently been introduced to assist with reducing carrier abuse of the system.

Currently, the Ports do not penalize the terminal for exceeding a stated TTT. Some terminals have incentives for carriers where they rebate the booking fee or a portion of the fee for a high percentage of meeting booking times and providing the correct container data. The booking window is typically 2

hours inclusive of a booking period and an allowance for early and late arrival, arriving outside the window would require a new booking. The rebate varies and is confidential on a per terminal basis. The largest threat to a carrier is the loss of the port licence to operate, with carriers warned with a formal notice of violations when abusing the systems, such as making more than one booking time for a container, changing the booking details, or missing a scheduled time without notification.

The Clean Truck Program for the POLB calls for carriers to replace older trucks working at the port and includes registration requirements to identify clean trucks, ensure reliable short-haul service, and improve air quality, security, and safety. Over the course of the implementation of the progressive ban (which commenced in 2009 and ended in 2017) older trucks servicing the port were phased-out and replaced with cleaner, more efficient trucks. The POLA has an identical program.

For a carrier to obtain a port licence to operate within the port, they must commit to meet the following obligations:

- Agrees to dispatch all trucks under its purview based on a VBS(s) with every terminal.
- The carrier does not need to own the trucks, but they must certify all trucks under their dispatch control meet the standards.
- Agrees that all trucks, fuelled by fossil fuels, are using engines no older than 2017. This is based on a California State emissions requirement.
- Agrees to equip each vehicle with a RFID tag or other technological identification method provided by the Port.
- Provide transport services with trucks that comply with all federal, state, and port environmental, security, and safety regulations, and certifies that it shall not dispatch any vehicle that it knows, or in the exercise of due diligence, should know, does not comply.
- Agrees to enter into the Truck Registry all required information for each driver it dispatches for transport services at the port. Entry into the registry must occur at least 24 hours ahead of the driver attempting to enter a terminal.
- Agrees to be responsible for dispatching to the port for the purpose of providing transport services, only drivers that possess a valid Commercial Driver's licence, a valid TWIC, and is fully insured. The carrier also warrants that the drivers are below the hours-of-service requirement established by the Federal Government throughout the entire journey.
- Fees are $500 USD per carrier company with a $250 USD annual fee per vehicle (as of January 2022).

Application for and receiving a licence will take over a week.

The unintended consequences resulting from these restrictions, are that small carriers and most of the independent owner-operators were eliminated from being able to operate in the port. This is due to several reasons, but the largest reason is the dispatching requirement and the carrier being responsible for the drivers and the trucks to follow the above listed obligations.

For example, a long-haul driver from Chicago coming to Long Beach with their own rig would have to go through a local dispatcher (national carriers can use their remote dispatch operations), have a valid RFID tag and meet all the vehicle and driver criteria, including being in the registry. If the long hauler is not licensed by the port prior to departure, they will not be able to enter the port. Due to these requirements, it is not efficient to have long-haul trucks registered for an irregular terminal visit. This

has resulted in having long-haul trucks delivering the container to a local carrier for further dispatch to the terminal.

The recent supply chain issues especially; the lack of empty containers and available chassis; the responsibility for the vehicle and driver compliance; and the shortage of labour (including the health and benefits issues), has created an environment where only a few (relative to what existed several years ago) carriers can serve the ports. These carriers are generally larger as they can manage the requirements and have more negotiating ability with drivers as they are able to offer additional employment benefits.

2.1.3.1 Variable Pricing Program

In addition to the port licence requirement, the San Pedro ports have also sponsored a program called PierPass. PierPass is a non-profit third-party entity that charges carriers for containers delivered or picked up from the container terminals during peak times, and then pays the terminals to keep extended gate hours, including weekend gates. The intent is to encourage off-peak activity through lower costs and encourage the terminals to extend their gate hours through subsidises. In 2020, the marine terminals received $235 million USD to cover extended gate expenses of $276 million USD.

PierPASS Inc. is a not-for-profit company created by the West Coast Marine Terminal Operators Agreement, with member container terminal operators from the POLA and POLB, to address multi-terminal issues such as congestion, air quality and security. PierPASS launched the Off-peak program in July of 2005 to reduce severe cargo-related congestion on local streets and highways around the Los Angeles and Long Beach ports. Off-peak established regular night and Saturday work shifts to handle trucks delivering and picking up containers at the 12 container terminals in the 2 adjacent ports.

PierPass developed Off-peak as a market-based solution to what was then a critical public problem: after a rapid rise in cargo volume in the early 2000s, trucks were causing severe congestion on the roads and highways and in the neighbourhoods around the ports, while thousands of idling trucks caught in this traffic every day added to air pollution. The ports came under strong community and political pressure to find a solution. Off-peak nearly doubled the potential capacity of the ports without requiring taxpayer funding or waiting years for new infrastructure construction. As an incentive to use the Off-Peak shifts and to cover the added cost of the shifts, a Traffic Mitigation Fee (TMF) is required for most cargo movement at the 2 ports (9).

From December 1, 2021, through January 31, 2022, the TMF will be $78.23 USD per TEU or $156.46 USD for all other sizes of container for non-exempt international container moves through the terminals at the Ports of Los Angeles and Long Beach between the hours of 7:00 a.m. and 5:59 p.m. Monday through Friday. Containers exempt from the TMF include:

- Empty containers
- Import cargo or export cargo that transits the Alameda Corridor in a container and is subject to a fee imposed by the Alameda Corridor Transportation Authority
- Domestic and transhipment cargo
- Loaded containers moves through the terminals from 6:00 p.m. through 6:59 a.m. Monday through Saturday and all day (24 hours) on Saturdays, Sundays, and holidays
- Empty chassis and tractor-only trucks are also exempt.

The Alameda Corridor (heavy-haul corridor), is a rail corridor between the port terminals and the downtown Los Angeles rail yards. There are several intermodal yards that are not on-dock that require transport between the intermodal yard and the marine terminal.

All PierPass trucks must be tagged with an RFID tag (TruckTag). Tag's cost $125 USD per vehicle and are also tied into the Federal Government's Homeland Security system for container tracking and security. Trucks are required to use a VBS. A terminal can have more than one of the systems, but a carrier would typically choose only one platform to use.

The PierPass initial data from 2005 indicates a shift in activity from the daytime shift to night and weekends.

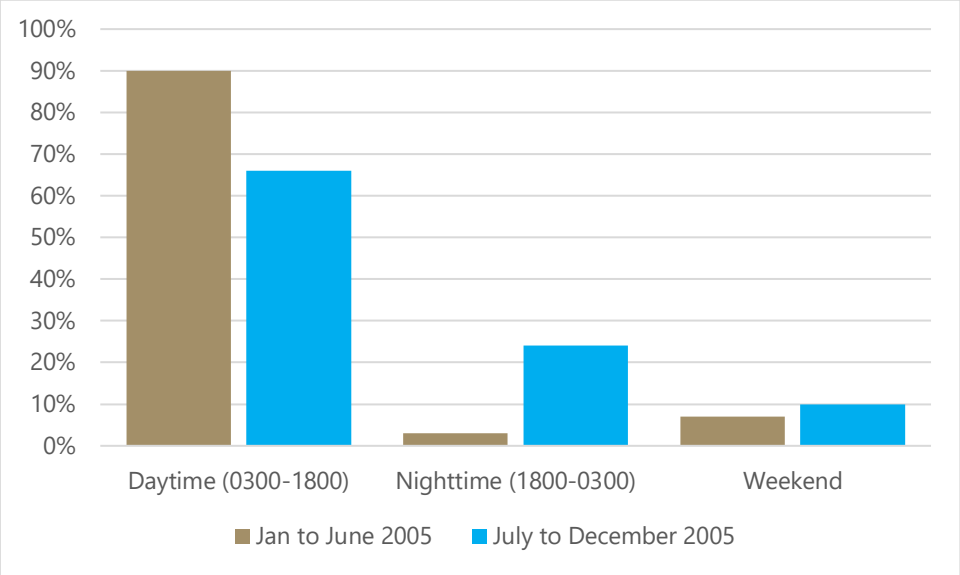


Figure 2-7 POLA & POLB; Percentage of containers through road transport by shift type before and after the introduction of PierPass (10)

Terminal gate moves include all import, export and empty containers that pass through a container terminal's gate.

According to the POLB, TTT for a single container have been reduced from over 2 hours in the early 2010's to 58 minutes during peak periods and 38 minutes during non-peak times (data as of 14 January 2022). This is due to the effectiveness of PierPass with the VBSs in reducing gate queues and internal terminal congestion through reducing peak periods by incentivising off-peak movements.

The Port of Long Beach publishes a Weekly Advance Volume Estimate (WAVE). The report provides a forecast of the expected activity at the port over the following week (11). The information it provides is:

- Projected weekly container volumes, vessel calls
- Estimated container, move types, export, and empty returns
- Average terminal gate TTT (an average based on all terminal data from the previous week).

One of the largest issues, especially in today's supply chain crunch, is missed bookings. Historically, bookings when made did not cost anything and there was no penalty if missed. Carriers also started making more than one booking for the same container to cover themselves if traffic or other issues prevented them from keeping the first scheduled booking. As of November 2021, according to the terminal interviews, 30% of the missed bookings were due (as claimed by the carriers) to the terminal gates being backed up. In discussion with eModal (a VBS provider), APM Terminals, and others, eModal is now charging to make a booking. If the booking is missed, the initial amount charged is not refunded and the carrier must make another booking but only after the initial booking's grace period has expired. These new procedures are currently in effect (January 2022).

2.1.4 Port of Vancouver, British Columbia

Table 2-3 POV; Summary table (2020)

Measure	Port Botany	Port of Vancouver
Volume of TEU	2.7 Million TEU	3.5 Million TEU
# of Container Terminals	3	4
Empty Containers Import/Export	0.9% / 63%	3% / 35%

The Port of Vancouver, British Columbia (POV) operates as a landlord port operator and leases 4 container terminals. The forecast is for 10-13 million TEUs by 2060. The existing practical capacity is 6 million TEUs, growing to 8.5 million TEUs with the proposed Roberts Bank Terminal 2 expansion project which is to be completed in 2035.

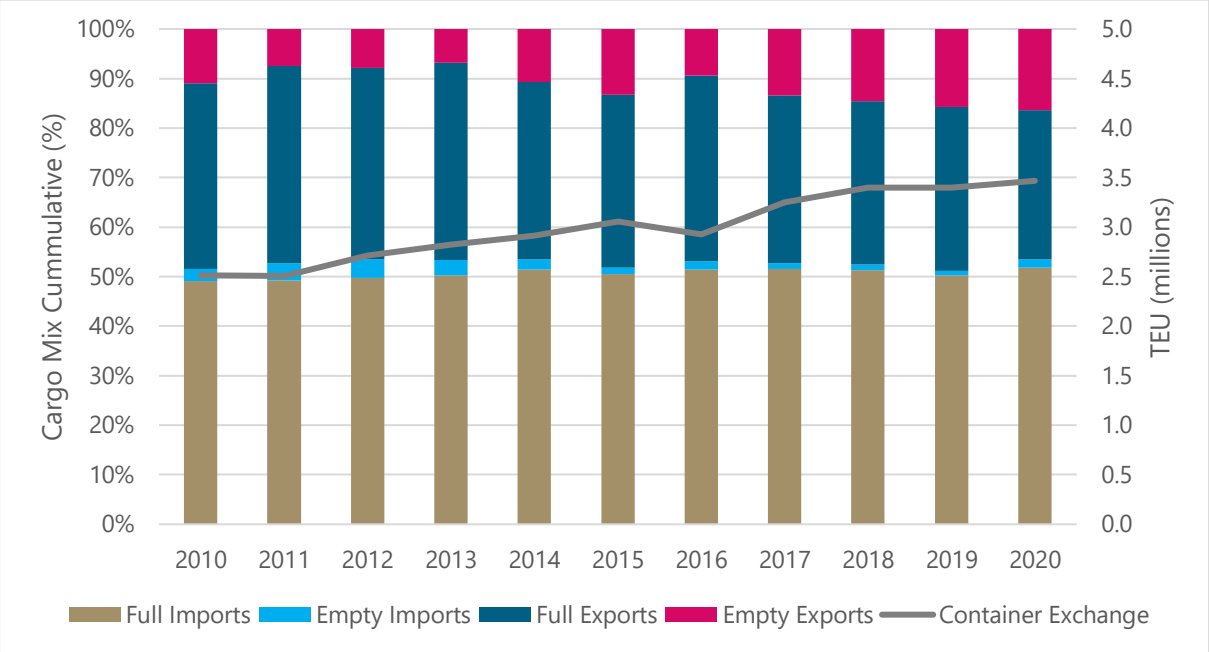


Figure 2-8 POV; Container cargo mix and exchange from 2010 to 2020, percentages excluding transhipments (12)

The 4 container terminals are located in different places around Vancouver with 3 close to developed areas and the fourth, the Deltaport container terminal, positioned out of the city (Figure 2-9, Figure 2-10, Figure 2-11). The Port has recently completed a road staging facility (DeltaPort Truck Staging Facility) in Delta, British Columbia to support the DeltaPort terminal. The staging facility receives trucks entering the DeltaPort terminal (largest terminal for the port at 2.4 million TEUs), stages them in queues and then the terminal dispatches the trucks into the terminal. Thus, the facility acts as a remote gate 10 km inland.

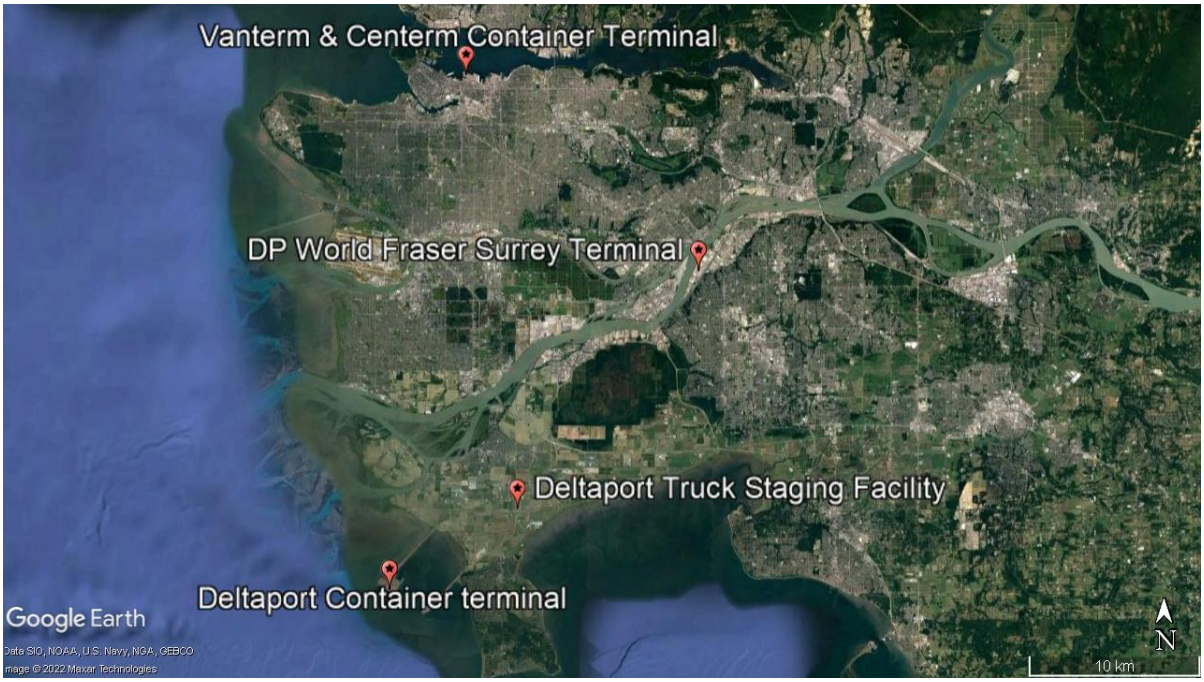


Figure 2-9 POV; Container terminal locations (13)

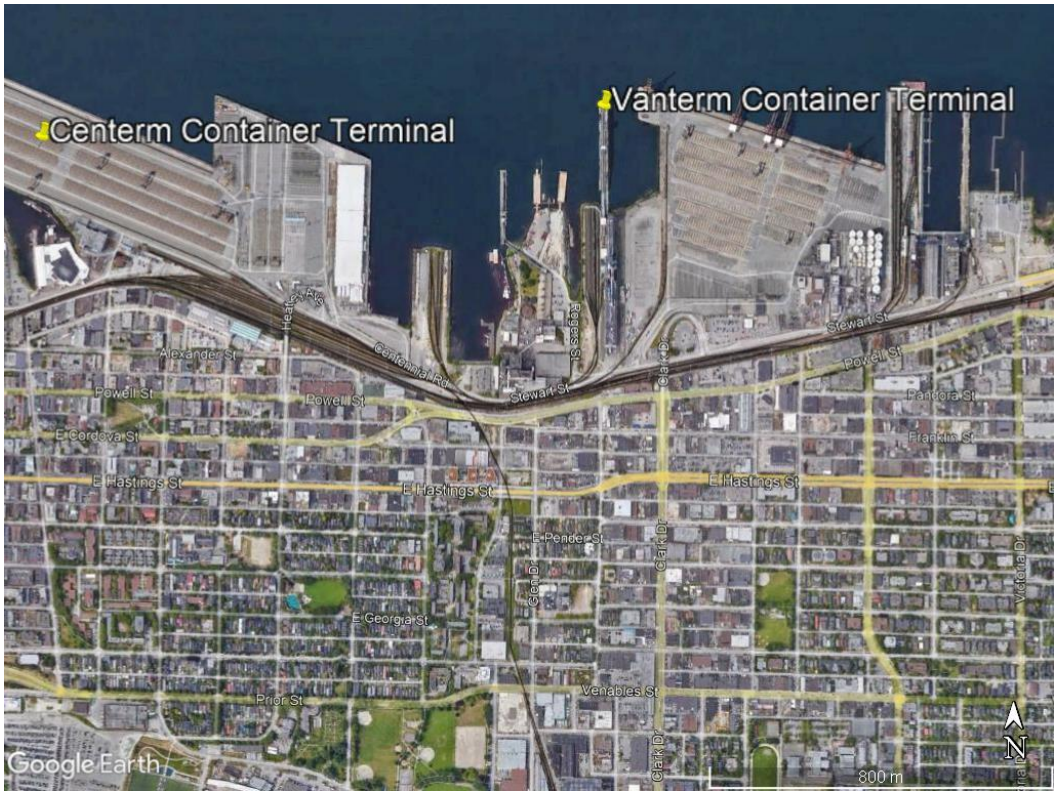


Figure 2-10 POV; Centerm and Vanterm container terminal locations and proximity to local zones (14)

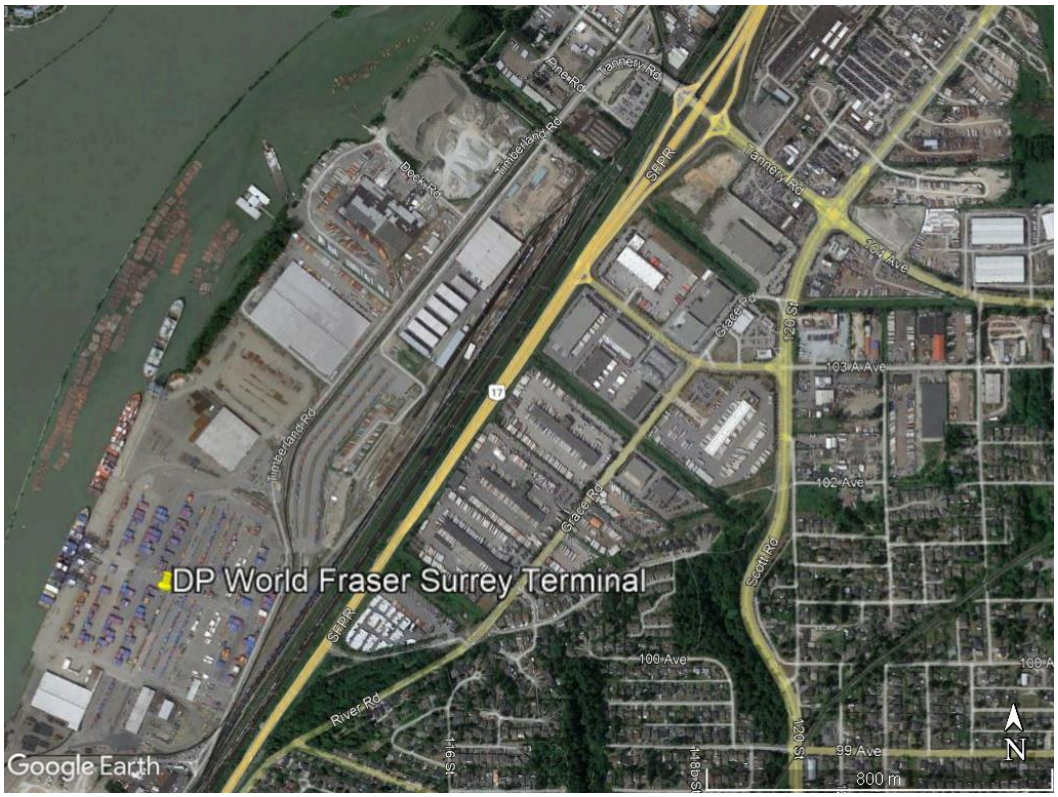


Figure 2-11 POV; DP World container terminal location and proximity to local zones (15)

In 2005, the Canadian Federal Government introduced a Truck Licensing System (TLS) to be implemented at all Canadian port authorities. The program, originally developed as an environmental incentive, was jointly pursued by the Port of Vancouver. An Access Agreement was added to the TLS as part of the 2015 revision emphasizing congestion management and security regulations, and applies to all parties transporting containers, both local and long-haul carriers. It requires all carriers transporting containers to or from a terminal to sign and comply with an Access agreement prior to accessing the terminals or port.

The responsibility for enforcement and administration is on the Province of British Columbia via an appointed Container Trucking Commissioner. The Commissioner issues and oversees all licences for the Port of Vancouver.

Two of the key elements of the new licence are a rolling truck age program and a separate TLS program for long-haul carriers. The Rolling Truck Age Program requires all trucks always be less than 10 years old, primarily to reduce pollution and increase vehicle safety. The Access Agreement has changed in the past several years but as of January 2022:

- Requires all carriers with greater than 5 trucks in their fleet to register all their vehicles and drivers with the port. Companies with less than 5 trucks are not eligible for consideration.
- Requires the use of a VBS to enter a marine terminal. Bookings cost $52.50 CDN and are non-refundable. Truck arrival must be within the 1-hour booking window with a 30-minute grace period for early or late arrival.
- Long-haul trucks can enter the port with advanced registration but are not required to use the VBS. They must have trucks less than 10 years old per the new 2022 TLS.
- The 4 container terminals have agreed to use the same platform for bookings with the Port monitoring compliance. The platform is an internal software system, developed jointly, including the Port who collects and distributes the fees.

In 2014, the Port launched the Smart Fleet trucking strategy. The key initiatives are (16):

- GPS on all port-licensed trucks, allowing the Port to track and report on TTT and wait times.
- A common data interface and a single point of entry and reservation system connecting trucking companies to all container terminal operations, to effectively plan and select reservations for increased efficiencies.
- A recently revised TLS policy and system interface to stabilize the industry by working with carriers that can meet financial and operational obligations. The policy does not permit operators lacking reliable equipment and ability to use technologies to enhance scheduling and bookings.
- Vehicle age requirements to ensure lower air emissions and increased vehicle safety improvements.
- Identification of technology-based solutions to improve environmental sustainability.
- Collaboration with terminal operators and industry leaders, working together to improve efficiency of port operations.

As a result of the Smart Fleet and the 2021 TLS (new requirements to be implemented in April 2022), the Port has reduced the number of carriers from over 2,000 local carriers to 85 that are registered based on fees charged, vehicle age and compliance with other port trucking regulations in the Smart Fleet. The Director of Inland Operations indicated that turn times are averaging 40-48 minutes for

single transactions, down from over 70 minutes before 2015. The reduction in the number of carriers accessing the terminals has provided a cadre of drivers who visit the terminal several times a day versus once per day (or week or month). Repetitive visits increase the knowledge of the terminal and the processes required. Having a group of drivers who frequently visit the terminals, increases the industry knowledge of the terminal and the processes required. This increased knowledge combined with the introduction of a VBS, limiting arrivals to the booking window, and regular night gates are considered to be key factors in reducing the TTT.

As all container trucks are equipped with GPS the port has access to the number of movements and times within the terminal. Based on this GPS data the Port of Vancouver publishes the live wait time and TTT for each of the terminals. The wait time is given for the time at the terminal pre-gate and the time within the terminal yards (Figure 2-12). The data is trended and displayed hourly for that day for each terminal (Figure 2-13).

- The current average wait time is updated once per minute and reflect the average waiting time for exchanges completed within the last thirty minutes.
- The total average wait time is updated each minute and reflects the total average waiting times for exchanges completed that day.

The Port publishes a weekly report summarising the landside performance metrics for each terminal with times given for waiting at the gate and within the terminal (17).

Figure 2-12 POV; Example of estimated truck waiting and flow times at each terminal (18)

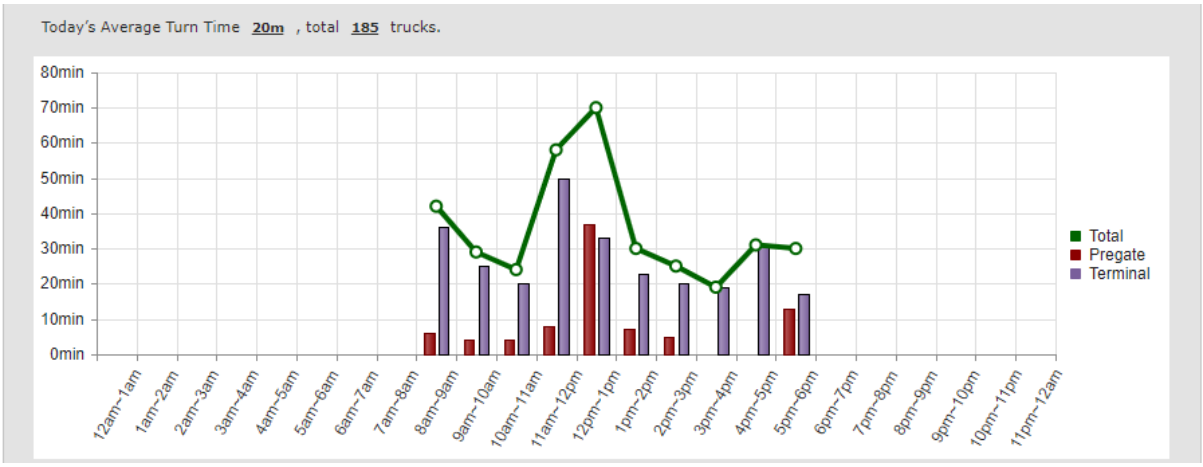


Figure 2-13 POV; Average TTT by hour for pre-gate lanes and terminal yard from GPS equipped trucks (18)

2.1.5 The Northwest Seaport Alliance; Ports of Seattle and Tacoma, Washington

Table 2-4 NWSA; Summary table (2020)

Measure	Port Botany	Northwest Seaport Alliance; Ports of Seattle and Tacoma
Volume of TEU	2.7 Million TEU	3.3 Million TEU
# of Container Terminals	3	8
Empty Containers Import/Export	0.9% / 63%	8% / 38%

The Northwest Seaport Alliance (NWSA) is a container operations alliance between the Port of Seattle and the Port of Tacoma. It was established in 2014 and put all container terminals in both ports under one management structure, removing the competition between the ports. Both ports are landlord ports and lease terminals to terminal operators.

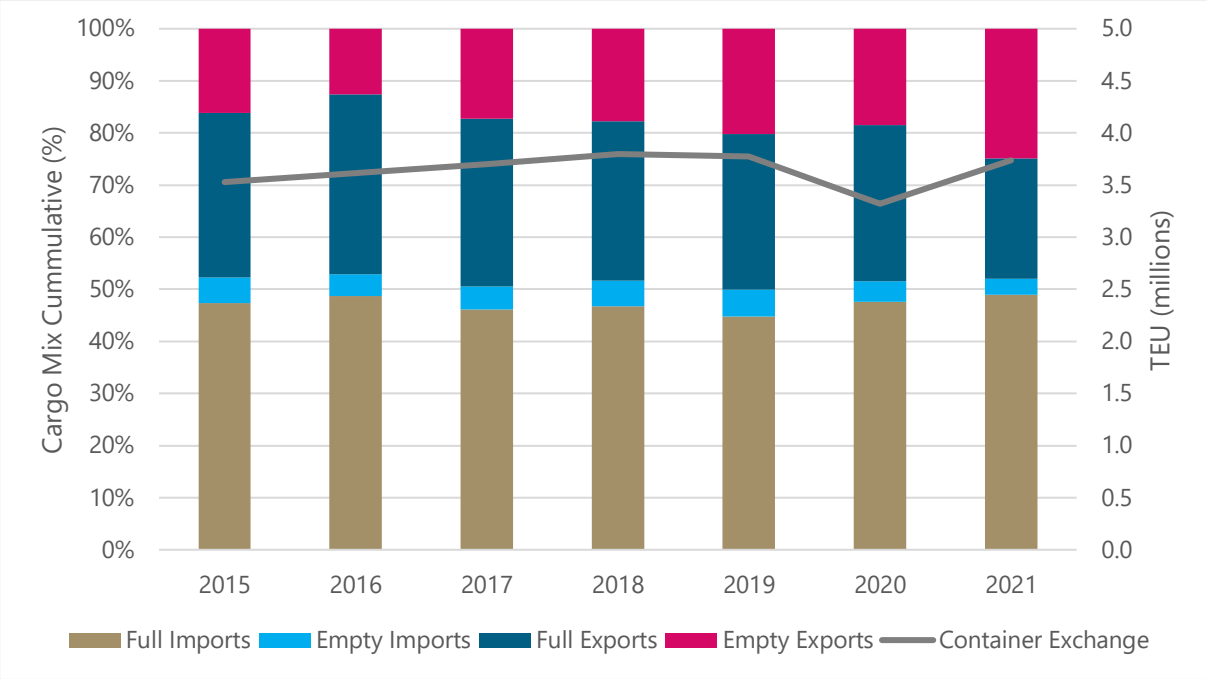


Figure 2-14 NWSA; Container cargo mix and exchange from 2015 to 2021, percentages excluding transhipments (19)

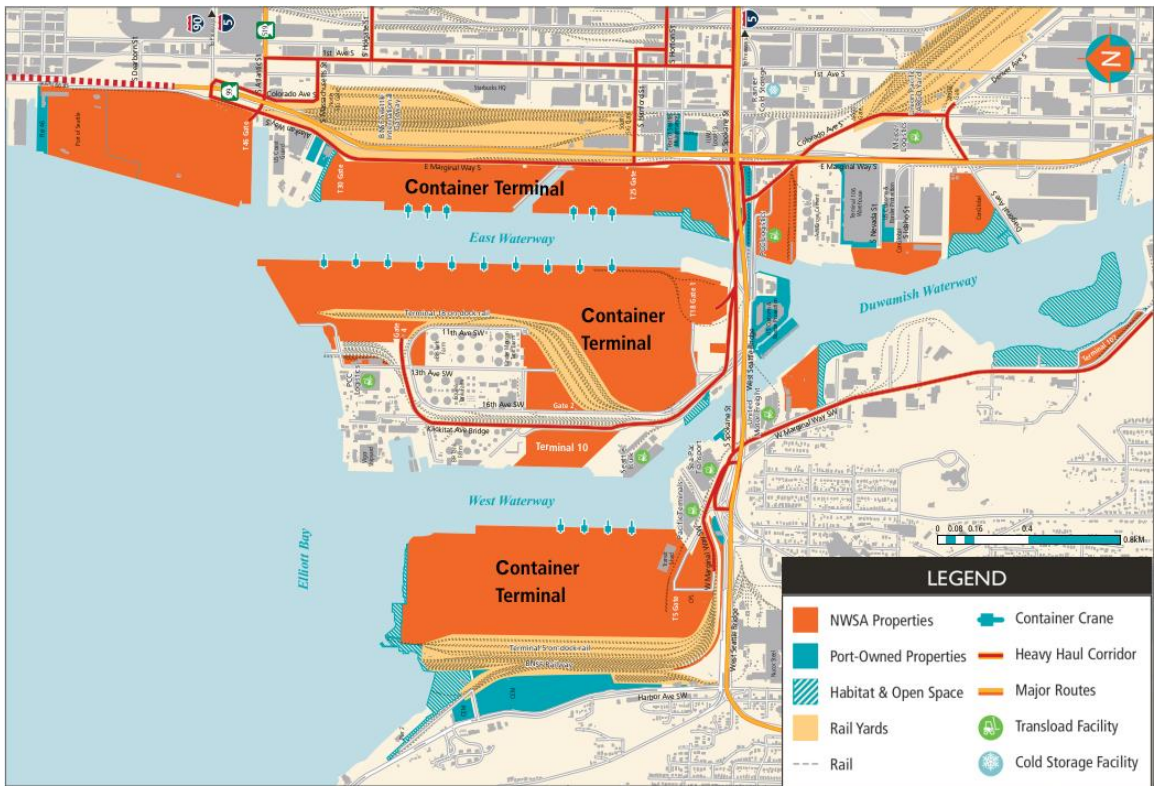


Figure 2-15 NWSA; Port of Seattle terminal locations; Grey – Commercial/Residential zones (20)

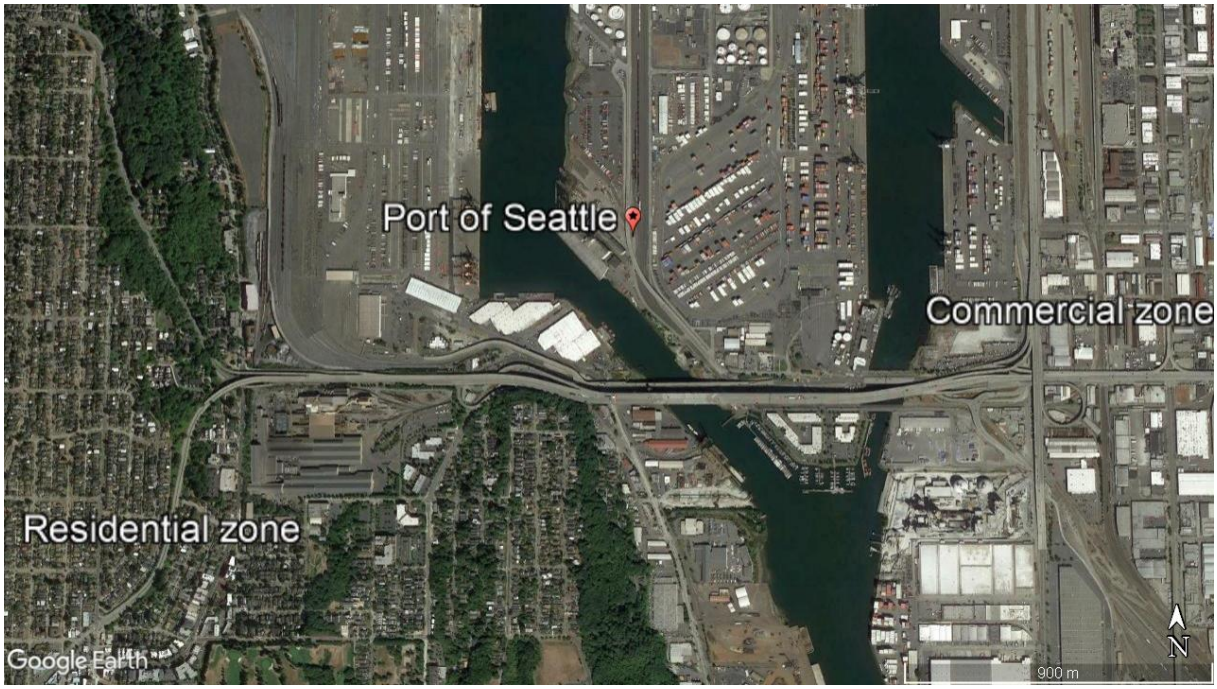


Figure 2-16 NWSA; Port of Seattle locations and proximity to local zones (21)

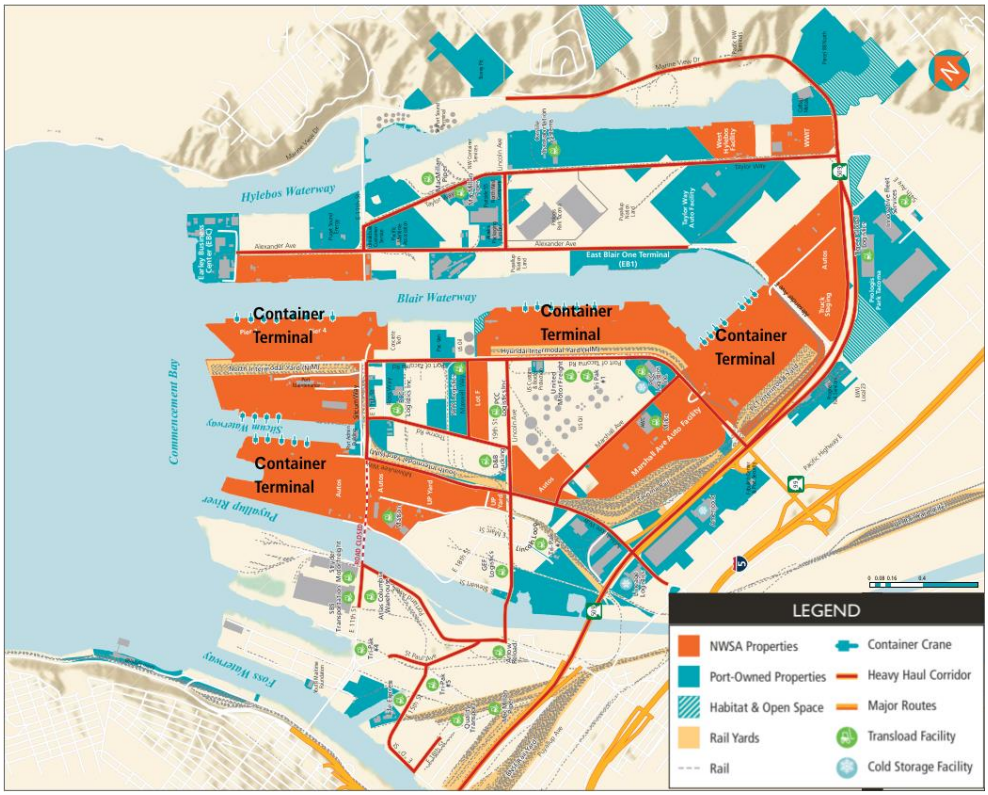


Figure 2-17 NWSA; Port of Tacoma terminal locations (20)

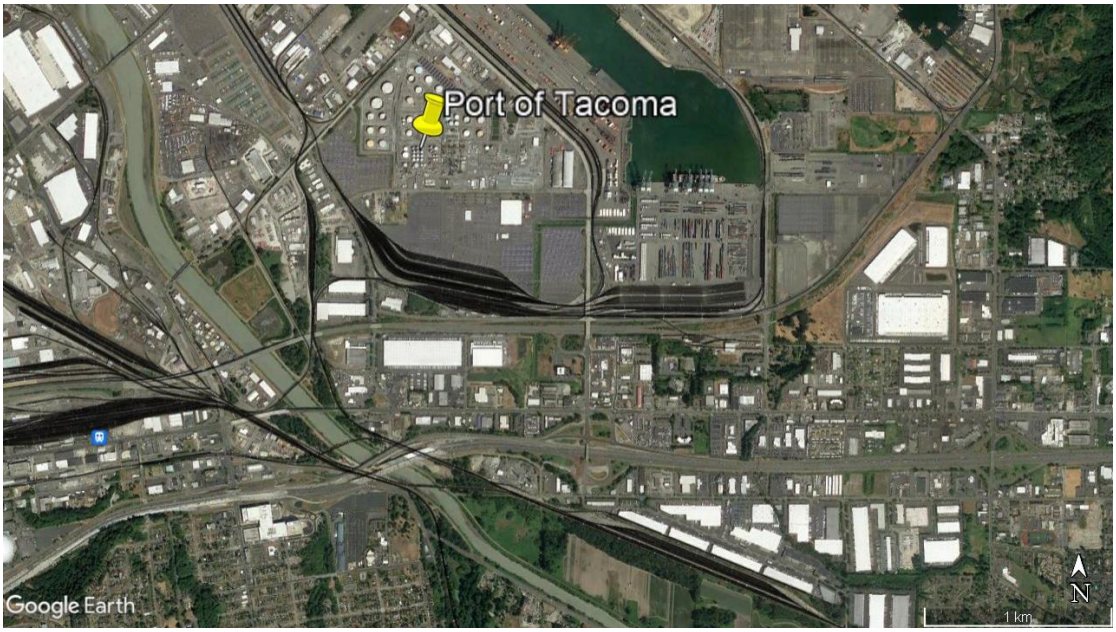


Figure 2-18 NWSA; Port of Tacoma location and proximity to local zones (22)

The Ports of Seattle and Tacoma joined the Port of Vancouver in 2008 in adopting trucking guidelines to promote the use of cleaner engines and cleaner fuels. The 2008 guidelines also documented required changes for terminal equipment and vessels entering Puget Sound. The guidelines were updated in 2015 and 2018. As of January 2022, the NWSA is offering a $10,000 USD grant to registered carriers to upgrade their engines to be within the Clean Truck Program guidelines for the age of the engine.

The NWSA Clean Truck Program requires all trucks to have an engine less than 10 years old and have a valid and registered RFID tag with the NWSA truck registry. Also, all trucks are required to have a port licence to operate within the terminals of the NWSA, which requires the use of a VBS for all transactions at all terminals.

With the recent supply chain issues and port congestion issues, the NWSA has created several off-terminal parking areas for trucks, especially for long-haul trucks, to wait for their bookings. The current booking window is 1 hour with an early/late allowance between 15 and 60 minutes depending on the terminal. Arrivals outside the booking window will require a new booking to be made by the carrier. The NWSA publishes the live camera feed and TTT for each terminal gate on its website.

2.1.6 Port Authority of New York and New Jersey

Table 2-5 PANYNJ; Summary table (2020)

Measure	Port Botany	Port Authority of New York and New Jersey
Volume of TEU	2.7 Million TEU	7.6 Million TEU
Number of Container Terminals	3	6
Empty Containers Import/Export	0.9% / 63%	0.6% / 64%

Measure	Port Botany	Port Authority of New York and New Jersey
Road / Rail	85% / 15%	91% / 9%

The Port Authority of New York and New Jersey (PANYNJ) is a landlord port with 6 container terminals in the New York/New Jersey metropolitan area.

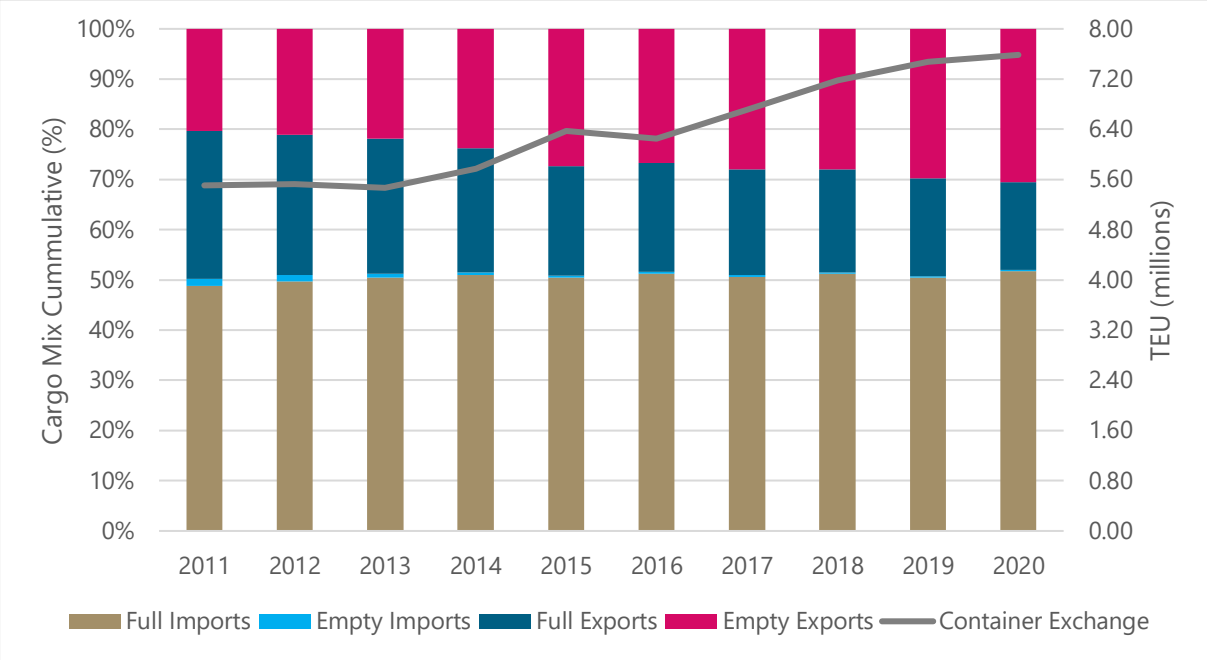


Figure 2-19 PANYNJ; Container cargo mix and exchange from 2011 to 2020, percentages excluding transhipments (23)

Figure 2-20 PANYNJ; Container terminal locations and proximity to local zones (24)

The PANYNJ requires all trucks using the port's terminals to be registered. Registration includes:

- A driver registration with valid TWIC, Commercial Driver's Licence, and insurance.
- RFID Tag on each truck issued via the PortTruckPass system by the PANYNJ. The tag is specific to each individual vehicle and is required on all Class 8 trucks. Class 8 defines the gross vehicle weight towing capacity of greater than 33,000 lbs. (14,969 kg).
- A SeaLink card which is PANYNJs uniform driver identification system.
- An engine newer than 2010.

The Port has also established 4 off-terminal secure parking areas that allow overnight secure parking and act as a remote gate when the delivery or pick-up is tied into a booking system.

A VBS is not required by PANYNJ but is highly encouraged. The APM Terminal and Maher terminal and GCT Terminals (2 terminals) prioritise bookings made for carrier access for delivery or pickup of containers. In discussions with terminal operators, if a truck has a booking, they can use specific gate lanes if they are within their appointed time, typically 60 minutes. If they do not have a booking or are more than 30 minutes early or late of their scheduled entry, they must queue in a separate lane. For example, the APM Terminal has 24 lanes but only 2 lanes are used for non-scheduled arrivals.

2.2 Port of Valencia, Spain

2.2.1 Port Description

Table 2-6 PAV; Summary table (2020)

Measure	Port Botany	Port of Valencia
Volume of TEU	2.7 Million TEU	5.4 Million TEU
Number of Container Terminals	3	3
Empty Containers Import/Export	0.9% / 63%	37% / 23%
Transhipments	5%	57%

The Port of Valencia (PAV) located in Spain has over 100 regular service lines connecting it to over 1000 ports on all 5 continents. Its location has made it key to an extensive network of feeder services to Eastern Mediterranean countries and the Black Sea, which result in many transhipments to these destinations. In the period between December 2020 and November 2021, the PAV handled a total of 5.5 million TEUs with transhipments accounting for 2.9 million TEU.

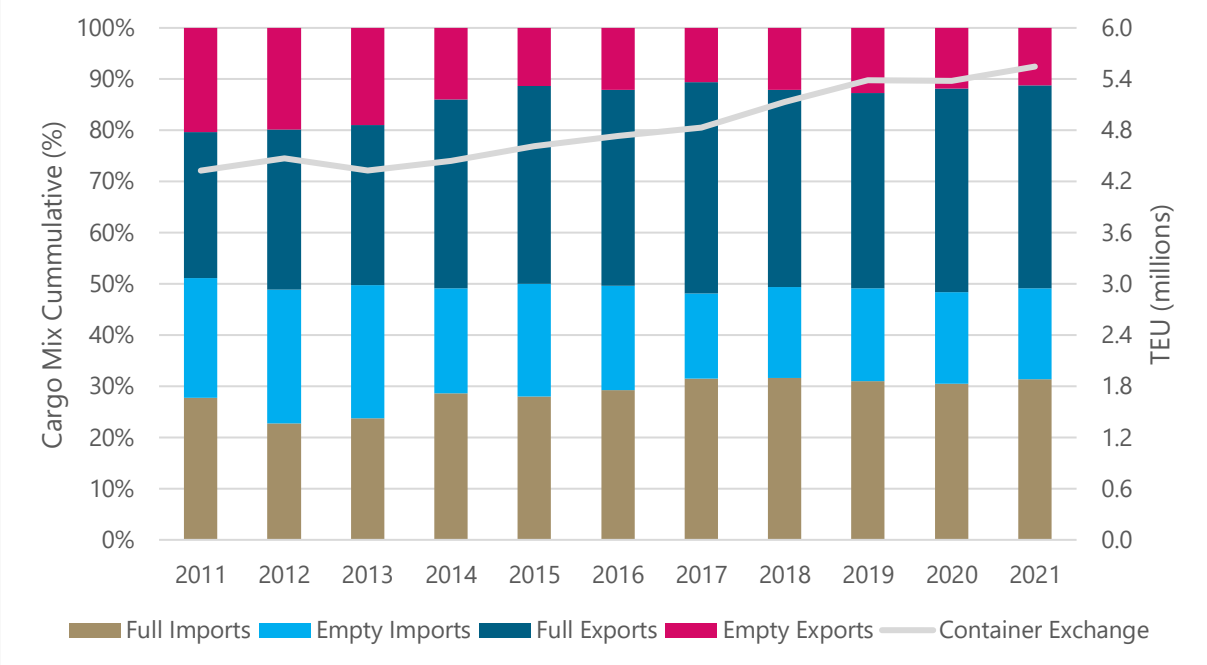


Figure 2-21 PAV; Container cargo mix and exchange from 2018 to 2021, percentages excluding transhipments (25) (26)

The PAV runs and manages the port, under the guidance of the Spanish State Ports Agency, acting as a landlord to the terminal operators inside the port area. The PAV is responsible for the management of the trucks including access and traffic regulation (speed, parking, etc.) in the area between the port entry gate and terminal entry gate. The PAV is not responsible for the activity of the trucks outside the port entry gate (access streets) or inside the terminals. Activity outside the port is regulated by the Spanish Guardia Civil (state paramilitary force).

Figure 2-22 PAV; Location of terminals; Purple - Container Terminals; Brown - Shared Port Zones; Yellow/Green/Peach/Red – Other port facilities (27)

The port is located within an urban area. There is only one access road to the port for trucks, located on the south side of the port. There are 5 entry gates to the port area and 8 port exit gates on this road, to limit access to the port, with terminals having their own gates. The port gates are not for the exclusive use of the trucks. Any authorized vehicle can use one of the port gates to access the port.

Unlike the other ports discussed within this section (Section 2), PAV does not have a VBS. The PAV has a Port Community System (PCS) that provides a platform for communication between stakeholders (discussed in section 2.2.3.1).

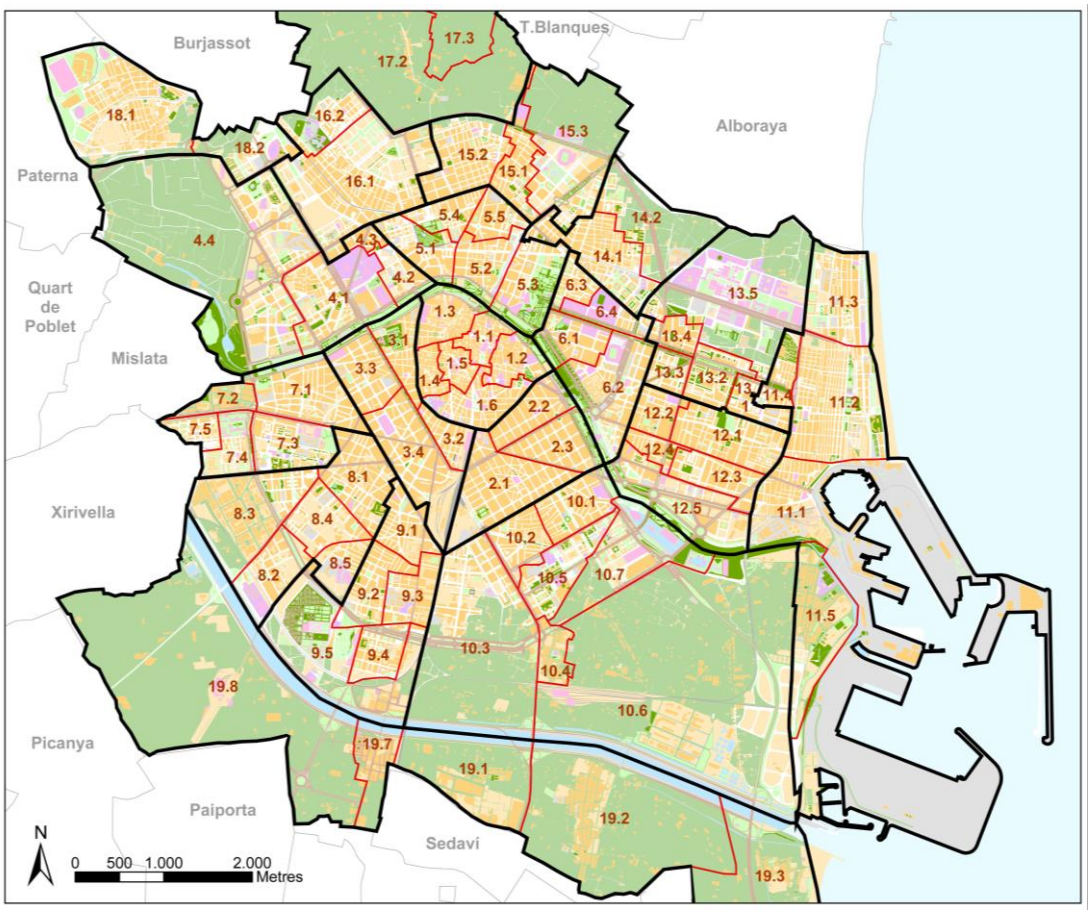


Figure 2-23 PAV; Local area zoning; Grey – Port; Green – Low density; Yellow – Developed commercial and residential (28)

2.2.1.1 Container Terminals

There are 3 container terminals in the PAV with a combined area of 225 ha, a total quay line of 4.7 km and a handling capacity of 8 million TEU. All 3 container terminals use Rubber Tyred Gantry's (RTG) (more than 70 across the port) and reach-stackers for yard moves, and for lifting between land and wharfside trucks (29) (30). Yard trucks are used to deliver containers from the yard to the wharfside cranes. The 3 terminals are operated by:

1. CSP IBERIAN VALENCIA TERMINAL, S.A.U. (CSPV), part of the COSCO SHIPPING Ports (Spain) Terminals group
2. Mediterranean Shipping Company (MSC) Terminal Valencia
3. A.P. Moller-Maersk (APM).

Performance

There is a compensation system for trucks that are delayed service by a terminal. This is described in more detail in Section 2.2.3.5.

Terminals set their own targets and service levels without input from PAV. PAV has seen terminals limit access to trucks when their yards are overcrowded. Therefore, to avoid queues outside the terminal gates and congestion in the common areas, the terminal may ask the PAV to restrict access to the port area. If trucks are allowed access to the port while there is congestion at the terminal, the terminal will have to compensate the trucks for any waiting time. Stopping trucks entering the port area, through the collaboration of the PAV, is a way for the terminal operator to avoid paying compensation when terminal service levels decrease. Closing of the port access gates can be done without notice. The drivers are then forced to queue on the highway approaching the gates and cannot move towards the port or drive away from the port.

Empty Container Handling

Traditionally, the only problem for PAV regarding empty containers has been the lack of availability for export cargo use. The port has 2 depots managed by specialised companies. There are also several other depots outside the port in the areas around Valencia. During periods of high flow of empty containers, the PAV obliges all empty containers to leave the terminals and go to the depots (inside or outside the port). The terminals can store empty containers in their yards, but cannot inspect, clean, or repair them.

2.2.2 Landside Servicing Mode

2.2.2.1 Road Transport

Prior to its first entry authorisation, for a vehicle to access the port it is required by PAV to provide information on the driver and the vehicle. Following authorisation vehicles can access the port through the automatised port gates. Optical Character Recognition (OCR) technology is used for real-time recognition of vehicles. Personnel of the port Police (special administrative police force) are available for assisting drivers at the security checkpoint.

The access road is the V-30 highway, which is not for the exclusive use of the port. Congestion of the access road and entry gates can be caused by congestion of the container terminals at peak hours, or due to a terminal backlog. Trucks may have to queue on the access road without the ability to exit the queue. There have been cases of queues lasting more than 5 hours.

PAV and the terminal operators constantly collaborate in taking decisions to solve the congestion episodes.

Once inside the port area, there is no great demand for parking spaces from drivers. While there are no dedicated areas, drivers presently use an esplanade in the northern part of the port. There is no time limit or charge to use this area. In the future the esplanade will be part of a new container terminal on the north quay.

APM and CSP require trucks to have the code (Number or Quick Response code [QR]) associated with the transport order at the terminal gate to enter. MSC has an OCR system providing direct access through the terminal gate based on an associated transport order (discussed in 2.2.3.3).

The OCR is an Automatic identification and Data Capture (AIDC) technology. Container terminal operators are leveraging OCR to automate the identification of equipment and its key features as it is handled at points of work within a facility. OCR is widely used for the identification of equipment

markings (e.g. the written text of licence plates, container number stencils) and to record the condition of the equipment itself. The key benefit of OCR is that it provides a reliable method of identification, without requiring application of any tag or device to the asset, that also includes a visual record of the asset at the time of reading (31).

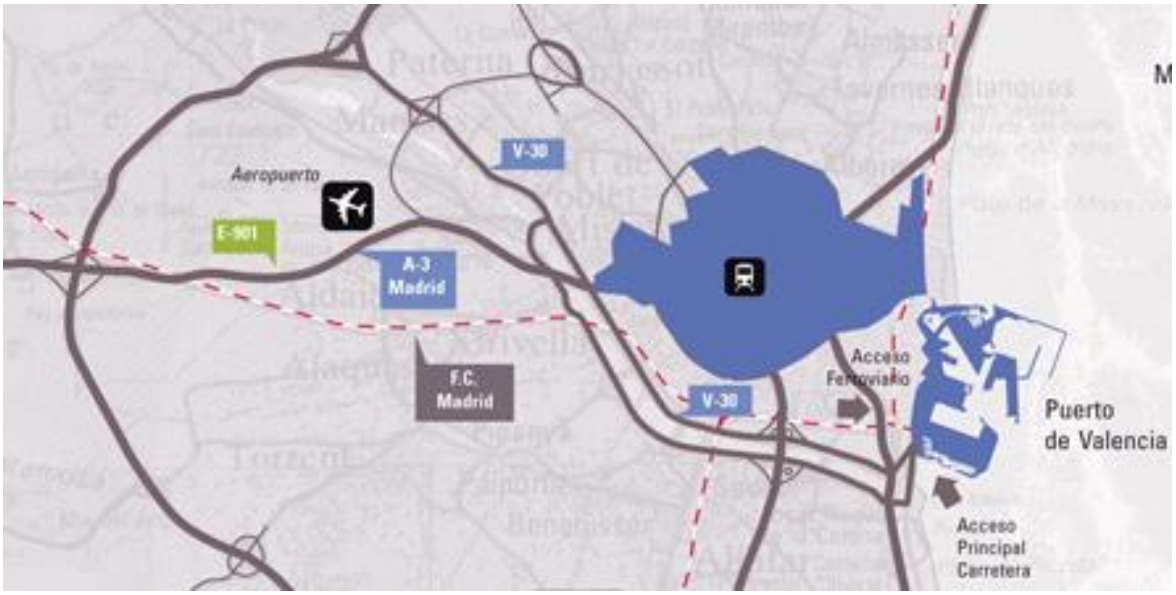


Figure 2-24 PAV; Road and rail access, Red/White – Rail; Grey - Road (32)

Terminal Opening Hours and Storage

Landside operation hours have traditionally been from 8am to 9pm. In recent years, to improve the situation on the access road to the port at peak times, the PAV has asked the terminals to extend hours, allowing trucks to access the port from 6am. The terminals have agreed to this request, but it has been noticed that carriers do not make much use of this first 2 hours. To clear the yard CSP and MSC terminals only allow trucks to enter to pick up containers during the 6am to 8am period. The landside opening hours for each of the terminals (Table 2-7) indicates they are not open for night shifts and only a day shift on Saturday and not open on Sundays.

Table 2-7 PAV; Terminal landside opening hours (29) (33) (34)

	CSP	MSC	APM
Monday to Friday	0600 – 2100	0600 – 2000	0600 – 2000
Saturday	0800 – 1400	0800 - 1400	0800 - 1400

APM has implemented a system to organise the arrival of trucks wanting to unload export containers. Previously, carriers were allowed a window of 15 days prior to the ship's call to unload containers at the terminal yard. To avoid yard congestion and queues at the access gates, APM has limited the window to 3 days. In addition, through the PCS, APM publishes twice a day the list of future vessel calls and authorises the transport orders that drivers upload into the system. Authorisation is based on the date of the vessel call and the yard occupancy level.

Congestion at the Port

In Valencia there are 2 main causes of congestion:

- The arrival of container mega-ships with associated large import and export volumes, which generates several days of congestion before returning to normal port levels.
- Industry strikes.

Congestion events can generally be forecast. The PAV therefore has some time to co-ordinate measures with the terminals, the port police, and especially with the Guardia Civil which oversees organising traffic on the access road to the port.

In the immediate vicinity of the port (1-2 km away), there are esplanades where the queues of trucks are organised. An order of priority is established for accessing the port (e.g. refrigerated containers or agri-foodstuffs first).

Carrier Challenges

Two aspects can make it difficult for trucks to carry out land operations in the container terminals:

- Shortage of machinery and personnel. Priority is always given to wharfside operations, even at times of road transport congestion in the yards. This leads to many delays in land operations.
- 9pm terminal closing time. If 9 o'clock arrives and the truck has accessed the port (common areas) but has not entered the terminal because of queues, it will not be allowed to enter the terminal. This results in lost time and increased costs to the carrier as they will need to return and queue again on the following day.

2.2.2.2 Rail Transport

Two of the three container terminals have direct rail access (APM and CSPV). MSC does not have direct access, but uses an intermodal station located outside the port area, between the port and the Logistics Activities Zone.

The PAV considers that rail transport offers a support to the reduction of road traffic but is aware that road transport is still the mainstay of container traffic in Valencia. One of the most relevant problems is the lack of rail transport planning. The terminals that rely on the public operator (Administrador de Infraestructuras Ferroviarias) wait until the train is fully loaded before authorising the journey. This results in a lack of frequency or organisation of train departures and arrivals.

2.2.3 Landside Management

2.2.3.1 Port Community System

ValenciaportPCS is a technological platform created by PAV providing services designed to streamline and facilitate the operating processes of companies within the port community. Any company can participate in the development and implementation of services. Proprietary systems can be integrated with the platform. The system is designed to support the transactions of the entire port community (Figure 2-25).

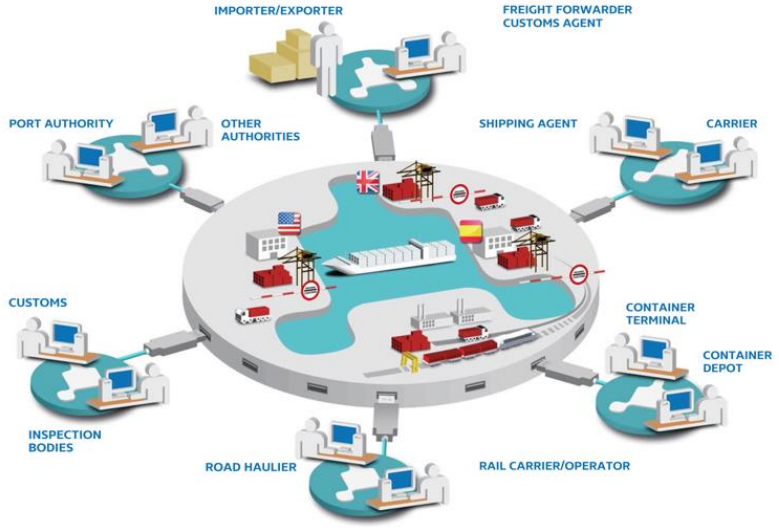


Figure 2-25 PAV; PCS stakeholder diagram (35)

For carriers it is used for planning their arrival at the port. In the PCS application, the driver registers the data of their visit to the port and finds out if the terminal entrance will have any issues. At the request of the carrier associations, the driver also has a real-time connection to the cameras positioned at the port access gates and terminal gates, so that they can estimate the level of congestion on the roads outside and inside the port. This is intended to enable the driver to plan their arrival without the risk of excessive delays. This function is based on the integration of data from the container terminal gates.

Other services included in the PCS are broken down into the following categories:

- Port Operations
  - A single location for all documentation required by the PAV itself and other official bodies such as the Harbourmaster's office and Customs.
- Inland Transport
  - Enables agents involved in the road transport of goods to compile and manage transport orders including cargo acceptance and delivery orders required to transport goods inside the port premises. The platform also provides agents with notifications of the delivery and receipt of containers at the terminal or depot.
- Customs
  - Allows shipping agents to present and amend import and export cargo manifests directly to the PAV and the Spanish State Tax Agency.
- Track and Trace
  - The Cargo Tracking service allows users to obtain track and trace information of their shipments, such as the status of their cargo, transhipments carried out and/or documents processed.
  - The platform also enables users to integrate this information into their systems to present it to their customers.
- Integration

- Companies handling large volumes of shipping documents prefer to transmit the corresponding data through a direct integration of their management systems, saving the time needed to copy and reintroduce the data in their systems. Development of the PCS is undertaken to continue to integrate with third party systems.

Some future improvements to the PCS are:

- An alert system in the PCS application. At present, the application does not allow for instant notification of incidents. Currently, communications to stakeholders involved in port activities are made by email and in some cases by WhatsApp groups. An instant alert system would allow drivers to be informed of any problems and/or delays in real time. The system has been developed and is about to be implemented.
- VBS. The working groups are analysing and discussing the failures that led to the rejection of the system in the first implementation attempt. The aim is to improve the previous version and to re-propose a VBS in the medium term.

2.2.3.2 Working Groups

The PAV is responsible for the creation and control of several working groups whose purpose is to analyse the port's activities and implement improvements and/or problem-solving initiatives. All the initiatives implemented in recent years have been discussed and approved in the working groups. The PAV considers the working groups to be a key element in the improvement of the port's services and performance.

There are different groups, depending on the subject to be dealt with. The participants in the groups are all those involved in the port's activities, including the carriers' associations, terminal operators, and terminal representatives. Groups are also formed with stakeholders who are not directly involved in the port's activities but who have a role in the logistics chain or security. The meetings are generally held every 2 months unless immediate action is required.

Through the working groups, the PAV has the possibility of getting to know the needs and problems of each group. Through discussions with carriers and industry associations, and terminals, it has been possible to find solutions to the frequent episodes of congestion that have occurred in the past.

The addition of real-time camera footage hosted on the PCS was implemented based on feedback from a working group. Carriers consider this an important functionality to enable planning an arrival time without the risk of excessive delays. The intention is to avoid queues occurring and, if they are occurring, to try to prevent more trucks from joining.

- Drivers will check if there is vehicle congestion, and its location. This allows them to check whether the congestion is at the entrance to the port or at the terminal. Depending on this, they can decide to come to the port or schedule a driving break, to avoid exceeding their allowed driving hours.
- If there are queues, carriers can reorganize sending trucks to the port. In the event of possible congestion at a terminal, they can direct the trucks to other terminals with less traffic. If they have to use a specific terminal where queues are occurring, they can assign the trip to drivers with more available driving hours. They can also warn the importing client that the container may arrive late, allowing them to prepare for the later reception at their warehouse.

2.2.3.3 Landside Booking Systems

Closing Time

From 2005 until 2019, the Closing Time system was used to manage the arrival of trucks. The main feature of the system was that the carrier wishing to access the port had until 3 p.m. on the day before the day of the visit to communicate its intention to the PAV through the Closing Time platform. In no case could the visit to the port take place on the same day on which the request was made.

The increase in road traffic in recent years combined with the lack of flexibility in the Closing Time system, and the new technological tools available to the port through the PCS, motivated the PAV to replace the Closing Time system. In 2020 a more flexible and efficient system was introduced based on Transport orders.

Transport Orders

The new Transport order system allows the carrier to communicate with the terminal via the PCS. A transport order is generated for each agreed operation. The carrier gives the order to the driver that will go to the port to drop off and/or pick up a container. The order is valid for 3 days before expiry, during which the driver can access the port and carry out the operation. In contrast to the Closing Time system, carriers can access the port on the same day that they have communicated the order.

All transport order procedures can be carried out in the PCS. The services offered by the PCS reportedly greatly facilitate the work of all those involved in the supply chain. In most cases, paperwork and delays in operations are avoided. One of the functions considered most relevant is the possibility for the driver to see if there are any status issues at the terminal before arriving at the port. Thanks to this service, potential documentation problems can be solved before arriving at the port.

Vehicle Booking System

In the past, the PAV has tried to install a VBS, however resistance from transport associations meant it was not implemented. The PAV recognises a VBS would assist landside operations, however the current transport order system with a 3-day expiry is the solution that has been developed to provide some control over the mass arrival of trucks.

The main issue raised regarding a VBS is having a fixed timetable for operations. There are 2 types of transport associations in Spanish ports:

- Transport employers' associations, which bring together the large national transport companies that have their own fleets of trucks but also subcontract trucks and labour to third parties. These are most hostile to the implementation of a VBS as they consider that, to manage the volume of work they have, they need a lot of flexibility to carry out operations.
- Associations of owner-operators, who have small fleets of trucks (sometimes no more than 2) and who welcome the improvements that a VBS could offer in terms of waiting times and efficiency.

Any changes must be discussed widely in the working groups before a decision is taken. The preferred way to implement new tools in Valencia is through small pilot projects. Unfortunately, one of the

problems of implementing a VBS pilot project is that the terminal systems do not allow for a partial implementation of a VBS (e.g. 3 gates with VBS and 3 gates without it). Given the resistance to implement a VBS, none of the terminals are willing to undertake a trial.

2.2.3.4 Public Reporting

The PAV provides public information on the goods transported through the port in a system called FORELAND 4.0 (Figure 2-26). Its aim is to provide detailed up-to-date statistical information on the activity at the port.

The information provided gives a full picture of the aggregate container information through the port. There are 3 reports that present the information on all cargo, container cargo, or rolling cargo. The information can be visualized for a specific month or year, or multiple periods, and is broken down by the below information:

- Imports, exports, and transhipments
- Full and empty containers
- Origin and destination by port and country
- Cargo type.

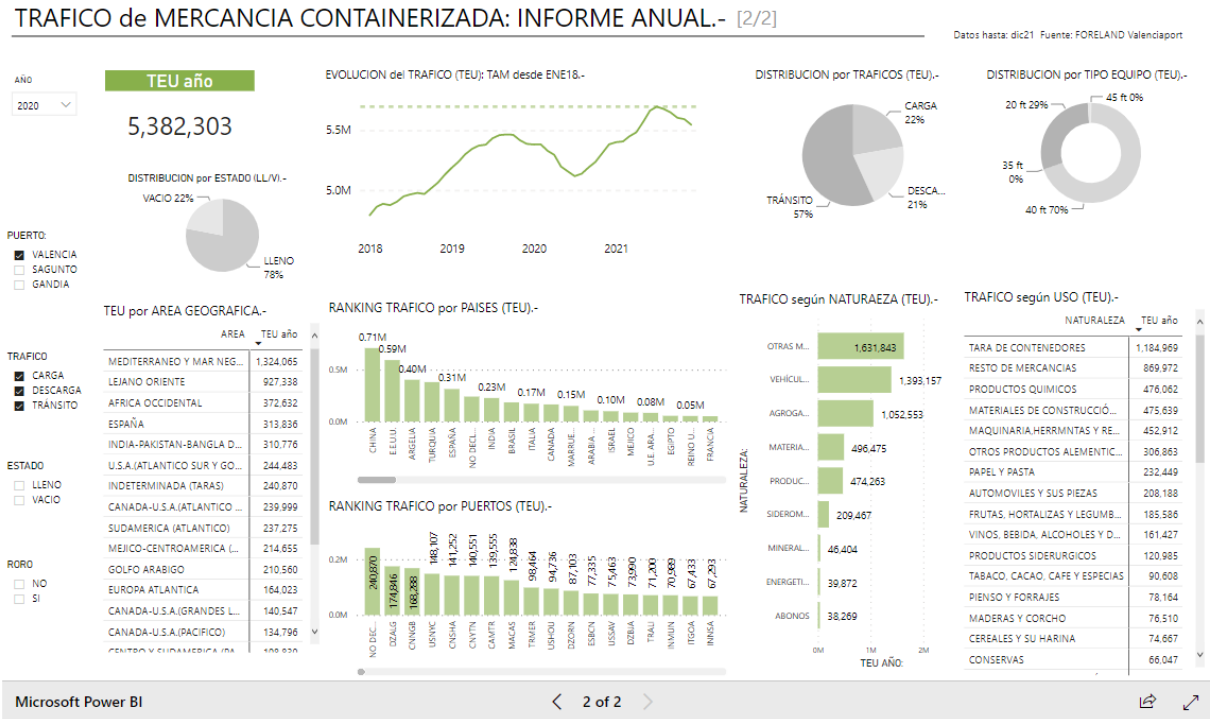


Figure 2-26 PAV; Foreland 4.0, Container cargo dashboard (25)

2.2.3.5 Compensation System

A compensation system for the carriers accessing the terminals is in place at PAV. The carrier compensation system is government legislation outlined in Law 15/2009, on the land transport of goods contract with Article 22. Stoppages (36).

1. When the vehicle must wait a period of more than 2 hours until its loading and stowage or unloading and unloading is completed, the carrier may demand compensation from the shipper for stoppage.
2. Said period will be counted from the availability of the vehicle for loading or unloading in the terms required by the contract.
3. Unless a higher compensation has been expressly agreed for this case, the stoppage of the vehicle for reasons not attributable to the carrier, including loading and unloading operations, will give rise to compensation in an amount equivalent to the Public Indicator of Income for Multiple Effects/day multiplied by 2 for each hour or fraction of stoppage, without taking into account the first 2 hours or calculating more than 10 hours per day for this concept. When the delay of the vehicle exceeds 1 day, the second day will be compensated in an amount equivalent to that indicated for the first day, increased by 25%. When the stoppage of the vehicle exceeds 2 days, the third and subsequent days will be compensated in an amount equivalent to that indicated for the first day increased by 50%.

Interpretation

If a driver has entered the terminal gate but due to delays in operations must wait more than 75 minutes to unload/load a container, the transport company is entitled to compensation. The compensation is hourly, and each terminal has its own tariffs. The Port is not involved in this system and the terminals set the rules.

The right to be compensated is a particularly sensitive issue for the carriers as the regulations that apply to these cases are very confusing and the terminal operators systematically try to find reasons not to pay the compensation. For this reason, there are many legal disputes between carriers and terminal operators. Obtaining compensation can be complicated and tedious, and in most cases the carriers do not proceed to completion with a claim.

Terminal Guidance

The only terminal at the PAV that provides public information on the carrier compensation system is MSC Terminal Valencia (34).

Service commitments

MSC has the capacity to commit an average of 70 movements per hour with the commitment that the TTT must not exceed, under normal conditions, 70 minutes for 1 container movement and 110 minutes for 2 container movements.

Delays in the provision of the service

The maximum time is counted from terminal gate entry until terminal gate exit, with the trucks given a margin of 10 minutes to leave through the terminal gate, after the last movement.

The amount of compensation that carriers can have the right to request is 18.23 Euros per hour or fraction of an hour that exceeds the maximum time.

Procedure for managing delays

To qualify for compensation the original booking must have been made at least a day prior to the day of the booking and the claim to be valid must be made within 30 calendar days from the date on which it occurred. The following evidence is required to present a case for compensation:

- A copy of the transport orders
- Document issued by the Terminal containing the confirmation of the transport order, the time of entry, time of last movement, and time of departure from terminal
- Descriptive compensation invoice for the delay
- Any other documentation that the terminal may require for the proper management of the process.

The delay will be investigated only once the documentation has been provided and the terminal does not have a justification for the delay.

Acceptance of a delay will occur through payment of the invoice. In case of dismissal of the claim, the invoice will be returned to the carrier, who can proceed with the claim by a legal means if they deem appropriate.

There is no government oversight of terminal compliance to the regulation, leaving the terminal operators to self-manage their compliance, often with carriers unhappy with the outcome.

Waivers

MSC reserves the right not to be held responsible for:

- Delays that occur outside its facilities
- Delays originating from circumstances outside the terminal, such as those derived from malfunctions, improper use, or errors in the booking system, or any other system used to regulate these operations.

There will be no obligation on the part of MSC to provide compensation for delays in the event of force majeure. The following are stated as mere examples of force majeure:

- Adverse weather situations (winds, rains, meteorological accidents) that force the suspension or stoppage of the activity of the terminal
- Suspension, deficiencies, and any other incident in the electrical supply services that affect the operating machinery of the terminal
- That the driver is involved in an accident at the terminal
- Containers to be collected from the Inspection Zone
- Collection of containers that need special handling
- Strikes, partial or general stoppages
- Natural catastrophes of any order
- Rebellion or political and civil disturbances of any order
- Other events that are not under the control or management capacity of MSC.

2.3 Port of Rotterdam, Netherlands

2.3.1 Port Description

Table 2-8 POR; Summary table (2020)

Measure	Port Botany	Port of Rotterdam
Volume of TEU	2.7 Million TEU	14.3 Million TEU
Number of Container Terminals	3	5
Empty Containers Import/Export	0.9% / 63%	14% / 19%

The Port of Rotterdam is the largest seaport in Europe and the world's largest seaport outside of East Asia. It is located in and near the city of Rotterdam, in the province of South Holland in the Netherlands. The map below (Figure 2-27) shows the terminal locations with container terminals shown in orange. The grey areas on the map are developed urban or commercial areas and white is a mix of agricultural and green spaces.

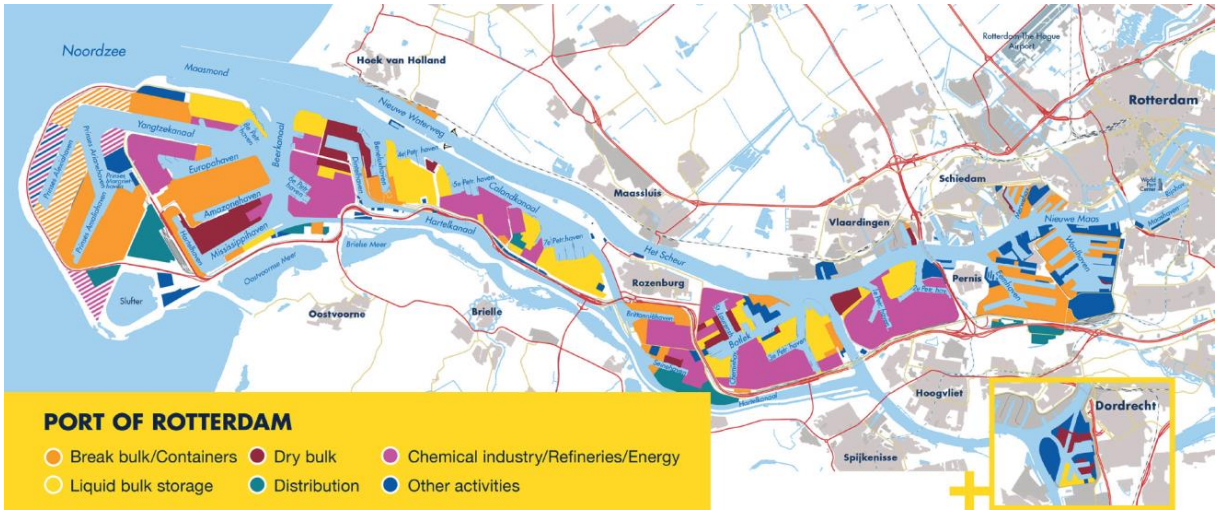


Figure 2-27 POR; Location of terminals and proximity of local zones; Grey - Urban/developed areas; White - Agricultural/green space (37)

The Port of Rotterdam Authority (POR) has a permanent lease and operates as an unlisted public limited company with shares held by the Municipality of Rotterdam and Dutch Government. PORs core tasks are the development, management and operation of the port, maintaining smooth and safe handling of shipping and supporting the future-resilience of the port.

POR is based on a landlord model. The terminal operators have the full control of their own processes and operations, how carriers are managed inside the terminal is not a POR responsibility. The role of the POR is to help the terminals and the drivers to connect with each other. For example:

- The POR provides a system to arrange timeslots.

- The POR provides information to the drivers about the status of the container inside the terminal so they know what they can expect once they arrive to the terminal gate (custom documents required or other incidents).
- The POR constantly works to provide better connections between freight-forwarder, terminal operators, and carriers to avoid ambiguity of information. The key method is facilitating the PortBase (POR PCS) interface.
- The POR is investigating new solutions like RFID technology to be sure that the communication in the future will be even better than it is today.

POR had an annual exchange in 2020 of 14.3 Million TEU with a split of 52% import to 48% exports and empty containers representing 14% of imports and 19% exports.

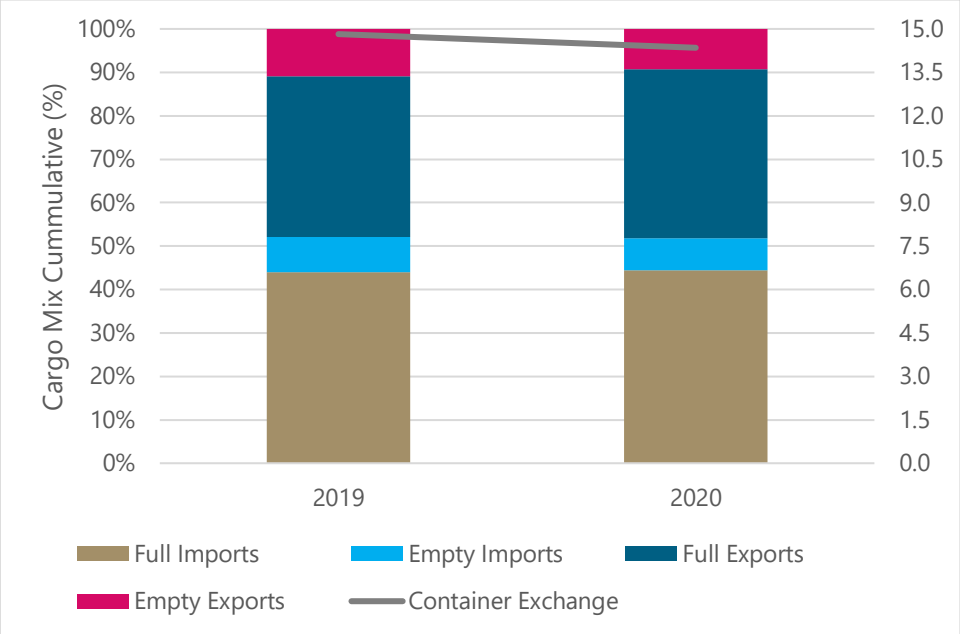


Figure 2-28 POR; Container cargo mix and exchange in 2019 and 2020, percentages excluding transhipments (38)

2.3.1.1 Container Terminals and Facilities

The total container terminal quay length is approximately 16 km with the largest terminal having 3.6 km of quay and the smallest 150 m. The trucks approach the terminal without passing through a restricted port access gate.

Terminals vary between focused on large deep sea container vessels to small inland shipping. There are 14 container terminals with 5 of the terminals servicing deep-sea vessels and the remaining a mixture of short-sea, and inland shipping barges. All the deep-sea terminals are in the Maasvlakte port area (Figure 2-29) and operate 24/7 with the remaining terminals located throughout the remaining port area.

Figure 2-29 POR; Location of deep-sea container terminals; 1 - Rotterdam World Gateway; 2 - APM Terminals Maasvlakte II; 3 - Hutchison Ports ECT Euromax; 4 - Hutchison Delta 2; 5 - Hutchison Ports ECT Delta (39)

APM Terminals Maasvlakte II is an example within the port of digitalization and automation with fenced-off automated areas, separating machinery and people. 80% of crane movements are automated with the other 20% performed remotely. After unloading from the deep-sea vessel, import containers are placed according to their inland transport mode to make them directly available. Each transport mode: rail, road, and inland shipping, has dedicated yard and equipment capacity which provides direct container availability. The exchange of container information prior to container arrival takes place entirely via the PCS. Pre-booking of time slots for collection and delivery to the terminal are available for carriers and inland shipping with a VBS which offers fixed time windows. The system also provides advanced notice of any delays to incoming deep-sea vessels for improved planning (40).

Empty Container Handling

Additional to the container terminals there are over 20 Empty Container Parks (ECP) located at the port with an approximate area of 120 ha. The ECPs allow for the storage of empty containers and offer

ancillary container services. Generally, 30-40% of the empty containers go to the deep-sea terminals to be shipped back to China. When the capacity of the deep-sea terminals for empties is covered, the containers go to the ECPs. This results in the ECPs having more congestion than the deep-sea terminals. There are no performance requirements from the POR on the ECPs and normally the operation is completed smoothly requiring minimal interaction.

Truck Marshalling Areas

Large parking facilities are provided all around the port area for a fee. They are well utilised with an occupancy rate of over 80%. Facilities are provided for use such as restaurants, restrooms, showers, Wi-Fi, etc. The combination of the VBS and equipped parking area is a simple solution but very helpful for both port and drivers. The POR is discussing whether to further increase parking capacity.

An option at some of Truck Marshalling Areas (TMA) that is used frequently is that trailer exchanges are allowed, so that a driver can leave a trailer and pick-up another. This allows carriers to optimise transits by having 2 chassis.

2.3.2 Landside Servicing Mode

The port has an extensive network of intermodal transport connections with direct links between all the terminals; deep sea, short sea, road, rail and inland waterway connections.

2.3.2.1 Road Transport

Approximately 40% of road trips from the port remain within the local region. The main connection in and out of the port area is the A15 motorway, with a direct connection to the local and national and European networks. The A15 separates traffic flow from the densely populated local area.

The Road Traffic Accessibility Prediction (Figure 2-30) shows the peak congestion conditions with a colour-coded intensity:

- Yellow - congested but still no traffic jams
- Orange - extremely congested, tendency for traffic jams
- Red - too congested, traffic jam.

Figure 2-30 POR; Peak traffic conditions on the Rotterdam Ring (41)

According to the POR there may be waiting times outside the port due to local congestion at peak times, resulting in a delay longer than normal (usually not more than an hour). However, inside the terminal the operators have enough capacity to manage operations. Trucks arrive at a specific time due to the VBS. Once at the terminal the waiting time is minimal with a TTT of approximately 30 minutes for all terminals.

Terminal capacity has not been an issue at the port, the main problem is that although terminal landside operations are open 24/7, carriers work mostly during daytime hours. The carrier's position is that warehouses are only open 8 hours a day, they therefore can only transfer containers between the port and warehouse during that time. For this reason, there are 2-hour peaks at the terminals as the carrier's cycle between the terminal and warehouses. POR has working groups that include the forwarders, carriers, terminal operators, and others to discuss how the frequency of trucks at peak time can be reduced.

To address congestion issues the POR works with various regional parties such as Ministry of Infrastructure and the Environment, the Rotterdam metropolitan region, and the Rotterdam municipality, to further improve the accessibility of the port area. This has led to ongoing construction projects in most road sections in the Rotterdam region to assist with congestion.

The newer developed port area 'Maasvlakte' has led to an increase in the number of trucks transiting to the port. To improve the air quality in the local area trucks that enter the Maasvlakte area are subject to additional requirements for registration and must be fitted with an engine less than 7 years old and rated to Euro VI emission standards. These requirements form part of the Maasvlakte Air Quality Agreement 2008 between the Municipality of Rotterdam, Port of Rotterdam, and Ministry Infrastructure and the Environment. Enforcement of the access requirements is through camera surveillance with licence plate recognition.

2.3.2.2 *Rail Transport*

At the port there is an intermodal terminal that serves as a primary hub for the European rail network. It has 8 tracks of 750 m length and can transfer between rail and road. In addition to this most of the deep-sea terminals have their own rail facilities. The port has 400 international rail services for containers, liquid, and bulk each week.

Rail is a key transport mode at the port with POR looking to increase the share of cargo on rail from 11% in 2016 to 20% in 2030.

A rail connection allows for the exchange of containers between terminals (PortShuttle). Cargo flows can be consolidated to one terminal with inland and transhipment containers transferred to the correct train line.

Figure 2-31 POR; Container terminal rail connections (42)

2.3.2.3 *Inland Shipping*

Like rail transport inland shipping is an efficient transport mode for long distance and large volumes. The port is situated at an end point for inland cargo flows and serves as an important connection from deep sea service lines. Inland shipping networks can reach the Netherlands, Germany, Belgium, France, Switzerland, and Austria with normal transit times between 1 and 4 days depending on the destination. These connections have resulted in inland shipping representing approximately 50% of incoming and outgoing cargo between the port and destinations in Europe.

Similar to TMAs there are over 150 public berth locations with capacity for around 500 inland vessels. This provides space for vessels to wait until a terminal is available for loading/offloading (43).

2.3.3 Landside Management

There are no agreements between the POR and the terminal operators for the management of the landside interface or performance levels but there is constant communication (minimum every 3 weeks) to make sure the process is still running smoothly. The POR doesn't interfere in the terminal operation itself.

In the Netherlands there is the Ministry of Infrastructure which has contact with POR and terminal operators. The role of the ministry is to facilitate and help the work inside the port, mainly promoting projects or bringing stakeholders together, but it and the POR cannot establish any target or rules for the terminals as that would be an interference into private company operations. The POR does not see its role to be involved in managing the performance of the terminals, ideally, they are interested in improving their systems and performances to satisfy their clients.

To help with this process the POR assists with communication between terminal operators to find the best solutions for the supply chain. It considers initiatives that will improve the quality of the port and help the terminals and carrier's complete operations as quickly as possible. Improvement initiatives can be slowed occasionally due to a lack of cooperation if a terminal operator does not see a need.

2.3.3.1 Vehicle Booking System

A VBS is available for all container terminals at the POR. The system is managed through the PCS platform with the booking slot itself made to the TOS. Most of the terminals offer a 30-minute slot but they have an allowance for arriving early or late, with the total booking window varying between 75 minutes and 2 hours. Arrival outside the window requires a new booking. The slots for the peak periods are booked very quickly.

In the beginning there was resistance from carriers to the system as there was an additional fee introduced. The POR spent time consulting industry to explain the benefits and to receive feedback on how it can be improved.

There has been an improvement in port efficiency since the system was implemented with benefits such as:

- No paper used in the process. With the existing high cargo exchanges the old paper system would have resulted in long waiting periods.
- The availability of real-time information about the container status avoids carriers attempting to pick-up when the container is not ready.
- Information is provided about when the best window is to book a slot and what wait time you should expect once you arrive.
- Having a fixed booking time means the trucks can wait at a TMA with facilities provided instead of a long line at the terminal.

Feedback from carriers has been that they are now required to do more work in the pre-process then previously. However, before the VBS was implemented the port handled only 4 million TEUs compared to the 15 million TEUs a year it now handles, all with no queues and if the pre-process is followed correctly, the driver can complete the operation in 30 minutes.

2.3.3.2 Port Community System

The PCS (PortBase) is used for logistics planning and the exchange of information. The PCS connects all parties in the port and facilitates the exchange of data between companies and government authorities. There are packages and customized services within the PCS to address all port sectors and stakeholders. All links in the supply chain can easily exchange information. Most of these services are reusing the data already present in the PCS which without it they would each be required to create.

The main advantages are greater efficiency, lower costs, better service provision, better planning, shorter turn times, fewer errors, maximum reuse of information and 24/7 availability. The PCS dropped the number of telephone calls in the community each year by 30 million and the number of emails by 100 million (44).

The services required can be selected and customized to the user or user group within an organisation. Services within the PCS focus on all port sectors: containers, general cargo, dry bulk, and liquid bulk. All links in the supply chain can exchange information easily and efficiently between relevant stakeholders. Each stakeholder group within the PCS has its own service package.

2.4 Port of Antwerp, Belgium

2.4.1 Port Description

Table 2-9 APA; Summary table (2020)

Measure	Port Botany	Port of Antwerp
Volume of TEU	2.7 Million TEU	12 Million TEU
Number of Container Terminals	3	5
Empty Containers Import/Export	0.9% / 63%	14% Total
Road / Rail	85% / 15%	58% / 7% (35% Barge)

The Port of Antwerp in Belgium has a total of 86 terminals distributed over the 2 sides of the port handling all types of cargo. There are 5 deep-sea container terminals. It is located on the river Scheldt, 90 km south-east of the North Sea, and is surrounded by an extensive network of international motorways to industrial centres and other European destinations.

The port is owned and operated by the Antwerp Port Authority (APA), which has a key role in the port's day-to-day operation, managing and maintaining the port and responsible for safe shipping. The APA operates the port facilities with the terminals leased to terminal operators for cargo operations.

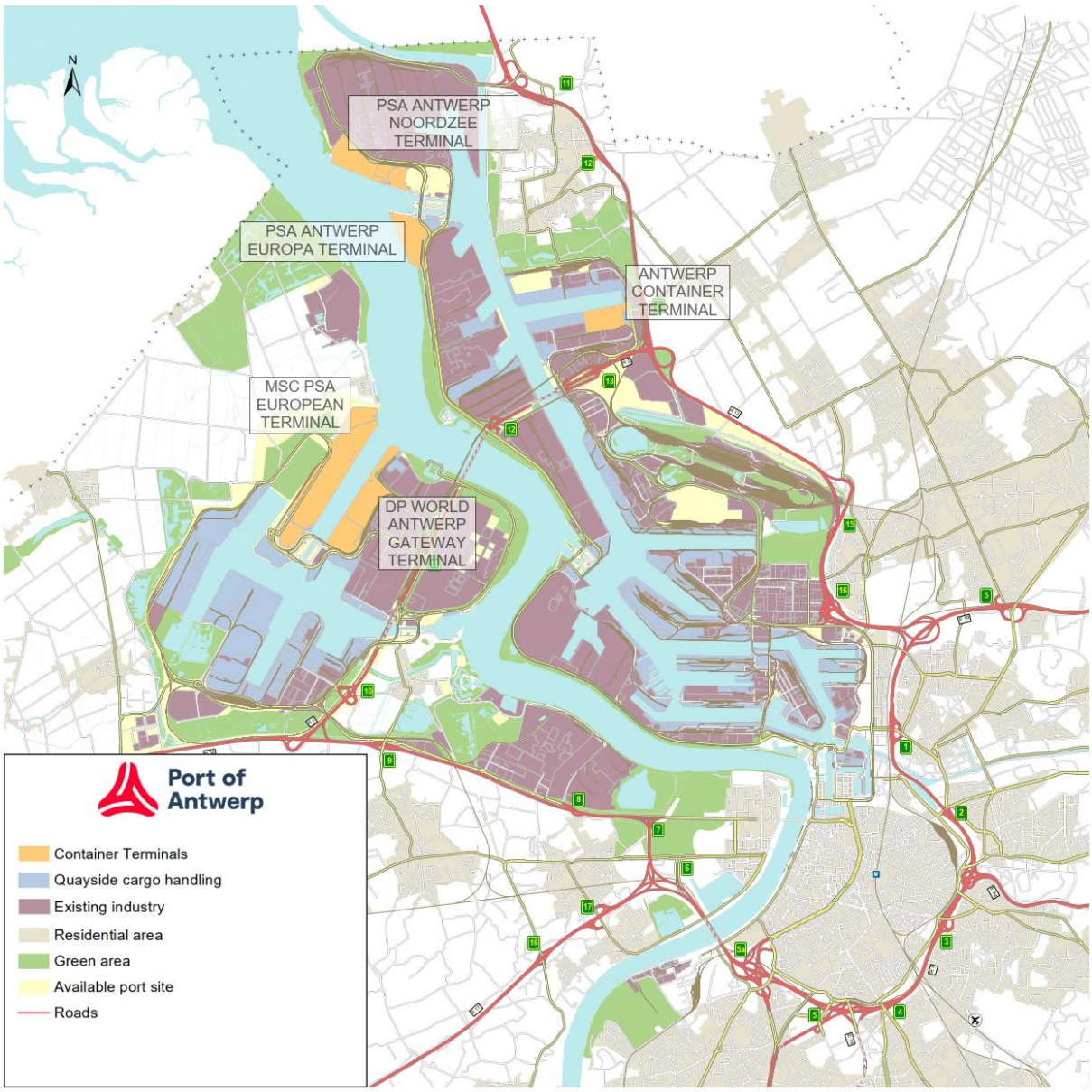


Figure 2-32 APA; Location of terminals and proximity of local zones; Deep-Sea container terminals labeled; Grey - Port Area; Red - Highways; Yellow - Local Roads (45)

The container throughput at the terminal has increased over the last decade. Since 2010 the total TEUs handled has increased from 8.5 Million TEU with 48% imports and 52% exports, to 12 million TEUs, 47% imports and 53% exports in 2020 (Figure 2-21). The percentage of full and empty containers exchanged between 2010 and 2021 has been consistent at 86% and 14% respectively (46).

The volume of containers exchanged in Antwerp in 2020 was 60% of all cargo being moved through the port with breakbulk, dry bulk, liquid bulk, and rolling stock making up the remaining 40% (Figure 2-34).

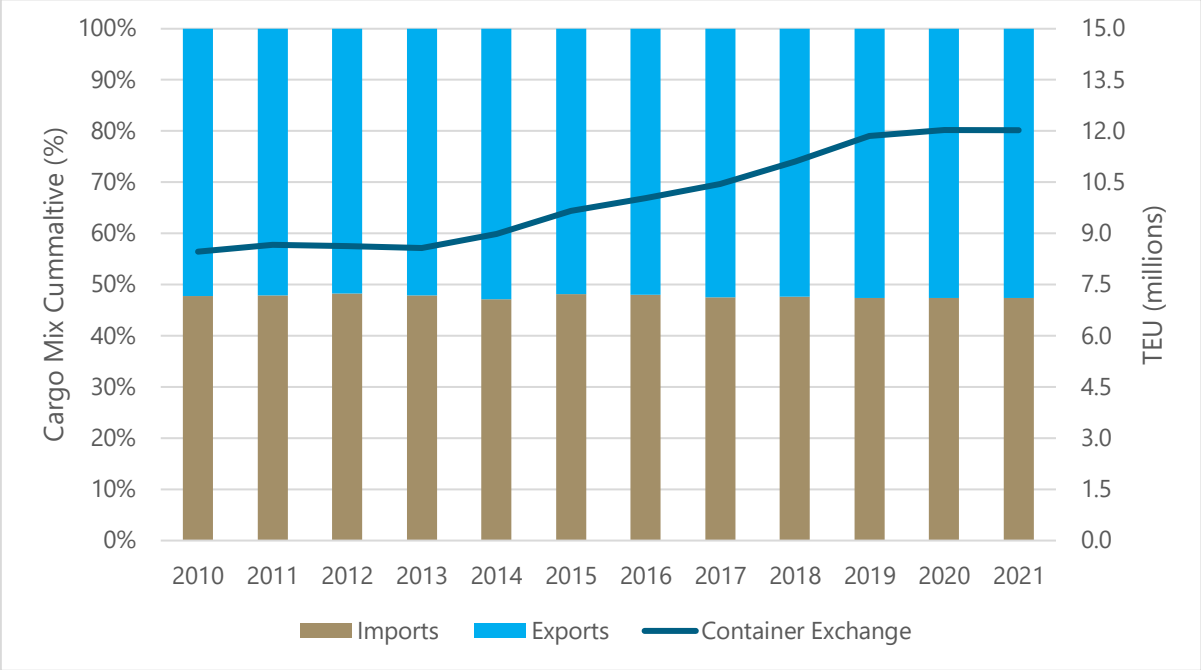


Figure 2-33 APA; Container cargo mix and exchange between 2010 and 2021, percentages excluding transhipments (46)

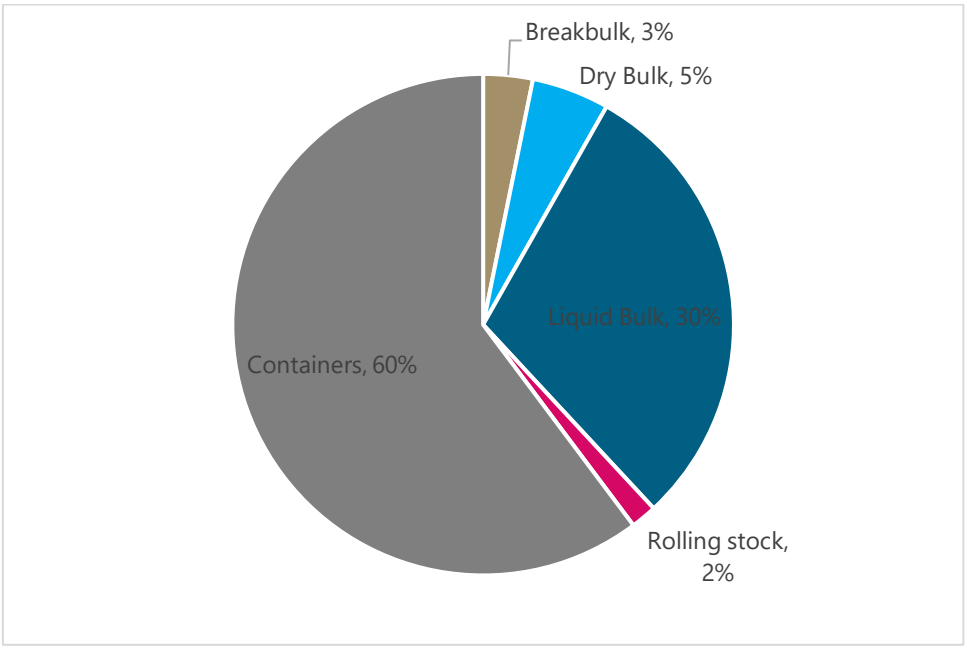


Figure 2-34 APA; Breakdown of all cargo trade (46)

The APA provides parking at the port with the Goordijk TMA offering 210 spaces. APA is constructing additional parking areas at strategic locations in the port area, on both the left and right sides of the river, with a planned new TMA offering 370 spaces.

With container growth increasing each year the Flemish Government plans to provide additional container handling facilities in the port area including additional terminals, a new tidal lock, and new

logistics sites. To service the additional capacity new roads, rail and inland navigation infrastructure will be provided.

2.4.2 Landside Servicing Mode

APA is accessible through a multimodal transportation network consisting of roads, rail, and inland shipping. This provides transport to and from the port to other destinations, with intermodal terminals connecting services.

In 2018, over half of the freight containers going to and from the port (56.2%) were transported by road, 36% by inland shipping and 7.8% by rail. In line with the 2030 growth expectations and in the interest of reducing future contributions to road congestion, the Port of Antwerp is encouraging a modal shift from road transport. By 2030, the percentage of road transport should fall to 43% in favour of inland navigation and rail (Figure 2-35).

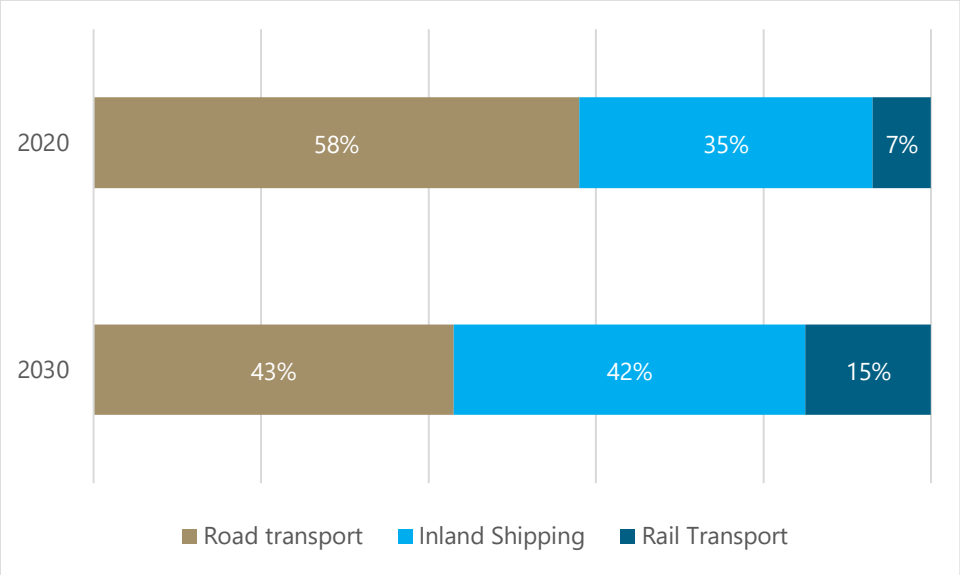


Figure 2-35 APA; Modal split for container transport (47)

2.4.2.1 Road Transport

To improve connectivity and mobility around the port, the APA in partnership with industry and the government has:

- Encouraged carriers to utilise off-peak access to the large container terminals which are now open Monday 5am to Saturday 2pm. This is intended to spread landside operations between peak and off-peak times and decrease peaks in container operations. The ongoing challenge is the lack of interest from carriers to operate at night.
- Allowed port specialist vehicles such as mobile cranes, fork and lift trucks and straddle carriers more mobility. Through the introduction of a port wide ordinance by APA and the Flemish Government these vehicles can on a regular basis use the public highways on the Left and Right sides of the river. The adapted traffic scheme is intended to smooth cargo transfer between local operations such as terminals and warehouses.

- Discussed topics related to road transport with organisations representing local companies. Meetings are organised each year for the Left and Right sides of the river. These meetings allow for stakeholders to be properly informed of infrastructure projects in the area and to mutually work out solutions. The meetings provide an opportunity for the exchange of expertise and experience on the topics and how to best utilise alternative modes of transport.

2.4.2.2 Rail Transport

The port is located at the intersection of 3 main rail corridors (Rhine-Alpine, North Sea-Mediterranean, and the North Sea-Baltic). It is directly connected to the pan-European inland network with 500 destinations with 300 weekly services. Rail services amount to 24 million tonnes of freight per year shifted through the 8 intermodal terminals at the port. The container terminals have on dock rail access that connects to the intermodal terminals at the port for onward transfer to the destination (Figure 2-36).

The APA plan to double rail transport to 15% by 2030 has led to the introduction of subsidies for rail transport to lower the cost of bundling rail containers from different container terminals, and to support the introduction of new intermodal rail services. The support scheme is a temporary measure to bridge the period until there are enough volumes to justify the new service route.

The support scheme consists of 2 interrelated support systems:

1. Support for functioning and costs associated with the intermodal terminal
2. Support for the shuttle trains between the intermodal terminal and the container terminals.

Every train or port shuttle that passes through an intermodal terminal can receive up to 500 euro for each passage as a compensation for the costs associated with the intermodal terminal. The compensation is provided 50/50 between APA and the Flemish government.

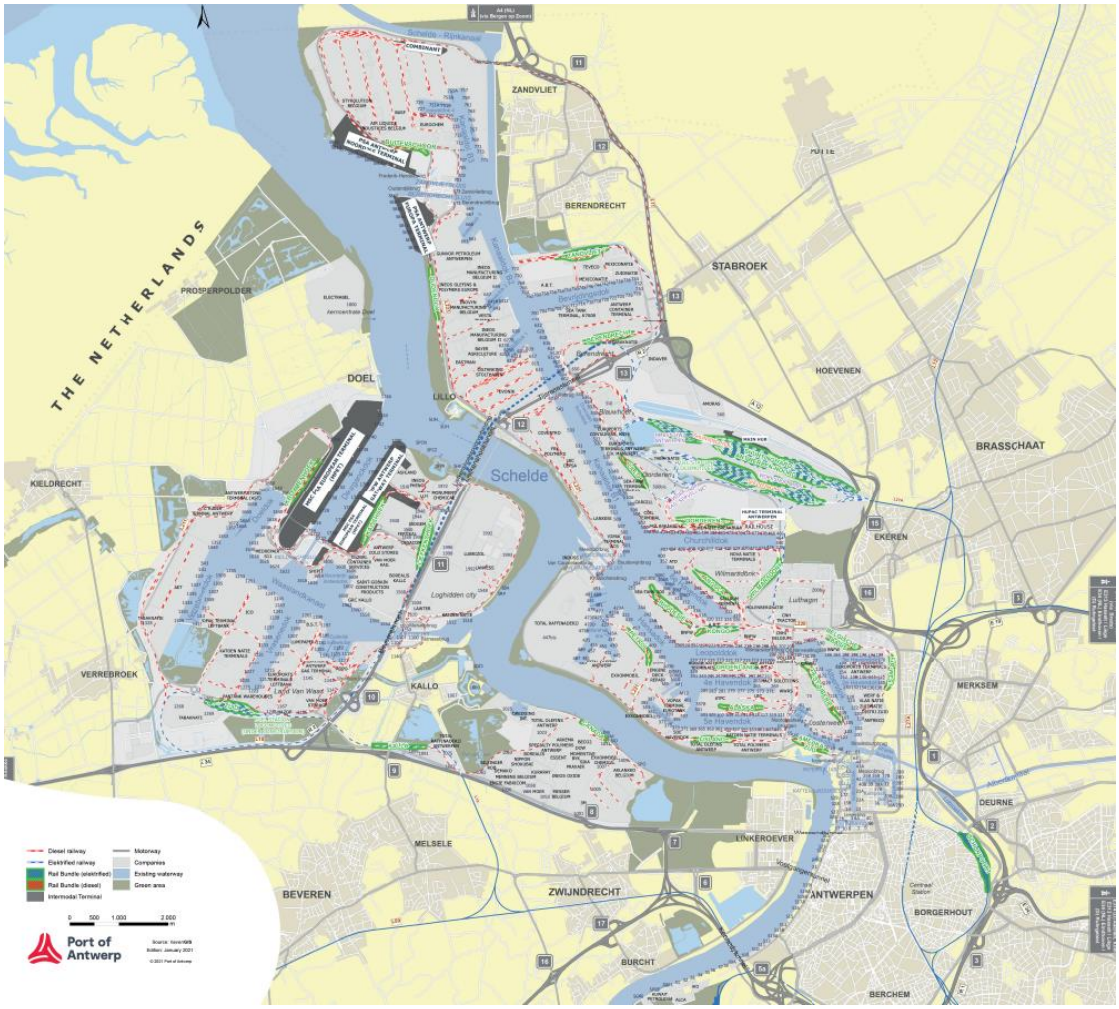


Figure 2-36 APA; Rail transport terminal access map and proximity to local zones; Red/white – Rail access (48)

2.4.3 Landside Management

The Port of Antwerp is a large complex with many stakeholders in different industries. Due to the size of the market many specific tools have been developed to assist with optimizing the supply chain through the port. C-Point is the APA's PCS tool developed to assist with interactions between stakeholders. One functionality that can be accessed through the PCS is the authorisation system Certified Pick-up.

2.4.3.1 Container Import Procedure

To address the safety and efficiency concerns of a previous pin code system, a new procedure was introduced by APA from January 2021 called Certified Pick-up (49). It is a container release process based on authorised identification and assigns the right container to the right carrier with an audit trail. It does not provide a booking for container collection at the terminal. The Certified Pick-Up system can be accessed directly or through the PCS. It is mandatory for all supply chain partners involved with import containers leaving the port by truck, rail, or barge (including transhipments and empties) to use the system. A driver can pick up a container with their Alfapass (a universal ID-card used at the terminal in combination with biometric authentication).

Through the Certified Pick-up platform:

- The cargo owner submits a commercial release once all requirements are met (payment etc.) and nominates the carrier.
- The shipping line generates a release right for a container, based on commercial release information.
- This right is passed to the required carrier. The right is only generated when a carrier is nominated.
- The terminal will notify the platform when the container is ready for pick up. Once the container is released by both parties (Cargo owner and terminal operator) the carrier can pick up the container with their Alfapass at the terminal. Both releases are independent and can be completed at any time.

Figure 2-37 provides a flow chart for the Certified Pick-up process.

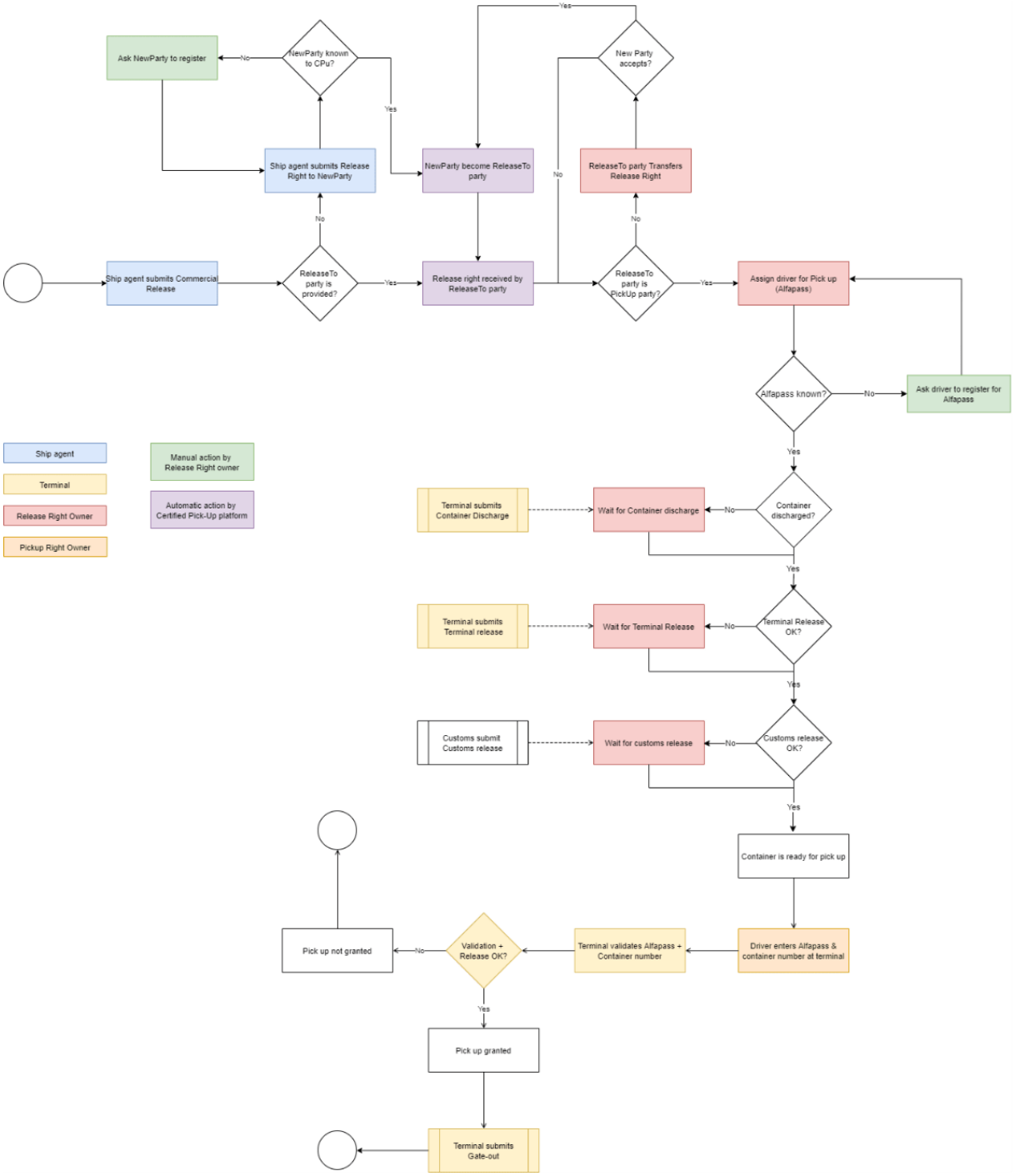


Figure 2-37 APA; Certified Pick-Up process flow chart (50)

2.4.3.2 Antwerp Port Community System

The Antwerp PCS, C-point (51) (Community, Communication and Connection), is used to improve efficiency in the supply chain at the port. It is an initiative by the APA and AlfaPort (organisation representing companies and business associations from the Port of Antwerp), that is provided by a third party (NxtPort). C-point is the network of systems and solutions for electronic communication in

the Port of Antwerp. It comprises the exchange of data between companies and authorities and offers services regarding nautical functionalities, cargo and logistics, dangerous goods, and customs. All types of freight and transport modes are supported.

It provides efficient electronic message and information exchange in the support of the day-to-day administrative and operational activities between port stakeholders. Advantages of this system include:

- Electronic communication and one-time data entry lead to lower costs and fewer errors. Furthermore, the services involved can process the information faster.
- Data ownership remains with the sender of the data. The strictest standards for cyber security are enforced.
- C-point affords transparency of the supply chain. Being able to see the exact status of goods and knowing which stage of processing they are at ensures more efficient and up-to-date scheduling and handling.

The exchange of information and messages is done using standardised formats. Users can send and receive messages via the system, to and from their trading partners and the various authorities. Electronic messages are based on open international standards so that messages can be exchanged all over the world using alternative applications. The services included in the C-point are shown in Table 2-10.

Table 2-10 APA; PCS services (51)

	Cargo & Logistics	Customs	Hazardous	Nautical
Audience	**Logistics planning:** Shipper/consignee, Custom agents, Shipping agents, Shipping companies, Freight forwarders, **Operations:** Terminal operators, Barge transport Rail / Road / Barge transport **Port Authority**			
Features	• Container release • Container booking notification • Transport booking (seagoing ship) • Electronic payments • Electronic invoicing • Inland Transport Order • Container loading/unloading order (sea transport) • Container loading/unloading order (barge/rail transport) • Notification of arrival of import consignment (seagoing ship) • Stowage position information • Pre-notification of delivery and collection of containers on the terminal (road or rail transport) • Berth request (barge) • Track & Trace containers	• Customs declaration • Notification of arrival (seagoing ship) • Notification of exit (seagoing ship) • Records exchange • Export manifest declaration • Import manifest declaration • Transhipment notification • Customs declaration • Notification of arrival of export consignment	• Notification of dangerous goods • Notification of arrival/departure of dangerous goods • Consult Dangerous Goods register	• Berthing dues notification • Ship's waste declaration • Order for pilot, tug, or mooring services • Electronic invoicing • Berth reservation (seagoing ship) • Berth request (barge) • Terminal planning (barge) • Prenotification (seagoing ship)

2.5 Port of Manila, Philippines

2.5.1 Port Description

Table 2-11 Port of Manila; Summary table (2020)

Measure	Port Botany	Port of Manila
Volume of TEU	2.7 Million TEU	3.1 Million TEU
Number of Container Terminals	3	2
Empty Containers Import/Export	0.9% / 63%	0.4% / 72%
Transhipments	5%	0%
Road / Rail	85% / 15%	100% / -

The Port of Manila is located at the heart of the Philippine capital, strategically positioned to regional and international markets and the city of Manila. It is operated by the Philippine Ports Authority (PPA). The PPA was created in 1974 by Presidential decree, primarily to administer and manage the country's ports across the Philippine archipelago of 7,100 islands. It's scope and functions include planning, development, financing, operation and maintenance of ports or port districts for the entire country, including all port construction projects under its port system (52). The PPA is also responsible for the enhancement of domestic and international trade; promotion of regional development, and collection of all port revenues for services rendered and to ensure a reasonable rate of return on its assets being utilized in the conduct of its operations (53).

The port contains several terminals servicing various cargo types including containers. There are 2 international container terminals; Manila International Container Terminal (MICT) located between North and South Harbour, and Asian Terminals, Inc. (ATI) located in South Harbour. North Harbour is a domestic container terminal only (54). The port areas and city of Manila are indicated in Figure 2-38.

Figure 2-38 Port of Manila; Location of terminals and proximity to local zones (55)

Cargo exchange data is available through the PPA for the ports throughout the Philippines. The international container cargo exchanges and breakdown for MICT and ATI are captured in Figure 3-3 for the period between 2010 and 2020. There has been an upward trend in the volumes through the port over the past 10 years from 2.6 million TEU in 2010 to 3.1 million TEU in 2020. The cargo mix has remained constant with imports to exports split approximately 50/50. There has been an increase in the proportion of empty containers exported as the quantity of cargo exported has remained approximately the same, with empty containers increasing.

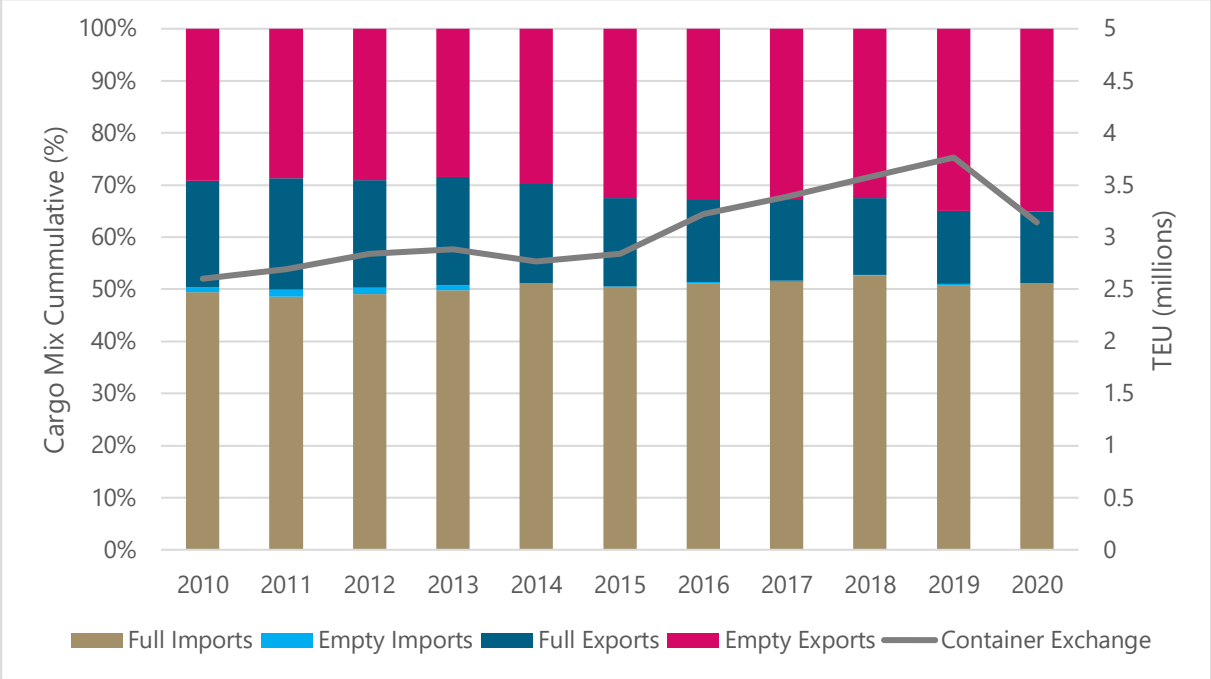


Figure 2-39 Port of Manila; Container cargo mix and exchange between 2010 and 2020 (56)

Figure 2-40 shows MICT has a higher proportion of containers.

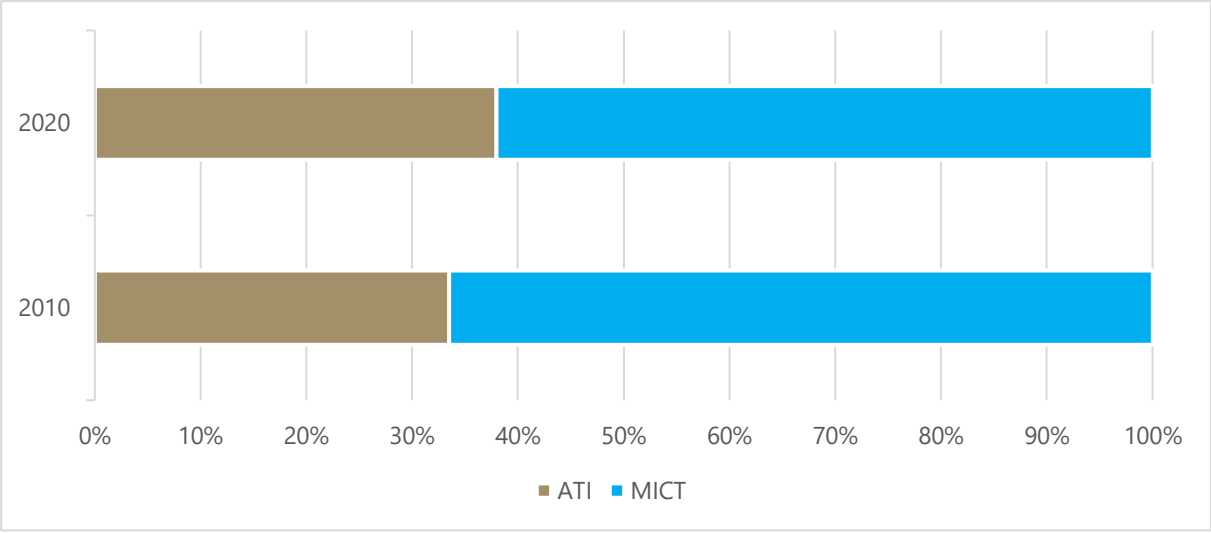


Figure 2-40 Port of Manila; Cargo exchange share between terminals (56)

Manila International Container Terminal

International Container Terminal Services, Inc. (ICTSI) began operating the MICT terminal in 1988. The terminal has an annual capacity of 3 million TEUs and 7 berths spread over 1.85 km. The terminal has 7 automated entry gates and a 4 ha TMA inside the terminal gates, the terminal uses RTGs for its yard container movements and operates 24/7. To further improve the mobility of trucks inside the terminal,

an additional truck ingress, equipped with optical character recognition, was made operational in 2020 (57) (58).

Figure 2-41 Port of Manila; MICT container terminal (57)

Asian Terminals Inc

ATI is backed by DP World (DPW) and operates the Manila South Harbour facility with 5 container berths over 975 m of quay-line. It has an annual capacity of 1.9 million TEU and is serviced by 28 RTGs and 24/7 operations. The internal TMA can accommodate up to 100 trucks (59) (60) (61) (62).

ATI has provided several access gates for its South Harbour Port. These access gates are equipped with weigh bridges and supported by automated truck queuing and call-up systems. This improvement scheme has complemented PPAs effort toward improving traffic flow along the port roads.

Off-dock Yards

ATI and ICTSI operate off-dock facilities that have been established as extensions of their respective port terminals and as customs bonded facilities. This allows the immediate transfer of cargoes to the facility while still being cleared by customs in Manila. Arriving shipments can be transferred immediately to off-dock facility upon the request of Bureau of Customs (BOC)-accredited consignees. While stored at the secure facility, cargo clearances and other requirements can be simultaneously processed through online systems electronically linked to BOC (59) (62) (63).

ATI operates another 2 ha ECP located 7 km from the port, it allows for delivering empty containers at the facility before proceeding to ATI for pick-up of laden boxes. The ECP serves to ease high yard utilization during peak season (59) (62).

2.5.2 Landside Servicing Mode

Currently the only mode of transport for transferring containers in and out of the port is through road transport. In the future it is understood that the PPA and port stakeholders are looking to develop

small port terminals in different provinces where cargoes can be transported via smaller domestic cargo ships.

2.5.2.1 Road Transport

Regulation

The congestion in Manila has been an issue for over a decade. A portion of this congestion can be attributed to trucks travelling to and from the port however, causes of traffic include (64):

- Limited capacity of the existing roads to cope with increasing volume of private and public vehicles
- Illegal structures and other obstructions along the carriageways
- Poor road geometry and engineering
- Inadequate traffic signal systems
- Poor public transport system
- Frequent vehicular accidents
- Poor enforcement of and compliance with traffic rules and regulations
- Instant flooding in selected areas on rainy days.

In terms of programs to address congestion in the city, over time the Metropolitan Manila Development Authority (MMDA) has implemented rules for various vehicle types.

- For regular cars the MMDA has tried implementing schemes like restricted days for vehicle colours and plate numbers. These have had limited success as people with multiple cars would change from one vehicle to another to avoid the rules.
- For trucks there have been variations on truck bans since 2007 with a complete truck ban Monday to Saturday in the mornings (6am-10am) and evenings (5pm-10pm) since 2012. In 2014 the truck bans were suspended on specific routes, but trucks are only able utilize a single lane (65) (66) (67) (68).

The suspension of the truck bans on specific routes helped operations at the port and paved the way for a smoother flow of traffic. However, there was still congestion due to imports, especially during the peak months from July to September. To encourage the removal of import containers on a Sunday and/or Monday morning before 12 noon, trucks that committed to doing this were allowed to utilize additional routes for travel at other times. These vehicles were tagged specifically for identification (69) (70).

In 2016 MICT and ATI introduced a VBS, locally known as a Terminal Appointment Booking System (TABS). TABS aimed to minimize congestion in the port and its surrounds by having trucks book in advance the delivery of goods in and out of the port. The MMDA recognized the need to encourage more trucks to participate in the VBS and granted a truck ban exemption for participating trucks. Trucks with valid bookings can be verified via a text message from any mobile phone (71) (72).

Feedback received on the trucking experience at the port prior to the implementation of the VBS indicates long wait times and heavy congestion entering and leaving the port.

- Congestion at and within port area was chaotic, with container trucks forming large queues.
- Trucks would arrive at the port with no guarantee of being able to collect or deliver containers.
- Trucks arriving from outside Metro Manila would stay waiting at the port gate until they could be serviced, adding to the already heavy congestion in the area.
- Trucks departing after being serviced would be subjected to heavy congestion for many hours while trying to leave the area.
- Truck bans were found to be counterproductive as they led to trucks not being able to access the port to deliver or collect their containers.

2.5.3 Landside Management

2.5.3.1 Pre-Vehicle Booking System Landside Interface

Prior to 2016 and the introduction of the VBS it is understood that container drop-offs and collections were managed manually with a paper-based system. Communications to customs brokers, carriers, and other stakeholders were done either be email, phone, or fax. Trucks were not managed resulting in long queues every day. Once in the queue trucks could not leave as it was bumper-to-bumper traffic. The traffic outside the port was managed by the city police and the city traffic enforcers while traffic within the port was managed internally by port police.

Traffic Light System

A system in place at the terminals prior to the VBS was to communicate container status through a traffic light system. The road traffic signal colours showed the status of containers as ready for collection (green), not ready (red), or their release is underway or being processed (amber). Accessibility and availability of this information was only possible through the computer just outside the gates of the terminal. Truck drivers then would need to queue outside (with their trucks parked at the port roads) to monitor for their time to collect their containers (73).

2.5.3.2 Vehicle Booking System

The VBS was initiated in 2014 by the terminal operators, the PPA (government) and port stakeholders as a collaborative solution to road congestion, to maximise efficiency in the delivery and withdrawal of cargoes, enhance the operating guidelines and standardize fees. 1-Stop were contracted to provide the required systems. The VBS was first introduced as a trial in October of 2015 and formalized through the PPA issuing an Administrative Order (AO) in 2016 (AO-06) (72) (74). All containers full or empty handled at ATI and MICT are subject to AO-06 (75).

AO-06 detailed the operating rules of the VBS such as the number of zones (specific period for which a booking is made for container exchange), specific zone rules, and the associated fees. Each booking zone is 1 hour long and assigned 1 of 4 demand categories. Each demand category has different associated rules. The demand categories are specific to each terminal operator with differences in the demand category associated with each zone. Table 2-12 shows the zones and demand categories at ATI and Table 2-13 shows the same at MICT.

Table 2-12 Port of Manila; ATI - Booking time zones; Blue – Free; Green – Medium demand; Red – High demand; Yellow - Rebate (75)

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
0000-0059	Free	Free	Free	Free	Free	Free	Rebate
0100-0159	Free	Free	Free	Free	Free	Free	Rebate
0200-0259	Free	Free	Free	Free	Free	Free	Rebate
0300-0359	Free	Free	Free	Free	Free	Free	Rebate
0400-0459	Medium	Medium	Medium	Medium	Medium	Medium	Rebate
0500-0559	Medium	Medium	Medium	Medium	Medium	Medium	Rebate
0600-0659	High	High	High	High	High	High	Rebate
0700-0759	High	High	High	High	High	High	Rebate
0800-0859	High	High	High	High	High	High	Rebate
0900-0959	High	High	High	High	High	High	Rebate
1000-1059	Medium	Medium	Medium	Medium	Medium	Medium	Rebate
1100-1159	Free	Free	Free	Free	Free	Free	Rebate
1200-1259	Free	Free	Free	Free	Free	Free	Rebate
1300-1359	Free	Free	Free	Free	Free	Free	Rebate
1400-1459	Free	Free	Free	Free	Free	Free	Rebate
1500-1559	Free	Free	Free	Free	Free	Free	Rebate
1600-1659	Medium	Medium	Medium	Medium	Medium	Medium	Rebate
1700-1759	High	High	High	High	High	High	Rebate
1800-1859	High	High	High	High	High	High	Rebate
1900-1959	High	High	High	High	High	High	Rebate
2000-2059	High	High	High	High	High	High	Rebate
2100-2159	High	High	High	High	High	High	Rebate
2200-2259	Free	Free	Free	Free	Free	Free	Rebate
2300-2359	Free	Free	Free	Free	Free	Free	Rebate

Table 2-13 Port of Manila; MICT Booking time zones; Blue – Free, Green – Medium demand, Red – High demand, Yellow - Rebate (75)

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Sunday
0000-0059	Free	Free	Free	Free	Free	Free	Rebate
0100-0159	Free	Free	Free	Free	Free	Free	Rebate
0200-0259	Free	Free	Free	Free	Free	Free	Rebate
0300-0359	Free	Free	Free	Free	Free	Free	Rebate
0400-0459	Medium	Medium	Medium	Medium	Medium	Medium	Rebate
0500-0559	Medium	Medium	Medium	Medium	Medium	Medium	Rebate
0600-0659	Medium	High	High	High	High	Medium	Rebate
0700-0759	Medium	High	High	High	High	Medium	Rebate
0800-0859	Medium	High	High	High	High	Medium	Rebate
0900-0959	Medium	High	High	High	High	Medium	Rebate
1000-1059	Medium	Medium	Medium	Medium	Medium	Medium	Rebate
1100-1159	Free	Free	Free	Free	Free	Free	Rebate
1200-1259	Free	Free	Free	Free	Free	Free	Rebate
1300-1359	Free	Free	Free	Free	Free	Free	Rebate
1400-1459	Free	Free	Free	Free	Free	Free	Rebate
1500-1559	Free	Free	Free	Free	Free	Free	Rebate
1600-1659	Medium	Medium	Medium	Medium	Medium	Medium	Rebate
1700-1759	High	High	High	High	High	Medium	Rebate
1800-1859	High	High	High	High	High	Medium	Rebate
1900-1959	High	High	High	High	High	Medium	Rebate
2000-2059	High	High	High	High	High	Medium	Rebate
2100-2159	High	High	High	High	High	Medium	Rebate
2200-2259	Free	Free	Free	Free	Free	Free	Rebate
2300-2359	Free	Free	Free	Free	Free	Free	Rebate

Depending on the demand zone the booking may provide a rebate or be free (providing an incentive for use), or for the medium and high demand zones incur a fee (75). Table 2-14 shows the associated fees for each demand zone. The currency is listed in points, the points system is discussed in Section 2.5.3.3 with 1 point equivalent to 1 Philippine Peso.

Rebate slots are available on Sundays where traditionally there was a very low number of drop-offs and pick-ups. The rebate encourages booking on a Sunday, supporting the VBS objective of spreading

out deliveries through the week and eliminating peaks in traffic. Rebates are earned at each of the terminals when the truck arrives within the booking window, with the rebate credited to the account after the transaction. The rebated points can be used to off-set other booking charges (75).

Table 2-14 Port of Manila; ATI and MICT Booking Fees (75)

Booking Slot	Booking Fees
Free Demand Zone	Free of Charge
Medium Demand Zone	300 points (per booking)
High Demand Zone	500 points (per booking)
Rebate	Rebate of 300 points (can be used to off-set other booking charges

A double transaction incentive exists for bookings that include both an export/delivery and import/collection with the import booking being free of charge. The refund is automatically given following the completion of the exchange based on the following conditions (76):

- The truck manifest must be a dual manifest with at least one export container and one import container
- The truck must arrive at the gate within the booking window.

To ensure compliance and protect the system from abuse, trucks that arrive outside of the allowable booking window incur a penalty per the booked demand zone (Table 2-15 & Table 2-16). The booking window includes an additional grace period either side of the booked zone. Additionally, to support export growth and prevent shut-outs, containerized exports may arrive early at the terminal within the below criteria (76) (77):

- ATI – Early arrivals are allowed within the grace period without being charged an off-slot early penalty
- MICT – Trucks may arrive before their booked zone within the grace period (2 hours) without penalty and up to 6 hours early with an off-slot early penalty.

For trucks incurring the no-show penalty the below rules apply for late acceptance (75) (78):

- ATI - Trucks that arrive within 2 hours after becoming a no-show will still be accepted, outside this period they will need to be rebooked
- MICT – All trucks that arrive after incurring the no-show penalty will be serviced without needing to rebook for up to 12 hours from the booked zone, outside this period a new booking is required.

Table 2-15 Port of Manila; ATI - Arrival window grace periods and penalties per booking (75)

Booking Zone	Grace Period	Off-slot	No-show
High	-1 / +3 hours	-	> 3 hours (1,625)
Medium	-1 / + 2 hours	> 2 hours (1625)	> 3 hours (3,251)
Free	-1 / +1 hours	> 1 hour (1625)	> 2 hours (3,251)
Rebate	-1 / +1 hours	> 1 hour	> 2 hours

Table 2-16 Port of Manila; MICT - Arrival window grace periods and penalties per booking (75)

Booking Zone	Grace Period	Off-slot	No-show
All Booking Types	-2 / +2 hours	< or >2 hours (1625)	> 3 hours (3,251)

Slots can be changed at anytime until the actual start of the booked zone. The original booking charge is not refunded if the slot is subject to payment of a fee. Re-listed bookings will only be charged a no-show penalty if the booked slot was not claimed by another user, resulting in the loss of the original booking fee and a no-show penalty (listed slots are always the priority slots given away to avoid unnecessary penalties in the system) (75).

Vehicle Booking System Operation

The terminal operators use the Advanced Booking system (Appendix A). Advanced booking generally requires that an import container must have a yard position within the terminal before a slot can be booked.

To make a booking in the VBS the below requirements must be met (75) (79).

- For inbound cargoes – container must be landed in the yard and receipt by the terminal operator of the On-Line Release System instruction from the BOC (Customs clearance).
- For outbound cargoes – submission to the terminal operator of the Pre-Advice Notice from shipping lines.

The VBS procedure follows the below steps (79).

1. The consignee or his/her broker (user) logs on to the VBS website (https://1-stop.com.ph) using a unique and secure username and password.
2. The user selects the intended terminal where the container booking will be made.
3. Upon entering the VBS portal, the user will upload the details of container/s they are authorized to transact. The user will then select the specific booking zones when containers will be collected/delivered by their designated truck.
4. Upon completion, the confirm button is clicked to officially book the transaction. Secure electronic information will then be sent simultaneously to the terminal confirming such booking, prompting appropriate landside container planning and allocation of resources at the terminal.

5. Finally, the truck assigned by the user will arrive at the terminal on the scheduled time to pick-up or deliver container/s.

2.5.3.3 Points Payment System

The Points Payment System (PPS) is the payment system used for the VBS. Users purchase points which are then used to pay for booking appointments and the associated payment transactions in the VBS (80).

The PPS was introduced in 2016 as a matter of ease for VBS users, with points purchased in advance of making bookings. Once points are bought in advance, registered VBS users can quickly manage their booking transactions. Compared with using money, the user can easily withdraw or cancel their appointments without applying for the refund of the booking fees. Once purchased, points can only be withdrawn from PPS into the local currency if the user closes their account. This may occur if the user is no longer operating or will no longer be operating in the port.

When payments are made for bookings or penalties the points balance will decrease (or increase if using rebate slots). A carrier must have sufficient points in their account before a booking can be created, with the minimum number of points set by the terminal. An account may go into negative if penalties are applied however would need to be in credit prior to new bookings being made. There is no minimum top up amount and points can be added to an account at any time with the points in an account never expiring. Points can be purchased through a number of methods with the process shown Figure 2-42 (80) (81) (82).

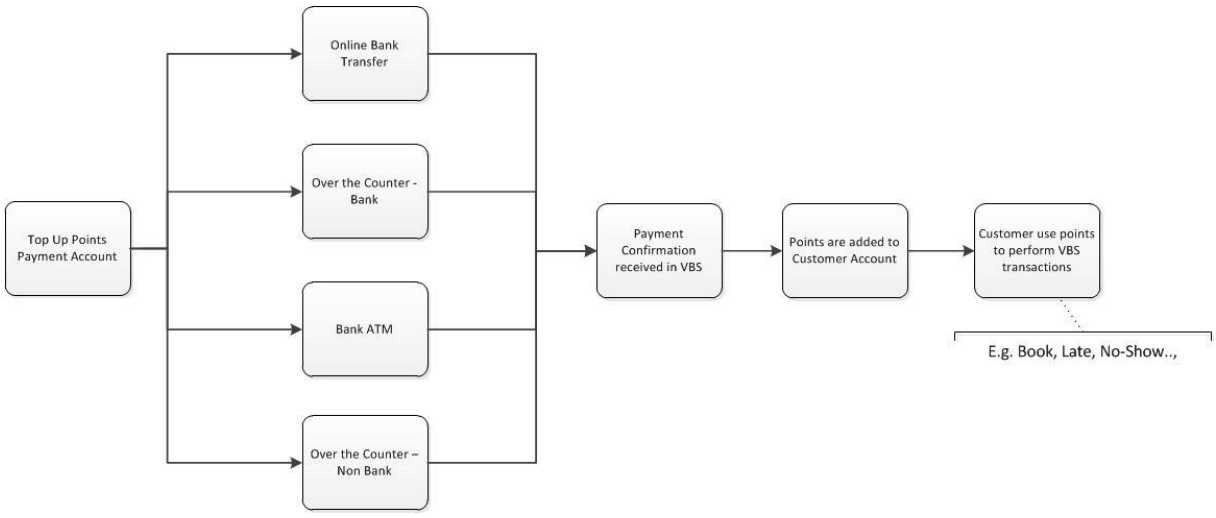


Figure 2-42 Port of Manila; 1-Stop PPS top-up process (81)

Generally, when the PPS was introduced it was received positively, with the below feedback reported by stakeholders.

- It is understood that the point system has simplified the transaction processes in the VBS by port users with points easily purchased through the various methods. The reported impacts on landside operations from the PPS are limited given its relevance only to payment methodology. The increased transparency the VBS and PPS provide to fee rates and payment transactions between port stakeholders is a reported improvement.

- The criticism reported by some users was that buying points in advance via the VBS, without getting any interest in return, provided the port with additional interest benefit that the users wouldn't receive.
- When the PPS was introduced some criticism was that users didn't have control over penalties imposed through the PPS. For example, if a truck fails to show up or arrived late after their booked appointment, the system automatically deducts the penalty for the no-show without consultation with the user.
- The terminal has the discretion to waive fees for late arrivals or no shows. It is understood that active communication between the terminal operator and the carriers when one or the other is having delays has been key to managing the landside operations efficiently.

2.5.3.4 Philippines Port Authority

The PPA is involved in the oversight of the port landside interface through the issuance of AOs. The PPA is also responsible for the issuing of business concessions or franchises. In previous years (prior to VBS) the PPA had been hands-on in attending to truck movements, and therefore congestion, through the port police. Day-to-day operations including the traffic management is now managed by the terminal operators via the VBS.

The terminal operators are expected to abide by the policies, regulations, orders, and directives issued by the PPA. The PPA provides support to terminal operators so that they can deliver their mandates. When the terminal operators and PPA decided to implement a VBS within the terminals, the PPA issued an AO to provide a regulatory mechanism to ensure the VBS would have legal authority. However, the operation of the VBS is left to the terminal operators to manage.

As part of the VBS regulation the terminal operators are required to remit to the PPA a 20% government share of the VBS gross revenue in accordance with their respective contracts (75). Since the introduction of the VBS the PPA has seen a net revenue increase of approximately 16%.

The PPA has organised a working group with representatives from terminals, carriers, customs, and other stakeholders to collaborate on solutions to resolve traffic congestion at and around the port. They work closely with the City Government of Manila to collaborate on resolving traffic congestion at the port, as this impacts the city.

2.5.3.5 Handling of Empty Containers

The port stakeholder working group raised with customs that high yard volumes were not only caused by queuing container trucks, but by empty containers remaining in the terminal for long periods. As a result, in 2019 the BOC issued a directive that addressed overstaying empty containers in the port. The directive temporarily prevented customs brokers, carriers, and importers from returning empty containers to the port unless they had a Special Permit to Load (SPTL).

- The SPTL was made available from the port BOC office.
- Empty containers with SPTL can only be moved to the port within 72 hours of scheduled loading on the vessel.
- This encouraged international cargo shipping to have their own depots outside Metro Manila to store their empty containers.

– Many international cargo shipping companies did not agree with the BOC as they thought having their own depots outside Metro Manila to store their empty containers was too costly and impractical for them.

The directive was effective as the number of empty containers at the port yards decreased. The approach cleared the yards and allowed higher usable yard volumes.

To address the handling of empty containers the terminal operator ATI formed the Empty Loadout Shipping Alliance (ELSA), a collaboration between ATI and its shipping line partners to expedite the evacuation of empty containers. ELSA allowed participating lines to share vessel resources in loading out empty containers from the terminal regardless of container ownership. This in turn fast-tracked the recirculation of empty containers to regional markets, helping to immediately ease logistics bottlenecks brought about by the build-up of empties in the local supply chain because of import peaks (74).

2.5.3.6 Cameras

The container terminals have cameras at the major roadways and gates leading in and out of the port, providing visibility to port users of the traffic at the terminals (74). Examples of the camera feeds at MICT are shown below in Figure 2-43.

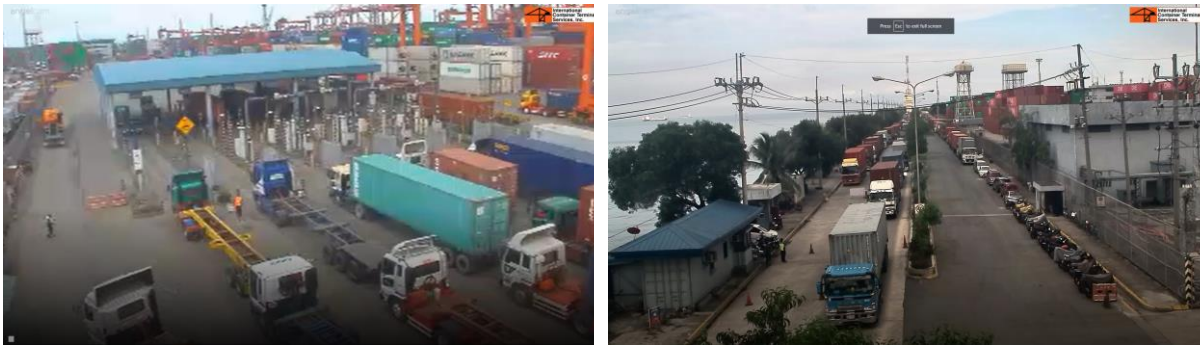


Figure 2-43 Port of Manila; MICT Cameras Friday 9am, Left – Entry gates; Right – Exit gate (83)

2.5.4 Landside Performance

Port stakeholders have not reported any performance requirements in place on the terminal operators. There is no information publicly available on the landside performance levels of the terminals and this information is not understood to be shared with the PPA.

2.5.4.1 Vehicle Booking System Impact

The performance impacts with the introduction of the VBS is publicly documented from around the time of its implementation, in addition to receiving feedback from current port stakeholders.

The VBS was introduced to allow terminal operators to properly manage the flow of trucks inside the port and reduce the impact of the port on vehicular traffic in Manila city. According to the PPA, VBS has resulted in better port productivity and efficiency. VBS impacts and feedback received is summarised below (84).

- Terminal yard utilization has improved, and container collections increased, suggesting that the VBS has positively affected port operations.
  - Combined yard volumes before and after the introduction of the VBS decreased by approximately 5% (10,000 TEU).
  - The daily cargo gate-outs had an average increase of 13% (1,000 TEU) to the normal combined cargo withdrawal of 7,000 TEUs daily.
- There has been an increased efficiency during peak periods that helped decongest the port and surrounding areas. The improvement was noted within the first few months.
- The VBS addressed issues faced by stakeholders at the port like inadequate city road network, inefficient practices, and road use regulations.
- The truck bans eased the traffic congested on the road outside the port. In the early VBS trial period some trucks struggled to access the port for their VBS appointment due to the truck ban. Observing the reduction in the traffic congestion surrounding the Port following the introduction of the VBS, the city council issued a truck ban exemption for trucks with a VBS booking.

The terminal operator ATI reported several benefits following the introduction of the VBS with it being instrumental in sustaining operational efficiency (72) (74) (79) (85) (86).

- Efficiency and operational predictability
  - Since truck arrivals are pre-advised, the terminal can now deploy resources that match demand and pre-plan containers inside the terminal before the truck reaches the port. Because of this, mobilization of terminal resources can be optimized and effectively programmed based on actual demand.
- Organized trucks on roads
  - Truck arrivals are based on booked time slots, hence the flow of trucks in and out of the port are better managed. The orderly arrival of trucks spread throughout the day avoids bottlenecks at the port's gates and eases traffic flow along major roads.
- Faster TTT
  - An increased number of truck transactions with quicker TTT resulted in processing 53% more trucks, spread throughout the 24-hour period, thus easing traffic density and avoiding unnecessary strain in terminal operations.
  - Despite higher transactions, TTT became faster. 80-90% of trucks being serviced within 1 hour of gate entry.
  - The faster TTT gives drivers more opportunities to do multiple trips per day.
- Transaction transparency
  - Shipment information can be viewed by consignees and their authorized brokers on a real-time basis online, hence enquiries on shipment status are quickly available and easily verifiable for greater transaction transparency.
  - The VBS being automated and online allows it to be free from any form of human intervention, promoting greater transparency and streamlined processes for the industry.
- Community benefits
  - Reducing the road congestion in the port vicinity benefited the surrounding communities, other road users and the environment in general.

- It allowed trucks to traverse major road networks leading in and out of Manila's port zone, even during rush hours, for those with a valid VBS booking. Traffic enforcers can monitor compliance by sending the truck's number plate to a designated mobile number to verify the VBS transaction and exemption from truck ban.

Feedback received from the transport industry at the port indicates a large improvement in wait time and efficiency collecting containers since the implementation of the VBS.

- Processing at the terminal is hassle-free and convenient. On presentation of the driver's Identification card (MICT) or QR code (ATI), the driver is directed to the exact storage area for container loading.
- Since the introduction of the VBS 2-3 containers can be collected each day depending on the congestion throughout the city. Prior to the introduction of the VBS, due to the queue at the port it would take up to a day or more to access the port for a single container.
- Journey planning with VBS now only requires consideration of the travel time from the truck depot to the port, with the primary factor being traffic in the city. On arrival, there is no congestion accessing the terminal.
- Logistics companies can plan out their trucks and drivers' schedule, maximising drivers' time and income, especially for drivers who are paid per trip they make.
- MICT reportedly has a scheme to reduce the booking fee during high demand zones if they see low usage and want to encourage bookings for those slots. This includes refunding already booked slots the fee difference.
- Criticism of the off-slot or no-show penalties are that they are very high while no incentive is provided for arriving on time. The high penalties have resulted in more value placed on journey management given the large penalty for missing the booking window.

Feedback from stakeholders indicated that early in the VBS implementation there was some criticism of the VBS. The oppositions were primarily based on the following issues:

- Difficulty for drivers in understanding the VBS. It took a while for drivers to learn the new system
- Slow internet causing difficulty in booking appointments
- High demand created difficulty booking a user's preferred zones
- Carriers inconvenienced by the increased booking administration requirements
- Cost of enrolment fees were seen as being very high
- Off-slot and no-show penalties were seen as being too high
- The fees for the booking system were seen as being high especially for big operators who had hundreds of container cargoes every week coming in and leaving the port. The terminal operators however suspended fees for the first 6 months to allow users to adjust.

2.5.4.2 Container Dwell Times

While VBS has improved congestion on routes to the port, and around the terminals, a time release study by the BOC at the Port of Manila in 2019 found that container dwell time within terminals was significant (87). The study found:

- Import Shipments

  - Red shipments - subject to strict document examination and X-ray/physical inspection had an average dwell time of 11 days, 5 hours, and 51 minutes.
  - Blue shipments - not subject to such strict procedure able to be released immediately upon payment of duties and taxes had an average dwell time of 7 days, 14 hours and 6 minutes.
- Export shipments
  - The over-all average time from submission of export declaration to issuance to load is 1 hour and 11 minutes.

The study reported that delays were not due to terminal operations but due to clearance of containers by customs. This is because of the practice of filing, submitting, and bringing of documents from one office to another by brokers; and permits from relevant government agencies are not directly transmitted to the BOC.

These practices highlighted the need to institute a paperless environment in customs, which was seen to be achieved through:

- Full computerization and automation of the systems in the port. It was noted that the physical presence of brokers was required before documents could be acted upon by concerned customs personnel.
- Stronger coordination and online linkage with other government agencies with respect to the issuance of permits, clearances, and other supporting documents, so that they may be transmitted directly online.

With movement towards computerization since 2019, the dwell time for containers due to customs clearance is understood to have decreased, assisted by using the VBS. The terminal operators are engaged with the BOC to improve services in relation to the unimpeded and online release of cargo to reduce releasing time from filing of entry and more seamless X-ray and inspection procedures (58).

3 Part Two: Study of Australian and New Zealand Container Port Landside Management Models

The focus for the study of ports within Australia and NZ is to understand how they operate their landside interface. The main topics investigated at each port were:

- Port and terminal location characteristics and operation modes
- Port cargo exchanges
- Management of the landside interface, servicing modes and methods
- Landside operational performance reporting
- The challenges that are faced and how these are addressed
- Future growth and planned development.

The information on the ports investigated was compiled based on available information and input from stakeholders listed in Table 3-1. The ports that were investigated were:

- Port of Melbourne, Victoria, Australia
- Port of Fremantle, Western Australia, Australia
- Port of Brisbane, Queensland, Australia
- Port of Lyttelton, New Zealand
- Port of Tauranga, New Zealand
- Port of Auckland, New Zealand.

Table 3-1 Part two; Stakeholders engaged for discussion

Port	Stakeholders Engaged
Port of Melbourne	Patrick Terminals, Victorian International Container Terminal, Container Transport Alliance Australia, Victorian Transport Alliance, Port of Melbourne, Freight Victoria
Port of Fremantle	Patrick Terminals, DP World, Fremantle Ports
Port of Brisbane	DP World, Hutchison Ports, Patrick Terminals, Queensland Trucking Association and its members, Port of Brisbane
Port of Lyttelton	Lyttelton Port Company
Port of Tauranga	Port of Tauranga
Port of Auckland	Stakeholders were unavailable for participation

The location of the ports investigated are shown on the map in Figure 3-1.

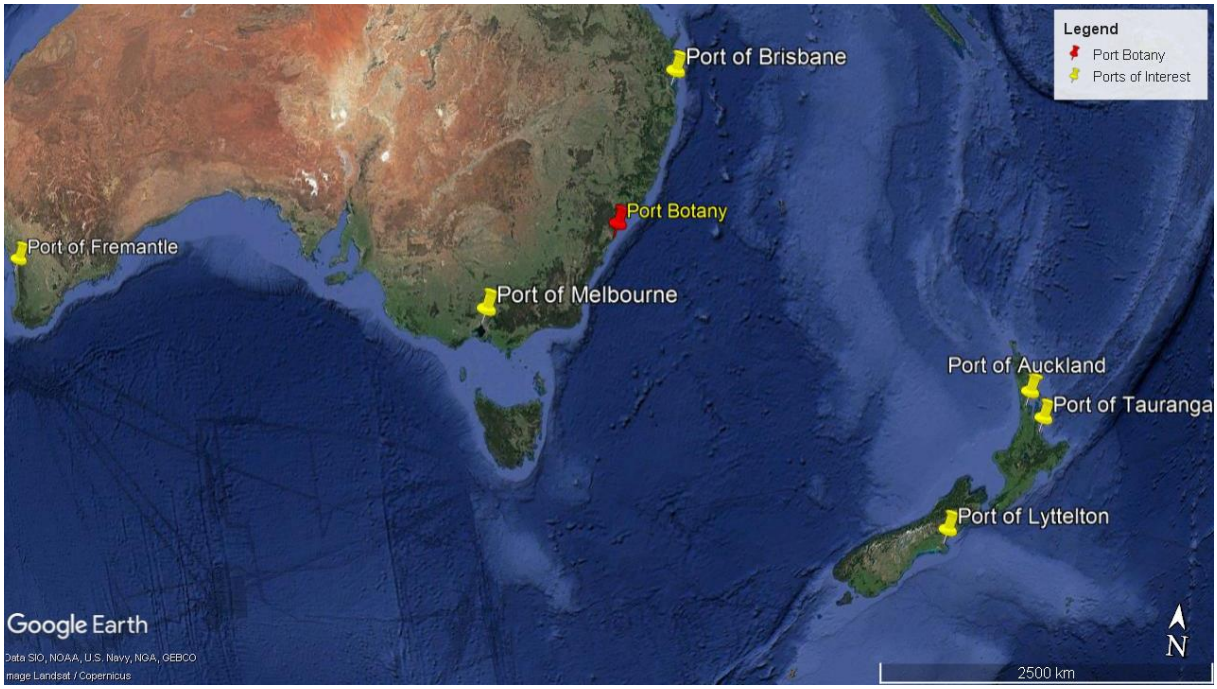


Figure 3-1 Part two; Location of Australia and NZ ports of interest (88)

Landside operations at a container terminal are based on interactions between the terminal operator and the carriers. This relationship at each terminal is managed by the terminal operator through a Carrier Access Agreement with the carriers. The carriers must agree to abide by the terms of the agreement to enter the terminal. The agreement covers the terms and conditions of the VBS, safety and security terms, and other general conditions. These agreements are between the terminal operator and the carriers and are not subject to special regulation by others.

In December 2021, the Infrastructure and Transport Ministers endorsed National Voluntary Guidelines for stevedores applying infrastructure and access charges at Australia's container ports. The National Transport Commission developed the guidelines to provide greater certainty and transparency for both stevedores and landside transport operators. The guidelines set out processes for the introduction of any new stevedore landside charges, including notification periods, and require an explanation of price increases at NSW Ports. The stevedoring companies – Patrick terminals (Patrick), DPW, Hutchison Ports (Hutchison) and Victoria International Container terminal (VICT) – have all agreed in principle to follow the guidelines subject to clarification on how the participating jurisdictions will implement and administer them.

3.1 Port of Melbourne, Victoria, Australia

3.1.1 Port Description

Table 3-2 Port of Melbourne; Summary table (2020)

Measure	Port Botany	Port of Melbourne
Volume of TEU	2.7 Million TEU	3 Million TEU
Number of Container Terminals	3	3
Empty Containers Import/Export	0.9% / 63%	9% / 39%
Transhipments	5%	4%
Road /Rail	85% / 15%	92% / 8%

The Port of Melbourne is operated by Port of Melbourne Operations Pty Ltd (PoM) a private entity with a 50-year lease of the port. Within the port all cargo types are handled including containerized cargo, dry/liquid bulk, and breakbulk. The terminals are leased to terminal operators to undertake cargo operations (89).

The Port of Melbourne has 3 container terminals at Swanson and Webb Docks, operated by DPW, Patrick, and VICT. A map of the port location with reference to local residential and commercial zones is provided in Figure 3-2.

Swanson Dock and Webb Dock are in different parts of the Yarra River. Swanson Dock is located upstream past the West Gate Bridge while Webb Dock is located at the mouth of the river.

DPW and Patrick are on Swanson Dock West and East respectively, each with 3 berths of approximately 900 m total and 40 ha of terminal area. Both use manually operated equipment, using straddle carriers within the terminal for all container movements including to load/unload trucks, within the yard, and delivering to the ship-to-shore quay cranes for vessel loading.

VICT is located on Webb Dock East with 2 berths of 660 m total and 35 ha of terminal area. VICT operates fully autonomous equipment except for the vessel loading which is controlled remotely. Automatic Stacking Cranes (ASC) are used for container movements between the landside interface and the container yard. For container movements between the yard and the wharfside, VICT operates Automatic Container Carriers (ACC).

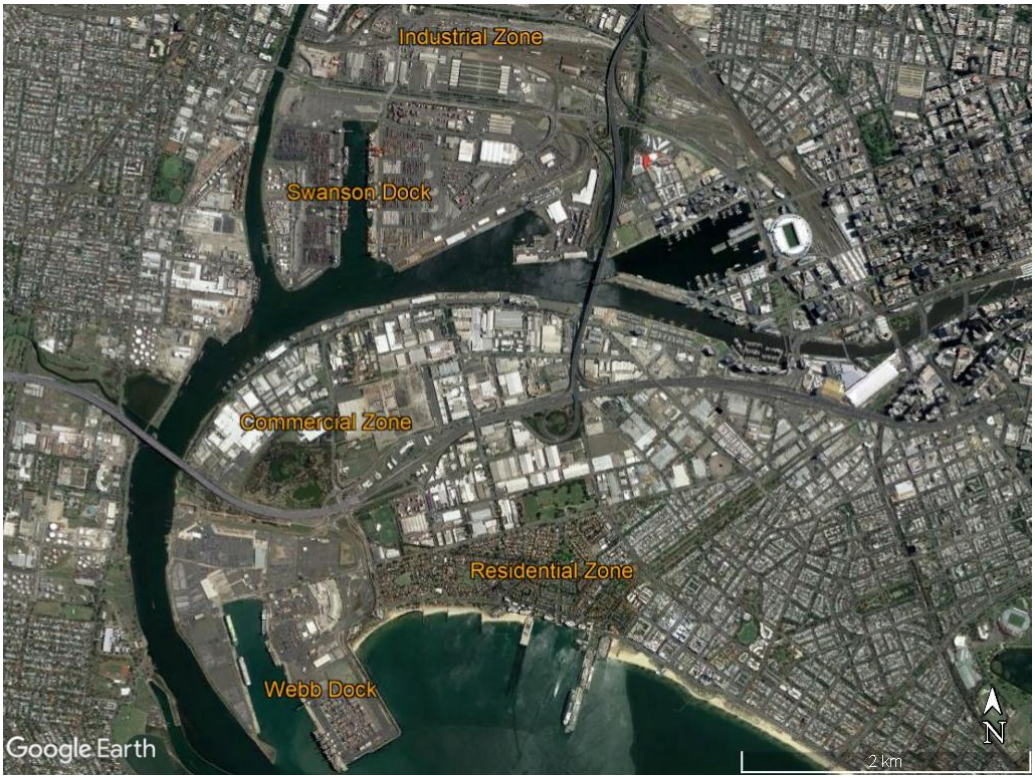


Figure 3-2 PoM; Location of terminals and proximity to local zones (90)

The Bureau of Infrastructure and Transport Research Economics (BITRE) publishes the Waterline statistical report providing information on container movements, and trends in productivity on both the wharfside and the landside. General exchange and performance data for container cargos is provided to BITRE.

The data for the whole of the port shows a steady increase in the container exchange over the last decade with 3 million TEUs exchanged in 2020. The mix of imports to exports over the last 10 years has remained approximately equal at 50% each, with the largest change being an increase in the export of empty containers. See Table 3-3 for comparison on values between 2010 and 2020 and Figure 3-3 for a graph of the trend over time.

Table 3-3 PoM; Container cargo mix and exchange in 2010 and 2020 (91)

Trade	Cargo type	2010	2020
Import	Full	45.5%	46.6%
	Empty	4.5%	4.4%
Export	Full	33.8%	30%
	Empty	16.2%	19%
Total Exchange (TEU)		2,351,000	2,999,000

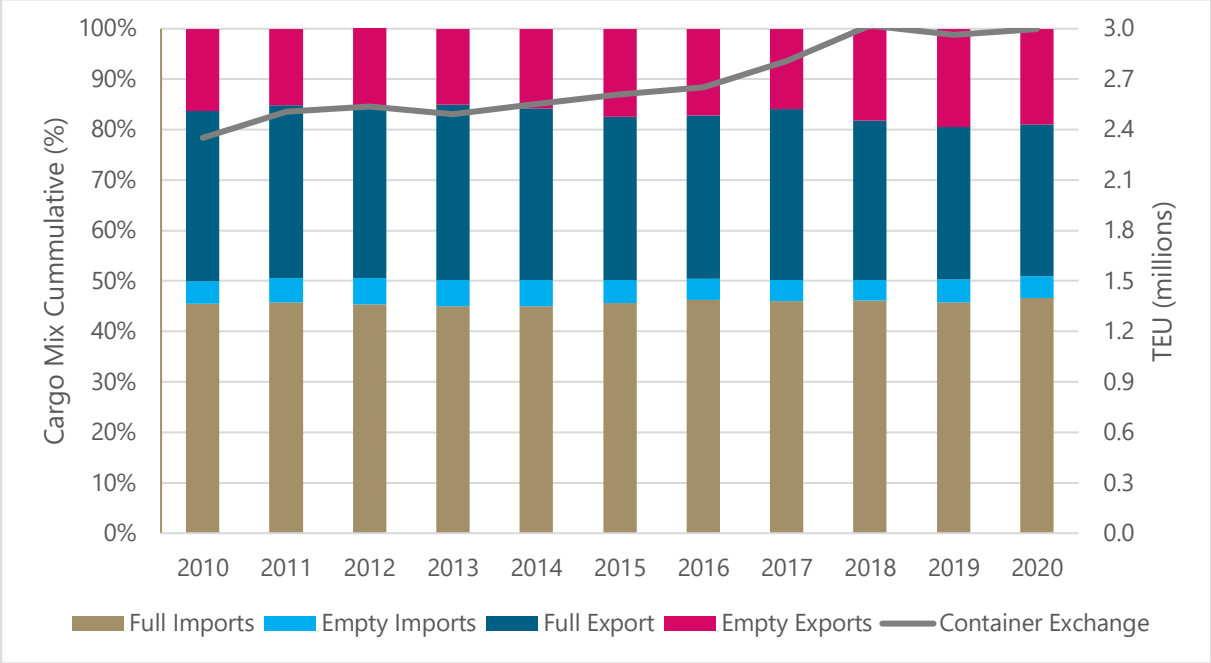


Figure 3-3 PoM; Container cargo mix and exchange between 2010 and 2020, percentages excluding transhipments (91)

The origin and destination of full containers that transit the Port of Melbourne is predominantly within metropolitan Melbourne (Figure 3-4).

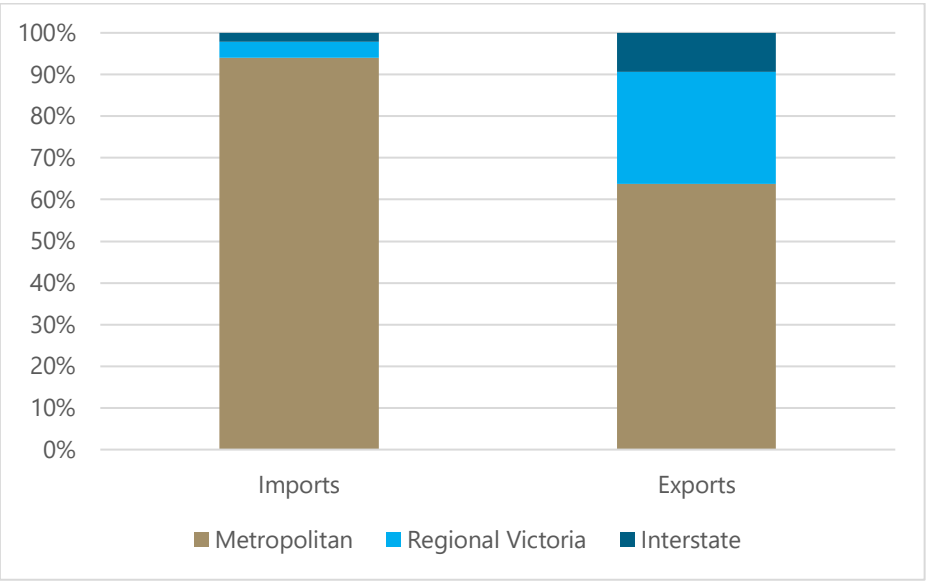


Figure 3-4 PoM; Container mix by origin and destination; excluding Tasmania cargo (92)

Container movement within metropolitan Melbourne is handled predominantly by road transport with on-dock rail only at DPW in Swanson Dock. Generally, 17% of full export TEUs were moved by rail and <1% of full imports. The absolute volume of containers transported by rail over the decade from 2009 remained relatively unchanged.

Figure 3-5 shows the trend of road/rail split at the port.

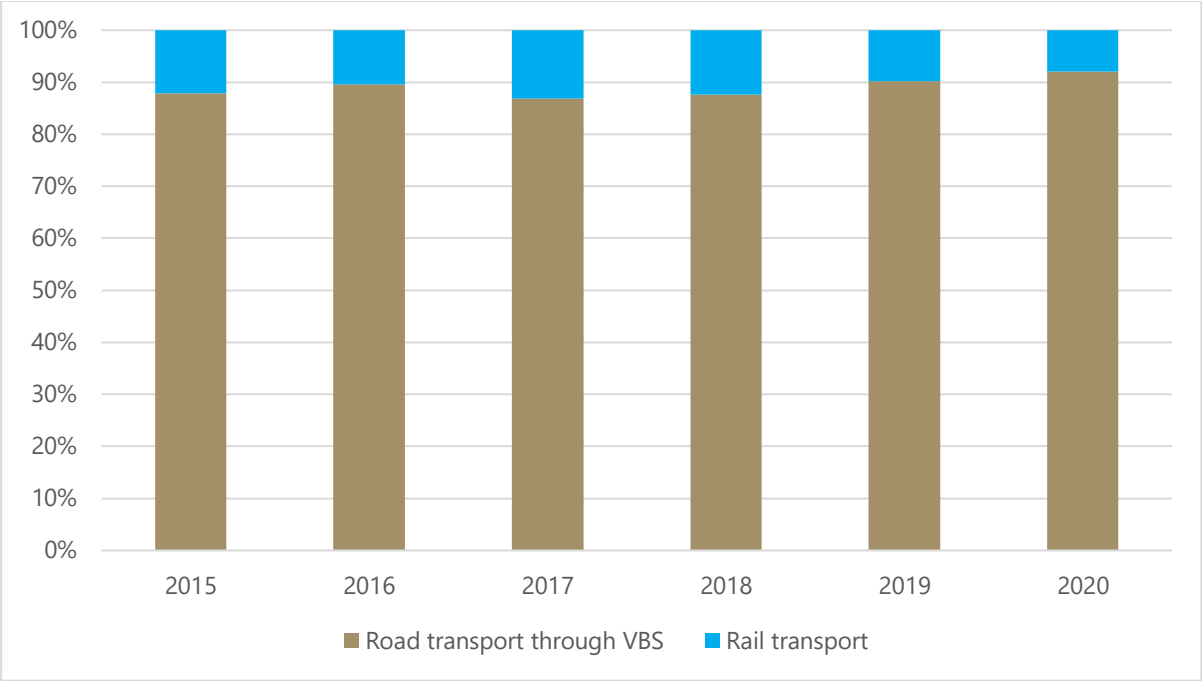


Figure 3-5 PoM; Container cargo transported by road (through VBS) and rail transport (91)

3.1.2 Landside Servicing Mode

3.1.2.1 Road Transport

DPW and Patrick are accessed through their respective terminal gates on Coode Road and Anderson Road, both accessed from Appleton Dock Road. VICT is accessed from Webb Dock Drive. All the terminals are located with on/off ramps to the highway system nearby their access roads. The highway system then provides access for trucks to travel in any direction away from the port and out of the city without travelling on local roads. Lorimer Street also serves as a key connection between the terminals and nearby destinations (Figure 3-6).

Figure 3-6 PoM; Container terminal locations and road transport access (93)

As noted in Section 3.1.1, the main mode of transport for container movement at the port is by road transport.

To assist with landside performance PoM encourages more efficient operations, such as dual runs (delivering and collecting containers to the terminal on the same truck visit), however it is left with the terminals to implement systems to accommodate this. PoM has provided approvals to encourage a productive supply chain with B Triple trucks approved and other High Productivity Freight Vehicle (HPFV) configurations for transit through the port either approved or soon to be. These changes have increased the use of trucks that can carry up to 4 TEU. The number of trucks with varying capacities is split from 1 TEU through to 4 with most trucks able to carry 2 TEU (Figure 3-7).

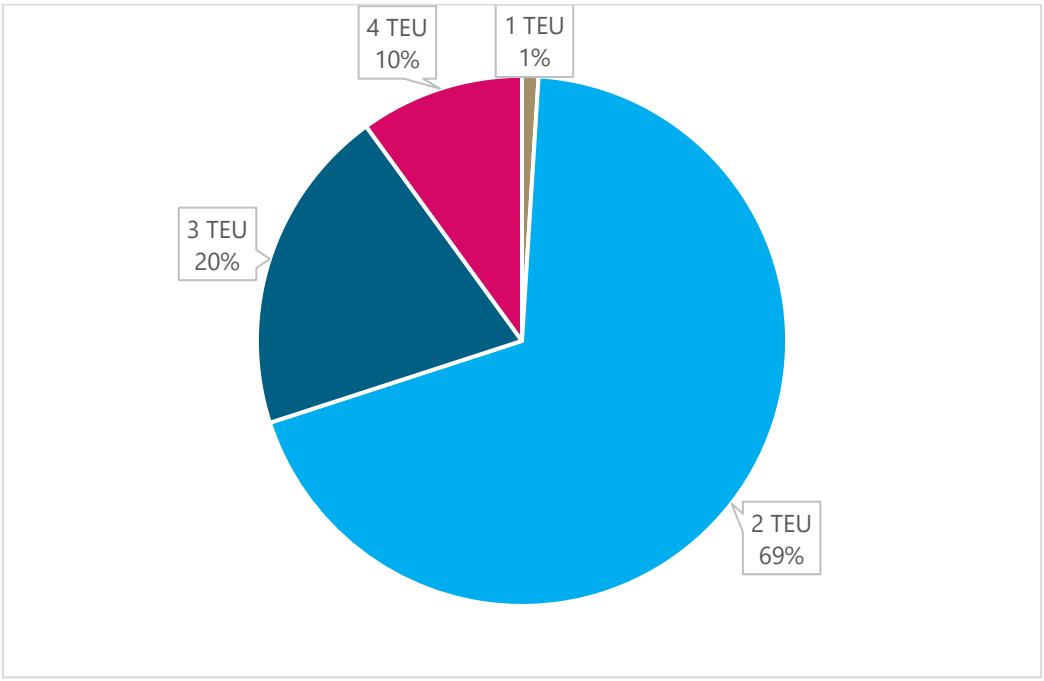


Figure 3-7 PoM; Container road transport vehicle TEU capacity (93)

3.1.2.2 Rail Transport

There are 3 near-dock rail terminals which operate in the PoM. However, only Swanson Dock West (DPW) has the rail siding within its terminal. Webb Dock is not currently serviced by rail. There is, however, an unused rail corridor between Webb Dock and the Bolte Bridge which is proposed to be used for the future Webb Dock Freight Link.

The port is connected to both Victorian and interstate rail networks. South-east bound freight trains must navigate the busy corridor through Southern Cross and Flinders Street stations, and travel south-east on passenger rail lines. This arrangement presents significant capacity restraints.

The current role of the port rail system is limited to medium and long-haul container transportation. From 2015 rail share reduced from 12% to 8% reflecting the slower growth of containers in regional Victoria compared with metropolitan Melbourne. Rail services and network developments have been limited during the last decade with the road network having the capacity to service terminal capacity. With increased volumes expected over time new investments including the PoM Rail Transformation Project and the Department of Transport Port Rail Shuttle Project are planned to increase rail mode share (92). Plans include the development of on-port rail infrastructure with the PoM having purchased existing rail terminals in port, such as ACFS, to enable expansion, and the Victoria state government developing the inland intermodal terminal Western Interstate Freight Terminal.

There are currently no incentives offered by PoM to increase the rail share of containerised freight. However, they are trying to reduce cost to transport containers via train by providing efficient infrastructure to facilitate this change.

3.1.3 Landside Management

3.1.3.1 Vehicle Booking System

A third-party VBS called 1-Stop is in use by all PoM terminal operators to issue booking slots to carriers (a slot is a specific container booking within a zone, with each day split into 24 x 1-hour zones). Trucks must arrive within the zone at the terminal entry gate with a typically tolerance of 15-30 minutes before and after the booked time zone. Trucks allowed to enter after the zone has ended are required to pay an off-slot fee, at VICT the truck can arrive up to 3 hours following the end of the zone. If a carrier fails to attend a zone that has been booked, they will be charged a no-show fee (94) (95) (96).

Other fees are also applied and have a few purposes such as covering the cost of infrastructure and equipment, and to influence the behaviour of the carriers to maintain port efficiency. The types of fees that can apply to influence behaviour are listed below and can be known by various names at different terminals.

Table 3-4 PoM; Landside container handling fees (97) (98) (99)

Fee (AUD)	DPW	Patrick	VICT
Slot Fee	$31	$35.40	$30.75
No-show Fee	$222.40	$221.50	$205.00
Off-slot Fee	$79.90	$85.00	$79.50
List Fee	-	-	$79.50
Premium Slot Fee	-	-	$117.00

The below figure illustrates some of the penalties that may be applied for slot bookings. It should be noted that terminals have discretion in how fees are applied. A slot fee is the standard booking fee (100).

- Arriving outside the booked zone may result in an additional off-slot fee
- Failing to arrive or arriving outside the allowed off-slot period for a booked slot will incur an additional No-show fee
- Releasing a booked slot prior to the zone may still incur the Slot fee if not re-booked by another carrier
- Releasing a slot close to the booked zone will incur an additional List fee
- At VICT the premium slot fee was introduced to discourage carriers from requesting slots beyond allocated, as may occur especially around Export Cut-off and Import Last Free days.

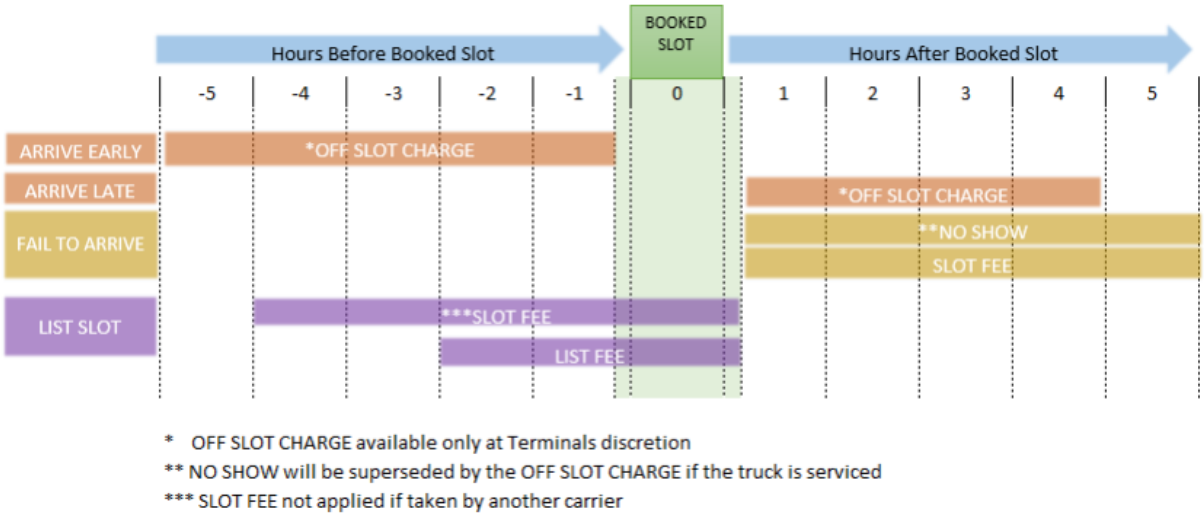


Figure 3-8 PoM; VICT VBS example of booking windows and applicable fees (99)

VBS was first introduced in the '90s when landside operations were a first-in-first-served arrangement. Trucks would commonly be queued up at the terminal overnight with no driver, to be ready for operations in the morning. With the introduction of VBS it was agreed that there would be a small penalty if late for a zone. Since the original introduction penalties have increased significantly. In discussions with industry some feedback provided included:

- There is a minimal operational increase in performance attached to some penalties and fees
- The penalties do not match the offence
- The penalties are too high
- The penalties are increasing significantly over time with no signs of terminal improvement
- It is likely that if the system were to be introduced now, the terminal operator would also be subject to penalties
- The fees from the terminal are passed from the carrier to the customer, however given there are 3 terminals with different fee update schedules this requires transport operators to be regularly updating pricing to their clients. The different schedules make it difficult to add price increases for carriers' own cost increases.

Terminal operators make bookings available typically 2 days prior to the relevant zone with VICT differentiating import slots by releasing the bookings 3 days prior but limiting ability to book until a container has been discharged. Terminals are able to exercise discretion over the number of slots allocated to each carrier per zone. There is a preference by carriers for some zones over others. The preferred zones are normally between 6am to 9am on a weekday followed by weekday evenings and then weekends. These preferences can be driven by staff preferring to work more during regular hours and companies preferring to keep work within normal pay hours.

The number of slots issued and utilisation of those slots both since 2010 and for the different shifts are shown in Figure 3-9 and Figure 3-10.

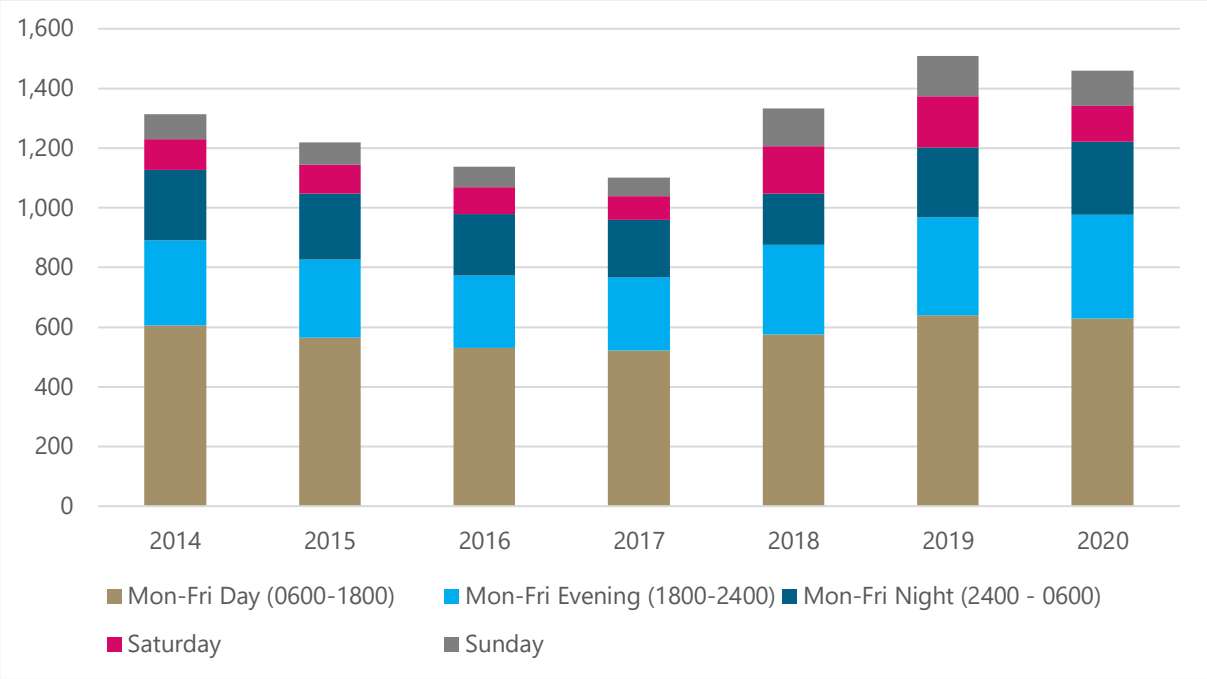


Figure 3-9 PoM; Available VBS slots by peak and off-peak periods between 2014 and 2020 (91)

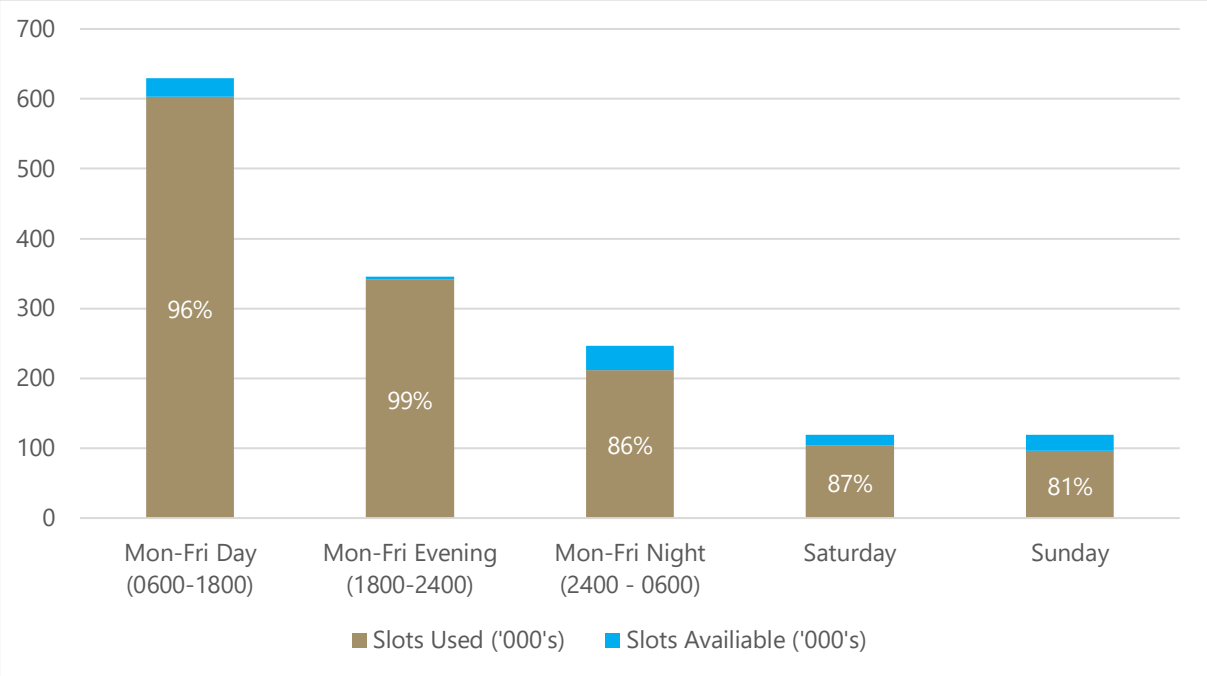


Figure 3-10 PoM; Available and used VBS slots by peak and off-peak periods in 2020 (91)

VICT have been using the Advanced Booking system (Section Appendix A) since they began operations and see it as a necessary system for their ASC operations.

Every 30 minutes VICT submits the estimated time of discharge for containers to the VBS indicating to carriers when the containers within their import list will likely be able to book the container to a slot.

VICT can see the list of upcoming import and export containers registered by the carrier. The carrier may also notify VICT to group specific containers. VICT are then able to group containers together in the same modules for the carrier to collect at the same time. VICT reported that this functionality is not commonly used by carriers with the priority to be slots rather than specific containers, with slots in high demand especially in peak times.

Availability of slots can mean that once the container is available in the yard for booking, the carrier may have to wait a day or 2 especially if they require a slot during peak periods as containers released earlier (e.g. 1 or 2 days before) are likely to have been booked in for slots already.

3.1.3.2 Automation

Automation of terminal equipment also impacts on the landside interface operations. Both terminals at Swanson Dock are manually operated compared to VICT at Webb Dock which has a fully automated yard operation. At ASC automated terminals separate wharfside and landside equipment is used, so that the servicing of a vessel does not detract from landside operations. A key benefit to ASC automation is that you get a predictable level of performance, however there is also no ability to increase landside resources if there was/is an issue in another part of the system causing delays. Straddle operations can adjust by shifting drivers and equipment and/or negotiating discretionary effort from the workforce.

Trucks can pickup and drop-off multiple containers to VICT at the same time however, if the containers are in different modules, the driver will be required to reposition for each different module. This contrasts to a straddle terminal where the straddle can retrieve containers from different locations and load to a truck waiting in a single loading bay.

3.1.3.3 Port of Melbourne (the Port)

PoM typically has a hands off approach with the international container terminals, unless there is a broader issue impacting multiple users.

There are limited systems in place to monitor queuing at the container terminals. The PoM rely on a camera network, and for port security to report back any issues. They also receive feedback from other port users if there are queues impacting other operations. To address possible congestion, terminal operators have clauses in their lease to manage their traffic and not cause hazards on the port roads.

When there are redevelopment works proposed by the terminal operators, they must show that the development will not impact existing operations and road flows and allow for sufficient overflow capacity inside their terminal via modelling/simulations.

As an example, DPW were looking to integrate 2 sites by closing Coode Road. DPW had to undertake numerical modelling to demonstrate that this development would not impact other users.

Previously, PoM have held forums with terminal operators, and carriers, focusing on what is happening in the port and what changes are required such as expanding and refining existing operations, but this is not a regular occurrence.

3.1.3.4 Terminal Management

The main constraint around bookings is the number of available slots per zone, with one slot required per container. The number of slots per hour reflects the terminal's capacity; determined by how many drivers and machines they can commit to the road operation.

DPW and Patrick use the expected exchange per vessel and the volume of VBS bookings to determine how many machines to dedicate to the landside.

At VICT the number of modules and cranes is fixed at 10 each (one crane/module) with an average moves per hour of 10. The terminal could therefore allow for approximately 100 slots per zone. However, the number of slots is also affected by stack-runs, planned maintenance and stack height.

When trucks arrive at VICT, they first pass a gate equipped with OCR which recognizes the vehicle information. They then proceed to the second gate kiosk. If they are not within their booking zone (including off-slot allowance) it will be directed out of the terminal. If they are within their zone but the stack is unavailable due to other trucks being loaded/unloaded, it will be directed to a waiting area until it can be serviced.

An option VICT provides when booking for multiple import and export containers, is to book these across consecutive zones. For example, a truck wanting to drop off 2 containers and pick up 2 may struggle to book 4 slots in the 1 zone, therefore they can book slots across 2 consecutive zones. These slots can then all be serviced in the first zone. This option allows trucks to complete dual runs without being restricted by the number of slots.

3.1.3.5 Handling of Empty Containers

The port generally operates 24/7 and encourages carriers to also, leading to the staging of containers (holding containers at an intermediate location between origin and destination) at the carrier's depot. Most empty containers need to be staged at the carrier's depot as the ECPs do not operate 24/7. There are over 10 ECPs with the majority operated by shipping lines who want their empty containers delivered to their park. Victorian Transport Association (VTA) claim this process of staging contributes to a downturn in productivity and an increase in cost (101).

The delivery of empty containers to the terminal are typically by stack runs (pre-arranged movement of a large volume of containers, with little consideration of the specific containers, into or out of a terminal by a single carrier, within a short period of time) but can also be through direct return empties (DRE). With DREs shipping lines have an allowed allocation within the terminal, returned through booking a slot in the VBS. In a stack run a large volume of containers are shifted from an ECP or depot to the terminal.

Terminals can manage stack runs in different ways. As an example, VICT will provide the carrier with an allowed delivery rate of up to 20 slots per hour and a maximum number of containers. The delivery rate limit is required so that the stack run does not impact normally allocated slots. The maximum preferred dwell time for empty containers within the terminal before being loaded on to a vessel is 2.5 days.

There can sometimes only be a few hours' notice (approx. 6 hours) given to a carrier of the requirement for a stack run. This can strain the carrier's resources due to the short notice, high intensity, and limited time for completion. This disrupts the supply chain as limited longer-term

planning for these can be undertaken, as it may lead to under-utilised carrier resources if the timing was not as planned for.

3.1.4 Landside Performance

3.1.4.1 Performance Targets

Terminal operators do not have any active penalties for non-performance. The PoM has not set any performance requirements, as PoM acts primarily as a landlord. Advisian is not aware of any performance reporting requirements to the PoM. For commercial reasons terminal operators have internal Key Performance Indicators (KPIs) for landside performance.

The key metric measured and targeted is TTT. This measures the time elapsed from entering the terminal gate to the time when the last container is loaded/removed. It does not include the time waiting outside the gate or the time to exit the terminal. During normal operations measuring from the gate should be consistent as correct resources should be assigned to the number of slots issued. The main issues raised with TTT are:

- On busy days, during peak periods, or when there is disruption inside the terminals, queuing can result for a significant amount of time before they reach the gate, which is time not captured in the TTT. At an extreme, queueing at the gate for a booked zone may result in entering the gate after the zone has ended, possibly resulting in an off-slot fee. Terminals can use discretion to waive fees depending on the situation however, feedback from industry is that if there is a queue resulting in the truck arriving after the booking window, the truck will be fined for being late even if terminal has caused the delay.
- It does not measure the impact of multiple containers being dropped off and/or picked up, which while overall is more efficient, will increase the TTT. It has been suggested that Container Turn Time (CTT), which considers the time to exchange each container, can be a better indication of performance. Freight Victoria recommends reviewing TTT in conjunction with the average TEU per truck movement (102).

Other metrics for measuring performance are also important in assessing efficiency. Having a low TTT is positive, however the total number of slots made available, and slot uptake (what % of available slots are used) provides context for these performances. Depending on the situation carriers may be more interested in slots being available rather than just a low TTT, especially on the last free day (last day before storage fee apply) or close to vessel cut-off (deadline for all containers to be in the terminal ready for vessel loading).

Figure 3-11 shows the level of landside service since 2010, providing TTT and CTT compared to TEU density per truck.

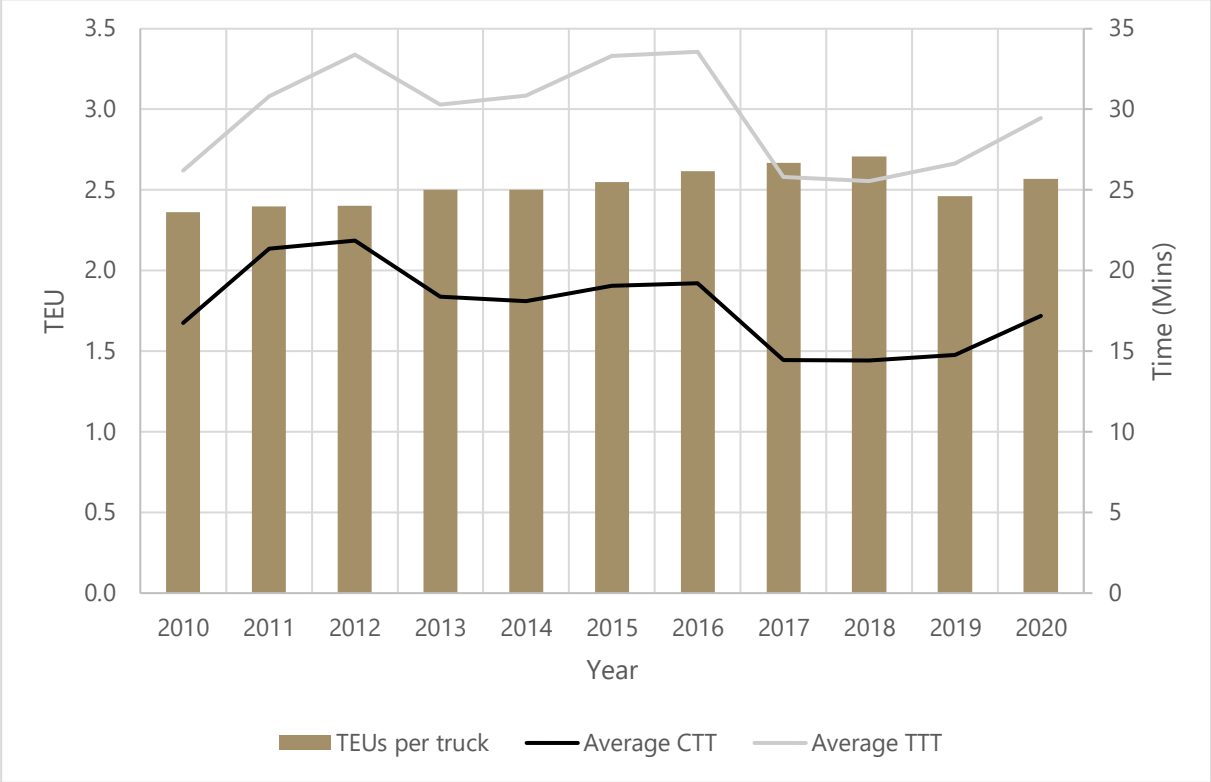


Figure 3-11 PoM; VBS road transport landside performance (91)

3.1.4.2 Industry Frameworks

Freight Victoria

Freight Victoria, part of the Victoria State Government's Department of Transport (DoT), has the role of understanding what is occurring in the industry and identifying and resolving issues that may exist. They have not identified any issues that currently require regulation to resolve and recognise that when regulation is introduced there is an associated cost that must be outweighed by the benefits.

In response to industry feedback Freight Victoria undertook a complete review of pricing and access at the port as prices were increasing frequently. They found a need to increase transparency at the port regarding pricing and more information around the performance of container terminals to allow for future decision making. The Voluntary Performance Port Model (VPPM) was created comprised of the Voluntary Pricing protocol (VPP) and the Voluntary Performance Monitoring framework (VPMF).

Voluntary Pricing Protocol

The VPP has established protocols around landside charges including notification periods, fee explanations, and timing for changes. The protocol requires that detailed reasons are provided for the fee change, and feedback themes are published. This provides a public justification for changes in landside charges. They have seen fewer complaints from industry since the pricing protocol was

introduced as it has provided carriers with adequate time to respond to the charges and pass them on to customers. The specific guidelines introduced were (103):

- Terminal operators must notify the Executive Director, Freight Victoria of the proposed pricing change 60 calendar days prior to the proposed implementation date. The 60-day notice must be accompanied by:
  - Detailed reasons for the increase or introduction of the pricing change, including all relevant supporting information or data, and
  - A link to the public notice on the terminal operator's website which includes:
    - Publicly available rationale for the price change
    - The due date for industry feedback; and
    - Terminal Operator contact information.
- When the DoT receives a 60-day notice from the terminal operators, the DoT will email its VPPM industry stakeholder list within 1 day to advise of the proposed pricing change. This email will include the link to the terminal operator's 60-day notice, the proposed date of change, closing date for industry feedback and the due date of the 30-day final notice.
- Both government and industry have 21 calendar days from the 60-day notice period to provide formal, written feedback direct to the terminal operator on the proposed pricing change.
- The terminal operator must issue a final notice of the pricing change to the Executive Director, Freight Victoria, which provides a link to the final notice on its website 30 calendar days prior to the proposed implementation date of the pricing change. When the DoT receives the final, 30-day notice from a terminal operator, the DoT will email its VPPM industry stakeholder list within 1 calendar day to advise of the proposed pricing change. The final 30-day notice on its website must include:
  - A summary of engagement themes received in writing from industry and government, and
  - Any response from the terminal operator.

Voluntary Performance Monitoring Framework

The VPMF provides visibility to industry on the performance of the port landside operations. This system does not regulate terminal performance it only provides visibility of performance metrics aligned to the BITRE Waterline report on container handling. The data is provided on monthly basis at a terminal level rather than at the port level quarterly or 6 monthly of BITRE Waterline reports. The reports are released quarterly on the VPMF website (104). See Figure 3-12 for an example of the dashboard.

The terminal operators were onboard with providing the data if it was aligned to the Waterline reports, with the voluntary approach to data provision helping to build relationships with the terminal operators without the pressure of a regulated system. Freight Victoria has not found any issues with the quality of the data reported as terminal operators are given the opportunity to explain any performance variations that may impact on the metrics.

The performance metrics covered are (102):

- Total TEUs transported by trucks

- Road productivity
  - Average TEU per vehicle movement
  - Proportion of vehicles backloaded
- Road service efficiency (TTT)
- Terminal operator performance
  - Number of VBS slots available
  - Proportion of VBS slots used
- Carrier performance (proportion of VBS no shows).

In the future Freight Victoria is investigating the inclusion of ECPs in the performance model with data provided for greater transparency.

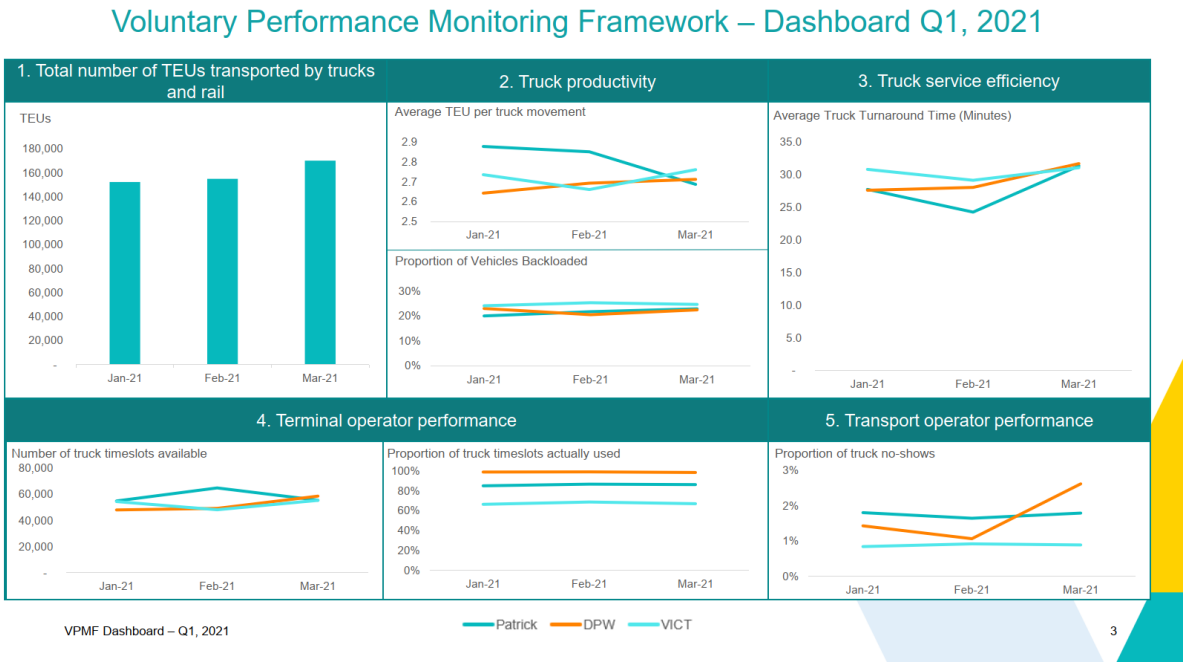


Figure 3-12 PoM; VPMF Dashboard Q1, 2021 (102)

3.1.4.3 Challenges

Terminal Operators

The terminal operators have the responsibility of assigning available resources across; wharfside, landside, and ancillary operations (yard moves, quarantine/Customs move). Some challenges that impact on landside performance include:

- High volumes of containers in the yard can occur due to changes to vessel schedule, vessel bunching (multiple vessels arriving together) and seasonal peaks. Subsequently containers cannot be separated into stacks efficiently to allow for imports and exports, weight, destination, and

shipping line. Additional moves are then required to access containers and more equipment or time is required to service the same stacks.

- Specific events can cause issues with terminal performance including low vessel performance (e.g. difficult access to container locks, inefficient container positioning), weather events, industrial activity, machinery/IT outages, labour shortages, and delays waiting for quarantined containers.
- Capacity of the broader supply chain. For example, limited capacity at ECPs, resulting in delays in stack runs arriving at the terminal, resulting in assigned resources not being fully utilized and additional resources then required on a subsequent shift.
- There is strong preference from carriers to work during specific hours resulting in high demand for slots at the terminal during peak periods and low demand in weekends and evenings.
- Trucks often arrive at the beginning of a booked zone leading to a peak in demand in the first 20 minutes.
- Increasing the amount of equipment to cater for peak period demands leads to under-utilisation in off-peak periods.
- Stacks are accessed for both landside and wharfside operations, and so equipment for both sides may be operating in the same area. A busy wharfside day will therefore impact on landside operations, even where there is dedicated equipment (e.g. VICT) or shared equipment, as terminal equipment must queue for access to a particular stack. Priority will normally be given to wharfside operations as this is the commercial priority for the terminal operator.
- When stack heights are high it is more likely additional moves will be required to access booked containers. These additional moves reduce the capacity to service the zone and therefore to proactively prevent queuing the terminal may issue fewer slots.
- Alternatively, to alleviate yard volumes and not unnecessarily penalize carriers with storage fees, the terminal may over allocate a zone. In this case TTT would be higher but with the priority being to issue slots and move containers.

Carriers

In transiting between destinations to meet booking times, carriers need to account for loading and waiting times, and unforeseen events.

- The lack of an outside marshalling area can result in congestion at the terminal gate. There are no waiting areas for an upcoming zone at the Swanson Dock terminals. VICT has capacity within the Webb Dock terminal for trucks to wait if they are within their zone if the relevant equipment is busy. There is some capacity on the roads leading to and inside the port for short term parking with minimal impact to operations. However, there is generally no parking for trucks allowed in Melbourne streets. A truck may resort to waiting at the gate for the upcoming booked zone which will essentially close the gate for anyone else, resulting in congestion.
- Due to no queue measurement and the nature of the TTT metric, queues and time spent waiting is not captured. Some carriers may use GPS to measure the time they are queued prior to entering the terminal. However, if a truck arrives at the terminal prior to the booked zone, they may wait outside the terminal. In this case the GPS would indicate this as queued time rather than time parked waiting for a booked zone.

- The capacity and restrictions on the road network outside of the terminal (e.g. roadworks, truck curfews, truck weight/length restrictions) may impact on a trucks transit to the terminal, resulting in delays arriving at the terminal which may lead to off-slot fees if significantly delayed.
- HPFV normally include two 40ft trailers and can carry TEUs. Currently HPFVs are not allowed access to the port via the West Gate Bridge and the Bolte Bridge due to weight (68.5 T) and class (HPFV) restrictions. They must, therefore, transit the non-freeway roads, increasing the number of trucks in local road networks, identified in orange in Figure 3-6.

3.1.4.4 Responding to Challenges

Swanson Dock

For Swanson Dock terminals the terminal operations teams can adjust resources as required to maintain landside service levels. When there is a pause in vessel operations (e.g. vessel departing or arriving) straddles can be re-assigned to servicing the landside.

Landside performance is continually monitored by the Shift Operations team. There are dedicated personnel on the ground (Road Foreman), as well as in the Equipment Controller office. Each part of the process is electronically & visually monitored; straddle performance can be monitored individually, with the number of incomplete timeslots in the terminal updated, and the number of trucks in the yard electronically & visually (cameras) tracked.

Based on the current activities in the terminal the Shift Supervisor and Operations manager can then reassign resources from wharfside to landside if required, and vice-versa. Other actions that can be taken to respond to or prevent congestion are to adjust the resource distribution, stack runs, and number of booking zones if not working 24 hours.

It has been found that the key to actively managing landside performance is to communicate with carriers when there will be impacts, as they may be able to adjust bookings or encourage less export and more import container bookings.

Webb Dock

VICT have recently implemented an additional yard maintenance step. Previously imports landed in the yard would maintain their position until they were booked for pick up and loaded to the carrier. Now when the cranes are not performing wharf or landside activities, they undertake warehousing which moves containers within stacks to be ready for pick up. This optimises the location of import containers based on upcoming carrier bookings.

Equipment outages or other issues can result in one or more modules being unavailable or having slow servicing. This can lead to a backlog of bookings waiting to be completed. If the outage persists the terminal may cancel the affected bookings, and if required cancel bookings in a subsequent zone. This allows the backlog to clear and no queueing to impact on the road network.

The first 20 minutes of a zone is often the busiest as trucks arrive ready for the start of the zone. VICT investigated allowing trucks to arrive earlier than their booked zone for a fee. While most drivers may prefer early arrival for paying a fee, this is not always the preference of the carrier and therefore the system has not been implemented.

VICT asked industry if a differential pricing model, where weekend slots would be offered at a discount, would be an incentive to encourage booking off-peak times. The feedback received was that it was unlikely the discount offered would be a high enough incentive.

3.1.5 Future Development

3.1.5.1 Forecasted Growth

The PoM forecasts total container trade volumes will grow over the long term by 3.5% per annum, from 3 million TEU in 2019 to around 8.9 million TEU by 2050 (Figure 3-13). These are unconstrained forecasts that assumes availability of port and surrounding infrastructure.

Metropolitan Melbourne heavy commercial vehicle and total network traffic are expected to grow proportionally with trade growth. The port truck fleet is expected to move towards larger vehicles, supporting increased road freight efficiency and productivity.

The total weekday daily port road movements at Swanson Dock are forecast to grow from 8,500 to 10,500 over the next 30 years. This assumes delivery of the West Gate Tunnel Project, expected road productivity improvements, peak spreading and improvements in port rail capacity. It is expected that with the improvements there is sufficient road network capacity servicing to Swanson Dock to handle this growth.

At Webb Dock the weekday daily road movements are forecast to grow from 2,400 to 9,300 in 2050. The road network is expected to be sufficient for the forecast growth in container exchange due to the following proposed improvements:

- Landside transport operational improvements are achieved (rail mode share, fleet mix, productivity and weekend spread changes)
- Webb Dock Freight Link is delivered
- Localised road network improvements are delivered.

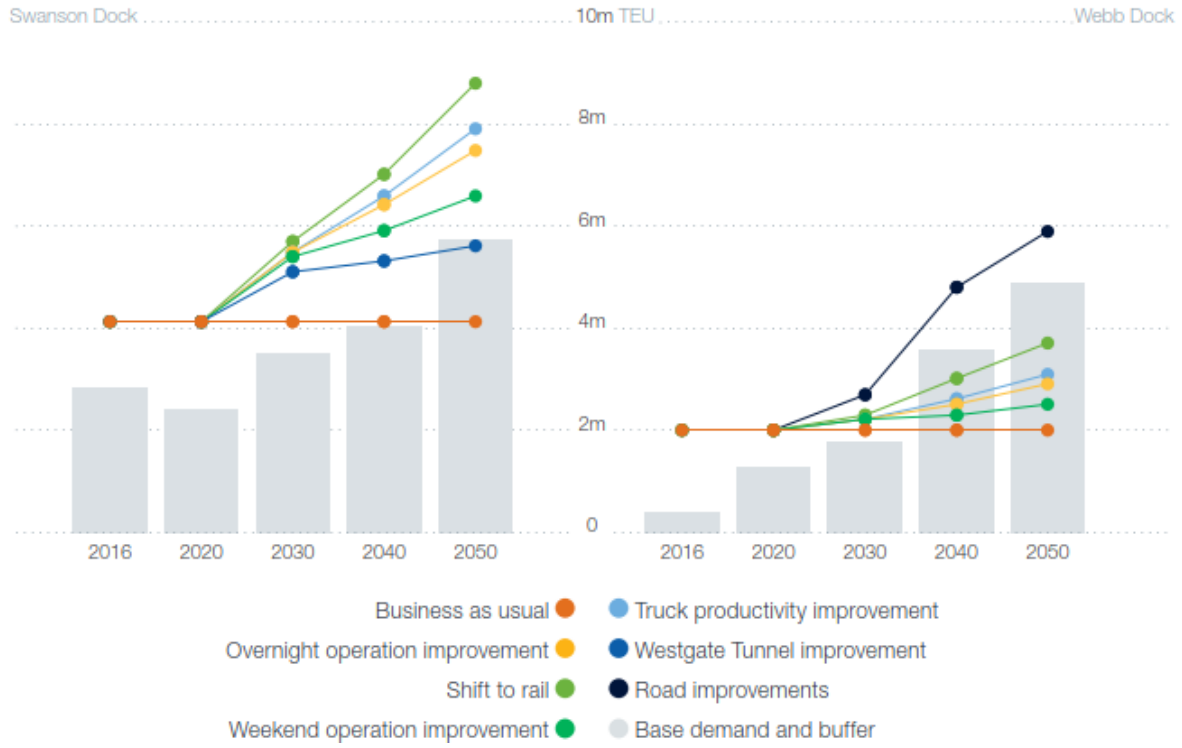


Figure 3-13 PoM; Forecasted future container growth between 2016 and 2050 with port capacity shown based on future developments (93)

3.1.5.2 Developments

The currently forecasted freight growth will impact on operations if there are no improvements to infrastructure. There are also road network expansions surrounding the port that will change how freight is delivered to the port such as the West Gate Tunnel Project which will result in a 24/7 ban for heavy vehicles on the Inner West roads. This will impact the ECPs, local industry and regional freight.

Moving forward the focus of PoM is to make sure the port and terminals can handle the forecasted growth with infrastructure such as road and rail network and access, wharf length, sufficient gates, and channel size through:

- Investment in rail infrastructure to help increase the transport split towards rail
- Parking capacity may be an area investigated during future development
- Improvements to traffic flow around the port are also being investigated through potential changes or closures.

Road

The PoM has requested the West Gate and the Bolte Bridges be upgraded to address the restrictions on HPFVs vehicles. Planning and delivery of these upgrades is expected to take some time. Until these upgrades are delivered PoM has suggested the introduction of real time HPFV mass limit monitoring, with an overall operating mass limit of 68.5 tonnes. This would allow HPFV movements such as 4 TEU of empty exports or 4 TEU of light imports (93).

Rail

The Port Rail Transformation Project (Figure 3-14) includes the planning and delivery of improvements to rail access at the Swanson Dock container terminals and the road network connection to the Webb Dock container terminal. This project includes the development of a new East Swanson Rail Terminal and a range of upgrades to the wider port rail network. Once delivered, on-dock rail will be provided at each of the Swanson Dock container terminals.

Rail terminals will be developed to support the Webb Dock Freight Link. The new rail terminal will support the direct transfer of import and export containers between the port precincts through dedicated fright links and ultimately connecting to the wider rail network.

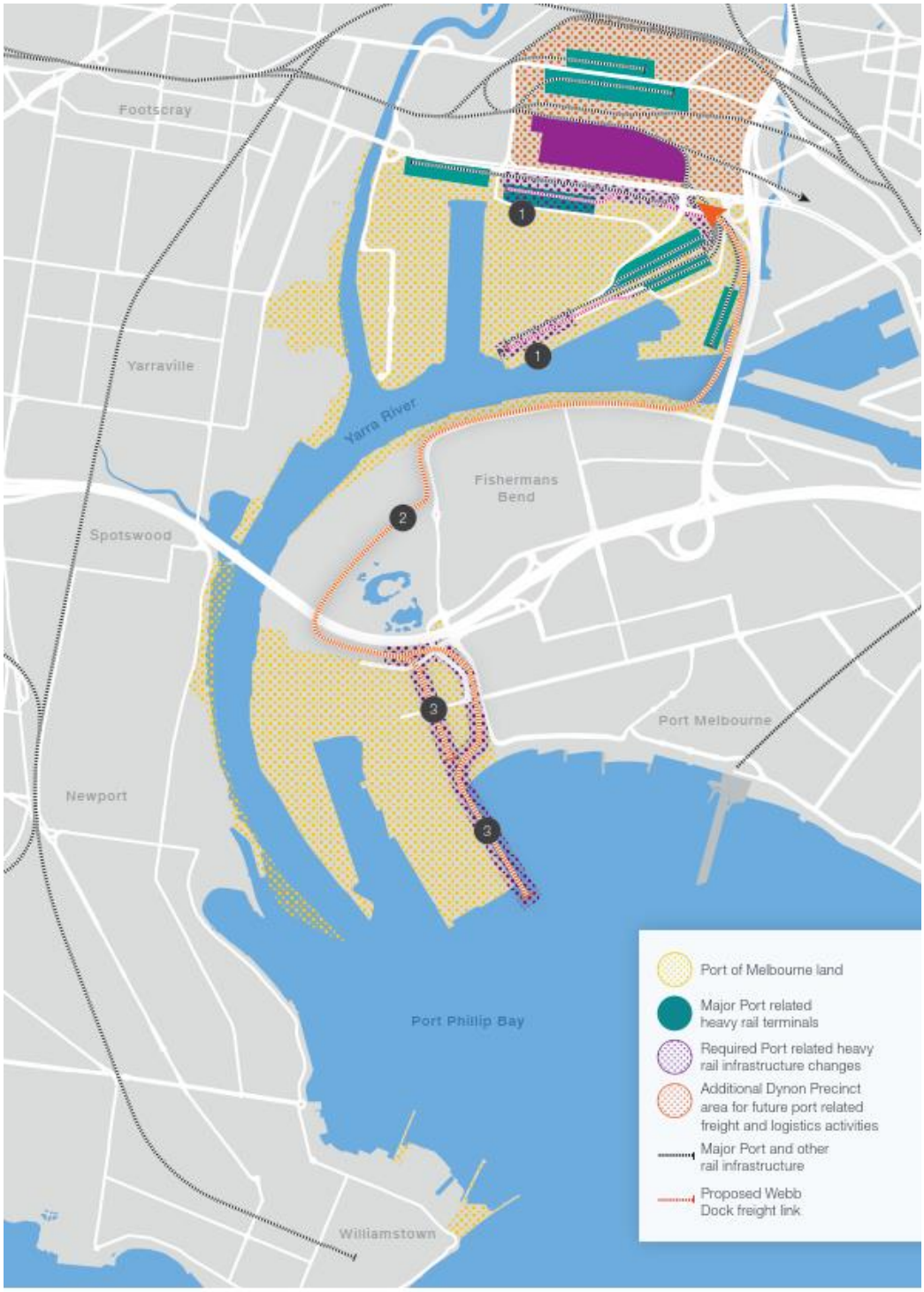


Figure 3-14 PoM; Rail transport infrastructure existing and future developments (105)

Terminals

Freight Victoria's VPPM will be developed to include other parts of the container freight supply chain including ECPs, rail container freight performance, and freight transport network performance (102).

A new Webb Dock North container terminal is being investigated (in the current Tasmanian terminal location). This terminal would provide 2 new container berths and would be directly connected to an on-port rail terminal and the Webb Dock Freight Link.

Existing terminal planned upgrades consist of (106):

- VICT has indicated that its further investment plans include civil works project, as well as purchases of new quay cranes, automated stacking cranes and automated container carriers.
- DPW has indicated it will invest in additional yard equipment and infrastructure to ensure projected trade demands are met and service levels are maintained on both quayside and landside operations.
- Patrick will undertake various civil, pavement and reefer work in the next 3 years to increase capacity. To cater for volume growth, Patrick plans to replace existing, and purchase additional, straddles, and invest in the Port's rail project.

3.2 Port of Fremantle, Western Australia, Australia

3.2.1 Port Description

Table 3-5 Port of Fremantle; Summary table (2020)

Measure	Port Botany	Port of Fremantle
Volume of TEU	2.7 Million TEU	0.78 Million TEU
Number of Container Terminals	3	2
Empty Containers Import/Export	0.9% / 63%	5% / 44%
Transhipments	5%	0%
Road / Rail	85% / 15%	82% / 18%

The Port of Fremantle is located at Fremantle, on the mouth of the Swan River. It operates both an Outer and Inner Harbour. The Inner Harbour is where most of the container trade for Western Australia is handled. The Inner Harbour also caters for vehicle imports, cruise ships, non-containerised cargos, and research/specialist vessels.

The Outer Harbour is located 22 km south in Kwinana and is a major bulk cargo port handling grain, petroleum, liquid petroleum gas, alumina, mineral sands, fertilisers, coal, sulphur, iron ore and other bulk commodities.

The port is managed by Fremantle Ports with the 2 container terminals at the Inner Harbour North Quay leased to DPW and Patrick. DPW operate berths 1 and 2 (526 m in length) and Patrick operates berths 3 and 4 (726 m in length). The terminals both operate 7 days but may only work night shift as required. The terminals use manual forklifts and/or RTGs with no automation of yard equipment.

The North Quay Rail Terminal (NQRT) is located to the west of Patrick and is operated by Intermodal Group. This is the hub for all inbound and outbound rail containers.

Figure 3-15 & Figure 3-16 show the main infrastructure related to container operations at the Port of Fremantle and the proximity of the local residential areas.

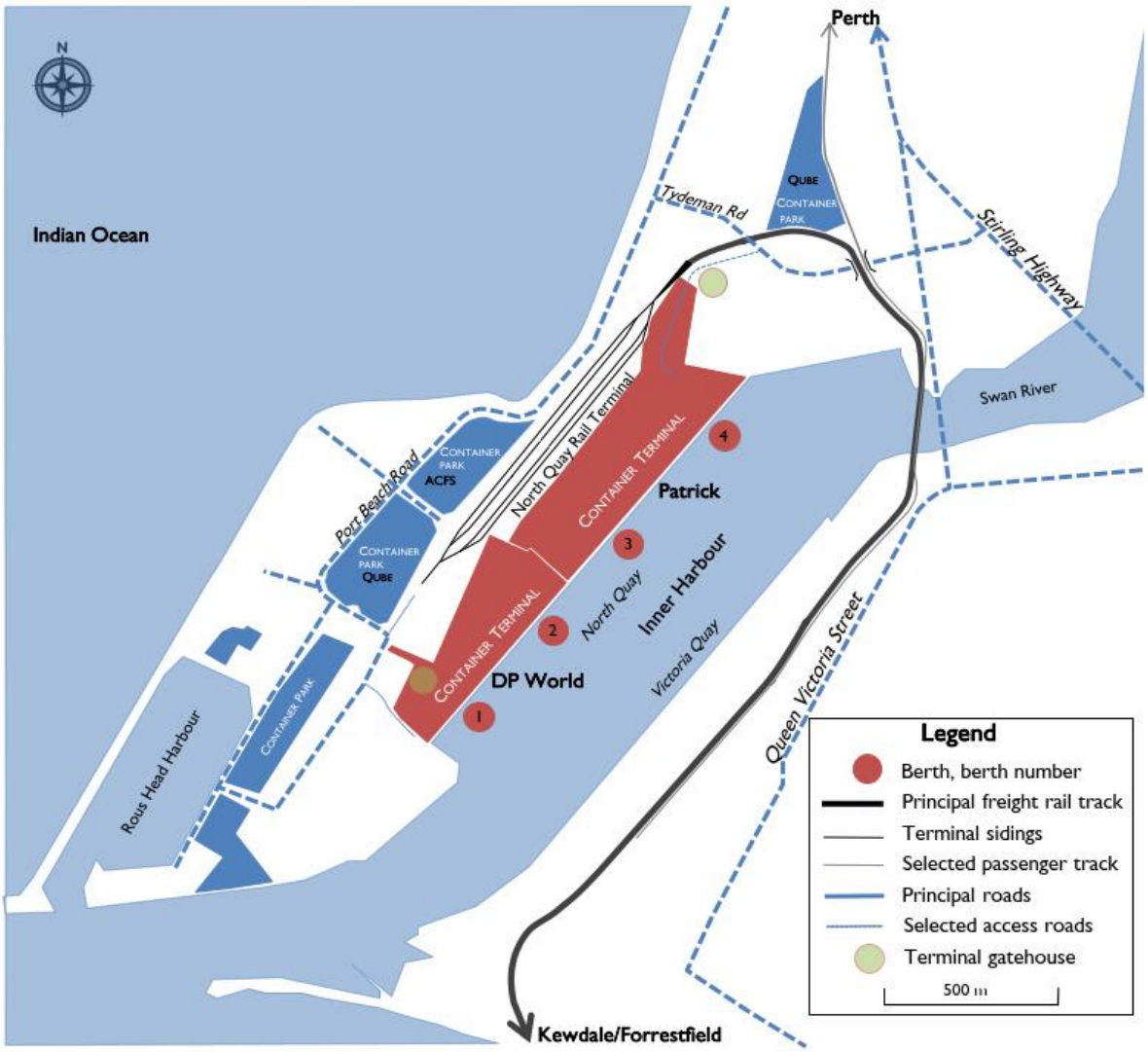


Figure 3-15 Port of Fremantle; Terminal locations and Road/Rail transport access (107)

Figure 3-16 Port of Fremantle; Port location and proximity to local zones (108)

Table 3-6 and Figure 3-17 below shows data collected by BITRE indicating a steady increase in container trade over the past 10 years of approximately 3% per annum. The split between imports and exports has remained the same with a 4% shift in exports towards empty containers.

Table 3-6 Port of Fremantle; Container cargo mix and exchange in 2010 and 2020 (91)

Trade	Cargo type	2010	2020
Import	Full	48%	49%
	Empty	3%	2%
Export	Full	31%	27%
	Empty	18%	22%
Total Exchange (TEU)		583,000	781,000

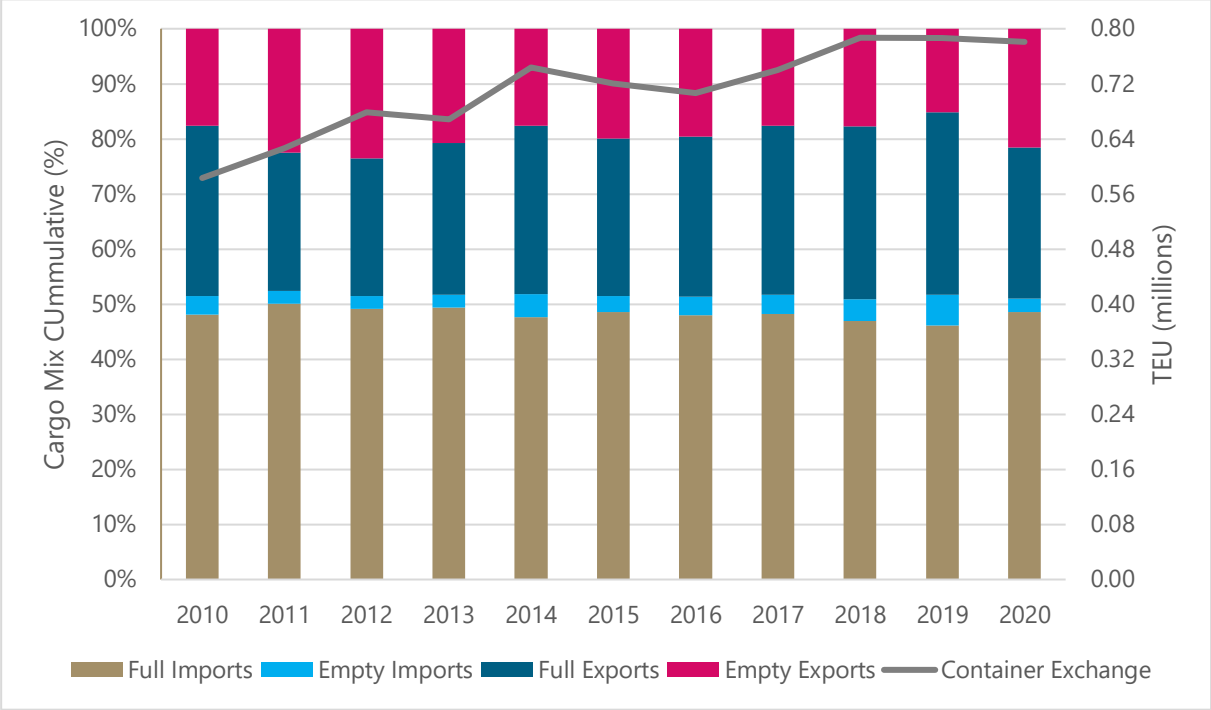


Figure 3-17 Port of Fremantle; Container cargo mix and exchange between 2010 and 2020, percentages excluding transhipments (91)

3.2.2 Landside Servicing Mode

The road and rail network connection from the port to the intermodal terminals is shown in Figure 3-18.

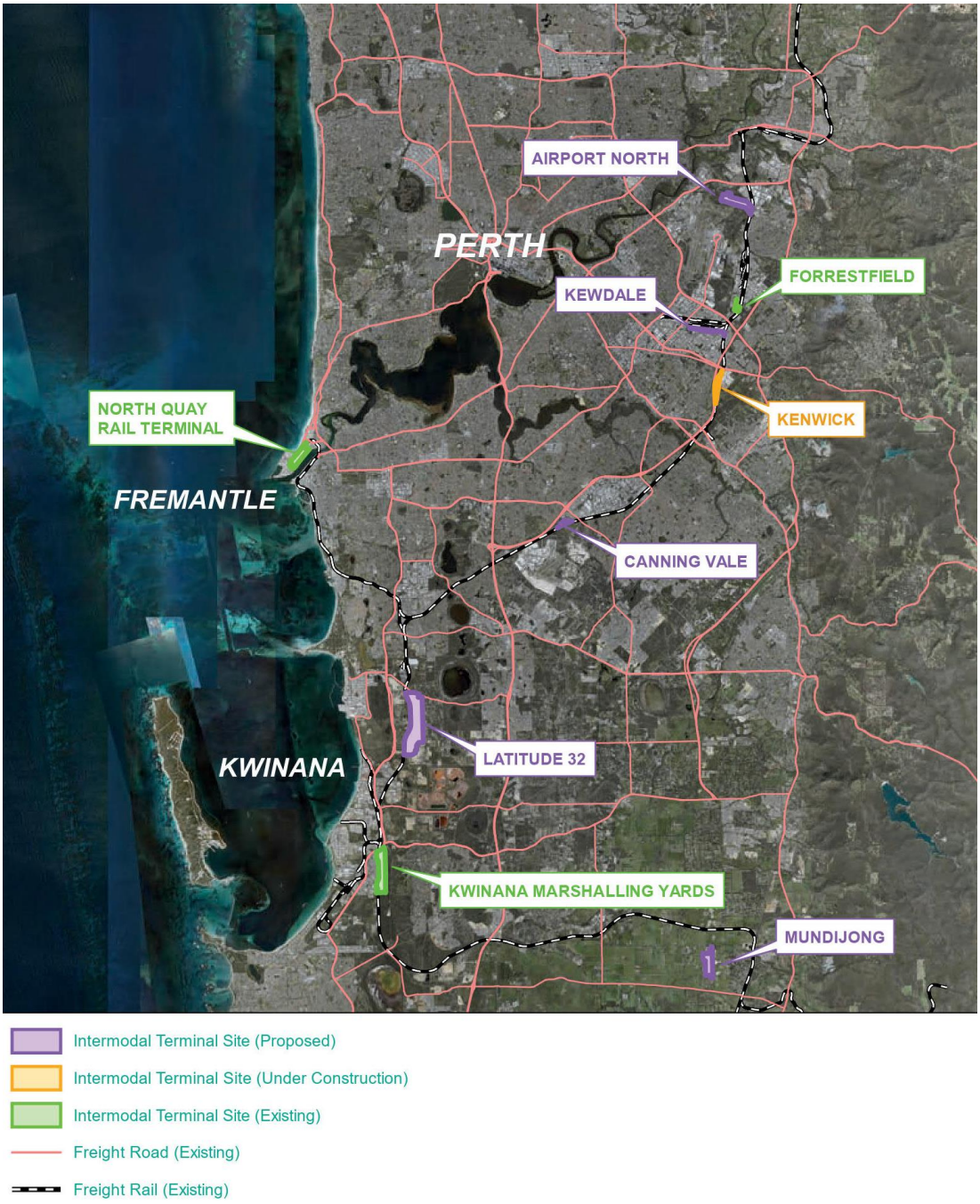


Figure 3-18 Port of Fremantle; Road and rail transport infrastructure network (109)

3.2.2.1 Road Transport

The key road connection into the port is Tydeman Road from Stirling Highway, and Port Beach Road / Rudderham Drive. Patrick is accessed from Tydeman Road, and DPW from Rudderham Drive. Public access to the Rottnest ferry terminal, Rous Head harbour and the North Mole lighthouse uses the same port access roads as trucks.

Queuing into the terminals is not a large issue at the port. Queuing and congestion at the terminals is the responsibility of the terminal operators and managed through the use of the Congestion Management System (CMS), ongoing performance improvements, and cancellation of slots. Section 3.2.3.2 contains more information on existing and proposed measures for congestion management.

The connection between the main port road and the highway away from the port (Tydeman Road to Stirling Highway) can become congested especially in peak periods due to the volume of trucks. Shifting volumes to off-peak periods and rail helps to address these congestion issues.

Stack runs

The terminal operators prefer the use of off-peak operations (evenings and weekends) for stack runs. This is encouraged by the performance requirements from Fremantle Ports (discussed in 3.2.4.1). Larger carriers will utilise the slots during off-peak for stack runs in and out of the terminal and prioritise other transport activities during the day, making more slots available for smaller carriers that prefer day shifts.

Utilising stack runs is efficient for the terminal and the carriers as imports can be stacked in blocks for a particular carrier ready for pick up, with stack runs of full containers being frequent. When loading, the yard equipment can move through the container stack without searching for a particular container making for a faster TTT.

DPW found many small stack runs inefficient to manage effectively so has increased the minimum number of containers for a stack run from 15 to 30. This has decreased the full cargo handled by stack runs from approximately 85% to 65%. Booking slots through the VBS is encouraged for smaller numbers of containers.

Staging

As reported in the 2017 container movement study (92) nearly 80% of both full import and export container movements by road and rail are staged. These containers are transferred to an intermediate location, rather than being supplied directly to the customer from the container terminal. This relieves pressures on the carriers as they can focus on collecting and delivering multiple containers to a terminal at the same time. Transporting containers by rail requires staging at a rail terminal, contributing to the high level of staging. Staging locations are mainly located to the east and south east of Perth including Kewdale, Forrestfield, Welshpool, Canning Vale and Jandakot, but also at the Rous Head Industrial Park (adjacent to the container terminals) (110).

3.2.2.2 Rail Transport

The rail network passes through Fremantle itself, and in part uses the passenger line. There are currently 6 freight movements per day. There are limitations during the morning and afternoon commuter peaks when freight trains are not able to use the passenger line.

As shown in Figure 3-18 the NQRT is located to the west of the Patrick terminal. It is the hub for all inward and outbound rail container cargo. Trains access the terminal on a freight-only line from Midland (apart from the short section of track in Fremantle shared with the passenger rail network). It also connects to interstate intermodal terminals at Kewdale and Forrestfield.

DPW stacks the import containers to be transported by rail together in the yard for transit by carriers to the off-dock rail terminal. The access for the rail imports is through a separate gate so they do not need to transit the public road when travelling between the terminal and rail terminal.

In 2021 an average of 18.4% of all containers were moved both in and out of the port via rail. This is a key government priority to enable safer more efficient transport, and reduced road congestion. The Western Australian Government offers a subsidy for rail on a per container basis, to encourage its use and enhance profitability. The aim is to see the rail percentage increase to around 30%.

3.2.3 Landside Management

3.2.3.1 Vehicle Booking System

The VBS is a web-based booking system by 1-Stop. This allows carriers to book slots for the pickup / delivery of containers to and from the terminals. Currently slots are issued for 1-hour zones with a tolerance of 5 minutes before the zone and 30 mins following the zone within which the truck can arrive. For the 30 minutes following the zone, for approximately 2 hours the truck can arrive to the terminal, however, will be charged an off-slot fee. Timings may vary between terminals. To plan the allocation of equipment within the terminal DPW will issue slots based on 2 scenarios, 1 for a vessel in berth (less slots) and 1 without vessel at berth (more slots).

The fees and penalties associated with the VBS for each terminal are listed below in Table 3-7. At the terminal operator's discretion, they may waive fees for late arrivals or no shows. It has been reported that active communication between the terminal operator and the carriers when one or the other is having delays is key to managing the landside operations efficiently.

Table 3-7 Port of Fremantle; Landside container handling fees (111) (112)

Fee (AUD)	DPW	Patrick
Slot Fee	$33	$36.50
No-show Fee	$222.40	$221.50
Off-slot Fee	$81	$85

3.2.3.2 Congestion Management

Fremantle Ports operates a CMS (113) in conjunction with a 60-bay TMA at Rous Head. The CMS is an information and control system to facilitate safe and efficient management of queuing and related safety hazards and risks during congestion. Once the CMS is in use, as determined by either Fremantle Ports or the terminal operator, drivers are required to abide by the directions given and adhere to all signage.

If congestion is occurring the terminal operator will decide to use the TMA by activating the CMS, Fremantle Ports can direct its use if it believes it is required. Once activated trucks intending to access the terminal will be directed to the TMA. On reaching the TMA they will register their arrival and wait for call up by the terminal operator on the messaging signs. The order of call up will be based on first-in-first-served. The terminal operator is required to let Fremantle Ports know when they are using the CMS/TMA and provide justification for its use. The understanding with the CMS/TMA is that a terminal

operator is expected to correct the performance delay and not just use the TMA as a traffic management system to assist with their day-to-day operations.

DPW are currently developing their own TMA within their terminal boundary. This is aimed to avoid congestion within the terminal and have better visibility of containers that carriers have booked within the yard area, so uncongested yard areas can be prioritised. This will allow DPW to call through specific vehicles in a timely manner until congestion is cleared.

Fremantle Ports is also developing a 3D digital twin of port operations, which currently covers live vessel tracking information. They are in the process of developing the second stage, being a new real-time road and rail video analytics system. Cameras will be installed at key locations and operate 24/7. The system will use artificial intelligence to recognise the various types of vehicles and the TEUs carried. It will provide real-time data to the port, in particular recognising when potential congestion may develop prior to it becoming a larger issue. In the future, the system is intended to be able to identify between full or empty cargo. The expectation is that the terminals would be able to receive a notification advising them on upcoming potential congestion issues.

3.2.4 Landside Performance

3.2.4.1 Performance Targets

The port takes an active role in monitoring operations, collecting data, and encouraging improvements to terminal operations. Operating agreements included in the lease agreements is the main mechanism used to achieve this.

In 2021 Fremantle Ports finalised leases for the 2 container terminals, for a 10-year period with options to extend for a further 11 years. These operating agreements include incentives (variable portion of the lease) for improvements in landside and wharfside performance, along with KPIs. Other terminals such as intermodal and ECPs also have KPIs with Fremantle Ports.

These KPIs are focused on improving the flow of cargo through the port. The terminal operators have both wharfside indicators (crane and ship rates) and landside indicators. Landside indicators are designed to improve cargo flow efficiency and include:

- Off-peak movements – required to be at a certain defined percentage
- Slots released – a minimum number for differing shifts
- TTT – an approximate average of 21-23 minutes is required by the port.

From a rail perspective the KPIs focus on encouraging the use of rail rather than road transport and include:

- Defined percentage of cargo transported via rail
- Dwell times – minimising container time in the terminal.

Fremantle Ports seeks data in relation to the KPIs from the operators fortnightly. When KPIs are not met there is a discussion to determine why and develop action plans to improve performance.

Fremantle Ports are mindful they are operating in a port city with residents close by, hence the desire to increase off-peak and rail movements.

The figures below give insight to the landside performance of the port over the last decade (Figure 3-19, Figure 3-20, Figure 3-21).

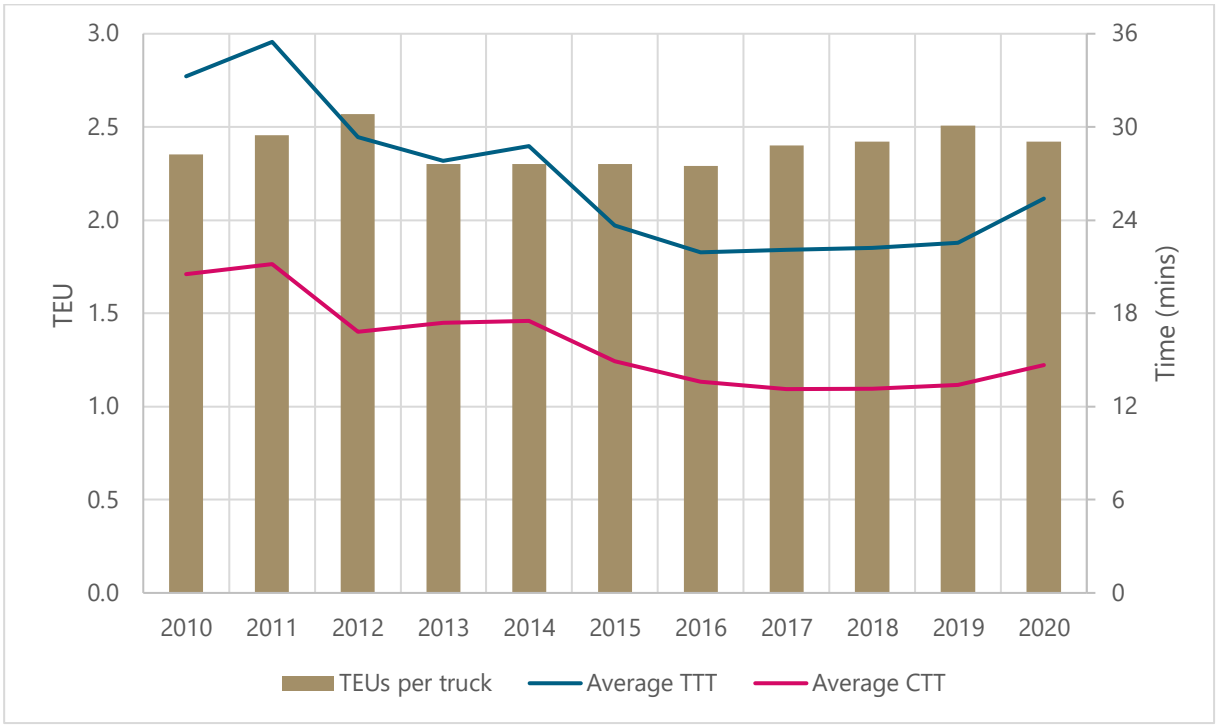


Figure 3-19 Port of Fremantle; VBS road transport landside performance (91)

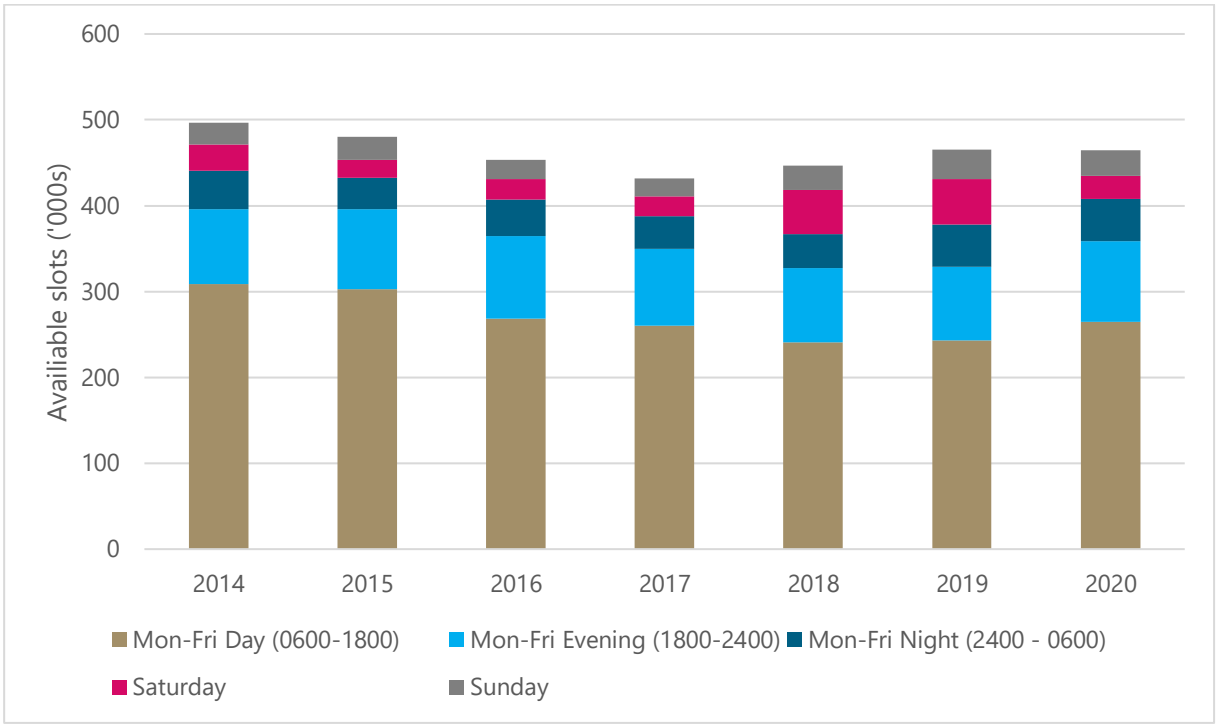


Figure 3-20 Port of Fremantle; Available VBS slots by peak and off-peak periods between 2013 and 2020 (91)

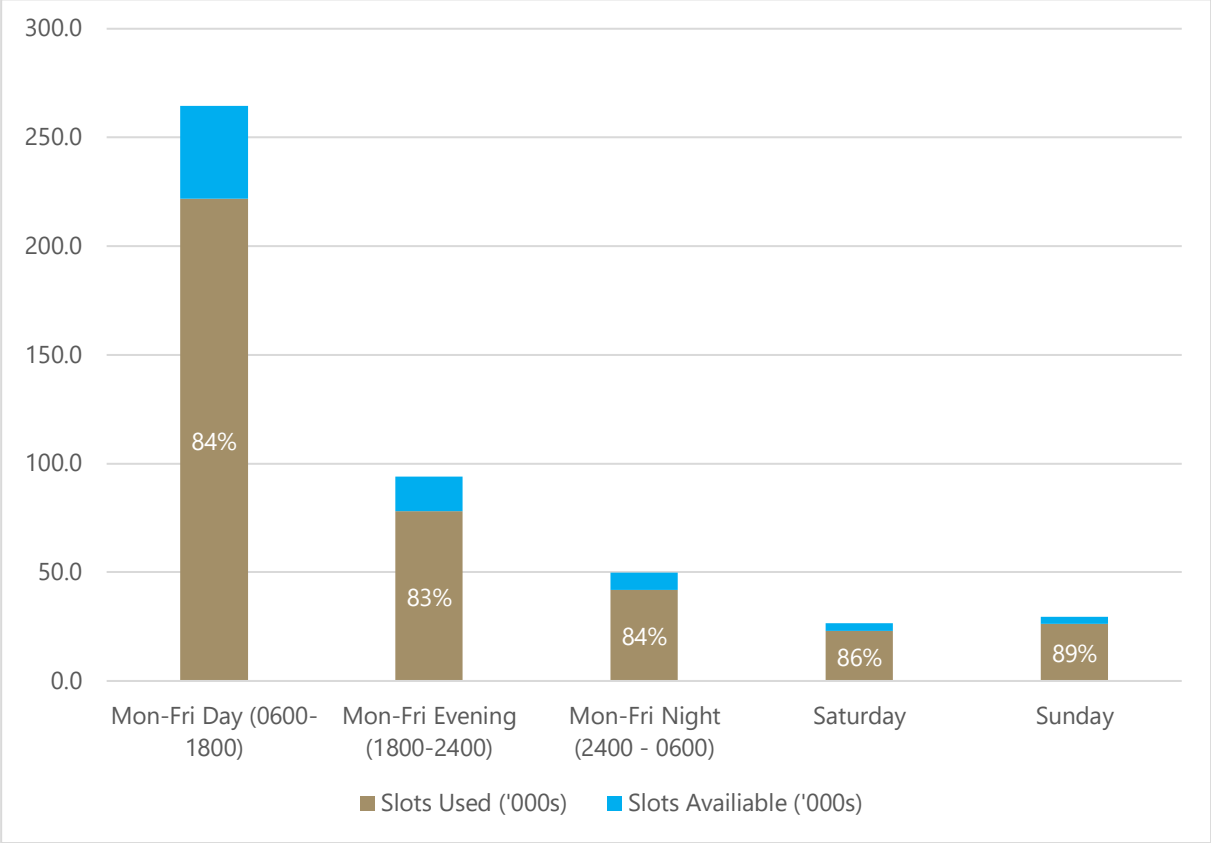


Figure 3-21 Port of Fremantle; Available and used VBS slots by peak and off-peak periods in 2020 (91)

3.2.5 Future Development

The Western Australian Government formed an independent taskforce in 2017 to develop a plan to manage the growing freight demands of Perth and surrounding regions for the next 50 years. Studies completed identified a TEU growth rate of between 3% and 4%, as demonstrated in Figure 3-22.

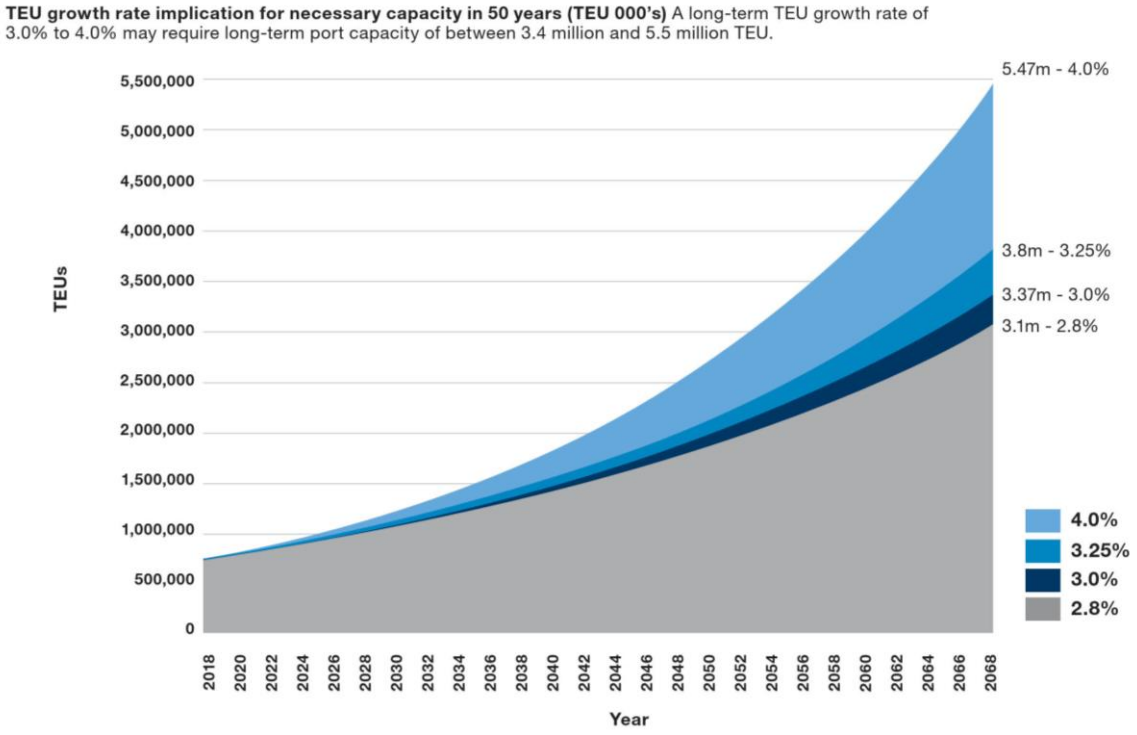


Figure 3-22 Port of Fremantle; 50 year forecasted future container growth from 2018 till 2068 (114)

The Inner Harbour currently is unable to cater for the expected long term TEU growth, as existing road and rail links will become constrained and reach their capacity by mid 2030s. There is limited existing land for the further expansion of terminal yard areas. Future shipping trends focus on larger container ships and the current orientation of existing wharf structures inside the Inner Harbour limit the maximum vessel size.

In 2020 the Western Australian Government selected a site in Kwinana for the proposed location of a new container port. They are developing a business case for this project over the next 3 years.

The existing port is required to remain operational, and the Western Australian Government are investing in improving some of the critical road junctions, to improve safety and the efficiency of road movements. There is also a commitment to build a new Swan River Crossing to replace the existing Fremantle Traffic Bridge. This new crossing will cater for a passenger rail line, enabling the existing rail link to the port to become 100% dedicated to freight. A third intermodal terminal is also in the planning stage which will enable a tripling of rail movements in the future and encourage a hub and spoke model and reduce road movements around Fremantle.

3.3 Port of Brisbane, Queensland, Australia

3.3.1 Port Description

Table 3-8 Port of Brisbane; Summary table (2020)

Measure	Port Botany	Port of Brisbane
Volume of TEU	2.7 Million TEU	1.4 Million TEU
Number of Container Terminals	3	3
Empty Containers Import/Export	0.9% / 63%	10% / 48%
Transhipments	5%	5%
Road / Rail	85% / 15%	97% / 3%

The Port of Brisbane (POB) is located at the mouth of the Brisbane River (aerial view - Figure 3-23). The origin of the port was a strategic decision by the Queensland Government in 1976 to relocate the port facilities from the Hamilton Reach of the Brisbane River to the mouth of the river to accommodate the trend towards larger and deeper draught vessels.

The port was developed at the entry to the Brisbane River at Fisherman Island with the first ship received at the port in 1980. Since that time Fisherman Island has expanded to 230 ha of reclaimed land.

The port includes heritage operational areas further up-river including the cruise terminal at Hamilton and fuel berths at Colmslie.

For the year 2019/2020 the port handled 31 million tonnes of cargo worth $466 million AUD, including 1.3 million TEUs of container trade (Table 3-9 & Figure 3-24) and 2,246 vessel calls including 25 cruise ships.

There are 3 adjacent container terminals at Port of Brisbane as follows:

- DPW operates from Wharves 4, 5, 6 and 7 with 8 modules using ASCs
- Patrick operates the Patrick Brisbane Autostrad Terminal at Wharves 8 and 9
- Hutchison is based at Wharves 10 and 11 and is operated by Hutchison Port Holdings using ASCs with 3 modules.

Across the rail lines from the container terminals are various port related activities including car storage (Patrick Autocare and PrixCar Services), container depots (Qube Logistics, Chalmers Industries, Australian Container Freight Services, IPS Logistics), Australian Customs, and port administration offices.

In addition to the 3 container terminals there are several container depots at Fisherman Island and in the surrounding areas adjacent to the port including Hemmant and Cannon Hill. These depots are used for packing and unpacking of containers and for staging deliveries of containers to and from the container terminals on Fisherman Island.

See Figure 3-25 for port layout with reference to facility and access locations.

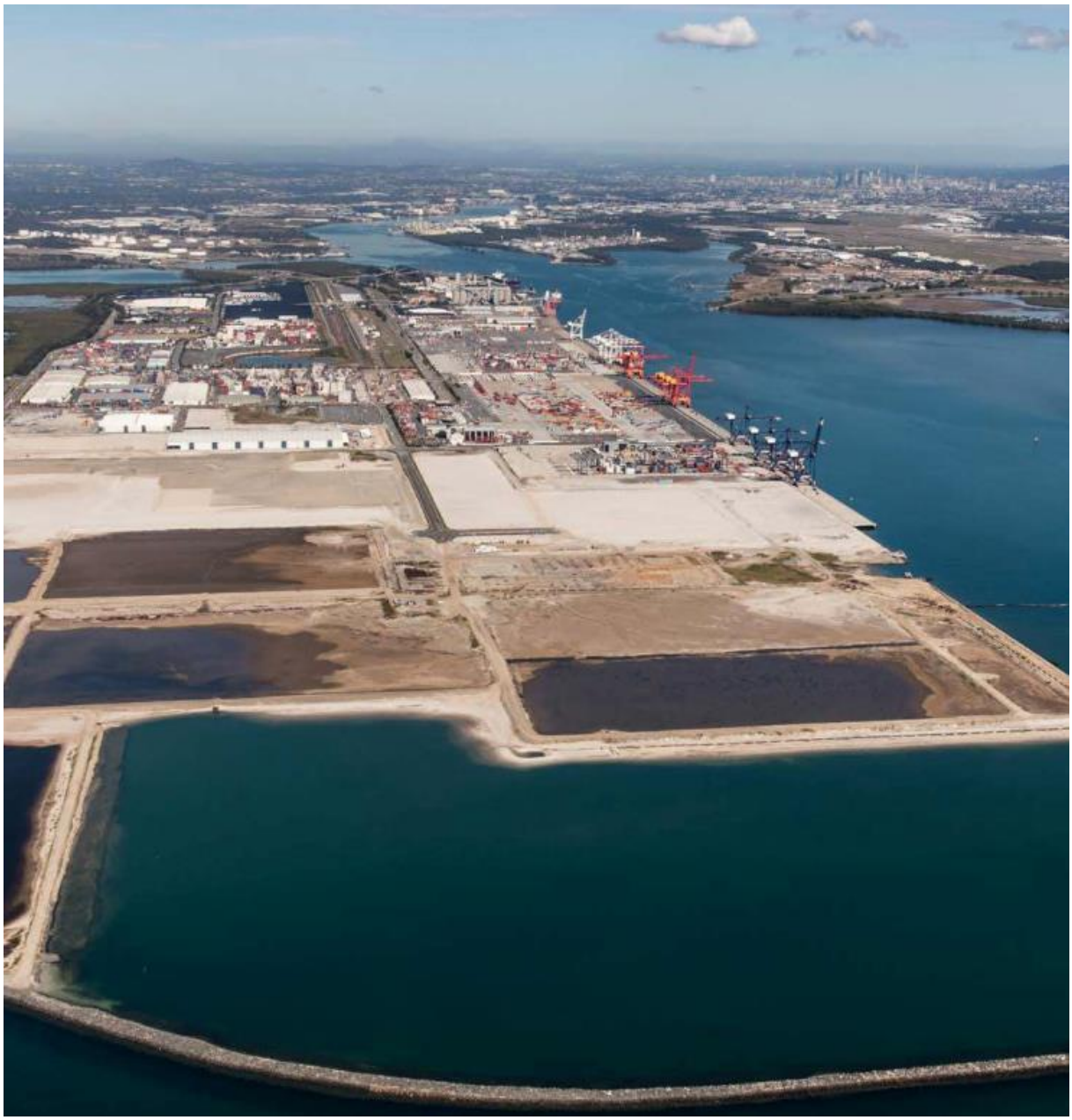


Figure 3-23 POB; Aerial view of port (115)

The port performance over the last decade from data collected by BITRE is provided in Table 3-9 and Figure 3-24.

Table 3-9 POB; Container cargo mix and exchange in 2010 and 2020 (91)

Trade	Cargo type	2010	2020
Import	Full	44%	46%
	Empty	6%	5%
Export	Full	28%	26%
	Empty	22%	23%
Total Exchange (TEU)		953,000	1,356,000

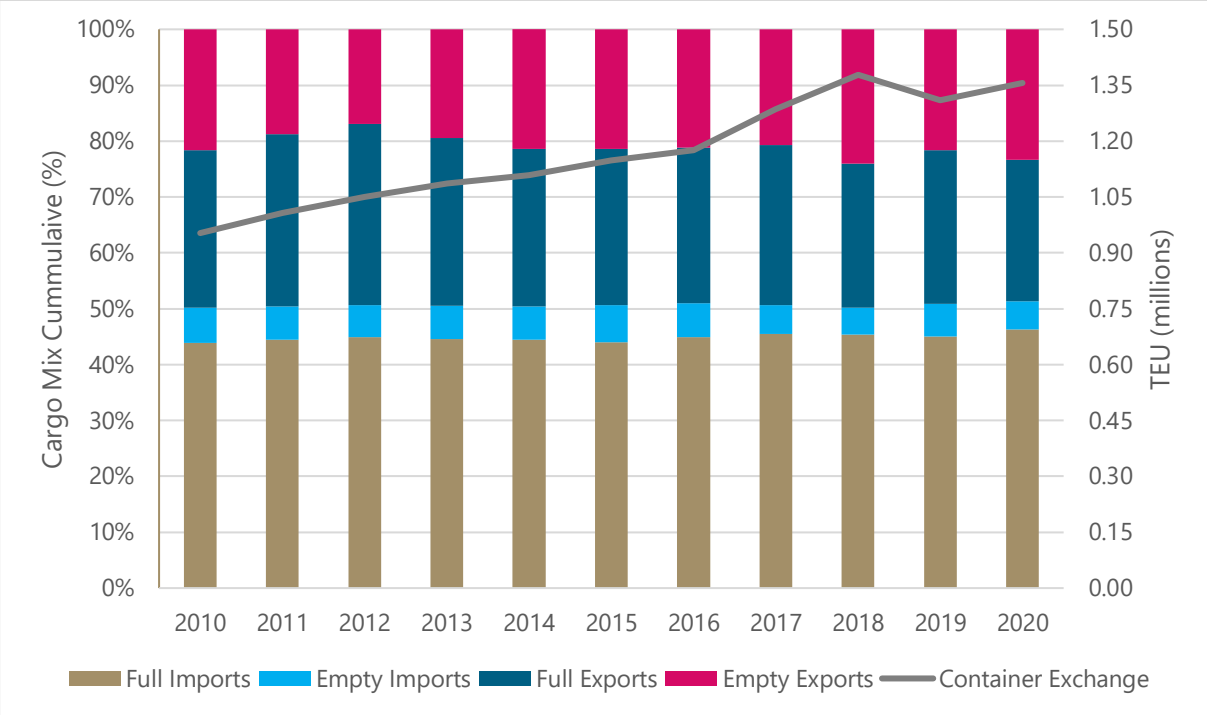


Figure 3-24 POB; Container cargo mix and exchange between 2010 and 2020, percentages excluding transhipments (91)

3.3.2 Landside Servicing Mode

3.3.2.1 Road Transport

As outlined above the Port of Brisbane is located on Fisherman Island at the mouth of the Brisbane River (Figure 3-15). The port is physically separated from the mainland and access onto the island is via a single road bridge.

The Port is a self-governing local authority and hence has sole control of the road network. The road network at the port comprises a loop of roads including:

- Port Drive which crosses the bridge to the port and runs up the western side of the island. This provides access to the 3 container terminals, which are at the northern extent of the port.
- Bishop Drive crosses to the eastern side of the island at the northern end and links with Lucinda Drive.
- Lucinda Drive runs along the eastern side of the island and crosses over the rail line at the southern end, connecting with Port Drive.
- Other internal roads provide access to the bulk and general terminals including Queensland Bulk Handling, Sunstate Cement, GrainCorp and Australian Amalgamated Terminals.

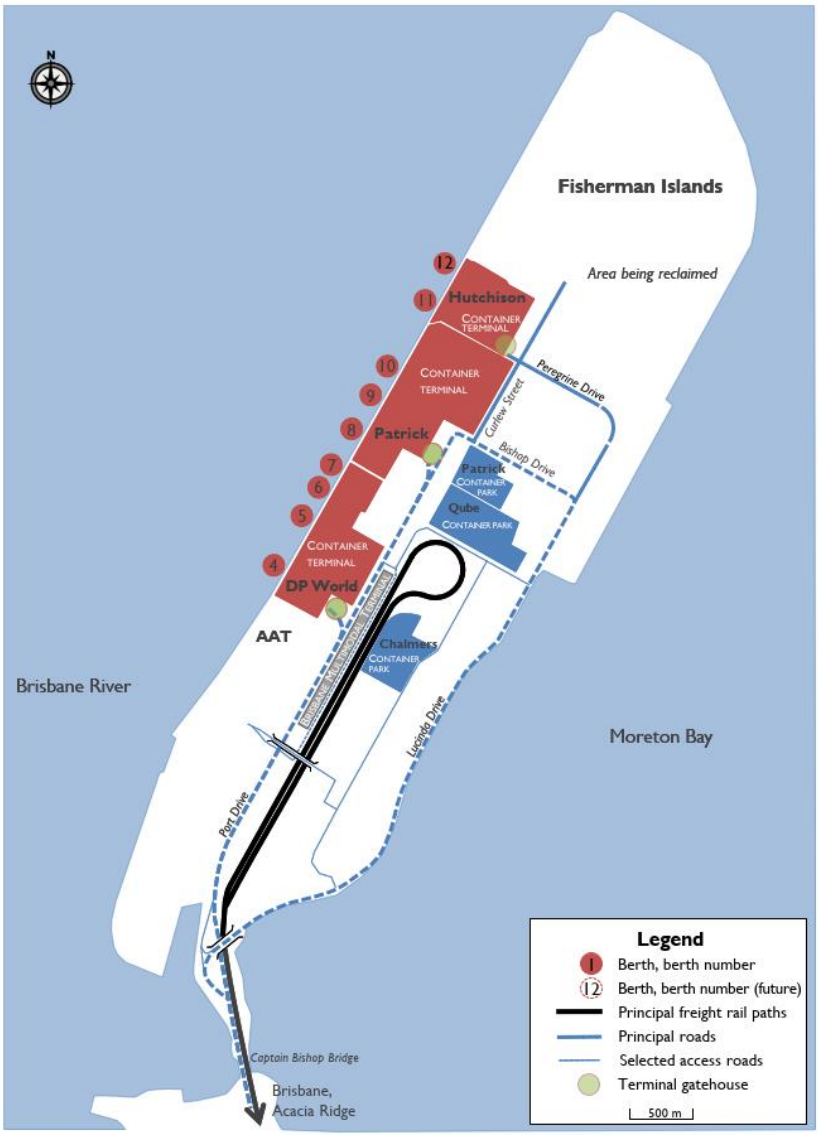


Figure 3-25 POB; Terminal locations and road/rail access (107)

The port is serviced by good road linkages to the surrounding regions. Port Drive connects directly to the M4 Port of Brisbane Motorway, which connects to the M1 Gateway Motorway, allowing trucks to travel from the Port of Brisbane to the Gold and Sunshine Coasts without encountering any traffic lights.

The biggest improvements in efficiency from the carrier perspective in recent years are:

- Adoption of the use of A-Double trucks which allow 4 TEUs to be carried at once:
  - B-Doubles were pioneered 20 years ago at Port of Brisbane and can accommodate 3 TEUs. B-Doubles have high axle loads that are not suitable for public roads and hence are restricted for use only at Port of Brisbane. This meant carriers with depots outside the port could not use B-Doubles.
  - A-Doubles can accommodate 4 TEUs but have a lower axle load allowing them to be used on public roads and by carriers with depots outside the port
  - With the rise in use of A-Double trucks the larger carriers are increasingly looking to target balanced imports and exports – each truck delivering export containers and collecting import containers in a single round trip to maximise efficiency. A truck can potentially carry out 8 container moves on a single visit to the terminal leading to much higher efficiency.
- The use of staging, which allows bulk movements of containers between depot and terminal using a dedicated fleet of high-capacity A-Double trucks. A separate fleet of low-capacity trucks is used for movement of containers between the depot and the customer, allowing economies of scale to be achieved.

3.3.2.2 Rail Transport

The port is serviced by rail which runs to the Brisbane Multiuser Terminal (BMT) located in the centre of the island. Rail does not run into the container terminals and containers using rail need to be moved by road between the terminal and the BMT using the road landside interface.

Port of Brisbane advised that only 1% of containers at the port are handled by rail. This is largely because of the efficiency of the road carrier industry and the direct road network connections to the NSW border, Toowoomba, and the Sunshine Coast.

Rail is seen to be less efficient due to the need for additional container handling at each end of the transit. The rail at the Port of Brisbane is located off-dock and therefore requires an additional transit by road which adds cost. Additionally, with strong road connections to cities like Toowoomba, 150 km is still cost efficient with road transport.

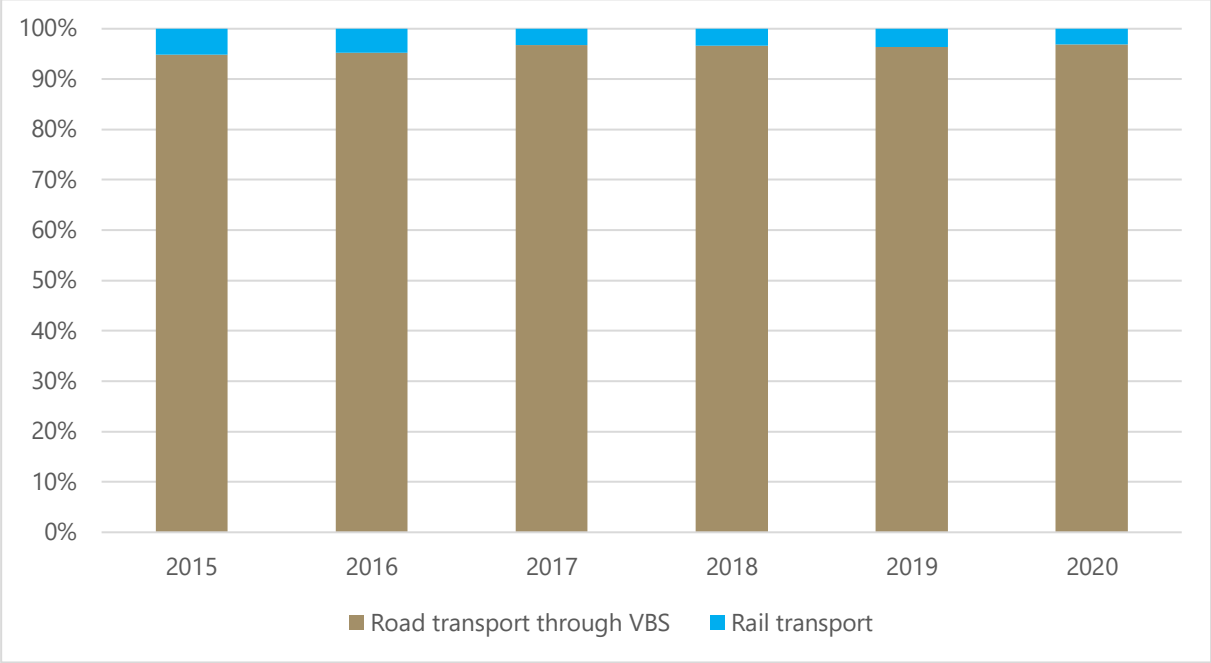


Figure 3-26 POB; Container cargo transported by road (through VBS) and rail transport (91)

3.3.3 Landside Management

3.3.3.1 Vehicle Booking System

All 3 container terminals operate a VBS. Patrick and DPW use the 1-Stop system and Hutchison uses a similar internal system. Slots can be booked in 2 ways:

- Individual bookings for a 1-hour time zone
- Stack runs for large carriers with a significant volume of containers to be moved. A certain number of slots per hour are allocated to a stack run. Stack runs are preferred during off-peak times.

The fees and penalties associated with the VBS for each terminal are listed below in Table 3-10.

Table 3-10 POB; Landside container handling fees (116) (117) (118)

Fee (AUD)	DPW	Patrick	Hutchison
Slot Fee	$31	$35.40	$19.50
No-show Fee	$222.40	$221.5	$62
Off-slot Fee	$79.90	$85	$130

The BITRE data on slots issued since 2013 and the utilisation of slots in 2020 for the port are shown in Figure 3-20 & Figure 3-21.

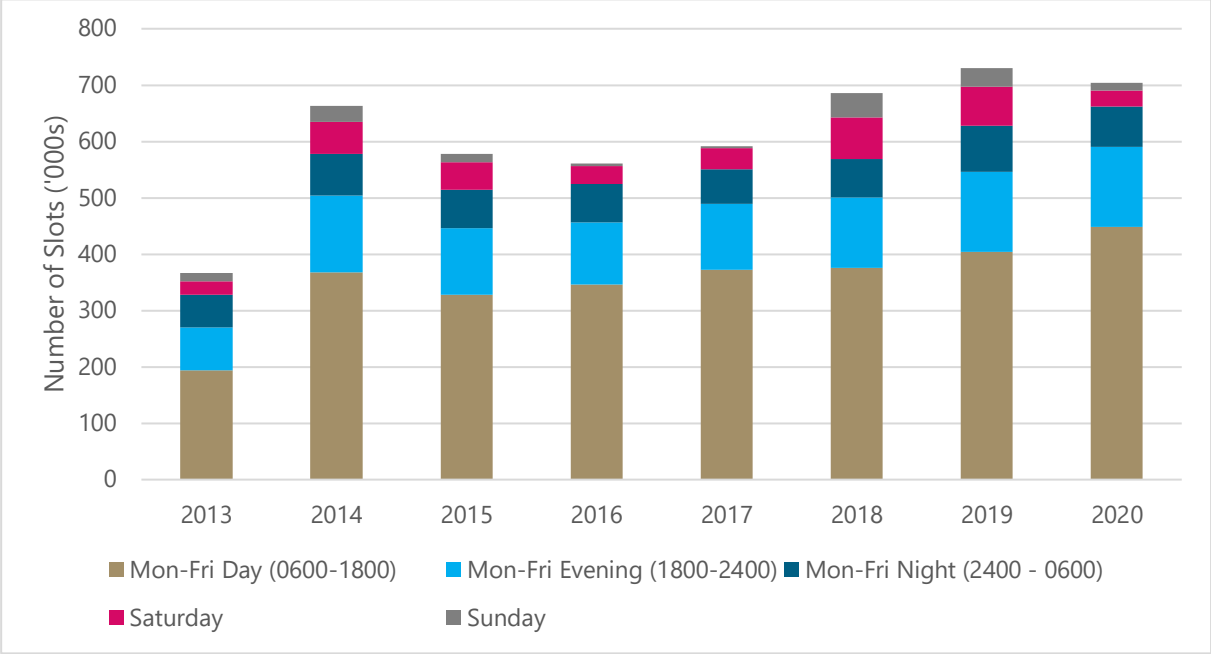


Figure 3-27 POB; Available VBS slots by peak and off-peak period between 2013 and 2020 (91)

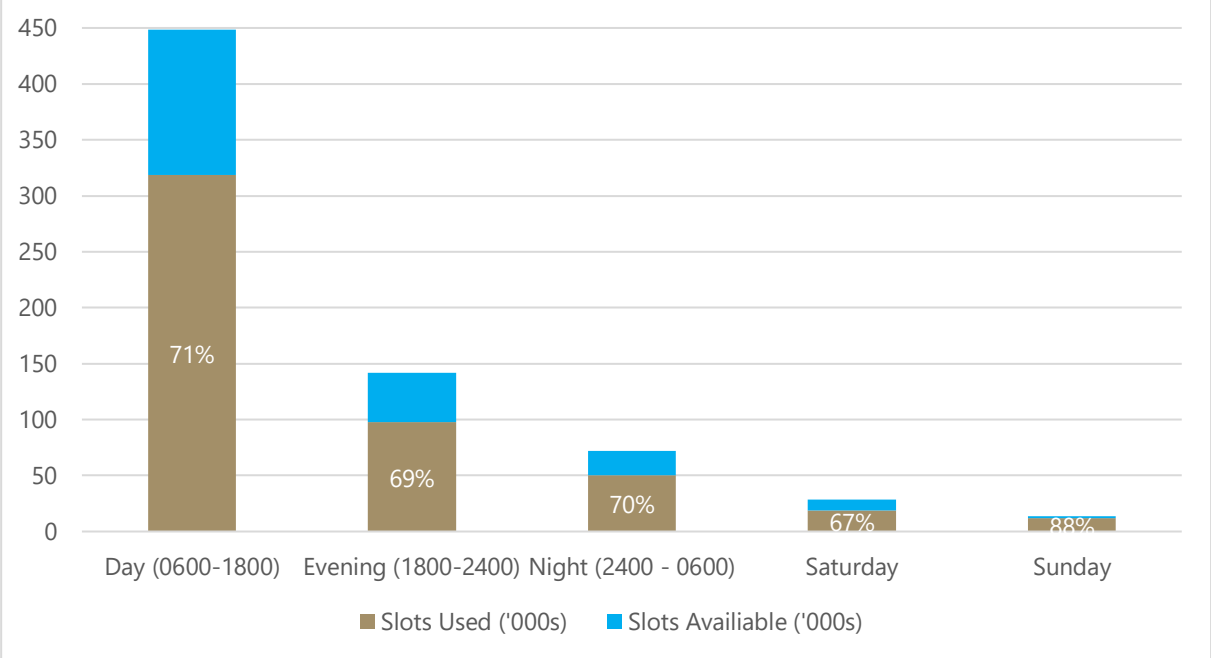


Figure 3-28 POB; Available and used VBS slots by peak and off-peak periods in 2020 (91)

DPW use the Advanced Booking system (Section Appendix A).

To assist carriers with their planning DPW will, when possible, provide the expected discharge times for containers.

This approach to booking slots is understood to provide an even playing field for carriers as they have immediate visibility of when containers are ready for booking and can select slots at that time.

It was reported in Melbourne that there can be a wait between the container being landed in the yard and an available slot for booking. No issues were reported around the availability of booking slots at DPW in Brisbane, with the terminal indicating that there are normally excess slots available over the day.

Terminal Management

DP World

DPW accepts trucks 15 minutes before the start and up to 30 minutes after the end of the scheduled slot, giving a window of 1 hour 45 minutes. Trucks are still accepted after the 30-minute grace period but with an off-slot fee. A no-show is 2 hours after the end of the zone window and trucks may also be accepted if there is a spare slot(s) available.

The VBS is reported to be managed in a pro-active way with communication managed via the 1-Stop portal to advise carriers of any issues. In addition, email and individual phone calls may be used to advise carriers of issues inside the terminal.

Slots are released in the VBS based on DPWs ability to service the landside – if equipment is scheduled for maintenance then slots are reduced.

The entry time starts from when the truck arrives at the entry gate at the front of the terminal. DPW has a queuing area before the entry gate and a TMA inside the entry gate. Hence queuing outside the terminal rarely occurs, which was confirmed by Port of Brisbane.

The DPW terminal operates 24/7 with 3 shifts (day, evening, night). On occasions the terminal will close for a shift, but this is the exception.

DPWs performance target for TTT is 30 minutes which was achieved in 2021 with a CTT of 17 minutes.

Hutchison Ports

Hutchison's VBS accepts trucks 30 minutes prior to the start and 30 minutes after the end of the booked 1-hour zone, and hence trucks have a 2-hour window for each booking.

According to the terminal off-slot fees are advertised on-line but are not enforced, although the terminal monitors for abuse of the system. The only penalties charged to the carriers are for no-shows.

Export containers are accepted up to 5 days prior to vessel cut off and import containers are given 3-days free storage.

Hutchison is a smaller terminal which does not operate 24/7. It operates a day and afternoon shift with night and weekend shifts as required.

Hutchison has limited queuing area outside of the terminal with this terminal reported by Port of Brisbane to cause the most issues with queuing.

Patrick Brisbane Autostrad Terminal

The Patrick terminal in Brisbane was one of the first container terminals in the world to use unmanned container handling equipment and operates its terminal using auto-straddle carriers between the quay, yard, and the road interchange area.

The terminal uses low height stacking to suit the autostrads and consequently can select a container with minimal rehandling of other containers, shortening the time at the interchange.

The terminal leases a nearby parcel of land at the port for use as a TMA. If needed trucks can wait in this area until they are called to proceed to the terminal. This results in very low occurrence of queuing issues at either the terminal or the TMA.

The terminal utilizes stack runs during off-peak times at the preference of the carriers. With the terminal operating 24 hours through the week till 2pm Saturday where it closes for the remainder of the week.

The overall landside performance of the port for TTT and CTT is shown below in Figure 3-25.

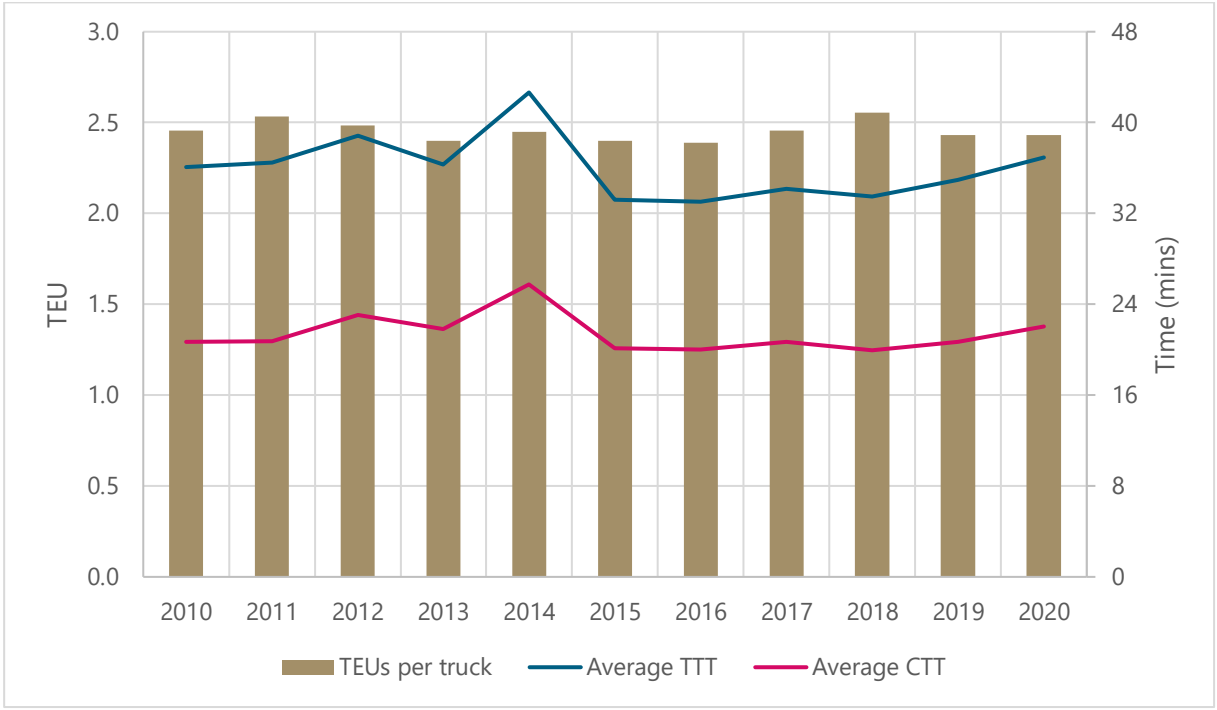


Figure 3-29 POB; Road transport through VBS landside performance (91)

3.3.3.2 Landside Forums

Port of Brisbane hosts a Landside Logistics Forum every 3 months where issues affecting the industry can be raised and the industry informed of proposed changes. This forum is very popular and well attended.

3.3.4 Landside Performance

3.3.4.1 Performance Targets

Under the terms of the leases between terminal operators and the Port of Brisbane there are no performance requirements to be met. The terminals are required to provide performance data to the Port, as monthly averages. These show trends in terminal performance over time.

It was noted by the Port that there are no performance agreements between the carrier and the terminal and that the balance of power lies with the terminals.

In relation to regulation there are no measures in place at a state or federal level to control performance of the port operations. Since Port of Brisbane was privatized in 2010 the Queensland Government has no participation in the operation of the port.

3.3.4.2 Road Transport

In relation to congestion and queuing outside terminals, the Port advised that it does occur but there is no measurement or monitoring system, and no means for the Port to influence outcomes.

It was reported that there are a lot of roadways inside the port where trucks can park to wait for bookings if they arrive early at the port. In addition, trucks can wait at the service station on Port Drive, on the landward side of the bridge to Fisherman Island.

In general, the Port's view is that Patrick and DPW have adequate space inside the terminals and good systems in place to manage situations where congestion can occur, which are normally associated with equipment breakdowns or storms. Hutchison on the other hand does not have the same queuing capacity inside the terminal nor the required systems in place to manage queues outside the terminal. Hutchison has the most frequent queuing issues and regards queueing outside its terminal as outside its responsibility.

The Port of Brisbane advised that movement of containers at the port is very concentrated, with 80% of containers in the port handled by the 5 or 6 largest carriers. Communications between carriers and the terminals at the port are generally very good.

Discussions were held with representatives from the trucking industry including the CEO of the Queensland Trucking Association and the CEO of a mid-sized carrier operating a fleet of trucks, who advised they handle approximately 7.5% of the port's container volume, from a depot located off-port.

The overall view was that the port works efficiently and cooperatively since the introduction of VBSs, and stack runs performance has improved. One terminal was identified as being difficult to deal with and resistant to change which adversely affects performance. As a result, the carrier interviewed charges a higher fee for containers through that terminal.

3.3.4.3 Challenges

The main issues on the performance of the landside operations at Port of Brisbane from the carrier's perspective were as follows:

- The conventional landside performance measure is TTT. It was pointed out by the terminals that a more accurate and informative measure of landside performance is CTT, particularly with the rise in use of A-Double trucks with multiple container transactions.
- The $50 AUD charge on vehicles over 26 m in length imposed by Patrick at its Brisbane and Sydney terminals is regarded as being anti-competitive and a tax on productivity.
- The power imbalance in the relationship between carriers and terminals was noted with carriers being the weaker party. An example is for a truck making regular cycles between depot and terminal throughout the day, typically bookings are made at 2-hour intervals. This allows the truck to pass through the terminal, drive to the depot to be unloaded/loaded before returning to the terminal. If the first zone of the day is delayed by the terminal for whatever reason, the truck will be behind schedule for the rest of the day. They may be charged an off-slot fee even though the reason for delay is a flow on affect attributable to the terminal's earlier issues.
- Furthermore, the off-slot and no-show charges imposed by the terminals do not reflect costs incurred by the terminals, the fees are a penalty rather than reimbursement of costs and do not result in greater efficiency of the carriers.
- It was reported by the carrier that Hutchison only operates on weekdays and Patrick does not operate on Sundays. Only DPW operates 7 days per week with stack runs by the carrier frequently undertaken during the Sunday night shift. To provide the required quantity of container movements to operate cost effectively during off-peak periods, more than one terminal is needed to be operating. Uniformity of working hours between terminals is required to improve efficiency.

In the view of DPW, outside of storms the most significant issues affecting landside performance is:

- The reactive nature of carriers and the reluctance to work outside of normal hours. The automated terminal has ASC machines that can work 24 hours of every day, but this performance cannot be capitalised on unless the rest of the supply chain works the same hours.

3.3.5 Future Development

The port is in the fortunate position of having plenty of area within the port boundary for additional land to be reclaimed and for continuation of additional quay line to be constructed. The Port of Brisbane currently has constructed wharves 1 to 11 and has plans in place for future development of wharves 12 to 16 when growth in volumes requires.

In addition, the 2 semi-automated terminals DPW and Hutchison can expand capacity to meet future growth in container volumes. DPW currently operates 8 ASC modules and master planning has been undertaken for the terminal to expand this capacity to 24 ASC modules, effectively increasing capacity by a factor of 3. Similarly, the Hutchison terminal currently has a small container terminal operation in Brisbane with 3 ASC modules but with the space to increase to 8 ASC modules if future growth occurs.

The only terminal with constraints on future expansion is the Patrick terminal which operates a low-density mode of container stacking using auto-straddle carriers with restricted stacking height. The terminal currently uses most of the available area for stacking containers and hence has limited options for future expansion using this technology.

3.4 Port of Lyttelton, New Zealand

3.4.1 Port Description

Table 3-11 Port of Lyttelton; Summary table (2020)

Measure	Port Botany	Port of Lyttelton
Volume of TEU	2.7 Million TEU	0.45 Million TEU
Number of Container Terminals	3	1
Empty Containers Import/Export	0.9% / 63%	18% / 34%
Transhipments	5%	8%
Road / Rail	85%/ 15%	79% / 21%

The Port of Lyttelton is operated by the Lyttelton Port Company (LPC) who is responsible for the management of the harbour's commercial and recreational facilities. LPC is a publicly listed company with 65% of the shares being held by Christchurch City Council. LPC operates the terminals within the port.

Road freight access to the port is primarily by the Lyttelton Road Tunnel (constructed 1964) and along Norwich Quay which is a road with the port on one side and light industrial / commercial buildings on the other. This road is separate from residential and the main retail areas which are situated along London Street. Rail freight access to the port is via the Lyttelton Rail Tunnel (constructed 1867).

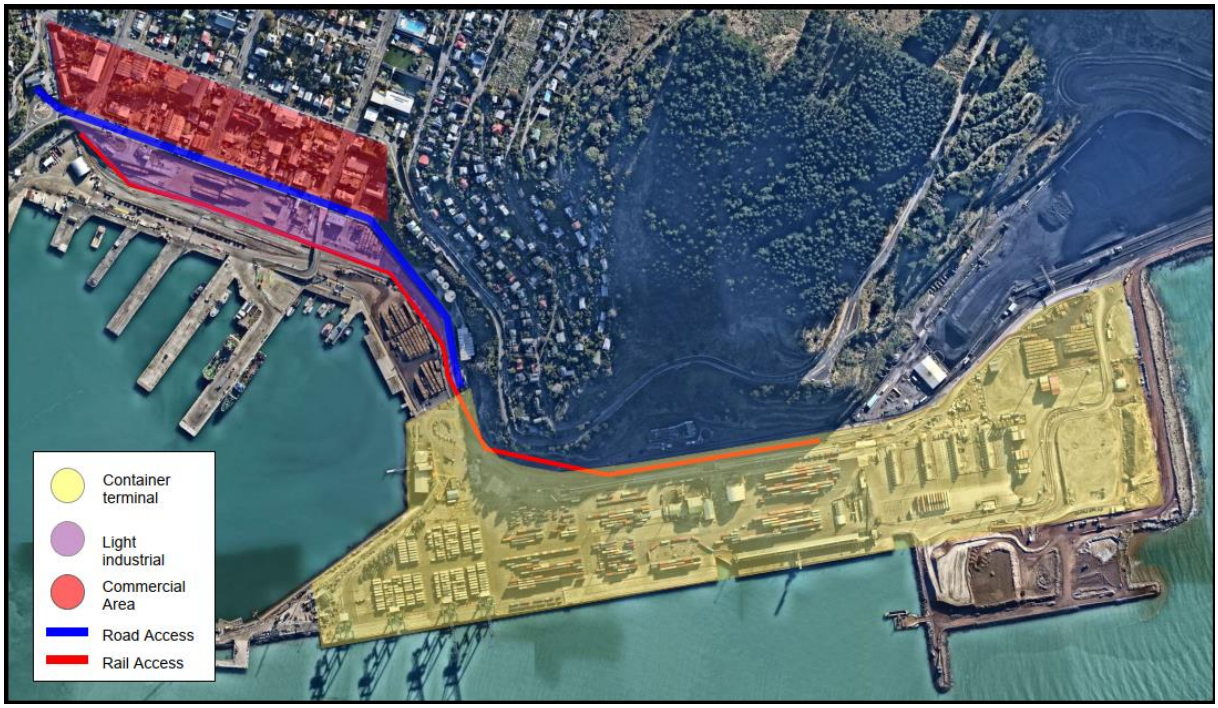


Figure 3-30 LPC; Location of terminal and road/rail transport access and proximity to local zones (119)

The Port provides facilities including container handling, general cargo (fertiliser, gypsum, cement, and non-containerised cargo), an oil berth, a coal berth, cruise facilities, drydock facilities and a marina for recreational berthing. LPC also has 2 inland intermodal ports; MidlandPort and CityDepot at approximately 30 km and 10 km from the port respectively, accessed by rail and road.

The Ship to Shore (STS) container operations are handled by 4 STS cranes and 27 straddle carriers.

The Port's container handling facility processes approximately 440,000 TEUs per year. Container handling is undertaken at a dedicated container terminal on Cashin Quay which was opened in 1976. This facility currently has 3 container berths (Figure 3-30).

The NZ Ministry of Transport publishes trade information to the Freight Information Gathering System (FIGS). Data is supplied individually by the ports. Information is for cargo exchanges, transport mode and movement type. Port performance is only provided for wharfside operations.

The overall throughput for all cargo in the port in 2021 is shown in Table 3-12 and the container growth since 2013 in Figure 3-31.

Table 3-12 LPC; All cargo trade exchanges for 2021

Trade	Cargo Type	Volume	Unit
Containers	Import	207,500	TEUs / Year
	Export	195,500	TEUs / Year
General cargo	Import	745,900	Tonnes /Year
	Export	558,600	Tonnes / Year
Coal	Export	1,187,100	Tonnes / Year
Liquids (Oil)	Import	1,051,500	Tonnes / Year

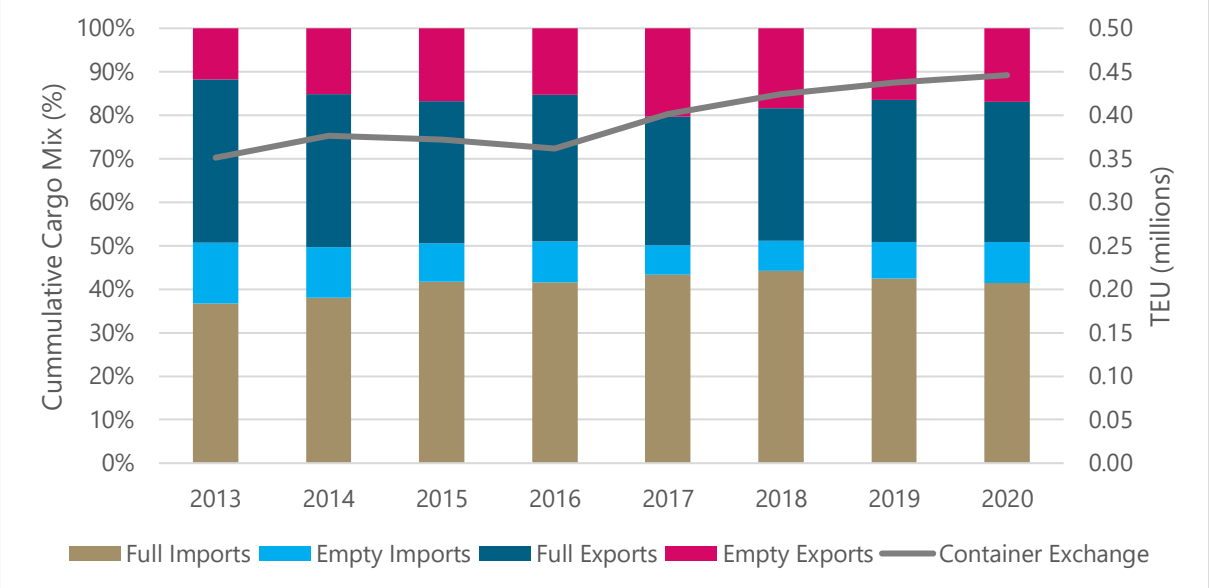


Figure 3-31 LPC; Container cargo mix and exchange between 2013 and 2020, percentages excluding transhipments (120) (121)

3.4.2 Landside Servicing Mode

Movements to and from the 2 inland ports are mainly serviced by train services and make up approximately 20% of incoming and outgoing container traffic (Figure 3-32). The remainder of the containers are serviced by road transport. Coal movements are serviced by rail at approximately 1,140 movements per year. Most of the general cargo is serviced by road freight with approximately 350,000 movements per year.

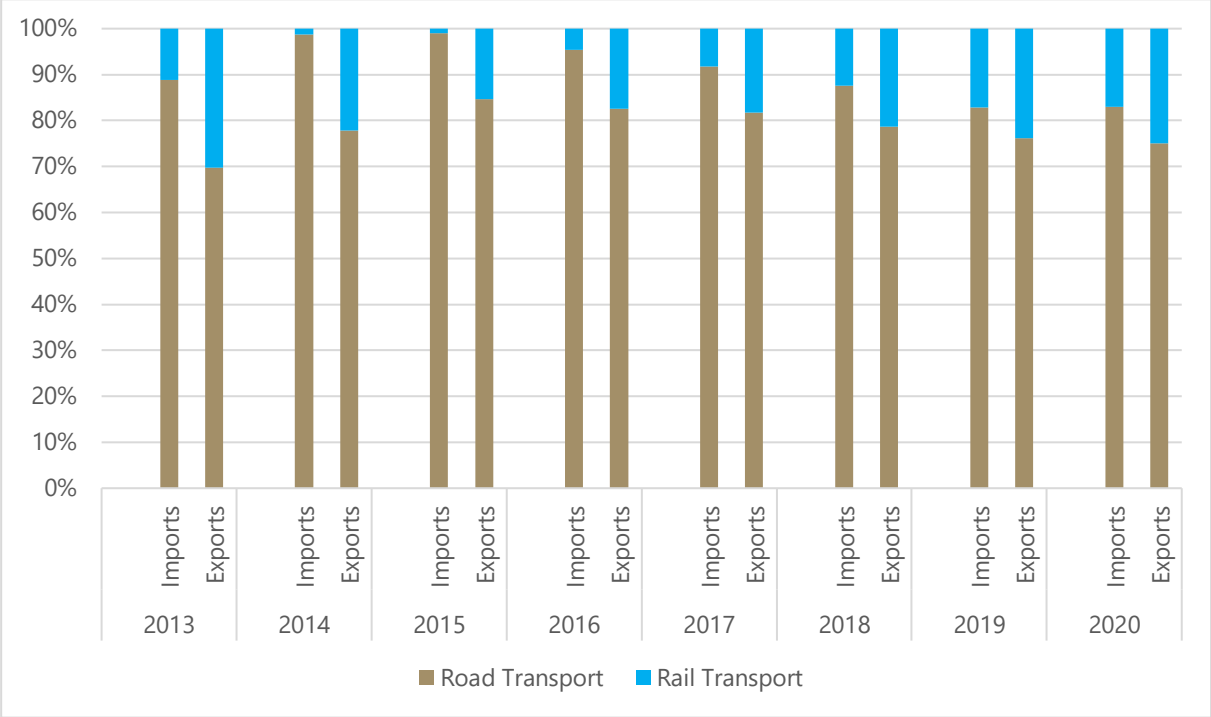


Figure 3-32 LPC; Container transport mode for imports and exports between 2013 and 2020 (121)

3.4.3 Landside Management

3.4.3.1 Vehicle Booking System

LPC uses 1-Stop's VBS which is linked to their Depot Operating System (Depot Pro) and the TOS (Navis N4). 1-Stop is used by all container carriers visiting any LPC site and is a cloud-based system accessed via a website.

LPC allocate carriers bookings in 1-hour time slots allowing a 15-minute grace period either side of the hour that they can arrive within.

After the grace period for the booked time slot carriers can enter the terminal for an additional 30 minutes, however, will be charged an additional off-slot fee.

If the carrier does not arrive within the 2-hour time frame, the booking becomes a no-show and a new booking must be made.

At the terminal's discretion and normally when running ahead of schedule, early receivals (more than 15 minutes prior to the booked slot) will be opened using 1-Stop and trucks can process early for bookings without penalty.

The terminal provides monthly reporting to carriers. Carriers that have a high number of unexplained late/no-show occurrences will be contacted directly and have the bookings more closely monitored.

The following are the associated container charges published for customers on the LPC website.

Table 3-13 LPC; Landside container handling fees (122)

Fee (NZD)	Amount
Slot Fee	$12.50
Off-slot Fee	$ 78

3.4.3.2 Handling of Empty Containers

LPC has a dedicated empty container storage facility at the port away from the active berths. Containers are moved from this yard area for removal by road or rail transport.

3.4.4 Landside Performance

3.4.4.1 Performance Targets

LPC do not have externally set operational performance targets or reporting requirements at the terminal. There is a South Island Port User Working Group (SIPUWG) where fair targets are currently a topic of discussion. Internally the port target for approximately 70% of road visits to be serviced within 30 minutes of arrival at the entrance gate.

The SIPUWG was formed in 2019 and has a focus to promote the key values of health and safety, productivity, chain of responsibility, and compliance between all South Island port companies and their users. Forming the working group was a way for road transport and other industries to develop a stronger and more positive relationship with the port to work collaboratively to help improve communication and accountability between all stakeholders involved in the South Island supply chain.

The members comprise port users from throughout the South Island, including carriers responsible for 90% of road freight movements through Lyttelton Port. The working group also has the backing of the Road Transport Forum, Road Transport Association NZ, National Road Carriers Inc., and the NZ Trucking Association, providing further support from within the transport industry. Group membership has initially focused on container carriers and exporters, other port user groups such as shipping companies, and other cargo carriers including bulk, log, and vehicle, may also join as the group increases its membership numbers (123).

3.4.4.2 Challenges

Peak Periods

LPC have a daily planning session to formulate the strategy for all moves for the following day. This gives visuality to the team on the expected upcoming activities and possible issues. This in turn informs how many straddles/drivers LPC will require for the 24-hour period. If more staffing is required, they can be brought into service specific areas of need.

Landside Challenges

The key challenges faced by the landside team are:

- Vessels being off window
- Vessels calling less frequent but with larger volumes to exchange
- Back-to-back vessels
- Closures due to natural events (predominantly wind).

Over time the port has optimised its operations to cater for the planned shipping schedules. When vessels are impacted by the above listed challenges, this has knock-on impacts on the container yard and landside facilities including surges in containers to receive and/or remove from the yard. The key for the port is to manage the impact on its staff from the additional workload. When the port cannot offer enough slots for container removal, the port will consider providing additional free storage days to carriers. This helps spread the demand for the number of slots required in a 24-hour period.

Where weather has caused the Port to cease operations, carriers will be serviced outside their booked zone. Although technically a no-show, the Port will honour the arrival outside the allocated window. These stops in operations impact the capacity of the port and leads to peaks.

Addressing the challenges

The initial mechanism for addressing the challenges is the collaborative relationship between the Landside Manager and Waterside Manager. When challenges occur, they create a plan to address the specific situation. If delays to landside operations are unavoidable, then road and rail carriers are contacted. LPC will:

- Extend booking times to allow more than 2 hours if required
- Ensure ECP booking time slots are extended so that carriers are unaffected at other sites as a flow on effect of delays at the main terminal. Any off-slot fees would be waived with only the slot fee still applying.

LPC uses their interactive relationship with carriers frequently using the facility to encourage stack runs for moving containers and minimising the number of yard moves required to get to a container. This may mean adjusting the schedule of a carrier to arrive after another container above or in front has been dispatched. This approach maximises the container handling capacity of the port through minimising yard moves.

3.4.5 Future Development

LPC recently completed a series of projects to optimise their operations and increase their capacity. These included:

- A new 230 m container berth
- Sixteen hectares of new reclaimed land
- Four new reefer (refrigerated container) towers
- A new rail siding, doubling the terminal rail capacity
- Capacity enhancements and a rail upgrade at LPC CityDepot
- Two new ship to shore cranes.

In June 2021 LPC commenced a 3-year, $85 million NZD development of the eastern reclamation. By mid-2023 the TEU capacity at the terminal will have increased from the current level of 500,000 to 620,000 TEUs annually. Along with the land development they will have 9 new straddle carriers.

3.5 Port of Tauranga, New Zealand

3.5.1 Port Description

Table 3-14 Port of Tauranga; Summary table (2020)

Measure	Port Botany	Port of Tauranga
Volume of TEU	2.7 Million TEU	1.3 Million TEU
Number of Container Terminals	3	1
Empty Containers Import/Export	0.9% / 63%	45% / 10%
Transhipments	5%	10%
Road / Rail	85% / 15%	57% / 43%

The Port of Tauranga is operated by the Port of Tauranga Limited (POT), a publicly listed company with 54% of the shares held by the Bay of Plenty Regional Council (124).

The Port provides facilities including container handling, general cargo (logs, fertiliser, and non-containerised cargo), an oil berth and a marina for recreational berthing. There are also 2 inland intermodal terminals; Ruakura Superhub in Hamilton (inland port expected to open mid-2022) and Metroport in South Auckland approximately 110 km and 200 km from the port respectively.

The POT operates the container terminal, which has with 3 berths over approximately 770 m of quay line, with 9 ship-to-shore quay cranes. Manually operated straddle carriers conduct container movement between wharfside and the yard and the yard and the landside interface.

In total the POT has 6,216 TEU ground slots at the terminal, with 3,426 dedicated reefer connections. This is supplemented by a capacity of 2,880 TEU at MetroPort Auckland.

Figure 3-33 POT; Location of terminal, and road/rail access, and proximity to local zones; Blue - Road access; Red – Rail access (125)

The total cargo handled by the port increased significantly from 511,300 TEU in 2010 to 1,200,800 TEU in 2021. The split between imports and exports for all cargo types has remained approximately the same at 63% and 37% respectively (Figure 3-34).

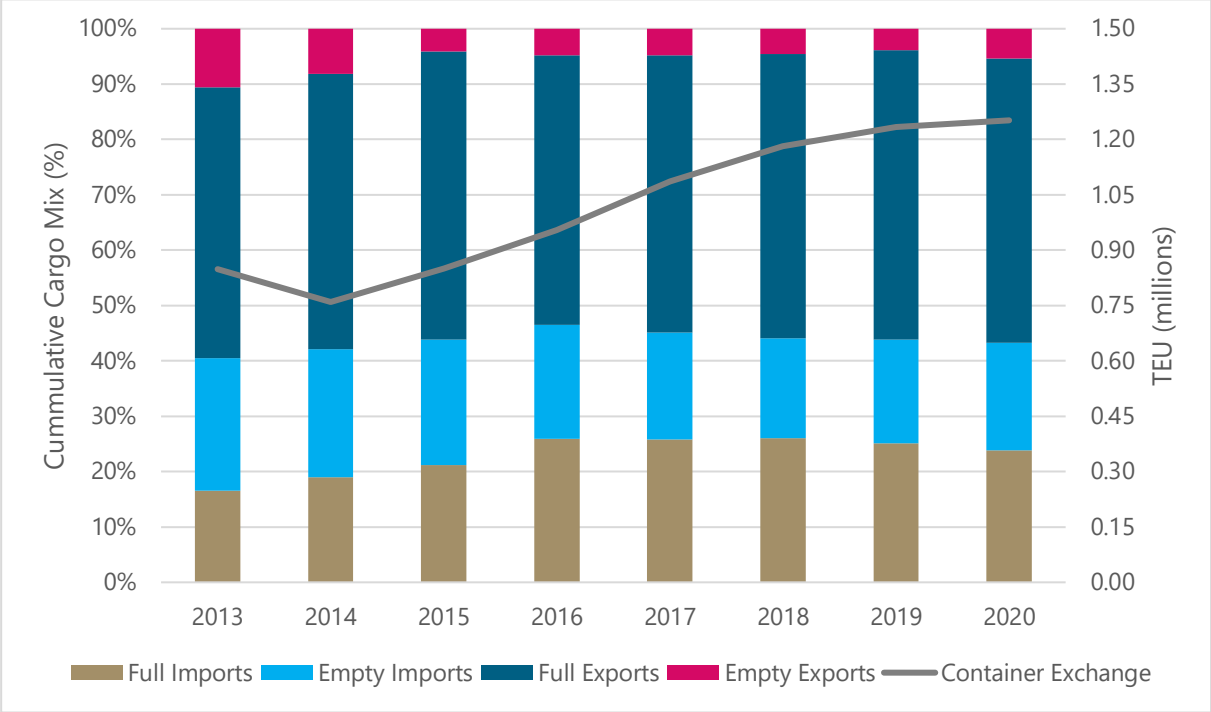


Figure 3-34 POT; Container cargo mix and exchange between 2013 and 2021, percentages excluding transhipments (121) (126)

3.5.2 Landside Servicing Mode

Road and Rail transport access to the port is primarily by State Highway 2 or dual rail carriageways (Figure 3-33) for north and south traffic. State Highway 2 connects to State Highway 1 (which runs the length of the country) south of Auckland. Although they skirt residential areas these routes are primarily through commercial or industrial areas.

Landside container exchanges between the truck and terminal happen in a dedicated location within the terminal, with 10 lanes for pick up and drop off of containers, aimed at limiting queuing.

Rail freight access is primarily from the north along a branch line that feeds directly into the port. KiwiRail provide the rail connection between the intermodal terminal (MetroPort) in Auckland and the port terminal.

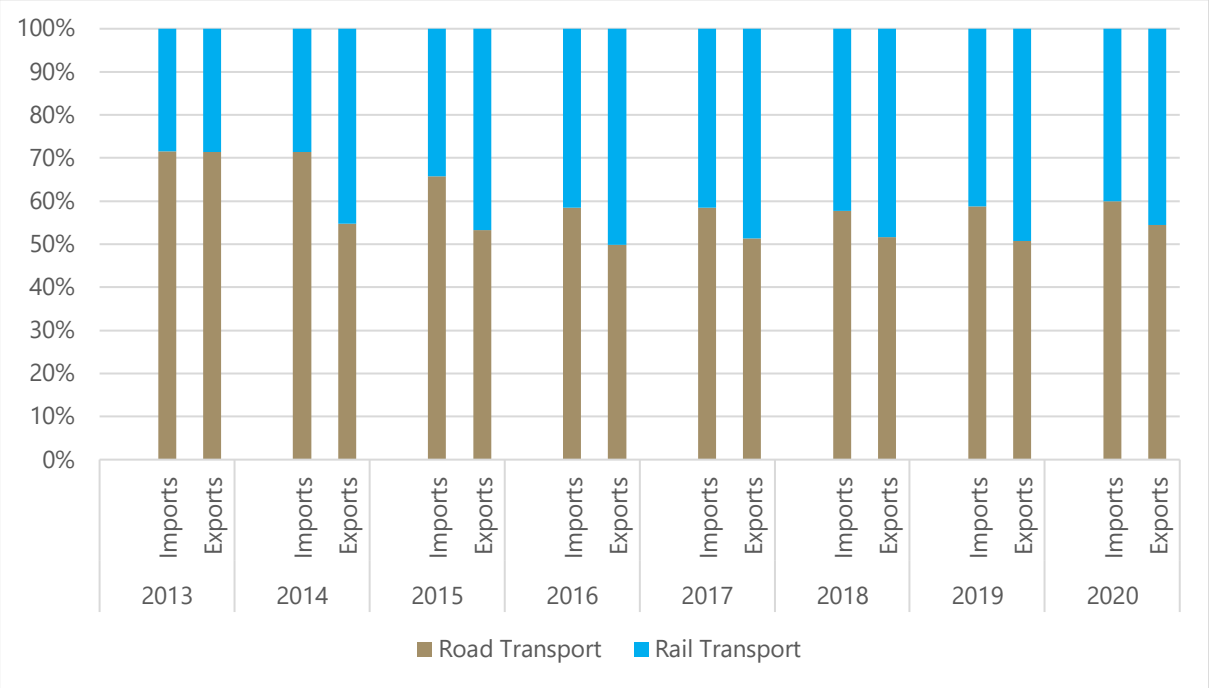


Figure 3-35 POT; Container transport mode for imports and exports between 2013 and 2020 (121)

3.5.3 Landside Management

3.5.3.1 Vehicle Booking System

POT uses a VBS (Containerchain) to smooth arrivals and have mandated an e-gate application for carriers to interact in a contactless manner. The gate in/out process is GPS enabled through a driver application. Operational efficiency for carriers drove the shift to use technology to manage access for road transport. This electronic interaction ensures information is validated which in turn minimises issues when they arrive.

The Port advised the VBS works on the issuing of 30-minute zones with the total arrival window including allowances for 10 minutes prior to, and 30 minutes following, the zone. A booking is a no-show 4 hours after the completion of the booked zone. A cancellation fee would apply for bookings cancelled within 3 hours of the booked zone.

The POT advised that they currently don't apply the off-slot or no-show fees due to delays from local non-port related traffic issues that is impacting carriers beyond their control. The published VBS fees for the port are listed in Table 3-15.

Table 3-15 POT; Landside container handling fees, Peak period is Monday to Friday 0500-1900 & Saturday 0600-1600, Off-peak is all other times (127)

Fee (NZD)	Amount
Slot Fee (Peak/Off-peak)	$ 8.12 / $ 3.05
No-show (Peak/Off-peak)	$ 7.11 / $ 3.05

Fee (NZD)	Amount
Cancelation Fee (Peak/Off-peak)	$ 7.11 / $ 3.05

3.5.3.2 Handling of Empty Containers

Empty containers are understood to be primarily moved via rail transport between the intermodal terminals and the port. The process was described in the Ports 2019 annual report (128).

> "Dedicated trains run 12 times a day between Tauranga and the inland intermodal terminal. Imported containers are transferred to Auckland. Trains are then filled with emptied containers to be shifted to Hamilton, where Fonterra can refill them with exports. The train is reloaded with cargo bound for export from Tauranga. This avoids the need to constantly relocate empty containers via road and sea, reducing lead times and costs for shippers, optimising train capacity and avoiding carbon emissions."

3.5.4 Landside Performance

POT currently do not have any set operational performance targets. The Port monitors TTT which is measured gate to gate. There was an approximate average of 25 minutes from April 2019 to September 2020 with an internal target of 20 minutes.

The Port publishes the real-time average TTT on its website for the current hour, for both the container and intermodal terminals.

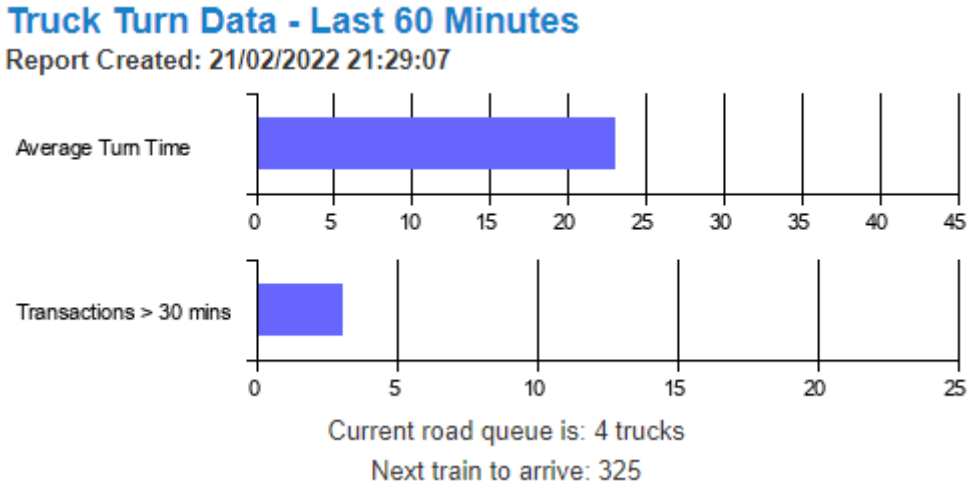


Figure 3-36 POT; Example of published TTT (129)

3.5.4.1 Challenges

The Port advised that much of the increase in cargo volume in recent years has been absorbed without adding significant movements to local highways, due to the use of rail and the growth in transhipment.

From available information the key challenges faced by the terminal for its landside operations are (130):

- Long waiting times for road transport
  - In April 2019, the Port introduced a VBS to help spread truck visits and avoid heavy peaks, but this also relies on trucks arriving on time
  - Congestion outside the terminal can prevent trucks from arriving during their booked zone
- Port of Auckland capacity
  - Large volumes of imported containers have been diverted to the POT due to the Port of Auckland only operating at a third of its crane capacity, resulting in vessels waiting at anchor for 1 to 2 weeks before berthing. This has coincided with the peak export season resulting in congestion across all areas of operations.

In their 2021 annual report the Port stated they are addressing the challenges as follows (124):

- POTs new landside exchange area opened in January 2020 speeds up cargo deliveries and collections from the terminal with 10 lanes (double the previous number). The landside exchange and introduction of the VBS have complemented each other to provide greater capacity for a better spread of trucks throughout the day. This has decreased the average TTT to approximately 20 minutes (with occasional spikes to 30 minutes due to high yard volumes).
- To incentivise deliveries during off-peak periods to address road congestion, reduced slot fees are offered compared to during peak periods.
- The increase in cargo volumes over recent years has been absorbed without adding significant volume to road transport, due to the use of rail and the growth in transhipment.
- POT is lobbying for state highway designation for the nearby Totara Street. It is a busy route that has access to local industry. Such a designation would help fast-track infrastructure improvements (e.g. intersections) for safety and capacity.

3.5.5 Future Development

POT is pursuing several major capital projects to more than double the capacity of the Tauranga Container Terminal:

- Container Terminal Capacity
  - Storage capacity will be further extended with the opening of the intermodal terminal in Hamilton (Ruakura Superhub) in mid-2022. This inland port, along with increased train services to and from the port, will result in an increase in the number of containers that can efficiently be imported or exported through Tauranga.
- Berth expansion
  - The Port has applied for resource consent to extend the container berths to the south of the existing wharves. Stage one of this project would convert 220 m of cargo storage land. This is intended to allow the POT to grow the container throughput to between 2.8 and 3.0 million TEUs.
- Automation
  - POT is pursuing plans to automate container storage at the terminal to increase their capacity within the current land footprint.

3.6 Port of Auckland, New Zealand

3.6.1 Port Description

Table 3-16 Port of Auckland; Summary table (2020)

Measure	Port Botany	Port of Auckland
Volume of TEU	2.7 Million TEU	0.88 Million TEU
Number of Container Terminals	3	1
Empty Containers Import/Export	0.9% / 63%	4% / 53%
Transhipments	5%	4%
Road / Rail	85% / 15%	90% / 10%

Ports of Auckland Limited (POAL), the successor to the Auckland Harbour Board, is the Auckland Council owned company administering Auckland's commercial freight and cruise ship harbour facilities.

POAL has 610 m of quay line with yard operations conducted by manual straddles. POAL is in the process of upgrading to an automated straddle yard operation.

POAL operates seaports on the Waitematā Harbour and the Manukau Harbour, and 4 inland intermodal terminals, South Auckland, Palmerston North, Mount Maunganui, and Waikato. The container terminal operates the landside road exchange 24/7.

The location of the terminal, road/rail transport access and proximity to local zones is shown in Figure 3-37.

Figure 3-37 POAL; Terminal locations and road transport access (131)

POAL has maintained, with some fluctuations, similar levels of container exchange since 2010 with 818,000 TEU of containers exchanged in 2021 (Figure 3-38).

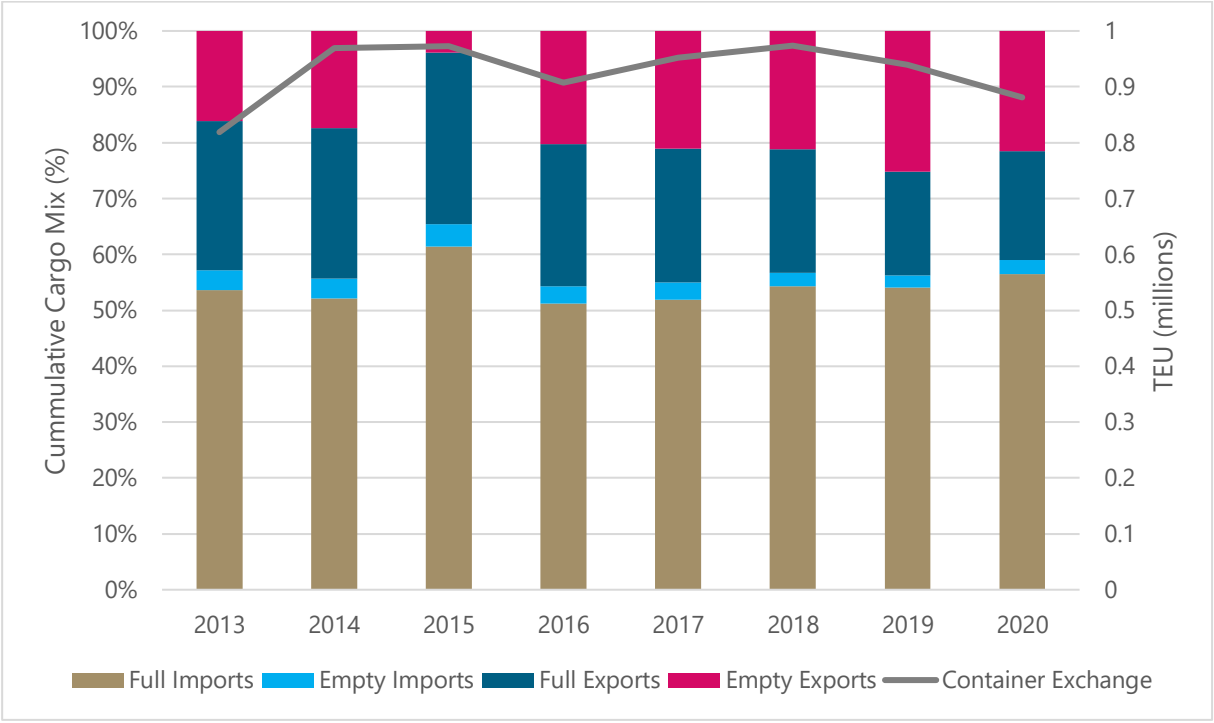


Figure 3-38 POAL; Container cargo mix and exchange between 2010 and 2021, percentages excluding transhipments (132) (121)

3.6.2 Landside Servicing Mode

POAL has a rail exchange within the terminal with 4 parallel rail lines of 500 m each, able to accommodate 128 wagons at a time for the loading and discharge of containers. The container exchange is performed by heavy lift machinery including straddle carriers and reach stackers. The rail exchange connects the terminal with the POAL freight hubs. POAL has a target to increase rail throughput to 30% over the next decade. The rail network enables the POAL to balance the volumes of imports and exports to minimise exporting empty containers (133) (134).

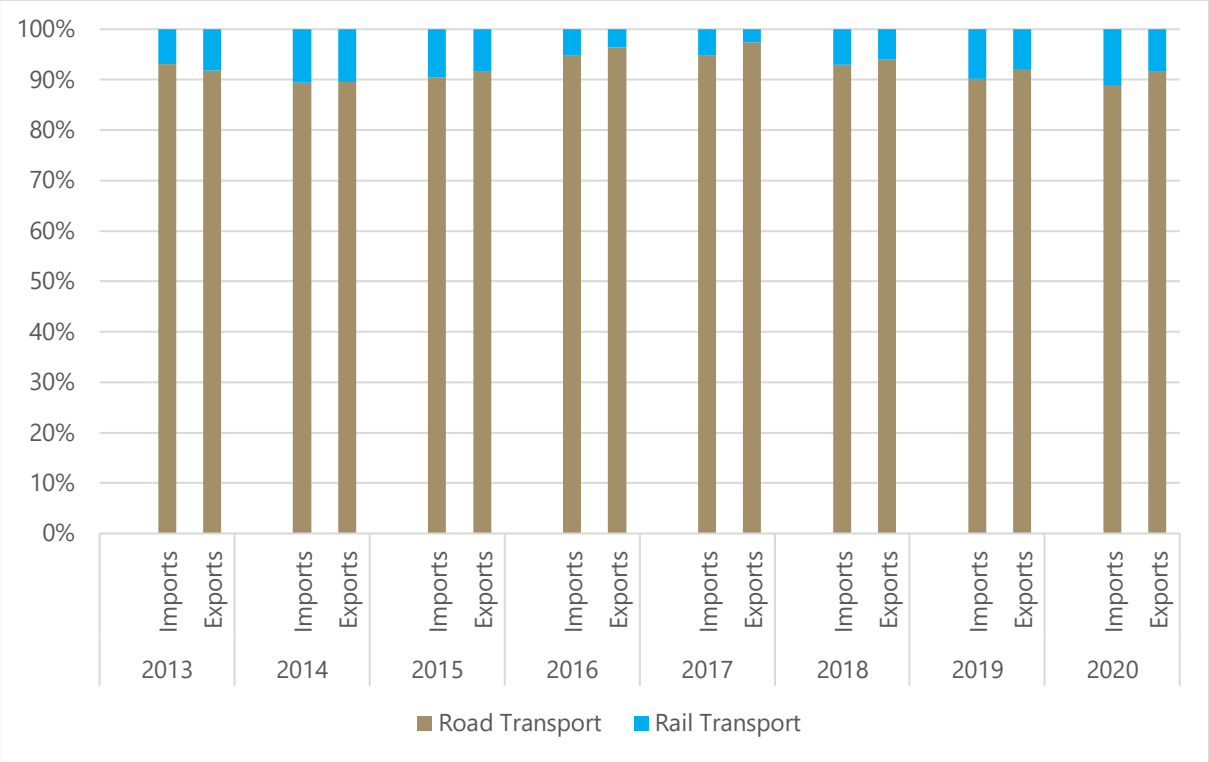


Figure 3-39 POAL; Container transport mode for imports and exports between 2013 and 2020 (121)

3.6.3 Landside Management

3.6.3.1 Vehicle Booking System

POAL operates a VBS for container booking and was understood to be transferring its VBS from using 1-Stop to Containerchain's VBS and eGate/Driver products for all POAL sites in July 2021. The first stage of the implementation was to be the change in the VBS at the container terminal (135).

The change to Containerchain is reportedly to establish a standard approach for carriers when booking slots across the logistics terminals in the Upper North island. The inland terminals Metroport and Southdown already use Containerchain. The guidance for the VBS is:

- The zones will be 30 minutes with 15 minutes early allowance and no late allowance
- Slot fees will apply based on a demand-based pricing model with peak and off-peak rates differing (this is currently not implemented)

- Bookings can be cancelled up to 1 hour prior to the zone
- Bookings within 1 hour of the zone will still incur the booking fee
- Bookings cancelled by the terminal will have the fees waived
- No-show fee will apply if the carrier arrives after the completion of the zone
- Carriers must apply in writing within 2 days to appeal a no-show or cancellation charge. Consideration of the appeal will be at the sole discretion of POAL.

Table 3-17 POAL; Landside container handling fees (136)

Fee (NZD)	Amount
Slot Fee	$ 8.39
No-Show Fee	$ 75

3.6.4 Landside Performance

POAL publishes its TTT in the form of the proportion within 3 categories: less than 30 minutes, between 30 and 60 minutes, and greater than 60 minutes. These values are published as a monthly average. The landside performance for TTT at the terminal since 2010 is shown below. Most years at least 70% of TTTs are within 30 minutes.

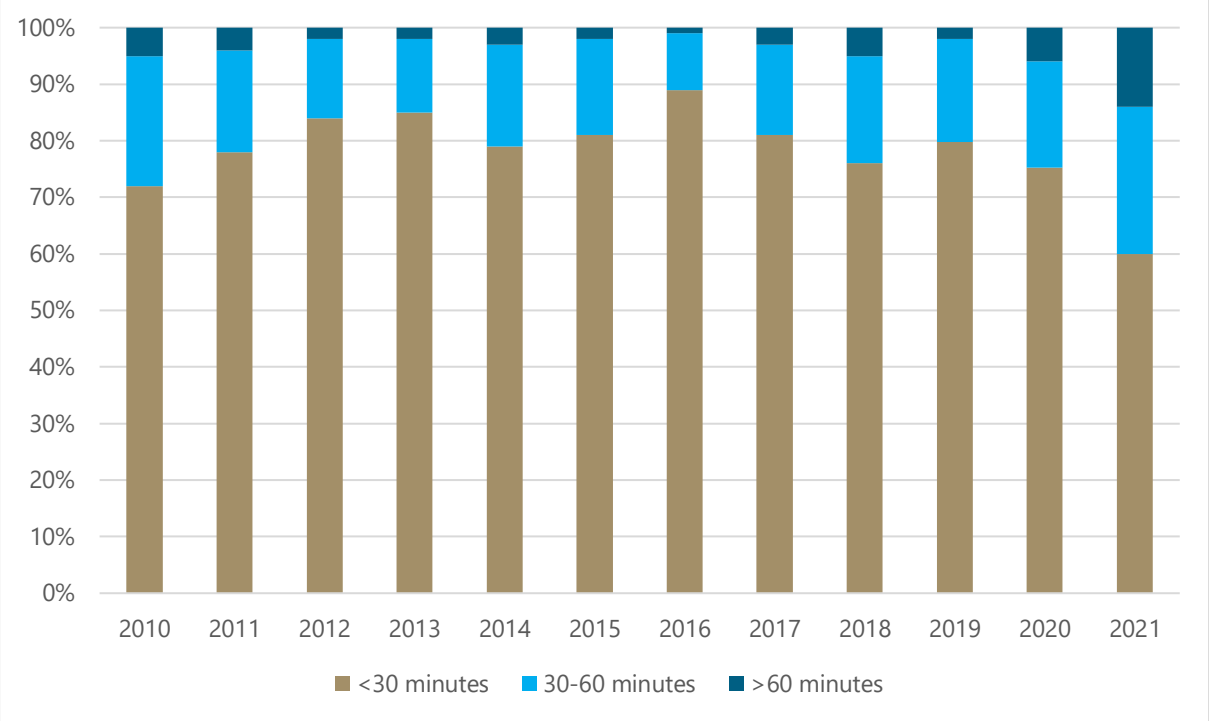


Figure 3-40 POAL; Landside performance TTT between 2010 and 2021 (132)

There has been vessel congestion at POAL throughout the global pandemic with Maersk in 2021 omitting POAL for 11 weeks and concentrating its North Island supply through the Port of Tauranga. Freight was then transported on rail through to the inland container port, Metroport (137). One reason

for port congestion was a labour shortage caused by a continuous peak in import trade, and a need to reduce maximum staff hours (138).

POAL has been completing its automation project which was placed on hold in June 2021 to address safety risks. The automation project was reset with new requirements; at each stage safety, reliability, and performance targets are now required.

3.6.5 Future Development

POAL are in the process of implementing automatic straddles for the loading and unloading of trucks and container yard operations. It will be a hybrid or partial automation as the straddle carriers between the cranes and the yard will remain manual for a higher productivity. The capacity of the terminal will double through the addition of the automation and improvements to terminal layout (138).

4 Conclusion

Advisian has undertaken a comparative analysis of:

- International approaches to government regulation of landside container management at key cargo ports of relevance for the PBLIS review
- Approaches in Australia and NZ for managing the landside container interface at cargo ports
- Operational experience over the past decade, particularly relating to landside transport.

Table 4-1 List of ports investigated by region

North America	Europe	Southeast Asia	Australia	New Zealand
Port of Los Angeles	Port of Valencia	Port of Manila	Port of Melbourne	Port of Lyttelton
Port of Long Beach	Port of Rotterdam		Port of Fremantle	Port of Tauranga
Port of Vancouver	Port of Antwerp		Port of Brisbane	Port of Auckland
Port of Seattle				
Port of Tacoma				

New regulations, new and improvements to systems (VBS, PCS), performance requirements, introduction of higher capacity vehicles and changes in operations has seen improvements in port efficiency over the last 10 years. There has been increased container handling rates at all the ports investigated, and in many cases a reported reduction in paperwork. However, performance associated with wharfside operations, landside operations, carrier operations, physical and IT infrastructure is all highly inter-related. Due to this it is difficult to provide statistics showing the improvement or negative impact of one individual change on the overall system. Overall, the study has found:

Performance measures

- Most ports have publicly available landside interface performance measures. For some terminals these are live while others are provided on a historic basis. Data is usually collected directly by the terminal.
- The most common landside metric used to assess performance is the TTT (measured from gate entry to last container movement or gate exit). It is common for a terminal or port operator to share the real-time TTT metric on their website along with camera footage of the gates, and in some cases the wait time at each gate is also available.
- In Australia and NZ port level data (performance and cargo information) is self-reported by terminals to the government. This is replicated in Melbourne at a terminal level with voluntary reporting to Freight Victoria. Additionally, Freight Victoria has introduced a voluntary pricing protocol (process around price changes) that all the terminals have accepted and has resulted in greater transparency with industry. A similar system is being considered at a national level.

Government regulation

- Some ports have government regulations, or requirements from the landlord port operator, about the landside interface, generally around the requirement to use a VBS and/or environmentally friendly engines. This however can vary significantly based on the country or port.
- In North America all the investigated ports require carriers operating into and out of their container terminals to be licensed with the port. The original licence requirement was an initiative to direct trucking companies to use cleaner diesel engines. This has been expanded to require access through scheduling of bookings to address congestion. The result has been a decrease in the number of companies servicing the ports due to these requirements and associated compliance costs.
- The management of the operations are generally left to terminal operators with port operators and regulators preferring to facilitate infrastructure improvement rather than be involved with regulating levels of service. Only at the Port of Valencia is regulation in place that provides carriers with compensation in the event of delays. However, this regulation has no government oversight, leaving the terminal operators to self-manage their compliance, often with carriers unhappy with the outcome.

Performance requirements

- It is uncommon for port operators through their lease agreements with the terminal to include operating or performance requirements however the terminals can be required to submit data on wharf and landside performance to the port, but without any associated requirements. Only the Port of Fremantle reported to use performance requirements to influence behaviour at its leased facilities, with incentives (variable portion of rent) in the lease agreement for meeting the set targets associated with improving cargo flow through the port.

Vehicle Booking Systems

- Over the past decade terminals have moved heavily towards VBS to assist with management of terminal operations. Those ports that do not have a VBS are investigating the installation of a system.
- At most of the ports investigated a VBS was used for managing bookings, with each terminal generally deciding on the specific software used. Generally, 1-hour zones are issued with a specific allocation of slots available within each zone decided by the terminal (one slot is required for each container). The zones include an allowance each side for arriving at the terminal gate.
- For the international ports investigated, arriving outside of the booking time including allowances will result in a new booking required for access, and the original booking fee is forfeited.
- In Australian and NZ, it is typical that following the completion of the zone carriers arriving are allowed entry for a few hours (the time varies by terminal operator) however, an additional fee can be charged.
- In the Port of Manila all transactions within the VBS are made with pre-purchased points. Each point is equivalent in value to the local currency. The use of points simplifies the transactions especially around refunds, and guarantees that payment is received prior to the rendering of services.

Advanced booking

- Terminals in both Australia and the Port of Manila reported using an advanced booking system. They were generally terminals where the yard is split into modules with dedicated equipment for each module, landside transfers and wharfside transfers. Bookings are made for a specific module; therefore, the yard position of the container is required prior to making a booking. This contrasts to a terminal that has shared yard resources (e.g. straddle terminal) where the yard position of the container is not important to the booking and can therefore be attached later.
- A benefit is carriers can only book import slots when required and not in expectation that the containers will be ready, reducing wasted slots. On the other hand, the high demand for slots can mean that the time between the container being ready and the next available slot can be longer than preferred.
- Where advanced booking is not used, carriers can book slots without an attached container but based on their available labour force. If a particular container is not available for collection it can be swapped for another anywhere in the yard. Alternatively, if a more recently landed container has higher priority, it can be swapped for a previously booked container. However, carriers can also book slots without containers, which are then not used if a suitable container is not available.

Vehicle Booking System fees

- Differential pricing for slot times is limited in its application in the ports investigated, with only the Ports of Los Angeles and Long Beach, the Port of Tauranga, and the Port of Manila having an active program. At the Ports of Los Angeles and Long Beach an additional fee is charged to access the port during peak periods that is then paid to the terminals to cover the cost of operating the landside interface during off-peak periods. The system is credited with helping to decrease congestion during peak hours.
- Fees are associated with VBS use at all the ports investigated. Australia and Manila are unique in allowing booked arrivals outside the booking window, however additional fees are charged for this feature and a penalty if the booking is missed. The Ports of Long Beach and Los Angeles only recently introduced the booking fee to address carrier abuses of the system. The specific VBS fees for bookings can vary by terminal operator. While publicly available in Australia and the Philippines, they are generally not publicly available for the international ports investigated.
- Feedback from industry in Australia is that the fees associated with the VBS (booking, off-slot, no-show) are high and continue to increase with little change to terminal performance. It is believed that the off-slot and no-show fees are a penalty rather than reimbursement of costs and do not result in greater efficiency of the carriers.

Port Community System

- All the European ports investigated had a PCS. The services offered depends on the engagement from stakeholders and the integrations to the platform. Some services may be accessed through the PCS or separately. The PCS is primarily used for the exchange of information between all parties within the port supply chain.
- The availability of real-time information about container status and congestion levels (Valencia) has improved the ability of carriers to plan trips to the port. Only the Port of Rotterdam and the Port of Valencia had their respective booking systems integrated into the PCS.

- Sharing information through the PCS allows the maximum reuse of information and has reduced the number of communications required among stakeholders by providing a single location for all documentation including to the Harbourmaster and Customs.

Staging of containers

- Within Australia there has been a move to staging containers at a depot (normally carriers depot) rather than transporting directly between the terminal and customer.
- Staging allowed carriers to utilise specialist fleets for specific destinations, with high-capacity trucks used for movements between the depot and the port, and lower-capacity trucks for movements between the depot and customer. Similarly, country or long-haul carriers not setup for access to the port can drop containers to a carrier that can access the terminal.
- When it comes to empties, staging is often required due to ECP having limited operating hours and the requirement that specific empty containers be returned to specific ECPs (shipping lines want their containers returned to their ECP).

Trucking and rail

- Most of the ports investigated are interested in increasing the share of cargo movements that are completed via rail. The ways this is being done is through:
  - On dock rail: at container terminals, terminals have an incentive to shift containers by rail if the siding is within the terminal, as they can shift large numbers at once. When the siding is located elsewhere an additional truck movement is required and the movement is no different to a normal road exchange or stack run.
  - Subsidies: The Port of Antwerp is providing subsidies to lessen the cost of rail transport through the intermodal terminal at the port and the port shuttle service to the terminals.
- North American carriers generally have GPS systems which track the truck, with the tags read and tracked by the terminal, local dispatch, or a third-party VBS. GPS or RFID tags are required on all port-licensed trucks, allowing the port operator to track and report on TTT and wait times.
- HPFV are common especially for carrier fleets focused on container movements to and from the port. HPFV carry up to 4 TEU, on a single trip potentially 8 TEUs can be exchanged at the terminal, delivering exports, and collecting imports.

Table 4-2 contains a summary of the performance measures, regulations/performance requirements, structure, and operational experience for these ports.

Table 4-2 Conclusion summary of ports investigated

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Ports of Los Angeles & Long Beach	Long Beach publishes a Weekly Advance Volume Estimate (WAVE). The report provides a forecast of the expected activity at the port over the following week.	Port registration and licence required for carriers to operate within the port precinct. The Clean Truck Program calls for carriers to replace older trucks working at the ports. PierPass charges carriers for bookings during peak times, and then pays the terminals to operate landside during off-peak.	To obtain a port licence a carrier must meet several obligations including using a VBS and abiding by clean truck regulations. The addition of PierPass to the VBS is credited with reducing TTT from 2 hours to 58 minutes over the last decade. This has been through reducing peak periods by incentivising off-peak movements.	To address carrier abuses (multiple bookings for a single container, no-shows) of the VBS, a booking fee has been introduced. To address road congestion trucks queueing on the road prior to their booking time are subject to fines from local police. These actions have reduced carrier VBS abuses and road congestion. Some terminals have rebates based on a high percentage of meeting the booking times and providing the correct container data. The clean truck program and the registration requirements has resulted in only the larger carriers having access to the ports. The largest threat to a carrier is the loss of the port licence, abuses of the VBS can result in losing that licence.
Ports of Vancouver	The waiting time at the terminal pre-gate and the TTT are collected through truck GPS and publicly published live.	The Canadian Federal Government introduced a Truck Licensing System (TLS) for all Canadian port authorities. Enforcement and administration are by the Province of British Columbia via an appointed Container Trucking Commissioner. The Port of Vancouver has launched a Smart Fleet trucking strategy for the purposes of managing carriers within the port.	The TLS licence includes a rolling truck age program (<10 years), and an access agreement that requires truck registration and the use of a VBS. One requirement of the Smart Fleet trucking strategy is all trucks to be equipped with GPS for the tracking of landside performance. Terminal/carrier access agreements requires the use of a VBS to enter a marine terminal. Long-haul trucks can enter the port with an advanced registration and are not required to use the VBS.	The 4 container terminals have agreed to use the same internally developed platform with the Port monitoring compliance. These programs have resulted in a reduction in the number of registered carrier companies from 2,000 to 85. Having a group of drivers who frequently visit the terminals, increases the industry knowledge of the terminal and the processes required. This combined with the introduction of a VBS, limiting arrivals to the booking window, and regular night gates reduced the TTT from 70 minutes in 2015 to 40 minutes in 2021.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Ports of Seattle & Tacoma	The NWSA publishes the live camera feed and TTT for each terminal gate on its website.	The NWSA joined the Port of Vancouver in adopting trucking guidelines to promote the use of cleaner engines and cleaner fuels.	The NWSA Clean Truck Program requires a port licence for access, engines less than 10 years old, and all trucks be equipped with a RFID tag. The port licence requires all bookings be made through the VBS. NWSA is offering a USD10,000 grant to registered carriers to upgrade their engines to be within the Clean Truck Program.	To address congestion NWSA has created several off-terminal parking areas for short and long-haul trucks.
New York and New Jersey	There is no public visibility of landside performance data for the terminals within PANYNJ.	The PANYNJ requires all trucks accessing the terminals to be registered with the Port.	The requirements for registration are a valid TWIC (identification card), Commercial Driver's licence, insurance, & driver registration with PANYNJ, engines must also be less than 10 years old. A VBS is not required by PANYNJ but is highly encouraged.	A few terminals do require carrier bookings for access. Carriers with bookings can use several specific gates for entry within their booking time. Carriers without bookings or outside their time must queue in a separate lane for a limited number of gates.
Port of Valencia	There is no public visibility of landside performance data for the terminals within the port.	A compensation system for delays to carriers accessing the terminals at the port is in place. The requirements for compensation from government legislation outlined in Law 15/2009, on the land transport of goods contract with Article 22. Stoppages	The compensation system applies for a truck delayed within the terminal gates for more than 75 minutes. The compensation is based the length of the delay. The government and the Port do not take an active role in the application of the law with each terminal responsible for its implementation. A Transport Order system is used for bookings. An order is generated for each agreed exchange between the terminal and carrier. The order is valid for 3 days during which time the driver can decide when to visit the terminal. The system is accessed through the PCS. Drivers can also see the status of containers to check for issues prior to pick up.	The compensation system is a sensitive issue for carriers as there is no clear guidance on the requirements. Terminals make it complicated to claim and have many exceptions leading to most carriers giving up their claim when the only resolution is to pursue a legal remedy. Carriers prefer the Transport Order system over a VBS as the lack of a set booking time and wider pickup window (3 days instead of 1 hour) provides greater flexibility in their operations. The terminal operator manages its service levels based on the number of currently valid transport orders.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Port of Rotterdam	There is no public visibility of landside performance data for the terminals within the port.	The Port, local government, and Ministry of Infrastructure introduced the Maasvlakte Air Quality Agreement 2008, which created access requirements to enter Maasvlakte (area of the port with all deep-sea container terminals). Enforcement of the access requirements is through camera surveillance with licence plate recognition.	The development of the Maasvlakte area led to increased road activity. To improve the air quality in the local area, trucks that enter the Maasvlakte area are subject to additional requirements for registration. They must be fitted with an engine less than 7 years old and rated to Euro VI emission standards. A VBS is available for all container terminals at the port through a PCS.	There was initially resistance to the introduction of VBS from carriers due to the additional fee and increased paperwork (previously handled by the terminal). To handle the container volume the Port sees the VBS as necessary and successful with a TTT generally of 30 minutes.
Port of Antwerp	There is no public visibility of landside performance data for the terminals within the port.	The Port introduced Certified Pick up. It is a container release process based on authorised identification. The Port and the Flemish Government have introduced a port wide ordinance for increased mobility of port equipment. They have also jointly introduced subsidies for rail services and intermodal terminals.	Certified pick-up requires approval prior to all import container collection (regardless of transport mode). This system is a separate requirement to the VBS used by each terminal. The cargo owner must release the container to the carrier and the terminal must release it as ready. The approval is linked to the driver's ID card, used for terminal access. The traffic ordinance is intended to smooth cargo transfer between local operations by allowing port vehicles (e.g. straddle carriers) access to public highways around the port. Rail subsidies were introduced to assist with increasing the number of rail services and reduce the cost of bundling containers from different terminals. The Port has a PCS in operation.	The Antwerp PCS is used to improve efficiency in the supply chain at the port. It is an initiative by the Port and the industry association that is provided by a third party. The intention with the PCS is that several services are offered to the users through a common platform. The exchange of information is through standard international formats that allows exchange between other applications. Many services relate to the relay of container information and status updates between stakeholders. Being able to access this information on a single platform reduces the communication required to update all stakeholders. The reduction in duplicate communication across the industry reduces the administrative burden, increasing the efficiency in managing port operations including landside movements.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Port of Manila	There is no public visibility of landside performance data for the terminals within the port.	The port is owned and regulated by the PPA with the terminals leased to private companies. The terminal operators are responsible for operations with the PPA overseeing / supporting through the issuing of directives. The Manila city council, to address congestion in the city enforces regulations restricting the movement of vehicles within the city. For trucks this has been bans during periods of the day and restricted access to routes in the city. The introduction of the VBS was a collaborative effort between the terminal operators and the PPA with a regulation issued that detailed the structure and mandated use of the VBS. High yard volumes at the port were contributing to lower port productivity. To improve cargo flow the BOC implemented the requirement for a loading permit (SPTL) for empties delivered to the port area.	The use of a VBS is required at the 2 international container terminals. Booking zones are classified by demand with specific rules, fees, and penalties for each demand category. Demand categories include free and rebate categories. Payment transactions within the VBS are by using points rather than the local currency. A point is equivalent to a Philippine Peso. Points are pre-purchased with all VBS bookings requiring pre-payment. This system simplifies the payment process associated with the VBS. The SPTL only allows empties to be delivered to the port within 72 hours of loading, this has reduced volumes at the port and encouraged the use of empty depots outside the port area. There was some push back on having to use off site depots due to the additional cost.	There was no formal land interface system at the port before VBS. Trucks would queue outside the gates waiting for their turn to deliver or collect containers. Wait times could exceed 1 day. Queues at the port would create further congestion in the surrounding areas impacting the local community. The introduction of a VBS improved congestion at the port with there no longer being an issue with queuing. Journey planning only requires consideration of the city congestion. Trucks able to make 2-3 visits to the port per day compared to one prior to VBS. Trucks with valid bookings were exempted from truck bans after VBS introduction. Trucks are restricted to traveling on specific routes, however these routes often have dedicated lanes for trucks with valid bookings. Initial pushback on the VBS was based on having to learn the new system, the additional burden to make bookings and the high fees associated with bookings and penalties. Port stakeholders now generally support the VBS given improved landside performance at the port.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Port of Melbourne	There is no public visibility of landside performance data for the individual terminals. For all the Australian ports investigated BITRE publishes the Waterline statistical report on wharfside and landside productivity. This information is aggregated at a port level.	Freight Victoria introduced the Voluntary Performance Monitoring Framework (VPMF). which includes the Voluntary Pricing protocol (VPP) and the Voluntary Port Performance Model (VPPM). The Port requires terminals as part of their lease to manage their traffic and not cause hazards on the port roads. Local restrictions (bridges) on HPFV increases the number of trucks on local road networks.	The VPP was implemented to provide transparency around landside pricing with a protocol that includes providing reasons for the change, a feedback period, publishing of feedback themes and a response. The VPPM was implemented to provide visibility on landside performance. Terminals submit data each month. The terminals were onboard with providing data aligned with BITRE, and the voluntary model has assisted with building relationships without pressure of regulation. All terminals operate a VBS. VICT uses Advanced Booking which requires the container to be in the yard to be booked for pick-up.	Freight Victoria has received fewer complaints regarding pricing from industry since VPP was introduced, with the assumption being that the increased notice on changes allows industry time to adjust their rates. The general feedback from industry was that VBS fees are too high and increased frequently. Delays can occur with Advanced Booking between a container being ready and the next available slot, especially if peak times are preferred. The other terminals allow slots to be booked without a specific container attached. Staging of containers at carrier depots is common even with empties. Staging empties is due to the ECP limited operating hours and the need to return specific containers to each park. Congestion can result due to the lack of TMA. The Port advised there is some short-term parking on the roads leading into the port however, the lack of parking is an issue raised by industry, with no truck parking areas at the port. VICT only has a TMA for trucks within their zone.
Port of Fremantle	There is no public visibility of landside performance data for the terminals within the Port of Fremantle. The Port is installing cameras that will recognise types of vehicles and load carried for increased real-time data on movements.	The Port uses performance requirements to influence behaviour at its leased facilities (container terminals and ECPs). The agreements include both incentives (variable portion of lease) and performance requirements.	Terminal KPIs are focused on improving the flow of cargo. Fortnightly data is provided with deficits to be addressed. KPIs include proportion of volume during off-peak, minimum number of slots, average TTT, proportion of volume by rail. All terminals use a VBS. A CMS is in place with a TMA. The terminal can activate the CMS, which directs carriers to the TMA to prevent congestion on the road. The	Off-peak stack runs are common for shifting large volumes for containers (full and empty), freeing up the peak times for smaller carriers that don't operate 24/7. Staging of containers is common (80% of the full imports by road). Rather than being supplied directly to the customer from the terminal they go via a depot. This has relieved pressure on the carriers as they can focus solely on port collections.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
			TMA operates as a remote gate with carriers called up in the order they arrived.	
Port of Brisbane	There is no public visibility of landside performance data for the terminals within the Port of Brisbane.	The Port has leases with the terminals that requires the provision of performance data to the port, but the data is based on monthly averages and hence of limited relevance. The Port has approved the use of high mass HPFV within the port precinct. Trucks are allowed to park on approach roads within the port.	High mass HPFVs have been approved for 2 decades, but only within the port, due to their high payload. All 3 container terminals operate a VBS, Patrick and DPW use the 1-Stop system and Hutchison uses a similar internal system. DPW uses Advanced Booking. The Port hosts a landside logistics forum every 3 months where issues affecting the industry can be raised and the industry can be informed of proposed changes. This forum is very popular and well attended.	Carriers based outside of the port precinct adopted a lower payload HPFV approved on general roads to achieve the same efficiency as those within the port precinct. DPW believes Advanced Booking "evens the playing field" between carriers, as bookings can only occur for a container that is ready versus booking for preferred slots. No issues with the availability of slots after landing in the yard were reported. Queueing is uncommon as there is sufficient capacity within 2 of the terminals to wait if needed. There is no measurement or monitoring of congestion and no means for the port to influence outcomes if queuing does occur. The use of staging has allowed economies of scale in carrier fleets. A dedicated fleet of HPFV can be used for port visits and a lower capacity fleet for customer transits. Under-utilised off-peak zones are due to limited demand by industry, with only one terminal operating 24/7. There are high labour costs to maintain a consistent night shift and overall container volumes are catered for in normal operating times.
Port of Lyttelton	There is no public visibility of landside performance data for the terminal. The NZ Ministry of Transport; FIGS publishes self-reported port data.	The South Island Port User Working Group (SIPUWG) is currently in its early stages having been formed in 2019. One of the topics that will be discussed is fair targets for container operations however, it is still early in the process	The Port uses a single VBS for its container and intermodal terminals. The Port has internal targets for approximately 70% of road visits to be serviced within 30 minutes of arrival at the entrance gate.	The terminal provides monthly VBS reporting to carriers with direct contact if a high number of unexplained late/no-show occurrences are occurring. In the event of a terminal issue, booking times are extended or alternatively storage fees are waived. The same would be considered at the ECP to avoid flow on impacts.

	Performance measures	Regulation / performance requirements	Model structure and performance	Operational experience
Port of Tauranga	The Port publishes live on its website the current real-time average TTT for the hour at the container and intermodal terminals.	There are no regulatory requirements or performance targets.	The Port uses a VBS with the gate in/out process GPS enabled through a driver application. Reduced off-peak booking fees are used to encourage spread of arrival times.	The electronic interaction with the driver application ensures information is validated, minimising issues on arrival. Late arrival or no-show fees are currently not enforced due to non-port related traffic issues that are impacting carriers. A new landside truck exchange provides expanded capacity for truck bays at the terminal allowing more trucks to be serviced at the same time. This combined with the VBS which limits the number of bookings per zone, spreading operations over the day, has decreased average TTT to 20 minutes.
Port of Auckland	The Port publishes landside performance data monthly to its website.	There are no regulatory requirements or performance targets.	The Port operates a VBS and was understood to be transferring its VBS between providers (1-Stop to ContainerChain) for all its sites in July 2021. The change is to establish a standard approach for carriers when booking slots across the logistics terminals in the Upper North island.	The Port has published that they will use a demand-based pricing model however this is yet to be implemented with off-peak and peak fees currently set the same.

5 References

1. **NSWPorts.** News and Resources - NSW Ports Trade Report. [Online] January - December 2021. https://www.nswports.com.au/resources.

2. **Google Earth.** Map showing United States and Canada. 2015.

3. —. Map showing Western Europe. 2015.

4. —. Map Showing the Philippines and surrounds. 2015.

5. **The Port of Los Angeles.** About Container Statistics. *The Port of Los Angles Website.* [Online] 2021. https://www.portoflosangeles.org/business/statistics/container-statistics.

6. **Port of Long Beach.** Port statistics. *Port of Long Beach Website.* [Online] 2021. https://polb.com/business/port-statistics/#yearly-teus.

7. **The Port of Los Angeles.** Terminal Map. *The Port of Los Angles Website.* [Online] https://www.portoflosangeles.org/business/terminals/terminal-map.

8. **Port of Long Beach.** Documents - Facilities Guide 022421. *Port of Long Beach Website.* [Online] March 2021. https://polb.com/documents/#fact-sheets.

9. **PierPASS.** PierPass Website. [Online] https://www.pierpass.org/.

10. **United States Department of Transportation - Federal Highway Administration.** *FHWA Operations Support - Port Peak Pricing Program Evaluation.* 2009.

11. **Port of Long Beach.** Wave (Weekly Advance Volume Estimate). *Port of Long beach Website.* [Online] https://polb.com/port-info/wave-weekly-advance-volume-estimate/.

12. **Vancouver Fraser Port Authority.** Reporting, statistics, resources - Statistics Overview. *Port of vancouver Website.* [Online] 2008-2020. https://www.portvancouver.com/about-us/statistics/.

13. **Google Earth.** Map showing Vancouver. 2019.

14. **Vancouver Fraser Port Authority.** Juristictional map. *Port of Vancouver Website.* [Online] https://www.portvancouver.com/port-dashboard/jurisdictional-map/.

15. **Google Earth.** Map showing DP World Fraser Surrey Terminal. 2019.

16. **Vancouver Fraser Port Authority.** Smart Fleet trucking strategy. *Port of Vancouver Website.* [Online] https://www.portvancouver.com/truck-rail/truck/smart-fleet-trucking-strategy/.

17. —. Supply chain performance - Trucking metrics. *Port of Vancouver Website.* [Online] https://www.portvancouver.com/port-dashboard/supply-chain-performance/.

18. —. GPS Dashboard. *Port of Vancouver Website.* [Online] https://www.portvancouver.com/port-dashboard/gps-dashboard/.

19. **The Northwest Seaport Alliance.** Cargo Statistics - NWSA Historical Cargo Statistics. *The Northwest Seaport Alliance Website.* [Online] https://www.nwseaportalliance.com/about-us/cargo-statistics.

20. —. Terminals - Facilities Guide. *The Northwest Seaport Alliance Website.* [Online] https://www.nwseaportalliance.com/cargo-operations/terminals.

21. **Google Earth.** Map showing Port of Seattle. 2020.

22. —. Map showing Port of Tacoma. 2020.

23. **The Port Authority of New York and New Jersey.** Facts and Figures. *The Port Authority of New York and New Jersey Website.* [Online] https://www.panynj.gov/port/en/our-port/facts-and-figures.html.

24. —. Container Terminals. *The Port Authority of New York and New Jersey Website.* [Online] https://www.panynj.gov/port/en/our-port/container-terminals.html.

25. **Port Authority of Valencia.** Foreland 4.0. *VALENCIAPORT Website.* [Online] https://www.valenciaport.com/en/business/foreland-4-0/.

26. —. Publications - Statistical Yearbook. *VALENCIAPORT Website.* [Online] 2010-2012. https://www.valenciaport.com/en/publicaciones/.

27. —. Port of Valencia. *VALENCIAPORT Website.* [Online] https://www.valenciaport.com/autoridad-portuaria/infraestructuras/terminales-e-instalaciones/puerto-de-valencia/.

28. **Ajuntament de València.** Geographic Situation - Map of the city. *Valencia City Council Website.* [Online] https://www.valencia.es/cas/la-ciudad/situacion-geografica.

29. **CSP Iberian Valencia Terminal SAU.** CSP Iberian Valencia. *CSP Iberian Valencia Terminal SAU Website.* [Online] https://cspspain.com/en/valencia.

30. **MSC Terminal Valencia.** infrastructures. *MSC Terminal Valencia Website.* [Online] https://www.msctv.es/sobre-nosotros/infraestructuras/.

31. **Port Equipment Manufacturers Association (PEMA).** *PEMA Information Paper; OCR in Ports and Terminals.* 2013.

32. **Port Authority of Valencia.** Access. *VALENCIAPORT Website.* [Online] https://www.valenciaport.com/comunidad/valencia/accesos/.

33. **APM Terminals.** Operating Hours & Holidays. *APM Terminals Valencia Website.* [Online] https://www.apmterminals.com/en/valencia/practical-information/operating-hours.

34. **MSC Terminal Valencia. Muelle MSC.** Services. *MSC Terminal valencia Website.* [Online] https://www.msctv.es/en/services/.

35. **Port Authority of Valencia.** ValenciaportPCS. *VALENCIAPORT Port Community System Website.* [Online] https://www.valenciaportpcs.com/valenciaportpcs/por-que-valenciaportpcs/.

36. **Agencia Estatal Boletin Oficial del Estado.** Legislación consolidada – Ley 15/2009, de 11 de noviembre, del contrato de transporte terrestre de mercancías – Artículo 22. Paralizaciones. [Online] boe.es/buscar/act.php?id=BOE-A-2009-18004&p=20091112&tn=1#a22.

37. **Port of Rotterdam Authority.** Annual Reports - Annual Report highlights 2017. *Port of Rotterdam Website.* [Online] 2017. https://www.portofrotterdam.com/en/about-port-authority/finance/annual-reports.

38. —. Facts and Figures. *Port of Rotterdam Website.* [Online] https://www.portofrotterdam.com/en/experience-online/facts-and-figures.

39. —. Terminals - Map of terminals and depots in the port of Rotterdam. *Port of Rotterdam Website.* [Online] https://www.portofrotterdam.com/en/logistics/storage-and-transhipment/terminals.

40. **APM Terminals.** Portbase Appointments. *APM Terminals Rotterdam Maasvlakte II Website.* [Online] https://www.apmterminals.com/en/maasvlakte/practical-information/online-services.

41. **Port of Rotterdam Authority.** Road Transport. *Port of Rotterdam Website.* [Online] https://www.portofrotterdam.com/en/logistics/connections/intermodal-transportation/road-transport.

42. **PortShuttle Rotterdam.** Container Exchange by Rail. *Port Shuttle Website.* [Online] https://portshuttle-rotterdam.com/en/container-exchange-by-rail/.

43. **Lakshmi, Shailaja A.** Rotterdam Port Trials New App on Berths. *Maritime Logistics Professional.* 2019.

44. **Portbase.** Benefits. *Portbase Website.* [Online] https://www.portbase.com/en/port-community-system/benefits/.

45. **Port of Antwerp.** Public map of the port. *Port of Antwrp Website.* [Online] https://www.portofantwerp.com/en/publications/brochures-maps/public-map-port-large.

46. —. Yearbook of Statistics 2021. *Port of Antwerp Website.* [Online] https://www.portofantwerp.com/en/publications/statistics/yearbook-statistics-2021.

47. —. Mobility. *Sustainability Trend Report Website.* [Online] 2020. https://www.oursustainableport.com/en/indicators/mobility.

48. —. Rail transport for goods. *Port of Antwerp Website.* [Online] https://www.portofantwerp.com/en/rail-transport-0.

49. —. Certified Pick up. *Port of Antwerp Website.* [Online] https://www.portofantwerp.com/en/certified-pick.

50. **NxtPort.** Certified Pick up. *NxtPort Website.* [Online] https://www.nxtport.com/documentation/certified-pick-up.

51. **Port of Antwerp.** What is C-point? *C-point Website.* [Online] https://www.c-point.be/en.

52. **Philippine Ports Authority.** Annual Report. *Philippine Ports Authority website.* [Online] 2020. [Cited: 6 April 2022.] https://www.ppa.com.ph/?q=annual-report.

53. —. Integrated Management System. *Philippine Ports Authority website.* [Online] 23 June 2017. [Cited: 6 April 2022.] https://www.ppa.com.ph/.

54. **International Container Terminal Services, Inc. ("ICTSI").** About MICT. *MICT Website.* [Online] [Cited: 8 April 2022.] https://www.mict.com.ph/.

55. **Google Earth.** Map Showing the Port of Manila and surrounds. [Online] 2018.

56. **Philippine Ports Authority.** Port Statistics. *Philippine Ports Authority website.* [Online] 2010-2020. [Cited: 8 April 2022.] https://www.ppa.com.ph/content/statistics-1.

57. **International Container Terminal Services, Inc. ("ICTSI").** Manila International Container Terminal. *ICTSI Website.* [Online] [Cited: 8 April 2022.] https://www.ictsi.com/what-we-do/our-terminals/manila-international-container-terminal.

58. —. ICTSI continues to invest in Manila flagship; More green upgrades rolled out. *MICT Website.* [Online] 8 December 2021. [Cited: 8 April 2022.] https://www.mict.com.ph/press-releases/ictsi-continues-invest-manila-flagship-more-green-upgrades-rolled-out.

59. **Asian Terminals Inc. (ATI).** SEC Filings; SEC Form 17-A (December 31, 2020) Annual Report. *ATI Website.* [Online] 14 May 2021. [Cited: 8 April 2022.] https://www.asianterminals.com.ph/ati_sec_disclosures.aspx.

60. —. Welcome to ATI. *ATI Website.* [Online] [Cited: 8 April 2022.] https://www.asianterminals.com.ph/.

61. —. Container Terminal Division (South Harbor). *ATI Website.* [Online] [Cited: 8 April 2022.] https://www.asianterminals.com.ph/ati_containerterminal.aspx.

62. —. 2020 Annual Report. *ATI Website.* [Online] [Cited: 8 April 2022.] https://www.asianterminals.com.ph/ati_investorrelations_annualreport.aspx.

63. **Laguna Gateway Inland Container Terminal (LGICT).** Laguna Gateway Inland Container Terminal. *LGICT website.* [Online] [Cited: 4 May 2022.] https://www.lgict.com.ph/.

64. **Metropolitan Manila Development Authority (MMDA).** Metro Manila traffic & Transport System Declaration. *MMDA website.* [Online] 3 December 2010. [Cited: 19 April 2022.] https://mmda.gov.ph/legal-matters.html.

65. —. MMDA Special Traffic Committee Resolution No. 13-01. *MMDA website.* [Online] 7 JanurRY 2013. [Cited: 19 April 2022.] https://mmda.gov.ph/12-legal-matters/1374-special-traffic-committee-resolutions.html.

66. —. MMDA Special Traffic Committee Resolution No. 13-02. *MMDA website.* [Online] January 2013. [Cited: 19 April 2022.] https://mmda.gov.ph/12-legal-matters/1374-special-traffic-committee-resolutions.html.

67. —. MMDA Special Traffic Committee Resolution No. 13-04. *MMDA website.* [Online] 13 December 2013. [Cited: 19 April 2022.] https://mmda.gov.ph/12-legal-matters/1374-special-traffic-committee-resolutions.html.

68. —. MMDA Special Traffic Committee Resolution No. 14-01. *MMDA website.* [Online] 13 May 2014. [Cited: 27 April 2022.] https://mmda.gov.ph/12-legal-matters/1374-special-traffic-committee-resolutions.html.

69. —. MMDA Special Traffic Committee Resolution No. 14-02. *MMDA website.* [Online] 9 June 2014. [Cited: 19 April 2022.] https://mmda.gov.ph/12-legal-matters/1374-special-traffic-committee-resolutions.html.

70. —. MMDA Special Traffic Committee Resolution No. 14-07. *MMDA website*. [Online] 5 September 2014. [Cited: 27 April 2022.] https://mmda.gov.ph/12-legal-matters/1374-special-traffic-committee-resolutions.html.

71. —. MMDA Special Traffic Committee Resolution No. 16-01. *MMDA website*. [Online] 13 January 2016. [Cited: 27 April 2022.] https://mmda.gov.ph/12-legal-matters/1374-special-traffic-committee-resolutions.html.

72. **Philippine Ports Authority.** Port News NO. 84. [Online] January - March 2016. [Cited: 6 April 2022.] https://www.ppa.com.ph/port-news.

73. **Asian Terminals Inc. (ATI).** Corporate Milestones. *ATI Website*. [Online] [Cited: 8 April 2022.] https://www.asianterminals.com.ph/ati_milestones.aspx#.

74. —. 2019 Annual Report. *ATI Website*. [Online] [Cited: 8 April 2022.] https://www.asianterminals.com.ph/ati_investorrelations_annualreport.aspx.

75. **Philippine Ports Authority.** PPA Admistrative Order NO 06-2018, Terminal Appointment Booking System (TABS). *Philippine Ports Authority website*. [Online] 8 May 2018. [Cited: 6 April 2022.] https://www.ppa.com.ph/?q=issuances.

76. **1-Stop Connections PTY LTD.** What is double transaction refund? *1-Stop online help website*. [Online] [Cited: 14 April 2022.] https://help.1-stop.biz/pages/viewpage.action?pageId=20119930.

77. **International Container Terminal Services, Inc. ("ICTSI").** 2021 MCT Advisories; Advisory NO. 2021-1578 TABS slot reservation activation system starts today. *MICT Website*. [Online] 4 October 2021. [Cited: 8 April 2022.] https://www.mict.com.ph/mictadvisories.

78. —. 2021 MICT Advisories; Advisory NO. 2021-1624 12-Hour TABS Booking Validity. *MICT Website*. [Online] 2021 October 2021. [Cited: 8 April 2022.] https://www.mict.com.ph/mictadvisories.

79. **Asian Terminals Inc. (ATI) .** TABS User's Guide & FAQs. *ATI Website*. [Online] [Cited: 8 April 2022.] https://www.asianterminals.com.ph/index.aspx.

80. **1-Stop Connections PTY LTD.** FAQ. *1-Stop online help website*. [Online] [Cited: 14 April 2022.] https://help.1-stop.biz/display/VBSE2/FAQ.

81. —. The Points Payment System. *1-Stop online help website*. [Online] [Cited: 14 April 2022.] https://help.1-stop.biz/display/VBSE2/The+Points+Payment+System.

82. —. How Points are used for booking system transactions. *1-Stop online help website*. [Online] [Cited: 14 April 2022.] https://help.1-stop.biz/display/VBSE2/How+Points+are+used+for+booking+system+transactions.

83. **International Container Terminal Services, Inc. ("ICTSI").** MICT EYES. *MICT Website*. [Online] [Cited: 8 April 2022.] https://www.mict.com.ph/mict-eyes.

84. **Philippine Ports Authority.** Port News NO. 83. [Online] October-December 2015. [Cited: 6 April 2022.] https://www.ppa.com.ph/port-news.

85. **Asian Terminals Inc. (ATI).** 2016 Annual Report. *ATI Website*. [Online] [Cited: 8 April 2022.] https://www.asianterminals.com.ph/ati_investorrelations_annualreport.aspx.

86. —. 2015 Annual Report. *ATI Website*. [Online] [Cited: 8 April 2022.] https://www.asianterminals.com.ph/ati_investorrelations_annualreport.aspx.

87. **Philippine Bureau of Customs.** Bureau of Customs Time Release Study. *Bereau of Customs website*. [Online] 2019. [Cited: 6 April 2022.] https://customs.gov.ph/boc_time_release_study/.

88. **Google Earth.** Map showing Australia and NZ. 2015.

89. **Port of Melbourne.** About the port. *Port of Melbourne Website*. [Online] https://www.portofmelbourne.com/about-us/about-the-port/.

90. **Google Earth.** Map showing Port of Melbourne. 2018.

91. **Bureau of Infrastructure and Transport Reseach Economics.** Waterline Statistical Report. Canberra : Australian Government. Vols. 52-67.

92. **Port of Melbourne.** *Port of Melbourne 2020 Container Logistics Chain Study*. 2021.

93. **Port of Melbourne (PoM).** *2050 Port Development Strategy*. 2020.

94. **DP World Australia.** National Terminal Carrier Access Terms and Conditions - Effective 1 July 2020. *DP World Australia Website*. [Online] 26 May 2020. customer.dpworld.com.au/caremore/login.

95. **Patrick Terminals.** National Terminal Access Terms & Conditions. *Patrick Terminals Website*. [Online] 11 October 2018. patrick.com.au/customer-info/general-terms-conditions-and-additional-documents.

96. **Victoria International Container Terminal (VICT).** VICT - Carrier Access Agreement Billing Terms and Conditions. *VICT Website*. [Online] 26 June 2019. vict.com.au/customer-and-user-information/terms-and-conditions/.

97. **DP World Australia.** Final notification DP World Melbourne - Ancillary Charges from 1 January 2022. *DP World Australia Website*. [Online] 1 November 2021. customer.dpworld.com.au/caremore/login.

98. **Patrick Terminals.** Vehicle Booking System (VBS) Fees March 2022. *Patrick Terminals Website*. [Online] 06 January 2022. patrick.com.au/customer-info/.

99. **Victoria International Container Terminal (VICT).** Vehicle Booking System (VBS) Charges. *VICT Website*. [Online] 01 November 2021. vict.com.au/customer-and-user-information/terminal-tariff-and-vbs-charges/.

100. —. Vehicle Booking System (Premium Slot Fee). *VICT Website*. [Online] 30 April 2021. vict.com.au/customer-and-user-information/terminal-tariff-and-vbs-charges.

101. **Victorian Transport Association (VTA).** VTA Priority Report Spring 2021-76. *VTA Website*. [Online] https://vta.com.au/info-center/media-release/priority-reports/.

102. **Victoria State Government Department of Transport.** Voluntary Perfromance Monitoring Framework Quarter 1 (January to March). *Department of Transport Website*. [Online] 2021. https://transport.vic.gov.au/ports-and-freight/commercial-ports/voluntary-port-performance-model/performance-indicator-dashboard.

103. —. Voluntary Pricing Protocol. *Department of transport Website*. [Online] 1 July 2020. https://transport.vic.gov.au/ports-and-freight/commercial-ports/voluntary-port-performance-model/voluntary-pricing-protocol-for-stevedore-landside-charges.

104. —. Voluntary Performance Monitoring Framework. *Department of transport Website*. [Online] 2021. https://transport.vic.gov.au/ports-and-freight/commercial-ports/voluntary-port-performance-model/performance-indicator-dashboard.

105. **Port of Melbourne Operations.** Port Rail transformation Project - Our Plan for Rail. *Port of Melbourne Website*. [Online] 2020. https://www.portofmelbourne.com/facilities-development/port-rail-transformation-project/.

106. **Australian Competition & Consumer Commission (ACCC).** *Containerstevedoring monitoring report 2020-21*. Canberra, ACT : Commonwealth of Australia, 2021.

107. **Bureau of Infrastructure and Transport Reseach Economics.** Waterline Statistical Report. Canberra : Australian Government, 2021. Vol. 67.

108. **Google Earth.** Map Showing Port of Fremantle. [Online] 2018.

109. **Government of Western Australian: Westport.** Issue 13: Future-proofing Perth's freight network. *Westport Website*. [Online] 27 August 2020. westport.wa.gov.au/updates/news/issue-13-future-proofing-perth-s-freight-network/.

110. **Fremantle Ports.** Landisde - Fremantle Port Container Movement Study. *Fremantle Ports Website*. [Online] 2017. https://www.fremantleports.com.au/landside.

111. **DP World Australia.** Final Notification DP World Fremantle - Ancillary Charges from 1 January 2022. *DP World Australia Website*. [Online] 30 November 2021. https://customer.dpworld.com.au/caremore/login.

112. **Patrick Terminals.** VBS Charges Fremantle March 2022. *Patrick terminals Website*. [Online] 07 March 2022. https://patrick.com.au/customer-info/.

113. **Fremantle Ports.** Vehicle Traffic Management Policy. *Fremantle Ports Website*. [Online] https://www.fremantleports.com.au/landside/road.

114. **Government of Western Australian: Westport.** Issue 8: Why Fremantle can't handle the long-term freight task alone. *Westport*. [Online] 19 August 2019. https://westport.wa.gov.au/updates/news/issue-8-why-fremantle-can-t-handle-the-long-term-freight-task-alone/.

115. **Port of Brisbane.** Master Plan 2018-2048. *Port of Brisbane Website*. [Online] 2018. https://www.portbris.com.au/property/masterplan/.

116. **DP World Australia.** Final notification DP World Brisbane – Ancillary Charges from 1 January 2022. *DP World Australia Website*. [Online] 1 January 2022. https://customer.dpworld.com.au/caremore/login.

117. **Patrick Terminals.** Vehicle Booking System (VBS) Fees Brisbane Effective 07 March 2022. *Patrick Terminals Website*. [Online] 6 January 2022. https://patrick.com.au/customer-info/.

118. **HutchisonPorts.** Brisbane Landside Services Tariffs Effective from 15th March 2021. *HutchisonPorts Website.* [Online] (https://hpaportal.com.au/HPAFI.

119. **Google Earth.** Map showing ort of Lyttelton. [Online] 2019.

120. **Lyttelton Port Company.** Annual Report. *Lyttelton Port Company website.* [Online] 2013-2021. http://www.lpc.co.nz/about-us/publications/.

121. **New Zealand Ministry of Transport.** "Freight and logistics: Containers. *Ministry of Transport Website.* [Online] 2013-2020. https://www.transport.govt.nz/statistics-and-insights/freight-and-logistics/sheet/figs-containers.

122. **Lyttelton Port Company.** New Container Charges from January 2021. *Lyttelton Port Company Website.* [Online] 5 October 2020. https://www.lpc.co.nz/customer-portal/pricing-conditions/.

123. —. News - LPC's commitment to working with Port users. *Lyttelton Port Company Website.* [Online] 30 October 2020. https://www.lpc.co.nz/lpcs-commitment-to-working-with-port-users-established/.

124. **Port of Tauranga.** Integrated annual Report 2021. *Port of Tauranga Website.* [Online] https://www.port-tauranga.co.nz/investors/financial-information/download-annual-report/.

125. **Google Earth.** Map showing Port of Tauranga. [Online] 2016.

126. **Port of Tauranga.** Port Trade and Statistical Information. *Port of Tauranga Website.* [Online] 2021. https://www.port-tauranga.co.nz/news-and-media/archive/.

127. —. Principal Tariff: Effective 1 July 2021 – 30 June 2022. *Port of Tauranga Website.* [Online] https://www.port-tauranga.co.nz/cargo-and-shipping/tariffs-terms/.

128. —. Integrated Annual Report. *Port of Tauranga Website.* [Online] 2019. https://www.port-tauranga.co.nz/investors/financial-information/download-previous-annual-reports/.

129. —. Truck Turn Time Tauranga at 21 February 2022 at 21:29:07. *Port of Tauranga Website.* [Online] https://www.port-tauranga.co.nz/tauranga-container-terminal/truck-turn-time-tga/.

130. **Sunlive.** Port of Tauranga's container conundrum. 14 December 2020.

131. **Google Earth.** Map Showing Port of Auckland. 2019.

132. **Port of Auckland Ltd.** Annual Report. *Port of Auckland Website.* [Online] 2012, 2017, 2021. https://www.poal.co.nz/media/reviews.

133. —. Road, Rail and Pack/Unpack. *Port of Auckland Website.* [Online] https://www.poal.co.nz/our-story/our-operations/road-rail.

134. —. Freight Hubs. *Port of Auckland website.* [Online] https://www.poal.co.nz/our-story/our-operations/freight-hubs.

135. —. Ports of Auckland VBS Replacement – Update. *Port of Auckland Website.* [Online] 16 June 2021. https://www.poal.co.nz/media-publications/Pages/Ports-of-Auckland-VBS-Replacement-%E2%80%93-Update.aspx.

136. —. Price schedules – Receival and delivery, effective 1 January 2022. *Port of Auckland Website*. [Online] https://www.poal.co.nz/ops-information/Pages/price-schedules.aspx#ReceivalandDelivery.

137. **Kundu, Ankur.** Auckland Port congestion, the big challenge for New Zealand. *Container News*. [Online] 2 August 2021. https://container-news.com/auckland-port-congestion-the-big-challenge-ahead-for-new-zealand/.

138. **Port of Auckland Ltd.** Annual Report. *Port of Auckland Website*. [Online] 2021. https://www.poal.co.nz/media/reviews.

139. **1-Stop Connections.** How to do an Advanced Booking. *1-Stop online help website*. [Online] https://help.1-stop.biz/display/VBSE2/How+to+do+an+Advanced+Booking.

Appendix A
Advanced Booking

Advanced Booking

There is a significant difference in yard arrangement and the collection of containers between a traditional terminal (e.g. using straddle carriers) and a module (e.g. ASC based) based terminal.

- With a traditional terminal the equipment (e.g. straddle) can retrieve a container from any yard position. Due to this flexibility the carrier can book slots at the terminal based on preferred zones rather than the specific container. Slots can be booked without a container attached initially or the container on the booking can be swapped based on availability. This can allow the carrier to book slots for impending imports based on the expectation that they will be ready for collection, and if the schedule changes an alternative container may be put into the slot. The disadvantage of this system is that carriers may end up with more slots booked than they have containers to pick up, and therefore slots are left unused.
- In an ASC terminal and an RTG terminal the cranes can only pick up from a specific module and deliver to the lanes associated with that module. Slots are therefore booked for a specific module, and the container to be picked up must be within that specific module. This means carriers cannot book slots until they know where a container has been placed. They also cannot swap containers between slots that are in different modules.

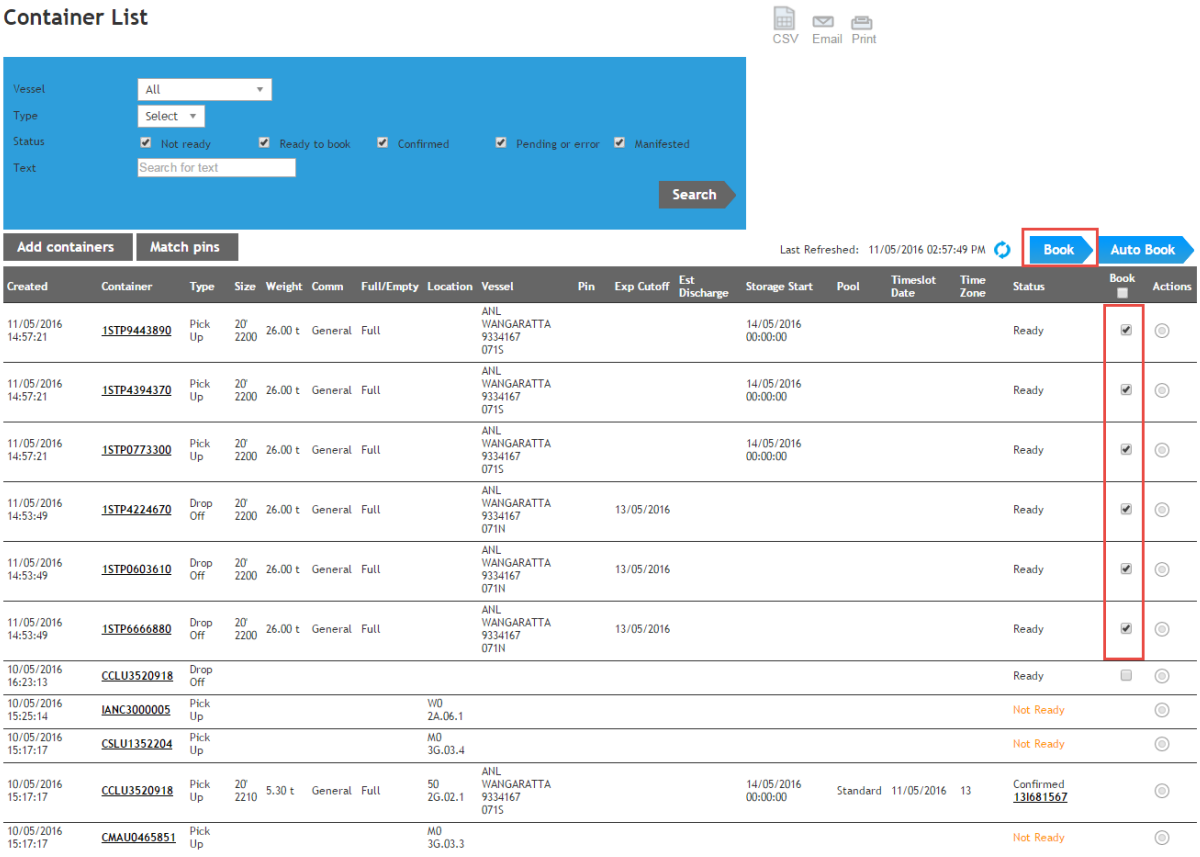
1-Stop offers a method of booking slots called Advanced Booking. The system is understood to be originally designed for ASC operations, where the module a container is placed in is only confirmed once it is landed. In the Advanced Booking system, the container must be landed in the yard before it can be booked for pick-up. In preparation for the container landing:

- The carrier can upload a list of upcoming import and export containers to the Advanced Booking portal. The carrier can then monitor the status of the import containers at the terminal (e.g. expected time to be landed, if a container has been landed, which module a landed container is placed in).
- The carrier can attach additional information to the container such as a group code. This can be useful if some containers are all going to the same destination or need to be collected first.
- The terminal can see the information uploaded by the carrier and use this to try and keep containers which have been grouped together, to allow loading from a single module
- The terminal can submit the estimated time of discharge for containers to the VBS. For registered containers this information will appear in the carrier's container list, indicating when they will likely be able to book the container to a slot.

When the containers are ready (landed in the yard) the carrier can book the container in Advanced Booking directly to an available slot. Available import and export slots are displayed sorted by date and then zone. Depending on slot availability the carrier can choose to pick up multiple containers within a single module at the same time, potentially paired with dropping off containers to maximise productivity.

A potential disadvantage of this system in a busy container terminal is that once containers land, it may be some time before a new slot is available, as containers which have been discharged earlier will have taken the more immediate slots. This can create additional administration for transport operators if high priority containers become available closer to the allocated booking time.

Figure A-1 and Figure A-2 are examples of the Advanced Booking system from 1-Stop.



Container List

CSV Email Print

Vessel: All
Type: Select
Status: Not ready, Ready to book, Confirmed, Pending or error, Manifested
Text: Search for text
Search

Add containers | Match pins

Last Refreshed: 11/05/2016 02:57:49 PM | Book | Auto Book

Created	Container	Type	Size	Weight	Comm	Full/Empty	Location	Vessel	Pin	Exp Cutoff	Est Discharge	Storage Start	Pool	Timeslot Date	Time Zone	Status	Book	Actions
11/05/2016 14:57:21	1STP9443890	Pick Up	20' 2200	26.00 t	General	Full		ANL WANGARATTA 9334167 071S				14/05/2016 00:00:00				Ready	☑	
11/05/2016 14:57:21	1STP4394370	Pick Up	20' 2200	26.00 t	General	Full		ANL WANGARATTA 9334167 071S				14/05/2016 00:00:00				Ready	☑	
11/05/2016 14:57:21	1STP0773300	Pick Up	20' 2200	26.00 t	General	Full		ANL WANGARATTA 9334167 071S				14/05/2016 00:00:00				Ready	☑	
11/05/2016 14:53:49	1STP4224670	Drop Off	20' 2200	26.00 t	General	Full		ANL WANGARATTA 9334167 071N		13/05/2016						Ready	☑	
11/05/2016 14:53:49	1STP0603610	Drop Off	20' 2200	26.00 t	General	Full		ANL WANGARATTA 9334167 071N		13/05/2016						Ready	☑	
11/05/2016 14:53:49	1STP6666880	Drop Off	20' 2200	26.00 t	General	Full		ANL WANGARATTA 9334167 071N		13/05/2016						Ready	☑	
10/05/2016 16:23:13	CCLU3520918	Drop Off														Ready	☐	
10/05/2016 15:25:14	IANC3000005	Pick Up					W0 2A.06.1									Not Ready		
10/05/2016 15:17:17	CSLU1352204	Pick Up					M0 3G.03.4									Not Ready		
10/05/2016 15:17:17	CCLU3520918	Pick Up	20' 2210	5.30 t	General	Full	50 2G.02.1	ANL WANGARATTA 9334167 071S				14/05/2016 00:00:00	Standard	11/05/2016	13	Confirmed 131681567		
10/05/2016 15:17:17	CMAU0465851	Pick Up					M0 3G.03.3									Not Ready		

Figure A-1 PoM; 1-Stop Advanced booking; Container list view showing container details and status (139)

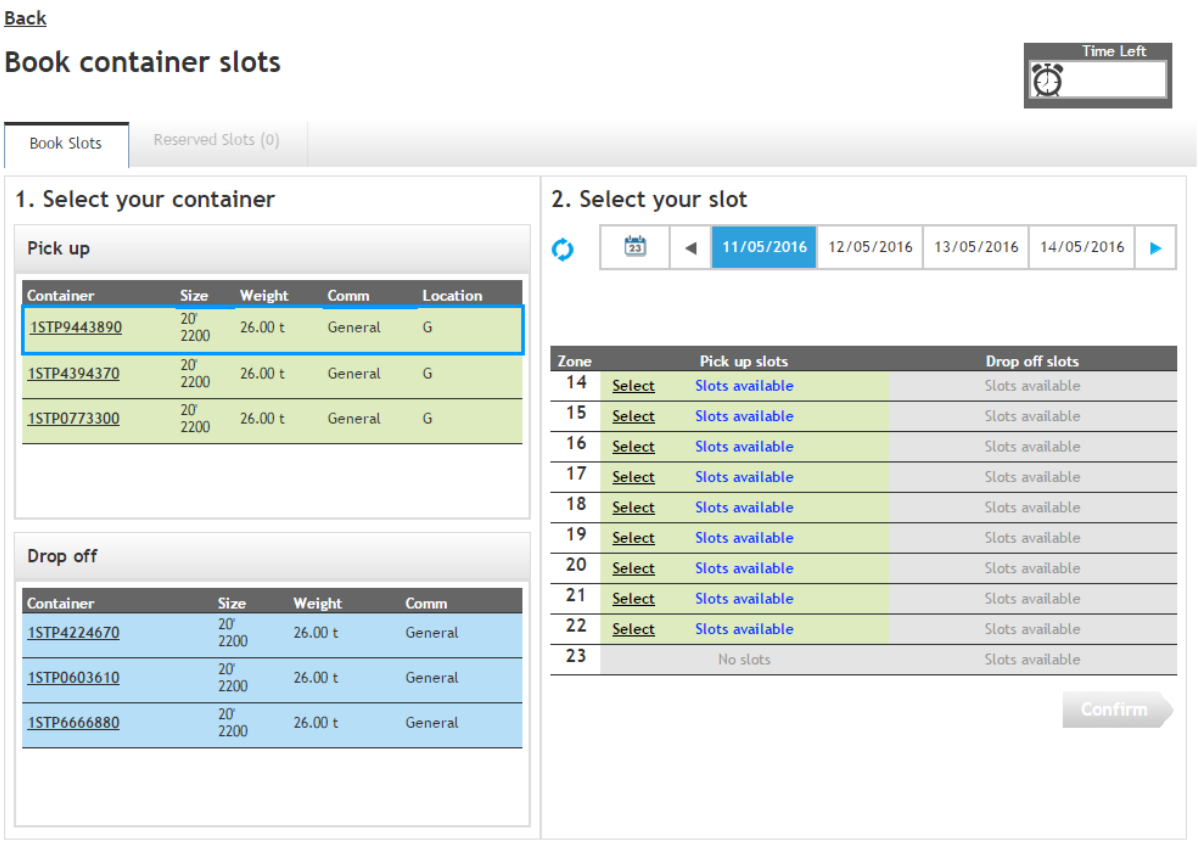


Figure A-2 PoM; 1-Stop Advanced booking; Container booking view showing available zones and container locations (139)